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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Caralluma edulis,
Chang, pipu, ittu.
ASCLEPIADACEÆ.
F. B. I. iv. 76.
The Plains, Rawalpindi, Multan.

small, fleshy, branched or not, stem and branches 4-grooved, nearly round, sometimes leafless; leaves ½ in. long, soon falling off, ovoid-lanceolate, short-pointed, fleshy; flowers ¼ in. diam., solitary or in pairs in the upper lobes 5, short-pointed, corolla small, shaped, lobes 5, narrow, ovate enlarged, coronal scales in a ring staminal column, 5-lobed, lobes with process on the inner face which overlaps the anthers, staminal column very short, anthers short, with a shallow notch at a rounded apex, resting on, or joined to the stigma, stigma flat; follicles slender, smooth, round, seeds crowned with a bunch of hairs. This plant is eaten by the poor as a vegetable.

BOOK NO.
1186

Exacum tetragonum,
Titakhana, ava chiretta.
GENTIANACEÆ.
F. B. I. iv. 95.
The Plains to 5,000 ft.

medium size to large, stem square, little branched below; leaves 5 by 1½ in., short-pointed, or 1½ by ⅔ in., nearly blunt, 5-nerved, sessile of stem clasping, broadly lanceolate; flowers blue, 1½ in. diam., in terminal branching racemes, calyx deeply 4-lobed, lobes ½-⅔ in. long, ovate, long-pointed, keeled, or sometimes hardly 3-winged, corolla wheel-shaped, lobes 4, ¾ in. long, oblong, short-pointed, stamens 4, on the corolla tube, anthers ¼ in., straight, style ½ in. long, thread-like, stigma round; capsule ⅓ in. diam., nearly round, seeds very many, minute. This plant is used by Indians as a tonic bitter in place of Chiretta.

Exacum pedunculatum,
GENTIANACEÆ.
F. B. I. iv. 97.
The Plains to 3,000 ft.

small, stem square, much branched; leaves 1⅛ by ⅓ in., oblong with rounded ends or lanceolate, 3-nerved, nearly sessile; flowers ⅔ in. diam., blue in many-flowered terminal rigid stalked clusters on main stalks ½-1½ in. long, calyx lobes 4, ⅛-¼ in. long, ovate, long pointed, wing distinct lanceolate, corolla wheel-shaped, lobes 4, ⅛-⅓ in. long, oblong with rounded ends, stamens 4, anthers ⅛ in., style long stigma nearly round; capsule ⅛ in., nearly round,

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

valves 2, seeds very many, minute. This plant is used by Indians as a bitter tonic in place of gentian.

Hoppea dichotoma,
GENTIANACEÆ.
C. B. I. iv. 100.
The Plains to 3,000 ft.

very small, annual, smooth, stem square, much branched; leaves ¼ in. long, ovate, sessile; flowers $\frac{1}{12}$ in. white in sessile 2-3 flowered dense or loose clusters, calyx ¼ in., bell-shaped, lobes 4, ovate, long-pointed, thin, green marginal nerve, corolla bulging on one side, shorter than the calyx, tube $\frac{1}{20}$ in., lobes short, triangular, stamens 4, 1 perfect, 3 barren, in the throat of the corolla, style short, stigma hardly divided, capsule nearly round, very small, seeds very many, minute, nearly black.

Enicostema littorale,
Chota kirayata.
GENTIANACEÆ.
F. B. I. iv. 101.
The Plains to 1,500 ft.

small, annual, smooth, stem round or square, branched, spaces between leaves short; leaves 2 by ½ in., or smaller and nearly linear, ovate-lanceolate, sessile; flowers ⅛ in. long, white or bluish in sessile axillary clusters, calyx $\frac{1}{10}$ in., deeply divided into 5 lobes, which are narrowly oblong and blunt, corolla funnel-shaped, tubular, tube ⅛ in., lobes 5, $\frac{1}{10}$ in., spreading, oblong with rounded end, stamens 5, in the upper part of corolla tube, scales at the base, anthers oblong, short-pointed, within the tube, style short, linear, stigma round; capsule ⅛-¼ in., oblong with rounded ends, seeds many, nearly round, larger than those of the last species. This plant is bitter and used in place of quinine or chiretta.

Erythræa ramosissima,
GENTIANACEÆ.
F. B. I. iv. 101.
The Plains, 1-2,000 ft.
Ludhiana, Hoshiarpur (Thomson).
Baluchistan (C. B. Clarke).

small, branched, very leafy; leaves 1½ by ⅔ in. sessile, stem leaves oblong, short-pointed or with rounded ends; flowers ¼ in., pink in sessile bracteate clustrers, calyx ¼ in., tubular, teeth 5, lanceolate or linear, with a prominent ridge, equal to the corolla tube, corolla tube ¼ in., lobes 5, spreading, stamens 5, near the mouth of the corolla tube, short, linear, style linear, stigmas oblong; capsule ⅓ in., oblong, nearly 2-celled, seeds very small.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Erythræa Roxburghii, see Herbs, Unbranched, Simple, Entire.

Erythræa Meyeri, see Herbs, Unbranched, Simple, Entire.

Erythræa babylonica,
GENTIANACEÆ.
F. B. I. iv. 102.
The Plains.
Lahore.
Rawalpindi (Dovie).

small, stem unbranched below, square with sharp angles; leaves ½-½ in., radical leaves 2, none when in flower, stem leaves oblong, distant from one another; flowers ⅛ in., pink, nearly sessile in equally branching clusters, calyx ½ in., nearly as long as the corolla tube; otherwise like *Erythræa ramosissima*. Dovie notes that the pedicels and calyx are longer in the Rawalpindi specimens.

Canscora diffusa,
GENTIANACEÆ.
F. B. I. iv. 103.
The Plains to 4,000 ft.

small to medium size, annual, stem square, densely branched above; leaves 1½ by ½ in., 3-nerved, often stalked, lower leaves lanceolate or oblong with a rounded end, upper passing into ovate, short-pointed, sessile, thin bracts; flowers ½ in., pink on slender, zigzag stems in loosely spreading leafy terminal clusters, bracts ½ in., leaflike, a few uppermost linear, calyx ⅛ in., tubular, 4-toothed, round, keeled, teeth lanceolate-linear, corolla tube ⅛ in., cylindric, lobes 4, ⅛ in., long, nearly 2-lipped, stamens 4, one larger perfect on the corolla throat, 3 smaller lower down, style linear, stigmas 2, short; capsule ⅛ in. oblong, seeds minute, dark-brown, many-sided.

Canscora decussata,
Sankkapuli.
GENTIANACEÆ.
F. B. I. iv. 104.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

small to medium size, annual, stems square, the angles winged; leaves 1½ by ½ in., sessile, oblong-lanceolate, 3-nerved; flowers ⅛ in., white on stalks in the forks of erect winged branches of clusters, calyx ⅛-⅛ in., with narrowly lanceolate wings, corolla tube equal to the calyx in length, lobes ⅛ in., ovate, with broad blunt tips, otherwise like the last species but the capsule and seeds much larger. This plant and the preceding are used as laxatives and nerve tonics by Indians.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Gentiana Moorcroftiana,
GENTIANACEÆ.
F. B. I. iv. 108.
Himalaya, 8-12,000 ft.
Kashmir, Lahoul.

small, nearly smooth, stem with 4 lines running down it, branched; leaves 1 by $\frac{1}{2}$ in., oblong-pointed or with the ends rounded, narrow below, bases sometimes joined; flowers $\frac{1}{2}$-1 in., blue in nearly terminal racemes, calyx tubular, tube $\frac{1}{10}$ in., lobes 4-5, linear $\frac{1}{3}$ in., corolla tubular, funnel-shaped, mouth $\frac{1}{3}$ in. diam., lobes 4-5, stamens 4-5, within the tube, style short or none, stigmas 2; capsule $\frac{2}{3}$ in., lanceolate, dividing into 2, seeds very many, small, yellow-brown. All the gentians are bitter stomachic tonics and are used by the natives of India.

Gentiana tenella,
Tita.
GENTIANACEÆ.
F. B. I. iv. 109.
Kashmir, 10-14,000 ft.

small, sometimes straggling, stem with 4 lines, branched; leaves $\frac{1}{2}$ by $\frac{1}{4}$ in., oblong or ovate, lowest broad at the tip narrowed to the stalk; flowers bluish, $\frac{1}{2}$ in. diam. on terminal solitary stalks 1-3$\frac{1}{2}$ in. long, calyx-tube barely any, lobes 5, $\frac{1}{3}$ by $\frac{1}{10}$ in. oblong with the end rounded, unequal, corolla tubular, tube $\frac{1}{2}$ by $\frac{1}{8}$ in., lobes $\frac{1}{3}$ in., oblong with the end rounded; capsule $\frac{2}{3}$ in., oblong-linear, sessile; otherwise like the last species.

Gentiana aquatica,
GENTIANACEÆ.
F. B. I. iv. 110.
Kashmir, 13-16,000 ft.

small, branches many from the base, little divided, leaves $\frac{1}{4}$-$\frac{1}{3}$ in., stem leaves $\frac{1}{3}$ in. ovate or with a broad tip, margins turned in, usually blunt, with a bristle on the tip; flowers blue $\frac{4}{10}$ in. on solitary terminal stalks $\frac{1}{8}$-$\frac{1}{3}$ in. long, calyx $\frac{1}{4}$-$\frac{1}{3}$ in., lobes 5, in., lanceolate, short-pointed, smooth, margins even, erect, corolla tube hardly longer than the calyx, lobes 5, short, with folds, bifid between the lobes; capsule $\frac{1}{3}$ by $\frac{1}{8}$-$\frac{1}{6}$ in., short ovoid with broad top, flattened, stalk $\frac{2}{3}$ in. long, capsule projecting beyond the calyx, seeds 3-angled, not much longer than broad; otherwise like the last species.

HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Gentiana quadrifaria,
GENTIANACEÆ.
F. B. I. iv. 111.
Himalaya, 3-10,000 ft.
Simla, Matiana (Collett).
Kashmir.

small, annual or biennial, branching from the base, stems many; leaves green, radical leaves persistent, rosulate, ½-1½ ins., ovate or lanceolate, stem leaves ¼-½ in., leathery; flowers ½ in. long, blue in terminal, 3-5 flowered stalked clusters, calyx shorter than the corolla tube, teeth 5, lanceolate, rigid, often irregularly toothed, corolla ¼-½ in., lobes 5, with small bifid folds between, stamens and style as in *G. Moorcroftiana*, capsule ⅛ by ⅛-¼ in., ovoid, nearly projecting from the calyx; seeds many, small, smooth, 3-angled.

Gentiana decemfida,
GENTIANACEÆ.
F. B. I. iv. 112.
The Plains from 1-3,000 ft.
Sutlej Valley, Sufi (Collett).
Hoshiarpur.

small, annual, branches ascending; leaves silvery shining, radical leaves 1 by ¼ in., nearly sessile, ovate with an abrupt bristle point, stem leaves ¼-½ in., stiff uppermost lanceolate; flowers ½ in. long, blue in lateral and terminal shortly stalked clusters, calyx ⅓ in., lobes 5, ⅛ in., narrowly lanceolate, glistening, corolla ½ in., hardly longer than the calyx, lobes 5, folds bifid stamens and styles as in the last species; capsule ⅛, by ⅛ by ⅛ in., shortly oblong with rounded ends, enclosed in the calyx, stalk ¼ in., seeds many, very small, oblong with the ends rounded and barely 3-angled.

Gentiana argentea,
GENTIANACEÆ.
F. B. I. iv. 112.
Himalaya, 7-12,000 ft.
Simla (Collett).
Murree (Douie).

small, annual, almost exactly like the last species but the leaves are more silvery and the uppermost leaves surround the flowers which are closely clustered almost into a head.

Gentiana capitata,
GENTIANACEÆ.
F. B. I. iv. 113.
Himalaya, 4-12,000 ft.
Simla (Collett).

small, annual, stems branched or not, bared of leaves below; leaves ⅛ by ¼-⅓ in., green, broadly ovate with a broad tip, thick, shining with a bristle at the tip, flowers blue or white, sessile, ¼ in. long, clustered in leafy heads ½-⅔ in. diam., calyx ¼ in., lobes ⅛ in., 5, oblong, short-pointed, edges thin, corolla ½-¾ in., lobes 5, folds with a notch at the tip,

HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

stamens and style as in the last species; capsule $\frac{1}{6}$ in. long and broad, round, flattened; stalk $\frac{1}{6}$ in., nearly enclosed in the calyx, seeds many, very small, oblong, with rounded ends, nearly twice as long as broad, smooth, 3-angled.

Gentiana carinata,
GENTIANACEÆ.
F. B. I. iv. 113.
Himalaya, 8-12,000 ft.
Kashmir.

small, annual, stem branched, radical leaves $1\frac{3}{4}$ by $\frac{1}{3}$ in., persistent, oblong lanceolate, sessile, short-pointed, stem leaves similar, smaller, curved, flowers nearly sessile, lateral and terminal, clustered, calyx tube $\frac{1}{4}$ in., lobes 5, $\frac{1}{6}$ in., shorter than the tube, lanceolate, long-pointed, erect, corolla $\frac{1}{2}$ by $\frac{1}{6}$ in., tubular fringed, lobes 5, folds bifid, stamens and style as in the last species; capsule $\frac{1}{3}$ by $\frac{1}{8}$ in., oblong with rounded ends, flattened, seeds many, small oblong with rounded ends, nearly 3-angled, smooth.

Gentiana cachemirica,
GENTIANACEÆ.
F. B. I. iv. 115.
Himalaya, 9-12,000 ft.
Kashmir.

small, annual, branches often long, leafy and numerous from the root, radical leaves 1 by $\frac{1}{3}$ in., ovate oblong broader at the tip, short-pointed with a bristle at the point, stem leaves $\frac{1}{3}$-$\frac{2}{3}$ in.; flowers 1-$1\frac{1}{2}$ in. blue, solitary, sessile, calyx tube $\frac{1}{3}$ in., bell-shaped, lobes 5, $\frac{1}{4}$ in., oblong with a broad tip, a broad space between the lobes, corolla 1-$1\frac{1}{2}$ in., tubular with a bell-mouth, lobes 5, $\frac{1}{3}$ in. ovate, short-pointed, erect, folds between the lobes, stamens and styles as in last species; capsule $\frac{1}{3}$ by $\frac{1}{6}$ in., seeds many, small, round, glistening, white.

Gentiana venusta, see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Gentiana nubigena, see Herbs, Unbranched, Simple, Entire.

Gentiana Kurroo, see Herbs, Unbranched, Simple, Entire.

HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Gentiana detonsa,
GENTIANACEÆ.
F. B. I. iv. 118.
Kashmir, 9-15,000 ft.

medium size, much branched, leaves 1½ by ¼ in., oblong linear, much apart, hardly joined at the base; flowers ¾-1¼ in. long, scattered on small stalks in clusters on main stalks 1-8 in. long on branches, calyx tube ½ in., cylindrical, funnel-shaped, lobes 4, ½ in., 2 lobes ovate-lanceolate, 2 lanceolate, corolla tube 1 by ⅛ in., lobes 4, ⅜ in., fringed or toothed, stamens and style as in the last species; capsule ¾ by ⅛ in., stalk ½ in., seeds nearly oblong, minutely scaly and netted.

Gentiana contorta
GENTIANACEÆ.
F. B. I. iv. 118.
Himalaya, 5-8,000 ft.
Simla, Summer Hill (Collett).

small, annual, branching, leaves 1 by ⅛ in., ovate, stems 2-7 flowered; flowers blue, 1-1½ in. long on stalks, ½-¾ in. in racemes, calyx tube ⅛ in., cylindrical, funnel-shaped at the mouth, lobes 4, ⅛ in. ovate, short-pointed, unequal, corolla tube ¾ in. with 4 large oblong glands within near the base, lobes 4, ⅛ in., stamens and style as in the last species; capsule ½ by ⅛ in., stalk ⅛ in. oblong, seeds many, minute, nearly round, finely netted.

Jaeschkea gentianoides,
GENTIANACEÆ.
F. B. I. iv. 119.
Himalaya, Kashmir, 8-13,000 ft.

medium size, stiff, slender, slightly grooved; leaves 1½ by ¼ in., narrowly lanceolate, sessile, bases shortly united; flowers ½-¾ in., blue, many, in branching racemes, calyx lobes 5, ¼ by $\frac{1}{10}$ in., lanceolate, short-pointed, nearly 3-striate, corolla ⅛ enlarging to ½ in., tubular, with a tendency to lateral bulging lobes 5, short, triangular-lanceolate, in fruit ⅛ by ⅛ in., stamens 5, on the bulge in the corolla tube, anthers blue or greenish, style linear-short, stigma 2-lobed; capsule ½ in., oblong, with the ends rounded, flattened, very shortly stalked, seeds 10-30, $\frac{1}{10}$ in., much larger than in the last 11 species.

Jaeschkea latisepela,
GENTIANACEÆ.
F. B. I. iv. 119.
Kashmir, 9-13,000 ft.

very like the last species, but with a thicker stem and broader leaves, sepals broader, even orbicular, and capsule sessile.

HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Pleurogyne carinthiaca,
GENTIANACEÆ.
F. B. I. iv. 119.
Himalaya, Kashmir,
10-13,000 ft.

small, annual, branching from the base, radical leaves 1 by ⅛ in., sometimes persistent, ovate, with a broad tip, stem leaves ½ by ⅛ in., ovate, narrowed at the base; flowers blue, ¾ in., on stalks ¼ by 2 in. long, calyx lobes 5, ¼-½ by ⅛ in. blunt or very short-pointed, corolla tube very short, lobes ⅛ by ¼ in., blue with green veins, fringed near the base, stamens 5, on corolla tube, filaments somewhat flattened, stigma sessile; capsule ½ in., oblong, short-pointed, sessile, carpels separating, seeds very many, small, nearly round, smooth.

Pleurogyne spathulata
GENTIANACEÆ.
F. B. I. iv. 119.
Kashmir, 13,000 ft.
Lahoul (A. Kerner).

very like the last species, but the radical leaves are longer, linear narrowing from the broad tip to the base, the stem leaves are longer and narrower, and the corolla lobes are longer.

Swertia purpurascens, Chiretta,
GENTIANACEÆ.
F. B. I. iv. 121.
Himalaya, 5-12,000 ft.
Kashmir, Dalhousie,
Dharamsala, Simla,
Mashobra (Collett).
Changlagalli,
Murree (Douie).

medium size, annual, stem rounded or with 4 ridges, branched; leaves 1½ by ½ in., oblong or lanceolate, 3-1-nerved, lowest leaves blunt, uppermost short-pointed, smooth, base narrowed; flowers ½ in. across, purple or dark-red, with a darker ring at the base of the corolla lobes, in branching leafy many flowered racemes, calyx-lobes barely united at the base, 5, ⅛ in., oblong, one-nerved, corolla wheel-shaped, lobes 5, ¼ in., ovate, short-pointed, turned back, one horse-shoe-shaped naked depression or gland at the base of each lobe, stamens 5, dilated below into a tube, not united to the corolla, anthers long-pointed, style long, stigmas 2, nearly linear; capsule sessile, oblong, dividing into two, seeds many, $\frac{1}{20}$ in. diam., round, smooth, light yellow. This plant is used as a substitute for true *chiretta*, see below.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Swertia paniculata,
GENTIANACEÆ.
F. B. I. iv. 122.
Kashmir,
Himalaya, 5-8,000 ft.
Simla, Mashobra (Collett).

very like the last species, but the corolla-lobes are white in the upper half with two purple spots at the base forming a ring with gaps, one depression at the base of each lobe, ovate, naked, stamens united to the corolla and not joined into a tube, capsule long-pointed, seeds smaller.

Swertia tetragona,
GENTIANACEÆ.
F. B. I. iv. 122.
Himalaya, 5-8,000 ft.
Kashmir, Simla, Mashobra (Collett).

very like the last species, but stem more square, corolla lobes white with two hairy oblong glands on each lobe, no style, two stigmas consisting of two closely placed half round plates.

Swertia cordata,
GENTIANACEÆ.
F. B. I. iv. 123.
Himalaya, 4-12,000 ft.
Simla, Mashobra (Collett).
Kuldana near Murree (Douie).

medium size, annual, stem 4-ridged; leaves $\frac{3}{4}$ by $\frac{3}{4}$ in., ovate, short-pointed, 5-3-nerved, base often heart-shaped, sessile; flowers $\frac{1}{2}$-$\frac{3}{4}$ in., yellowish-white, margin streaked with purple in many flowered branching racemes, calyx lobes $\frac{1}{3}$ by $\frac{1}{8}$ in., 5, ovate-lanceolate, short-pointed, barely united, corolla lobes 5, $\frac{1}{4}$-$\frac{1}{3}$ in. oblong, short-pointed or blunt, one large circular sticky naked yellowish spot at the base of each lobe, stamens 5, linear, hardly united at the base, style cylindric, stigmas 2 half round, capsule $\frac{1}{2}$ by $\frac{1}{10}$, often barely $\frac{1}{4}$ in., seeds $\frac{1}{15}$ in., nearly round, covered with raised rows of glands. In North Kashmir the flowers are often double.

Swertia chirata,
Chiretta,
Charayata.
GENTIANACEÆ.
F. B. I. iv. 124.
Himalaya, 4-10,000 ft.
Kashmir, Simla, Chadwick Falls, Mashobra, Matiana (Collett).
Jaku (Bomford).

medium size to large, annual, 4-ridged at the top, rounded below; leaves 2 by $\frac{3}{4}$ in., broadly lanceolate, lower often much larger and stalked, stem leaves nearly sessile, oblong, with rounded ends, short-pointed, 5-nerved; flowers bright green-yellow with purple nerves, nearly $\frac{3}{4}$ in. diameter, in large leafy many-flowered branching racemes, sessile or on short-clustered flower staiks, calyx lobes 4, $\frac{1}{2}$ in., lanceolate, distinctly united, corolla lobes 4, $\frac{1}{4}$ in.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

ovate, long-pointed, two glandular depressions at the base of each lobe with a fringe of long white or pink hairs, stamens 4, linear, ununited, style cylindric, stigmas 2, oblong; capsule ¼ in, and more, ovate, short-pointed, seeds $\frac{1}{50}$ in., many-angled, smooth. This plant is exported to the plains and to Europe to supply a bitter tonic, more appreciated in India than in England.

Swertia alata,
Chiretta, hatmul, bui.
GENTIANACEÆ.
F. B. I. iv. 125.
Himalaya, 4-6,000 ft.
Kashmir, Simla above Lalpani, Naldera (Collett).
Dharampur.
Brogh (Bomford).

medium size, stem winged, branching, 4-angled when not winged; leaves 1¾ by ⅔ in., ovate, short-pointed, 5-nerved, stem leaves nearly sessile; flowers ½ in. across, bright green-yellow with purple veins in large leafy many-flowered branching racemes, one slit-like gland on each lobe, fringed covering a minutely velvety margined glandular depression, in other points very like the last species.

Swertia angustifolia,
Pahari kiretta.
GENTIANACEÆ.
F. B. I. iv. 125.
Himalaya, 2-7,000 ft.
East of the Chenab.
Simla, Mashobra (Collett).
Dharampur (Bomford).

medium size, 4-ridged or 4-winged; leaves 2½ by ¼ in., linear-lanceolate, nearly 1-nerved, sessile, narrowed at the base, upper stem leaves barely stalked; flowers ½ in. across, white or pale blue with darker dots in many flowered branching racemes, calyx lobes 4, barely united, ½-⅔ in., oblong-linear, often longer than the corolla lobes sometimes shorter, corolla lobes ¼-½ in., 4, one large green circular naked depression partly covered by a scale, stamens 4, linear, anthers oblong, capsule ⅓ by ⅛ in., ovate, seeds $\frac{1}{50}$ in., many-angled glistening along the edges.

Swertia pulchella,
GENTIANACEÆ.
F. B. I. iv. 125.
Himalaya, 1-4,000 ft.
Kangra.

very like the last species, but leaves nearly 3-nerved, calyx lobes lanceolate much shorter than the corolla generally, corolla lobes ovate-lanceolate, the depression is smaller than in the last species.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Swertia speciosa, GENTIANACEÆ. F. B. I. iv. 128. Kashmir, Sonamerg, The Chor (Collett).

medium size to large, root stock perennial, stem annual, hollow, thick; radical leaves long stalked, stem leaves 5 by 2 in., ovate, 7-nerved, long-pointed, bases united, stem-clasping, tube at the base ½-½ in., flowers 1½ in. diam., bright grey in small branching narrow racemes on a short main stalk, calyx lobes 5, ½ by ⅛ in., ovate, short pointed, toothed, much overlapping at the base, corolla lobes 5, ¾ by ½ in., oblong with a broad tip narrowed to the base, long-pointed, two glandular depressions at the base on each lobe nearly united, long-fringed stamens 5, linear, flattened, anthers ovate small, stigmas 2, nearly sessile; capsule ⅔-¾ by ½ in., seeds ⅛ in. diam., smooth.

Swertia petiolata, GENTIANACEÆ. F. B. I. iv. 128. Kashmir, 9-12,000 ft. Gulmerg, Tragbol.

medium size to large, rootstock perennial, stem annual, thick; radical leaves long stalked, lower stem leaves 3½ by 1 in., oblong joined into a tube ½-1 in., stalk 2-3 in., leaves at the base of the branched raceme 1½ by ½ in., sessile, hardly joined together, upper stem leaves stalked or sessile; flowers bright grey or nearly white with blue-green nerves, 1-1½ in. diam., in small 3-5-flowered branching racemes on main stalks ½-1½ in. long, calyx lobes 5, ⅓ by ⅛ in. or ½ by ⅛ in., lanceolate short-pointed, corolla lobes 5, ½ by ⅜ by ⅛-½ in., short-pointed with round glands or toothed with long glands, 2 glands yellow, depressed, much fringed on each lobe, stamens 5, style very short, stigmas short, capsule ½ by ¼ in., seeds very rough with glandular ridges.

Swertia Thomsoni, GENTIANACEÆ. F. B. I. iv. 129. Kashmir, Sonamerg, 9,250 ft.

very like the last species, but sepals ¼ by $\frac{1}{10}$ in., short pointed, corolla lobes ⅓ by ⅛ in., nearly blunt, 2 yellow gland spots at the base of each lobe, not well defined, usually naked, rarely minutely hairy, capsule ¼ by ½ in., seeds $\frac{1}{15}$-$\frac{1}{20}$ in., round, partly winged, smooth, glistening from a very minute network.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Swertia cuneata,
GENTIANACEÆ.
F. B. I. iv. 129.
Himalaya, 11-14,000 ft.

medium size, rootstock perennial, stem annual, hollow; leaves 3 by $\frac{3}{4}$ in., usually blunt, stem leaves oblong with a broad tip narrowed to the base or stalked; flowers blue, 1 in. diam. on long main stalks solitary or in 3-flowered clusters, each flower on a minor stalk $\frac{1}{4}$-2 in. long, calyx lobes barely united, $\frac{1}{4}$-$\frac{1}{2}$ in. narrowly oblong, blunt, short pointed or with a broad tip, narrowed to the base with a bristle at the tip, corolla lobes $\frac{1}{3}$-$\frac{1}{2}$ by $\frac{1}{8}$-$\frac{1}{6}$ in., blunt, 2 glands on each lobe fringed with hairs $\frac{1}{8}$ in. long or hardly any, glands linear vertical near the edge of each lobe, stigmas 2, half circular plates; capsule $\frac{1}{2}$ in., seeds blackish brown.

Swertia cærulea,
GENTIANACEÆ.
F. B. I. iv. 129.
Himalaya, 5-9,000 ft.
Chamba (Clarke).
Kagan (Barrett).

small, very like the last species, but the flowers are in a linear dense branching raceme on short main stalks, sepals narrowly lanceolate, corolla lobes rather longer, bright blue to purple with green veins, ovate, short pointed, glands small, oblong, with oblong small fringed scales, stigmas sessile, semi-circular; capsule larger narrowly oblong, seeds yellow-brown.

Halenia elliptica,
GENTIANACEÆ.
F. B. I. iv. 130.
Himalaya, 6-12,000 ft.
Kashmir, Mashobra, Mahasu, in woods (Collett).

small to medium size, stems 4-sided, angles narrowly winged; leaves 1-2 by $\frac{3}{4}$-$1\frac{1}{4}$ in., ovate, blunt, sessile, 5-nerved, stem leaves 1 by $\frac{1}{2}$ in., short-pointed, lower often stalked; flowers $\frac{1}{2}$ in. diam., pale blue axillary and forming a loose terminal branching raceme, calyx nearly split down to the base into four segments $\frac{1}{4}$ in., lanceolate, corolla bell-shaped, divided more than half way down into 4 lobes, a pit at the base of each lobe is prolonged into a hollow spur $\frac{1}{8}$-$\frac{1}{3}$ in. long, upturned, stamens 4, joined to the base of the corolla, style very short, cylindric, stigma 2-lobed, small; capsule $\frac{1}{3}$-$\frac{1}{2}$ in., sessile, ovate, splitting nearly to the base, seeds $\frac{1}{16}$ in. and more, fewer and larger than in most *Swertias*, smooth, yellow.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Trichodesma indicum, *Chhota kupha, kallri-buti, ratmandu, nila kvai.*
BORAGINACEÆ.
F. B. I. iv. 153.
The Plains to 5,000 ft.
Valleys below Simla (Collett).
Nurpur, Kangra, Rawalpindi, Hazara, and Choa Saidan Shah (Douie).
Baluchistan (C. B. Clarke).

small, annual, rough with hairs on tubercles and elsewhere; leaves 1-4 in., sessile lanceolate, stem clasping, lower opposite, upper often alternate, short pointed; flowers $\frac{3}{4}$-1 in. across, pale blue turning to pink, then white, solitary on drooping axillary stalks, becoming terminal racemes by the lessening number of floral leaves, calyx $\frac{1}{2}$ in., conical, divided into 5 lobes, which are prolonged below into 5 recurved tails, lobes lanceolate, finely long-pointed, covered with grey or white silky hairs, corolla tube $\frac{1}{2}$ in., lobes $\frac{1}{4}$ in., ovate, abruptly tapering into a fine point, a yellow glandular spot at the base of each, stamens 5, short, woolly, anthers lanceolate, joining to form a woolly cone, tips bare, twisted, style terminal, not divided, stigma small; fruit oblong with rounded ends, 4-ridged, separating into 4 rough nutlets $\frac{1}{8}$ in.

Trichodesma africanum,
BORAGINACEÆ.
F. B. I. iv. 154.
The Plains.
Baluchistan (Boissier).

small, annual, very like the last, but rougher with stiff hairs, leaves ovate-oblong, long stalked, racemes generally lateral and dividing into two, flowers slightly smaller, nutlets with prominent margins fringed with barbed hairs.

STAMENS FOUR.

Buchnera hispida,

see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed.

STAMENS TWO.

Veronica Anagallis, Speedwell,
SCROPHULARIACEÆ.
F. B. I. iv. 293.
The Plains to 9,000 ft.
Valleys below Simla, Mashobra (Collett).
Baluchistan (Lace).

medium size, perennial, nearly smooth, stem hollow; leaves 2-6 by $\frac{1}{4}$-$\frac{2}{3}$ in., oblong ovate, stem clasping; flowers blue or purplish, $\frac{1}{4}$-$\frac{1}{2}$ in. diam. in axillary racemes 3-6 ins. long, bracts shorter than the flower stalks, calyx 4-fid, segment $\frac{1}{16}$-$\frac{1}{8}$ in. long, corolla $\frac{1}{4}$-$\frac{1}{2}$ in. diam., 4-lobed, stamens 2, pink, style linear; capsule $\frac{1}{8}$-$\frac{1}{4}$ in. notched, flattened, seeds few, biconvex.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

STAMENS TWO.

Veronica verna,
SCROPHULARIACEÆ.
F. B. I. iv. 296.
Himalaya, 5-7,000 ft.

small, stem slender, nearly smooth, sometimes branched from the base very leafy; leaves ⅛-½ in. overlapping or the lower far apart, sessile, oblong, sometimes lobed; flowers small, blue, nearly sessile along the stem forming with the leaves a spike, calyx 4-fid, segments unequal, linear-lanceolate, corolla 4-lobed, shorter than the calyx, stamens two, style linear; capsule ⅛ in. diam. indented above the base, narrow, keeled, seeds much flattened.

Veronica serpyllifolia,
SCROPHULARIACEÆ.
F. B. I. iv. 296.
Himalaya, 8-13,000 ft.
Narkanda (Collett).

small, smooth, or glandular velvety, branched from the base; leaves ⅛-¾ in. rather leathery, sessile, rounded or oblong floral leaves alternate; flowers white or blue in racemes 1-4 in. long; lower bracts leaf-like, upper narrow; calyx 4-fid, segments ⅛-¼ in. oblong with few hairs, shorter than the corolla, corolla ¼ in. diam., 4-lobed, stamens 2, style linear; capsule broadly heart-shaped, shorter than the calyx, seeds much flattened.

Barleria acanthoides,
ACANTHACEÆ.
F. B. I. iv. 484.
The Plains
Kirana Hill (Edgeworth).
Baluchistan (Boissier).

small, grey, prickly; leaves 1¼ by ½ in. ovate with the tip rounded and broad almost sessile, bracts none, bracteoles 2, linear, spine tipped, rigid, often toothed, flowers white, 2½ ins. long solitary or in crowded one-sided spikes, sepals 4 in two pairs, outer pair ovate, corolla 2¼ by ⅛-¼ in. nearly linear, lobes 5, nearly equal, ovate, stamens 2 and two aborted ones also, style long, capsule ⅝ in., four-sided.

Barleria cristata,
Todrelu, Jansasigah.
ACANTHACEÆ.
F. B. I. 488.
The Plains to 6,000 ft.
Valleys below Simla (Collett).
Hazara (Douie).

large, hairy, branching; leaves 2-4 by 1 in., shortly stalked, ovate lanceolate, short pointed, flowers purplish blue or white, 1¼-1½ in. long in short crowded head-like, nearly sessile, axillary spikes, bracts none, bracteoles ½-⅝ in. linear-lanceolate, toothed, sepals 4 in two pairs, outer sepals ¾ in. toothed, nearly spinous, corolla 5-lobed, 1¼-1½ in. long, lobes ½ in., ovate, tube funnel-shaped

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

STAMENS TWO.

stamens 2, two aborted much smaller, style long, capsule $\frac{1}{3}$ in. oblong with a short point, seeds 4 or less, silky. The seeds are supposed to cure snake bite, the leaves and roots to reduce swelling.

COROLLA TWO-LIPPED.

STAMENS TWO.

Martynia diandra, see Herbs, Erect, Opposite, Exstipulate, Lobed.

Nelsonia campestris,
ACANTHACEÆ.
F. B. I. iv. 394.
The Plains, to 4,000 ft.

small, annual, woolly, with trailing flower stems 1-3 ft. long; leaves of the main stem 4-6 in. long, oblong with rounded ends, stalked, flowering stem-leaves nearly sessile, $\frac{1}{2}$-2 ins.; flowers $\frac{1}{5}$ in., purple or white, in crowded ovate or cylindric mostly sessile spikes $\frac{1}{2}$-2 ins. long, terminal on lateral branches, bracts $\frac{1}{6}$-$\frac{1}{4}$ in., ovate, blunt, woolly with glands, green, calyx $\frac{1}{6}$ in. green, marked with longitudinal lines, hairy or nearly papery, corolla $\frac{1}{6}$ in., tube slender, 2-lipped, lobes 5, blunt, spreading, stamens 2, attached above the middle of the tube, style 2-lobed; capsule $\frac{1}{6}$-$\frac{1}{5}$ in., oblong, short-pointed, seeds 8-12, yellowish with brown granular marks, ovoid with rounded ends.

Andrographis echiodes,
ACANTHACEÆ.
F. B. I. iv. 505.
The Plains.

small to medium size, annual, velvety and with spreading white hairs; leaves $2\frac{1}{2}$ by 1 in., oblong, blunt, sessile, base narrowed; flowers pink or white with purple, $\frac{1}{4}$-$\frac{1}{2}$ in., in dense hairy sticky axillary racemes about the length of the leaves on very short flower stalks, bracts small, bracteoles minute or none, calyx deeply 5-lobed, lobes $\frac{1}{6}$-$\frac{1}{4}$ in., linear, in fruit sometimes $\frac{1}{3}$ in., corolla $\frac{1}{3}$-$\frac{1}{2}$ in., tubular 2-lipped, white or pink with dark-purple lower lip, velvety, stamens 2, filaments hairy, anthers protruding, white bearded, style slender, minutely

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

divided at the tip; capsule $\frac{1}{3}$ by $\frac{1}{6}$ in., short-pointed at both ends, oblong, 2 to 3 times as long as broad, seeds 6-12, bony, wrinkled, twice as long as broad.

Justicia betonica, ACANTHACEÆ. F. B. I. iv. 525. The Plains.

large, branches round, smooth, tips velvety; leaves 1-1$\frac{3}{4}$ in., ovate-lanceolate, dotted on both surfaces, leaf stalk $\frac{1}{3}$ in.; flowers $\frac{1}{3}$ in. long, white, with rose spots, on short-stalked continuous usually terminal spikes, bracts $\frac{2}{3}$-$\frac{1}{3}$ in., white with green nerves, ovate, short-pointed, bracteoles $\frac{1}{3}$-$\frac{1}{2}$ in., like the bracts, calyx 5-segmented, segments $\frac{1}{6}$ in., linear-lanceolate, velvety, corolla 2-lipped, upper lip 2-lobed, lower 3-lobed, stamens 2, anthers 2-celled, lower cell white tailed, style bifid, thread-like; capsule $\frac{2}{3}$ in., club-shaped, velvety, 4-seeded, seeds ovoid, somewhat flattened, smooth.

Justicia heterocarpa, ACANTHACEÆ. F. B. I. iv. 531. The Plains. Ferozepore (Vicary).

small, covered with minute grey velvety down; leaves 1 by $\frac{1}{2}$ in., ovate, with minute lines nearly smooth, stalk $\frac{1}{8}$ in.; flowers minute, solitary to four together, axillary, bracts and bracteoles small, linear, calyx divided into 5, segments $\frac{1}{8}$ in., linear, minutely velvety, corolla $\frac{1}{3}$ in., 2-lipped, upper lip shortly 2-lobed, lower lip shortly 3-lobed, transversely marked, stamens 2, anthers ovate, lower part white tailed, style filiform, bifid; capsules of two kinds in nearly every axil, normal capsule $\frac{1}{3}$-$\frac{1}{6}$ in., oblong, ends rounded, short-pointed, scarcely stalked, velvety, 4-seeded, abnormal capsule winged, crested, one-seeded, seeds in normal capsules rough, almost hairy, in abnormal capsules the one seed is larger and smooth.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

Justicia pubigera,
ACANTHACEÆ.
F. B. I. iv. 536.
Himalayas, 4-7,000 ft.
Simla (Collett).

large, stems round, hairy; leaves 2¾-1¼ in., shortly stalked, ovate-lanceolate, hairy on both surfaces, long-pointed; flowers purplish-red in axillary, stiff loose clusters, forming terminal leafy branching erect racemes, bracts ⅛-⅛ in., linear, bracteoles none or minute, calyx 5-parted, segments ¼ in., linear, velvety, corolla ⅝ in. long, velvety, straight, tubular, 2-lipped, lower lip ⅓ in. long, 3-lobed, recurved, upper lip erect notched, stamens 2, anther-cells distinct, upper blunt, lower white tailed, style minutely 2-lobed; capsule ½ in., velvety, stalked, seeds 4 or less.

Justicia diffusa,
ACANTHACEÆ.
F. B. I. iv. 538.
Himalayas, to 3,000 ft.

small, stems 4-angled, smooth or minutely velvety; leaves 3¼-4¼ ins., oblong, long-pointed at both ends, stalk ¼ in., somewhat hairy; flower ¼ in., in slightly hairy slender terminal or axillary spikes, bracts ⅛ in., linear shorter than the calyx, bracteoles $\frac{1}{10}$-⅛ in., lanceolate, calyx 5-segmented, segments ⅛ in., like the bracts, lanceolate, minutely hairy above, stamens 2, style like the last species; capsule ⅛-¼ in., 4-seeded.

Justicia simplex,
ACANTHACEÆ.
F. B. I. iv. 539.
Himalayas, to 7,000 ft.
Simla (Collett).

small, hairy, branched, grooved; leaves 1-1¼ in., ovate or lanceolate, short-pointed, hairy, shortly stalked; flowers small, pale purple, crowded in densely hairy cylindric spikes ¾-1 in. long, terminal or axillary, bracts as long as the calyx, green-keeled, very hairy, short-pointed, lanceolate, bracteoles hairy, linear, calyx 4-segmented, segments hairy, lanceolate; corolla ⅛ in., 2-lipped, upper lip erect, narrow, notched, lower wider, 3-lobed, stamens and style as in the last species; capsule ⅛ in.

HERBS, ERECT WITH OPPOSITE EXSTIPUTATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

Dicliptera Roxburghiana, Var. bupleuroides, *Kirch, somni.*
ACANTHACEÆ.
F. B. I. iv. 553.
The Plains, to 6,000 ft.
Simla (Collett).
Common in the hilly districts of the area.

largo, hairy, loosely spreading, stems grooved; leaves 2-5 by $\frac{3}{4}$-$2\frac{3}{4}$ ins., long-pointed, ovate-lanceolate, stalked, somewhat velvety; flowers pink, spotted with purple, or white crowded in axillary clusters towards the ends of branches, bracts $\frac{1}{2}$ by $\frac{1}{5}$ in., often 3-nerved, long-pointed, bracteoles linear, calyx 5-parted, segments linear, corolla velvety, $\frac{1}{4}$ in. long, tube cylindric, twisted, limb 2-lipped, upper lip erect, notched, lower recurved, 3-toothed, stamens 2, anther-cells blunt, style minutely 2-lobed; capsule $\frac{1}{4}$ in., 2-celled, winged, seeds 4, warted.

Peristrophe bicalyculata, *Atri lal.*
ACANTHACEÆ.
F. B. I. iv. 554.
The Plains.

small, spreading, hairy; leaves 2 by 1 in., ovate, long-pointed, leaf stalk $\frac{1}{4}$ in.; flowers rose or purple in axillary or terminal clusters, bracts 1-4 together, linear, short-pointed, $\frac{1}{3}$ in. long, long-stalked, calyx deeply 5-lobed, segments equal, linear, lanceolate; corolla $\frac{1}{3}$-$\frac{1}{2}$ in., tube slender, deeply 2-lipped, upper lip hardly notched, lower shortly 3-lobed; stamens 2, anthers ovoid, style thread-like, minutely 2-cleft; capsule $\frac{1}{3}$-$\frac{1}{2}$ in., seeds 4, flattened, covered with minute papillæ.

(To be continued.)

REVIEW.

CATALOGUE OF THE LEPIDOPTERA PHALÆNÆ IN THE BRITISH MUSEUM.

VOLUME IX.

BY

SIR GEORGE F. HAMPSON, BART.

The ninth volume of Sir George Hampson's Catalogue of the Moths of the World concludes the survey of the species belonging to the Noctuid Subfamily Acronyctinæ and deals with 725 species belonging to 185 genera, these numbers including a few additions to Volumes VII and VIII which dealt with the earlier groups of this Subfamily.

It need hardly be said that a complete survey, such as this is, of the entire literature and inter-relations of a whole group of species is of inestimable benefit to every lepidopterist who has to deal with any species contained in the group, whatever his particular line of study, although only those who have groped their way through the tangled jungle of synonymy can have any idea of the vast amount of labour entailed in the preparation of a work of this nature.

When it is stated that the key to the Acronyctine genera alone occupies 17 pages, some idea can be formed of the magnitude of the scale on which this catalogue is being produced. It may be noted, *en passant*, that this key to the genera is founded almost wholly on structural differences of tarsal and tibial spines, development of proboscis, presence of an areole, etc., and scarcely at all on neurational characters, which last are scarcely so reliable since they are sometimes subject to variation; for example, on comparison of a specimen of *Mudaria cornifrons* with the description and figure on page 226 of this volume, we find that in this particular individual veins 3 and 4 and 6 and 7 of the hindwing are distinctly stalked, although normally they are emitted from the two angles of the cell.

Sir George Hampson has so made himself our first and foremost specialist in the Noctuidæ that criticism of his arrangement and general treatment of the family appears unnecessary. But there is one small point which we may bring forward and the more especially so because it is a matter which affects the whole range of nature to which the binomial system of nomenclature is applicable. We hold that a name, once applied to a genus or species, is inviolable (except of course in the case of an adjectival word used as a specific name, when the termination may be made to agree with the gender of the name of the genus in which the species is placed, or in the case of an obvious misprint for which there is evidence) and should not

be changed from its orginal spelling. The language of entomological nomenclature is Latin, a language which is used by common consent as a kind of neutral ground whereon entomologists of every race or dialect may meet on equal terms; entomological Latin (in common with the Latin of other branches of science) is often bad, we readily admit, and may often and does often degenerate into the school boy or canine variety—we recollect a recent case in the Transactions of a leading Society where an author wrote a paper on the early stages of certain moths, and called their eggs "ovæ" throughout his paper!—but it fulfils its object by providing a vehicle of expression which is mutually understood by all who use it, and it appears unnecessarily pedantic to insist too much on the strict letter of the law and to claim that Latin of the Augustan epoch, and of no other period, is to be accepted. Latin may be technically a "dead" language, but we submit that it is capable of expansion—nay, more, it has expanded—in its vocabulary since the days of Augustus. This being so, it is an unnecessary source of confusion to alter the spelling of well-known names merely because they contain a letter which Horace might not have recognised. In this volume, however, a name such as "*jankowskii*" becomes "*jancouscì*" and "*howardi*" becomes "*howardi*" (this latter a particularly objectionable change), whilst names like "*hilzingeri*" and "*schlumbergeri*" are allowed to persist unchanged; we wonder which Horace would rather have had to pronounce! If *Cephonodes kingi* is to be changed to *C. cingi* why not go further and alter its name to *C. regis*?

Another point to which we can only refer very briefly is the instability of nomenclature caused by the alteration of well-known names under a system by which the Law of Priority is invoked to sanction the resuscitation of some unfamiliar name unearthed from the musty records of the past. We are glad to note that the Zoological Society is taking steps to protect well-recognised names in general use. The student will note in the present volume that the familiar *Nonagria* has become *Sesamia*, the well-known *Nonagria uniformis* being now called *Sesamia uniformis*.

As regards the genera and species with which we are more immediately concerned, the following list gives all those occurring within the limits of the Indian Region.

† Means figured by text-block.
‡ , figured in atlas of coloured plates.
* „ new genus or species.

† 4312 .. Lophotyna*	.. albirena, Moore.	.. 1724	.. Sikhim; Bengal.
† 4318 .. Gortyna	.. leucostigma, Hb.	.. 1795	.. ? Khasis.
4351 .. Hydræcia	.. basalipunctata, Grcs.	.. 1594	.. Khasis.
4357 .. Pyrrhia	.. umbra, Hufn.	.. 1598	.. Kashmir; Punjab; Khasis.
† 4359 .. Calloecia*	.. swinhoei, Butl.	.. 2025	.. Bombay.
† 4441 .. Cytocanis*	.. denticulosa, Wlk.	.. 2016	.. Bombay; Madras.
† 4505 .. Elydna	.. bosca, Swinh.	.. 1885	.. Burma.

4506 .. Elydna	.. plagiata, Wlk.	.. 1886	.. Punjab; Bombay; Ceylon; Burma.
† 4512 .. ,,	.. reclusa, Wlk.	.. 875	.. Bombay; Madras; Ceylon.
† 4513 .. ,,	.. erigida, Swinh.	.. 938	.. Travancore; Burma.
† 4514 .. ,,	.. bipuncta, Snell.	.. 1874a 1877 (pt.)	.. Punjab; Sikhim; Khasis.
4516 .. ,,	.. lineosa, Moore	.. 1877 (part)	.. Punjab (Kulu; Dalhousie).
† 4517 .. ,,	.. truncipennis*	..	.. Punjab; Sikhim; Khasis; Ceylon.
‡ 4518 .. ,,	.. ochreipuncta, Hmpsn.	.. 1869	.. Sikhim.
4521 .. ,,	.. renalis, Moore	.. 1878	.. Ceylon.
‡ 4523 .. ,,	.. rectilinea*	..	.. Punjab (Kulu; Sultanpur; Dalhousie).
‡ 4524 .. ,,	.. bisignata, Hmpsn.	.. 2058a	.. Madras.
‡ 4527 .. ,,	.. atripuncta*	..	.. Ceylon.
‡ 4528 .. ,,	.. ochracea, Hmpsn.	.. 2058	.. Burma.
† 4530 .. ,,	.. transversa, Wlk.	.. 2057	.. Bombay; Ceylon; Burma.
† 4536 .. Androlymnia*	.. emarginata, Hmpsn.	.. 2098	.. Simla; Nilgiris; Ceylon.
† 4539 .. Nikara	.. castanea, Mö.	.. 1792	.. Sikhim.
† 4540 .. Apocalymnia*	.. tenebrosa, Hmpsn.	.. 1874b	.. Madras (Cuddapah; Horsley Konda).
4543 .. Calymnia	.. restituta, Wlk.	.. 2055	.. Punjab; Nepal.
‡ 4549 .. ,,	.. flavifimbria,*	.. 2056 (part)	.. Kashmir; Punjab (Note C affinis to be deleted from Indian List).
‡ 4554 .. ,,	.. ochreimargo, Hmpsn.	.. 1873	.. Punjab; Sikhim.
† 4575 .. Basilica*	.. chrysosticta, Hmpsn.	.. 2089a	.. Bombay.
† 4600 .. Mudaria	.. cornifrons, Mo.	.. 1825	.. Bengal.
‡ 4658 .. Phragmatiphila*	.. fumea, Hmpsn.	.. 1798a	.. Sikhim (1800').
‡ 4659 .. ,,	.. leucaneura*	..	.. Burma.
‡ 4660 .. ,,	.. grisescens*	..	.. Sikhim (1800').
‡ 4672 .. Calamistis*	.. microsticta, Hmpsn.	.. 1793	.. Sikhim.
† 4673 .. ,,	.. submarginalis, Hmpsn.	.. 1946	.. Nilgiris.
† 4676 .. Rabila	.. frontalis, Wlk.	.. 1591	.. Ceylon.
‡ 4689 .. Apenostola*	.. procera, Stdgr.	..	.. Kashmir.
† 4700 .. Sphetta	.. apicalis, Wlk.	.. 1585	.. Bombay; Ceylon.
† 4737 .. Acrapex	.. acuminata, Hmpsn.	.. 1954	.. Nilgiris.
4739 .. ,,	.. hamulifera, Hmpsn.	.. 1952	.. Ceylon.
‡ 4742 .. ,,	.. brunnea*	..	.. Ceylon (Maskeliya).
‡ 4744 .. ,,	.. atriceps*	..	.. Khasis.
‡ 4745 .. ,,	.. leucophlebia, Hmpsn.	.. 1953	.. Nilgiris; Travancore.
† 4746 .. ,,	.. prisca, Wlk.	.. 1951	.. Travancore; Ceylon.
‡ 4748 .. ,,	.. roseotincta*	..	.. Ceylon (Maskeliya).
† 4756 .. Sesamia	.. pallida, Butl.	.. 1950	.. Bombay (Mhow).
† 4759 .. ,,	.. inferens, Wlk.	.. 1943 (part)	.. Bengal; Assam; Madras Ceylon; Burma; Andamans.
† 4766 .. ,,	.. cretica, Led.	.. 1943 (part)	.. Punjab (Dharmsala); Sikhim (1800').
‡ 4767 .. ,,	.. uniformis, Ddgn.	..	.. Bengal; Bombay.
‡ 4773 .. Xylostola*	.. robusta, Hmpsn.	.. 1945	.. Sikhim; Khasis.
† 4774 .. ,,	.. indistincta, Mo.	.. 1889	.. Sikhim; Nilgiris; Ceylon.
† 4777 .. Arcilasisa	.. sobria, Wlk.	.. 1939	.. Punjab; Nepal; Sikhim; S. India.
† 4782 .. Clethrorasa*	.. pilcheri, Hmpsn.	.. 1960a	.. Sikhim (5000').
† 4785 .. Apsarasa	.. radians, Westw.	.. 1962	.. Sikhim; Assam.
‡ 4786 .. ,,	.. figurata, Mo.	.. 1962 (part)	.. Andamans.

† 4794 ..	Chasmina	.. sericea, Hmpsn.	.. 1957	..	Ceylon; Burma.
† 4796 ..	,,	.. tibialis, Pb.	.. 1958	..	Punjab (Jubbulpore, Dehra Dun; Sikhim; Nilgiris; Ceylon.
4799 ..	,,	.. judicata, Wlk.	.. 1959	..	Punjab (Jubbulpore); Rajputana; Nilgiris; Ceylon.
4800 ..	,,	.. rejecta, Pb.	.. 1960	..	Punjab (Jubbulpore); Madras; (Nilgiris, Travancore, Trevandrum); Ceylon; Burma; Nicobars.
‡ 4802 ..	,,	.. maculata, Hmpsn.	.. 1961	..	Burma
† 4807 ..	Callyna	.. siderea, Gn.	.. 2169	..	Punjab (Almora, Dharmsala, Allahabad); Nepal; Khasis; Bombay (Poona); Ceylon.
4809 ..	,,	.. costiplaga, Mo.	.. 2173	..	Bombay; Nilgiris; Ceylon.
4812 ..	,,	.. jugaria, Wlk.	.. 2171	..	Punjab (Dehra Dun, Manpuri); Sikhim; Bengal; Ceylon - Andamans.
4813 ..	,,	.. semivitta, Mo.	.. 2171 (part).		Punjab (Kulu); Sikhim.
‡ 4814 ..	,,	.. mystica, Wlk.	.. 2172	..	Burma.
4815 ..	,,	.. monolenca, Wlk.	.. 2170	..	Sikhim; Assam; Bombay (Kanara Karwar); Nilgiris; Ceylon (Trincomali); Burma; Nicobars.
† 4902 ..	Scudyra	.. venosa, Mo.	.. 1571	..	Punjab (Almora); Sikhim Bengal.
† 4905 ..	,,	.. longipennis, Wlk.	.. 1572	..	Sikhim; Silhet.
4906 ..	,,	.. catocalina, Wlk.	.. 1573	..	Sikhim.
‡ 4909 ..	,,	.. bala, Mo.	.. 1570	..	Sikhim (7,000-10,000).
† 4911 ..	,,	.. transiens, Wlk.	.. 1569	..	Sikhim; Assam; Burma.
† 4913 ..	,,	.. albifascia, Wlk.	.. 1574	..	Sikhim; Bombay (Kanara); Burma.
4914 ..	? ,,	.. nepcha, Mo.	.. 1575	..	Sikhim.
† 4917 ..	Protoscudyra*	.. picta, Hmpsn.	.. 1872	..	Sikhim; Khasis.
† 4920 ..	Opsyra*	.. chalcoela, Hmpsn.	.. 2174a	..	Sikhim (5,000-10,000).
‡ 4932 ..	Micrapatetis	.. pyrastis*	..	..	Madras (Gooty).
‡ 4933 ..	,,	.. flavipars*	..	..	Bombay.
† 4936 ..	Hypocalamia*	.. meterythra, Hmpsn.	.. 1760	..	Punjab (Murree).

The following are Corrections and Additions to Volumes VII and VIII of the Catalogue :—

Vol. VII.

2864a ..	Trachea	.. confluens, Mo.	.. 1753	..	Sikhim.
2894 ..	,,	.. monilis, Mo.	.. 1835	..	
3378a ..	Oroplexia	.. simulata, Mo.	.. 1776	..	Sikhim.
† 3452a ..	Pachylepis	.. dilectissima, Wlk.	.. 2169	..	N. E. Bengal; Nilgiris; Ceylon; Burma.
† 3452b ..	Xantholepis*	.. dicycla, Wlk.	.. 2110	..	N. India; Burma.
† 3467a ..	Poecilogramma	.. albiscripta, Hmpsn.	.. 2139a	..	Khasis; Bombay (Kanara, Karwar); Nilgiris; Ceylon (Maskeliya).
3553 ..	Pariambis	.. pulla, Swinh.	.. 2089	..	Punjab (Simla, Campbellpur, Dharmsala, Cawnpur); Bengal (Calcutta); Bombay (Deesa, Poona); Ceylon (Wellawaya).

3553*a*.. Parinamtra	.. unduligera, Butl.	.. 2078	.. Punjab (Dharmsala)	Madras (Belgaum).

Vol. VIII

3887*a*.. Antha	.. rotunda, Hmpsn.	.. 2191*a*	..Sikhim.

[T. B. F.]

The number *preceding* each species is its number in the present Catalogue : the number *following* each species is its number in the old arrangement followed in the "Fauna of India" volumes.

THE SHOOTING SEASON, 1908-1909

BY

N. B. KINNEAR.

In the spring of 1909 the Honorary Secretary sent out with No. 1, Vol. XIX, of the Journal a form on which members were requested to fill in the results of the past Small Game Shooting Season. Owing to unavoidable delays the report has not been published earlier, but it is hoped that when the forms, which are being sent out with the present Number, are returned there will not be such a delay in reporting on them.

Twenty-eight returns relating to some thirty districts have been sent in, and we are specially grateful to Col. Waller Barrow, R.A.M.C., for obtaining a number of reports from Officers stationed chiefly in the N.-W., without which this report would hardly have been worth publishing.

The information asked for in the forms was unfortunately too brief, and a mistake was made in not making the forms larger, as there was barely room for the information asked for; this, however, is being remedied in the Schedules sent out with the present issue.

Before giving some details as to the various districts, it may be as well to mention briefly what the rainfall was like in different parts of the country. According to the Indian Weather Reveiw of the Annual Summary there was an abnormal rainfall in the N.-W., it being the largest departure from the normal since 1875, *i. e.* + 8·75 as compared with + 6·74 in that year.

In the East part of Central India, the greater part of the C. P., Hyderabad South and Malabar, the rainfall was all above normal, and in Rajputana West there was nearly 15″ more rain than the normal supply. In the Bombay Deccan, Central India West, Mysore, and Madras South-East the fall was below normal, but nowhere was the deficit more than 11 per cent. Through Eastern Bengal, Behar and the East of the United Provinces there was a deficit of over 20 per cent., but in the Bay Islands and Orissa there was an excess of about 20 per cent. In Assam the fall was slightly below the average, but in Burma it was a little above.

QUAIL.

Quail appear to have been fairly good in the Gurdaspur district, especially at Bakloh, Ajmer, Etah, Sita Road, Nasirabad, Neemuch, Deesa, Bhandara, Aurangabad and in the Bahraich district in Oudh, though bad in the adjoining district of Gonda. From Dera Ismail Khan, Multan, Abu Road, Gonda district, Champarum and Dharwar, the returns are not good, the last-named being "very bad." Apparently the reason for quail being in small numbers at such places as Dera Ismail Khan, Multan and Abu Road was the excessive amount of water about and the sodden condition of the ground at the time of the southward migration, which was no inducement

for the birds to stop. At first sight one would have imagined the same conditions existed at Ajmer where quail were "abundant in places," since we know there was a very heavy rainfall and "the tanks were full to overflowing." On looking at the rainfall returns, however, we find that for the month of September the fall was below the average and so the ground may have had time to dry and be suitable to quail "in places."

SNIPE.

Snipe were reported as being (1) "very good", "good" or "plentiful" in the Gurdaspur and Kangra districts, at Dera Ismail Khan, Mahi Kantha, Champarum, Cuddapah, Sonapur and the Andamans; (2) "fair" or "average" at Sita Road, Nasirabad, Neemuch, Deesa, Etah, Bhandara, Aurangabad and Dharwar; (3) "scarce" or "bad" at Phillour, Multan, Seistan, Ajmer, Abu Road, Bahraich and Gonda Districts, Balaur, Mysore, Manipur and Lower Bengal.

Comparing these reports with the rainfall in the districts we find that there was an average fall in all those which come under (1) except at Champarum in Bengal, where it was below the average. There, however, the snipe were frequenting the semi-dry beds of large jheels in perfect security since it was impossible to get near them. In the districts under (2) the rainfall was either above or a little below the normal, but in those which come under (3) all kinds of rainfalls were experienced: for instance, at Ajmer and Abu Road there was an abnormally heavy fall, while in the Gonda and Bahraich districts of Oudh the fall was much below the average.

In the Andamans snipe arrived in the beginning of September and nothing but pintails were shot. The first snipe to be seen and shot in the Bhandara district was a pintail on October 9th.

DUCK AND GEESE.

Taken as a whole, the season seems to have been bad all over except in the N.-W., Assam and one or two isolated localities. In the Gurdaspur and Kangra districts the season was a good one and quite up to the average, and at Dharwar in the Southern Mahratta Country certain kinds of ducks were very abundant. According to Lieut.-Colonel Impey birds were unusually abundant on the famous Bharatpur Jhil in Rajputana (J. B. N. H. S., Vol. XIX, pp. 750-1), while in Lower Bengal they were more numerous than usual, and at Sonapur in Assam the season was very good. The returns from Nasirabad, Neemuch and Deesa give the season as an average one with plenty of duck about, and those from Dera Ismail Khan, Etah and Manipur give it as "fair." The remaining localities which include Phillour, Multan, Sita Road, Ajmer, Abu Road, Bahraich and Gonda districts, Champarum, Bhandara, Aurangabad, Balur, Bangalore, Cuddapah and Mysore are returned as "bad" or "very bad."

It is difficult to account for the scarcity of duck in parts of Sind,

Rajputana, Oudh and the Peninsula since in many places where they were scarce the rainfall was not far below the average. The excessive rain and overflowing tanks at Ajmer and Abu Road and the want of rain and the drying up of the tanks in the Gonda and Bahraich districts are the two extreme conditions which ducks do not like, hence their absence. In what way, however, can we account for the absence of duck in Mahi Kantha, where the rainfall was about normal and there were plenty of snipe, which shows there was no scarcity of water? In Lower Bengal the rains were bad, but nevertheless duck were more numerous than usual.

With so few returns at our disposal, it is very difficult to attempt to give any reason for the season being bad as a whole, since the rainfall appears to have been up to the average leaving out Rajputana and Oudh. Probably the distribution of rain during the monsoon and an examination of the rainfall returns for previous years might help to explain matters, but with so few returns it would be impossible to make any safe deductions.

Coming now to geese, it is rather interesting to find that there were "rather more than usual" at Ajmer where it will be remembered there was a great deal of water but no duck. At Sita Road and Ghaziabad the season for geese was good, but at both these places duck were said to be very bad. The remaining returns show that at Dera Ismail Khan, Etah and Manipur the season was good or fair, while at Sonapur it was reported as being very good for Bar-headed Geese.

As an instance how a district may vary or how differently people may judge the season, it is worth mentioning that out of the four returns for the Gurdaspur district, three give the season as good for duck, while the fourth says "very scarce"; and it is remarked that they "had not come in by the 15th November," while in one of the other returns they are said to have begun to come in between the 15th and 20th October. The only other districts in which the arrival of duck is mentioned are Bhandara in the C. P., where the first duck to be seen was a gadwall on October 29th; Neemuch, where Lieut. Logan Home shot a garganey and a common teal out of a flock of four on 18th October and remarks:—"These were the first of the year to be seen here" and in the Champarum district of Bengal where a flock of garganey appeared on May 20th. Colonel Impey in the Journal mentions that the first arrivals noticed on the Bharatpur Jhil were garganeys which arrived on the 15th August. By the end of November the garganey had been replaced by the common teal, but they returned again in February, some remaining till April.

If more details of bags are given in the next returns, the comparison of the distribution of the different kinds of duck would be most interesting. As it is, there are few details in the present returns, but some of these are of interest and may be worth mentioning.

At Dera Ismail Khan mallard were in good numbers, gadwalls fair,

pochards scarce, and the white-eye the only kind at all well represented. Pintail and teal were also scarce and not a single spot bill was seen, though Lieut. Francis says "I spent many days of the cold weather boating on the Indus, yet I never came across a single spot bill."

At Sita Road, where the season was a bad one, pintail were especially scarce and at Etah there were fewer mallard and more gadwall than in the previous season. White-eye were also more numerous. In the Champarum district, Bengal, white-eye and tufted duck were unusually numerous. Spot bill and cotton teal were very good and teal good at Dharwar, but the other varieties were scarce. Marbled duck were very numerous at Seistan and one was shot at Bharatpur. In Manipur State Colonel Shakespear reports that Mr. W. A. Cotgrave shot a pink-headed duck in November 1908 and another was recorded in the Journal Vol. XIX., p. 264, by Mr. E. R. Jardine from Koolay, Upper Burma, shot in December 1908. In the same Journal, Lieut. W. R. C. Tennison, R.A., mentions shooting two stiff-tailed ducks near Nowshera.

We are indebted to the following members and others for sending in Shooting Season returns :—

Col. W. G. Walker, (Kangra Valley); Major G. H. Frost, I.M.S., (Gurdaspur Dist.); Capt. A. M. Rundall, (Gurdaspur Dist.); Capt. R. J. Bradley, (Gurdaspur Dist.); Lt. H. L. Scott, (Kangra and Gurdaspur Dist.); Lt. R. B. Phayre, (Gurdaspur Dist., Phillour and Ghaziabad); Major R. C. Kennion, (Seistan); Lt. R. F. Francis, (Dera Ismail Khan); Lt. N. Mosley, (Multan and Sita Road); Lt. W. M. Logan Home, (Nasirabad, Neemuch and Deesa); Mr. E. H. Young, (Ajmer); Mr. R. Whately, (Abu Road); Major E. O'Brien, (Mahi Kantha); Mr. O. O'Donnell, (Bahraich and Gonda Districts); Mr. W. B. Cotton, I.C.S., (Etah); Mr. J. S. E. Walker, (Ghorasan); Major H. R. Baker, (Cannanore; Mr. C. W. M. Hudson, I.C.S., (Dharwar); Mr. E. Lund, (Balur); Lt. C. D. Gregson, (Bangalore); Major H. P. Ainslie, (Cuddapah and Mysore); Mr. L. W. Middleton, (Sonapur, Assam); Lt.-Col. J. Shakespear, (Imphal, Manipur); Mr. W. T. Page, (Lower Bengal); Mr. P. F. Wickham, (Andamans).

MISCELLANEOUS NOTES.

No. I.—FOOD OF THE HOOLOCK OR WHITE-BROWED GIBBON.

It may interest you to know that a tame Hoolock (*Hylobates hoolock*), about 8 years old, kept by a friend of mine, ate some time ago two seed capsules with the seeds of the common Datura (*D. alba*) with apparent relish and without any visible ill-effects; it is surely strange that a poison so virulent to man does not affect an anthropoid ape?

J. C. H. MITCHELL.

TEZPUR, ASSAM, *8th April*, 1919.

[Dr. A. Powell to whom we have referred the above case writes as follows:—

"Dhatura is not a 'virulent' poison to man. It is mostly given by criminals with the intention not of murdering but of facilitating robbery while the victim is in a state of deep narcotic sleep. The vast majority of cases recover.

Rabbits, apes and monkeys are scarcely affected, even by enormous doses of Dhatura or Belladonna. 'One animal's meat is another's poison.' As a whole, carnivorous are more sensitive than herbivorous animals to the common poisons. Thus, monkeys and fowls are unaffected by doses of strychnine that would kill a pack of hounds. Pigeons thrive on an exclusive diet of poppy seeds, and I doubt if they could be poisoned by the largest doses of opium."—EDS.]

No. II.—VITALITY OF A TIGER.

Recently I had a very striking example of the extraordinary vitality of a tiger. I got "khubber" of a kill and went to the place which was in a patch of thatching grass on the top of a hill. While I was looking at the kill the Tiger came out of the grass. I could only see his face at which I fired using a ·500 bore H. V. rifle, 80 grs. cordite, 576 grs. bullet. He went over to the shot and lay on his back with the blood bubbling out of his nose where the bullet had struck him. Thinking him dead and not wishing to spoil the skin with another shot, I went off to send the elephant to have him carried in. On our return about an hour later, he was not there, but from the blood traces it was clear he had rolled into the adjoining nullah. As it was late in the evening we postponed looking for him till next day, but, although we found where he had lain all night and even put him up, I could not get him. Some days after some Nagas brought me a chip of bone which appeared to be a portion of a jaw with a fragment of a molar which they said they had found in the jungle in a mass of fly blown pus at a spot where the tiger had been lying up.

Seven weeks later I got "khubber" of several kills of goats and finally of a young heifer. I went to this last kill, and found the beast badly clawed about the head with some very superficial punctures in the neck. I put it down to a leopard and tied up a goat. In a few minutes a tiger came out and I killed him with a ·303 bullet in the brain. When skinning the tiger,

I found the septum of the nose divided but healed and a hole through the nasal orifice slantwise to the joint of the left lower jaw. The joint was fractured and the pieces had come away, but instead a new muscular growth had formed which held the broken end of the lower jaw-bone to the joint. The tiger was in a famished condition, and it was abundantly clear that it was the same beast I had shot and lost seven weeks before.

W. J. H. BALLANTINE.

HAFLONG, NORTH CACHAR HILLS, *8th May* 1910.

No. III.—PANTHER FOUND AWAY FROM ITS USUAL HAUNTS.

The following may perhaps interest your readers. Late in the afternoon of the 4th instant a "shikari" came to tell me that a panther was surrounded by 60 villagers, about 3 miles from the Cantonment of Ahmedabad. I left at once but the 3 miles proved to be considerably more, and I only reached the village near which the panther had been seen by the "shikari" to find that it had been killed by the villagers who were determined not to lose the chance of getting the reward for his skin. The next morning they brought the dead body on a cart and obtained the Government reward, selling the dead beast as he lay to a native skin-dresser for Rs. 3. The skin, I may add, was much damaged, for the poor beast had been driven about from 11 A.M. to 6 P.M., from field to field, without any water, and when quite exhausted clubbed to death with lathies; a couple of the more plucky villagers rushing in as leaders. It is not often that panthers are to be found in neighbourhoods, such as this part of Guzerat; and this beast (a fine male) must have strayed from the Hills near "Idar" some 50 miles to the East.

This is the second time, however, that I have known a panther straying a long distance, from any cover, for in 1904 at Sirsa in the Punjab I followed up a panther that had come a long distance from the nearest Hills (Ulwar), and so little did the villagers realize the power of their visitor that some of them attacked him single-handed when they found him lurking near their goat enclosure and the Sirsa Hospital had 4 cases of bad mauling in consequence.

R. H. HEATH.

AHMEDABAD CAMP, *15th June* 1910.

No. IV.—THE CALL OF THE SLOTH-BEAR.

I notice in last November's number of the Journal (No. 3, Vol. XIX) on page 745, that it is rare to hear Sloth Bears calling. I was in the Billigarungun Hills, Mysore, shooting last April, and coming back to camp in the evening heard a curious howling some distance off. This my Sholega

trackers told me were bears. I went out in that direction next evening and met three bears together, out of which I was fortunate enough to bag two.

RONALD T. FOSTER, CAPT.,
1st Sherwood Foresters.

BANGALORE, 24*th May* 1910.

No. V.—OCCURRENCE OF THE ERMINE (*PUTORIUS ERMINEA*) IN CHITRAL.

From Blanford's *Mammalia* (p. 166), it appears that the Ermine has only once been reported with any certainty from within Indian limits, *viz.*, from near Dros, north of the Zoge-la in Kashmir. Hodgson's specimen from Nepal is believed to have been obtained from a trader in skins, and Adam's statement that it occurs in the lower and middle regions of the Western Himalayas, is discredited by Jerdon, and his doubt apparently supported by Blanford, there being no skin other than the Kashmir one just referred to, in any of our Museums procured in the Himalayas.

It is interesting therefore to be able to record a specimen from within Chitral Territory, the skin of which I send you. This specimen was killed by a Chitrali at Ayun (*Circa* 5,000 feet), who saw it come down to the river to drink in March this year.

The skin was submitted to the Mehtar, who elicited from his attendants that it is called "mirimustran" in Khowar, and that "it is well known in Chitral, but is not commonly or numerously found everywere."

F. WALL, C.M.Z.S.,
MAJOR, I. M. S.

CHITRAL, 21*st May* 1910.

[In Volume XVIII, pp. 882-3, of the Journal, Mr. R. C. Wroughton described a new race of stoat or ermine under the name *Mustela whiteheadi* from three specimens obtained by Mr. C. H. T. Whitehead in the Hazara district, N.-W. Frontier Province. There is also a specimen in the Society's collection of what is probably a stoat in winter dress (but the tip of tail is missing, and it is impossible to say whether it is a stoat or a weasel) from the Kurram Valley where it was obtained by Colonel Rattray in February 1899. Shortly before Mr. Wroughton's paper was published we received a letter from Lt. D. MacIntyre of the 2nd Gourkhas, saying he had shot an animal like a stoat and asking if the stoat had been known to occur before in Chitral or India. He offered to send us the skin and skull of the one he had shot for examination, but though we asked for specimens none have been forthcoming. Mr. MacIntyre at the end of his letter mentions that his Chitrali shikari says "there are two kinds of the same animal, one large and the other like the one mentioned. The former (possibly the pine-marten), he calls *khardush*, the latter *musá* or *musha*." Unfortunately we have seen no skin with a skull of the stoat from Chitral, and it is therefore impossible to say whether the one which is found there is the ordinary *Mustela erminea*, *M. whiteheadi* or the very small *M. ferghanæ* which was described by Mr. Oldfield Thomas in 1895 from a specimen from Ferghana, Central Asia.—EDS.]

No. VI.—TAPIR (*TAPIRUS INDICUS*) NEAR HOUSES.

The Tapir which occurs in the South of Tenasserim Division is usually a very timid animal, but a friend told me the other day that a Burman at Kado had seen one in his garden in the evening. Kado is a large village a few miles from Moulmein. The Burman did not recognise it as a tapir, but described it as a very large 'pig' half black and half white.

J. B. MERCER ADAM, F.C.H.,
Assistant Conservator of Forests.

RANGOON, 27*th July* 1910.

No. VII.—NOTES ON TIGERS.

Perhaps the following notes may be of interest to some members. In 1909, a Karen took 5 tiger cubs, apparently from one mother. They were certainly all found in the same lair, so it seems certain they were all the offspring of one mother. I did not see the cubs myself, but I have had the story corroborated by respectable and educated Karens. I do not know if this is an absolute record, but I should fancy so, as my experience in Burma has been that the tiger generally has one or two cubs only, rarely three.

I came across a curious case of wanton destruction by a tiger the other day. The beast entered the town of Papan, and killed a bullock and a pony, wounding another bullock, so that it died next day. The tiger had no cub with it, so it was not a case of the mother teaching her young to kill, and the kills were separated, so that the tiger seems to have wandered round slaying. It is no uncommon thing for tigers to enter Papan and even to kill cattle in side sheds, which is strange, as the station is surrounded with dense jungle which contains plenty of pig and barking deer.

I heard a story the other day from some Karens that a tiger had a pair of cubs which she kept in the fork of a tree, apparently six or eight feet from the ground. I was unable to corroborate this, and had not even time to go to the spot, so I give the story for what it is worth; and hope that, if any members have heard of similar cases, they will let us have the benefit of their experience.

J. B. MERCER ADAM, F.C.H.,
Assistant Conservator of Forests.

RANGOON, 27*th July* 1910.

[The usual number of young produced by a tiger is two, but there are records of larger numbers up to five and even six is not unknown.

A tiger having young in a forked tree seems rather improbable and sounds more like a panther, though we have never heard of such an instance.—EDS.]

No. VIII.—INTELLIGENCE DISPLAYED BY SHORT-BILLED MINIVETS (*PERICROCOTUS BREVIROSTRIS*) WHEN THEIR NESTS ARE IN DANGER.

The following extracts from my journal may, perhaps, be of some interest to ornithologists :—

12*th April* 1907.—To-day's result was

and a nest of the short-billed Minivet (*P. brevirostris*) containing four young partially fledged.

The nest was placed on the upper surface of a horizontal branch of a medium-sized Himalayan Cedar (*C. deodara*), at a height of 30 feet from the ground, and was well concealed. It was only discovered by watching the movements of the parent birds

I was greatly disappointed at not having found the nest before when it contained eggs, but to make up for the loss, I had the good fortune of being the spectator of the following incident, which clearly demonstrates the sagacity of birds.

When my man had climbed up the tree close to the nest, the parent birds (as I afterwards discovered them to be) began to behave in a most singular manner. They would turn their tails inwards between their legs, spread out their wings, and flutter down from a neighbouring tree on to the ground, just as a young bird, which could scarcely fly, would do. I thought at first that these birds were the young ones from some other nest which may be close by, and began chasing them about in order to catch them. As soon as I got close to one of them, it would steady itself, and fly on to the branch of a neighbouring tree, only to repeat the performance again. After watching them for some time, and observing them closely, I discovered to my astonishment that they were the parent birds! Their object in behaving in this extraordinary manner apparently was to entice us away from the spot by trying to delude us into the belief (as they undoubtedly did at first) that they were the young birds from the nest.

I did not disturb the nest that day, but when I visited the spot again a week later, the young ones were quite fledged, and flew off the nest long before my climber had got up to it. The old birds repeated the performance mentioned above. Of course, I was wiser this time.

31*st May* 1908.—I had another interesting experience with these birds to-day, exactly similar to the one related above.

On our way back home after a long ramble, we were passing along a hill covered with Himalayan cedars, and hearing a pair of these birds twittering quite close to us, I suspected that there was a nest, and accordingly began to search the trees; but could not locate it anywhere. That there was a nest

I was certain, for the old birds had something in their mouths, and after flying a few yards off, would return to a particular tree (the one next to that on which the nest was situated), and would fly off again. Determined to find the nest, I ordered my man to climb each tree in turn, and make a systematic search on all the branches. While he was thus employed, I examined some of the other branches with a pair of binoculars. After a fruitless search lasting over an hour and a half, I decided to go home, and visit the spot again on the following day. We had just gathered up our guns and other things, and on taking the "last look," I happened to spot the nest. It was placed on the surface of a horizontal bough of a Cedar, about 25-30 feet from the ground. Its outline could only just be seen from below. Needless to say my climber was up the tree like a monkey, and when he got close to the nest, the old birds (who apparently knew for certain by this time that their family were in danger) became quite desperate, and began to behave in exactly the same manner as previously related.

The nest in this case contained two young ones, fully fledged, both of them flew off the nest as soon as my man got close to it.

P. T. L. DODSWORTH, F.Z.S.

SIMLA, *7th July* 1910.

No. IX.—THE HIMALAYAN GREENFINCH.

Could any ornithologist kindly let me know whether the Himalayan Greenfinch (*Hypacanthis spinoides*, Vigors) is a permanent resident at moderate elevations?

In the neighbourhood of Simla (7,000 feet), these birds first begin to appear about the middle of July to breed, remain till the end of October and then seem to disappear. Are they subject to a seasonal movement along the Himalayan ranges? Stoliczka states (J. A. S. B., XXXVII, pt. ii., page 61) that in the lower hills this bird is not uncommon even during the *summer months* between 5,000-9,000 feet, and is also found associated with the Himalayan Goldfinch (*Carduelis caniceps*) in Spiti and Lahaul. The latter species appears to be partially migratory, being found in the summer at *high* elevations extending to W. Tibet, and during the winter months "all along the hill-stations of the *lesser* ranges."

P. T. L. DODSWORTH, F.Z.S.

CARLTON GROVE, SIMLA, *19th July* 1910.

No. X.—NOTE ON THE SPOTTED MUNIA (*UROLONCHA PUNCTULATA*) AND THE INDIAN RED MUNIA (*SPORÆGINTHUS AMANDAVA*).

This afternoon after a heavy shower of rain, termites started to fly out of a hole near one of my aviaries. They flew straight up and then through

the wire netting, and whilst watching them, I noticed some of the Spotted Munias pick them off as they went through, and one or two of the Red Munias caught them in the air with their bills and devoured them whilst hovering. I can find no note of any of these birds doing this before, and it seems to be most interesting.

CHAS. M. INGLIS.

BAGROWNIE FACTORY,
LAHERIA SIRAI, 18*th June* 1910.

No. XI.—NOTE ON BLYTH'S BAZA (*BAZA JERDONI*).

The following may perhaps prove of interest :—

On April 2nd, 1910, I secured a female specimen of Blyth's Baza (*Baza jerdoni*) at Kurseong, Eastern Himalayas, 6,000 feet, and I have seen the bird once before. I mention this as Blanford says in Vol. III., *Birds* (*Fauna of British India*) that it is a very rare species, and that only one specimen has been recorded from Sikhim and one from Tenasserim. My specimen had not assumed the adult plumage ; its dimensions were length 19 ; bill from gape 1·35 ; tail 9·5 ; tarsus 1·5 ; expanse of wings 40.

It had eaten two Agamoid lizards (*Japallura variegata*) as well as several *Coleopterous* (Longicorn) and *Orthopterous* (Mantidæ) insects.

E. A. D'ABREU, F.Z.S.

KURSEONG, 2*nd April* 1910.

No. XII.—OCCURRENCE OF THE LESSER FLAMINGO (*PHŒNICONAIAS MINOR*) IN KATHIAWAR.

I gather from *Indian Ducks and their Allies* that this bird has not hitherto been recorded from Kathiawar. I was shooting at Bhimsana in this district (Okhamandal) on the 6th March last, when I was struck by the small size of a flock of Flamingos passing overhead within range, and dropped one of them. It was a Lesser Flamingo. I then turned my attention to the other flamingos on the water, and found that out of perhaps 300 birds, nearly 100 belonged to the smaller species. In places both species were feeding together when the difference in size was much more marked than when on the wing. Apart from its smaller size, the Lesser Flamingo was distinguishable at a considerable distance with the glass by the dark colour of the bill.

A. W. MOSSE, CAPT., I.M.S.

DWARKA, 1*st May* 1910.

No. XIII.—PIED IMPERIAL PIGEON AND SHELDRAKE IN ARRACAN.

Mr. C. Hopwood, Deputy Conservator of Forests, Akyab, Lower Burma, has recently presented to the Society skins of a Pied Imperial Pigeon

(*Myristicivora bicolor*) and Sheldrake (*Tadorna cornuta*). The pigeon was obtained at St. Andrew's Bay, Sandoway, on February 12th, and the duck at Nyangye, Kyankju District on 31st January of this year.

The occurrence of these birds in Arracan is of great interest and as Mr. Hopwood writes "neither of these birds have been recorded from Arracan before." Within our boundaries the Pied Imperial Pigeon has a very limited distribution being only a seasonal visitant to the Andamans, but a resident in the Nicobars and according to Blyth, it is found in the Mergui Archipelago. Outside the Indian Empire, it is found in Siam, Cochin China, and some of the Indo-Malayan Islands.

There is no mention in *Indian Ducks and their Allies* of the Sheldrake occurring in Burma and in Bengal it is only of rare occurrence. Major Harrington has kindly informed us that a Sheldrake was shot by Mr. A. J. Jardine "at Meiktilla about 1887, and that it was identified on the spot by Colonel Adamson (late of the Burma Commission) and afterwards by the Bombay Natural History Society." We have been unable to find any reference to the skin either being sent for identification or presented to the Society.

N. B. KINNEAR.

6, APOLLO STREET, BOMBAY, *July* 1910.

No. XIV.—A BREEDING GROUND OF THE IBIS-BILL (*IBIDORYNCHUS STRUTHERSI*).

In the last week of April this year I was marching up the Bhaghirathi Valley and found that *Ibidorynchus* was fairly numerous at between eight and nine thousand feet. From Jalla to Harsil (where I first took these eggs in 1906) and up to and beyond Derali the river runs in several branches and with no great fall, through a wide valley and among large shinglebeds, and on these the *Ibidorynchus* breeds.

They are specially fond of nesting on the little islands, which are numerous and sometimes rather hard to get at; the nest is always placed right in the open; I never saw one under the shelter of a stone or stranded log as mentioned in the *Birds of India*, a common site is near the edge of a shingle-bank. The nest is easily found by keeping a sharp look-out ahead, and the bird will be seen running stealthily away; if the nest is not then immediately discovered the bird will return to it in a short time. I found fourteen nests in a few days, the eggs were mostly well incubated although I was a fortnight earlier than in 1906. In four nests, I found incubated clutches of three eggs, so it seems they sometimes lay three only. The nests have already been described, all I saw were made as before of little smooth black stones.

It is curious the eggs of this bird should have remained unknown so long,

as Mr. Wilson of Harsil ("Mountaineer"), who corresponded with Hume on birds, was quite aware of the existence of *Ibidorynchus* at Harsil, and that they bred there: but from a letter of his in "*Stray Feathers*" it seems, he believed, they nested under logs and drift timber, so it is perhaps not surprising he had not seen the eggs. The villagers of those parts who are constantly about on these banks do not seem to know the eggs. I found a nest with the bird sitting on it not fifty yards from some men cutting up a huge log—work they had been at for several days. They were much pleased at being shown the nest, but said they had never seen the eggs before, really one would have thought they must have trodden on them sooner or later.

However, it is a good thing they do not know of and go for these eggs, as the whole breeding ground is only about ten miles long and is easily searched being merely the river-bed; and I was, therefore, careful to give them no hint as to the value of these eggs to collectors, or to take them out with me, as it would be a great pity were this interesting bird to be driven from this very favourite haunt, the only one, I believe, that has been recorded in British India, though doubtless others exist.

S. L. WHYMPER.

Jeolikote, *July 28th*, 1910.

No. XV.—A VARIETY OF THE PEA-FOWL.

I have frequently heard Burmans say that there are two species of peafowl, in the one a tail is grown in the male, but the other species never gets a tail. I at first thought that this might be due to their being young birds or to bad feeding and seasonal conditions. But I was then told that the two species occur in separate flocks in the same areas, and the long-tailed species has yellow cheeks, the short-tailed brown. I have obtained a number of peafowl, but I have never been able to corroborate the existence of two species, although I think it probable that they do exist as the Burman is an accurate observer of birds and beasts. Perhaps some other member may have notes on the subject.

J. B. MERCER ADAM, F.C.H.,
Assistant Conservator of Forests.

Rangoon, *26th July* 1910.

No. XVI.—THE INDIAN WHITE-EYE (*ZOSTEROPS PALPEBROSA*.)

With reference to Captain Perreau's interesting article on the Seasonal Change of Colour in the Indian White-eye, I may mention I was mistaken in the same way when collecting in the Bhamo Hills; one day I shot a pair of *Z. palpebrosa* with chestnut foreheads, and at the time thought I had made a great find. But when the skins were taken to the Natural History Museum, S. Kensington, it was suggested that the chestnut on the foreheads

might be caused by the pollen of flowers, and sure enough on the application of a damp rag, the chestnut came off showing it was not permanent, and so my new White-eye turned out to be only the Indian ones with discoloured foreheads.

H. H. HARINGTON, MAJOR,
92nd Punjabis.

MANDALAY, *22nd July* 1910.

No. XVII.—THE IMPORTANCE OF CORRECTLY IDENTIFYING POISONOUS SNAKES.

A member of our Society has communicated to our Honorary Secretary a snake-bite casualty of special interest, as the snake was believed to be a krait, the injuries sustained treated under this belief, the symptoms were of a nature sufficient to impress most people with the idea that the patient was suffering from severe ophitoxæmia, and in reality the offender proved to be a snake of an innocent character.

The bitten subject, a cooly woman in Chanda (C. P.), aged 22, was bitten by a snake in two places on the middle of the middle right finger. Twenty-five minutes later she was brought to a dispensary, where the subordinate in charge believing the snake which had been killed and accompanied her, was a krait, applied a ligature, freely incised the wounds, rubbed in crystals of permanganate of potash, and injected two doses of antivenene 30 c.c. each. She complained of burning pain in the hand and arm which later became numb, thirst, and vomitted twice. Half an hour later, she was comatose with respirations 30 per minute, and a weak pulse of 120, which later became imperceptible, and swallowing was reported as impossible. After lying unconscious for 5½ hours, with brief intervals of consciousness, she revived, asked for water, drank, and then slept soundly to awake next day quite well, except for burning pain and numbness in the hand and arm.

Fortunately the snake was killed, and our correspondent had it placed in a bottle, and sent it to the Honorary Secretary, when it proved on examination to be the harmless Wolf snake (*Lycodon hutiens*). The notes of the case were supplied by the Hospital Assistant who attended the case.

The symptoms—vomitting, collapse with weak pulse, and incapability to swallow (not a genuine paralysis) are all to be attributed to an attack of syncope, in the main due to fright, but probably aggravated by the pain occasioned by the surgical wounds, and the burning of the permanganate.

Had the snake not been killed, this casualty like so many others would probably have been reported as another case of snake-poisoning cured by antivenene or permanganate of potash. It is a pity that every case of snake-bite known to our members is not similarly reported, especially when the snake, as in this instance, is available for trustworthy identification.

F. WALL, C.M.Z.S.,
MAJOR, I.M.S.

CHITRAL, *19th May* 1910.

No. XVIII.—A FATAL CASE OF VIPERINE POISONING.

Our Secretary has forwarded me the detailed notes of a snake-bite casualty which ended in the death of Mr. W. N. Neale lately near Broach. These notes were furnished by the Assistant Surgeon and the Civil Surgeon, who attended the case, and from these I extract the following information. Mr. Neale was bitten below the inner bone of the right ankle on the night of the 12th of May by a snake which he saw and described as being about two feet long. He was wearing socks at the time. He came indoors, applied a ligature above the ankle, and unable to persuade his servants to cut open the site of the injury had to do so himself, making two superficial incisions with a razor, and then he applied crystals of permanganate of potash. From the notes I conclude that the incisions, and the application of the salt were not what a Surgeon would consider at all satisfactorily performed.

He passed a restless night, and in the morning sent for a local snake charmer, who grasped the tissues as well as he could two or three times with his teeth, and sucked with the idea of forcibly extracting the poison. Being in great pain he sent for an Assistant Surgeon, 11 miles distant, who arrived in the afternoon of the 13th instant. He found two fine punctures ¾ an inch apart at the seat of the injury, one being very slight: the other was still bleeding and the foot was enormously swollen and discoloured greenish-blue. Mr. Neale was in great agony.

On the 14th instant the patient developed bleeding from the gums. He appears to have remained in much the same state till the 18th instant when he was carried to Tankari, and admitted into hospital, at 4 a.m. on the 19th. His wounds had then healed, and the foot had completely subsided to normal proportions, but there was swelling of the right calf and thigh. Later, pain in the right groin shooting into the abdomen was experienced, and the abdomen became distended, painful and tender. There were blood stained patches and spots in the skin of the arms and chest, and a large extravasation formed over the right buttock, and bled freely externally. His gums were still bleeding. He had no fever, but his respiration was hurried, and his pulse weak, and frequent. An enema relieved the abdominal symptoms, the stool being very dark (probably from admixture with blood).

On the 20th he had very severe pain in the right hip, which became swollen, and he could not bear to have it touched or moved. He was decidedly weak as shown by his pulse and at 2 a.m. had a fainting fit. He then complained of burning pain all over the body, and still had special pain in the right calf and thigh, but his abdominal pain was less and the swelling reduced. He vomitted three times during the day. Bleeding from the buttock had stopped, and the bleeding from the gums was slight. He had another fainting fit at 6 p.m. but rallied again. At 10-30 that night

the Civil Surgeon arrived from Broach and found the patient quite conscious, free from any nervous disturbance, but very exhausted. The breathing was distressed, and there was some congestion of the lungs. The pulse was thin and weak. The extremities were cold and livid. The gums were blue, spongy, and bleeding, and expectoration blood-stained. There were extravasations of blood beneath the skin of various sizes on the face, chin, neck, chest and back, and a very large one over the right buttock, and another on the inner side of the left (right?) thigh. The right foot was swollen to twice the size of the left, the tissues round the bitten part were sloughing and there was cellulitis of the foot and ankle.

The abdomen was tender and swollen. He saw a tarry stool that had been recently voided. In spite of every endeavour to save the patient, he continued to grow weaker, and died from heart failure at 2 a. m. on the 21st May.

Remarks.—The symptoms detailed above are all due to diminished coagulability of the blood, such as we know is induced by the poisons of both vipers and colubrine snakes. The absence of any nervous phenomena, negatives the idea that the culprit was a colubrine species, whilst the severity of the symptoms arising from the altered state of the blood, which we know are specially pronounced in viperine toxæmias, strengthens the assumption that it was a viper that inflicted the injury. The casualty occurring near Broach clearly points to the offender being either the "Phoorsa" (*Echis carinata*), or Russell's viper (*Vipera russelli*), but we cannot be certain which.

The symptoms are just those that might be seen in a case of scurvy, a disease in which the coagulability of the blood is profoundly altered. Visible hæmorrhages occurred from the gums, which were just in the same state that is so typical of that disease, from the bowel and beneath the skin. Invisible hæmorrhages account for the pain, tenderness, and swelling of the abdomen, and vomitting which recall to the physician's mind the identical state of affairs one sees in Henoch's purpura, another disease affecting the coagulability of the blood. The pain, swelling and tenderness of the right hip joint is similarly explained reminding one of the kindred state—arthritic purpura. Further invisible hæmorrhages explain the swelling and pain in the muscles of the calf and thigh. Death was due to exhaustion from constant hæmorrhages.

F. WALL, C.M.Z.S.,
MAJOR, I.M.S.

CHITRAL, *9th June* 1910.

No. XIX.—FOOD OF CROCODILES.

With reference to Captain Forsyth's inquiry in the last Journal, I have also *frequently* found large numbers of round stones in the stomachs of Gharials (*Gavialis gangeticus*), shot on the Gogra River.

The stones always had a most offensive odour, and gave one the idea of having been in the stomach for some time. Even after the lapse of several months, and constant exposure, they never lost the smell entirely.

It is some years now since I last shot a crocodile, but, as far as I remember, I generally found these stones only in the stomachs of the *large* ones; I have hitherto always been under the impression that these stones were taken as aids to digestion, but it would be most interesting to know the exact purpose which they serve.

P. T. L. DODSWORTH, F.Z.S.

CARLTON GROVE, SIMLA, S. W.,

17th July 1910.

No. XX.—ANOTHER FATAL INSTANCE OF VIPERINE POISONING.

I have to-day despatched to you a specimen of a snake obtained at Hangu (2,700 feet) in the district a few days ago. I shall be very much obliged if you will identify the snake for me. As far as I can tell, it seems to be an *Echis carinata*; this snake caused the death of a kakar serving under me, who was bitten and treated by potassium-permanganate and ligature—in the accepted way—almost immediately: he died however in 27 hours after the accident with symptoms of viperine toxæmia.

This snake is said to be common in Hangu though I have not met it before. I have had successful cures of *Echis* bite in Kohat (1,700 feet) during the last 3 years.

I shall be much obliged if you will let me know as soon as possible how you identify the specimen sent.

C. H. REINHOLD, CAPT., I.M.S.

FORT LOCKHART, N. W. F. P.,

19th July 1910.

[The snake proved to be a specimen of *Echis carinata*.—EDS.]

No. XXI.—VARIETIES OF THE COMMON GREEN WHIPSNAKE (*DRYOPHIS MYCTERIZANS*).

In our last Journal (p. 229) I made some remarks on the varieties of this snake, but overlooked the fact that the variety I alluded to under the name *lepidorostralis* had been already christened by Dr. Annandale under the name *anomalus*. This latter name must of course take precedence and my apologies are due to Dr. Annandale for my oversight.

F. WALL, C.M.Z.S.,

MAJOR, I.M.S.

CHITRAL, *15th August* 1910.

No. XXII.—FISHING IN BURMA.

Very little seems to be known about the game fishes of Burma, and my object in writing is to ask members to give their experiences as to the species, localities and proper bait to use at the different season. I am a keen fisherman, but I know very little about identifying the species, and should be thankful to be recommended a good book on the subject of classification.

My experience has been that the best flies to use are generally dark flies, hackle and no wing, with a silver body at dusk. Peacock feather is useful also. Of the winged flies, I prefer Brackenclock and Alexandra. As regards spoons, I find copper and silver the best and of artificial baits, a silver devon or a blue and silver rubber minnow, my objection to the latter being that it quickly becomes brittle in this climate.

I have found mahsir in the Sittang in Pyinmana District, and also the fresh water shark (*ngahnyin*). The mahsir also occurs, I believe, in the Bilin Chaung in Thaten district and in the Salween and its tributaries, but I have not caught them myself here.

I should be much obliged if some Burma member could give me the Burma name of mahsir? I have heard "ngatamigma" used in Pyinmana, but elsewhere in the dictionary it appears to be used for a species of cat-fish. In the Salween and Thaten districts the name is apparently "Ngathalin." I find an irregular use of the names of fishes in different places, and it is difficult to find a Burman who can give the names of the species, except the very commonest, with certainty.

J. B. MERCER ADAM, F.C.H.,
Assistant Conservator of Forests.

RANGOON, *27th July* 1910.

[The true Mahseir (*Barbus tor*) is not found in Burma, but there are several other large species of *Barbus* which inhabit the Burmese rivers. Thomas's "Rod in India" and Day's Fishes (*Fauna of Brit. India*) are the best books for classification, but we shall be happy to identify any specimens which may be sent in spirit to our the Society's Museum.—EDS.]

No. XXIII.—NOTE ON DR. BENTLEY'S PAPER "THE NATURAL HISTORY OF MALARIA."

One of the methods recommended in the above paper for the clearing of wells and fountains of Anopheles larvæ is the introduction of the small surface-feeding fish called "Piku." It will be of interest to the members of our Society to know that the first to recommend these fish, and to use them for this purpose was the late Mr. E. H. Aitken, one of our original members. I remember well in the monsoon season of 1902, when living in a chummery with him in Ezra House, Apollo Bunder, the delight with which he watched the lightning-like darts of the Pikus when mosquito larvæ

were placed in the aquarium he kept in the verandah. Many a day have I spent with our old friend Eha, in searching the valley to the west of the Malabar Hill reservoir, for mosquito larvæ for the purpose of feeding these hungry fish. We used to call the Pikus "scooties" because of the extreme nimbleness of the fish and the way they dart about like boys after a football.

Observing the eagerness with which the scooties devoured mosquito larvæ Mr. Aitken introduced a lot into the basin of the Wellington Fountain in front of the Sailors' Home in Bombay with the object of keeping the water free of larvæ; but alas, boy nature is the same all the world over, and in a few days our scooties had disappeared. The locality where he got the scooties from was the pool below the bund of the Vehar reservoir, where they swarm in hundreds.

I can add my testimony to the value of these fish as devourers of larvæ for I have kept them ever since in the tank in my fernery at Parel, and I can never find any mosquito larvæ there.

W. B. BANNERMAN, M.D., D.SC.,
LT.-COLONEL, I.M.S.

PAREL, BOMBAY, *July* 1910.

No. XXIV.—PAIRING OF THE SPIDER *NEPHILA MACULATA*, FABR.

For a long time the manner of the copulation of spiders was a subject of much doubt and speculation, as also the purpose of the specialisation of the male palpal organ.

In recent years research has revealed the delicate anatomy of the male palp and its adaptation as a sort of force pump capable of taking up and ejecting the seminal fluid. It has also been discovered that the fertilisation of the female is not effected by direct copulation, but through the agency of the male palp as an intromittent organ. However, direct observations have been very few, so that a description hardly needs an analogy.

With so large a spider as *Nephila maculata* (the body of the female is about 35 mm. long), observation is specially favourable, and I consider myself fortunate in happening on a pair in the act.

The male of *Nephila maculata* (of all the *Nephila* I believe) is very much smaller than the female and bears no resemblance to her. As the male is not described in the volume of *The Fauna of British India* on *Arachnida*, it may be of interest if I transcribe a short description from my notes.

"Length of body 8 to 10 mm., uniform light brown, the abdomen of a slightly darker shade than the thorax; legs in the same proportion as in the female and darker brown than the abdomen. Palp with a globular appendage terminated by a long acumen, globular portion jet black with black bristles above. The abdomen is rounded oval and not elongate as in the female" (see figure of the latter on page 218, *Arachnida, loc. cit*).

The female in the present instance was hanging vertically, head upwards in the remains of a web at a height of three feet. When I first saw the group the male had evidently already charged his palps with the seminal fluid, for I could not thereafter detect any movement or gesture that in any way suggested the taking up of any substance. I am not, therefore, able to throw any light on this operation about which too little is known.

He was running excitedly over the back of his consort in a rather aimless manner, so that it almost seemed that he imagined himself on the ventral surface and had lost his bearings. However, he very soon slipped round behind the fourth pair of legs and took up a position a little below the genital aperture so that he could reach to it with his palps by flexing the forelegs and straightening the hind ones. He then struck at the genital aperture, by alternate, rapid pecks of the palps, much as the fingers strike the keys of a typing machine. After a dozen strokes or so he drew himself back by straightening the front limbs and flexing the hind ones, and pausing for an instant, appeared to be replenishing the stock of semen at the distal end of the palp (this renewal is, of course, mere suggestion as no movement was seen that would prove it, but in any case the palps were held up and were not applied to any part of the bodies of either of the pair during the short interval). He then stretched forward towards the vulva once more and recommenced the tap-tapping. These operations were reiterated several times during a period of the three or four minutes. I had then to move on but on repassing the spot about half an hour later, the male was observed quietly squatting on the female's back. Throughout, the female was absolutely quiescent and made no attempt at molesting her spouse—a fact that does not agree with the popular idea that the female invariably devours her mate if opportunity offers.

This event took place on the 28th May, a very early date for these spiders which usually appear after the monsoon has broken, at least in these parts; indeed, these were the first specimens I had seen since January.

It would be interesting to ascertain where the eggs are laid and when they hatch out. I have never seen egg-sacs in the webs, and I have never come across immature specimens of this spider. I have noted males in the webs from October to December and gravid females in November and December.

Where are the eggs deposited, when do they hatch out, where do the immature individuals live, do the eggs only hatch out after the hot season? these are points for elucidation.

The disparity in size between the males and females is further evidence of Nature's economy where economy is desirable. It is the normal condition among lowly creatures for the females to be larger and more formidable than the males; not only is this necessary for defence but also for the provision of a large number of offspring. In such cases the females are

usually polyandrous, and in the case of the subject of this note, it is common to find several males in each web.

The greater importance of the females with polyandrous creatures and her subjection among polygamous and monogamous ones may be verified even among human beings and suggests philosophical reflections which, however interesting, are, perhaps, out of place in a Journal devoted to Natural History.

C. E. C. FISCHER.

COIMBATORE, *June*, 1910.

No. XXV.—FURTHER NOTE ON THE SPIDER *NEPHILA MACULATA*.

In connection with certain points raised at the close of a note on the copulation of the above spider, I would like to note that I have to-day (10th June) found a young female in a small web spread between two bushes, about three feet from the ground.

From the following comparative measurements, it will be seen that the individual was quite young :—

	Young.	Mature, *vide* 'Arachnida,' page 217.
Total length ..	9 mm.	37 mm.
Carapace ..	3 mm.	12 mm.
1st leg ..	24 mm.	72 mm.
4th leg ..	21 mm.	64 mm.

The young one seen to-day was found at an elevation of about 500 feet, whereas the pair in *copula* were seen at nearly 3,000 feet, some 20 miles from here.

To-day's capture seems to show that the eggs are hidden somewhere to tide over the dry season, and the young ones hatch out when there is sufficient moisture and very soon build their webs. I may mention that the adult pair found some days ago were on bushes in swampy ground bordering a perennial stream and, therefore, in a permanently moist atmosphere.

DONI, SOUTH MALABAR,
10*th June* 1910.

C. E. C. FISCHER.

No. XXVI.—BIOLOGICAL NOTE ON *APHNÆUS HYPARGYRUS*.

(*With a Plate.*)

A. hypargyrus (Butler) is confined to N.-W. India, Sind and Afghanistan in particular. These notes were made on specimens captured on the wing or bred from ova at Hyderabad, Sind. In this place, the insect is

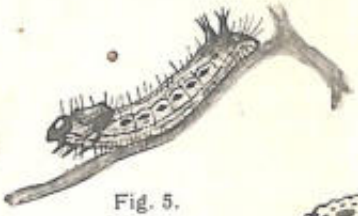


Fig. 5.



Fig. 1.



Fig. 6.



Fig. 2.

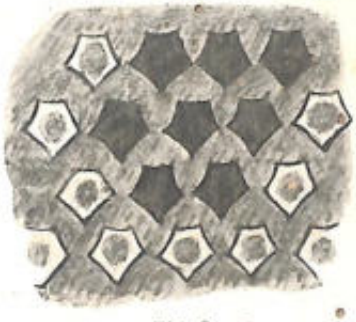


Fig. 3.



Fig. 4.



Fig. 8. ♀



Fig. 7. ♂



Fig. 9. ♀

F.C.F.

Life History of Aphnæus Hypargyrus.

locally plentiful, being restricted, as far as I have observed, to two small areas of rather more than one acre in extent. The country for some miles round furnished no specimens.

The imago is too well known to need a further description here, but I have shown in the plate figs 7, 8 and 9 the upper sides of male and female and underside of female. They are generally seen in small groups of three or four settling on or fluttering round low bushes or herbs at the corners of intersecting pathways or roads.

The ovié shown in the plate, fig. 1, are the size of the head of a No. 10 entomological pin and are not unlike the spineless shell of *Echinus esculentus*. They are dome-shaped, flattened on the resting surface, and present a pit at the apex of the dome. The upper surface is mamillated and finely pitted between the mamillar processes. In colour they are a dead-white and are exceedingly beautiful objects under a low power microscope. They are deposited usually on a dead twig in juxta-position to the food-plant or they may be laid on the bract at the base of a leaf-stalk.

On the 5th day the larvæ hatch out and appear first as tiny, hairy, mahogany-red creatures. The head from first to last moult, is a shiny jet-black. The hair of the first skin is coarse and white with the exception of eight black hairs which project horizontally back from the rear of the thirteenth segment.

The full-grown larva is a prettier object than the generality of its class. Fawn is the prevailing colour, but the mahogany-red tint persists on the first three segments and on the dorsum of the 11th, 12th and 13th, there is however a small patch of fawn on the sides of the first two segments.

There are fine double-lines of mahogany-red along the back and sides and a row of dots of the same colour extending from the 4th to the 10th segments. On the dorsum of the second segment is a shiny, black chitinous plate beneath which the head of the larva is retracted when alarmed.

The head is usually quite visible, especially when the larva feeds, thus differing from most lycænid larvæ. On the back of the twelfth segment, the larva bears two fleshy pillars surmounted by three stiff bristles, arranged in an equilateral triangle.

These pillars are hollow and from them project fine hairs. When the larva is irritated, a fleshy tongue is flickered in and out of these with great rapidity, very much in the manner of a snake's tongue. A diagram of these pillars is shown in fig. 2, the latter representing the tongue projected and showing the fine hairs attached to its tip.

When the larva is at rest, it will project the tongue like processes in and out, about every ten seconds and will continue doing so for long periods. I was not able to determine whether this action was protective in nature or for the purpose of signalling up ants. I noticed that it was carried on for a long time preparatory to spinning the cocoon. Like most lycænid larvæ

they are nearly always attended by ants, and this fact is of great use in searching for them, as it is easier to notice the ants than to see the larvæ.

Their food-plant is a species of *Cassia*, and they show a partiality to the young buds. When moulting they spin two or three leaves together, in which they lie until the change is effected. Often two or three will go into partnership to build this temporary cocoon, but as soon as the cocoon is finished the partnership is dissolved, and they wander off in different directions. The partnership is almost invariably brought about by the agency of ants, who pilot the larvæ to a suitable spot. The final cocoon is but a little more compact than the temporary ones and usually consists of two leaves, loosely woven together and open at both ends. The pupa is firmly fixed by the tail to one portion of the cocoon, and is dark-brown or blackish in colour. The head is rounded and stands out in relief from the body by reason of the very prominent shoulders. The abdomen tapers gradually.

The larvæ viewed under the microscope show a remarkable arrangement of star-like, fleshy processes which cover the entire skin so closely as to form a complete net-like coat. Fig. 3 shows a portion of the skin at the site of one of the lateral spots, viewed from above and it will be observed that the colouration is confined to the stellate processes. Fig. 4 shows them in profile.

The pupæ hatch out in from ten days to some weeks, this depending on the season.

F. C. FRASER, M.B.,
CAPTAIN, I.M.S.

HYDERABAD, SIND, *June* 1910.

LIFE HISTORY OF *APHNŒUS HYPARGYRUS*.

EXPLANATION OF PLATE.

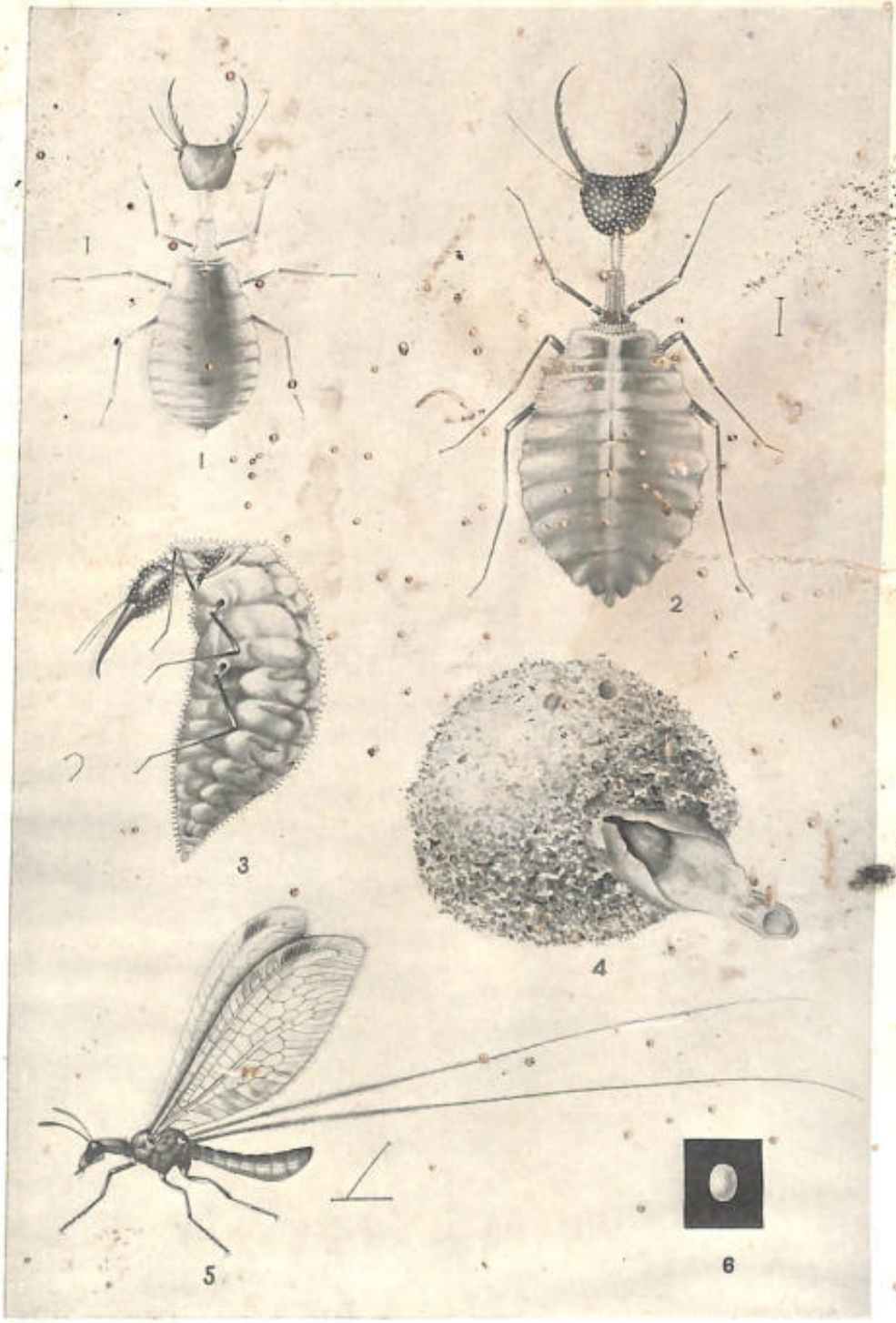
Fig. 1. Egg, seen under ⅛ objective.
„ 2. Pillars, showing process retracted and protruded.
„ 3. Skin, showing arrangement of the stellate papillæ.
„ 4. Stellate papillæ in profile.
„ 5. Larva, slightly enlarged.
„ 6. Pupa.
„ 7. ♂ imago.
„ 8. ♀ „
„ 9. ♀ „ (underside).

No. XXVII.—ENTOMOLOGICAL NOTES.

CROCE FILIPENNIS, WESTW.

(With a Plate.)

In April the insect is found flying in houses usually in the morning and evening. It hovers in the air, not however at one place but always with



Croce filipennis, Westw.

a forward and backward motion. The mode of flying is rather clumsy on account of the unweildy nature of the much elongated linear hind wings. It may be found in the company of mosquitoes, but can be at once distinguished from the peculiar manner of fluttering. The adult winged insect appears only in April, lays eggs and dies within a few days. Only one cycle is passed through in the course of the whole year, the egg and pupa stages occupying about a week and three weeks respectively and the larval stage the rest of the year.

Egg.—The insect laid eggs freely when captured alive and confined with a little quantity of dry dust or sand. Three laid 5, 6 and 8 eggs, respectively. The egg is almost round or slightly oval, the diameter being about ½ m.m. in one direction and a little less in the other. The surface of the egg is smooth, and the colour very pale yellow with a slightly bluish tinge. In confinement eggs were deposited either in clusters of 2 to 5 or in a scattered manner, a single egg being laid at one place. In the cluster they stuck to one another loosely. The eggs hatch in about 8 days.

Eggs laid on	Hatched on
4th April ..	.. 12th April
19th „ ..	.. 27th „
23rd „ ..	.. 1st May

Larva.—The young larva hatches out by bursting the egg shell which is white when empty. It measures a little more than 1 m.m. from the tip of the jaws to the hind end. The general appearance and shape are characteristic and remain the same throughout the larval state, *viz.*, a flattened and somewhat disc-shaped body with an elongated, narrow neck bearing the big round head, which is armed with formidable jaws. The 3 pairs of legs are slender and long. The colour of the body of the young larva is pale yellow and changes to grey with growth. After the first moult minute knobbed processes are apparent on the body, which help the larva to simulate the colour of the earth by holding particles of dust among them. The head and the jaws in the young larva are yellow and become brown later on. A grown up larva measures about 7 m.m. from the tip of the jaws to the hind end and about 3 m.m. across the thickest part of the abdomen. The neck is about 1½ m.m. long and the jaws about 1¼ m.m. The body segments are not clearly cut, but are more or less distinct on account of ateral indentations and shadings of colour. Fig. 1 pictures a larva 20 days old and fig. 2 are 7½ months old.

The larvæ were observed to moult only once, just after a month after hatching. The skin split from about the middle of the body over the neck to the base of the head, whence the fissure extended laterally forward on each side to liberate the head and the jaws.

The larvæ, especially when young, are active creatures and run about rather quickly in search of food. They were fed with silver-fish (*Lepisma* sp.)

and occasionally with bed bugs. They preyed on each other, when no food was available. They used to sit with the body hidden under dust or rubbish and lie in wait with open jaws for any passing silver-fish. They were not infrequently dragged to some distance by the prey, but hardly ever let go the hold. The silver-fish was often made motionless by pricking before being supplied and the larvæ would come and suck it. The winter was passed in a more or less resting but not a perfectly dormant condition. The larvæ stirred out if touched. They wanted no food at the time.

The larval stage lasts about a year. Some hatched on the 12th April and formed cocoons the next year between the 20th and 30th March.

PUPA.—The larva pupates in a round cocoon formed by binding particles of sand with a very thin white silk exuded from the hind end. A retractile straight yellow needle-like process is thrown out and taken in alternately, which applies the silk to the particles of sand by touching them with its tip from which the silk appears. All this time the larva either contracts or expands the body and keeps on turning round and round slowly. The finished cocoon measures about 4 m.m. in diameter and looks like a small ball of particles of sand cemented together loosely. Before turning into the pupa the larva rests for some time inside the cocoon with the head doubled on the ventrum. Such a resting larva is pictured in fig. 3. The pupa also remains ventrally curved inside the cocoon. Before emergence of the imago, it begins to straighten the body alternately. Thus the head strikes against the wall of the cocoon. In this way a hole is burst open in the wall of the cocoon through which the head with a portion of the thorax is pushed out. Then the skin bursts along the middle of the thorax and head and liberates the imago. Fig. 4 pictures an empty cocoon with the pupal skin protruding out of it. The period of the pupal stage is about three weeks. One formed cocoon on 20th March and emerged as the winged insect on 12th April.

C. C. GHOSH,
Assistant to Imperial Entomologist.

PUSA, BENGAL, *June* 1910.

EXPLANATION OF PLATE.

Croce filipennis, Westw.

1. Young larva, 20 days old, 1st stage, × 25.
2. Larva, 7½ months old, × 18.
3. Larva resting inside cocoon before pupating, × 18.
4. Cocoon with the pupal skin protruding out, showing how the imago emerges, × 16.
5. The adult insect, × 6.
6. A single egg, × 18.

No. XXVIII.—THE FOOD OF DRAGON-FLIES.

I was much interested in Mr. Maxwell-Lefroy's note on what Dragon-flies eat. I have never been able to identify an insect taken by one but that they are very bold in attacking some of a size nearly equal to their own, is, I think, pretty certain. When fly-fishing in the evenings, I have repeatedly seen a dragon-fly follow and strike at the flies on my cast. Even more curious when fishing for *orcinus* with a mulberry on my hook, I have repeatedly seen a dragon-fly go for the mulberry as I swung it over the rapid, and felt the sharp tug to the line caused by its striking it. No doubt it took the mulberry for a beetle, but is it possible that the dragon-fly could have killed and eaten a beetle of the size of a ripe mulberry? I can only state what has actually happened. My experience is probably not singular, as the same thing has happened so often.

F. J. MITCHELL.

SRINAGAR, 31*st July* 1910.

No. XXIX.—NEW VOLUMES OF THE "FAUNA."

With reference to the Imperial Entomologist's list (Journal, Bombay Natural History Society, Vol. XX, page 203) of the Volumes sanctioned by the Secretary of State for publication in the *Fauna of British India and Ceylon*, may I inform your readers that the two additional Volumes have recently been sanctioned and are now in the course of preparation in the Indian Museum, Calcutta. Assistance in the collection of specimens to be used in the preparation of these Volumes would be most gratefully accepted. They are to deal with (I) the Nemocera other than mosquitoes and Chisonomidæ (*i. e.*, the crane-flies or daddy-long-legs, fungus-midges, moth-flies, etc.) by Mr. E. Brunetti and (II) the sponges, coelenterates and polyzoa of stagnant water by myself. The Editor of the "Fauna" has also asked me to make arrangements to obtain for him specimens of ticks, leeches and meloid beetles (blister-flies) to be used in the preparation of other volumes in England and America. Most Indian Zoologists will agree as to the importance of rendering the official "Fauna of India" as complete as possible, and I have, therefore, no hesitation in appealing for assistance to the Members of the Bombay Natural History Society. I think it is a matter for special congratulation that it should at last have been found possible to sanction the preparation of part of the "Fauna" in the country with the animals of which it deals.

CALCUTTA,
6th August 1910.

N. ANNANDALE,
Superintendent of the Indian Museum.

[We hope members will collect specimens of the above mentioned animals, and we shall be happy to forward them to England or Calcutta.—EDS.]

No. XXX.—SCIENTIFIC NOMENCLATURE.

I am glad to reply to Mr. Venning's note. There can be no doubt that the botanical genus *Melastoma* is feminine, but the snake genera *Lycodon* and *Oligodon* are quite properly treated as masculine; the vowel in the last syllable is the Greek Omega, and the names (though ionic dialectical forms rather than Attic Greek) are quite correctly formed adjectives, masculine or feminine at choice.

As to the Latinising of proper names, I think the position is as follows. The termination of a family name in Rome was—*ius*, because the name was an adjective; Cæsar's family name was *Julius*, because he belonged to the *Gens Julia*, the Julian family. A personal name, however, would be treated as a substantive, and made Latin by the simplest practicable alteration, such as the addition of—*us*, if no acknowledged Latin form already exists. Hence the family names Brown and Smith should be *Brownius* and *Smithius;* but (and from the point of view of scientific species-names this is the important fact) the genitives of names ending in—*ius* should properly be written to end in—*i* only, not in—*ii*; thus the genitive of *Caius* is *Cai*, of *Smithius Smithi* and as this is the case usually in question, the matter seems to be resolved thereby.

EDWARD MEYRICK.

MARLBOROUGH, WILTS., *22nd July* 1910.

PROCEEDINGS

OF THE MEETING HELD ON 23RD JUNE 1910.

A Meeting of the Members of the Bombay Natural History Society took place on Thursday, 23rd June, at the Society's Rooms, Mr. John Wallace, C. E., presiding.

The election of the following 61 new members since the last meeting was duly announced :—Mr. G. E. Browning (Trichur) ; Miss Margaret E. Fountaine (England) ; Mr. J. A. MacGregor (Bezwada) ; Mr. D. de M. S. Fraser (Goona) ; Mr. G. F. de Montmorency, I.C.S. (Lyallpur) ; Mr. A. A. Brown (Bombay) ; Mr. W. G. Moore (Mandalay) ; Mr. E. Street (Mandalay) ; Mr. H. E. Beamish (Mandalay) ; Mr. H. D. Giberne (Mandalay) ; Mr. W. H. L. Cabell, I.C.S. (Bhamo) ; Mr. Fred. Bishop (Rangoon) ; Mr. W. B. Sommers, M.B. (Rangoon) ; Mr. T. M. S. Culbertson, A.M.I.C.E. (Bombay) ; Mr. H. R. Aston (Shwebo) ; Mr. E. L. Moysey, I.C.S. (Bandra) ; Mr. A. O. St. J. Dixon (Bombay) ; Mr. P. O'Brien (Thana) ; Mr. E. J. Farmer, I.C.S. (Lashio) ; Mr. David W. Winsor (Sirur, Poona) ; Dr. M. F. Suter (Bombay) ; Mr. O. C. B. Wimbush (Bombay) ; Mr. G. M. Boughey, I.C.S. (Simla) ; Mr. Chas. S. Schults (Tokio, Japan) ; Mr. V. H. Boalth (Lahore) ; Mr. W. D. Cruickshank (Bharatpur) ; Mr. B. L. Chavdhari, B.A., B.Sc. (Calcutta) ; Mr. Granville Lee-Warner (Jubbulpore) ; Capt. M. E. Rae (Bombay Political Department) ; Mr. C. R. S. Betts (Bokahat, P.O., Assam) ; Mr. J. G. Ryan (Cawnpore) ; Lt.-Col. E. G. Snow (Peshawar) ; Lt. C. E. Litchfield (Peshawar) ; Lt. H. G. Robinson (Peshawar) ; Mr. F. J. Mitchell (Srinagar) ; Mr. W. Walsh (Shwebo) ; Mr. T. S. Grigson (Rangoon) ; Mr. Frank T. Barton, M.R.C.V.S. (England) ; Capt. A. T. Hunt, R. N. (East Indies Station) ; Mr. C. William Beebe (U.S.A.) ; Mr. A. W. King (Dacca) ; Mr. M. C. Koechlin (Travancore) ; Mr. A. J. Turner, B. Sc. (Lon.) F.I.C. (Bombay) ; Mr. P. M. Baker, B.Sc. (Lon.) A.M.I.M.E., A.M.I.E.E. (Bombay) ; Mr. H. S. Chatfield, B.A., Oxon. (Bombay) ; Mr. David Arthur, I.M.S. (Lucknow) ; Mr. A. D. Keogh (Narayanganj) ; Capt. G. C. Morphett (Punjab) ; Capt. A. M. Rundall (Dalhousie) ; Mr. W. S. Powell, I.F.S. (Rangoon) ; Mr. Walter Ogilvy (Monywa) ; Mr. A. G. Murray (Nelliampatty) ; Mr. A. F. Hood (Kindat) ; Mr. J. P. Bradshaw (Bombay) ; Capt. G. A. Hassels-Yates (Bombay) ; Mr. G. O. De R. Channer (Murree) ; Mr. J. R. Webster (Bombay) ; Mr. F. M. O'Callaghan (Gauhati, Assam) ; Mr. C. E. Milner (Tharrawaddy) ; Mr. A. E. Jones (Simla) and Mr. W. Colin-Durham (Bombay).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowleged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donors.
Indian Marten (*Mustela flavigula*).	Kulu	General Osborn.
Jackal (*Canis aureus*)	Bunder Abbas ..	Capt. Rae.
Jungle Cat (*Felis chaus*) ..	Cannanore ..	Major H. R. Baker.
Swayne's Hartebeest (*Bubalis Swaynei*).	Somaliland ..	Capt. A. H. Mosse.
Phillips Dik-Dik (*Maddoqua Phillipsi*).	Do. ..	Do.
Speke's Gazelle (*Gazella spekei*) ..	Do. ..	Do.
Pelzeln's Gazelle (*Gazella pelzelni*).	Do. ..	Do.
Soemmering's Gazelle (*Gazella sommerringi*).	Do. ..	Do.
Waller's Gazelle (*Lithocranius walleri*).	Do. ..	Do.
Clarkes' Gazelle (*Ammodorcas clarkei*).	Do. ..	Do.
Baiza Orix (*Orix beiza*)	Do. ..	Do.
Greater Koodoo (*Strepsiceros capensis*).	Do. ..	Do.
Gaur's (*Bos gaurus*) head ..	Kanara ..	Anonymous.
1 Himalayan Striped Squirrel (*Funambulus macclellandi*).	Darjeeling ..	E. A. D'Abreu.
2 Bats and young rat, sp. ? ..	Do. ..	Do.
3 Painted bats (*Cericoula picta*).	Shwebo ..	Major Delme Radcliffe.
41 Bird skins, including *Aquila hastata*, *Siphia hyperthia*, *Aegithaliscus erythrocephalus*, *Turdus viscivarus*, *Merula unicolor*.	Himalayas ..	S. L. Whymper.
1 Altai Accentor (*Accentor himalayan*).	Simla	P. T. L. Dodsworth.
1 Malabar Pied Hornbill (*Anthracoceros coronatus*).	Kanara ..	T. R. Bell.
3 Eggs of Common Sandgrouse (*Pterocturus exustus*).	Cutch	H. H. The Rao of Cutch.
2 Brown-headed Gulls (*Larus brunnicephalus*).	Cannanore ..	Major H. R. Baker.
2 Indian Monitors (*Varanus bengalensis*) alive.	Dharwar ..	T. H. Abraham.
A number of toads and frogs ..	Cannanore ..	Major H. R. Baker.
3 Mosquito-eating fish (*Anabas scandens*, *Haplochilus lineatus* and *Polyacanthus cupanus*).	Salsette ..	Dr. Bentley.
A large number of Diptera, Hymenoptera, Hemiptera, Orthoptera and Neuroptera.	S. India ..	E. E. Green.
A large number of Lepidoptera, in papers, mostly new to the collection.	Various ..	Capt. W. H. Evans, R.E.

Contribution.	Locality.	Donors.
Several beetles	Maymyo ..	J. H. Lace.
1 Snake, several fish, echinoderms and crustaceaus.	Bay of Bengal ..	Dr. W. Forsyth.
Some Lepidoptera and Coleoptera.	Palni Hills ..	Dr. T. V. Campbell.
74 Beetles	Dera Ismail Khan	Lt. R. T. Francis.
A collection of butterflies ..	Kashmir ..	T. R. Bell.

Minor Contributions.—Mrs. Dimmock, Miss Goldney, Mrs. Swinhoe, Dr. Deane, Majors Girvin and O. A. Smith, Lt. Jenkins, R.G.A., Messrs. C. E. Durnford, L. H. Savile, C. Hudson, I.C.S., H. S. Wise, A. H. Marshall, P. Briscoe, J. Clarke and Messrs. Murray Brothers.

EXHIBITS.

The Secretary drew the attention of Members to the valuable contribution which Capt. A. H. Mosse had made to the Society consisting of 9 heads of gazelles, etc., from Somaliland. These heads having been mounted by one of the leading taxidermists in England were a great acquisition to the Museum and it was to be desired that other Members would follow Captain Mosse's example and provide the Society with a good specimen of the male and female of each of the Indian game animals.

Col. W. B. Bannerman, I.M.S., exhibited a brood of young live Phoorsas (*Echis carinata*) which were born in the Bacteriological Laboratory at Parel on 15th June 1910. The cage was one which contained 8 adult Phoorsas.

THE PIED-CRESTED CUCKOO.

Mr. Kinnear exhibited some skins and eggs of the Pied-Crested Cuckoo (*Coccystes jacobinus*) and remarked that every year in the latter part of the hot weather there appears to be a large influx of Pied-Crested Cuckoos into Bombay and the surrounding district. They generally made themselves noticeable about the first week in June and were not in evidence after the end of the rains. He mentioned that this Cuckoo was found all over India, but in many places it was according to Blanford "either met with only during the rains or more abundantly at that period."

During the last three weeks quite a number of examples had been brought into the Museum, which for the most part had been rescued from the attacks of crows, who seem to have a special dislike to this bird. He asked why should crows be so persistent in their attacks on this apparently to them harmless cuckoo? It could not surely be from any fear of the cukcoo laying in their nests since there is no record of an egg being found in the crow's nest, that of the larger Babblers *Argya* and *Crateropus*, as a rule

being chosen though sometimes that of a laughing thrush is selected, and Mr. Stuart Baker has recorded two instances where eggs were found in the nest of a small Nepal babbler (*Alcippe nepalensis*.) It might, however, be worth mentioning that a cuckoo belonging to the same genera, the spotted cuckoo *C. glandarious* of S. Europe and N. Africa, lays its eggs in the nests of crows and magpies. Crows were, of course, always ready to mob any strange bird; for instance, two weeks ago an Indian Pitta, halting on migration, was rescued from their clutches in the University Gardens and brought to the Museum. A crested cuckoo can, however, hardly be called a strange bird after the first few days of its arrival, and the crows must surely have some other reason for mobbing it. He suggested to members that they should endeavour to note when last Pied-Crested Cuckoos were seen at the end of the rains, and that those who happened to be in the country in the neighbourhood of Bombay, during the cold weather might keep a look-out for this species and report its occurrence. He added that any observations which might help to elucidate the cause of the great antipathy which crows have for Pied-Crested Cuckoos would always be of interest.

PAPER READ.

Note No. 2 on the giant water-storing Climber (*Calycopteris floribunda*) Lamk, by Lt.-Col. K. R. Kirtikar, I. M.S. (Retd.), with a microscopic demonstration of sections of the plant by Prof. V. N. Hate, B. Sc.

PROCEEDINGS

OF THE MEETING HELD ON THE 25TH AUGUST 1910.

A Meeting of the Members of the Bombay Natural History Society took place on the 25th August 1910 at the Society's Rooms, Major C. R. Hoskyn, R.E., presiding.

The election of the following 47 new members since the last meeting was duly announced:—Mr. Kawasji Dadabhoy Dabash (Bombay); Mr. E. W. Lace (Waltair, Vizagapatam Dist.); Dr. A. G. H. Smart, M.B. (Kelanton *via* Singapur); Mr. M. M. Wadia (Bombay); Mr. E. A. D'Abreu (Kurseong); Mr. J. H. Manning Fox (Barrackpore); Mr. I. W. Stokes (Bombay); the Mess President, 1st Connaught Rangers (Dagshai); Mr. G. H. Welchman (Parlakimedi, Ganjam Dist.); the Mess President, 101st Grenadiers (Mhow); Mr. Joston Honfray (Gauhatti, Assam); Mr. James I. Smith, I.C.S. (Koraput, Vizagapatam Dist.); Mr. J. A. Anderson (Rangoon); Mr. A. de C. Carson (Jaffna, Ceylon); Mr. A. J. Kilmartin (Jaffna, Ceylon); Mr. K. M. Balfour (Jhansi); the Mess President, 41st Dogras (Cawnpore); the Director, Dept. of Agriculture (Eastern Bengal and Assam); Lt. L. H. L. Mackenzie, I.M.S. (Bombay); Mr. J. H. Smith (Bhuj); Mr. P. N. W. Wilson (Jubbulpore); Mr. H. M. Hope-Johnston (Jubbulpore); Major J. R. Carter (Jetalsar, Kathiawar); Mr. W. A. Nicholetts (Tejpur, Assam); Mr. D. S. Withers (Sibsagar, Assam); Mr. N. Macmichael, I.C.S. (Chatrapur, Ganjam

Dist.); Mr. J. W. Glasson, I.C.S. (Bhadrachalam, Godaveri Dist.); Capt. A. E. St. V. Pollard (Wellington, Nilgiris); Mr. J. H. B. Shand, I.M.S. (Bombay); The Economic Botanist to the U. P. Government (Cawnpore); The Honorary Secretary, King Edward Library (Rawalpindi); the Deputy Director of Agriculture (Mandalay); Mr. F. J. Parton (Koppa, P.O., Kadur Dist.); Mr. J. R. Lemarchand (Kookila Mook, Assam); Capt. A. W. Howlett, I.M.S. (Bombay); Mr. E. D. Sampson (Hubli); Mr. Hugh A. Lomas, I.C.S. (Mussoorie); Mr. A. P. Davis (Mandalay); Mr. W. J. Stanbridge (Kasauli); Dr. N. Annandale (Calcutta); Mr. Charles Cole Barker (Tezpur); Mr. Seymour C. G. Wood (Bombay); Mr. E. W. Bolitho (Neemuch); Capt. O. Kennedy-Crawford-Stuart (Myitkyina, Burma); Mr. A. H. D. Barron (Manipur); Mr. G. S. Hart (Nagpur, C. P.); and Mr. A. Wimbush, I. F. S. (Salem, Madras Presidency).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting:—

Contribution.	Locality.	Donor.
Skin and skull of Wild Dog (*Cyon dukhunensis*).	Kanara	T. R. Bell.
Skin and skull of Mountain Fox (*Vulpes montana*).	Rawalpindi	A. W. Mercer.
Deformed Marmot's skull	Kashmir	A. F. Brooke, R.F.A.
17 Birds' skins, 2 Flying Squirrel skins and 1 Marmot skin.	Chitral	Major F. W a l l , I. M. S.
7 Bird skins	Toungyi, Burma	Capt. S. Lightfoot.
Albino Hoopoe (*Upupa indica*)	Amballa	A. F. Brooke, R.F.A.
4 Eggs of Ibis Bill (*Ibidorhynchus struthersi*).	Bhagirthi	S. L. Whymper.
Eggs of little Bittern (*Ardetta minuta*).	Kashmir	Major J. Elgee.
Great Indian Reed Warbler (*Acrocephalus stentoreus*), Bronze-winged Jacana (*Metopidius indicus*) and nest of *A. stentoreus*.	Do.	Do.
2 Snakes (*Zamenis rhodorachis* and *Tropidonotus tesselatus*).	Muhummerah, Persian Gulf.	Lt. A. T. Wilson.
7 Snakes (*Xenopeltis unicolor, Zamenis mucosus, Lachesis gramineus, Dip. multimaculata*, &c.)	Toungyi, Burma	Capt. S. Lightfoot.
A number of Frogs and Toads	Cannanore	Major H. R. Baker.
A small collection of Butterflies	Kashmir	T. R. Bell.
A small number of Beetles and other insects.	Haka, Chin Hills.	F. E. W. Venning.
12 Crustaceans (in exchange)	Various	Indian Museum.

Minor Contributions.—Mrs. Millard, Mr. E. R. H. Jackson, Dr. D. A. Turkhud, Mr. V. Joshi and Mr. G. Wilson.

CONTRIBUTIONS TO THE LIBRARY.

Mr. B. D. Richards, the Honorary Librarian, drew attention to the four Volumes of "Reichenbachia" by F. Sander, which Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.), had kindly presented to the Society's Library and the beautiful coloured plates of Orchids were greatly admired by all present.

JOURNAL.

The Secretary mentioned that the next number of the Journal was in the press and would contain, amongst other coloured illustrations, three in connection with "The Game Birds of India" by Mr. Stuart Baker. They would be, the Woodcock, the Eastern Solitary Snipe and the Wood-Snipe. He was glad to say that a number of new members were joining in consequence of this series, and doubtless when others saw the beautiful illustrations, they would join the Society so as to obtain the journal. The Society spare no expense in obtaining the best sketches and illustrations which could be had.

EXHIBITS.

The attention of members was drawn to the specimen of Indian Lion which had been presented to the Society by H. H. The Nawab of Junagadh, G.C.S.I., through the kindness of Mr. C. H. Hill, I.C.S., C.S.I., C.I.E. This specimen which has only just arrived from England has been excellently mounted and proves a valuable addition to the Society's Museum, particularly so now that there are so few Lions left in India.

Capt. Patton, I.M.S., exhibited a common Indian Fruit Fly breeding in Oranges and made some remarks in connection with it.

Dr. Bentley and Capt. Taylor, I.M.S., showed their new method of mounting Mosquitoes.

PAPERS READ.

The following papers were then read :—

1. A new method for making permanent preparations of mosquitoes with demonstrations by Dr. C. A. Bentley and Capt. J. Taylor, I.M.S.

2. The Kathiawar Lion by Lt.-Col. L. L. Fenton.

The Secretary said that through the good offices of Mr. C. H. Hill, I.C.S., and Major J. B. Carter, of Jetalsar, the Society had been able to obtain some excellent photographs of a large Indian lion, which is in captivity in the gardens at Junagadh. These photographs show how the mane grows when the animal is kept in confinement and bears out the contention that the mane is destroyed in wild specimens, because of the thick jungle in which they are found.

These photographs will be published in the Society's journal with the above paper.

A vote of thanks was passed to the authors of the papers read, and the meeting then terminated.

EXTRACTS FROM THE PROCEEDINGS OF THE BALUCHISTAN NATURAL HISTORY SOCIETY HELD ON 28TH OCTOBER 1909.

Read list of donations made to the Museum during the month, the specimens themselves being passed round for inspection. Of these the most important were:—

A fine Mahseer, from the Beji river near Babarkach, presented by Major A. L. Jacob.

A Beech Marten, from the Brewery, Quetta, presented by Mr. F. W. Starnack.

A Stone Curlew, from Saranan, presented by Mr. G. L. J. Davis.

A Himalayan Solitary Snipe, from Kowas Tangi near Ziarat, presented by Lieutenant Leared.

Two Rock Thrushes, from Quetta, presented by Mr. J. W. N. Cumming.

A Leopard skin, from Mangi, presented by Mulla Alif.

In addition to the donations received during the month, the Python (*Python molurus*), Cobra (*Naia tripudians*), and Double-Headed Snake (*Eryx johnii*), exhibited alive by Mr. Flynn at the last meeting and which had since been killed and mounted by Mr. Flynn, were also passed round for the inspection of such of the Members absent on that occasion; while Mrs. Drake exhibited a curious pair of Markhor horns found on the Murdar range in which one of the horns was of the close spiral type and the other had open curls like that of the Astor type.

Read letter No. 633, dated 9th October 1909, from Mr. Maxwell-Lefroy, stating it was impossible to identify the *Psychida* larvæ presented by Mr. Dracott, but that he would do so later, if any of them developed into moths.

The Hon'ble President then concluded the meeting with a few remarks. He suggested that the Sambar Head and other exhibits not of local origin which had been placed in the Museum be kept apart. He desired that the thanks of the Meeting be conveyed to Mulla Alif for the Leopard skin he had sent in and expressed a hope that it would not be long before another would be secured. He further referred to the appeals read at the last Meeting and expressed the hope that members would respond by sending in their observations on the arrival and departure, etc., of Woodcock and Snipe and the migration of birds in general, and expressly asked that advantage be taken of the present shooting season to secure and send in specimens of snipe, grouse, duck, hare, etc.

In conclusion he mentioned that when passing through Bombay on his return from leave, the Honorary Secretary, Bombay Natural History Society, desired him to thank the Members of the Baluchistan Natural History Society for their help to the Bombay Natural History Society.

25th November 1909.

Read list of donations made to the Museum during the month, the exhibits themselves being passed round. Of these, the most important were—

A Jackdaw, from Baleli, presented by Master Walter Cumming.

A Fossil (*Amblypygus altus* ?), from Manzai, presented by Col. C. W. Jacob.

A Red-tailed Chat, from Kaliphat, presented by Lt. G. T. Raikes.

Three specimens of *Pyrrhocoris apterus* (?) found by Mr. Dracott in a fissure in a rock and in a building at Hanna.

The Honorary Secretary brought to notice the rarity of the Jackdaw and the Red-tailed Chat, remarking that the existence of the former in Baluchistan had not previously been recorded, while Major Gough remarked that he had also seen some recently.

Read letter, No. 1874, dated the 3rd November 1909, from Mr. I. H. Burkill, M.A., Offg. Reporter on Economic Products to the Government of India, Calcutta, intimating that the specimen of Artemisia (vernacular "Tirkha") sent to him had proved, on examination, to be *A. maritima*, and that the white tufts on the plant are the work of insects.

Read letter, dated 6th November 1909, from Mr. N. B. Kinnear, Keeper of the Museum, Bombay Natural History Society, intimating that the Snipe sent to him for identification was *Gallinago solitaria*, the Himalayan Solitary Snipe, and that it tallied with a bird received by the Society recently from Garhwal, the absence of any black on the head and of the pale median stripe on the crown being doubtless due to its being a young bird.

21st December 1909.

Read list of donations received and purchases made by the Museum since the last meeting, the objects themselves being passed round for inspection.

Of these, the most important were—

A Hyæna, from Gulistan, presented by S. B. Haji Ghulam Hyder Khan.

A large Cormorant, from Khushdi Khan Ban, presented by Lt. R. M. Jacob.

Two Bramblings, from Quetta, presented by Lt. A. M. Lloyd.

A Barnes's Chat, from Baleli, presented by Master Arthur Cumming.

A copy of a work entitled "Insect Intruders in Indian Homes" by Mr. E. P. Stebbing.

A painting by Mrs. Dracott, of two wild plants found growing at Hanna.

Read letter, No. 939, dated 2nd December 1909, from Mr. H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S., Imperial Entomologist, Agricultural Research Institute, Pusa, forwarding three moths which had come out of some of the cases found by Mr. Dracott at Hanna and referred to in the Society's Proceedings of 22nd October 1909, and stating that they are undescribed in the Fauna of India and are probably new to science.

27th January 1910.

Read list of donations made to the Museum since the last meeting, the

specimens themselves being passed round for inspection. Of these, the most important were—

A Brambling from Quetta, presented by Master Bertie Smith, and a beautiful male Smew, from Nushki, presented by Major F. C. Webb Ware, C.I.E.

A copy of Lepidoptera Indica, Part LXXX, by Colonel C. Swinhoe, M.A., F.L.S., F.Z.S., presented by the Government of India in the Home Department.

A number of shells belonging to the Quetta Museum which had been kindly identified by the Indian Museum, Calcutta.

Various specimens of Mollusca, Lizards, Fish, Coleoptera, Hemiptera, Neuroptera and Diptera, presented by the Indian Museum, which formed a most interesting and welcome addition to the exhibits on view.

A set of coloured plates of insects presented by Mr. H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S., Imperial Entomologist, Agricultural Research Institute, Pusa.

List of botanical specimens contributed by the Baluchistan Forest Department to the Museum, prepared originally by R. B. Bhai Sadha Singh, Retired Extra Deputy Conservator of Forests, and now revised by Lala Mulraj, the present Extra Assistant Conservator of Forests in Baluchistan.

Some observations on bird migration made at or near Quetta and communicated to the Honorary Secretary during the month, were then read.

24th February 1910.

Read list of the zoological donations made to the Museum since the last meeting, the objects themselves being passed round for inspection.

Of these, the more important were—

A Brandt's Rose Finch, obtained in Quetta, by Master H. Smith.

A Himalayan Griffin, obtained in Quetta, by Master C. Anscomb.

A Griffin Vulture, obtained in Quetta, by purchase.

A female Smew, from Saranan, presented by Mr. A. Sisson.

A fine Golden Eye, from Saranan, presented by Mr. G. L. J. Davis.

31st March 1910.

Read list of donations made to the Museum since the last meeting, the objects themselves, which were numerous, being passed round for inspection. Of these, the most important were—

A valuable collection of the Sea Shells, etc., from the Persian Gulf, presented by Mr. F. W. Townsend, Chief Officer, I.G.T. Str. "Patrick Stewart."

An Afghan Jerboa, from Quetta, presented by Master Bertie Smith.

Two Ruffs, from Baleli, presented by Master Walter Cumming.

A Strickland's Chat, from near Baleli, presented by Mr. J. W. N. Cumming.

Several Flamingo, from Khushdil Khan Abigum and Nari Bank, presented by Captain D. I. Shuttleworth, Mr. Wood and Mr. L. 'Esteve.

A Great Black Headed Gull in winter plumage, from Saranan, presented by Mir Ahmed Khan.

A Rock Sparrow, from Quetta, presented by Lt. A. M. Lloyd.

An Allied Grey Shrike, from Kuchlak, presented by Corporal Bridger and Private Hudson.

An Eastern Calandra Lark (?), from Baleli, presented by Corporal Bridger and Private Hudson.

An exceptionally fine collection of Duck, etc., obtained, with two exceptions, from Khushdil Khan, *viz.*—

A Gadwall, from Baleli, presented by Lt. P. Shepherd.

A male Pochard or Dun Bird, from Saranan, presented by Mrs. S. D. Turner.

A female Pochard or Dun Bird, presented by Lady McMahon.

Three Shovellers, presented by the Hon'ble Sir Henry McMahon and Majors Cobbold and Gough.

Two Pintail Ducks, presented by Lt. H. C. Finnis.

A Wigeon, presented by the Hon'ble Sir Henry McMahon.

A Golden Eye, presented by Major E. C. Cobbold.

A White-Eyed Duck, presented by Mr. Bartholomew.

A female Mallard, presented by Captain W. J. Maxwell-Scott.

A Pelican, presented by Miss Elliott.

A pair of Great Crested Grebe, presented by Colonel Woodyatt and Major Gough.

In addition to the above, three paintings by Mr. S. D. Turner of a wild plant, and a painting by Miss Anscomb of some wild Tulip Flowers, were also passed round.

28th April 1910.

Read list of donations made to the Museum since the last Meeting, the objects themselves being passed round for inspection. Of these, the most important were :—

A collection of 51 species of named Diptera, presented by the Indian Museum, Calcutta.

A fine lizard, from Mach, presented by Mr. E. Wood.

A Krait, from Fort Sandeman, presented by Major C. H. Ward.

A Booted Eagle, from Quetta, presented by Major H. Gough.

A lovely Red-headed Bunting, from Quetta, presented by Lt. A. M. Lloyd.

Specimens of Iron Pyrites, Crystalline, Limestone, Chromite, Manganese Ore and Magnesite, from Hindubagh, and of Halotrichite (Iron Alum) from Harnai, presented by Mr. W. C. Clements ; and lastly

A fine collection, presented by Mr. F. W. Townsend, of Marine Fauna, from the Mekran Coast with a long length of Cable laid in 1886 covered with shells.

Read following extracts from letter, dated the 16th April 1910, from Major F. C. Webb Ware, C.I.E.:—

"In the year 1907, when passing the same place (along Trade route between Nok Kundi and Tratoh) I picked up alive, but with broken wings, three duck and one teal, and the levies who carry the mail tell me that this place is an almost certain find for maimed duck, etc., at a certain season of the year. The matter is of some little interest, as it would tend to show that under certain circumstances, firstly, birds flighting at night keep far closer to the ground than is perhaps generally supposed; and, secondly, that they favour certain definite paths of flight, being guided in these by the surface conditions of the ground over which they fly.

"Although scarcely falling within the limits of Natural History research, I think that it also interests some of your members to learn that measurements were taken last year to ascertain the rate of progress south of the Sand Barkans, which cross the Trade route between Chah Gandan Tratoh and from the connection between the Sandy desert north of the Koh-i-Sultan Range and that lying west of Kharan, and it was found that the progress made was 100 feet. It is more than probable that the distance these Barkans cover varies according to the year and it may be noted that common report has it that the winds which blow across this stretch of country from the north were last year rather below their normal strength."

In addition to the above observations on bird migration, Mr. Clements remarked that he had once seen a brown Cobra at Khost. This was confirmed by the Hon'ble President, who stated that he had seen Cobras at Sharigh, and remarked that one had also been secured at Duki. He added that one of Col. Drake's servants was bitten by a Cobra in Quetta and died in about 25 minutes, but it is very doubtful whether the snake belonged to these parts.

The Hon'ble Sir Henry McMahon further mentioned having seen during the week large numbers of tortoises, 5 and 6 together, along the Railway track between Quetta and Nushki and again between Quetta and Chaman.

The Honorary Secretary then passed round, for the information of the members, a set of 4 volumes of Seebohm's "History of British Birds" purchased by the Museum during the month.

In conclusion, the Hon'ble President proposed that a special vote of thanks be conveyed to Mr. F. W. Townsend for his very valuable gifts to the Museum, and urged upon more of the members to record their observations as to the migration of birds, those already received being most useful. He also impressed upon members the necessity for reporting the exact locality where found when sending specimens to the Museum, this being especially important in the case of snakes and fishes.

J. W. N. CUMMING,
Honorary Secretary.

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1065 1079



1a.



1b.



1c.



1d.



2a.



2b.



2c.



2d.



2e.

J.G.del. J.Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall).

1. Psammodynastes pulverulentus, *harmless, head x 3.*
2. Ancistrodon himalayensis, *poisonous, nat. size.*

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OF THE



THE COMMON INDIAN SNAKES.

THE ACCOMPANYING PLATE XIII.,

OF

Psammodynastes pulverulentus and *Ancistrodon himalayensis*—was omitted from No. 1, Vol. XX.

The description of these Snakes will be found on pages 65 to 79 of this Volume.

EDITORS.

Genus—GALLINAGO.

GALLINAGO CŒLESTIS.

The Common or Fantail Snipe.

Scolopax gallinago.—Linn., Sys. Nat., i., p. 244; Seebohm, Geogr. Distr. Charadr., p. 484; *id*, B. Jap. Em., p. 346.

Scolopax sabinii.—Vigors. Trans. Linn. Soc., xiv, p. 557. Irish Naturalist, Jan. 95, Barrett-Hamilton.

Gallinago scolopacina.—Blyth, Cat. B. Mus. As. Soc., p. 272; Jerdon, B. of I., iii, p. 674; Godwin Austin, J. A. S. Bengal, xxxix, p. 273; McMaster, *ibid*, xl., p. 215; Blanford, *ibid*, p. 276; Hume, Nests and Eggs, Indian Birds, p. 586; *id*, Str. F. I., p. 235; Adam, *ibid*, p. 395; Hume, *ibid*, ii, p. 295; Parker, *ibid*, p. 335; Hume, *ibid*, iii, p. 182; Blyth, B. of Burm., p. 156; Blanford, East Pers., ii, p. 282; Butler and Hume, Str. F., iv, p. 15; Scully,

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JANY. 1911. VOL. XX. No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART III.

(With Plates A, B & C and Maps A & B.)

(Continued from page 278 of this Volume.)

Family—CHARADRIIDÆ.

Genus—GALLINAGO.

GALLINAGO CŒLESTIS.

The Common or Fantail Snipe.

Scolopax gallinago.—Linn., Sys. Nat., i., p. 244; Seebohm, Geogr. Distr. Charadr., p. 484; *id*, B. Jap. Em., p. 346.

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ibid, p. 186; Fairbank, *ibid*, p. 439; Hume and Dav., *ibid*, vi p. 459; David and Wen., *ibid*, vii, p. 88; Ball, *ibid*, p. 228; Legge B. of Cey., p. 821; Murray, Vert. Fauna Sind, p. 240.

Gallinago gallinago.—Sharpe, Cat., xxiv, p. 633; *id*, Hand-List, B., i, p. 165; Oates, Game B. Ind., ii, p. 455; *id*, Cat. Eggs B. M., ii, p. 61.

Gallinago gallinaria.—Cripps, Str. F., vii, p. 302; Hume, *ibid*, viii, p. 70; Bingham, *ibid*, p. 196; Scully, *ibid*, p. 255; Butler, Cat. B. of Sind, p. 61; *id*, Cat. B. S. Bom. Pres., p. 76; Vidal, Str. F., ix, p. 84; Bingham, *ibid*, p. 196; Reid, *ibid*, x, p. 86; Barnes, B. of Bom., p. 345.

Gallinago cœlestis.—Hume and Mar., Game Birds, iii, p. 359; Butler, Str. F., ix, p. 428; Barnes, *ibid*, p. 459; Davidson, *ibid*, x, p. 320; Hume, *ibid*, p. 413; Oates, B. of B. B., ii, p. 381; Hume, Str. F., x, p. 413; *id*, *ibid*, xi, p. 321; Blanford, Fauna, B. I., iv, p. 286; Finn. Indian Waders, p. 144; Bahr, P. Z. S., p. 12; Butler, B. N. H. S. Journal, xii, p. 427; Stuart Baker, *ibid*, p. 501; Wilson, *ibid*, p. 641; Rattray, *ibid*, xvi, p. 695.

The Snipe.—The "Times" 26th December 1908, 27th August 1909.

Vernacular Names.—*Chaha* or *Chaha chiriya* (Hin.); *Chegga*, *Khada-Kocha* (Bengali); *Kocha Sorai*, *Chaha-Sorai*, *Chergya* (Assamese); *Bharak* (Nepal); *Chek-lonbi* (Manipur); *Myay-woot* (Burm.); *Chaha-charai* (Ooriya); *Tibud*, *Pan-lawa* (Mahr.); *Mor-ulan* (Tam.); *Muku-puredi* (Tel.); *Kaeswatuwa* (Cingalese); *Daodi-dap* (Cachari); *Vok-ti-alin* (Kuki); *Ti-inrui* (Naga).

Description.—*Adult male*.—Crown to nape dark brown or blackish brown, with a few specks of pale rufous; a broad median stripe and broad superciliaries reaching back to the neck pale rufous; a line from the bill through the eye and over the ear coverts dark brown; sides of the head rufous speckled with brown; neck rufous blotched with brown and with two fairly definite lines of brown on lower throat and neck; chin and upper throat plain unspotted rufous. Back velvety black, the scapulars with broad, pale rufous edges, which form a longitudinal line down each side of the back. Upper back much speckled and barred with rufous, lower back barred with pale rufous, upper tail coverts rufous barred with wavy lines of

black and with obsolete shaft streaks; tail black with narrow rufous bars and a broad terminal band. Lesser wing-coverts brown, tipped rufous, median coverts barred with rufous and brown and greater coverts brown with white tips. First primary brown with a white outer web, other primaries brown with narrow white tips, increasing in width on the innermost; secondaries barred brown and black and mottled with white on the inner web. Breast dull buff or brownish, with dark brown bars; flanks the same; abdomen white; undertail coverts rufous or buff and brown, the former colour predominating. Lesser underwing coverts white, much barred with brown, principally so on the edge of the wing; median underwing coverts white, seldom with any barring at all, greater coverts brown with a broad white edge; axillaries white more or less barred with brown.

"Bill rufous brown, paler at the base; irides deep brown, legs olive-green. Tail feathers 14 or 16 in number" (Blanford).

"The bills have the terminal one-fourth or more deep brown to blackish; the rest pale brown or horny brown with a yellowish tinge, dark along the edges, often brownish green just at the base of the upper mandible, and generally yellowish or yellowish green or olive, on the basal fourth (more or less) of the lower mandible; the irides are deep brown, almost black; the legs and feet are ordinarily greenish, often pale olive green or greenish olive; and as the season advances they acquire a stronger yellow tinge, the legs of birds killed in April and May being often a distinct yellow green; there is often a dusky shade over the joints and the claws are deep brown to black" (Hume).

"Length 9·0 to 10·3; expanse 15·0 to 17·5; wing 4·9 to 5·6; tail from vent 2·5 to 2·9; tarsus 1·20 to 1·34; bill from gape 2·39 to 2·7; at front 2·43 to 3·75; weight 3·3 oz. to 5·1 oz.; average 4·15 oz." (Hume).

Adult female.—"Total length 10·5 inches, culmen 2·8, wing 5·3, tail 2·45, tarsus 1·3" (Sharpe).

The female does not differ from the male in colouration but is a rather larger bird.

"In this species also the females do average slightly larger and have longer bills than the males."

"Length 9·2 to 12·5; expanse 16·0 to 18·25; wing 4·9 to 5·71; tail from vent 2·3 to 3; tarsus 1·25 to 1·33; bill from gape 2·5 to 2·9; at front 2·62 to 3·0; weight 3·1 to 5·5 oz.; average 4·27" (Hume).

"*Young.*—Differs from the adult in being more rufous, especially on the throat and neck. The black markings of the back are more broken up and mottled with rufous bars, and the pale outer bands along the scapulous are not so wide" (Sharpe).

Nestling—Pale fawn tinged with rufous above and fading almost to white on the underparts. Upper parts mottled with deep brown, or blackish brown; wing with two dark bars and head with the orbital streak and bars on the head well defined.

The above description is taken from a Cashmere nestling, and nestlings from England appear to be brighter and more chestnut. All nestlings have tiny silvery tips to many of the feathers.

There is a form of the Fantail which has been honoured with a separate name and called Sabine's Snipe (*Gallinago sabinii*) but which is now recognised by all ornithologists as being merely a melanistic form. The home of this is in Ireland whence specimens extend to England in some numbers, one also having been obtained in Scotland and one on the Continent. In the "Irish Naturalist" for January 1895 Barrett-Hamilton has written an article on Sabine's Snipe in which he accounts for no less than 55 specimens of which 31 were obtained in Ireland and 22 in England. The only record of its occurrence in India is made by Finn in his "Indian Waders," in which he says "a fresh specimen of a snipe was brought to me for identification which was an undoubted example of this form."

A comparatively far more common variation in India is the pale form, one cannot call them albinistic as they are not true albinos. Even this, however, is very rare. Mr. W. K. Dods, who has shot many thousands of snipe, has never found one, and in 28 years-shooting in India I have been no more lucky.

The Indian Museum has five specimens of this pale snipe. They are all of a very pale fawn, almost white, ground colour and have the usual markings, but all of a pale fawn or rufous fawn tint. With the exception of one bird all have the bill and feet normally

coloured and one bird has also some normal feathers, on the upper plumage, which are now shewing that it would probably have moulted into the ordinary plumage.

There is one specimen with pale feet and bill, probably therefore a permanent pale type, but the colour of the irides is not mentioned on the ticket.

In addition to the above specimens there is one which has part of its plumage dark and part pure white; even this, however, is not true albinoism as the bill is dark as well as the feet and the white plumage is most probably due merely to some injury.

In the possession of the Bombay Natural History Society there are three more of these pale snipe but one of them has numerous feathers on the back and scapulars with normal coloured patches upon them and the tail also is practically normally coloured; this bird, which was obtained by Major Harrington in March 1896 at Meerut, is in full unabraded plumage and it is impossible to say whether it is in course of losing its colouration or commencing to reacquire it.

A fourth, and far more interesting specimen, is one sent by Mr. N. Z. Nicholas from Scind. In general plumage this is the palest bird I have seen but the median and greater wing coverts are normal as are the quills and under-surface of the wings, including the axillaries. This probably is a specimen which has originally lost its colouring through shock or injury and is now gradually recovering. The feet of this bird are distinctly dark and the beak appears also to have been so in life.

There is a very beautiful specimen of the Fantail in the Indian Museum, recently presented by Messrs. Manton & Co. and procured in the vicinity of Calcutta, which is of a still more rare form than either the pale or melanistic variety. From this bird every atom of red colouring has been eliminated and the consequence is that the whole plumage consists of various tones and shades of grey, ranging from pure white on the under parts to the deep velvety black of the scapulous. The bird as a whole gives one the impression of being a lovely dark silver grey.

The cause of this bird's colouration is undoubtedly the exhaustion of the rufous colouring pigment. The question of pigmentation as

applied to plumage is still in its infancy and it is not easy to lay down the law on the subject with our present scanty knowledge Our piebald snipes and other birds generally have the white plumage caused by some local injury which completely checks circulation of all pigment to the part injured, on the other hand the uniformly pale fawn snipe appear to have lost the power of generating the dark pigments and to have their rufous pigment deficient as well. Sickness in many birds causes loss of brilliance in colouration and in some cases actual loss of colour, heat with humidity increases depth and brilliance and a dry sun combined with open country causes excessive evaporation and consequent bleaching.

Distribution.—Sharpe, including *raddei* with *coelestis*, says that its distribution is Europe generally and Northern Asia up to about latitude 70', migrating south in winter to Senegambia, N.-E. Africa, India, and the Malayan countries, as far as Batchian. It occurs in Greenland but only occasionally in North America, and is accidental in Bermuda.

Within our limits there is no portion of the Indian Empire from East to West and North to South in which the Common Snipe will not be found provided there is suitable country for it. It is, however, less numerous to the extreme south, and is less common in the north-east than is the Pintail and is rare in Southern Burma but straggles into Malaya, and I have lately received a specimen from Siam whence it had not previously been recorded. Mr. Venning informs me that he has repeatedly obtained it in the Chin Hills.

Although the Common Snipe has a breeding range which, if one includes Radde's Snipe, extends completely across Asia yet migration into India undoubtedly takes place to a far greater extent from the west than the east and it would appear that Eastern birds do not as a rule penetrate so far south as the Western. A certain number of Fantails do yearly come into India *via* the great rivers of the East such as the Dihong, Dibong, Brahmaputra and Irrawaddy, but a far greater number come *via* the Western rivers and passes.

As a matter of fact it is not at present at all certain whether


INDIAN EMPIRE
AFGHANISTAN
KABUL
KASHMIR
Chitral
Gilgit
Srinagar
PUNJAB
Lahore
Quetta
Peshawar
Delhi
Simla
BALUCHISTAN
SIND
RAJPUTANA
Ajmere
Jeypore
Jodhpur
Bikaner
CENTRAL INDIA
Allahabad
Calcutta
BENGAL
CENTRAL PROVINCES
Nagpur
BERAR
Bombay
Poona
HYDERABAD
Hyderabad
Goa
Bellary
MYSORE
Madras
Cochin
Madura
Trincomali
CEYLON
Colombo
Laccadives
Andamans
Nicobars
TIBET
HIMALAYAS
BHUTAN
Darjeeling
ASSAM
Shillong
BURMA
Mandalay
China Hills
CHINA
SIAM
Bangkok
ARABIAN SEA
BAY OF BENGAL
GULF OF SIAM
20th Aug.
25th Aug.
1st Sept.
5th Sept.
10th Sept.
15th Sept.
20th Sept.
25th Sept.
1st Oct.
5th Oct.
10th Oct.
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in their annual migrations snipe, either Fantail or Pintail, do make use of the great waterways and, personally, I am rather inclined to believe that such is not the case. Were it so we should expect to find snipe on their first arrival most numerous in those swamps and rice fields which are situated close to the exits of the big rivers from the Hills; but they are not so found and though I have served some 25 years in the Hills and Plains of Assam my experience goes to prove the contrary. Thus during the seasons of migration snipe are comparatively common in the Khasia Hills wherever there are swamps over 5,000 ft. These hills are situated on the south bank of the Brahmaputra and all these birds must have come straight across the river instead of working along it and thus skirting the hills. In the North Cachar Hills I repeatedly found snipe passing the day on lofty peaks, arriving before daybreak and leaving in the dusk of the evening. Every year in August and in March and April snipe were to be found on the Guilang peak, lying up in the ditch which surrounded the small Fort, this peak being almost 4,000 ft. high. At Hangrum over 6,000 ft., the same thing occurred and once in early August snipe were found absolutely swarming in some scrub jungle on a hill slope just outside the rest-house. The birds were very thin and very tired and so loath to rise that they were easily killed with dust shot and half charges of powder. Again all through the Assam Valley snipe appear to work due north and south and no east and west along the course of the Brahmaputra and it seems probable that in migration snipe and many other waders instead of following the courses of the great rivers work straight across them, from one range to another.

The Fantail Snipe seldom arrives in India until August has well advanced, and even then it will only be found in the extreme North. By early September it has worked as far South as Central Bengal, Bombay and the North of the Central Provinces, but it is not found in any numbers until the middle of that month and it does not usually appear in Madras and Travancore until the end of September and more often still not until the middle of October. Writing from Coorg, Major J. C. Macrae informs me that the first snipe shot in 1908 was on the 14th September and

in 1909 on the 18th September. Oates long ago wrote "The Fantail does not appear" (in Burmah) "until the cold weather is well in, say in December," but I have records now of birds shot in Southern Burmah as early as September 26th.

In Eastern Assam sportsmen generally try for snipe on the 4th August, and this is the earliest date upon which I know of a Fantail having been killed, but after this there is a long gap and the next earliest was shot on the 26th August. Mr. L. W. Middleton shot a few Fantail in 1909 at Gauhati on the 5th September; at Chittagong a few are annually shot before the end of August, but all that I have *seen* shot there in this month were Pintail and the Fantail must be a *rara avis* before September. In Behgal one *hopes* for snipe on the 1st September but does not always get them even at as Northern a latitude as Calcutta, and many a hot and weary trudge have I had on the first two or three days of September without a chance of firing a shot. In Southern and Central Bengal there are but few birds in before the middle of the month.

Reid says that "the Common Snipe begins to make its appearance towards the end of September" near Lucknow. Doig records their arrival on the Eastern Narra in September. Maitland notes the first snipe shot at Jacobabad on the 28th August. Mr. A. Hosken shot 4 snipes near Secunderabad on the 26th August and Theobold says that they do not arrive in Southern India until October.

As one would expect, the further South the birds go on migration the earlier in the hot weather their departure takes place. Thus in Ceylon they leave in early March and in Western India, Travancore and Madras most birds have left by the end of that month though a few stay on well into April, and Hume says that individuals are to be seen "in the North and South of India in May and June." In North-Eastern India I think few birds stay after the middle of April, but a few are shot now and then even in May. In 1882 I shot three Fantails on the Haripal Bheel near Calcutta on the 24th May; in 1871 Baldwin shot seven and saw many more near the village of Goovsora in Lablatpore on the 2nd May.

In the *Indian Field* of the 12th May 1904 a correspondent records shooting snipe up to the 3rd May and "Raoul," in the same paper of the 26th July 1909, also records shooting a snipe on the 3rd May.

A few birds stay all the year round in the plains but these do not number one in every ten thousand of those that visit us and are undoubtedly birds which have been wounded and so temporarily incapacitated from long flights. In this category I place the birds shot during May at Haripal and also others which were found breeding in the Sonthal Parganas.

All snipe are more or less nocturnal, or at all events crepuscular, in their habits and their migrations take place almost entirely by night. As a rule moonlight nights are selected for their journeys and at the commencement and end of the migration seasons the constant pénch, pénch, of snipe flying overhead may often be heard although the birds themselves, even on the most brilliant of moonlight nights, may be far too high to be visible.

As sportsmen well know the snipe is very intolerant of sun and in the hotter months, during the heat of the day, most birds seek the shelter of some heavy crop, whilst those who stay in the fields of short rice or in similar places get under the shade of the banks which divide the fields or under some specially rank tuft high enough to afford them some protection.

I well remember on one occasion shooting near Calcutta on a very hot day in early September when still very unversed in the ways of snipe and accordingly failed to work the proper places when the sun got high up. The walking was delightful, thin paddy and ankle-deep mud and water, and from 7 A.M. up to about 9-30 the firing was continuous with a quickly mounting bag. Then suddenly the birds ceased to rise and weary tramping from 10 to tiffin time and again on to nearly 4 P.M. was rewarded with scarce half a dozen shots and these at birds which rose at our feet, generally doubling back at once and affording but difficult shots. After 4 P.M. however the birds seemed gradually to increase again and the last hour's shooting added some 20 couple to our sticks.

Shooting over the same ground by myself a few days later as

soon as it began to get hot I hunted about for the birds and eventually found that after 10 A.M. they all retired to jute and other high crops, generally resting near the edges of the field, but often being flushed from the very centre. Once inside crops of this sort the birds lie very close and one can almost stamp on them before they move and, even when forced to fly, they do so in a very lethargic manner and soon re-settle. On one occasion in the middle of a hot day in September an orderly of my father's actually caught a snipe in his hand, stooping down and picking it up as we passed along in line. The bird seemed to be uninjured and flew away well and strongly as soon as released. On another occasion I caught a snipe I had seen settle by throwing my *sola topee* over it, but was punished for my smartness by an erratic-firing friend who promptly blew to pieces the *topee* together with its fluttering captive.

Snipe seem to differ curiously in different provinces as to the haunts they prefer. Throughout Bengal one is accustomed to walk them up in the rice fields and though, of course, they also haunt shallow swamps and jheels as well, it is undoubtedly in the rice fields that five out of every six snipe are annually shot. In the Sunderbands we found that our biggest bags were obtained in the middle of the day in the big jheels of deep water, where we had to wade in any depth from our knees to our chests. The snipe got up close to us and appeared in most cases to have been resting *under* the big lily leaves which covered the whole surface of the water.

In Assam it is little use working the rice fields, though on rare occasions decent bags may be obtained in them. Generally the birds are found in weed covered lagoons and jungle fringed tanks where walking is hard and the shooting difficult. In many places in Assam there are wide stretches of water covered with dense masses of floating weed, strong enough to support one for a brief second, yet hardly thick enough to allow one to stand and shoot. In such places I have seen birds so numerous that to get bags of 200 couple all that was required was straight powder which, needless to say, was never to be found when shooting in ground of this description.

Of Burmah Tickell says :—" Snipe shooting in Burmah or Arakan is a pursuit of pleasure under considerable difficulties. The sport is in its prime long before the country has emerged from the flood of the rainy monsoon, so that Auceps has to wade through paddy fields up to his middle (if not haply higher) and under a sun which blisters his back, before he can make a good bag."

In Upper India Hume records that snipe are to be found " in every swamp or marsh, on the margins of ponds, lakes and rivers wherever there is a more or less muddy foreshore protected by low grass, rush or weed. Of all things they seem to love a kind of rush with a circular stem (*Scirpus carinatus*, I think) which is common about the edges of ponds and jheels in the North-West Provinces and which is a sure find for them. In the heat of the day, when *Urher* and similar crops run down to the water edge, alongside some jheel you will often find many snipe in those."

In Southern India they also seem to frequent ponds, jheels and river edges far more than in Bengal, but in many places they also are often shot in large numbers in the rice fields.

Reid notices a fact about snipe which is absolutely correct though not often noticed by sportsmen, and this is that snipe never allow their breast and lower plumage to become really wet or draggled.

There are three questions in regard to snipe shooting which seem to be ever green in their interest to sportsmen, and these three are—(1) is snipe shooting harder in England than in India, (2) what constitutes a good shot, and (3) what constitutes a good bag.

As regards the first question there is, I think, little doubt that, on the whole, snipe are harder to hit at home than in India. There *can* be no doubt that the average snipe at home is wilder, flies faster and twists more than he does out here but, on the other hand, the difference between shooting on a sweltering day in September in the Plains of India and shooting at home on a frosty day is very great indeed and goes a long way to level up the chances between the gun and the bird. As the weather gets colder the bird out here get away quicker and stronger and more nearly approach in their flight their English brethren.

As to what constitutes a good shot it is difficult to say. One

cannot find out if a man is a good shot by the result of one day's shooting. Sometimes birds seem specially sluggish, the walking is good and the shooter fit so that missing seem harder than hitting; other days birds are unaccountably wild, the walking is deep and treacherous and the powder consequently wasted. Possibly calculating on a whole cold weather's shooting the man who gets one bird to every two cartridges expended may *call himself* a good shot, he who finishes up the season with an average of two in three is a good shot, whilst the man with an average of three in four is hard to beat and may consider himself a really crack shot.

The best shooting I have ever *seen* was done by my father Mr. E. B. Baker in 1884 at Hugli. He commenced with 12 consecutive kills, then a miss and 12 more kills, then another miss and 14 kills, and after a third miss yet another dozen birds. This meant 51 birds in 54 shots, and his final bag for the day was 84 birds in 92 shots.

The best shooting I have ever *heard* of, which was properly authenticated, was the performance of Mr. H. Cornish, then Superintendent of Police, Orissa. The shooting was the result of a bet of 25 to 1 that he could not shoot a hundred birds with a hundred cartridges, 10 to 1 that he would not get 96 and 3 to 1 that he would not get 90. Mr. Cornish got up to his 50th bird without a miss and eventually failed by exactly four birds to get his hundred birds in a hundred shots. On this occasion the walking, as might have been expected, was as near perfection as possible, and the birds so numerous that it was never necessary to take difficult shots. Even under these circumstances the shooting was wonderful, and it will be long before it is beaten.

As to what constitutes a good bag, this depends entirely on the locality. In Upper India bags of 100 couple to two or three guns are always possible, but to a single gun bags of anything over 50 would be considered good. In Southern India such bags would be quite exceptional and in Ceylon practically unknown. In Assam a bag of 30 couple is good, though in Sylhet and sometimes in Cachar and Goalpara much bigger bags are obtained. In Bengal however it is every snipe shot's ambition to get 100 couple to his own gun, and though few ever realise this ambition

many get very close to it and some do even better. The same thing occurs in Burmah, and 100 couple to one gun has two or three times been beaten in that Province,

The honour of making the biggest bag on record belongs to Mr. W. K. Dods who, on the 18th February 1900, shot 131 couple of snipe and a quail. *In epistola* Mr. W. K. Dods writes to me—

"On the 17th February 1900 information reached me that there were a considerable number of snipe on a particular jheel of immense extent about 100 miles from Calcutta where I had already made some good bags. I accordingly started off that night well provided with cartridges in a slow jolting train that eventually deposited me at dawn within an hour's tramp of my destination.

"Some miles walk took me through cultivated country until the landscape, getting gradually more open, brought me to a large swamp tract of country covered with about the worst kind of 'ponk' it has ever been my fate to shoot in, a black reeking mud composed entirely of decayed and decaying vegetable matter in which one frequently sank to one's thighs. Growing in this ooze were dense clumps of hoogola reeds interspersed with fairly open glades, where birds could feed, and with other patches of thin null jungle in which snipe delight to rest during the day, secure from the too pressing attentions of the numerous hawks that infest these marshes.

"Though good for snipe, thin null does not make things any easier for the shooter, already heavily handicapped by the soft and insecure foothold. A snipe dodging through straggling patches of reeds until he gets high enough to feel the wind, only to again start twisting, makes this, in my opinion, the most difficult form of snipe shooting I know of. However, the birds make up in numbers for the numerous and disheartening misses one makes on a ground of this sort, and having been told by my men to expect a bag of 100 couple I came well supplied with ammunition.

"Unfortunately snipe on this particular jheel do not sit well till after 12 o'clock, so I began operations about 8 a.m. on another stretch of equally soft and "stagnant ponk" in which I pounded about till 10-30 getting 14 couple and tiring myself a good deal with

the heavy going. By 11-30 I was compelled to take another breather, by which time the bag had increased to 24 couple, and as I was now thoroughly disgusted with 3½ hours floundering about in the abominable mud I insisted on being taken on to the good ground—good indeed it was—not swarms of birds rising in wisps of 20 and 30 as one sometimes sees, but evenly distributed in ones and twos all over the place. There were also a considerable number of jack and painted snipe about, but these I tried to avoid shooting, though in the end I got two jacks. These were the result of snapshots taken at birds disappearing over the tall reeds when there was no time to discover one's mistake till after the trigger had been pulled.

"Many dead birds fell amongst the tall hoogola where retrieving them was most troublesome and tiring work for the coolies and, though I had three of my best men out that day, I would not like to say how many birds were lost.

"In spite of these drawbacks, the excellence of the sport and the difficulty of the shooting kept my keenness up till 5 p.m. when I found the men were so used up as to be practically useless and, as I was beginning to go a bit off my shooting myself, I decided to give up. On counting over the birds on the sticks I found 259 common or fantail snipe, 1 pintail snipe, 2 jack and a quail. What the latter was doing in such an uninviting spot it is hard to say, unless it had been driven in to the tall hoogola by hawks. I only once got two birds at a shot that day and was using an ordinary hammerless gun, Schultze powder, No. 8 shot, and last but not least a hand protector.

"Though I have on six other occasions shot bags of over 100 couple on that particular ground this was the last and best. Since then a dense growth of green rushes has spread itself all over the jheel and so covered up the feeding that birds are comparatively scarce though from 30 to 40 couple might still be got in a day. Taking into consideration, however, the long railway journey, the hard work and heavy going I have never considered the place worth visiting of recent years."

Such a bag as this has never fallen to my lot, but I once had the luck to come across the birds in such numbers that though I

was not on the ground until 3-30 I had to stop before 5 having run out of cartridges. On this occasion the bag consisted of 26 couple of snipe and 3½ couple of quail and the cartridges expended numbered 79. The ground was mud and water of only a few inches in depth and the walking was ideal, but the paddy was very long and we lost a few birds in it.

I have often been asked whether it is better to shoot at snipe directly they rise or to wait until the twistings ceased and the bird gets straight on the wing. Probably the best way to shoot is that which suits each individual best. I have seen equally good shots amongst both types of performers and do not think the preference can be given to either style. Mr. Cornish knocked his birds over so quickly that to the looker-on it appeared as if he must have spotted them before they rose. My father, on the contrary, was a slow shot and let them get well away before firing, yet as regards their second barrels, there was nothing to choose between them. Mr. Dods, who is probably the finest snipe shot in Eastern India at present, I believe lets his birds get well on the wing before shooting.

The ordinary call of the snipe is, as every one knows, a single note which has been described in many ways but may be syllablized as péch, pronounced sharply with a nasal twang. In the breeding season, however, the snipe makes a sound, called either drumming or bleating, which was for a long time a subject of keen discussion.

Dr. P. H. Bahr (in *loc. cit.*) has written a long and most interesting article on the manner in which this sound is produced and has conclusively proved that it is made by the tail feathers.

The following is an extract which he has kindly given me permission to take :—

"In the summer of 1904, in the Fens of Cambridgeshire, I began to observe the Snipes in the act of bleating through a strong prism binocular. I had read none of the literature on the subject, and so had no preconceived ideas. The observation I made then I have had ample opportunities of confirming.

"I find that ordinarily the bird flies up to a height of 60-100 feet above ground, in windy weather going higher, with its tail held

in the ordinary position of flight, then turning, it spreads its tail out like a fan, *the two outer tail-feathers* being spread out well in front of the other twelve and held firmly there. Immediately the birds begin to descend the bleat is heard (making due allowance for the time it takes for sound to travel). While descending the bird makes tremulous motions with its wings from the radiocarpal joint. The descent is made from 30—40 feet and occupies 2—3 seconds, the bleat lasting the same time. The bird does not drop head foremost through space, but at an angle of from 45—60 with the horizon. The tail as a whole is not vibrated, but it is quite easy to see the two outer tail feathers with a strong glass vibrating to such an extent that their terminal portions become indistinguishable. Snipes begin to bleat in March, but if the weather is mild, in February, and continue to the end of May, though I heard one last year in Sutherland still bleating on June 25th.

"At the beginning of the breeding season they may be seen bleating in pairs; but later on when the hen is sitting the cock bird may be seen performing alone over the marsh where the nest is placed. Under favourable conditions many bleat together, circling round the same spot for hours. On April 12th of last year, I had the good fortune to hear no less than twelve birds bleating together a concert which they kept up all through the night. Every now and again, as if by common consent, there would be a lull and all the birds would settle, but directly one began again all the rest immediately joined in the chorus.

"Snipe bleat best in the early morning and in the evening, especially when the weather is dull and damp. It may be of interest to note that last spring I saw a specimen of the melanistic variety (Sabine's Snipe) bleating.

"Once having convinced myself that the two outer tail-feathers are invariably spread out beyond the others—a fact which is now obvious to me with the unaided eye—it seemed to me that the two outer tail-feathers must be the active agents in causing the bleat. I accordingly procured several tails of the Common Snipe, and taking the two outer tail-feathers pierced the shaft with a pin to which I firmly bound it with cotton and inserted the feathers into a cork at the end of a stick some six inches long. A hole is

bored at the other end of the stick and a long string attached. This is whirled round the observer's head and a typical bleat is produced The second outer tail-feathers (sixth pair) produce a fainter sound, though this varies much in individual tails, the others make no sound at all.

"In order to ensure the success of the experiment it is necessary—(1) that the feathers be placed so that the narrow edge—the outer web—shall encounter the resistance of the air; (2) that the feather be firmly bound to the pin, so that it cannot turn on its support; (3) that the string be tied to one end of the stick, so that the long axis of the stick makes an angle with the direction of the string, if I may so put it, so that a vibratory motion is imparted to the stick as a whole, thus simulating the tremulous motion of the snipe's wings during the descent; (4) lastly, that the apparatus be moved at a uniform rate and not too fast.

"It is then found that after a period of silence the feathers begin to vibrate: first, the long-drawn-out note, which I may represent as "*Whu, Whu, UU,*" becomes gradually audible; it is then succeeded by a series of high and low notes "*Bah, Bah, Ah, Ah,*" resembling the bleat of a young goat, lasting 3-5 seconds, followed by a *pause of equal length*. This is repeated as long as the apparatus is revolving at a uniform rate. It is found that the individual tail-feathers, of which I collected a good number during the winter, vary considerably both in size, breadth and markings, and, as might be expected, the note produced varies according to their physical characteristics. Thus a long narrow feather produces a sound of far higher pitch than a broader one of the same length. This fact I have noted when comparing the sound made by the several birds when performing the nuptial evolutions over the breeding grounds. To ascertain which part of the feathers is essential in the production of the sound, I have cut off the narrow outer web without altering the bleat in any way; but if the barbs of the inner web be so disarranged that there is a break in their continuity, the web ceases to vibrate and no sound is produced. That the vibration of the inner web is the active causative agent may be seen by the following simple experiments. The feathers are attached to a cork with the outer web held away from

the observer, so that the narrow outer web shall cleave to the resistance of the air. Thus affixed, they are held out of the window of a train or while riding a bicycle. As the resistance of the air is encountered, the inner web begins to vibrate, slowly at first, but, as the train gains speed, so rapidly that its outline is entirely lost and it becomes blur; a low humming sound is at first heard which soon reaches the typical pitch of the bleat. When the train has reached the speed of some 20 miles an hour, the whole feather will vibrate on the pin. If the feathers are at all loose on their pins, it is curious to observe how they will always turn round, so that the narrow outer edge encounters the resistance of the air. Furthermore, if the feathers be damped, they appear to act better, thus explaining, perhaps, why snipe are found to be liable to bleat in damp weather. I think this simple experiment readily explains away the "adverse cases" of Prof. Altum ('Ornithologisches Central-blatt,' October 1880), already mentioned.

"That the hens bleat as well as the cocks is now, I suppose, a well-known fact (cf. Von. Preen, '*Naumannia*,' 1856, pp. 426, 427, and Meves, Proc. Zool. Soc., 1859, p. 200). I have observed it on several occasions myself. In the summer of 1902, I found four newly hatched snipe in a patch inhabited by only a single pair; while lying concealed in the neighbourhood, I observed repeatedly *both* old birds drumming above me. From the similarity of structure of the tail-feathers in both sexes—a fact which I have ascertained by dissection—one would infer that both sexes drummed. I cannot, however, agree with Meves that "as the feathers of the hen are generally less than those of the cock-bird, the noise also made by them is not so deep as in the other case." (*Op. cit.*, p. 200). I can find no difference either in the length of the feathers or in the intensity of the sound produced by the feathers of either sex. I have received a letter from Mr. S. A. Buturlin in which he says that in 1905 on the Kolyma Delta he frequently observed both sexes of the eastern representative of our species (*Gallinago raddei*) drumming.

"Since, the two outer feathers are extended beyond the other twelve during the descent, as I have described, I sought to find by dissection a mechanism by which this might be produced. On

examining the tail of a freshly-killed bird it is quite easy, by spreading out the tail, to make it assume the arrangement shown. I was unable, however, to find any special muscle peculiar to the species controlling in outer two tail-feathers. The muscle pubo-coccygeus ext. is inserted into the base of the shaft of the outer two tail-feathers, and is quite capable of perfoming this function. This muscle is to be found equally well developed in the other species of Plovers and Waders which I examined. The nomenclature of the muscular system of the tail is that of Gadow in Bronn's "Thier-Reich."

"I have tried the same experiments as I have just described with the primaries from the wing of the snipe, and was not able to produce any more sound with them than with others taken from other kinds of Waders, Pigeons, etc. There seems to have existed an opinion at one time that the bird produces two sounds, one with the wings and the other with the tail, the former being known as humming or drumming and the latter whirring or bleating produced while the bird is on the ground (cf. "Zoologist," 1881, p. 212, and 1846, p. 1501). I cannot say that this agrees with my own experiences."

To the above Dr. Bahr adds in a letter to me: "An old friend of mine, a very keen naturalist and observer, Master Leherer Prahl of Lilienthal, Germany, has been a disbeliever in the tail theory from observations extending over 40 years. He has now had the following experience which has converted him to my way of thinking.

"He had winged a snipe which ran before him and in so doing spread its tail with the thin outer feathers stiffened in front of the others and, as a strong wind was blowing, the feathers began to vibrate and the bird actually "*bleated*" whilst lying on the ground."

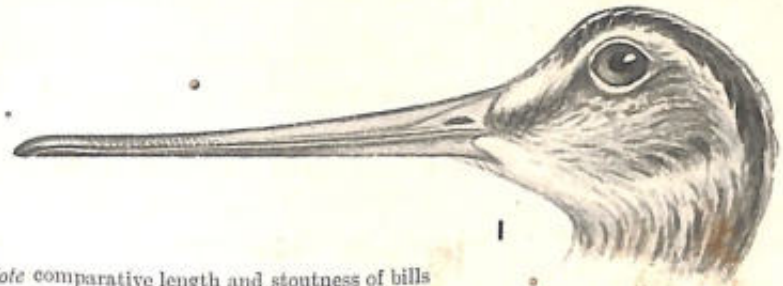
On the strength of the above article by Dr. Bahr, Mr. W. S. Paget-Tomlinson made some interesting experiments which fully confirmed what Dr. Bahr had already written. These experiments Mr. Paget-Tomlinson described in the *Times* of the 21st August 1909 and 26th December 1908 as follows:—

"However, the proof is best furnished by a simple experiment

devised by Dr. Bahr. Pierce the shaft of each outer tail-feather with a pin, to which it must be firmly bound. Insert the pins with their attached feathers on each side of a small cork, taking care that the outer web (narrow edge) of each feathers faces the same way. Fasten the cork to the end of a short stick (six inches long). Through a hole in the other end of the stick pass a long string. When the apparatus is whirled round the observer's head, care being taken that the outer web of the feathers meets the resistance of the air (as occurs with the outer tail-feathers of the snipe when it makes its descent) a long drawn-out note is first produced, which gradually rises in pitch, until the typical bleating sound is heard. The same effect can be obtained by holding the cork and its feathers outside a railway carriage window, when the train gets up speed, but only when the outer or narrow web of the feathers cleaves the air. This outer web may be actually removed from the feather without altering the bleating sound, but if the broad inner web be seriously damaged, no sound is produced. The second outer tail-feathers produce a fainter sound; the remaining ones none at all."

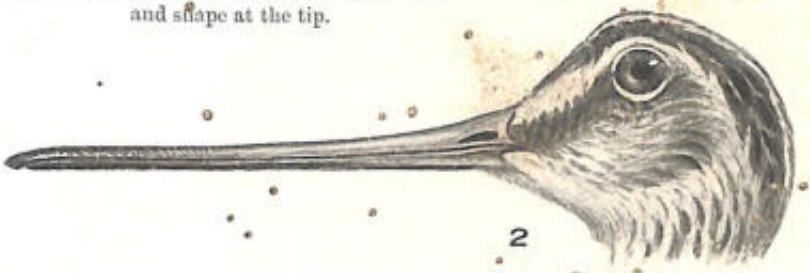
"Mr. Lee Warner, of Walsingham Abbey, suggested to me that it would be interesting to try the experiment of shooting an arrow with the tail-feathers of the bird attached, so as to imitate nature as far as possible. I have recently tried this, with the most perfect success. Employing an ordinary ladies' arrow as used in archery I slipped a small perforated cork down the shaft, as far as the feathers of the arrow. Having tied the cork securely, I fixed the pins, each carrying an outer tail feather, one on each side of the cork, at right angles to the shaft of the arrow, taking care that the outer or narrow web of the feathers faced towards so as to cut the air when the arrow was shot. It was, of course, also necessary to place the feathers in the same plane as the string, so that they would not be damaged as the arrow left the bow.

I shot it almost vertically to a height of about 60 or 70 yards. The velocity of the arrow in leaving the bow was probably too great to produce the normal "drumming" sound, though it somewhat resembled it; when the arrow turned to descend nothing could at first be heard, but when it gained speed, and was about 30 yards

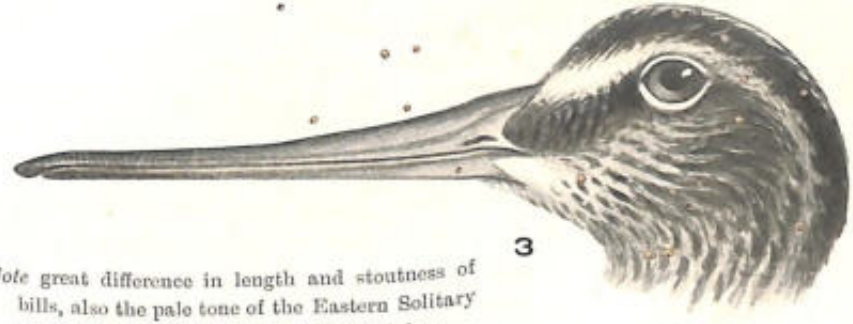


1

Note comparative length and stoutness of bills and shape at the tip.

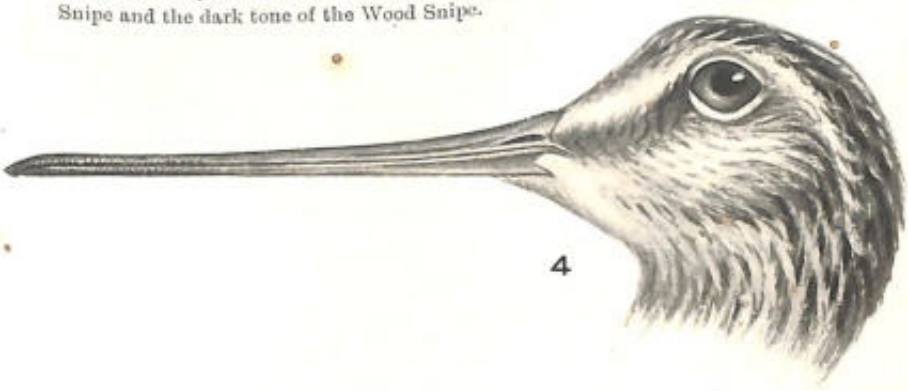


2



3

Note great difference in length and stoutness of bills, also the pale tone of the Eastern Solitary Snipe and the dark tone of the Wood Snipe.



4

HEADS OF SNIPE FOR COMPARISON OF BILLS

1. PINTAIL SNIPE (*Gallinago stenura*).
2. COMMON OR FANTAIL SNIPE (*Gallinago coelestis*).
3. WOOD SNIPE (*Gallinago nemoricola*).
4. EASTERN SOLITARY SNIPE (*Gallinago solitaria*).

from the ground, the most perfect imitation of the "drumming" was produced, continuing till the arrow pierced the sod."

Before leaving the topic of drumming or bleating, part of a very interesting article by Mr. Boyes may be quoted from the "Field" of July 1898. He writes: "I am not aware whether any naturalist has stated that the hen bird drums as well as the male, but I think I can settle this point in the affirmative, for one day I visited a very small strip of bog, and almost immediately rose the cock bird which commenced to drum alone and around me in a short time. I flushed the hen off her nest of three eggs and as she left it she dropped the fourth egg, which broke in its fall and the bird, continuing its flight, struck itself against some posts and rails and fell stunned to the ground, but soon recovered and flew away. I marked it, and afterwards went and put it up. All this time the male was drumming overhead and no other snipes were in the neighbourhood. The female now joined in the drumming and the two were drumming for some time, and then they both alighted on the tops of posts, and allowed me to walk quite near them nodding their heads at me all the while."

The reader will note the curious fact of the snipe sitting on the posts, but, though here in India the idea of the snipe perching seems curiously improbable, it is a well known fact that in their breeding range and when breeding they frequently do so.

The food of the Fantail Snipe consists of worms of all or any kind, insects, more especially water-insects, tiny shellfish, land shells, larvæ of dragon flies, caddis flies, etc. Digestion in snipes seems to be exceedingly rapid and often, even in very fat birds, the stomach will be found to contain only liquid, a fact which very probably gave rise to the belief, at one time so common, that snipe lived on microscopic insects and some nutriment they derived from suction of the mud itself.

All snipes possess more or less sensitive beaks furnished with nerves and also with muscles, which enable them to open the terminal halves of their bills when inserted in mud. Both nerves and muscles are more highly developed in the Fantail than in any other snipe (*G. major?*) and accordingly, as we should expect,

this species seeks its food more exclusively in mud and water than does any other.

On an examination of snipe shot very early in the morning or late in the evening, that is to say when feeding, I have often found their stomachs full of a tiny white worm which seems to be found in and about the roots of rice. I have shot snipe with these worms actually in their bills or gullets as well as in their stomachs, but never when the birds were shot late in the day before the sun had sunk low. To obtain these worms the bird has to bore deep into the mud and must often have to put its whole head under water before it can reach them, as I have shot snipe, containing this article of diet, feeding in water some inches deep.

The snipe is not a bird one would have expected to thrive in captivity but it has more than once been tamed. A most interesting account of a tame Fantail Snipe reared by hand appeared in "Nature" and again in the "Avicultural Magazine." This bird was so tame that it took worms from the hand of its owner and was sufficiently confiding to allow excellent photographs to be taken of it.

There is very little on record about the breeding of the Common Snipe within Indian limits although it must breed throughout the Himalayas at suitable elevations.

Brooks heard it drumming over a swamp in Kashmir where it doubtless had its nest, and Hume records that "numerous eggs have been collected by native collectors." "The nests found in Kashmir were described as cup-shaped hollows in soft, mossy, spongy turf, surrounded or overhung by rushes and grass, and sparingly lined with fine grass, and in one case with the needle-like leaves of a horse-tail (*Equisetum*)."

"The birds do not apparently commence laying in Kashmir until May, and much incubated eggs have been found late in June."

Wilson, Rattray, Buchanan, Ward and others have since taken its eggs in Kashmir.

The first-named records that he "came across about six couples of these birds on the Sambul Marsh. We found several of the nests,

but two only contained eggs. The nests, placed in the centre of a clump of thick grass or bracken, were shallow cups of dried coarse grass without any lining of any kind. We put the bird off the nest on two occasions. The first nest contained four beautifully fresh eggs and the second two. One of these eggs was fresh and the other broken and badly addled! Though the snipe never left the marsh during our search, we heard nothing of the drumming noise, but on several occasions noticed a bird hovering over its nest before settling."

I have two clutches of eggs of the Fantail Snipe which were taken in the Santhal Parganas. My general bird *factotum* skinner, egg collector, etc., in this district was a Mahomedan, who had lived all his life in the district and was more Santhal than Mahomedan in his ways and, like most Santhals, was a keen field naturalist. Shooting snipe one day with this man, he told me that a few bred every year in the ravines between the hills adjoining the Suri Road. I paid little attention to his story and thought that he was referring only to the Painted Snipe, but that same year he brought me a clutch of four eggs which were plainly snipe's eggs, and later on found another nest which I visited, taking the eggs with my own hand and shooting the bird as it left the nest.

Both these nests were placed at the foot of thinly-foliaged bushes standing in tiny swamps between low hills. The bushes themselves were so bare that they hardly screened the nest, but there were a good many tufts of grass and these had to be pushed on one side before the nest was visible. This, the nest, was composed entirely of a fine curly brown grass which formed quite a soft bed for the eggs to lie on. It measured only about 4" across and the centre of the depression was possibly an inch deep. The one I saw myself lay in a small hollow, which was probably made in the first place by the foot of some hoofed animal.

Blanford, who, however, makes no distinction between *cælestis* and *raddei*, thus defines the breeding range of the Fantail Snipe:—"The Common Snipe breeds throughout the greater part of Europe, Central and Northern Asia, but chiefly between latitudes 50 and 70 North."

The eggs of the snipe are normally always four in number and

are pyriform in shape, but less markedly so in some cases than in others.

The ground colour varies from a pale grey-green, grey-stone colour, or yellowish-stone colour to a comparatively dark olive-grey or olive-brown, in some cases the brown being dominant and appearing to be almost a pure though pale vandyke brown.

The markings consist of large irregular blotches, spots and dots of rich brown, often almost black and rarely with a purple tint. Secondary to these are similar markings of pale grey, lavender or purplish brown. These are scattered to some extent all over the surface, but, as a rule, they form a broad ring or cup at the larger end where they are almost invariably more numerous than elsewhere. In a few eggs a twisted line of deep brown may be found at the larger end, but this is exceptional.

In some eggs the markings are much elongated and are so disposed as to give the idea of having been laid on whilst the egg was being twisted, the trend of the blotches being distinctly spiral.

The texture of the shell is smooth and close and the surface fairly hard, in some cases with a decided gloss.

They are very large for the size of the bird, and Seebohm gives the measurements as between 1·5" and 1·65" in length and 1·05" to 1·25" in breadth. Oates gives the greatest length and breadth as 1·72" and 1·2" respectively and Dresser the average length as 1·61".

In the southern part of their usual breeding range, the Common Snipe begins to breed in early April and throughout May, but in the more northern latitudes it does not commence to lay until June and eggs have been taken well on into July. In the Himalayas I do not think it breeds before May, and I have eggs taken in June.

The three plates are excellent, but it is difficult on a half tone plate to shew the differences between pure white and pale rufescent and it is probably this reason which accounts for both wings and tails appearing to have more white on them than is generally the case in all the species depicted.

In Plate A the difference between the terminal portions of the bills of *Gallinago stenura* and *G. cœlestis* is not quite pronounced enough and the heads of both birds appear to be a trifle too large.

The difference also in tone and depth of colouring between the heads of *G. solitaria* and *G. nemoricola* does not strike one so forcibly in the plate as it does in real life, partly doubtless due to the fact that *solitaria* is more grey and less rufescent than *nemoricola*, a point which we can hardly expect to see emphasized in a black and white plate.

Turning to Plate B, the same remarks as to tone and depth of colouration apply to the wings of *solitaria* and *nemoricola* as to the heads in Plate A.

It is necessary also to point out that the wing of *G. cœlestis* is that of a rather darkly, heavily barred bird. The median wing coverts are *generally* pure white in this species and do not show the heavy markings at the bases which we see in these drawings. The axillaries also (these are the four long feathers at the base of the drawings) vary, as I have explained above, from pure white in typical *G. c. raddie* to others which are even more heavily barred than those in the plate.

As regards Plate C, all I need remark is that we must remember when examining it that some of the colouration which appears in this to be white, is really a faint rufous. Even allowing for this, however, both the Fantail and Pintail more often than not have tails a good deal less marked with white than those shewn here as examples of those birds.

GALLINAGO CŒLESTIS RADDEI (Buturlin).

Radde's Snipe.

Scolopax gallinago raddei.—Buturlin "Waders of the Russian Empire," Part I, p. 56 (1902).

Description.—"Differs from the western form of the Common Snipe in having the pale longitudinal stripes over the upper parts of the body conspicuously broader 2 to 4 mm. wide, the median pale stripe on the crown wider, the dark parts of the feathers of the mantle more freckled with rufous, the chest less spotted with brown, the wing lining and axillaries less conspicuously barred with greyish brown, the axillaries being often quite white."

The above description was obtained for me by Mr. H. E. Dresser, and is translated from the original Russian of Buturlin.

The breeding range of this snipe is given by Buturlin as follows:—

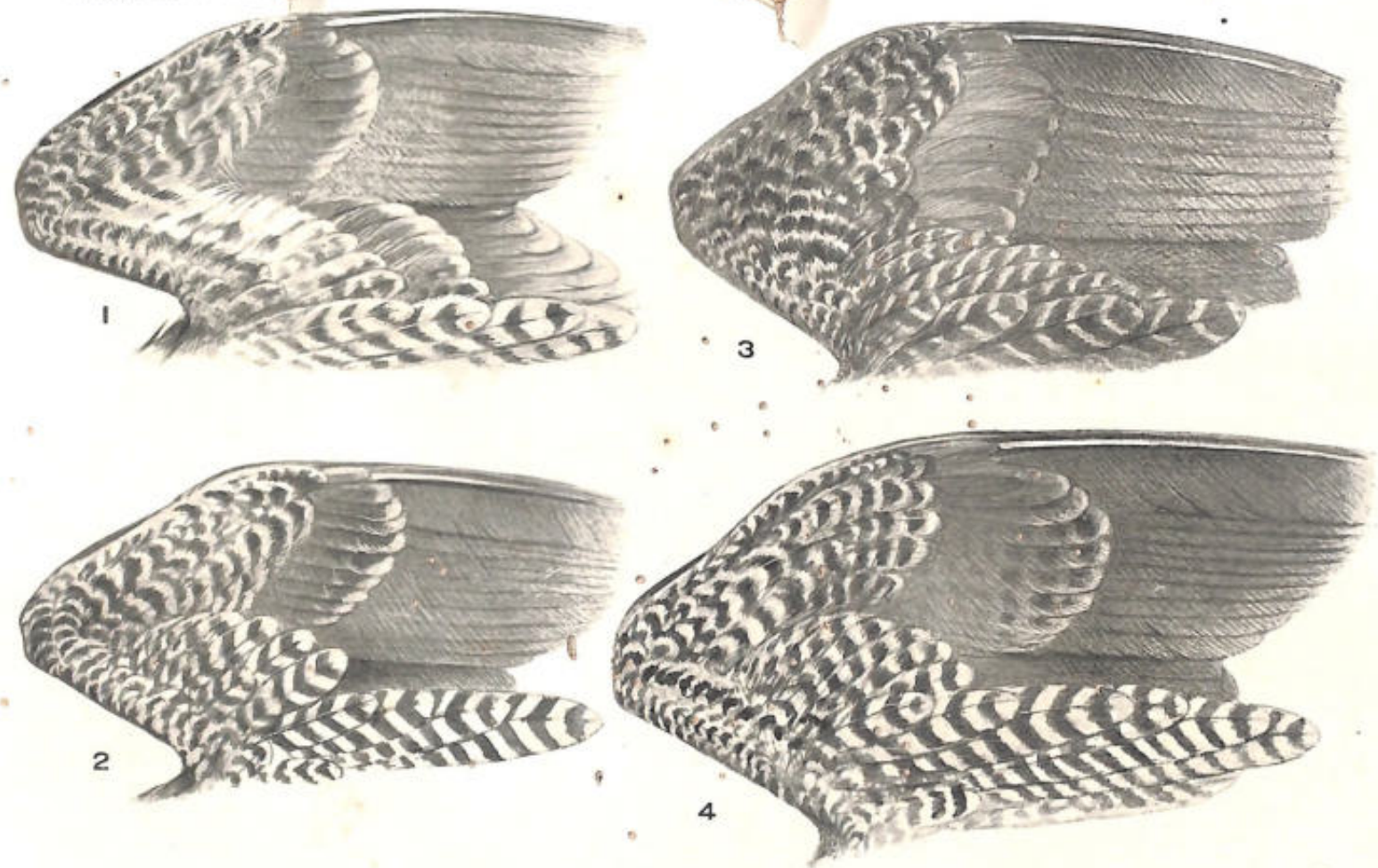
"Breeds in Eastern Siberia, east to Kamaskatka, and even the Commander Isles, and west to the Boganida Taimyr and Krasnoyarste."

Theoretically, therefore, this snipe should migrate in winter to the whole of Southern China and should visit Burmah and Eastern India in considerable numbers. As a matter of fact, however, typical specimens are not common, even in the east of India, though on the other hand, it may be found occasionally as far west as Bombay. Of the series of Fantail Snipe in the Asiatic Museum, there are but three specimens which can, without doubt, be allotted to this subspecies, and of these three one—strange to say—comes from Abyssinia. In Eastern Bengal, Assam and Burmah we shall find a very large proportion of birds more or less approach this race in the colouration of their axillaries and underwing coverts and to a less extent also in that of their upper plumage, but really typical specimens will be few and far between.

My own experience, gained from a close examination of my own bags and those of other sportsmen whenever possible, has been productive of some half dozen specimens one could really call typical. In some of these the axillaries were entirely pure white and the barring of the lower wing coverts absent except on the terminal thirds of the greater coverts and the shoulder of the wing.

I have a clutch of four eggs of this snipe in my collection, given me by Mr. H. E. Dresser, who secured them from Dr. Buturlin. As might be expected, they are not distinguishable from those of the Common Snipe, though they are duller coloured than most eggs of that bird.

The ground colour is dull olive—stone colour, in one egg—rather more brown than in the other three, and the markings consist of large and small blotches and spots of different shades of vandyke brown, all dark and many almost black. Underlying there are others of purple grey and washed-out brown. At the larger end, where the blotches are very numerous, they run into and overlap one another; elsewhere they are smaller and sparsely scattered. In one egg there is a long twisted line of dark brown, about 1½" in



UNDER WINGS OF SNIPE.

1. FANTAIL SNIPE } *Note* regular barring on the Pintail and whiter
2. PINTAIL SNIPE } median coverts on the Fantail.

3. WOOD SNIPE ... ... } *Note* difference in depth of colouration and
4. EASTERN SOLITARY SNIPE } comparative length of inner primaries.

length and very narrow; this forms a circle at the extremity of the larger end.

They are of the usual pyriform shape, and do not differ in texture from the eggs of *Gallinago coelestis*.

They measure 1·56" × 1·11", 1·56" × 1·13", 1·58" × 1·15", and 1·56" × 1·09". They were taken at Pokkodski, Kolyma on the 22nd June 1905.

GALLINAGO MAJOR.

The Great Snipe.

Scolopax major.—Gmelin, Syst. Nat., i, p. 661; Seebohm, Charadindon, p. 482.

Gallinago major.—Sharp, Cat. B. M., xxiv, p. 626; *id*, Handbook, iii, p. 201; Oates, Cat. Eggs, B. M., ii, p. 60; Oates, Game-Birds, ii, p. 467; C. Donovan, J. B. N. H. S. Journal, xii, p. 782. Finn, Indian Waders, p. 152.

Description.—Adult male.—"General colour above black, mottled with sandy buff, with which the feathers are fringed and barred in an irregular and wavy manner, so as to leave large patches of black; the scapulars with whiter and broader edges, so as to form a double line down the back; lower back, rump and upper tail coverts sandy buff barred with dusky brown, the end of the tail coverts white; wing coverts blackish brown, the marginal series with ashy fringes, the remainder with conspicuous white tips, before which is a black subterminal bar, the inner greater coverts also barred with sandy rufous; bastard wing and primary-coverts blackish, tipped with white; quills dark brown, the secondaries tipped with white, the innermost being barred with sandy rufous and resembling the back; tail feathers bright rufous, with black bases and black bars on the terminal half of the feather, scarcely visible near the tips; the white tip to the feathers gradually increasing in extent until the four outer ones on each side are entirely white except for a little black near the base; centre of crown whitish, bordered on each side by a broad band of black, slightly freckled with rufous, and followed by a broad superciliary streak, ashy whitish in front and fulvescent behind; a dusky streak from the base of the bill to the eye; sides of face whitish, with numerous tiny blackish spots,

and a dark patch below the ear-coverts; the hind neck and sides of neck sandy buff, streaked with black, chin, breast and abdomen white; the lower throat, fore neck and breast pale sandy buff, with central spots of black on the feathers; the sides of the breast and flanks regularly barred with black; the under tail coverts sandy buff, tinged with rufous, and having more or less complete bars of black; under wing coverts and axillaries white, barred with black, the latter very distinctly banded; lower primary coverts and quills below uniform ashy brown" (Sharpe).

"Bill brown; feet light slate colour; iris very dark" (Ayres).

"Bill dull flesh coloured at the base darkening to black at the end; legs dull flesh colour, the joints plumbeous, iris dark brown. Culmen 2·4, wing 5·5, tail 2·5, tarsus 1·4" (Dresser).

"Culmen 2·45, wing 5·55, tail 2, tarsus 1·35" (Sharpe).

Adult female.—Similar to the male.

"Culmen 2·5, wing 5·3, tail 2, tarsus 1·5" (Sharpe).

From the above it will be seen that the female, as far as is shewn by the few sexed females in the British Museum collection, is a somewhat smaller bird with longer bill and legs. The wing in a few females sent to me for examination have average 5·50.

Winter plumage.—"More sandy-buff than in summer, the buff edges to the feather of the upper surface broader and more conspicuous, the blackish markings on the fore neck larger and coarser, and either circular or horse-shoe shaped" (Sharpe).

Young.—The young have less white about them than the adult, the white outer tail feathers being a good deal barred, in addition to this the general tone is much more rufescent and the lower surface darker.

Nestling.—Ashy fulvous, the crown and centre of the back more rufous, sides of the face and a broad supercilium white, coronal and orbital lines black, and other lines of black about the face; wings rufescent fulvous, sides of back and a patch on each flank black. Under surface bright fulvescent, a dark patch on the lower throat and the centre of the abdomen nearly white.

Distribution.—Breeds in Northern Europe and in Western Siberia, as far North as 69° N. Lat., as far East as the Valley of the Yenesi and winters in Southern Europe and Northern Africa,

also extending throughout Western Asia, through Asia Minor to Persia.

The only record* of its occurrence in India is that in the B. N. H. Society's Journal, Vol. xii, p. 782, by Capt. Donovan.

This gentleman recorded that on the 5th Sept. 1899 he shot a bird near Madras weighing over 8 oz. and with a wing of about 6" in length which he sent to the Madras Museum for identification. The Museum authorities pronounced the bird to be *Gallinago nemoricola*, and then, as it was far advanced in putrefaction, threw it away.

Fortunately before sending the bird away Capt. Donovan carefully examined it and made copious notes. The main features noticed by him in his examination of the bird were (1) its outer tail feathers were soft, (2) not attenuated, (3) were white with only two or three bars near their bases on the outer webs, and (4) in addition to this the snipe had conspicuous white tips to the wing coverts.

These points are ample for the purposes of identification and there cannot be the least doubt but that the bird shot by Captain Donovan was a specimen of the *Double* or *Great Snipe (Gallinago major)*.

Moreover, there is no reason why the Great Snipe should not sometimes visit India though it is curious that it should be first recorded from the extreme S. E. It has been obtained at Fao in Southern Persia by Cumming and in its Western Range it migrates very much further South than the latitude of this place, indeed it has been obtained as far South in Africa as Cape Colony itself. Here in India we should expect to meet with it occasionally in any part of Baluchistan, Sind or Northern Bombay and less often in other parts of Western and Southern India.

The Great Snipe seems to be even more exclusively nocturnal in its habits than the other members of the genus, feeding almost entirely by night and not moving, unless forced to do so, after the sun has risen at all high.

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* Since this was written our Society has received a specimen of what proves to be undoubtedly *Gallinago major* from Capt. A. Boxwell, 119th Infantry, Bangalore, and this bird was shot on October 1910, near Bangalore. A note on the subject will appear in the next Journal.—Eds.

It is found in much the same sort of country and ground as *Gallinago cœlestis* but is perhaps rather inclined to lie up in thicker cover than does the latter bird. In their diet *cœlestis* and *major* resemble one another very closely, and an examination of the bills of these two birds will show that this is what we should expect as in structure and sensitiveness they are much the same.

Dresser says that their food consists of worms, small slugs, insects and larvæ.

The flight of the Great Snipe is very inferior to that of the Fantail or Pintail Snipe and more nearly approaches that of the Wood Snipe, though it does not appear to indulge in the curious side movements and sudden final plunge into cover so characteristic of that bird, still it is comparatively slow and heavy on the wing and offers an easy shot.

I can find no record of any day's shooting devoted entirely to this snipe, and when shot they seem invariably to form merely a part of the bag on days when the Common Snipe has been the object of pursuit.

Its breeding season varies according to latitude, in the most Southern portion of its breeding range its eggs may be taken as early as the last week in April, and throughout May into early June, but in the more Northern latitudes it will not be found to lay until at least a month later and few, if any, eggs will be taken before June.

It is very doubtful if the Great Snipe "drums" in the true sense of the word. Dr. Bahr, as a result of his experiments with the tail of this snipe, writes "the feathers produce *no* sound," a result which he obtained only from experiments with the tail-feathers of the Great Snipe and the Jack Snipe.

They do however produce a sound during the breeding season, which has not yet been explained and may therefore be either vocal or mechanical.

Professor Collett in Dresser's Birds of Europe (Vol. vii, p. 635) thus describes its breeding habits: "It has a so-called *Leg* or *Spel* like some of the Grouse tribe, a sort of meeting place where they collect to drum and often to engage in combat for the possession of the females. . . . It does not indulge in ærial evolutions but

remains on the ground. . . . . The male bird utters a soft, almost warbling note, which is accompanied by a peculiar snapping sound caused by striking the mandibles together several times in quick succession. If a person approaches one of their humming places he can hear at some distance the low note: 'bip, bip, bipbip, bip-biperere, biperere;' and when within 100 paces, if the night is still, he begins to hear other peculiar sounds. . . . . Whilst producing these notes the bird is in ecstacy and raises and spreads his tail like a fan, the outer tail-feathers showing in the half darkness like two white patches."

Dr. Bahr conjectures that these sounds are vocal, but he has shown (vide *G. cœlestis*) that the drumming of the Common Snipe *can* be produced, under certain circumstances, on the ground, and it therefore seems possible that the Great Snipe also "drums" by some mechanical vibration of his tail-feathers.

Seebohm says that this snipe "makes its nest in long grass, but more often in the middle of a hillock of sedge or grasses. A small quantity of moss or dead grass is placed as a lining to the depression, where its four eggs are laid."

"The eggs of the Great Snipe are very handsome, and vary in ground colour from pale greyish buff (sometimes with the faintest possible green tinge) to pale brownish buff, and are spotted and blotched with rich dark brown and paler brown and with underlying markings of purplish-brown and grey. Most of the blotches are distributed round the largest part of the egg, often in an oblique direction, and many of them are confluent. Some eggs have the large end covered with a network of streaks, but more often only a few lines are seen. The underlying markings are large, numerous and very conspicuous.

I have an extremely handsome clutch of three eggs of *G. major* in my collection taken in Denmark on the 14th June 1874. The ground colour is a bright pinkish stone colour blotched all over the surface with very large blotches of vandyke brown, some bright and clear, others almost black; the sub-surface marks are of the same description and nearly as large but one of a lavender and purple grey colour and rather less numerous.

When newly taken, these eggs must have been extraordinarily

glossy as now, after a lapse of 36 years, they are still more glossy than most snipes' eggs. "These eggs measure between 1·80" and 1·84" in length and 1·24" and 1·28" in breadth. They are of the usual snipe and plover pig top character in shape, but the texture seems harder and closer than in most snipes' eggs.

This curious pink ground colour agrees well with Oates' description of the eggs of *G. solitaria*, a colour, which he says, renders the eggs of that bird easily distinguishable from all other snipes' eggs.

The ordinary full clutch consists, of course, of four eggs as with all other true snipes.

Seebohm gives the size as varying between 1·7" and 1·9" in length and between 1·22" and 1·3" in breadth, and Dresser gives the average as 1·75" × 1·24" and in "Eggs of the Birds of Europe," p. 688, gives the variation in length as between 1·73" and 1·83" and in breadth as between 1·21" and 1·28". Jourdain gives the measurements as bigger than this and the average of 31 as being 1·79" × 1·33".

GALLINAGO STENURA.

The Pintail Snipe.

Scolopax stenura.—Kuhl. Seebohm, charadriidæ, p. 477; *id* B. Jap. Empire, p. 345.

Scolopax horsfieldii.—Gray, Zool. Misc., p. 2; *id* et Hardw. Ind. Zool., ii, Pt. 54.

Gallinago horsfieldi.—Hume. Str. F., iii, p. 182.

Gallinago stenura.—Jerd. B. of In., iii, p. 674; God. Ans. J. A. S. Beng., xxxix, p. 273; Blanford, *ibid*, xlx, p. 270; Marshal, Str. F., i, p. 428; Hume, *ibid*, p. 423; Hume, *ibid*, ii, p. 294; Parker, *ibid*, p. 335; Ball, *ibid*, p. 431; Blyth and Wald. B. of Burmah, p. 156; Armstrong, Str. F., iv, p. 340; Hume, *ibid*, v, p. 46; Butler, *ibid*, p. 212; Legge, B. of Cey., p. 816; Oates, B. B. B., ii, p. 383; Sharpe, Cat. B. M., xxiv, p. 619; Blan. Avi. of B. I., iv, p. 289; Finn, In. Waders, p. 148; Sharp, Hand List, B. M., i, p. 165; Oates' Indian Game Birds, ii, p. 469; *id*. Cat. Eggs B. M., ii, p. 356; Stuart Baker, J. B., N. H. S., xii, p. 500; Butler, *ibid*, xiii, p. 149; Wall, *ibid*, xv, p. 722.

Gallinago sthenura.—Le Mess., Str. F., iii, p. 380; Hume and

Dav., *ibid*, vi, p. 459; Hume, *ibid*, vii, p. 39; Dav. and Wen, *ibid*, p. 88; Ball, *ibid*, p. 228; Cripps, *ibid*, p. 301; Hume, *ibid*, viii, p. 69; *id*, *ibid*, p. 112; Bingham, *ibid*, p. 196; Scully, *ibid*, p. 354; Butler, Cat. B. of Scind, p. 61; *id*, Cat. B. S. Bom. Pres., p. 75; Vidal, Str. F., ix, p. 83; Bingham, *ibid*, p. 196; Reid, *ibid*, x, p. 68; David, *ibid*, p. 320; Davis, *ibid*, p. 413; Murray, Vert. Faun. Scind., p. 239; Hume, Str. Feath., xi, p. 319

Pintail Snipe.—W. Gaye., J., B. N. H. S., vi., p. 418; St. J. Richardson, *ibid*, p. 488.

Vernacular Names.—No natives appear to recognise the difference between the Pintail and Fantail Snipes and the vernacular names given to the latter apply equally to both.

Description, Adult Male.—The Pintail Snipe differs from the Fantail in colouration in having the whole of axillaries and under wing coverts regularly barred throughout with black, or brown, and white, the former colour being predominant. The average bird is also duller and darker in its colouration, this more so on the lower than the upper parts. The bill is proportionately shorter and stouter and the tail consists, normally, of 26 or 28 feathers, the external 8 or 9 on each side being very stiff and narrow, the outermost only about 1" in width.

The outer web of the first primary is, in all text books, said to be brown, but this is not quite correct, as in a large series one finds many specimens with very pale outer webs, though these may never be quite white.

"Length 9·75" to 10·9"; expanse 15·5 to 17·4; wing 4·95 to 5·42; tail from vent 2·0 to 2·57; tarsus 1·19 to 1·27; bill from gape 2·12 to 2·5; bill at front 2·2 to 2·6; weight 3·3 oz. to 4·75 oz., average 3·91" (Hume).

"The legs and feet are greenish or greenish leaden, but especially late in the spring these parts exhibit, in some birds, a distinct olive yellow tinge; the irides are deep brown; the bill generally has the gape, the extreme base and margins of the upper mandible greenish or olive, but sometimes some or all of them are unicolorous with the rest of the basal four-sevenths of the upper mandible which are usually pale hoary brown; on the other hand even these at times show a greenish tinge; the terminal three-sevenths of the

bill are deep brown, blackish hoary towards the tip, and paling towards the opposite direction." (Hume).

All I can add to these notes is that I have often seen the Pintail with legs and feet of an olive-yellow colour even in September and October, and have had specimens sent me in these months whose legs when fresh? were described as yellow, and it is probable that old birds have their legs more decidedly yellow than the young.

Description, Adult Female.—The female only differs from the male in being somewhat larger.

Hume gives the dimensions of the female as "length 10·1 to 11·17; expanse 16·1 to 18·25; wing 5·0 to 5·58; tail from vent 2·0 to 2·67; tarsus 1·2 to 1·35; bill from gape 2·38 to 2·62; bill at front 2·45 to 2·7; weight 3·75 to 5·1 oz., average 4·2 oz."

The average measurements of those I have measured have been *males*, wing 5·11", bill 2·35"; *females*, wing 5·25", bill 2·41". Sharpe gives the measurements as *male*, wing 4·9", bill 2·3"; *female*, wing 5·1", bill 2·45".

The Pintail Snipe is extremely variable in its plumage, and I quote Hume's remarks, anent this variation, in full. He says: "I have specimens now before me with the entire lower breast, abdomen and vent pure white and unmarked. I have others with the whole of these parts barred, almost as strongly and as regularly as in *nemoricula*. There are some in which the front of the throat and upper breast are fawn-coloured blurred with numerous illdefined spots and streaks of dark brown, and others in which the upper breast is strongly and distinctly, though irregularly *barred* . . . . The upper surfaces differ widely—some are altogether brighter, the black more intense, the markings on the scapulars are more intense rusty, their pale margins a brighter and richer buff."

The variations in the under parts are certainly individual, but on the upper parts the brightness and depth of colouring depend, as is so many birds, on the newness of the feathers. As is well known black and red are the colours, next to green which *weather* most and consequently shew most variation in the colouration of new and old feathers.

Just as there are pale and melanistic forms of the Fantail Snipe so are there of the Pintail.

Of the latter type there is, however, but one at present on record, that is the one recorded by Hume in Game-Birds. Of this he writes: "Before the mutiny I had a specimen procured near Dacca which was everywhere blackish dusky, darker than either of the only two Sabine's Snipe I ever saw, but very similar to these; but alike in these and in all the albinoid specimens I have seen, the wing lining and axillaries differed but little from the normal type, and had not participated, at any rate to the same extent, in the general change or loss of colour."

The pale, or albinoid specimens, as Hume terms them, are almost equally common in both species. Hume writes: "I have a fine example now before me, procured by my friend Mr. J. C. Parkin near Calcutta. The lower surface does not much differ from the normal type, except that the markings on the breast and flanks are pale brownish grey, but the entire upper surface is a mixture of pale cream colour and pale brownish grey. I have seen at least half a dozen similar creamy coloured birds in the course of the last thirty years. I also once shot one that was snow-white everywhere with only faint traces of grey markings."

The Bombay Natural History Society possesses three pale specimens of *G. stenura* and there is a fourth in the Indian Museum, Calcutta, all of which are very similar in their colouration to the pale specimens of *G. coelestis* already described. The Bombay birds, curiously enough, both have a few feathers of the scapulars and tail normally, or partly normally coloured, a fact I have also noticed regarding some of the pale specimens of the Fantail. The Indian Museum bird has a few normally coloured feathers on the upper back and appears to be moulting into normal plumage as these feathers are all new.

Another specimen in the Indian Museum is very beautiful, the ground is a pure white, but the markings are of a curious vinous grey pale everywhere with a few deeper markings, shewing on the scapulars.

In describing *Gallinago stenura* it has already been said that this snipe normally has 26 or 28 tail-feathers of which the lateral 8 or

9 pairs are attenuated; these outer feathers, however, vary considerably in number, and it is not unusual to find as few as 6 pairs only of these, the central feathers, 10 in number, never varying.

It is a curious coincidence, also, that in the majority of cases in which this small number of feathers is found, the birds seem considerably larger than the average. My attention to this curious combination, *i. e.*, extraordinary size with so few tail feathers, was first attracted by some letters to the *Indian Field* written by Mr. W. Val Weston, under the *nom-de-plume* of "Silvertoun." On the 29th October he wrote giving the measurement of one of these snipes: "beak 2⅝, wing 5⅛, weight 5½ oz;" on the 11th he sent the measurements of two more, "bill at front 2½ and 2¾, wing 5⅜ and 5½," and on the 30th of November he recorded a fourth but did not give measurements of bill and wing.

Mr. Val Weston has kindly added further information in regard to these big Pintails in letters. He first sent me a specimen (now in the Society's Museum) which measured when dry, wing 5·35, bill at gape 2·63, and then on the 2nd January 1910, wrote me as follows:—"Yesterday I shot two more of these big snipes and also an ordinary Pintail and a lot of Fantails. The difference between the big and small forms is most marked and they are easily distinguished when in the air. The measurements of the two are, wing, each 5½, bill at front each 2½, weight both considerably over 5 ozs. Tail feathers 22 and 23. The big Pintail does not come in at the same time as the ordinary small birds. By the 1st September the country is full of Pintail Snipe, but amongst them never one of these big birds. By October the Pintails have moved on and their place is taken by Fantails, and it is then that we begin to look for the big birds. *They come with the Fantails and not with the Pintails.* By the middle or end of February the Pintails begin to come back, and in March there are three Pintails to one Fantail, but I have never shot one of these snipes later than the 19th February, that is to say, never during the northward migration of the Pintails."

From the inquiries I have made from sportsmen there seems to be a very general idea that there is a form of Pintail which differs from the ordinary birds in being much larger, but an examination of the skins sent to prove this show that these birds

are nothing but very large specimens of the ordinary Pintail. I can see no single point about them beyond their unusual size by which one can discriminate them, though, as already observed, these very large birds seldom, if ever, have more than 22 feathers in their tails. This difference in size is perhaps even more noticeable in bulk than it is in wing and bill measurements. It must also be noted that Mr. Val Weston has remarked that the colour of these birds' legs is a far clearer brighter yellow than is the case with ordinary Pintail.

Distribution.—There is not much to add to Blanford's note on the distribution of this species. He writes:—"The Pintail Snipe breeds, as far as is known, in Eastern Siberia as far West as the Yenesei Valley and migrates in winter to South-Eastern Asia and the Malaya Archipelago. It is very rare in the Punjab, Sind and the North-Western Provinces, Rajputana and Gujrat; but increases in numbers to the Southward and Eastward and is found throughout the Peninsula in winter, predominating in Mysore and Southern India, whilst in the highland of Deccan, in Bombay and the Central Provinces and even somewhat further South the common snipe is more abundant and, whilst in Orissa and Bengal the two species are on the whole equally distributed everywhere, further East, in Assam, Sylhet, Cachar and throughout Burma. *G. stenura* is the snipe of the country."

It must be remembered that Blanford gives the Indian distribution in its widest sense. Throughout the Eastern portion of its Indian range the number of Pintail compared with Fantail varies very greatly in accordance with seasons, and sportsmen have to be very careful how they form their opinions on this subject.

The Pintail, without doubt, enters India *via* the Eastern Himalayas, comparatively few coming through them even as far West as Nepal. The Fantail, on the other hand, though migrating principally from the West, comes also in some numbers over and through the Eastern Ranges. But the Fantail arrives later than the Pintail so that to the East the Pintail predominates enormously during the early and late periods of its stay in India, that is to say, just after and just prior to its migration.

In this way a sportsman, who shoots in Cachar in September,

may find nothing but Pintail in his bag, whereas one shooting in the same district in December may find but few Pintails and nearly all Fantails.

In Eastern India the Pintails arrive early in August, but there are a few records of snipe being killed in July. Fasson writes *in epistola* to Hume: "I have flushed snipe in the Hill jungle in June; and Jarbo, up at Rangamati in the Hill tracts, shot half a dozen couple on the 31st July last."

Those seen in June were probably birds which had been wounded and therefore unable to migrate, whilst the occurrence of the others in July must have been abnormally early. The record of the first snipe to be shot each year in the Chittagong District has been recorded by "Politye" in the *Indian Field* of 9th July 1903 for the years since 1878, and according to this record the next earliest dates to those mentioned by Fasson were on the 6th August 1892 and 1st August 1886. Mr. Val Weston says that the Pintail Snipe sometimes puts in an appearance in Birbhum in the last few days of July but does not seem to have shot any in that month and such appearances must be unusual, for in 1903 he records the first snipe as being shot on the 23rd August.

"Raoul" in the *Indian Field* of the 26th July 1909 records having seen three snipes on the 20th of that month and again that in 1873 he saw snipe on the 13th July; but these notices of seeing snipe can hardly be taken into consideration as actual records, for there is always the *possibility* of other little waders having been taken for them.

In Dibrugarh the first few birds arrive about the 4th August, in Chittagong about the same time, in Cachar, in Jalpaiguri and the Himalayan Terai they arrive about the 12th of that month and in Nepal a little later still. Thence they work South and West, arriving in Ceylon in October, and seldom before the end of that month in any numbers.

The maps which accompany this article will show how the distribution of the Pintail and Fantail overlaps, as well as the approximate dates on which the earliest individuals of each species arrive at their respective destinations. The routes are marked in red and from these it will be seen that the Pintail seems to move more



MIGRATION ROUTES OF THE PINTAIL SNIPE (GALLINAGO STENURA)

diagonally, that is more South and West, than the Fantail does South and East and also to migrate further South as a body. Thus at no period of its stay in India is the Fantail altogether absent from the Northern portion of its range but in December and January hardly a Pintail is to be found in the extreme North-East of India, nearly all the birds having gone further South by that time. In February they recommence working North, and by March have again deposed the Fantail from its position of numerical superiority in North-Eastern India.

The Pintail is as nocturnal in its habits as are other snipe and like the latter normally migrates, by night, but a curious instance of diurnal migration has been reported to me by Mr. L. W. Middleton. He writes:—"On September 8th I went out in the morning to see if the snipe were in and shot six and put up over thirty, so, in the afternoon, about 5 o'clock I again went out, thinking I was going to have a merry time but I only saw three and of those two rose straight up and joined a whisp of eight or ten which were crossing over at the time. I only found two more and then sat down to watch, and whilst so doing actually saw five rise and join flights of others which were passing over. I saw fully ten small lots came into view and make across the Hills in a South-Westerly direction. Next morning I went down early and trudged for an hour without putting up a bird, but I must have seen several hundred crossing overhead, one lot alone numbering fifty to sixty birds. The day was a bright sunny one and exceptionally hot."

Mr. Middleton's letter was written from Gauhati, and the Hills, he refers to, are the Khasia Hills. It is interesting to note how he remarks on these snipe working from one hill range to another instead of down the valley in which he was shooting.

The Pintail Snipe differs a good deal from the Fantail in its habits and will often be found in situations never frequented by the latter except when driven there by heat or by being over shot. Very favourite haunts of the Pintail in Assam are the wide waste lands, of sun grass worn down by village buffalos to an average height of some 18 inches, here and there the land being almost bare, whilst in patches elsewhere the grass may be three or four feet high.

During the rains water, often to a considerable depth, covers these spaces, but by October and November they are practically dry, and even in the rains there are nearly always portions which are a little above water level. The Pintail Snipe shelter and feed in these grass lands, keeping almost entirely to the drier portions though, if the right kind of food is present, they also frequent the wet patches and the marshy bits which are dotted about over the whole of its area. Hume remarks on the feeding grounds of the Fantail and Pintail as follows:—"Both the Pintail and Fantail affect cover and moist ground so that where both these luxuries exist, you will continually flush both species at the same spot; but the difference between them is that, while the Pintail, if unable to get both his requirements, will stick to grass and such like cover, even if there be little perceptible moisture in the ground, the common snipe in such case will stick to the wet ground even if there be little perceptible cover there. The consequence is that whilst you often get both birds in precisely the same ground, you will often find the Pintail apparently quite at home in dry grass land, stubbles and scrub jungle where the common snipe would never, except accidentally, occur, and again you will find the Fantail on almost bare mud banks of rivers and tanks, where it is the rarest thing in the world to meet a Pintail."

Personally I do not think that cover is so great a necessity to the Pintail as Hume would suggest; the fact is that a great part of this bird's food consists of tiny shells, insects and other objects found for the most part on dry land and not in water or mud; accordingly the bird frequents dry quite as frequently as wet land, naturally preferring to get cover as well when that is possible.

Mr. H. A. Hole found snipe (undoubtedly the Pintail) feeding in absolutely bare ploughed fields in Cachar. I have myself shot them in Dibrugarh in mustard fields, from which the crops had been cut, and every year numerous birds are shot in the race course of that place on practically bare, but wet, grass land, the grass being but an inch or two high.

In Bengal, the most common resort of both Pintail and Fantail is paddy cultivation and shallow *bheel* land which is covered with vegetation of some kind, but whereas the Fantail never leaves this

under ordinary circumstances the Pintail will also often be found on adjoining dry grass lands and even in jungle.

Snipe-shooting is much the same whether one is after Fantail or Pintail and in Bengal in nine cases out of ten one covers the same country in pursuit of either or both.

Hume seems to have had unfortunate experiences in Bengal, for he writes:—"In one single spot in the Meerut District, on the Boorka Ganga, in the neighbourhood of Hastinapur, to my certain knowledge, over 700 couple of common snipe were bagged during December 1850 by different parties who visited the place . . . . I have never heard of any one place in Bengal, Burma or Southern India where anything like this bag of Pintail could have been made by any number of guns."

This statement of Hume's is, of course, very far wide of the mark; in Bengal there are many such places, in Assam a few and in Burma and Orissa others.

In the Sundarbands of Barisal, Khulna and Jessore there are many wide sketches of mingled *bheel* and rice cultivation where a party of seven guns would *have to shoot very badly* in order to miss getting 700 couple in ten days' shooting. In the famous Kanchrapara jheels in the eighties and nineties 100 couple of snipe to one gun has often been exceeded in a day's shooting and this country was so well stocked that it stood shooting day after day. I well remember shooting there once in 1883 with three other guns. We unfortunately missed an overnight train and in consequence arrived late, so that when we got to our ground we found that the two best beats were already taken. In spite of this, our bag that day was 170 couple, whilst the other parties of shooters, who came into the station as we were waiting for our return train back to Nadia, shewed sticks as follows; the first party of three guns 180 couple, the next party of two guns something over 100 couple and a third party of four very bad shots, 48 couple. Here was a bag of something over 500 couple for one day and I believe one might have gone on shooting at the same rate for many days.

I do not think it is any exaggeration to say that in the season Kanchrapara must furnish over 1,000 couple of snipe month after month.

Shooting in Nadia in 1883 when I was stationed in that district 40 to 80 couple was not considered a heavy *morning's* bag for a couple of guns; in Hooghly the same and in some of the rice fields quite close to the station bags of 75 to 125 couple to two guns was almost a common occurrence. Indeed in any of the good snipe districts of Bengal one does not call anything under 50 couple to one gun a good bag for a whole day's shooting.

In Orissa, I know of several bags of 100 couple to one gun obtained in places which could have held several guns for several consecutive days. Thus Mr. H. Cornish, to whom I have already referred, is credited with beating 100 couple twice in a week on the same ground near Cuttack.

Mr. H. Reily is said to have shot over 100 couple to his own gun in the same district and in Burma also over 100 couple has been obtained more than once. Shooting grounds such as these would furnish far more than 700 couple of snipe in a month unless the powder was of a very curious quality.

In some of the big Sylhet swamps bags of over 100 couple of snipe to parties of three or four guns are sometimes made, but there are few grounds which would give four guns five hundred couple in 20 days' shooting.

Cachar and the Assam Valley are even less productive of sport; in the former bags of 50 couple to a single gun are unusual and in the latter though, one comes across birds almost in thousands on rare occasions when they are migrating, the shooting is so difficult that big bags are exceptional; at such times also the birds themselves are on the move so that where one day the sportsman cannot shoot and load fast enough the next day he may not be able to scrape together five couple in five times that number of shots.

On one occasion I happened to be duck-shooting in North Lakhimpur in the extreme East of Assam when an enormous flight of snipe came in, both Pintail and Fantail. The day previous, we had been duck-shooting over the three principal *bheels* of that part of this district, perhaps putting up some 20 or so birds in the course of a 12 hours' shoot but after their arrival we could hardly move 20 yards without putting up one or more of them. That

evening shooting round the skirts of the *bheel* two guns picked up 42 couple and found the birds so numerous that we decided to devote the following day to them alone.

The ground we were to shoot over had once been high forest land which had sunk until it formed a swamp in which there were some three or four feet of water all the year round. The trees had, of course, all died but the stumps of many of the harder grained ones were still standing, white and bleached and looking like the ghosts of their former selves. In the centre of these swamps shooting on foot was impossible as the water was still too deep, but all over the more shallow parts grew a dense mass of floating weeds a couple of feet thick and quite firm enough to walk on with care. There were three guns to take the field on this occasion, *viz*, myself, a second who was an average but careful shot, and a third, who could be called nothing but a rank bad one.

Before we got into the swamp itself we picked up a couple of teal and two snipe out of pools at the edge and as soon as we got on the weeds away went snipe in every direction. At first, the shooting was easy, the weeds firm and the water shallow and our first dozen or so shots collected 8 birds but after this we got into deeper stuff and the shooting got worse and worse. The birds still swarmed on all sides but they were rather wild and the weeds, though strong enough to hold us as long as we moved, gave way when we stood, so that our 'fore leg,' on which the weight was, sunk as we fired. Sometimes we sank slowly and fired after a fashion, sometimes we sank with a sudden disconcerting splash, it might be a couple of feet or it might be four and sometimes it was even more than this.

It was very exhausting work and after a couple of hours, having the fortune to get on a small island, we called a halt and looked at the bag. C, the bad shot, had fired 42 shots and had not a feather to show. Y, the cautious man, had had 30 shots to 12 dead birds, and I myself, shooting at everything within range, got 18 birds in 65 cartridges. After a short rest we tramped on once more but C, after loosing off another 40 cartridges or so and bagging one bird fell into a buffalo wallow up to his neck, and on

being extracted from this he struck work and cleared off. Y and I persevered after we had lunched but with no better results until we struck a piece of good walking and here Y collected 5 birds in 7 shots and I was so fortunate as to get 8 consecutive birds. Then we got into deep stuff again and the average kills per cartridge again dropped. Eventually after the most exhausting day's shooting I have ever had we struck work at about 4 p. m. and totted up our bags. C had, before ceasing, fired 83 shots for one bird, Y, who had picked his shots all day, had got 44 birds in exactly 100 cartridges, and I had managed to collect 68 snipe in 204 shots, but of these 68, two I had shot before we started working the deep water and 8 I had got without a miss on a clean piece of walking so that really I had expended 194 cartridges in killing 56 snipe. It was no question of want of birds or of bad shooting as far as Y or myself were concerned, it was just the difficult walking and perhaps, to some extent, the attendant exhaustion. Each step one took, one was sinking more or less slowly the whole time with the consequence that the gunner was twice in every three shots under his birds.

The following day we abandoned the deep water altogether and Y and I worked round the edges and the across shallow stretches linking one swamp with another. In this way although we did not put up one-tenth the number of birds we had on the previous day we managed between us to pick up over 50 couple in under 200 cartridges.

The supposed differences between the Fantail and the Pintail in the matter of flight and voice have been much discussed, but I am ashamed to say that, to this day, I cannot tell one from the other when on the wing, nor could I ever, with any certainty, say what the bird was from its cry.

Other sportsmen and field naturalists, however, seem to find no difficulty in discriminating between them. Hume gives his own opinion as follows: "I individually am certain, that all conditions being identical, the flight of the Pintail is more laboured, and more direct, and less zigzaggy than that of the Fantail."

"As to the notes of the two birds, I am at a loss to understand how any one can assert that they are identical." At this point

Hume stops and forgets to tell us how to say what cry belongs to which bird. Some of his correspondents try to show in what they considered the difference exists. Stuart says: "It rises with a sharp loud cry unlike the ordinary snipe, and its flight is heavier."

Parker says that the Pintail has a more laboured flight than the Fantail.

Brooke also *thinks* that the cry is different and the flight rather slower and not so zig zag.

On the other hand we have observers like Baldwin, Scully and Butler, all declaring that they can find no difference in voice or flight between the two birds.

That some men can tell the difference is a fact as I found out one day at the cost of one rupee per bird. I was shooting with a friend who called out as a bird dropped "Hallo, that's a Pintail." It was so right enough, but my sceptical nature made me think it was a fluke his guessing correctly and I told him so. Thereupon he bet me a rupee a bird that he would name the next ten birds he should kill, and this he proceeded to do perfectly correctly and named as they fell, 6 Fantail and 4 Pintail. This sportsman, however, said that the voices were identical, but that the Fantail got up vertically and then cleared off whilst there was a perceptible pause as it changed direction; the Pintail, on the other hand, rose on a slant and kept going. He had never noticed any difference in their zig zagging as Hume calls it.

What is the best weapon for snipe? A difficult question to answer, and to every sportsman the answer would not be the same. Hume, we see, advises a 20 or 24-bore with a dram of powder, but this necessitates the man behind the gun being a brilliant shot and also the snipe being comparatively domestic in their habits. For a long day's shoot there is no doubt that the lighter the gun carried, the less tired the shooter will get and the less his shooting will deteriorate by the end of the day. There are few men, however, who are not strong enough to use a 16-bore throughout the longest day; personally, though I rejoice in but one arm, I find a 16-bore perfectly manageable at the end of the hardest day's tramp; and though I used a 20-bore one season I dropped it because I could not shoot straight enough with it, and also found

that when snipe were wild it did not kill the birds hit, the range of the weapon being insufficient.

The probable answer to the question is let each sportsman find out what suits him best, and when he has found out stick to the weapon as long as he can. If he starts with no bias for any special bore, let him commence his shooting with a 16-bore, and he will *probably* eventually find this light enough to carry, yet giving a sufficiently good pattern and with enough penetration to satisfy all his wants. I would not, however, ever advise a youngster to start with a 20-bore, much less with a 24.

On the table the Pintail does perhaps often rank as inferior to the Fantail. At their best the two birds are undistinguishable, but after a drought and when shot in scrub, the Pintail is often comparatively dry eating, a result which might be expected from the diet on which he has been living.

The bill of the Pintail snipe is not nearly so sensitive as that of the Fantail, and accordingly, we find him feeding far more on comparatively dry ground, boring less in the ground and indulging more on whatever he can get above it. A very large proportion of his diet consists of tiny snails and similar "shell fish" which are to be found in and about the roots of grass, etc., on damp ground, or else climbing up the blades to some height. But besides these and the worms, caterpillars and other soft items of food, all of which are also eaten by the Fantail as opportunity arises, the Pintail will eat grasshoppers, small beetles, and other equally hard substances, and I have shot birds in dry scrub with the stomachs full of a small kind of flying ant.

Nidification.—Very little is known about the nidification of the Pintail Snipe, though very recently Dresser has obtained its eggs through Russian collectors.

Seebohm visited its breeding grounds when they commenced to arrive in the first week of June, but he appears to have left before they begun to nest.

Prjevalsky gives a good account of its breeding on the Ussuri, though he calls it *G. heterocerea*. He says:—"In the latter half of April the birds choose their nesting localities in the thinly overgrown marshes, and their peculiar courting commences. Rising

into the air similar to our *G. scolopacina*, and describing large circles above the spot where the female is sitting, it suddenly dashes downwards with great noise (which is most likely produced by the tail feathers, like that made by our species and somewhat resembles the noise of a broken rocket). As the bird approaches the ground, the noise increases until it has got within a hundred yards, when it suddenly stops the sound and quietly flies on, uttering a note sounding something like *tiric, tiric, tiric*. Courtship lasts until the middle of June and is mostly heard or seen in the mornings and evenings, but occasionally in the day-time and even at night in the clear weather."

I was fortunate enough to take an undoubtedly authentic nest of this snipe on the 21st June 1890 at Guilang in the North Cachar Hills. Some Nagas brought me a pair of snipe, which they had trapped in a wide ditch surrounding a deserted Stockade, and on a search being made in the banks of this ditch a nest with four eggs was discovered. The two birds *appeared* to be quite sound in every way, but it is almost certain that one of them must have received some injury which prevented it migrating to its usual nesting ground though it had left the plains with the intention of going there.

The bottom of the ditch in which the nest was placed contained a little water, but the banks were only slightly moist and spongy and where the nest was placed in amongst the roots of long grass, it was quite dry. The nest was a circular pad of fine roots and grasses with a depression in the centre of about half an inch. It was curiously well and compactly put together, though there was no attempt to weave or intertwist together the articles of which it was composed.

The eggs, which were fresh, were four in number and averaged 1·48" × 1·12". The ground colour is a very pale, but rather right yellow stone, and the markings consist of very bold blotches and spots with one or two long scriggly lines of deep vandyke brown. These are nearly all confined to the larger third of each egg, only a few spots and specks being present in the smaller two-thirds. The underlying marks consist of blotches of purplish grey scattered about the egg in the same proportion as the primary markings.

The texture is fine and close and there is a fair gloss; the shape is the usual broad peg-top of all snipe's eggs.

Mr. H. A. Hole wrote me in 1890-1892 that he was sure that a certain number of snipe bred every year in the plains of Cachar, and that he had frequently put up snipe in the newly ploughed fields in June, July and August.

In 1890 and the following year he failed to obtain any eggs, but on the 14th June 1902, he got, amongst a great number of painted snipe's eggs, a clutch of three and a single egg which are undoubtedly true snipe's eggs and almost equally, certainly, those of the Pintail.

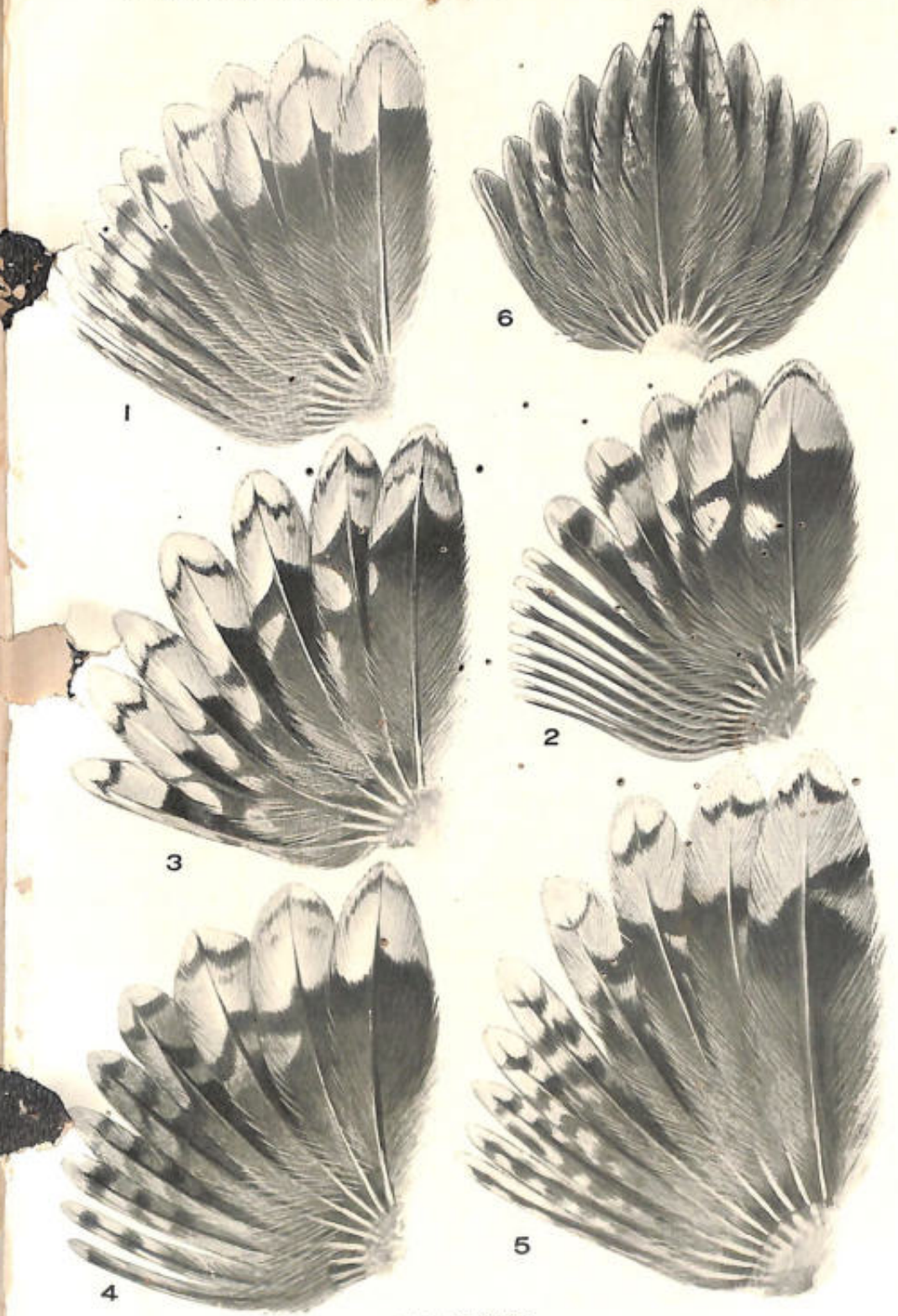
In both these cases the nests were found on the *bands* or banks bordering rice fields and were placed at the water's edge in dense grass and weeds. The rice fields in this part of Cachar are very small and consist of the low ground running between and around the small broken hills at the foot of the higher ranges. They are, as usual, divided by narrow banks of a foot or two in height, but in country of this character the borders of the field and the banks themselves are always much overgrown with grass, weeds and small bushes.

All four of these eggs are of the same type as those described above, merely differing in having a somewhat greener ground colour and the markings rather less heavy and more evenly distributed. They average 1·58" × 1·11".

I have also an oviduct egg in my possession which was taken from a female Pintail in the early part of August 1889, shot by some one in Cachar on the *bheel* surrounding the Rifle Range. The bird was dissected and the egg sent me by the late Col. Evans, I. M. S., at that time attached to the Regiment stationed in Silchar.

This egg differs from all others I have seen in being very dull in colour and curiously brown in general hue. The markings are like those in the Silchar ones, but have the distribution reversed, *i.e.*, they are principally confined to the smaller instead of the larger end.

The underlying spots are also unusually dark, and are of a purplish brown. The egg measures 1·55" × 1·14".



TAILS OF SNIPE.

1. SWINHOE'S SNIPE (*G. megala*). *Note* 20 tail feathers, outer 12 attenuated.
2. PINTAIL SNIPE (*G. stenura*). *Note* 26 tail feathers, outer 16 much attenuated.
3. FANTAIL SNIPE (*G. solitaria*). *Note* 14 tail feathers, none attenuated.
4. WOOD SNIPE (*G. nemoricola*). *Note* 18 tail feathers, outer ones narrow.
5. EASTERN SOLITARY SNIPE (*G. solitaria*). *Note* 18 tail feathers, outer 6 narrow.
6. JACK SNIPE (*G. gallinula*). *Note* 12 tail feathers.

Another oviduct egg was also once obtained in Cachar from a Pintail snipe. I think this was in August 1887 or 1888, but am not sure of the date and the shell being still soft, the egg was not preserved.

GALLINAGO MEGALA.

Swinhoe's Snipe.

Gallinago megala.—Swinhoe, Iho., 1861; Legge, B. of C., p. 817; Oates, Game Birds, ii, p. 475; Sharpe, B. M. Cat., xxiv, p. 624; *id.*, Hand-list, Vol. i, p. 165. Dresser, Bulletin, B. O. U., No. clvi. *Indian Field*, 8th October, 5th, 12th and 16th November 1903.

Scolopax megala.—Seebohm, Geogr., Dist. Charadr., p. 479.

Description.—Adult male.—Swinhoe's snipe is in colouration undistinguishable from the Pintail Snipe, but can always be identified by an examination of the tail. This in Swinhoe's snipe contains only 20 tail feathers, whereas the Pintail Snipe normally has 26 tail feathers and practically never less than 22. Even, however, when the tail is imperfect discrimination is easy for whereas the outer tail feathers of the Pintail are hardly broader than a pin those of Swinhoe's snipe are never under 2". Again the Pintail has 8 or 10 of the central feathers non-attenuated whereas Swinhoe's has only the 6 central ones showing no attenuation.

"Bill light yellowish brown for the basal two-thirds, yellower on the base of the upper mandible, blackish brown on the apical third; feet light yellowish grey, with blackish brown claws; iris dark umber-brown" (Swinhoe).

"Total length 9·5 inches, culmen 2·3", wing 5·4", tail 2·15", tursus 1·35"" (Sharpe).

Two adults in the Calcutta Museum from Foochow have wings of 5·42" and 5·45", respectively.

Adult female.—Similar to the male, but rather larger, "legs and feet pale bluish grey, nails black" (A. H. Everett). A bird sent me from the Shan States has the legs rather bright yellowish grey. The wing measures 5·64" and the skin is almost certainly that of a female.

"Total length 10·5 inches, culmen 2·6", wing 5·6", tail 2·15", tursus 1·35 " " (Sharpe).

" *Young Birds.*—As with *G. stenura* so with the present species, the young birds appear to be distinguishable by their more uniform dark brown throat and chest; the stripes on the sides of the brown are also black and not mottled with rufous" (Sharpe).

Normally Swinhoe's Snipe is a bigger bird than is the Pintail, but the difference in size is not sufficiently marked to make it a factor of any use for the purposes of identification. Thus a specimen of the former in the Calcutta Museum, probably a young bird, has the wing only 5·08", whereas the Pintail often has the wing up to 5·5".

Distribution.—*Gallinago megala* breeds in Eastern Siberia and Northern China, migrating South in winter to Southern China, the Philippines, Borneo and the Malaccas. It is possible also that it breeds in Japan, though Alan Owston tells me that he has so far never heard of its doing so.

As far as known, for certain, the record of its occurrence within the limits of the present work are two only in number. A skin of a bird, already referred to, was sent me from the Shan States in December 1908, and a second was shot by me in Dibrugarh in January 1903.

This snipe is essentially a far Eastern form, but there is no reason why it should not be found fairly constantly in Burma and also, occasionally, in Assam and the extreme East of Bengal. Unfortunately *casual* examinations of big bags of snipe are of no use in ascertaining whether specimens of *megala* form a part with others, but if sportsmen will take the trouble to examine the tail of those shot really carefully, there can be but little doubt that we shall soon obtained further records of its visiting India, more specially in its extreme Eastern limits.

There is practically nothing in record about this snipe, although it is common enough in its own habitat. It is only within the last two years that its nidification has become known, and even such records as these are confined to Russian works. Dresser informs me that he has received eggs from Buturlin which were taken in Eastern Siberia.

(To be continued.)

ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART XI.

(Continued from page 129 of this Volume.)

We now come to the third tribe the *Neottieæ* of which the general characters were given on p. 433 (Vol. XVI). It consists (in Bombay) of 3 genera of small, terrestrial orchids. These may be shortly differentiated as follows :—

Leaf single from a small underground *tuber*, cordate fanshaped, appearing after the *scapes*, which are few flowered, *sepals* and *petals* narrow, spreading, *lip* undivided or 3-lobed ..... 25. Pogonia.

Leaves few, alternate, *roots* of tuberous fibres, *flowers* numerous, white, small, crowded in spiral spikes ..... 26. Spiranthes.

Leaves small, gradually passing into the bracts, *flowers* small, in dense racemes, *dorsal sepal* forming a *hood* with the *petals*. 27. Zeuxine.

Stems short, densely leafy, *leaves* very thin and netted veined, *flowers* few, in short racemes, *sepals* united half way into a tube. 28. Cheirostylis.

25. *Pogonia.*

Low, terrestrial, tuberous herbs, flowering before the leaves appear. *Leaf* plaited, solitary, broadly cordate or orbicular. *Flowers* solitary or few, nodding, near the apex of the *scape* rising from the tuber, *sepals* and *petals* subequal, narrow, spreading, *lip* adnate to the base of the column, sessile, narrow, 3-lobed, slightly saccate, *column* elongate, curved, clavate, *stigma* oblong, *pollinia* 2 or 4, elongate, powdery, often coherent, without *caudicle* or *gland*.

Leaves purple, covered with vinous coloured hairs, veins about 15, *sepals* and *petals* dull white, *lip* entire, pink ..... 1. P. plicata.

Leaves green, glabrous, veins 7 or 9, *sepals* and *petals* greenish brown, *lip* 3-lobed, pink. 2. P. carinata.

1. POGONIA PLICATA, *Lindl.; Fl. Br. Ind., VI., p. 119*; *T. Cookè, Fl. of Bombay, II, p. 707.*

Tuber globose, ¾ inch in diameter, tuberiferous *suckers* springing from the petiole into the soil. *Leaf* orbicular cordate, about 4 to 5 inches in diameter, dark brown purple on the *upper surface* which is densely covered with thick, stiff, vinous coloured hairs, *sinus* folded, *under surface* lurid vinous purple, also clothed with the same hairs as on upper surface, *veins* arched flabellate, about 15 in number, raised on both surfaces, not channelled but slightly winged on lower surface. *Scape* slender, 3 inches long, invested with *sheaths*, the lower of these short, truncate, the *upper* elongate with a free, linear acuminate blade as long as the sheath. *Flowers* 2 on each scape, nodding, 2 inches and over in diameter, semi-patent, *bracteoles* small, very shortly sheathing, 2-or more-sected, *ovary* short, stout, inversely top-shaped, 6-keeled, *sepals* linear-oblanceolate, smoky white, tips falcate, nerves brown, *petals* similar but broader, *lip* with entire margins, ⅜ inch long, embracing the column, bright rose, with darker veins, a stout, white, linear *callus* passing through the centre to the dilated emarginate tip, where the margins are strongly recurved, column club-shaped, *anther* cup-shaped, *rostellum* obscure, *stigma* scarcely depressed.

Flowers appear immediately on the setting in of the rains about the middle of June. They survive a very few days only and are followed by the leaves which lie spread out on the ground.

Distribution.—Throughout the Western Ghats, more especially so to the southward, Bengal, Mysore and Western Peninsula generally.

2. POGONIA CARINATA, *Lindl.; Fl. Br. Ind., VI, p. 121*; *T. Cooke, Fl. of Bombay, II, p. 707*; *Dalz. and Gibs., p. 270.*

Tuber warted, globose, ½ inch in diameter, tuberiferous *suckers* springing from the petiole into the soil. *Leaf* 2½ inches in diameter, orbicular cuspidate, deeply cordate, green and glabrous, nerves 7 to 9, brown, petiole purple, 1½ inch long, flowers nodding, solitary, on *scapes* 3 inches long, *lower bracts* elongate, sheathing, upper below the flower, shorter, with an acuminate tip about ½ inch long, *sepals* and *petals* spreading, similar,

linear acuminate, greenish brown, about one inch long, *lip* ¾ inch long, 3-lobed, side lobes yellow, oblong rounded, embracing the column, *midlobe* ⅓ inch long, ovate oblong, subobtuse, or mucronate, crenulate, pink, with a central linear white *callus*, *ovary* pink, *column* green, curved club shaped, *anther* shallow, *pollinia* 4, cohering in pairs.

Flowers appear at the beginning of the rains in June to be followed by the leaves in July.

Dr. Cooke says that the flowers are numerous in each raceme of this species. I have never found more than a solitary flower, although I have cultivated many plants for years. As regards the description in every other respect, this agrees exactly with that given by Sir J. D. Hooker and T. Cooke, so that I am probably correct in looking upon it simply as a western form of *P. carinata*.

Distribution.—Bengal and Western Peninsula, common in pastures on the Ghats.

Note.—I have an incomplete description of yet a third species from the Belgaum Ghats. Although I had the plant in cultivation for some years I either missed seeing the flowers or they may have never appeared. The following is all the information I have on it at present:—

Leaf orbicular cordate, *sinus* open, *blade* up to 5 inches in diameter, green, clothed with very short, stiff white hairs above, quite smooth and grey punctate beneath, *veins* about 18 in number, raised and slightly channelled on the lower surface, impressed on the upper. *Leaves* appear towards the end of June.

26. *Spiranthes.*

Terrestrial herb, with tuberous fibrous *roots*. *Leaves* clustered near the base of the stem, shortly sheathing. *Flowers* small, on a twisted, erect, secund, glandular pubescent *spike*, *petals* more or less connate with the *dorsal sepal* into a hood, *lip* 3-lobed, not spurred, *column* short, cylindrical, *anther* erect, 2-celled, *pollinia* 4, united in pairs, sessile on a small *gland*.

1. SPIRANTHES AUSTRALIS, *Lindl.*; *Fl., Br. Ind., VI., p. 102*; *T. Cooke, Fl. of Bombay, II, p. 707*; *Dalz. and Gibs., p. 270.*

Whole plant 6 to 18 inches high. *Leaves* 4 to 5, 1 to 5 inches long, very variable, linear or linear-lanceolate, acute or acuminate, sometimes oblanceolate, shortly sheathing. *Spikes* slender, 3 to 6 inches long, *bracts* ovate acute, exceeding the sessile *ovary*, flowers $\frac{1}{10}$ to $\frac{1}{5}$ inch long, white, *sepals* ovate oblong acute, *petals* slightly

shorter, linear obtuse, more or less connate with the dorsal sepal into a hood, *lip* oblong, crisped, base saccate, 2-glandular, tip dilated, retuse or apiculate, *disk* hairy, *pollinia* cohering, clavate.

Flowers appear in the cold weather.

Distribution.—Said by T. Cooke to be very rare in the Bombay Presidency. It has been recorded from the Konkan, Ghats of the Southern Mahratta Country and North Kanara by Stocks, Dalzell and Gibson. It has been found on the higher elevations of the Nilgiri Hills, and is common along the Himalayas. It also occurs in Ceylon, Central and Northern Asia, China, Java, Australia and New Zealand.

27. *Zeuxine.*

Terrestrial herbs, *stems* creeping below, fleshy. *Leaves* membranous, scattered. *Flowers* small, spicate, *sepals* subequal, *dorsal* concave, forming a hood with the *petals*, *lateral* free, *petals* like the dorsal sepal, *lip* adnate to the base of the column, boat-shaped or saccate, *terminal lobe* shortly clawed or sessile, entire, 2-lobed or 2-winged, *sac* with 2 *calli* or *spurs* near the base within *column* which is very short, 2-keeled or winged in front, *stigmas* 2, lateral, distant, *anther* membranous, its cells contiguous, *pollinia* pear-shaped, attached by an oblong *gland* to the erect *rostellum*.

Leaves linear, sessile, *lip* hammer headed... 1. Z. sulcata.

Leaves ovate petiolate, *lip* with a deep 2-lobed obovate, wedge-shaped *midlobe* ... 2. Z. longilabris.

1. ZEUXINE SULCATA, *Lindl.; Fl. Br. Ind., VI, p. 106; T. Cooke, Fl. of Bombay, II, p. 708.*

Plant 2 to 12 inches high. *Leaves* 1 to 2 inches long, linear acuminate, erect, sessile on the sheaths, gradually passing into the linear bracts upwards. *Racemes* ½ to 2 inches long, densely flowered, *sepals* unequal, white, *dorsal* ⅓ inch long, concave, ovate obtuse, *lateral* smaller, obliquely ovate-oblong subobtuse, *petals* white, slightly shorter than the dorsal sepal, falcately oblong obtuse, forming a hood over the column with the dorsal sepal, *lip* yellow, equalling the sepals, boat-shaped, contracted into a short pubescent claw bearing a hammer-headed *terminal lobe*, *column* short, with 2 wings at its apex covering the *anther*, *pollinia* clavate sessile on an oblong gland.

Flowers during the cold season.

Distribution.—The commonest ground orchid in India, more especially in damp localities, found throughout the whole country and extending into Ceylon, Java, China, Japan and Philippines.

2. ZEUXINE LONGILABRIS, *Benth.; Fl. Br. Ind., VI, p. 107*; *T. Cooke, Fl. of Bombay, II, p. 709*: Monochilus longilabre, *Lindl.: Dalz. and Gibs., p. 271.*

Plant slender, about 6 to 10 inches high. *Leaves* few, distant, 1 to 1½ inch long, shortly stalked, ovate or ovate-oblong, acute, base rounded. *Scape* 4 to 10 inches long, slender, pubescent, with 2 or 3 distant lanceolate *sheaths*, *flowers* few, on a glandular pubescent *rachis*, *bracts* about equalling the pubescent *ovary*, *sepals* ¼ inch long, pubescent, green, oblong obtuse, *petals* white, ½ inch long, *lip* ½ inch long, with a *claw* which is saccate at the base, *sac* with 2 *spurs* within, *terminal lobe* obovate cuneate, deeply 2-lobed, lobes toothed on the outer margin, *anther* beaked, *pollinia* pear-shaped, adnate for about two-thirds of their length to the linear appendage of the small *gland*.

Distribution.—Seems to be rare in the Bombay Presidency. It has been recorded from the Konkan by Law and Stocks. It occurs in Bengal, Assam, Western Peninsula and Ceylon.

28. *Cheirostylis.*

Terrestrial herb, whole plant translucent when dry, lower part of *stems* succulent. *Leaves* membranous. *Flowers* few, small, subcorymbose, *sepals* connate into a gibbous tube in their lower half, *petals* narrow, shorter than the sepals. *Lip* inserted at the base of the column, the *sac* with enclosed *calli*, *limb* shortly clawed, broadly dilated, entire, toothed or crenate; *column* short, with two long fleshy appendages in front, *rostellum* 2-cleft, *stigmas* 2, lateral, *anther* erect, its *cells* short, *pollinia* 2, bipartite, *caudicle* short, *gland* oblong.

1. CHEIROSTYLIS FLABELLATA, *Wight.; Fl. Br. Ind., VI, p. 105 T. Cooke, Fl. of Bombay, II, p. 709*; *Dalz. and Gibs., p. 271.*

Plant 4 to 10 inches high, *stem* sometimes moniliform below. *Leaves* very thin, about 1 inch long, ovate acute, 3-nerved and reticulately veined, *base* rounded or subcordate, *sheaths* loose, of a glossy texture, *petioles* about ½ inch long. *Scape* 6 to 8 inches long, glandular pubescent, *bracts* ⅛ to ¼ inch long. *Flowers* 2 to 10,

white; glandular pubescent, *sepals* ½ inch long, united half way into a ventricose tube, the *lobes* ovate oblong, *petals* with exserted tips, falcately linear oblong, *lip* ¼ inch long, with a short saccate *claw* which has two enclosed *calli*, *base* hairy, *limb* broad, spreading, sub-orbicularly 2-lobed, *lobes* sub-5-fid, *column* very short, appendages and arms of the *rostellum* subspathulate, *anther* with a dilated membranous tip, *pollinia* 2, pear-shaped, subsessile on the elongate lanceolate *gland*.

Flowers appear from March to May.

Distribution.—Belgaum and North Kanara Ghats, Western Peninsula, Ceylon, Eastern Himalaya, Burma.

(To be continued.)



1.



2.



3.



4.



9.



5.



6.



7.



8.

J. G. del.

J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall).

1–6. Tropidonotus stolatus, *harmless, nat. size.*
7–9. Psammophis condanarus, *poisonous, nat. size.*

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

Illustrated by Coloured Plates and Diagrams.

BY

Major F. Wall, I.M.S., C.M.Z.S.

Part XIV with Plate XIV (Diagrams I and II and Map).

(Continued from page 79 of this Volume.)

The genus *Tropidonotus* is one of 242 into which the family *Colubridæ* is divided, and belongs to that "series" which is characterised by the absence of any grooved, or tubular teeth, *viz.*, *Aglypha.*

It is one of the most widely distributed of all the ophidian genera, representatives occurring in all five Continents.

It is divided into four sub-genera, *viz.*, *Tropidonotus*, *Nerodia*, *Amphiesma*, and *Macropophis* on differences affecting dentition, but these names are not in common use. As the differences are quite as important as those claimed to differentiate many other closely allied genera, such as *Macropisthodon*, *Helicops*, *Pseudoxenodon*, etc., it is difficult to see why the major rank of genus has not been conceded by Mr. Boulenger who includes them all in a single cumbersome genus, *i.e.*, *Tropidonotus*. Of the 80 odd species included under this generic title no less than 20 inhabit various parts of our Indian Empire.

TROPIDONOTUS (AMPHIESMA) STOLATUS.

The buff-striped keelback.—The species was referred to first by Carl Linnè in 1766 under the name *Coluber stolatus*. Russell figured it three times in his Volumes on the Indian Snakes published in 1796 (Plate X), and 1801 (Plates XV B and XIX).

Nomenclature (a) Scientific.—The generic name from the Greek τροπις a keel, and νοτος the back was introduced by Kuhl in 1822 in reference to the ridges on the scales of a snake whose precise

identity is not known. Boie in 1826 applied the title to our common English grass snake (*natrix*) which is therefore the type of the genus. *Amphiesma* from the Greek meaning "a garment" was initiated by Dumeril and Bibron in 1854, and applied to the snake under discussion, *viz.*, *stolatus* which is therefore the type. It is difficult to realise that anyone who has viewed the skulls of *natrix* and *stolatus* side by side can doubt the justification for dissociating them generically. In the former the maxillary teeth form an uninterrupted series, the last three or four of which progressively increase in size, but are none of them twice as long as the teeth in the middle of the jaw, see figure A. In *stolatus* there is a gap at the back of the jaw, succeeded by two subequal enlarged teeth fully twice as long as those at midmaxilla, see figure B, in fact the very condition which led Mr. Boulenger to separate three species previously included in *Tropidonotus*, under a new genus which he called *Macropisthodon*. See figure C. The specific name from the Latin meaning "dressed," and implying "decked" originated with Linnè in 1766. There is little doubt that the snake ought to be known scientifically as *Amphiesma stolatus*.

(*b*) *English.*—The "buff-striped keelback," is, I think, the most descriptive name for it, or for brevity "buff stripes."

(*c*) *Vernacular.*—Russell mentions "wanna pam," "wanapa pam," and "wanna cogli," as names by which it is known in South India. These are Telugu names derived from "vana" rain. The first two mean simply "rain snake," the second being the adjectival form of the first. Mr. Millard tells me that about Bombay it is called "wana kukroo" and "nanati." I heard it called "therlian" by the Malabaris about Cannanore. Colonel Dawson tells me it is called "churrutay" in Travancore, a word derived from "churul" a "coil," but the same name is applied to *Lycodon*, *Simotes* and other snakes. In Ceylon* Ferguson says it is called "ahara-kukka" and Mr. E. E. Green confirms this and tells me the words are Singhalese, the latter meaning "dog," and the former "food," but the name thus

* Rept. Fauna, Ceylon, page 20.

interpreted is enigmatical*. In Bengal Theobald† says it is known as "halhalliah," and Mr. D'Abreu whilst confirming this by telling me that this is the name applied to it in Murshidabad, remarks that in Behar it is called hur-hur-ra a local word meaning with a rustle hur-hurra in Bengali means "restless" and is the name by which it is known throughout that Province.

In Burma it is called "mywe shaw" meaning "crawling snake" and "myit shaw" "grass crawler."

General characters.—It is a graceful little reptile with the body rather short, and the tail rather long, *viz.*, about one-fourth the total length of the snake. Anteriorly the body attenuates somewhat to the head, so that the neck is fairly evident, and posteriorly reduces perceptibly in girth to the vent, where in females specially a further reduction marks the commencement of the tail. Dorsally the body and tail are rough with the keeling of the scales, which last are lustreless. The head is rather depressed, evenly rounded from the crown to the side of the face, specially over the muzzle, and has the snout moderately narrowed. The eye is large with a round pupil, and an iris flecked with gold especially at the pupillary margin. The nostril is open, and occupies about two-fifths of the depth of the suture between the nasal shields, leaving about one-fifth of the suture uninvolved above, and about two-fifths below. The tongue is a dull orange colour at the base, and has black tips.

Colour and markings.—The ground colour is olivaceous-brown of various depths of intensity, some specimens being dark, others light. A buff stripe beginning in the neck or forebody, at first obscure but becoming well defined, and conspicuous, passes down each side of

* Further enquiry brings to light the following story from old Ceylon records. It appears that the old Ceylon Kings kept a jester about the Court, and on one occasion at a garden party the King came across a snake called Ahan-kukka (Synonymous with the Pali word for the tame snake man-balla), meaning literally "ahan" I am, "kukka" a dog. He called for the jester, and seeking to have some fun at his expense, asked him before his courtiers and assembled guests the name of the snake, but the jester was quickwitted enough to discover the King's intention and replied untruthfully "ahara kukka" meaning "a dog looking for food" since which the snake has been so known.

† Cat., Brit. India, page 177.

the back to the tail tip. These involve one whole and two half rows of scales, and are separated from one another by five whole and two half rows. The ground colour is further ornamented with black, or blackish somewhat irregular crossbars which are always most obvious anteriorly, and often wholly disappear before the vent. The head is olivaceous-brown fading laterally to pearly-whitish, yellow or orange on the lips. There is I think always a blackish vertical short loreal streak, and generally some of the last supralabials are margined posteriorly with black. The chin is whitish, and the throat pearly-white, pale or bright yellow, or orange, these vivid hues being seen alike in some specimens of both the blue and red varieties. The belly is pearly-whitish with generally some roundish, scattered small, lateral black spots, chiefly anteriorly. Often an ill-defined pinkish or lilac suffusion is to be seen at the edge of the ventral shields. When desquamation is impending much of the beautiful colouring may be obscured but when once the little snake has divested itself of its old and seedy looking raiment, it is just the little dandy that its specific name implies.

Varieties.—Two distinct colour varieties are to be met with, one which may be styled the *forma typica*, and the other for which I propose the name *erythrostictus*.

Variety (A). *Forma typica.*—In this the overlapped margins of the scales, especially towards their bases are adorned with blue-grey or pale-blue often of a shade almost identical with that very beautiful flower *Plumbago capensis*. This ornamentation is concealed by the imbrication of the scales when the snake is quiescent, and only comes into view when the snake under alarm or excitement inflates itself. It is much more conspicuous, or may be wholly confined to the anterior half or third of the body. This is the common type which is universally to be met with throughout the area of its distribution in Plains and Hills alike.

Variety (B). *Erythrostictus.*—In this the far more beautiful variety, bright vermilion, replaces the blue adornment of *forma typica*. The vermilion however is usually if not always more extensively distributed than the blue of the last variety, so that it is usually more or less evident even in the quiescent state of the

snake. Specimens so ornamented frequently have a speckling of the same hue on the belly, and in many though not in all the throat is yellow or orange.

This variety is very local being as far as I am aware confined to the coasts of India, and even here is far less common than *forma typica* with which it is associated. I met with it most commonly on the West Coast in Cannanore where one-third of my specimens (16 in 47) were of this variety and have had specimens sent to me by Colonel Dawson from Travancore. Mr. Millard tells me he has never seen it about Bombay, but for all this I feel sure it must occur, for Murray mentions it in Sind presumably on the coast though he does not say so. I have seen three specimens from Madras sent by Mr. Dwane to our Society from one of which our coloured figure is taken. Dr. Günther* says Mr. Walter Elliot has figured such a specimen from Madras. I also met with it not infrequently in Rangoon. Nicholson † remarks that the varieties of this snake found in Malabar and Burma show the finest display of interstitial colours, by which I think he alludes to the vermilion variety for this is the one he figures. Theobald ‡ also remarks on the vermilion seen in specimens from Burma, and both he and Murray say that this brilliant suffusion is a seasonal manifestation. Whether these observations were made independently or Theobald simply reiterated Murray's words I cannot say, but I am fully convinced that neither the vermilion ornamentation, nor the brilliant yellow and orange gorgets seen in some specimens are seasonal. Dr. Günther's remarks on Mr. Walter Elliot's painting of a ♂ specimen with a yellow throat and vermilion adornment seem to imply that these highly decorative hues are acquired in the breeding season, but this is not the case, nor are they the prerogative of either sex, nor the insignia of maturity.

In Fyzabad I had two ♂ hatchlings on successive days, *viz.*, 25th and 26th October, one of which had a white throat, whilst the other had a bright yellow suffusion extending to the lips. On the 7th of November in the same year (1905) I had a ♀ adolescent $9\frac{5}{8}$ inches

* Rept. Brit. Ind., p. 267.

† Ind. Snakes, Plate xv, fig. 1. ‡ Cat. Brit. Burma. p. 47.

long with a bright canary gorget. Specimens with and without this adornment are to be met with of all ages and throughout the whole year, and I had vermilion specimens in Cannanore in the months of November and December.

I cannot say whether vermilion ♂ ♂ mate with vermilion ♀ ♀, or whether the two varieties interbreed. It is very remarkable if as appears to be the case these vermilion specimens are confined to our coasts. I have noted in my article on *T. piscator* in this series that similarly ornamented specimens I had only known from the coast, and I may here mention that in Cannanore I once got a specimen of the Common Indian Toad (*Bufo melanostictus*) with flaming red blotches instead of the usual black spots. I did not recognise the species, but sent the specimen to the British Museum where Mr. Boulenger identified it.

Identification.—In the matter of identification it is as well to remark that the buff-striped keelback is one of the very commonest if not actually the commonest snake to be met with in the Plains of India, Burmah and Ceylon. It is almost certain to be one of the first dozen snakes the novice beginning to collect these reptiles will encounter and it is more than probable it will be included in the first half dozen. The two dorsal buff stripes are almost characteristic of the species and they are always well defined, and conspicuous. Longitudinal striping it may be remarked is unusual among our Indian Snakes and when it occurs, it is usually a dark stripe that occurs in the position occupied by the buff stripes in this species. Among exception with which *stolatus* might be confused must be mentioned *parallelus*, and *modestus*, of the same genus, and *Psammophis condanarus*. In *parallelus* and *modestus* the light stripes are ill-defined, and far less conspicuous and both species are found only in Hills, the former in the Eastern Himalayas, Assam and Burmah Hills, and the latter in the Assam Hills. In *parallelus* the ventrals are more numerous, and in *modestus* the subcaudals more numerous than in *stolatus*. The rows of scales would at once distinguish *Psammophis*, being 17 anteriorly and 13 behind.

As colour, and markings are at least uncertain guides in diagnosis, one should rely on scale characters and the following combination taken in the order herein placed will prove the readiest means I can

suggest:—(1) Scales 19 in midbody, and 17 at a point two heads-lengths before the anus. (2) Nasals not touching the 2nd supralabial; (3) Rostral touching 6 shields and (4) a single anterior temporal.

Dimensions.—I have about 200 recorded measurements in my note-books and find that the length differs considerably in the sexes. Of ♂ ♂ I have only had 8 specimens of 1 foot 9 inches and over, of which only 4 reached 1 foot 10 inches the largest being 1 foot 10½ inches. On the other hand I have had 13 ♀ ♀ exceeding 2 feet in length. Two taped 2 feet 4 inches in Dibrugarh, and another 2 feet 5 inches in Fyzabad. Another specimen from Dibrugarh I judge to have been still larger, for the body was 1 foot 11½ inches, out of a total length of 2 feet 4 inches. In three ♀ ♀ in which the total lengths were 2 feet and ½ an inch, 2 feet 1½ inches, and 2 feet 1¾ inches, the tails measured 6 and 6¼ inches respectively so that at the lowest computation this specimen would have been if perfect two inches longer, and possibly three, making a length of 2 feet 6 or 7 inches.

Disposition.—This is a remarkably inoffensive little creature. Of all the snakes I know, it ranks among the most gentle, for I have picked it up scores of times in its native haunts, and I have never once been bitten or even struck at. Mr. Millard writes to me:—"It is the most gentle snake that I know. I cannot remember one ever having attempted to bite even when caught in the open." This placid disposition is all the more remarkable when one considers that the other common species of the same genus in the Indian Plains, *viz.*, *piscator* is among the most truculent of snakes. Little "buffstripes" is easily alarmed, and when danger threatens, turns, and glides off as rapidly as possible to any protection the nature of the ground may offer, and it is an adept in the art of concealing itself in the smallest patch of scrub or grass, sometimes vanishing in a most uncanny way. Probably it has found a hole and secreted itself therein, but a careful and systematic search sometimes fails to reveal the mystery of its disappearance. When brought into the open, it exhibits a lively activity making repeated attempts to escape.

When irritated some specimens but by no means all erect themselves, flattening the neck and forebody ventrovertebrally. This

flattening process involves a much greater length of the forebody, than is seen in the cobra and I have seen the whole body flattened to the vent. In the cobra the degree to which it is manifested laterally is far greater than is seen in any of the keelbacks and their allies. During this erection, and flattening of the forebody, *stolatus* distends itself by deep drawn inspirations bringing into view those beautiful ornamentations of blue, or vermilion as the case may be to which I have referred in dealing with its colour and varieties. This behaviour is never anything more than a demonstration of alarm, possibly a menace, the snake looking as if it intended mischief, but though I have irritated it as much as I knew how I never had one attempt to bite me.

Haunts.—Its choice of a home of course depends upon its food, but though this consists of frogs and toads I cannot recall ever having met with one actually in the water in marshland, pond or jheel, moat, canal, or rivers. The reason is obvious for during the season when it is in evidence—the rains—the whole country is wet enough to make frogs abundant everywhere, and even when the land is drying, or dry short of drought many species of frogs that do not congregate in collections of water are in hiding, and toads too. I know full well that in captivity water is essential to its well-being, and I have had specimens that were to be seen at times more or less immersed in their basins. Ferguson* says :—"In captivity it is fond of lying in water" and Mr. E. E. Green in a letter to me writes : "it submerges itself in its bath at rare intervals, and remains there for many hours." Nicholson† remarks that "in dry weather the offer of a drink will at once gain their hearts." Though it is not the swimmer, or hydrophile that *piscator* is, it is frequently to be met with in damp situations, such as drying paddy fields, and the banks of canals, and Mr. Millard remarks that in October near Bombay "it is exceedingly common in the rice fields, where one sees them constantly, probably attracted by the crop of young frogs."

During the rains the buffstriped keelback distributes itself broadcast all over the land, and will be found in grassy, and cultivated

* Bombay Natural History Journal, Vol. X, p. 72.

† Indian Snakes, p. 134.

areas of open country, but does not favour arid plains, nor jungle tracts. It is commonly to be met with in gardens, grass farms, golf-links, and similar situations about cantonments, and further afield in "khets" or any waste ground that has some sparse cover, and might harbour frogs.

It sometimes wanders into out-houses and bungalows, and especially in such of the latter where pot plants are available. In Rangoon once I had as many as four sent to me in one morning by a neighbour who flushed them in his verandah whilst re-arranging his ferns, &c.

The crepuscular gloom beneath the foliage of closely congregated pot plants, and the humidity derived from daily watering furnishes an ideal environment for mosquitoes, and other insects upon which frogs subsist, and there are always some pots with a chip out of their basal rims large enough to act as doorways to cosy quarters—from a batrachian standpoint—beneath. The same environment offers effectual concealment for the little buffstripes, and a plethora of its food supply. One of the four snakes above alluded to had swallowed a single frog, and another was replete with three inside. A specimen sent to our Society by Mr. Dwane from Madras was discovered on the horn of a living buffalo, a very curious situation for any snake.

Habits.—The buffstriped keelback is essentially diurnal in habit. It is met with abroad at any hour of the day, but is not usually encountered at night, though its relative *piscator* is frequently on the move under cover of darkness.

Though agile and active its movements are not really rapid. It always appears to me that its progression is much smoother than that exhibited by many snakes. When not roaming about the country, it often secretes itself in holes in the ground, or takes refuge in the masonry of drains, culverts, wells, out-houses, and such situations. I have sometimes detected one with its head issuing from a hole in the ground, but the slightest movement on my part caused a sudden retraction below the surface, followed after a few minutes by its re-appearance, when if satisfied that the coast was clear it emerged, and glided off.

This snake evinces a very marked disposition to æstivate,

disappearing for some months during the drought of a hot weather, to re-appear with the first heavy rains that announce the inauguration of the monsoon. This fact has evidently been noted by the observant native hence the names "wana kukroo," "wanna pam," and "wanna cogli." Only recently too (February) Mr. Millard tells me he has offered rewards for them in Bombay but the natives say they cannot guarantee getting them except in the rains when they are plentiful.

In Rangoon, Evans and I got no single example in 1900 before the 30th of April—the day the rains broke,—but from the 2nd of May to the 2nd of August no fewer than 21 specimens were brought in. Similarly in Cannanore in 1904, during the drought between the 1st of January and the 18th of March I got only 1 specimen out of a total of 60, but from the 19th March to the 4th June between which dates a few desultory showers fell there were 3 out of 71 snakes collected, and from the 5th June—the day the big monsoon burst—to the end of July out of 81 specimens, no fewer than 38 were *stolatus*. In Fyzabad in 1906 during the drought between the 1st of January and the 18th of June—the day the rains broke—I had received a solitary specimen, but after this I obtained 6 out of 21 specimens in June, and no fewer than 87 in July and August out of a total of 485 snakes of all kinds.

In Northern India it disappears during the cold months of the year, hibernating beneath the soil. In December 1904 several were unearthed by the sepoys of the 62nd Punjabis when out in camp near Rae Bareilly in December. They were found singly at a depth of from 9 to 18 inches below the surface, chiefly in the roots of clumps of giant grass, and when dislodged were dull, and inactive. I have never known it climb into bushes, trees, or habitations, though I have seen it in masonry crevices a yard above the ground, and one was found at Chakdara basking in a chink of rock at about the same elevation.

It is very curious studying my notes that so very few hatchlings and young specimens are brought to me. Why nearly every specimen should be mature or nearly so I cannot suggest an explanation for.

Food.—Its diet is almost entirely batrachian in character, and

whilst some show a decided partiality towards frogs, others find toads more attractive. In India it is usually the frogs *Rana cyanophlyctis*, or the young of *R. tigrina* that form its principle sustenance, these being perhaps the commonest frogs to be met with. For the same reason young toads of the species *Bufo melanostictus* are most frequently devoured. I have known *R. breviceps*, and *Microhyla ornata* taken in Fyzabad, and *Oxyglossus laevis*, and a species of *Rhacophorus* probably *leucomystax* in Burma. On several occasions I have found toads ingested, once a young *Bufo andersoni* in Fyzabad having proved the victim. I once found a gecko in a young specimen in Assam, but have never heard of a lizard being taken except on this occasion, and never a mammal. Usually a single frog, or toad satisfies its appetite, but I have more than once found as many as three in the stomach.

Colonel G. H. Evans, whose attention was once arrested by pitiful wails, found on investigation a frog in the jaws of a *stolatus*. It had been seized "a posteriori," and the snake when discovered made tracks without releasing its captive and succeeded in reaching a crevice in the ground some thirty yards away, down which it managed to insinuate itself by some lateral manœuvre head last still retaining hold of the frog. It was dug out, and froggie when released hopped away. Mr. Millard, who has known this species in captivity for over twenty years, tells me that they feed greedily on frogs, in fact he "cannot remember ever having seen it feed on anything else." On the other hand Mr. E. E. Green, who has a very intimate knowledge of the species in Ceylon, tells me that in captivity "it will look at nothing but the toad *Bufo melanostictus*," and he relates how on one occasion two *stolatus* seized the same toad in his vivarium, each proceeding to swallow from opposite points of seizure, till their noses met, when the larger snake began to engulf the smaller, but at this stage of the proceedings he interfered. In the Madras Museum * one buffstriped keelback ate 131 toads in the year, another 130, and a third 91 green frogs. Murray † says that in Sind like *piscator* it lives in pools, and feeds on fish. If this is a fact, its habits in that locality are different from those manifested in other parts of India.

* Administration Report 1896-7. † Vert. Zool. Sind, p. 380.

The Sexes.—It is remarkable that though the sexes are very evenly balanced in many parts of India, in some localities, notably Assam, there is a great disparity in favour of the ♀. Thus out of 37 specimens sexed in Cannanore 20 were ♂ and 17 ♀, and out of 118 sexed in Fyzabad 57 were ♂ and 61 ♀. In Assam—Hills and Plains—females are more than twice as numerous, for out of 89 specimens sexed in Dibrugarh 62 were ♀, and in Shillong in the Khasi Hills no fewer than 16 out of 21 specimens proved to be this sex. In a clutch of 5 eggs brought to me in Dibrugarh there were 4 ♀ ♀ and one ♂. The ♀ is usually at all times longer than the ♂. Starting from the egg it frequently has a slight advantage, it more than maintains this as growth advances, and finally attains proportions considerably in excess of the ♂ as already mentioned under dimensions *q. v.*

The relative proportions of the body and tail are subject to slight variation in individuals of both sexes, but I can discover no disproportion of sexual import.

The scent glands in both sexes furnish a greenish-yellow secretion of the consistency of custard.

The ♂ claspers are beset with numerous horny, claw-like, curved processes, which must function as anchors. The nearly allied species the "grass snake" so common in England *(T. natrix)*, I have more than once encountered "in copula." When disturbed instead of detaching themselves, the larger and more powerful ♀ made for the nearest cover dragging her partner unceremoniously behind.

It seems as if these processes which are recurved so as to oppose any traction efforts serve to maintain attachment during such an emergency. Their development is such, and they are so numerous that they must provide a very firm grip, during a turgid state of the organ, and I can well imagine that if under inordinate strain the parties were pulled asunder the female parts would sustain severe laceration.

Breeding season.—It is a curious fact that though this snake goes into retirement during the hot months in the Plains, this appears to be the season when matrimonial intercourse is for the most part indulged in. This is evidently so in many cases judging from

what we know of the period elapsing between coitus, and the deposition of eggs. The sexes must therefore in many instances retire in pairs, for when the rains burst, and the species reappear, many if not most of the females are already impregnated, and often to an advanced degree.

In Cannanore in 1904 a few showers at intervals of several days fell between the 18th March and 18th May, and frequent showers between the 20th May and 4th June. On the 5th June the monsoon burst, and *stolatus* up to this time a rarity, became abundant. I obtained a gravid ♀ in May, and 4 in June. In Fyzabad in 1906 the rains broke on the 18th June, when *stolatus* up to this date hardly in evidence became numerous. I got one gravid ♀ in June, nineteen in July, and four in August. In Rangoon in 1900 the rains broke on April 30th up to which date I had no specimen of *stolatus*. On the 30th May I got a ♀ with 8 eggs in an advanced stage of development. I have never had the good fortune to meet with a pair in conjunction, and have only had them rarely reported so. In Cannanore a pair was reported "in copula" on the 24th May, and two pairs similarly reported on the 18th June.

In Burma Theobald * reported an egg-bound ♀—precise locality not specified—in May, and Nicholson† a similar specimen in Rangoon in the same month. Evans and I had gravid ♀ ♀ in Rangoon twice in May, twice in June, twice in July, and once in October.

In Cannanore I had one egg-bound ♀ in May, four in June and four in July.

In Fyzabad I had one gravid ♀ in June, nineteen in July, and seven in August.

Nicholson† reported an egg-bound ♀ in Bangalore in August.

In Dibrugarh I had twelve gravid in April, thirteen in May, two in June, and one in July. In Shillong three specimens in an advanced stage of impregnation were brought to me in August.

A specimen from Hakgalla, Ceylon (4,600 feet) was egg-bound in September.

Period of gestation.—This is not exactly known, but it is probable that it will prove to be of the same duration as in the che-

* Cat. Rept. Brit. Burma, page 47. † Ind. Snakes, page 127.

quered keelback *piscator*, *viz.*, about two months. A specimen of mine in Cannanore captured on the 21st June laid five eggs on the 29th July. As the specimen was obviously gravid when caught gestation must considerably exceed five weeks. A specimen in captivity in the Madras Museum whose date of capture was unfortunately not recorded, laid the first of fourteen eggs on the 17th August. As it was noted that the specimen sloughed on the 28th June, at least seven weeks elapsed before the discharge of this egg. The ♀ at full term retires to any convenient refuge in the ground, and there deposits her eggs some few inches below the surface. Unlike some other snakes she does not appear to be attended by her consort at or subsequent to this eventful period. I have only once known a ♂ in company with a ♀ after impregnation. This was in Fyzabad in July. The two snakes were described as confronting one another with reared bodies, and they remained actively engaged in this manner for some minutes. Both were killed, and I sexed them, and found the ♀ in an advanced state of impregnation. It is impossible to know whether this was a chance encounter which seems probable or whether their behaviour was of an amorous, or hostile character.

Oviposition.—In Rangoon I had a specimen that laid eggs in August. In Cannanore a ♀ deposited her eggs on the 29th July, and another laid eggs in August. In Fyzabad a ♀ deposited eggs in August. The Madras specimen already referred to oviposited in August and September.

I have frequently had eggs in clutches brought to me unearthed after deposition under natural conditions. In Rangoon once in June, in Dibrugarh several in May (once as early as the 1st) and June, and in Shillong once in August.

The full complement of eggs is discharged normally within a few hours, but some specimens in captivity have discharged them fitfully at intervals. A specimen I captured in Fyzabad on the 7th July laid one egg that night, and discharged ten more on the night of the 12th of the same month. A specimen in the Madras Museum* laid fourteen eggs as follows:—August—one on the 19th, one on the 20th, two on the 22nd; September—three on the 12th,

*Admin. Report, Madras Museum, 1896 to 1897.

three on the 14th, one on the 15th, and three on the 18th—occupying a full month in the accomplishment of this function.

Snakes are credited with the power to retain their ova, or fœtus when circumstances are unfavorable for their deposition, but of course they cannot do so indefinitely. An unsuitable environment such as is likely to occur under captivity may explain the spasmodic discharge of the eggs in the above instances, but even in the vivarium the ♀ usually deposits her full complement within a few hours.

Eggs.—Inside the parent the ova lie in a single string like the beads of a necklace, their long axes disposed in the length of the body. They do not overlap one another nor lie transversely as is the case with their more prolific relative *piscator*. In their later stages owing to pressure within a contracted space, their poles are strongly flattened against one another, but no suggestion of this flattening is seen after they are discharged.

Immediately after expulsion the egg investment is moist and sticky so that many or all the eggs become firmly adherent to one another to form a cluster. They are pure white in colour, and the ovicular investment pliant like white kid. They are soft to the touch and their tension rather firmer than that of a grape. The poles are equally domed, and the eggs measure from $\frac{7}{8}$ to $1\frac{3}{8}$ inches in length, and $\frac{5}{8}$ to $\frac{3}{4}$ of an inch in breadth. Eggs in the same clutch always vary somewhat in their dimensions, but what one lacks in length is usually compensated for in girth. They sink in water.

When freshly oviposited they contain a custard-like material in which no trace of the developing embryo can be discerned.

It is extremely difficult to place eggs artificially under conditions favorable to their incubation. One of two things usually happens, either they shrivel up or become mouldy within a few hours, according as to whether their environment is too dry, or too wet. It is certain that they require a humid atmosphere, and I believe a light approaching twilight if not darker. After many unsuccessful attempts at incubation I find the best way to treat them is to put them on fresh earth every day under an inverted flower pot. I turn up earth in the morning to a depth depending on the humidity of the soil, and select that which is slightly damp, and

put this to a depth of three or four inches in a gumlah and the eggs on the top. The inverted pot gives them the darkness I think essential, and then the gumlah is placed in a shady place. The following morning the earth will be found already too dry, and if not changed the eggs shrivel very rapidly.

Prolificity.—*Stolatus* is not very prolific as snakes go. I have over 70 records of eggbound ♀ ♀, and clutches of eggs that have been laid, and find that it may lay from 1 to 14 eggs, but from 5 to 10 is the usual number.

Incubation.—The parent having laid her eggs remains with them for some time, perhaps even till they hatch. During hoeing operations on the tea estates around Dibrugarh, on several occasions a ♀ was unearthed, and brought to me with her eggs. Frequently eggs were brought without the ♀, but with the report that a snake had been seen with them. On one occasion eggs brought with the attendant parent were found to contain embryos 2¼ to 3 inches long. As there is no trace of an embryo when the eggs are first deposited, this implies that for at least more than half the full period of incubation this ♀ was in attendance.

It seems certain that the parent is not unremitting in her attentions, for on several occasions when eggs were unearthed the cooly upon interrogation denied that there was any snake with them.

Period of incubation.—This almost certainly depends upon temperature, and should therefore be more protracted in the Hills than in the Plains.

In Rangoon a ♀ laid 9 eggs on the 11th of August which hatched a month later, *viz.*, one on the 10th and six on the 11th of September. The remaining eggs were non-fertile. I feel certain from other observations, and the conditions under which these eggs were placed that the incubating period was artificially abbreviated. They were laid on damp cotton wool inside a wide mouthed stoppered bottle, and placed within a couple of yards or so of an earthenware basin containing live embers. These fire receptacles are in ordinary use in Burma in the rains, and are placed beneath a wicker cage on which one's clothes are placed to dry. Though the bottle was stood outside the cage, it must have derived considerable heat from the contained embers.

In Dibrugarh where the climate and temperature is much the same as Burma, I had eggs brought to me on the 21st May containing embryos $4\frac{3}{8}$ inches in length, but they did not hatch out till the 10th of June when they measured 6 and $6\frac{3}{8}$ inches, respectively. In this case the embryos grew about two inches in 21 days, or about one-third the length they attain to within the egg. Allowing a similar rate of growth for the whole of intraoval life the embryos would have been about 40 days acquiring a length of $4\frac{3}{8}$ inches, and the whole period would therefore exceed 60 days. Again in Shillong on the 8th of August I had eggs brought to me which contained embryos. 25 days later, *viz.*, on the 2nd of September, I extracted an embryo measuring $3\frac{1}{4}$ inches, or about half the length of a hatchling. If we allow 10 days for development sufficient to recognise the embryos as such, which is not excessive, we have about two months elapsing from the deposition of the egg to the full growth of the embryo in this case also.

Hatching.—The embryos liberate themselves from the egg by means of an osseous structure which is specially developed for this purpose, and is very soon—a day or two—shed after its function has been fulfilled. This is called the fœtal tooth or egg tooth, and is developed in the premaxillary bone. Unlike the ordinary teeth which are already developed at this stage of life it is flattened, and its cutting edge lies horizontally, projecting forward beneath the arch in the front of the mouth which is formed to admit of the protrusion of the tongue when the jaws are closed.

With this instrument the embryo makes one, or many incisions which penetrate the egg shell, but even when it has established an adequate means of exit, the little snake seems loathe to abandon its cradle, for it sometimes wholly withdraws itself within the shell after having almost vacated it, and often after lying with its head and forebody emerging, many hours elapse before it finally disengages itself, and effects its entry into the world.

In Rangoon I had one lot of embryos hatching out on the 1st and 3rd of August, another on the 10th and 11th of September, and on a third occasion on the 22nd of October (not November as previously reported in this Journal, Vol. XIII, p. 351). In Dibrugarh I had embryos hatching on the 10th of June, and others on

the 5th and 6th July. In Cannanore I had a hatchling $6\frac{1}{4}$ inches long on the 21st November, one in Dehra Dun $5\frac{7}{8}$ inches long on the 8th of October, one in Bangalore $7\frac{1}{2}$ inches on the 29th of September, two in Fyzabad measuring $5\frac{3}{4}$ and $6\frac{1}{4}$ inches in October and two measuring $5\frac{7}{8}$ and $7\frac{1}{4}$ inches in November.

At the time of hatching the ♂ has the genitals ensheathed, and concealed from view, but I have had an embryo of $6\frac{1}{2}$ inches length in which they were extruded, showing that it is only at a very late stage of embryonic development that their invagination occurs.

When the hatchling first leaves the egg it may, or may not have part of the yolk sac adhering to the navel. This orifice, or the recently obliterated remains of it, is very apparent in the hatchling, and remains so for some months, but eventually becomes completely effaced. At exovation from 14 to 18 ventral shields intervene between it, and the anal shield, and the scar itself involves two or even three ventrals.

Growth.—When the hatchling vacates the egg it is from $5\frac{1}{4}$ to 7 inches in length, and there is little difference in the length of the sexes for in one brood two ♂ ♂ were 6, and $6\frac{1}{8}$, and two ♀ ♀ $6\frac{3}{4}$, and 7 inches respectively. In another brood one ♂ was $5\frac{7}{32}$, and four ♀ ♀ $5\frac{5}{16}$, $5\frac{3}{8}$, $5\frac{1}{2}$, and $5\frac{14}{16}$ inches, respectively. In a third case a ♂ was $6\frac{1}{4}$, and a ♀ of the same clutch $6\frac{1}{8}$ inches. It is curious this being the case that all through my notes the average measurements of the ♀ in each month appreciably exceed those of the ♂, and this becomes increasingly apparent till by the end of the 2nd year there is a disparity of two inches or more in favour of the ♀. As far as can judge the young add from 5 to 8 inches to their length in each of the first and second years, which means that they approximately double their length in the first year and have trebled it by the end of the second, by which time they have attained maturity, and any further increase in length is small and slow. The smallest gravid ♀ I have had was 1 foot $5\frac{1}{2}$ inches, but many have been from 1 foot 6 inches to 1 foot 7 inches, all lengths attained at the end of the second year. It is evident therefore from my numerous records that the majority of individuals mate at this early age. It is interesting to note from the measurements of hatchlings given above, all of which were from Dibrugarh, how close the

measurements of individuals in the same brood run, whilst there is an appreciable difference in the average length of members of different broods.

Sloughing,—We know very little about this function, and although many snakes are kept in captivity in various institutions in India very little attention is paid to this curious habit, and seemingly no records kept. Similarly in Regent's Park, London, I failed to get any information.

A specimen I had in Rangoon sloughed on the 27th June, and again on the 24th July. Another cast its skin on the 7th and 25th of May, and again on the 23rd June in Rangoon. Some excellent records were kept some years ago in the Madras Museum,* from which I find that one specimen desquamated on the 29th June, 21st October, 22nd December 1896, and 25th January 1897. Another exfoliated on the 28th June, 6th July, 27th July, 3rd September, 14th December 1896, and on the 18th January, and 27th February 1897. This was the same specimen that laid 14 eggs, between the 17th August and 18th September. In another specimen ecdysis occurred on 17th March, 17th September, 26th December 1896, and 20th March 1897. It is very difficult to explain why in one instance four months elapsed, and in another six months, during the same period of the year in which a third specimen desquamated from every 3 to 5 weeks. All the specimens, judging from the consumption of frogs which I have quoted under food, appeared to have been in vigorous health, all the records were made in the same year, and we may assume that all the specimens were caged under similar conditions. It seems unlikely too that when special attention was being given to this function any of the occasions should have been overlooked.

Foes.—Doubtless so harmless, and diminutive a reptile frequently provides food for predaceous animals and birds. Evans and I once knew it fall a victim to the snake *Xenopeltis unicolor*, and I found one inside a banded krait (*Bungarus fasciatus*) in Dibrugarh. Mr. Primrose† in our journal has recorded one being swallowed by the green tree snake (*Dryophis mycterizans*).

Parasites.—The buff striped keelback harbours many Entozoa.

* Administration Report 1896. † Vol. XV., p. 347.

One of these is a maggot-like creature which I have figured in a recent issue of this Journal* and is called *Porocephalus crotali*. It is whitish in colour, about ¾ of an inch long, and attaches itself to the tissues about the entrails of the snake, but is not found in the intestine, or solid organs. Several are to be found in the same snake, but always solitary. The head, which is its thickest part, is furnished on its lower aspect with four curved claw-like hooks, yellowish in colour, and placed around the mouth. By these it attaches itself to the mesenteric folds. The body which gradually reduces in girth posteriorly, consists of several subequal segments. It no doubt sucks the blood of its host.

Another parasite, and one which must seriously affect the health of its host is a nematode worm called *Kalicephalus willeyi* after Dr. Willey, the Director of the Colombo Museum (*see* Plate figures G. H. I.) This I have only found in the stomach, attaching itself to the inner coats of that organ, but Von Linstow says it also inhabits the intestine of many snakes. It is of a gregarious habit, and the several members of a single colony vary very much in length, the longest being as much as 5 inches. It is about as thick throughout as the catgut on a tennis racquet, reddish-brown in colour, with a greyish-white caudal extremity. The head as shown by Von Linstow is compressed, and is furrowed dorsally, and ventrally. The mouth is large, and has six papillæ, three on each side situated around its margin. The body appears to be depressed, and its surface smooth. Often more than one cluster of these worms is found to have invaded the stomach. This organ as a result of these parasites becomes knuckled and distorted, and its walls very much thickened, cartilaginous, and rigid, so that it would appear doubtful if it could distend sufficiently to accommodate the relatively enormous bulk that is so often swallowed at a meal.

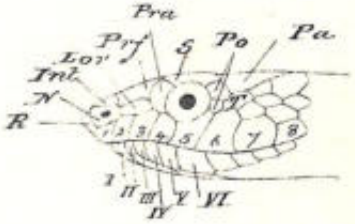
This worm appears to infest many snakes, for it has been reported from the stomach and gullet of Russell's viper (*Vipera russelli*, from the intestine of *Coluber helena* and from *Typhlops braminus*) by Von Linstow,† and I have found it in the stomachs

* Vol. XIX, p. 837.

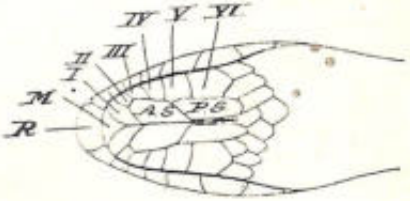
† Spol. Zeylan. Vol. I, p. 99, and Vol. III, p. 163.



A

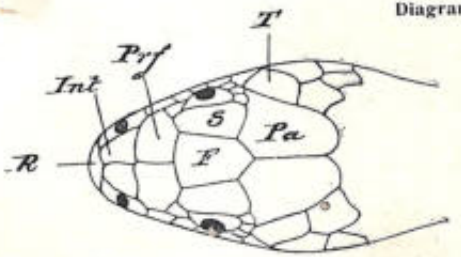


B

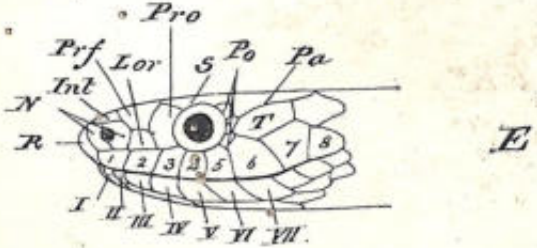


C

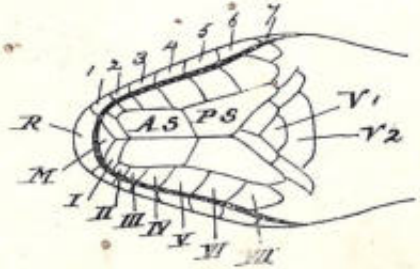
Psammophis condanarus.
(Nat. size.)



D



E



F

Tropidonotus stolatus.
(× 2)

COMMON INDIAN SNAKES. (WALL.)

A. B. C. Head Shields of *Psammophis condanarus*. **D. E. F.** Head Shields of *Tropidonotus stolatus*.

A. S. Anterior Sublinguals. *F.* Frontal. *Int.* Internasal. *Lor.* Loreal. *M* Mental. *N.* Nasals. *Pa.* Parietal. *Po.* Postoculars. *Pro.* Præoculars. *Prf.* Præfrontals. *P. S.* Posterior Sublinguals. *R.* Rostral. *S.* Supraocular. *T.* Temporal. *1* to *8.* Supralabials. *I.* to *VII.* Infralabials. *V 1* & *V 2* 1st and 2nd Ventrals.

of the banded krait (*Bungarus fasciatus*), and *Tropidonotus piscator* as well as in *T. stolatus*. Von Linstow further states that it occurs in snakes inhabiting South America. A third parasite infesting *stolatus* is a larval form of tapeworm, which though sent to Professor Von Linstow he could not further determine than that it was a species of *Pterocereus*. These parasites are white, and flattened, and locate themselves usually beneath the lining membrane of the abdominal cavity, but sometimes beneath the dorsal integument, where they form flat blister-like swellings. When these are cut into, the parasite is found in a convoluted mass which, when unravelled may measure up to 10 inches in length. They do not seem to invade any hollow or solid organ. They exist in large numbers in some specimens even to the extent of making the host appear gravid. I have found this worm also around the intestine in *Bungarus fasciatus*, beneath the peritoneum of *Tropidonotus piscator*, and beneath the skin of *Coluber radiatus* as well as in *T. stolatus*.

Local Distribution.—This species is a resident in the Plains, but wanders to an altitude in the Hills which varies with the locality. Its relative abundance in various districts in the Plains, and the altitude to which it wanders is interesting. In the low country in Ceylon Dr. Willey* reports it the commonest snake to be met with. Mr. E. E. Green tells me that in Kandy (1,700 feet) it is quite common, and Mr. Pearless† says that at Badulla (2,500 feet) it is very common, but at Hakgalla (5,600 feet) I only got one specimen out of 80 collected.

In Cannanore out of 377 snakes collected, 2 in every 13 were of this species, but at Paralai in the Anamallays (3,500 to 4,000 feet) I got no specimen out of 91 sent me in 1909. I am told, however, by the Revd. E. M. Gombert, S. J., that it is common in the Palney Hills (Shembaganur) between 5,000 to 6,000 feet.

In Fyzabad out of 704 snakes, 2 in every 9 were *stolatus*, but in the Western Himalayas at Almora (5,300 feet) I got only 2 in 38 snakes of all kinds in 1909. In the Bengal Plains it is evidently very common, for I got 7 specimens out of 25 sent me from the Jalpaiguri District, but out of a collection of 778 made in the

* Spol. Zeylan., April 1906, p. 233. † Spol. Zeylan. March 1909.

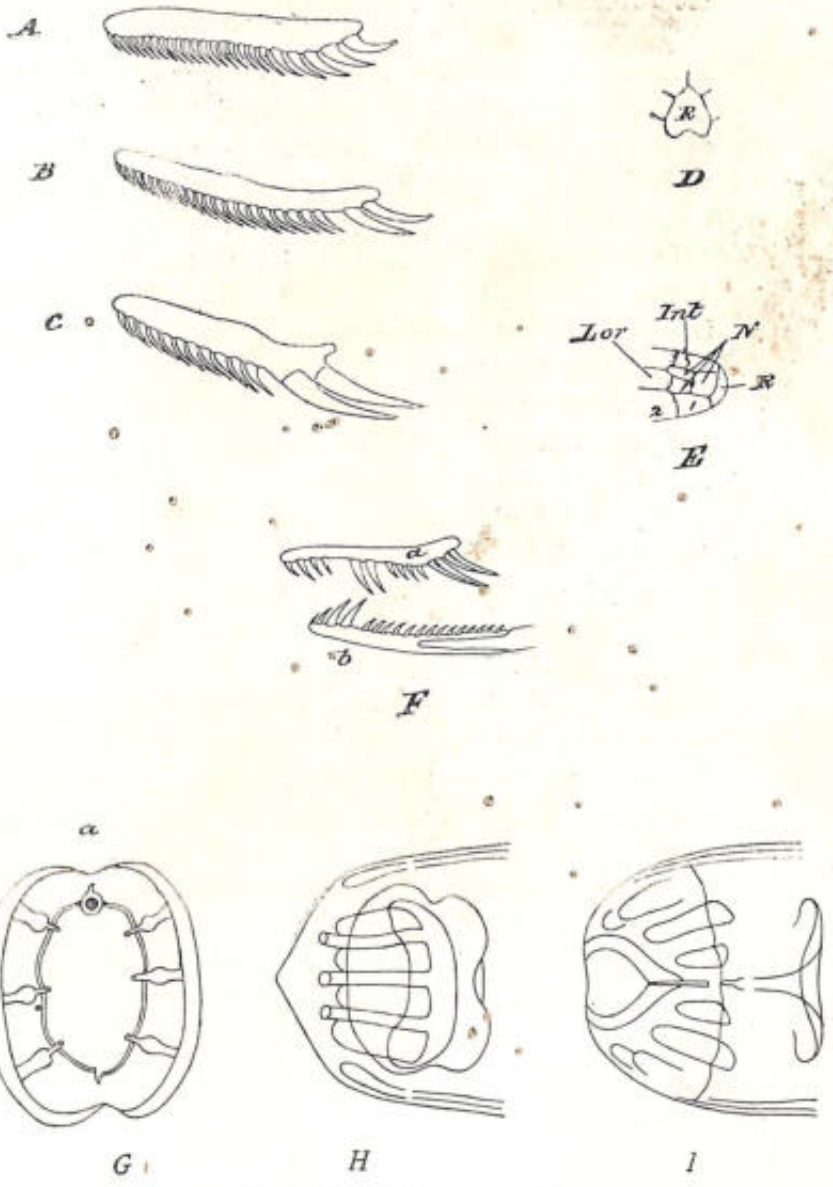
Eastern Himalayas below Darjeeling (1,500 to 7,000 feet) only one *stolatus* came to bag, this being found below 2,800 feet. The difference in the altitude to which it wanders in this, compared with the Western part of the same mountain range, is certainly noteworthy.

In the Plains of Assam out of 615 snakes collected 1 in every 4 was a *stolatus*, and in the Khasi Hills at Shillong (4,900 feet), it was nearly as common, for among 264 snakes collected 1 in every 7 was this species.

In Lower Burma out of 615 snakes mostly collected about Rangoon 1 in every 15 was a *stolatus*. I have had a specimen from Haka in the Chin Hills (6,500 feet).

Geographical distribution.—The whole of Southern Continental Asia from Sind in the West to China in the East. It also occurs in the Island of Ceylon, probably the Andamans, though I can find no record from this group, the Nicobars, Hainan, Hongkong, Formosa, and the Philippines.

Lepidosis.—*Rostral.*—Touches 6 shields, the rostronasal sutures being about twice as long as the rest. *Internasals*—Two, the suture between them being nearly as long as that between the præfrontal fellows, and subequal to the internaso-præfrontal sutures. *Præfrontals*—Two, the suture between them subequal or rather greater than the præfronto-frontal sutures; in contact with the internasal, postnasal, loreal, præocular, supraocular and frontal. *Frontal*—Touches 6 shields, the fronto-supraocular sutures being twice or more than twice the fronto-parietals. *Supraoculars*—About as long, but not so broad as the frontal along a line connecting the centres of the eyes. *Nasals*—Divided; in contact with the 1st only of the supralabial series. *Loreal*—One, about as deep as long. *Præocular*—One. *Postoculars*—Three usually, not infrequently four. *Temporals*—One, touching the 6th and 7th supralabials. *Supralabials*—7 with the 3rd and 4th touching the eye, or 8 with the 5th also touching the eye. *Infralabials*—7, the 7th usually touching 3 scales behind; 5th, 6th and 7th usually touching the posterior sublinguals. *Sublinguals*—Two pairs, the posterior rather longer, and separated by 1+2, o 1+1+2 small scales succeeded by the 1st narrow ventra



Kaliocephalus willeyi (much enlarged).
(After Von Linstow.)

COMMON INDIAN SNAKES. (WALL.)

A. Maxilla of *Tropidonotus natrix*. *B.* Maxilla of *Tropidonotus stolatus*. *C.* Maxilla of *Macropisthodon plumbicolor*. *D.* To show rostral from in front *P. conlanarus*. *E.* To show the nasals of *Psammophis longifrons*. *F.* Dentition of *Psammophis condanarus*—(*a*) Maxilla, (*b*) Mandible. *G.* Mouth seen in front (*a*) dorsum. *H.* Profile view of head. *I.* Dorsal view of head.

Costals—Two headslengths behind the head 19, midbody 19, two headslengths before the vent 17. The rows diminish by a fusion of the 3rd and 4th rows above the ventrals at a point shortly behind midbody. Keels present and strong in all but the last row usually, which may or may not have faint keels posteriorly. Apical facets present in pairs, but often obscure. *Ventrals*—Evenly rounded from side to side, 136 to 154 (120 to 161 Boulenger). *Anal*—Divided. *Subcaudals*—In pairs, 46 to 86 (89 Boulenger).

Anomalies.—The supralabials and infralabials are subject to frequent variation due to a confluence of shields, usually seen on one side, but sometimes on both. Thus I have seen 6 supralabials on one side in four specimens, the 2nd and 3rd touched the eye in one, the 3rd only in two and the 3rd and 4th in one. I have found 7 supralabials on one side twice of which the 4th alone touched the eye. In thirteen specimens I have found 8 with the 4th and 5th only touching the eye, in four of these on both sides. I once found 9 on one side of which the 4th, 5th and 6th touched the eye. With the infralabials it is not infrequently that one sees but 4 touching the anterior sublinguals instead of the normal 5. On 7 occasions I have seen a double loreal on both sides, one superposed above the other, one specimen was from Rangoon, one from Shillong, two from Trivandrum, and three from Dibrugarh. I have found two anterior temporals on one side in three specimens, and once this shield was confluent with the two supralabials below. In one specimen I have seen two præoculars, and in one other only two postoculars. In three cases I have seen the 2nd supralabial on one side slightly in contact with the nasal shield. I have once seen three pairs of sublinguals, the normal anterior pair being divided.

Dentition.—Maxillary.—22 subequal teeth, separated by a gap behind—that would accommodate a similar tooth—from two subequal, enlarged, and compressed teeth placed one behind the other which are fully twice as long as any of the preceding. *Palatine*—16 or 17, small, and subequal. *Pterygoid*—31 decreasing in length gradually behind. *Mandibular*—31 to 32, subequal except behind where they gradually diminish in size.

Our PLATE is disappointing in its colouring. The striping is

everywhere rather too well defined, and the light stripes should be buff, and not greyish-blue. The underparts shown in figs. 8 and 9 are misleading, as the colour should be pale yellow or pearly white.

The expression, and general form is very faithfully depicted.

Opisthoglyphous colubrines, or snakes which have grooved teeth placed in the back of the maxilla ("opisthe" behind, and "glypho" I carve) are divided into three sub-families : (1) *Homalopsinæ*, (2) *Dipsadomorphinæ*, and (3) *Lachistodontinæ*.

Psammophis is one of the 69 genera into which the second sub-family is divided, and includes 17 species. The genus is principally African, no fewer than 13 species being peculiar to that Continent.

Of the 4 species that are known from Indian limits one, *viz.*, *schokari* extends from North Africa into South-West Asia (Arabia to Sind), one, *viz.*, *leithi* is strictly speaking Holarctic, but just extends within Tropical limits (United Provinces), the remaining two, *viz.*, *longifrons* and *condanarus* are Tropical, the former exclusively so, but the latter extends into the Holarctic area (Western Himalayas, Sind, etc).

PSAMMOPHIS CONDANARUS (MERREM).

The Indo-Burmese Sandsnake.

Nomenclature—(*a*) *Scientific.*—The generic name was introduced by Boie in 1827 and is from the Greek "psammos" sand, and "ophis" snake. The specific name is a latinised version of "condanarouse" the vernacular name by which it is known according to Russell in Ganjam District.

(*b*) *English.*—I think the best name for it is the Indo-Burmese Sandsnake.

(*c*) *Vernacular.*—The only name I know of is that mentioned by Russell above, the meaning of which I have failed to obtain any information upon.

General characters.—It is a graceful snake of rather slender habit. The head is a longish oval with a rounded and somewhat narrow and short snout. The ridge from the eye above the lore is

prominent and the lore grooved horizontally. The nostril is rather small with a cleft proceeding downwards to the 1st supralabial. The eye is moderately small with a round pupil, and a brown iris sometimes edged along its pupillary border with gold. The tongue is red tipped with black. The body is rather slender, smooth and rounded in contour, it attenuates slightly in front to indicate the neck and very gradually behind, where it passes insensibly into the tail, which is unusually long being rather less than one-quarter to one-fifth the entire length of the snake.

Colour and markings.—The dorsum is marked longitudinally with well defined, alternate, nut-brown, and pale greenish-olive or buff stripes, the hues in each case being subject to much variation in individuals. The median pair of light stripes begin about the frontal shield, and end at the vent. They involve the upper half of the 7th and the whole 8th rows of scales above the ventrals at midbody, but are sometimes more or less confluent in the hind body.* The lower and broader light stripes begin on the rostral shield, pass over the eyebrows down the body, to the tail tip. These involve the upper half of the 3rd, the whole 4th, and the lower half of the 5th rows above the ventrals at midbody. The upper lip is creamy-yellow or opalescent and the lower half of the last row of scales and belly are opalescent, sulphur, or primrose-yellow, uniform except for a thin black and carrot-red line (which before desquamation may be modified to blue and rose-pink) on each side of the ventrals. The skin between the scales is blackish throughout.

Dimensions.—The largest specimen I have had was a ♂ measuring 3 feet $3\frac{5}{8}$ inches in Fyzabad, but I have had three others over 3 feet. Günther† mentions one 3 feet 4 inches.

Identification.—First count the scales two headslengths behind the head, at midbody, and two headslengths before the vent, and they will be found to number 17-17-13, respectively. Besides the genus *Psammophis* only three other Indian snakes have the same number of scales, and all are easily distinguished from this

* Rarely they are absent altogether or present for a short length anteriorly.

† Rept. Brit. Ind., p. 291.

genus by attention to the following points:—(1) *Lachesis trigonocephalus* has no enlarged plate-like shields on the head, a pit in the side of the face, strongly keeled scales, and a vertical pupil; (2) *Chrysopelea ornata* has the ventral shields keeled on each side; (3) *Gerardia prevostiana* has only 5 shields touching the rostral.

It remains now to separate *condanarus* from the other three species of *Psammophis*, and here the nasal shields will suffice.* In *condanarus* there is either a single nasal shield partially divided by a suture running from the nostril to the first labial as shown in Diagram I, figure B, or another suture above the nostril may completely divide the shield into two. In the other three species the shield is not only completely divided vertically into two parts, but the posterior part is further subdivided by a horizontal suture as shown in our Diagram (figure E).

To sum up the points to look for, and in the order here given are—

(1) Costals 17—17—13.

(2) Large plate like head shields.

(3) Rounded ventrals.

(4) Rostral touching 6 shields (see Fig. D of diagram).

(5) Posterior nasal not divided into two parts.

Haunts.—I have very rarely met with this snake myself in its natural haunts, but from enquiries made from those who have brought me specimens it appears to frequent grass land, and rather open jungle. In Fyzabad it came occasionally into the Cantonment, but was more often encountered in the little patches of tamarisk (jhow) outside Cantonment limits. Here it was frequently met with in the branches of the tamarisk shrubs showing a decided arboreal tendency. On one occasion it came into a house in the Cantonment. In Almora it is found usually in the wooded patches in and close at hand. Mr. P. W. MacKinnon, who gave me specimens, told me that it is common about

* The undivided condition of the anal will proclaim the identity of *leithi*. In *schokari* the supralabials are usually 9 with the 5th and 6th touching the eye, and the frontal touches 8 shields. In *longifrons* the frontal touches 6 shields and the supralabials are usually 8, rarely 9, with the 4th and 5th (rarely 5th and 6th) touching the eye.

Mussoorie and in the Dun, and he once shot a serpent eagle (*Circaetus gallicus*) which he saw stoop at something in a patch of grass, and found no less than 7 snakes of this species in its crop showing how plentiful it must be in that part of the Himalayas. Theobald* says that in Burma it inhabits grass land and paddy fields. From these observations it will be seen that it is by no means a desert snake such as its name suggests.

Habits and Disposition.—Very few specimens have reached me alive, but the few I have seen and played with showed me that it is a very active snake, very much on the alert, and quick in movement. It displays much spirit, and I had to treat it with respect and caution to avoid being bitten. One specimen I had lay reclining on a branch, and when I seized it by the tail slipped off, and began a most vigorous corkscrew contortion which had the effect of snapping its tail in my fingers when it immediately made off. This crafty manœuvre is practised by other snakes and particularly by the keelbacks (*Tropidonoti*) which accounts for so many of the specimens brought in to me having imperfect tails. The fact that Jerdon† found one in the act of swallowing so truculent and dangerous a snake as the *Echis* shows that it can be both plucky and vicious. Theobald‡ remarks on the activity of the specimens he saw in Burma. It is obviously of diurnal habit judging from the information I invariably received from its captors.

Food.—I have known a frog taken once, lizards of the genus *Mabuia* twice, and *Calotes* once. Jerdon's record of a viper (*Echis*) being overpowered by this species is indeed very remarkable.

The Sexes.—Females in Fyzabad I found largely predominated over males, 16 of the former coming to bag against 6 of the latter. In Almora too last year the only specimens I got, four in number, were all females. Both sexes grow to about the same length. The male claspers I found peculiar, differing from these organs in other snakes in that when forcibly extruded by digital

* Rept. Brit. Burma, p. 43.

† Journ., As. Soc., Bengal, xxii, p. 529.

‡ Cat. Rept., Brit. Burma, 1886, p. 43.

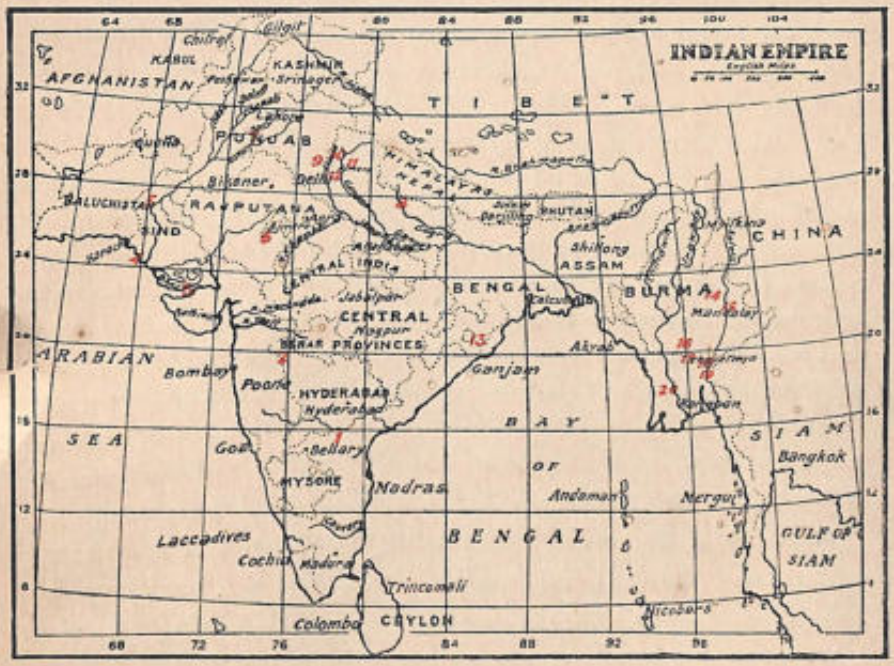
pressure behind the vent they were directed downwards instead of forwards. They are thin, long, and spirally twisted reminding me of a black buck's horn. Again they are entirely lacking in asperities or tentacles such as one usually sees on these organs in other snakes. The secretion from the anal glands in both sexes is greenish-yellow.

Breeding.—I can give no precise information in this direction. We do not know yet whether the species is oviparous or viviparous. The breeding season is probably about May. I had young in August 1906 measuring respectively 1 foot 2¾ inches and 1 foot 4⅜ inches which were obviously that year's production. The smallest specimen I have ever had measured 11¾ inches from Muktesar, date not known. I believe this was a hatchling, and if so, the two young alluded to above must have probably taken three months to grow to the lengths mentioned. Further of eight adult females collected in July and August none were gravid showing that the production of the young was already past. The length of the young when entering the world is probably about a foot, and my notes make it appear that they grow about eight inches a year.

Distribution.—As will be seen from the accompanying map the distribution of this snake based on the available records up to date is decidedly peculiar.

It inhabits Peninsular India from Sind in the West to Bengal (about 86° longitude) in the East, and from Kurnool in the South to the Western Himalayas in the North. It does not appear to occur in the Eastern Himalayas, nor in the Brahmaputra Basin, nor the Irrawady Basin except near its mouth, but re-appears in the Salween Basin. Beyond this it does not extend to Indo-China nor the Malayan Peninsula.

In the Indian Plains it is common in the Ganges Basin (at least in the United Provinces) but everywhere else is a decidedly uncommon snake. It may however prove to be a commoner snake than available records would make it appear, for it was not known from the United Provinces below the Himalayas before I went to Fyzabad where I found it common. In the Western Himalayas it is one of the commonest snakes at altitudes between 3,000 and 6,000



DISTRIBUTION OF *PSAMMOPHIS CONDANARUS*.

1 Kurnool (Nallamallay Hills) (Beddome). 2 Jalna (Jerdon). 3 Cutch (I. M.). 4 Kotri (B. M.). 5 Jacobabad (Murray). 6 Ajmer (Blanford). 7 Chillianwalla (B. M.). 8 Fyzabad (F. W.). 9 Hurdwar (Stoliczka). 10 Simla (Stoliczka). 11 Dehra Dun and Mussoorie (F. W.). 12 Almora and Muktesar (F. W.). 13 Ganjam (Russell). 14 Sagaing (F. W.). 15 Tounggyi (B. M. and F. W.). 16 Prome (I. M., Wall and Evans). 17 Tharrawady (F. W.). 18 Pegu (B. M.). 19 Manbee (Hmawbi? Theobald). 20 Bassein (I. M.).

I. M. implies Indian Museum, and B. M. British Museum.

feet. In Burma it is rather uncommon, Evans and I only obtaining five out of some 600 odd snakes. Two of these were from Prome, two from the Southern Shan States, and one from Sagaing.

Lepidosis—Rostral.—Touches 6 shields, the rostro nasal suture being much longer than the rostro-internasals. *Internasals.*—A pair, the suture between the fellows about two-thirds that between the præfrontal fellows, and about two-thirds to nearly equal to the internaso-præfrontal. *Præfrontals.*—A pair, the suture between them about one-third greater than the præfronto-frontal; in contact with internasal, postnasal (or nasal), loreal, præocular, supraocular, and frontal. *Frontal.*—Touches 6 shields, the fronto-supraocular suture three times the length of the fronto-parietals and twice the fronto-præfrontals. *Supraoculars.*—Length subequal to breadth; rather broader than frontal. *Nasals.*—Semi-divided or divided, in contact with the 1st and 2nd supralabials. *Loreal.*—One, about twice as long as high. *Præocular.*—One, not touching frontal. *Postoculars.*—Two. *Temporals.*—One, touching one supralabial only, normally the 6th. *Supralabials.*—Normally 8 with the 4th and 5th touching the eye, sometimes 9, the 5th and 6th touching the eye. *Infralabials.*—5 or 6, the last largest and in contact with 2 scales usually behind; 4th and 5th, or 5th and 6th touching the posterior sublinguals. *Sublinguals.*—Two subequal pairs. *Costals.*—Two headslengths behind head 17, at midbody 17, two headslengths before vent 13. The reduction from 17 to 15 is due to an absorption of the 3rd row above the ventrals, that from 15 to 13 to the absorption of the 7th row, but both steps occurring very closely together may be mixed or reversed; apical facets single, obscure; keels none. *Ventrals.*—166 to 188 (156 Boulenger) evenly rounded. *Anal.*—Divided. *Subcaudals.*—71 to 92 (64 Jerdon), from 9 to 12 ventrals intervene between the navel and anal shield.

Anomalies.—I have once seen an inferior loreal wedged between the 2nd and 3rd labials, and once the two last ventrals were divided like the anal.

Dentition—Maxillary.*—In front 4 (rarely 3) small teeth, the

* From 5 skulls from Fyzabad and Burma in my collection.

2nd longest, then a short edentulous gap succeeded by two large ungrooved teeth fully twice as long as the preceding. Behind these is a short edentulous gap, then a series of 4 or 5 small, subequal, teeth followed by a pair of obliquely set, grooved, fang-like, teeth fully twice as long as the immediately preceding ones. *Palatine.*—7 to 10 small subequal teeth. *Pterygoid.*—13 to 16 small and subequal. *Mandibular.*—In front 2 small followed by two ungrooved teeth fully twice as long as the preceding. After a short edentulous gap 12 to 18 small subequal teeth.

PLATE.—Our coloured figures with one exception are very disappointing. Fig. 6 gives a good illustration of the buff stripes as seen in the posterior part of the body.

Figs. 1, 2, 4, and 5 do not show the beauty of the vermilion ornamentation as seen in life, this true being not only too dingy, but too inconspicuous. In fig. 4 the belly should be pearly-white and the throat a bright yellow.

Fig. 3 is intended to represent a blue variety, but the blue is not well shown. The black bars in figs. 1 and 3 are shown too regular, those of each side more usually alternate, or, are broken up often forming a chequering rather than barring.

(To be continued.)

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES IV, PART I.

By

Sir George F. Hampson, Bart., F.Z.S., F.E.S.

(Continued from page 125 of this Volume.)

Hadeninæ.

Genus Trichestra.

Type.

Trichestra, Hmpsn., Cat. Lep. Phal. B. M. v., p. 8 (1905).. *arbuticolens.*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with hair in front, the 3rd moderate; frons smooth; eyes large, hairy, overhung by cilia; antennæ of male typically ciliated; head and thorax clothed with hair and scales, the pro- and meta-thorax with spreading crests; tibiæ fringed with hair; abdomen with dorsal series of crests. Forewing with veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle or shortly stalked; 8 anastomosing with the cell near base only.

1691*a*. Trichestra serrata, Hmpsn., A. M. N. H. (8) iv., p. 372 (1909).

Antennæ of male strongly serrate.

♂. Head and thorax reddish-brown mixed with white and some black; palpi and frons blackish; tibiæ and tarsi blackish ringed with white; abdomen dark-brown mixed with white, whitish at sides towards base. Forewing rufous mixed with grey and irrorated with black, the terminal area greyer, the veins slightly streaked with white; subbasal line double, black, from costa to vein 1; antemedial line double filled in with whitish, oblique, waved; claviform moderate, defined by black; orbicular white defined by black, small, rounded; reniform with white annulus defined by black, somewhat angled inwards on median nervure; postmedial line black, bent outwards below costa, then dentate and with white and black points beyond it on the veins, incurved below vein 4, some white points beyond it on costa; subterminal line white, excurved below vein 7 and at middle; a terminal series of black striæ with white points between them. Hindwing white tinged with brown especially on apical area; an indistinct dark discoidal point and curved postmedial line; a terminal series of black striæ;

cilia with a blackish line through them; the underside white, the costal area irrorated with rufous and blackish, a blackish discoidal spot, somewhat dentate postmedial line and terminal series of lunules.

Habitat.—KASHMIR, *Exp.* 26 mill.

Genus ELUSA.

	Type.
Elusa, Wlk., xvi, 202 (1858)	*ceneusalis.*
Alimala, Wlk., Journ. Linn. Soc., Zool., vi., p. 153 (1862)..	*ceneusalis.*
Seria, Wlk., Journ. Linn. Soc., Zool., vi., p. 193 (1862) ..	*cyathicornis.*
Penza, Wlk., Journ. Linn. Soc., Zool., vii., p. 56 (1864) ..	*punctiveps.*
Lugana, Moore, Lep. Atk., p. 145 (1882)	*antennata.*
Desana, Swinh., Cat. Het. Mus. Oxon. ii., p. 26 (1900) ..	*peninsulata.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to or to above vertex of head and moderately scaled, the 3rd moderate or long, somewhat porrect; frons smooth; eyes hairy, large, round; thorax clothed with hair and scales mixed, the pro- and meta-thorax with spreading crests; tibiæ fringed with long hair; abdomen with dorsal crests on basal segments, the crests on 3rd segment large. Forewing with the apex rounded, the termen evenly curved and not crenulate, the inner margin with scale-tooth at tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form a long areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male with the basal half of shaft bipectinate with short coalesced contorted branches, the medial part of shaft with rounded vesicle formed of coalesced branches and hollowed out in front, the terminal third of shaft pectinate above minutely serrate near the vesicle below; the hind tibiæ dilated and fringed with long hair behind.

B (*Seria*). Palpi of male with the 2nd joint reaching to about vertex of head.

a. Forewing with straight whitish subterminal line defined by small dark spots on inner side.

*a*¹. Forewing with the terminal half pale, the basal half blackish. .. .. *antennata.*

*b*¹. Forewing uniform brown .. .. .. *cyathicornis.*

b. Forewing with subterminal series of small whitish spots with dark spots on their inner side .. .. *bipars.*

1852. ELUSA ANTENNATA.

1851. ELUSA CYATHICORNIS.

1850. ELUSA BIPARS.

1682c. MISELIA CONSPERSA.

Noctua nana, Rott. Nat., ix., p. 132 (1776); nec. Hüfn. Staud. Cat. Lep. Pal., p. 162.

Noctua conspersa, Schiff. Wein. Verz., p. 71 (1776); Esp. Schmett. iv., pl. 119, f. 5; Hübn. Eur. Schmett. Noct., f. 52; Dup. Lép. Fr. vi., p. 354, pl. 95, f. 1.

Bombyx annulata, Fabr. Spec. Ins ii., p. 204 (1781).

Dianthœcia ochrea, Gregson, Ent. Rec. ii., p. 306 (1891).

Dianthœcia dealbata, Staud. Iris. v., p. 365 (1892).

Dianthœcia hethlandica, Staud. Iris. v., p. 366 (1892).

Euplexia niveifera, Hmpsn., J. Bomb. Soc. xvii., p. 469 (1906).

Head and thorax white with black markings; tegulæ and patagia edged with black, the former with black medial line; tarsi ringed with white; abdomen pale-brown. Forewing olive grey suffused in parts with black, and with white patches tinged in parts with yellow; a basal white patch on costa traversed by the double waved, subbasal line from costa to submedian fold; a double waved antemedial line traversing a white patch on inner margin; claviform defined by black with a bidentate white patch beyond it on base of vein 2 extending into the cell on outer side of the orbicula: which is round, white defined by black and with some white marks above it on costa; reniform white defined by black and with olive centre; postmedial line double, lunulate, filled in with white towards costa and inner margin, bent outwards below costa, slightly incurved at discal fold, incurved below vein 4, some white points beyond it on costa and a white patch on inner area; subterminal line white defined on inner side by some dentate black marks at middle, angled outwards at vein 7 and excurved at middle, the area beyond it more or less suffused with white and with a white apical patch; a terminal series of small black lunules; cilia chequered fuscous and white. Hindwing fuscous brown, the interspaces rather paler towards base; cilia white at tips; the underside greyish thickly irrorated with fuscous, a discoidal spot and curved postmedial and subterminal bands.

ab. 1. *ochrea*. Forewing with the markings ochreous instead of white.

ab. 2. *hethlandica*. Forewing much darker, often almost uniform fuscous, the cilia without white. Shetland Islands.

ab. 3. *dealbata*. Forewing with the white markings reduced, the apical patch absent. Armenia, W. Turkistan, E. Siberia.

ab. 4. *niveifera*. Forewing with the ante and post medial areas golden olive without white on inner margin. Punjab.

Habitat.—Europe; Armenia; Asia Minor; W. Turkistan; W. Siberia; Mongolia; Tibet; E. Siberia; Punjab, Simla. *Exp.* 36 mill.

Larva. Meyr. Brit. Lep. p. 77; Barrett, Lep., Brit., iv., p. 252, pl. 164.

Pale-brownish ochreous; dorsal line pale, traversing a series of dark V-shaped marks; two pale brownish lateral lines; spiracular line whitish;

spiracles pink; head pale-brownish with four dark streaks. Food plants: seed capsules of *Lychnis* and *Silene* 7-9.

1698*a*. Miselia illoba, Butl., A. M. N. H. (5) i., p. 162 (1878); id. Ill. Het. B. M. iii, pl. 44, f. 7; Staud Cat. Lep. Pal, p. 157; Hmpsn., Cat. Lep. Pal B. M. v., p. 151.

Graphiphora pacifica, Butl., A. M. N. H. (5) i., p. 165 (1878); id. Ill. Het. B.M. ii., pl. 30, f. 2.

Mamestra declinans, Staud. Stett. Ent. Zeit. 1888, p. 250; id. Rom. Mém. vi., p. 427, pl. 8, f. 2.

Head and thorax cupreous red; abdomen greyish tinged with rufous. Forewing cupreous red with some darker red-brown suffusion on costal area to postmedial line and in and below cell; subbasal line represented by a slight striga from costa; antemedial line indistinctly double, oblique, waved; claviform an ill-defined brown mark; orbicular and reniform with grey annuli defined by brown, the former rather oblique elliptical, open above, the latter slightly angled inwards on median nervure; an indistinct curved medial line; postmedial line fine, slightly bent outwards below costa, then waved, excurved to vein 4, then incurved; subterminal line indistinct, greyish defined on inner side by red-brown, angled outwards at vein 7 and excurved at middle; cilia brown with a fine whitish line at base. Hindwing white, the costal and terminal areas tinged with brown; a small discoidal spot; a fine brown terminal line; cilia whitish; the underside white, the costal area suffused with brown, a small discoidal spot, slight curved postmedial line on costal area and faint curved subterminal line.

Habitat.—E. Siberia, Ussuri; Japan; Corea; C. China, Kikiuang; Assam, Khasis. *Exp*. 44 mill.

1710. Monima rubida.

Genus Pimprana.

Type.

Pimprana, Moore, Lep. Atk., p. 41 (1882) .. .. ..*atcinsoni*.

Proboscis fully developed; palpi obliquely upturned, fringed with long hair in front, the 3rd joint short; frons with trincate conical prominence with raised edges; eyes rather small, round; antennæ of male ciliated; head and thorax clothed with long hair only and without crests; tibiæ fringed with long hair on outer side; abdomen with some rough hair on dorsum and lateral fringes of hair, but without crests. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1576. PIMPRANA ATCINSONI.

Sub-family CUCULLIANÆ.

Proboscis usually well developed, sometimes aborted or absent; palpi usually short, upturned or porrect, the 3rd joint sometimes long and dilated at extremity, in *Xantholeuca* rostriform; frons sometimes with rounded prominence with corneous plate below it, or with corneous processes of various forms; eyes naked, overhung by more or less developed bristly cilia from their margins, the eyes usually large and round, sometimes small and reniform; antennæ usually ciliated, sometimes serrate or pectinated, more rarely laminate or almost simple; head and thorax clothed with hair and scales when there are usually crests on the pro- and meta-thorax or a ridge-like dorsal crest, or clothed with hair only, the tegulæ sometimes produced dorsally into a ridge, or in *Cucullia* and allied genera produced behind into a more or less developed hood over the thorax; tibiæ without spines, the fore tibia sometimes with terminal claws; the proximal joints of fore tarsi sometimes with a series of curved claw-like spines; abdomen usually with a series of dorsal crests or one crest at base. Wings usually, rather broad, but often long and narrow, the termen rounded or crenulate, rarely slightly angled at middle; forewing with vein 1*a* weak, not anastomosing with 1*b*, 1c absent; 2 from middle of cell; 3 and 5 from near lower angle; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell; hindwing with veins 1 *a* and *b* present, 1c absent; 3, 4 from lower angle of cell; 5 obsolescent from or from just below middle of discocellulars; 6·7 from upper angle or shortly stalked; 8 arising free, then bent downwards and touching the cell, then again diverging. In *Thecophora* the male has a very large boat-shaped fovea in disc of hindwing the extremity of subcostal nervure being dilated and played on by the spines of the elongate 1st joint of hind tarsus, the tibia being shortened.

The imagos mostly appear in the autumn or spring, sometimes hybernating. Larva smooth, the warts with one hair, all the prolegs present, the 12th somite with more or less developed dorsal hump, in *Cucullia artemisiæ* there are subdorsal series of double hump-like warts. The larva of *Cucullia* and allies are usually bright coloured, feeding exposed on plants.

Key to the Genera.

A. Tegulæ more or less strongly produced behind into a hood .. .. *Cucullia.*

B. Tegulæ not produced behind into a hood.

a. Frons with trincate corneous prominence with raised edges and trilobate process from lower edge .. .. *Metalopha.*

b. Frons smooth.

a^1. Proboscis aborted, non-functional.

a^2. Thorax clothed with hair and hair-like scales. *Leucochlæna.*

b^2. Thorax clothed with hair only .. .. *Cteipolia.*

b^1. Proboscis fully developed.

a^2. Tegulæ produced into a more or less prominent dorsal ridge.

a^3. Palpi with the 3rd joint long and dilated at extremity.

a^4. Abdomen with dorsal series of crests, not flattened .. .. .. *Euscotia.*

b^4. Abdomen flattened, without dorsal series of crests .. .. .. *Elvesia.*

b^3. Palpi with the 3rd joint short.

a^4. Abdomen dorsally flattened .. *Amathes.*

b^4. Abdomen not dorsally flattened .. *Dichonia.*

b^2. Tegulæ not produced into a dorsal ridge.

a^3. Abdomen with dorsal crests on basal segments.

a^4. Thorax clothed with hair and scales mixed.

a^5. Eyes rather small .. .. *Nyctycia.*

b^5. Eyes large.

a^6. Thorax clothed chiefly with scales.

a^7. Thorax quadrately scaled .. *Daseuplexia.*

b^7. Thorax not quadrately scaled.

a^8. Thorax with divided ridge-like crest .. .. *Pachypolia.*

b^8. Pro- and meta-thorax with spreading crests.. .. *Eumichtis.*

b^6. Thorax clothed with rough spatulate scales and hair .. .. *Valeria.*

c^6. Thorax clothed with hair with a few scales mixed .. .. *Antitype.*

b^4. Thorax clothed with hair and hair-like scales.

a^5. Palpi with the 3rd joint very long, dilated at extremity and porrect .. *Sydiva.*

b^5. Palpi with the 3rd joint short.

a^6. Thorax with divided crest; forewing with the termen crenulate .. *Rhizotype.*

b^6. Thorax with spreading crest; forewing with the termen not crenulate.. .. .. .. *Bombycia.*

b^3. Abdomen with dorsal crest at base only.

a^4. Thorax clothed chiefly with scales .. *Bryotype.*

b^4. Thorax clothed with hair with a few scales mixed, and without distinct crests .. .. *Bryomima.*

c^4. Thorax clothed with hair and hair-like scales and with spreading crests on pro and meta-thorax .. .. *Blepharidia.*

d^4. Thorax clothed with hair only and without distinct crests .. .. *Dimya.*

c^3. Abdomen without dorsal crests.

a^4. Eyes small, reniform .. .. *Hypsophila.*

b^4. Eyes large, rounded .. .. *Cosmia.*

Genus CUCULLIA.

	Type.
Cucullia, Schrank, Fauna Boica ii., (2) p. 157 (1802) ..	*artemisiæ.*
Euderea, Hübn. Verz., p. 245 (1827)	*asteris.*
Eucalimia, Hübn. Verz., p. 245 (1827)	*gnaphalii.*
Callænia, Hübn. Verz., p. 246 (1827)	*umbratica.*
Argyritis, Hübn. Verz., p. 247 (1827)	*artemisiæ.*
Rancoxa, Smith, Ent. News., iii, p. 253 (1892); id. Trans. Am. Ent. Soc., xxi., p. 82 (1894)	*strigata.*
Triconophora, Hübn. Tent. incd.	*umbratica.*

A. Forewing without distinct dark facia on middle of inner margin.

a. Forewing with the orbicular and reniform more or less distinctly defined.

a^1. Forewing with the postmedial line angled outwards at vein 5, then almost straight, oblique. *albipennis.*

b^1. Forewing with the postmedial line irregular towards inner margin .. .. .. *nigrifascia.*

b. Forewing with the orbicular and reniform almost obsolete .. .. *pullata.*

B. Forewing with distinct dark fascia on middle of inner margin.

a. Forewing with the orbicular and reniform more or less distinctly defined.

a^1. Forewing with the orbicular elliptical .. *elongata.*

b^1. Forewing with the orbicular small, round .. *brevipennis.*

b. Forewing with the orbicular and reniform defined by dark points.

a^1. Hindwing nearly evenly suffused with brown .. *stigmatophora.*

b^1. Hindwing white, the veins and terminal area suffused with brown .. .. .. *blattariæ.*

1809. CUCULLIA ALBIPENNIS.

1808. CUCULLIA NIGRIFASCIA.

1812. CUCULLIA PULLATA.

1807. CUCULLIA ELONGATA, Butl; A. M. N. H. (5) vi., p. 67 (1880); id. Ill. Het. B. M. vi., p 11, pl. 103, f. 7.

" *albescens*, Moore., P. Z. S., 1881, p. 357, Staud. Cat. Lep. Pal., p. 215.

" *atkinsoni*, Moore., Lep. Atk., p. 131 (1882).

" *postera*, Staud. Rom. Mém. vi., p. 524 (1892).

Habitat.—W. SIBERIA; E. SIBERIA; TIBET; KASHMIR; PUNJAB; SIKHIM.

1810. CUCULLIA BREVIPENNIS.

1811. CUCULLIA STIGMATOPHORA.

1811 *a*. CUCULLIA BLATTARIÆ.

Noctua blattariæ. Esp. Schmett. iv., pl. 154, f. 4 (1786); Frr. Brit., pl. 81. Herr. Schäff. Eur. Schmett. Noct., pp. 202-3. Staud. Cat. Lep. Pal., p. 215.

Cucullia caninæ. Ramb. Ann. Soc. Ent. Fr. 1883., p. 19, pl. 1, f. 5; Dup. Lép. Fr. Suppl. iii., p. 415, pl. 37, f. 2.

" *scrophulariivora* Guen. Noct. ii, p. 130 (1852).

Head and thorax whitish tinged with rufous; palpi, two bars on frons and back of head dark rufous; tegulæ with blackish line near base, traces of a medial line and dark rufous tips; patagia with some black scales towards upper edge which is dark rufous; thorax dorsally blackish; mid and hind tibiæ with black points at their extremities; abdomen whitish tinged with red-brown, the crests dark. Forewing grey-white, more or less suffused with rufous, leaving the inner half paler; the costal area darker; subbasal line represented by an oblique striga from costa; antemedial line double below submedian fold, angled strongly outwards in the interspaces and inwards on the veins, above inner margin angled outwards to the postmedial line, its outer part forming a black streak; orbicular and reniform defined by some black points; postmedial line obsolescent, except below vein 2, where it forms a whitish lunule defined on each side by brown lines, and with a smaller lunule below it above inner margin; some whitish points on costa towards apex; an oblique series of slight rufous streaks between vein 6 and apex, and another series from termen below apex to vein 4, a prominent oblique streak below vein 2 with slight white and brown streaks below it; cilia blackish at base, grey at tips and intersected with white. Hindwing white tinged with brown, the veins and terminal area suffused with brown, in female mostly suffused with brown; cilia whitish with a brown line through them; the underside with slight discoidal lunule.

Habitat.—EUROPE; ARMENIA; ASIA MINOR SYRIA; KASHMIR. *Exp.* 44-52 mill.

Larva.—Kirby, Butt. and Moths, Eur. p. 255.

Citron-yellow above with black spots often conjoined into the form of a cross; sides grey dotted with black; head brown or red. Foodplants, the flowers and seeds of different species of *Scrophularia* 6-7.

Genus METALOPHA.

Type.

Metalopha, Staud. Iris. iv., p. 313 (1891) .. .. *liturata.*

Proboscis fully developed; palpi obliquely upturned, fringed with rough hair in front, the third joint short; frons with large corneous prominence with raised edges, its lower edges produced to a trilobate process; eyes large, round; antennæ of male simple, laminate; head and thorax clothed with rough hair, the vertex of head with large crest, the pro- and meta-thorax with double crests; pectus and tibiæ clothed with long hair; abdomen with some rough hair at base and lateral fringes of hair, but without crests. Forewing with the apex somewhat produced, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 rather strong from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2015. METALOPHA CASHMIRENSIS.

Genus LEUCOCHLÆNA.

Type.

Leucochlæna, Hmpsn. Cat. Lep. Phal. B. M. vi., p. 132 (1906).. *hispida.*

Proboscis minute; palpi porrect to just beyond frontal tuft and fringed with long hair below; frons smooth; eyes large, rounded; antennæ of male bipectinated with long branches to apex; head and thorax clothed with hair and hairlike scales, the pro- and meta-thorax with spreading crests; pectus and legs clothed with long hair; abdomen with some rough hair at base and lateral fringes of hair, but without crests. Forewing with the apex rounded, the termen obliquely curved and somewhat crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1708. LEUCOCHLÆNA LEUCOCERA.

Genus BOMBYCIA.

Type.

Bombycia, Steph. Ill. Brit. Ent. Haust. iii., p. 57 (1829). nec. Hübn. Tent. ined. .. .. *viminalis.*

Cleoceris, Boisd. Ind. Meth. p. 93 (1840) .. .. *viminalis.*

Hyada, Moore, Lep. Atk. p. 129 (1881) .. .. . *grisea.*

Sect. (Hyada). Antennæ of male with fascides of extremely long cilia.

1799. BOMBYCIA GRISEA.

Genus EUSCOTIA.

1806. EUSCOTIA INEXTRICATA.

Genus DICHONIA.

Type.

Dichonia, Hübn. Verz., p. 217 (1827) .. .. .. *areola.*

Xylocampa, Guen. Ann. Soc. Ent. Fr. 1837, p. 227 .. *areola.*

Proboscis fully developed; palpi with the 2nd joint oblique, clothed with long hair, the 3rd porrect; frons smooth, with large frontal tuft; eyes large, rounded; antennæ of male typically nearly simple; head and thorax chiefly clothed with scales, the tegulæ dorsally produced to a ridge, the head, pro- and meta-thorax with spreading crests; pectus and tibiæ clothed with long hair; abdomen with dorsal series of crests and lateral fringes of hair. Forewing rather narrow, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3-4 from angle of cell; 5 obsolescent from middle of discocellulars; 6-7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male ciliated.

A. Forewing with the terminal area blackish.. .. *lubrica.*

B. Forewing with the terminal area concolorous.

a. Forewing with bidentate white mark beyond the claviform and black streak from it to post-medial line .. .. *obliquisigna.*

b. Forewing without bidentate white mark beyond the claviform, or black streak from it to post-medial line .. .. *chlorota.*

1778. DICHONIA LUBRICA.

1789*a*. DICHONIA OBLIQUISIGNA.

1789*b*. DICHONIA CHLOROTA, Hmpsn., A. M. N. H. (8), iv, p. 386 (1909).

♂. Head and thorax grey-white mixed with brown and some black; palpi and antennæ blackish; tarsi blackish with slight pale rings; abdomen grey suffused with brown, the crest on 3rd segment tipped with black. Forewing grey-white suffused with brown and irrorated with black, the medial area somewhat darker; subbasal line black, waved, from costa to vein 1; antemedial line black, oblique, sinuous, angled outwards above inner margin, the area before it pale tinged with olive green; claviform whitish defined by black except above; orbicular and reniform with whitish annuli defined by black, the former round; postmedial line black, bent outwards below costa, then dentate, excurved to vein 4, then oblique, some white points beyond it on costa with slight dark streaks between them; subterminal line represented by a series of dentate brownish marks with

dentale pale olive green marks beyond them on termen; cilia brown with a series of whitish points at base. Hindwing greyish suffused with brown; an indistinct dark postmedial line; cilia with a series of whitish points at base; the underside grey-white irrorated with brown, a diffused brown discoidal spot and postmedial line.

Habitat.—Kashmir. *Exp.* 36 mill.

Genus Nyctycia.

Type.

Nyctycia, Hmpsn., Cat. Lep. Phal., B. M. vi., p. 299 (1906) . . *persimilis*.

Proboscis fully developed; palpi porrect to just beyond frontal tuft and fringed with long hair below; frons smooth; eyes rather small and somewhat reniform; antennæ of male minutely serrate with fascicles of long cilia; head and thorax smoothly clothed chiefly with scales, the pro- and metathorax with spreading crests; pectus and legs clothed with rather long hair; abdomen with dorsal crests on basal segments. Forewing rather long and narrow, the termen obliquely curved and somewhat crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell Hindwing with veins 3·4 shortly stalked; 5 obsolescent from just below angle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. I.—Palpi with the 3rd joint long and dilated at extremity.

1707*a*. Nyctycia plagiogramma, Hmpsn., Cat. Lep. Phal., B. M., vi, p. 299 (1906).

♂. Head and thorax reddish brown mixed with fuscous; palpi blackish at sides; frons with black bar; antennæ blackish; tegulæ with black medial shade; tarsi black with pale rings; abdomen ochreous brown suffused with fuscous except anal tuft and base of ventral surface. Forewing ochreous brown irrorated with fuscous; a sinuous black streak below base of cell; subbasal line represented by a black point on costa; antemedial line double at costa, then single, oblique to submedian fold, then obsolete; claviform fuscous defined by black and confluent with lower edge of orbicular, which has a slight greyish annulus defined by black, somewhat oblique elliptical; reniform slightly defined by black, an irregular sinuous medial line; postmedial line bent outwards below costa, then somewhat dentate and produced to short streaks on the veins, excurved to vein 4, oblique to submedian fold, then bent outwards, some pale points beyond it on costa; subterminal line greyish slightly defined on each side by black, minutely waved, slightly excurved at vein 7 and middle, with black streaks beyond it in the interspaces; a fine waved terminal line; cilia with fine pale line at base. Hindwing yellowish brown tinged with fuscous, the termen rather darker; cilia brownish ochreous with a dark line through them; the underside whitish irrorated with brown, a black discoidal lunule and indistinct sinuous postmedial line.

Habitat.—PUNJAB, Simla. *Exp.* 28 mill.

Sect. II.—Palpi with the 3rd joint short.

1707. NYCTYCIA PERSIMILIS.

Genus DASEUPLEXIA.

Type.

Daseuplexia, Hmpsn., Cat. Lep. Phal., B. M. vi., p. 303 (1906)..*lagenifera*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with long hair in front, the 3rd porrect; frons smooth, with tuft of scales on it and another between antennæ; eyes large, rounded; thorax clothed almost entirely with scales and quadrately scaled, the prothorax with divided crest, the metathorax with spreading crest; abdomen with dorsal series of crests on basal segments and with lateral fringes of hair on terminal segments. Forewing with the apex somewhat produced, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with the termen sinuous; veins 3·4 from angle of cell; 5 obsolescent from just below angle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with long branches, the apex simple.

1761. DASEUPLEXIA LAGENIFORMIS.

Sect. II.—Antennæ of male minutely serrate and fasciculate.

1740. DASEUPLEXIA LAGENIFERA.

Genus PACHYPOLIA.

Type.

Pachypolia, Grote, 6th Rep. Peab. Acad. Sci., p. 27 (1874)... *atricornis.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint fringed with hair in front, the 3rd short; frons smooth; eyes large, rounded; antennæ of male typically bipectinated with rather long branches, the apex simple; head and thorax clothed chiefly with scales, the thorax with divided dorsal ridge-like crest; pectus and legs clothed with long hair; abdomen with dorsal crests on basal segments. Forewing rather narrow, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle or shortly stalked; 8 anastomosing with the cell near base only.

Sect. II.—Antennæ of male ciliated.

1761*a*. PACHYPOLIA HIMALAYENSIS, Hmpsn., Cat. Lep. Phal., B. M. vi., p. 312 (1906).

♂. Head and tegulæ ochreous tinged with rufous; sides of palpi and frons blackish; tegulæ with black medial line; thorax deep rufous, the dorsal crest tipped with ochreous; pectus clothed with purplish pink and

brown hairs, the tarsi ringed black and pinkish ochreous; abdomen fuscous mixed with rufous and with slight greyish segmental lines, the anal tuft pale rufous. Forewing ochreous almost wholly suffused with purplish red-brown, the terminal area with fuscous, the veins with slight dark streaks; subbasal line represented by two slight striæ from costa; antemedial line double filled in with ochreous, angled outwards below costa then excurved to vein 1, where it is slightly angled inwards; claviform large, defined by black; orbicular with brown centre and ochreous annulus defined by black, oblique elliptical; reniform with fuscous centre and ochreous annulus defined by black on inner side only, somewhat constricted at middle and with its lower extremity dentate; a slight medial line; postmedial line double filled in with ochreous, bent outwards below costa, then minutely dentate, excurved to vein 4, then incurved to lower edge of reniform, some brown and ochreous striæ beyond it on costa, a black streak from it to termen above vein 4; subterminal line ochreous defined by rufous on inner side forming somewhat dentate marks at middle, very slightly angled outwards at vein 7 and dentate at veins 4·3, with black streaks from it to termen above veins 3 and 2; a terminal series of black points; cilia fuscous brown with fine pale line at base followed by a slight dark line. Hindwing greyish nearly uniformly suffused and irrorated with brown; a fine dark terminal line; cilia ochreous with a black line through them; the underside whitish irrorated with brown, strongly on costal area, a black discoidal lunule and sinuous postmedial line.

Habitat.—Sikhim. *Exp.* 38 mill.

Genus Eumichtis.

	Type.
Eumichtis, Hübn. Verz., p. 211 (1827)	*lichenea.*
Crino., Hübn. Verz., p. 216 (1827)	*sommeri.*
Epunda, Dup. Cat. Meth., p. 141 (1844)	*lichenea.*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with hair, the 3rd typically short; frons smooth; eyes large, rounded; antennæ of male typically bipectinated with rather long branches to apex; head and thorax clothed almost entirely with scales, the pro- and metathorax with spreading crests; tibiæ fringed with long hair; abdomen with dorsal series of crests and lateral fringes of hair. Forewing rather short and broad, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. IV.—Antennæ of male minutely serrate and fasciculate.

A. Forewing with black streak in submedian fold between ante-and postmedial lines .. .. .. *adjuncta.*

B. Forewing without black streak in submedial fold between ante-and postmedial lines .. .. *glenura.*

1714. EUMICHTIS ADJUNCTA.

2419*a*. EUMICHTIS GLENURA.

Sect. V.—Antennæ of male with fasciculate cilia.

1780. EUMICHTIS LEUCOSTICTA.

Genus VALERIA. *Type.*

Valeria, Steph. Ill. Brit. Ent. Haust. iii, p. 22 (1829) .. *oleagina.*

Synvaleria, Butl. Trans. Ent. Soc., 1890, p. 672 .. .. *jaspidea.*

Proboscis fully developed; palpi upturned, the 1st and 2nd joints clothed with long hair in front, the 3rd porrect, rather long and dilated at extremity; frons smooth, tufted with long hair; eyes large, rounded; antennæ of male typically bipectinated with long branches to apex, of female with short branches; vertex of head with crest; thorax clothed with long spatulate scales and hair, the pro and metathorax with spreading crests; pectus clothed with long hair; abdomen with series of large dorsal crests and lateral fringes of hair. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. II.—Antennæ of male bipectinate with long branches, the apex serrate.

1672. VALERIA HETEROCAMPA.

Sect. III.—Antennæ of male bipectinate with short branches, the apex serrate, of female ciliated.

1757. VALERIA VIVIDINIGRA, Hmpsn., Moths Ind., iv., p. 510 (1896).

Euplexia icamba, Hmpsn., Moths Ind., ii, p. 222 (nec Swinh).

Sect. IV.—Antennæ of male minutely serrate and fasciculate.

A. Forewing with the ground colour olive-green.

a. Forewing with the postmedial line incurved at discal fold .. .. *pardaria.*

b. Forewing with the postmedial line not incurved at discal fold .. .. *mucronata.*

B. Forewing ochreous white tinged with olive .. .. *icamba.*

1761. VALERIA PARDARIA.

1754. VALERIA MUCRONATA.

1755. VALERIA ICAMBA, Swinh. A. M. N. H. (6) xii, p. 260 (1893).

Euplexia heterocampoides, Hmpsn., Moths Ind., ii, p. 221 (1894).

Genus ANTITYPE.

Type.

Antitype, Hübn. Verz., p. 212 (1827) .. .. *chi.*

Polia. Hübn. Tent. ined. (nec Treit.) .. .. *flavicincta*

Proboscis fully developed; palpi obliquely upturned, short, the 2nd joint thickly clothed with hair in front; frons smooth; eyes large; antennæ of male typically ciliated; thorax clothed chiefly with scales or with hair and hair-like scales, the pro and metathorax with spreading crests; pectus clothed with long hair; tibiæ fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. II.—Antennæ of male more or less strongly serrate and fasciculate.

1799*a*. Antitype calamistis, Hmpsn., Cat. Lep. Phal. B. M. vi., p. 365, pl. 104, f. 28 (1906).

♂. Head, thorax and abdomen pale ochreous with a few fuscous scales; sides of palpi and frons fuscous; antennæ fuscous; patagia with indistinct black line near upper edge; tarsi black ringed with ochreous. Forewing pale silky ochreous tinged in parts with fuscous and sparsely irrorated with black; subbasal line represented by black striæ from costa and cell with some black scales beyond its lower extremity; antemedial line ill-defined, rather oblique, waved; claviform small, indistinctly defined by black; orbicular and reniform large, pale, indistinctly defined, the former round, the latter somewhat angled inwards on median nervure and with some pale points on its edges; traces of a medial line, oblique from costa to median nervure, then slightly waved, the area beyond it tinged with fuscous; postmedial line bent outwards below costa, then dentate, excurved to vein 4, then incurved; a subterminal series of slight pale points defined on inner side by small dentate black marks except towards costa, those above and below vein 5 more prominent; a terminal series of small black lunules. Hindwing ochreous suffused with fuscous; cilia ochreous with a fuscous line through them; the underside ochreous irrorated with fuscous, a discoidal lunule, a waved postmedial line bent inwards to costa and incurved below vein 4, a terminal series of small lunules.

Habitat.—Kashmir, Dras. *Exp.* 48 mill.

Genus Rhizotype.

Type.

Rhizotype, Hmpsn., Cat. Lep. Phal. B. M. vi., p. 573 (1906).. *flammea.*

Proboscis fully developed, palpi with the 2nd joint oblique, fringed with long hair below, the 3rd porrect; frons smooth; eyes large, rounded; antennæ of male minutely serrate and fasciculate; head and thorax clothed with hair and hair-like scales; vertex of head with crest; prothorax with large divided crest, metathorax with spreading crest; pectus clothed with long hair; abdomen with dorsal series of crests. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle;

from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the ground colour bluish-grey .. .. *poliorhiza*.

B. Forewing with the ground colour brownish-grey .. *paucinotata*.

1806*a*. RHIZOTYPE POLIORHIZA.

1814. RHIZOTYPE PAUCINOTATA.

Rhizogramma subdetersa, Staud Iris. viii, p. 325 (1895); id. Cat. Lep. Pal., p. 183.

Habitat.—TIBET; W. CHINA; KASHMIR.

Genus SYDIVA.

Type.

Sydiva, Moore, Lep. Atk., p. 65 (1882) .. .. *nigrogrisea*.

Proboscis fully developed; palpi with the 2nd joint obliquely upturned and fringed with hair in front, the 3rd porrect, very long and dilated at extremity; frons smooth; eyes large, rounded; antennæ of male minutely serrate and fasciculate; head and thorax clothed with long rough hair and hair-like scales, the vertex of head crested, the thorax without distinct crests; pectus and tibiæ clothed with long hair; abdomen clothed with rough hair; a series of dorsal crests on basal segments and lateral fringes of hair. Forewing with the apex somewhat produced, the termen obliquely curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1765. SYDIVA NIGROGRISEA.

Genus BRYOTYPE.

Type.

Bryotype, Hmpsn., Cat. Lep. Phal. B. M. vi., p. 382 (1906) .. *mesomelana*.

Proboscis fully developed; palpi oblique, fringed with hair in front, the 3rd joint short; frons smooth; eyes large, rounded; head and thorax clothed chiefly with scales, the prothorax with divided crest, the metathorax with spreading crest; tibiæ fringed with hair; abdomen with dorsal crest at base only. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male minutely serrate and fasciculate.

1781. BRYOTYPE FLAVIPICTA.

Sect. II.—Antennæ of male ciliated.

1734*a*. BRYOTYPE MESOMELANA.

Genus BRYOMIMA.

Type.

Bryomima, Staud. Iris. xii., p. 357 (1899) .. .. .. *carducha*.

Proboscis fully developed; palpi obliquely upturned, the 2nd joint fringed with hair, the 3rd short; frons smooth; eyes large, rounded; antennæ of male ciliated or almost simple; head and thorax clothed with hair and a few scales mixed, without distinct crests; tibiæ fringed with long hair on outer side; abdomen with dorsal crest at base only. Forewing with the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male with fasciculate cilia.

A. Forewing with the ante- and postmedial lines filled in with whitish .. .. *centralasiæ*.

B. Forewing with the ante- and postmedial lines not filled in with whitish.

a. Forewing more or less tinged with ochreous .. *chamæleon*.

b. Forewing olive-grey without ochreous tinge .. *virescens*.

1789. BRYOMIMA CENTRALASIÆ.

Polia centralasiæ, Staud. Stett. Ent. Zeit. xliii, p. 37 (1881); Alph. Hor. Soc. Ent. Ross, xvii, p. 77, pl. 3, f. 54; Staud. Cat. Lep. Pal., p. 180.

Hecatera transversa, Moore, Lep. Atk., p. 125 (1882).

„ *modesta*, Moore, Lep. Atk., p. 125 (1882)

Polia asiatica, Alph. Stett. Ent. Zeit. 1887, p. 169; id. Rom. Mèm. v., p 156, pl. 6, f. 7.

1789*b*. BRYOMIMA CHAMÆLEON.

Polia chamæleon, Alph. Stett. Ent. Zeit., 1887, p. 169; id. Rom. Mèm. v., p. 153, pl. 6, ff. 8.*a.b*. Staud. Cat. Lep. Pal., p. 180.

Head and thorax grey tinged with olive-yellow and reddish brown; tegulæ with slight dark medial line; patagia with bluish fuscous line near edges; tarsi banded with fuscous; abdomen grey tinged with ochreous and brown and irrorated with fuscous. Forewing grey more or less suffused with pale-reddish ochreous and thickly irrorated with fuscous; subbasal line represented by double black striæ from costa and cell; antemedial line double, minutely waved, angled inwards on vein 1; claviform short and broad, defined by black except above; orbicular and reniform with reddish annuli defined by black, both rather open above and below and constricted at middle; a rather diffused minutely waved medial line; post-

medial line slightly bent outwards below costa, then dentate, below vein 4, incurved to lower edge of reniform; a reddish subterminal line defined on inner side by small dentate blackish marks below costa and at middle, and with slight blue-grey suffusion beyond it, slightly angled outwards at vein 7 and excurved at middle; a terminal series of black points; cilia ochreous with a fuscous line through them. Hindwing ochreous nearly uniformly suffused with fuscous; cilia ochreous with a fuscous line through them; the underside whitish irrorated with fuscous, the costal area tinged with ochreous, a discoidal lunule, a diffused irregular postmedial line showing through to upperside, some fuscous suffusion on termen.

Habitat.—W. Turkistan; E. Turkistan; Kashmir, Barra Larcha, Koksu Kiujar; Punjab, Kulu. *Exp.* 48 mill.

1798. Bryomima virescens.

Genus Blepharidia.

Type.

Blepharidia, Pung. Iris. xiii., p. 122 (1900) .. .. .. *lama.*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with long hair in front; frons smooth; eyes large, rounded; antennæ of male typically minutely serrate and fasciculate; head and thorax clothed with hair and hair-like scales, the pro- and metathorax with spreading crests; tibiæ fringed with hair; abdomen with dorsal crest at base only. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. III.—Antennæ of male minutely serrate and fasciculate.

1794*a*. Blepharidia paspa.

Trigonophora grumi, Alph. Hor. Soc. Ent. Ross. xxvi., p. 449 (1892) nec. p. 447; id. Rom. Mém. ix., p. 29, pl. 1, f. 8; Staud. Cat. Lep. Pal., p. 184.

Blepharidia paspa, Püng. Iris. xiii, p. 123 (1900).

Head and thorax red-brown; tarsi dark brown with pale rings; abdomen ochreous brown. Forewing red-brown; the postmedial area brownish ochreous; subbasal line double, waved, from costa to submedian fold, with a greyish patch beyond it above vein 1, with black streak below it above inner margin; antemedial line double filled in with greyish, oblique, slightly waved, bent inwards to inner margin; claviform small, defined by black; orbicular and reniform small, with brown centres and whitish annuli defined by black, the former oblique, rather oblong, the latter narrow, open above and below; an indistinct medial line, oblique from costa to lower angle of cell; postmedial line indistinctly double, filled in with ochreous, bent outwards below costa, then minutely waved, very oblique below vein 4, some whitish points beyond it on costa; subterminal line whitish, defined

on inner side by a dark patch at costa and slight somewhat dentate marks at middle, angled outwards at vein 7 and dentate at veins 4-3; a terminal series of slight dark lunules; cilia with pale rufous line at base and intersected with rufous. Hindwing reddish-brown tinged with fuscous; a medial dark line and indistinct diffused subterminal band; the underside greyer with small discoidal lunule.

Habitat.—Tibet: Kashmir, Kiujar. *Exp.* 38 mill.

Sect. IV.—Antennæ of male ciliated.

1794. Blepharidia griseirufa.

Genus Dimya.

	Type.
Dimya, Moore, Lep. Atk, p. 121 (1882)	*..sinuata.*
Trichoridia, Hmpsn., Cat. Lep. Pal. B. M. vi., p. 400 (1906)	*..herchatra.*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with hair in front; frons smooth; eyes large, rounded; antennæ of male fasciculate or ciliated; head and thorax clothed with hair only, the vertex of head crested, the prothorax with spreading crest; pectus and legs fringed with long hair; abdomen with dorsal crest at base only and lateral fringes of hair. Forewing with the apex rather produced and acute, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3-4 from angle of cell; 5 obsolescent from middle of discocellulars; 6-7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I. (Dimya).—Antennæ of male fasciculate.

1797. Dimya sinuata.

Sect. II. (Trichoridia).—Antennæ of male ciliated.

A. Forewing with the orbicular and uniform confluent with a pale mark on median nervure .. .. *junctura.*

B. Forewing with the orbicular and uniform separate.

a. Forewing with the postmedial line not dentate. *endroma.*

b. Forewing with the postmedial line dentate.

a^1 Forewing without yellow or white lunules on subterminal line.

a^2 Forewing without white marks on reniform.

a^3 Forewing rufous .. .. .. *dentata.*

b^3 Forewing deep purplish grey..... *canosparsa.*

b^2 Forewing with white lunule on reniform .. *albiluna.*

c^2 Forewing with white annulus to reniform. *cuprescens.*

b^1 Forewing with white lunules on subterminal line .. .. *sichimensis.*

c^1 Forewing with yellow lunules on subterminal line .. .. *herchatra.*

1796. Dimya junctura.

1790. DIMYA ENDROMA.

1791. DIMYA DENTATA.

1788. DIMYA CANOSPARSA.

1788 *a*. DIMYA ALBILUNA, Hmpsn., Cat. Lep. Pal. B. M. vi, p. 404, pl. 105, f. 24 (1906).

♀. Head and thorax dark-brown mixed with ochreous and a few white hairs; pectus with ochreous hairs; tarsi ringed with yellow; abdomen grey-brown with the anal tuft fulvous. Forewing dark brown irrorated with blue-white scales except on medial area where the costal area and veins only are irrorated; subbasal line represented by slight blackish marks below costa and cell; antemedial line double, the inner line indistinct; angled outwards below costa, excurved from cell to inner margin; claviform moderate, defined by black; orbicular irrorated with blue-white and defined by black, round; reniform defined by blackish and with ochreous white lunule on its outer edge; an indistinct waved medial line; postmedial line bent outwards below costa, then dentate, excurved to vein 4, then incurved some white points beyond it on costa; subterminal line yellow-brown defined on each side by diffused black and with brown mark on its inner side below vein 7, angled outwards at vein 7 and excurved at middle; a terminal series of small black lunules; cilia black mixed with ochreous and with slight black line through them. Hindwing ochreous brown with slight discoidal spot, sinuous postmedial line, and diffused sub-terminal band; cilia ochreous with a diffused black line, near base; the underside brownish ochreous irrorated with brown, the terminal area suffused with brown, a small discoidal spot and rather diffused postmedial line excurved at median nervures, then incurved.

Habitat.—SIKHIM TIBET, Yatung. *Exp*. 38 mill.

1788*b*. DIMYA CUPRESCENS, Hmpsn., Cat., Lep. Pal. B. M. vi, p. 405, pl. 105, f. 25 (1906).

♀. Head and thorax rufous; abdomen ochreous tinged with rufous. Forewing cupreous brown slightly suffused with purplish grey especially on basal and postmedial areas; subbasal line represented by a slight grey striga from costa; antemedial line indistinctly double, filled in with grey waved, rather oblique; claviform absent; orbicular very faint with greyish centre defined by cupreous brown, small, round, reniform a narrow lunule with white annulus; postmedial line indistinctly double filled in with grey, bent outwards below costa, then dentate, oblique below vein 4; subterminal line only represented by the contrast between the greyish and cupreous areas; some whitish irroration on termen at extremity of veins. Hindwing ochreous-white suffused with cupreous brown, the terminal area rather darker; cilia rufous, paler at tips; the underside greyish irrorated with brown, the costal area tinged with ochreous, a slight discoidal lunule, sinuous postmedial line, and faint subterminal line.

Habitat.—Sikhim Tibet, Yatung. *Exp.* 34 mill.

1787. Dimya sichimensis.

1786. Dimya herchatra.

Genus Hypsophila.

Type.

Hypsophila, Staud. Stett. Ent. Zeit., 1888, p. 40 ..... *jugorum*.

Proboscis fully developed; palpi upturned to vertex of head and fringed with very long hair in front; frons smooth; eyes small, reniform; antennæ of male with fascicles of very long cilia; head and thorax clothed with long woolley hair only and without crests; pectus and leg clothed with woolley hair; abdomen clothed with woolley hair and without crests. Forewing triangular, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

1799*b*. Hypsophila jugorum.

Heliothis jugorum, Ersch. Fedtsch. Reise, p. 48, pl. 3, f. 46 (1874); Staud. Cat. Lep. pal, p. 219.

Hypsophila haberhaueri, Staud. Stett. Ent. Zeit. 1882, p. 50.

,, *pamira*, Staud. Stett. Ent. Zeit. 1888, p. 42.

♂. Head, thorax and abdomen clothed with greenish grey hair slightly tinged with rufous. Forewing greenish grey tinged with pale reddish brown and with slight dark irroration; antemedial line reddish brown, diffused, somewhat sinuous, oblique from costa to submedian fold where it is slightly angled outwards; orbicular very small, round, with slight grey annulus; reniform a fuscous lunule; postmedial line brown, very minutely dentate, oblique from costa to vein 6, excurved to vein 4, then obliquely incurved; subterminal line only defined by brown suffusion on inner side, its outer edge somewhat dentate and incurved at discal fold and below vein 3; a fine terminal dark line. Hindwing white, the basal and inner areas suffused with brown; a large blackish oblique oblong discoidal spot; terminal area black brown, its inner edge angled outwards at discal fold, then incurved to discoidal spot; cilia white. Underside of both wings whitish with the terminal area broadly fuscous leaving some whitish at apex of forewing beyond a dark bar from costa; both wings with large oblong black discoidal spot.

Ab. 1. *haberhaueri*.—Forewing with the ante-and post- medial lines defined by brown on medial area, approximated below the cell and conjoined into a brown band.

Ab. 2. *pamira*.—Forewing more uniform red-brown, the ante- and post-medial lines more approximated below submedian fold; hindwing with the

basal and inner areas more suffused with brown, leaving the discoidal spot on a white patch.

Ab. 3. Hindwing with the inner edge of terminal band less incurved at middle and well separated from the discoidal spot.

Ab. 4. Forewing with the medial area suffused with red-brown; hindwing with the discoidal spot forming a narrow lunule well separated from the inner edge of terminal band which is excurved, not angled, at discal fold.

Habitat.—W♀ Turkiestan; E. Turkiestan; Kashmir, Deosai Plains, Gourais Valley, Shoroda. *Exp.* 24-30 mill.

Genus Cteipolia.

	Type.
Cteipolia, Staud Iris. ix, p. 191 (1896)	*sacelli.*

Proboscis aborted, minute; palpi porrect to just beyond frons and fringed with very long hair below; frons smooth; eyes small, elliptical; antennæ of male with very long cilia; head, thorax and abdomen clothed with long rough hair and without crests. Forewing very narrow, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 typically strongly stalked; 5 obsolescent from middle of discocellulars; 6·7 strongly stalked; 8 anastomosing with the cell near base only.

Sect. II.—Hindwing with veins 3·4 from angle of cell.

1799c. Cteipolia acrophila, Hmpsn., Cat. Lep. Pal. B. M. vi., p. 421 (1906).

Head, thorax and abdomen brownish fuscous mixed with grey. Forewing grey suffused and irrorated with brownish fuscous; an indistinct diffused blackish subbasal line; antemedial line rather indistinct and diffused, excurved below costa and in submedian interspace; orbicular and reniform represented by small whitish spots indistinctly defined by diffused black and almost or quite conjoined; postmedial line defined by grey on outer side, bent outwards below costa, then minutely dentate, incurved below vein 4; subterminal line defined by fuscous suffusion on inner side, excurved below costa and at middle; the costa towards apex with series of black and grey points; a terminal series of black points. Hindwing semi-hyaline grey suffused with fuscous brown; the underside with small discoidal spot.

Habitat.—Kashmir, Kardong, 14,000′, Hunza. *Exp.* 24-28 mill.

Genus Elvesia.

1597. Elvesia diplostigma.

Genus Amathes.

	Type.
Amathes, Hübn. Verz., p. 222 (1827)	*litura.*
Agrochola, Hübn. Verz., p. 229 (1827)	*pistacina.*

	Type.
Rusina, Steph. Ill. Brit. Ent. Haust. ii, p. 111 (1829) ..	*circellaris.*
Anchoscelis, Guen. Aun. Soc. Ent. Fr. viii, p. 485 (1839) ..	*nitida.*
Dyschorista, Led. Noct. Eur., p. 143 (1857)	*iners.*
Spudæa, Snell, Vlind. Ned., p. 289 (1872)	*ruticilla.*
Heteromorpha, Failla. Ted. Nat. Sicil. x., p. 30 (1890) nec-Kirby Col. 1825	*ragusæ.*

Proboscis fully developed; palpi obliquely porrect, fringed with long hair in front, the 3rd joint short; frons smooth; eyes large, rounded; antennæ of male typically ciliated; head and thorax clothed with hair only, the tegulæ produced to a dorsal ridge, the pro- and metathorax without distinct crests; abdomen dorsally flattened, with lateral fringes of hair and some rough hair at base, but without crests. Forewing with the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. III. (*Amathes*).—Antennæ of male ciliated.

1597*a*. Amathes phœosoma, Hmpsn., Cat. Lep. Phal. B. M. vi., p. 488, pl. 107, f. 5. (1906).

♀. Head and thorax palebrownish ochreous; abdomen fuscous brown, darker above. Forewing palebrownish ochreous with slight dark irroration; traces of a waved subbasal line from costa to submedian fold; antemedial line very indistinct, oblique, waved; orbicular with faint brown outline, round; reniform with slight whitish annulus faintly defined by brown, constricted at middle and with its lower part filled in with pale fuscous; traces of a diffused medial line, oblique from costa to lower angle of cell, then inwardly oblique and sinuous; postmedial line almost obsolete, bent outwards below costa, then dentate and produced to a series of dark points on the veins, oblique below vein 4; the postmedial area rather darker; subterminal line indistinct, pale, defined on inner side by diffused dentate dark marks, slightly angled outwards at vein 7 and excurved at middle; a series of black points just before termen connected by a slight waved terminal line; cilia pale at base, mixed with fuscous at tips. Hindwing fuscous brown, the costal area whitish; cilia whitish tinged with brown; the underside whitish slightly irrorated with brown; a discoidal point and sinuous postmedial line with diffused spot at discal fold.

Habitat.—Punjab, Kulu, Sultanpur. *Exp.* 36 mill.

Genus Cosmia.

	Type.
Cosmia, Ochs. Schmett. Eur. iv, p. 84 (1816) non descr.; Treit. Schmett. Eur. v (1), p. 379 (1825)	*fulvago.*
Ochria, Hübn. Verz., p. 233 (1827)	*aurago.*

Type.

Cirrhia, Hübn. Verz., p. 234 (1827) .. .. .. *citrago.*
Citria, Hübn. Verz., p. 234 (1827) .. .. .. *fulvago.*
Mellinia, Hübn. Verz., p. 234 (1827) .. .. .. *palleago.*
Xanthia, Hübn. Tent. ined .. .. *fulvago.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint fringed with hair in front, the 3rd moderate; frons smooth; eyes large, rounded; antennæ of male minutely serrate and fasciculate or ciliated; head and thorax clothed with hair only, the prothorax with ridge-like crest; abdomen with some rough hair at base and lateral fringes of hair but without crests. Forewing with the apex produced and acute, the termen excurved at middle, then oblique; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked or from angle; 8 anastomosing with cell near base only.

Sect. II (*Cosmia*).—Antennæ of male ciliated.

A. Forewing with the postmedial line double.
  a. Forewing with the postmedial line minutely dentate .. .. *gilvago.*
  b. Forewing with the postmedial line not dentate .. *rectilineata.*

B. Forewing with the postmedial line single.
  a. Forewing with the postmedial line angled outwards below costa and excurved at middle.
    a^1. Forewing with the ground colour yellow.
      a^2 Forewing without two white spots on lower extremity of reniform .. .. *melonina.*
      b^2 Forewing with two white spots on lower extremity of reniform .. .. .. *distigmata.*
    b^1 Forewing with the ground colour ochreous suffused with reddish and irrorated with brown .. *albosignata.*
  b. Forewing with the postmedial line excurved from costa to vein 6, then oblique .. .. *approximata.*

1595. Cosmia gilvago.

1596. Cosmia rectilineata.

1593. Cosmia melonina.

1593*a*. Cosmia distigmata, Hmpsn., Cat. Lep. Phal. B. M., vi., p. 509, pl. 107, f. 19 (1906).

♀. Head and thorax orange-yellow largely mixed with red; tegulæ edged with brown behind; abdomen reddish ochreous dorsally suffused with brown. Forewing orange-yellow suffused and irrorated with red, the veins brown; a curved red subbasal line from costa to submedian fold; antemedial line excurved below costa, bent inwards in cell, angled outwards

in submedian fold, inwards on vein 1, then excurved to inner margin; claviform defined by red at extremity only, very large; orbicular and reniform yellow defined by red and with some red in centres, the former round, the latter with two small white spots at its lower extremity beyond lower angle of cell; an indistinct dark medial shade, oblique from costa to reniform, inwardly oblique below the cell, postmedial line brown, bent outwards below costa, then minutely dentate, excurved to vein 4, then oblique, a diffused oblique fuscous bar beyond it from costa to discal fold, with slight yellow points at costa; subterminal line red defined by yellow on outer side, dentate, slightly angled outwards at vein 7 and excurved at middle; a fine waved brown terminal line; cilia yellow intersected by brown at the veins and with a diffused brown line through them. Hindwing yellow suffused with brown, leaving the costal area, a patch in end of cell, and the termen and cilia yellow; the underside pale yellow, the costal area tinged and irrorated with red, the inner half tinged with brown, an indistinct sinuous postmedial line.

Habitat.—Punjab, Kulu, Sultanpur. *Exp.* 44 mill.

1592. Cosmia albosignata.

1592*a*. Cosmia approximata, Hmpsn., Cat. Lep. Phal. B. M., vi., p. 511, pl. 107, f. 22 (1906).

Head and thorax rufous; pectus clothed with whitish hair; abdomen ochreous dorsally suffused with brown. Forewing rufous with very slight darker irroration, the veins brown; subbasal line rufous, slightly curved, from costa to submedial fold, the antemedial line rising from costa just beyond it, very oblique, slightly excurved below costa and above inner margin; claviform large, faintly defined by rufous, orbicular and reniform large, defined by rufous, the former oblique elliptical; a rufous medial shade, oblique below costa and joining the antemedial line at inner margin; postmedial line excurved below costa, then oblique, very slightly incurved below vein 3; the postmedial area slightly suffused with brown; subterminal line dentate, slightly angled outwards at vein 7 and excurved at middle; a fine waved terminal line; cilia with a fine brown line through them. Hindwing pale yellow, the inner area suffused with brown; a faint slightly curved postmedial line and traces of a diffused subterminal band; the underside with the costal area slightly tinged with rufous, a discoidal point and slight sinuous postmedial line.

Habitat.—Kashmir, Dugi Pass, Jalauri Pass, Dana. *Exp.* 36 mill.

Sub-family Acronyctinæ.

Proboscis usually fully developed, often aborted or absent; palpi usually short, upturned or porrect, the 3rd joint sometimes long and dilated at extremity; frons sometimes with rounded prominence with corneous plate below it, or with corneous processes of various forms;

eyes naked, without bristly cilia from their margins, the eyes usually large and round, rarely small and reniform; antennæ usually ciliated, sometimes serrate or pectinated, more rarely laminated or almost simple; head and thorax clothed with hair and scales, when there are usually spreading or divided crests on the pro- and metathorax, sometimes with a flattened crest on prothorax projecting backwards, or a sharp triangular crest or dorsal ridge-like crest, or clothed with hair only, the tegulæ rarely produced dorsally into a ridge, or in one or two genera produced behind into a slight hood over the thorax; tibiæ without spines, the fore tibiæ sometimes with one or more terminal claws; the proximal joints of fore tarsi in a few genera with a series of curved claw-like spines; abdomen with dorsal series of crests, one crest at base only, or without crests, the crests on medial segments sometimes very large; Wings usually rather broad and triangular, sometimes long and narrow, the termen usually evenly curved and more or less crenulate, sometimes angled at middle or excised below apex and at tornus where there is in a few genera a scale-tooth; forewing with vein 1*a* weak, not anastomosing with 1*b*, 1*c* absent; 2 from middle of cell or in one or two cases from near its extremity; 3 and 5 from near lower angle; in *Euplixidia* vein 5 almost straight and from just below middle of discocellulars; 6 from upper angle or from just below it; 9 from 10 anastomosing with 8 to form the areole, or in a few genera the areole absent and either 7 or 10 from cell, vein 9 being sometimes absent; 11 from cell. Hindwing with veins 1*a* and 1*b* present, 1*c* absent; 3·4 from lower angle of cell, rarely stalked; 5 obsolescent from or from just below middle of discocellulars; 6,7 from upper angle or slightly stalked; 8 arising free, then bent downwards and touching the cell, then again diverging, in a few genera vein 8 anastomosing with the cell to or to beyond middle.

In the genera without an areole its absence appears to have been always caused by reduction from forms which once possessed it, as it is minute in some of their allies.

In *Eriopus* the males of most of the species have secondary sexual developments of the antennæ, the basal part of the shaft being thickened with an angular projection near its middle, often with scale-teeth or long bristles beyond it, the legs also have greatly developed tufts of hair of various forms.

The larvæ are usually smooth, the warts with one hair; all the prolegs present, the 12th somite with more or less developed dorsal hump.

In *Acronycta* the larvæ sometimes have the hairs spatulate at extremity; many species have tufts of long hair from the warts supplemented by bunches of fine feathery hair and whilst others have numerous secondary hairs from the skin, and large dorsal pencils of hair.

In *Nonagria* and allies the larvæ bore in reeds and are almost without

hairs, whilst in *Hydræcia* and the allied genera the larvæ bore in the stems and roots of various plants.

The genera *Perigea*, *Bryophila* and a few others come very close in structure to the sub-family *Erastrianæ* as regards the development of vein 5 of the hindwing, the former resembling *Amyna* and the latter *Lithacodia*, the essential difference in the sub-families being that the larvæ of the *Acronyctinæ* have all the prolegs fully developed, whilst in the *Erastrianæ* the first or first two pairs are more or less aborted.

KEY TO THE GENERA.

A. Forewing without an areole.
- *a.* Forewing with vein 7 stalked with 8·9
  - a^1. Frons with pointed corneous process .. .. *Pachylepis.*
  - b^1. Frons with slight rounded prominence .. *Micrapatetis.*
  - c^1. Frons without prominence.
    - a^2. Forewing with the termen angled at middle... *Neopistria.*
    - b^2. Forewing with the termen evenly curved.
      - a^3. Forewing with vein 9 absent .. .. *Cingalesa.*
      - b^3. Forewing with vein 9 present .. .. *Arboricornis.*
- *b.* Forewing with veins 8, 9, 10 stalked, 7 from cell.
  - a^1. Frons with transverse corneous plate .. *Xantholepis.*
  - b^1. Frons smooth .. .. *Borbotana*

B. Forewing with areole.
- *a.* Frons with long trilobate process and corneous plate below it .. .. *Mudaria.*
- *b.* Frons with truncate corneous prominence with raised edges.
  - a^1. Abdomen with dorsal crests on basal segments.
    - a^2. Proboscis aborted minute.. .. .. *Cetola.*
    - b^2. Proboscis fully developed.. .. .. *Scudyra.*
  - b^1. Abdomen with dorsal crest at base only.
    - a^2. Prothorax with spreading crest.
      - a^3. Hindwing with vein 5 from middle of discocellulars .. .. *Catamecia.*
      - b^3. Hindwing with vein 5 from below middle of discocellulars .. .. .. *Hypoperigea.*
    - b^2. Prothorax without crest.
      - a^3. Frontal prominence large.
        - a^4. Mesothorax with paired crests.. .. *Iambiodes.*
        - b^4. Mesothorax without crests .. .. *Apocalymnia.*
      - b^3. Frontal prominence very small .. .. *Thalatha.*
  - c^1. Abdomen without dorsal crests.
    - a^2. Frons with beak-shaped process from lower edge of prominence .. .. .. *Cytocanis.*

b^2. Frons with flattened plate from lower edge of prominence grooved in front .. .. *Callecia.*

c^2. Frons with wedge-shaped process in middle of prominence .. .. *Basilica.*

d^2. Frons without process in middle of prominence.

a^3. Frontal prominence long .. .. *Rabila.*

b^3. Frontal prominence short.

a^4. Palpi with the second joint reaching vertex of head .. .. .. *Stygiathetis.*

b^4. Palpi oblique, short .. .. .. *Dysmilichia.*

e. Frons with pointed prominence.

a^1. Frons with beak-like pointed prominence; palpi with the 2nd joint very broadly sealed .. *Apsarasa.*

b^1. Frons with slight pointed prominence; palpi slender .. .. *Protoseudyra.*

d. Frons with rounded prominence with transverse corneous plate at middle square in front .. *Phragmatiphila.*

e. Frons with rounded prominence with vertical ridge at middle .. .. *Pariamba.*

f. Frons with rounded prominence.

a^1. Abdomen with dorsal crests on basal segments..

a^2. Pro- and metathorax with spreading crests.. *Œderemia.*

b^2. Pro- and metathorax without crests .. *Gamycta.*

b^1. Abdomen with dorsal crest at base only.

a^2. Prothorax with spreading crest.

a^3. Build stout .. .. *Matopo.*

b^3. Build slender .. .. *Neomilichia.*

b^2. Prothorax without crests .. .. .. *Tycracona.*

c^1. Abdomen without dorsal crests.

a^2. Thorax clothed almost entirely with scales .. *Xylostola.*

b^2. Thorax clothed with hair and hair-like scales .. .. *Arcilasisa.*

g. Frons with transverse ridge .. .. .. *Antha.*

h. Frons smooth and without prominence.

a^1. Proboscis aborted or absent.

a^2. Abdomen with dorsal crest at base only .. *Calamistis.*

b^2. Abdomen without crests.

a^3. Thorax clothed with hair and hair-like scales.

a^4. Forewing with the apex produced and acute; hindwing with veins 3-4 usually stalked, 5 from below middle of disco-cellulars .. .. *Acraper.*

b^4. Forewing with the apex not produced; hindwing with veins 3·4 from cell, 5 from middle of discocellulars .. *Sphetta.*

b^3. Thorax clothed with hair only.

a^4. Palpi upturned .. .. .. *Sesamia.*

b^4. Palpi porrect .. .. .. *Simyra.*

b^1. Proboscis fully developed.

a^2. Abdomen with dorsal series of crests.

a^3. Thorax with double ridge-like crest.

a^4. Thorax clothed chiefly with scales.

a^5. Forewing long and narrow, the termen not excised towards tornus.

a^6. Tegulæ produced to a slight dorsal ridge.. .. .. .. *Delta.*

b^6. Tegulæ not produced to a dorsal ridge.

a^7. Forewing very narrow, the termen obliquely curved .. .. *Magusa.*

b^7. Forewing broader, the termen more erect .. .. *Parastichtis.*

b^5. Forewing shorter, the termen excised towards tornus.

a^6. Palpi with the 2nd joint reaching to about vertex of head .. .. *Stenopteryyia.*

b^6. Palpi with the 2nd joint reaching to about middle of frons .. *Dipteryyia.*

b^4. Thorax clothed with hair and hair-like scales .. .. *Agroperina.*

b^3. Thorax with broad ridge-like crest.. .. *Eurubita.*

c^3. Prothorax with triangular crest.

a^4. Thorax clothed chiefly with scales .. *Lophoteyia.*

b^4. Thorax clothed with hair only.

a^5. Forewing with the termen excised below vein 4 .. .. *Trigonophora.*

b^5. Forewing with the termen evenly curved.. *Chutapha.*

d^3. Pro-, meso- and meta thorax with large divided crests .. .. *Mania.*

e^3. Pro- and metathorax with divided crests.

a^4. Thorax clothed chiefly with scales.

a^5. Abdomen dorsally flattened .. .. *Cheenpa.*

b^5. Abdomen not dorsally flattened.

a^6. Forewing with vein 5 nearly straight, from just below middle of discocellulars. *Ecpleridia.*

b^6. Forewing with vein 5 curved, from just above lower angle of cell .. *Trachea.*

b^4. Thorax clothed with hair and hair-like scales .. .. *Paratrachea.*

f^4. Prothorax with spreading crest, metathorax with divided crest .. .. .. *Polyphænis.*

g^2. Pro- and metathorax with spreading crests.

a^4. Thorax clothed chiefly with scales.

a^5. Forewing with slight scale-tooth at tornus.

a^6. Forewing with the termen more or less angled at vein 4, then oblique .. *Eriopus.*

b^6. Forewing with the termen evenly curved, dentate .. .. *Data.*

b^5. Forewing without scale-tooth at tornus.

a^6. Palpi with the 3rd joint porrect .. *Ancara.*

b^6. Palpi with the 3rd joint upturned.

a^7. Palpi with the 3rd joint very long, in male tufted with long hair on inner side and recurved over head .. *Corythurus.*

b^7. Palpi with the 3rd joint shorter.

a^8. Forewing with the cilia strongly dentate towards tornus .. .. *Perigeodes.*

b^8. Forewing with the cilia slightly crenulate.

a^9. Palpi with the 2nd joint reaching vertex of head.

a^{10}. Abdomen with very large crests on 3rd and 4th segments; build slender .. .. .. *Chytonix.*

b^{10}. Abdomen with the crests on median segments equal; build stout .. .. *Perigea.*

b^9. Palpi with the 2nd joint reaching about to middle of frons.

a^{10}. Abdomen with large crest on 3rd segment; build stout .. *Euplexia.*

b^{10}. Abdomen with the crest on medial segments equal.

a^{11}. Forewing with the apex rectangular and somewhat acute .. .. .. *Gortyna.*

b^{11}. Forewing with the apex rounded .. .. .. *Oligia.*

b^4. Thorax clothed with hair and hair-like scales .. .. *Dasoechata.*

b^3. Prothorax without distinct crests.

a^4. Thorax clothed chiefly with scales.

a^5. Palpi with the 2nd joint reaching to vertex of head, the 3rd long.

a^6. Palpi with the 3rd joint porrect .. *Pseuderastria.*

b^6. Palpi with the 3rd joint upturned .. *Bryophila.*

b^5. Palpi with the 2nd joint reaching about to middle of frons, the 3rd short.

a^6. Forewing with the termen oblique towards tornus .. .. .. *Iambia.*

b^6. Forewing with the termen evenly curved.

a^7. Forewing long and narrow.

a^8. Forewing with the termen erect .. *Calogramma.*

b^8. Forewing with the termen obliquely curved .. .. .. *Prodenia.*

b^7. Forewing short and broad .. .. *Craniophora.*

b^4. Thorax clothed with hair and hair-like scales.

a^5. Mesothorax with paired crests; patagia curled upwards at extremity .. .. *Canna.*

b^5. Mesothorax without crests; patagia not curled upwards at extremity .. .. *Conservula.*

c^3. Thorax without crests .. .. .. *Clethrorasa.*

b^2. Abdomen with dorsal crest at base only.

a^3. Prothorax with sharp triangular crest, metathorax with spreading crest .. .. *Hydroecia.*

b^3. Prothorax with ridge-like crest, metathorax with spreading crest .. .. .. *Audrolymnia.*

c^3. Thorax with slight dorsal ridge-like crest .. *Pyrrhia.*

d^3. Pro-and metathorax with spreading crests.

a^4. Thorax clothed chiefly with scales.

a^5 Pro-and metathorax with the crests formed of very long spatulate scales.

a^6. Forewing with the apex produced and acute .. .. *Pœcilogramma.*

b^6. Forewing with the apex rounded .. *Opsyra.*

b^5 Prothorax with short spreading crest.

a^6. Palpi upturned, the 2nd joint reaching vertex of head.

a^7. Hindwing with vein 5 from middle of discocellulars .. .. .. *Monoïles.*

b^7. Hindwing with vein 5 from below middle of discocellulars .. *Hadjina.*

b^6. Palpi upturned, the 2nd joint reaching about to middle of frons .. .. *Namangana.*

b^5. Thorax clothed with hair and hair-like scales.

a^5. Palpi with the 3rd joint long and porrect. *Rhynchoplexia.*

b^5. Palpi with the 3rd joint short .. .. *Chiripha.*

c^4. Thorax clothed with hair only .. .. *Lasiplexia.*

c^3. Prothorax without crest, metathorax with spreading crest.

a^4. Palpi with the 2nd joint reaching to vertex of head .. .. *Aucha.*

b^4. Palpi with the 2nd joint reaching about to middle of frons.

a^3. Fore tibiæ broadly fringed with hair; forewing rather broad .. .. .. *Spodoptera.*

b^3. Fore tibiæ slightly fringed with hair; forewing long and narrow .. .. *Laphygma.*

f^2. Thorax without crests.

a^4. Palpi with the 2nd joint reaching to vertex of head .. .. *Chasmina.*

b^4. Palpi with the 2nd joint not reaching above middle of frons, the 3rd short .. .. *Acronycta.*

e^2. Abdomen without dorsal crests.

a^3. Pro and metathorax with spreading crests.

a^4. Forewing long and narrow .. .. *Arava.*

b^4. Forewing short and broad .. .. *Amphidrina.*

b^3. Prothorax with spreading crest; metathorax without crest.

a^4. Forewing narrow, the margins subparallel .. *Athetis.*

b^4. Forewing broad, triangular .. .. *Arenostola.*

c^3. Thorax without crests.

a^4. Thorax clothed chiefly with scales.

a^5. Forewing long and narrow .. .. *Prodenus.*

b^5. Forewing short and broad.

a^6. Palpi with the 2nd joint reaching to vertex of head slender.

a^7. Palpi flattened against frons .. .. *Callyna.*

b^7. Palpi cylindrical .. .. .. *Elydna.*

b^6. Palpi with the 2nd joint reaching to middle of frons, broadly scaled .. *Nicara.*

b^4. Thorax clothed with hair and hair-like scales.

a^5. Abdomen dorsally flattened.

a^a.	Palpi with the 2nd joint fringed with hair in front; hindwing with vein 5 from below middle of discocellulars ..	*Pyrois.*
b^a.	Palpi smoothly scaled; hindwing with vein 5 from middle of discocellulars ..	*Amphipyra*
b^1.	Abdomen not dorsally flattened.	
a^b.	Head and thorax clothed with rough hair and spatulate scales	*Oroplexia.*
b^b.	Head and thorax smoothly clothed with Hair and hair-like scales	*Colymnia.*
c^b.	Thorax clothed with hair only ..	*Hypa Calamia.*

Genus PYROIS.

Type.

Pyrois, Hübn. Verz., p. 208 (1827) .. .. .. *cinnamomea.*

Syntomopus, Guen. Ann. Soc. Ent. Fr. vi, p. 223 (1837) .. *cinnamomea.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and fringed with hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male minutely ciliated; thorax clothed with hair and hair-like scales and without crests; tibiæ fringed with long hair; abdomen dorsally flattened, clothed with rough hair at base and with lateral fringes of hair towards extremity, but without crests. Forewing with the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1659. PYROIS ALBICILIA.

Genus AMPHIPYRA.

Type.

Amphipyra, Ochs Schmett. Eur. iv, p. 70 (1816) non descr; Triet. Schmett. Eur. v. (1), p. 276 (1825) .. .. *tragopogonis.*

Scotophila, Hübn. Verz., p. 208 (1827) .. .. .. *livida.*

Pyrophila, Steph. Ill. Brit. Ent. Haust. ii, p. 164 (1829) .. *tragopogonis.*

Phiopyra, Guen. Ann. Soc. Ent. Fr. vii, p. 116 (1838) .. *pyramidea.*

Pyrophia, Hübn. Tent. ined. .. .. *pyramidea.*

A. Hindwing cupreous red.

a Forewing with the ante and postmedial lines present.

a^1 Forewing with strong dentate dark marks in the interspaces before subterminal line and streaks beyond it .. .. *magna.*

*b*¹ Forewing with the dentate marks before subterminal line and streaks beyond it slight .. *pyramidea*.

b Forewing with the ante and postmedial lines absent.

*a*¹ Hindwing deep cupreous red; size large.. .. *cupreipennis*.

*b*¹ Hindwing pale cupreous red; size moderate .. *livida*.

B. Hindwing not cupreous red .. .. .. *tragopoginis*.

1656. AMPHIPYRA MAGNA.

1655. AMPHIPYRA PYRAMIDEA.

Noctua pyramidea, Linn. Syst. Nat. Ed. x., p. 518 (1758); Esp. Schmett. iv., pl. 171, ff. 1-3; Hübn. Eur. Schmett. Noct., f. 36; Godart. Lèp. Fr. v., p. 136, pl. 56, f. 4; Donovan Brit. Inc. vi., pl. 193; Steph. Ill. Brit. Ent. Haust. ii., p. 164; Staud. Cat. Lep. pal., p. 200.

Amphipyra monolitha, Guen. Noct. ii., p. 414 (1852).

„ *surnia*, Feld. Reis. Nov., pl. 112, f. 17 (1874).

„ *obscura*, Obuth. Et. Ent. v., p. 85 (1889).

„ *obliquilimbata*, Grs. Berl. Ent. Zeit. 1888, p. 352.

1658. AMPHIPYRA CUPREIPENNIS.

1657. AMPHIPYRA LIVIDA.

Noctua livida, Schiff. Wien. Verz., p. 85 (1776); Fabr. Mant. Ins. ii, p. 138 (1787); Hübn. Eur. Schmett. Noct. f. 38; Godart. Lèp. Fr. v., p. 141, pl. 57, f. 1; Staud. Cat. Lep. pal. p. 200.

„ *scotophila*, Hübn. Beitr. I. 3-4. Z., p. 34 (1788); Esp. Schmett. iv., pl. 170, f. 3 (1791).

Amphipyra corvina, Motsch. Bull. Mox. xxxix., p. 194 (1866).

1659*a*. AMPHIPYRA TRAGOPOGINIS.

Noctua tragopoginis, Linn. Faun. Suec. p. 316 (1761); Clerck, Icones. pl. 1., f. 1; Esp. Schmett. iv., pl. 170, ff. 1-2; Hübn. Eur. Schmett. Noct. f. 40, Godart, Lèp. Fr. v., p. 145, pl. 57, f. 3; Steph. Ill. Brit. Ent. Haust. ii., p. 165; Smith, Cat. Noct. N. Am., p. 197; Staud. Cat. Lep. pal., p. 200.

„ *lucida*, Hübn. Ben. Mag. iii, p. 294 (1767).

Agrotis repressus, Grote, Can. Ent. iii, p. 192 (1871).

Amphipyra turcomana, Staud. Stett. Ent. Zeit., 1888, p. 32.

„ *bragi*, Lambillion, Rev. Ent. Namur, 1907, p. 29.

Head, thorax and abdomen pale glossy red-brown; palpi fuscous brown; pectus and legs darker red-brown. Forewing pale glossy red-brown irrorated with a few white scales; subbasal, antemedial and postmedial lines absent; orbicular represented by a blackish point, the reniform by two points; subterminal line represented by a series of white points on the veins, with a dark brown shade before them incurved below vein 3; a terminal series of

slight black lunules; cilia with a dark line near base. Hindwing whitish suffused with pale red-brown, the terminal area darker; a fine waved dark terminal line; cilia red-brown with a fine yellowish line at base; the underside whitish tinged with rufous, the costal and terminal areas to vein 2 red-brown irrorated with whitish, a small dark discoidal spot.

*ab.*1. *turcomana*, paler; forewing leaden grey with a yellowish tinge.

Habitat.—Canada; U. S. A.; Europe; Armenia; Asia Minor; Syria; Persia; W. Siberia; Kashmir, Scinde Valley; Punjab, Kulu.

Larva. Meyr. Brit. Lep., p. 114; Barrett. Lep. Brit. v, p. 253, pl. 217, f. 2. Green; dorsal, subdorsal and spiracular lines, white or pale yellow, the last sometimes partly edged with black above; head green; somite 11 with slight prominence.

Food plants. *Plantago*, Hawthorn, *Aquilegia*, etc., 5-6.

Genus Mania.

	Type.
Mormo, Ochs. Schmett. Eur. iv, p. 70 (1816) non descr.	*maura.*
Mania, Treit. Schmett. Eur. v (1), p. 294 (1825)	*maura.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately scaled in front, the 3rd moderate; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed with scales and hair mixed, the pro, meso and metathorax with divided crests; tibiæ moderately fringed with hair; abdomen clothed with rough hair, with dorsal series of crests and lateral fringes of hair. Forewing very broad, the apex rectangular, the termen evenly curved and the termen and cilia strongly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1766*a*. Mania oli"escaria.

Genus Magusa.

	Type.
Magusa, Walk. xi, 762 (1857)	.. *orbifera.*
Sasunaga, Moore, P. Z. S., 1881, p. 342	.. *tenebrosa.*
Callixena, Saalm. Lep. Madag., p. 324 (1891) ..	.. *versicolora.*

1771. Magusa tenebrosa.

Genus Stenopterygia.

	Type.
Stenopterygia, Hmpsn. Cat. Lep. Phal. B. M. vii, p. 61 (1908).	*subcurva.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately scaled, the 3rd short, porrect; frons smooth,

same colour, with thickened bases, about a foot long, nodding, sometimes branched. Fruit sessile on thickened knobs, first yellowish, then red, and finally black purple, ½ inch long, 3-4 lines wide, mucronate, with the more or less split perianth at the base. Seed ovoid, compressed, rather deeply furrowed on one side up to the middle, and indistinctly so on the opposite side. Embryo basilar.

HABITAT.—Aestuarial shores from Bengal to Burma and the Andaman Islands; forms a considerable portion of the impenetrable woods which cover the Sunderbuns; along the Salwin, between Amherst and Moulmein; Penang; Siam; Cochin China

FLOWERS.—In March and April; fruit ripens from June to December.

USES.—The leaves are used in the Sunderbuns to make ropes for tying boats and logs, and also for thatching.

The stems of the smaller trees are used as walking sticks; the longer ones serve for rafters.

The natives believe that snakes get out of the way of any person having such a stick.

CULTIVATION.—This palm is worth cultivation on account of its elegance, and well adapted for bank scenery.

ILLUSTRATION.—Plate VII. The photograph, supplied by Major Gage, shows a dense tuft of *Phœnix paludosa*. This species is not likely to be confounded with any other. Its habit is less genuine than in the others. In the big leaf in the foreground of the picture the bifarious arrangement of the solitary and downwards curved leaflets can be distinctly seen.

PHŒNIX ROBUSTA, Hook, f., Fl. Brit. Ind., VI, 427; Woodrow in Journ. Bomb. Nat. Hist. Soc., XII, 526; Rec. Bot. Surv. Ind., I, part 6,94; Brandis, Ind. Trees, 645; Cooke, Fl. Pres. Bomb., II, 801.—*Phœnix humilis*, Royle, *var. robusta*, Becc. Males. III, 379.

Name: Shelu (Mar.).

DESCRIPTION.—Trunk 15-20 feet high, about 15 inches in diameter, closely clothed and appearing tessellated from the spirally arranged sheaths of fallen leaves. Leaves 3-5 feet long, glabrous, shining, shorter, broader, thinner, and smoother than

those of *Phœnix sylvestris;* leaflets in fasicles, quadrifarious, strongly conduplicate. Spathe fringed with brown wool on the keel. Fruiting peduncle 2 feet long. Ripe fruit brown.—Materials are wanting for a complete diagnosis.

HABITAT.—On Parasnath in Behar; Deccan; gregarious on the top of trap hills near Bhorkas; Western Ghats: Nandgaon.

FLOWERS in February.

USES.—Woodrow says that in the country near Bhorkas, where it is locally abundant, it is used largely for the manufacture of date-matting.

* * Introduced Species.

PHŒNIX DACTYLIFERA, L. Hort. Cliff., 482; Spec. Pl. ed. Willd., IV. 730.—*P. excelsior*, Cavan. Icon. et Descr. Pl. II. 13.

NAMES.—The Edible Date; Khajur, Khaji (Hind.); Khajur (Beng.); Kasser (Bhot.); Khajur, Khaji (Panj.); Mach (N. Baluch.); Kajura (Pushtu); Karmah (Turki.); Pind Chirdi, Kurma, Tar, Khaji (Sind); Khajur (Bomb.); Kharjur (Mar.); Khajur, Karek (Guz.); Perich-chankay (Tam.); Kharjurapu, Perita, Mudda Kharjurapu (Tel.); Kharjura (Kan.); Swonpalwon (Burm.); Indi (Sing.); Pindakharjura (Sans.).

DESCRIPTION.—A tall tree, attaining 100-120 feet; trunk covered with the persistent bases of petioles; the foot often surrounded by a dense mass of root suckers which is never the case in *P. sylvestris*. Leaves grey, longer than those of *P. sylvestris*; pinnæ 8-16 inches long, regularly distichous, forming a very acute angle with the petiole, often approximate in twos or threes on the same side of the petiole; petiole grey, laterally compressed, almost flat. Male panicles white, compact, 6-9 inches long, on a short peduncle, flowers $\frac{1}{4}$-$\frac{1}{3}$ inch long, sweet scented; sheaths outside with rusty down. Peduncles of female inflorescence $\frac{1}{3}$-$\frac{1}{2}$ inch broad, sometimes broader below, spikes 12-24 inches long. Fruit oblong, 1-3 inches long, generally reddish or yellowish-brown when ripe, pulp fleshy sweet; numerous varieties are cultivated, differing in colour, shape, and taste of the fruit. Seed cylindric,



Phœnix dactylifera, L.

with a longitudinal furrow in front, and a small cylindric embryo in the middle of the rounded back. When the seed germinates, that end of the embryo which remains enclosed in the albumen enlarges at the expense of the albumen, the horny substance of which is converted into sugar and other soluble substances, which are absorbed by the embryo furnishing the substance for its early growth. The process is analogous to the conversion into sugar of the starch which fills the cells of the albumen of wheat, maize, rice and bamboos, during germination, with this difference, that the starch forms the contents of the cells, whereas, in the stone of the date, the walls of the cells themselves furnish the food of the growing embryo.

HABITAT.—In India the date palm is cultivated and self-sown in Sind and in the Southern Panjab, particularly near Multan and Muzaffargarh, also in the Sind Sagar Doab and trans-Indus territory. Near Dhera Ghazi Khan, date palms are very numerous on a strip 10-12 miles long from north to south. A few trees are found planted at many places in the Eastern Panjab, also at Saharanpur, and here and there in the Ganges Doab and Bandelkhand. It is also grown in the Deccan and Gujarat, but does not thrive in Bengal. The tree was probably introduced into India at the time of the first Mahomedan conquest of Sind, at the beginning of the eighth century. It thrives luxuriantly in the arid rainless regions of North Africa and West Asia, where it is exposed to extreme heat in the day-time, and not uncommonly to frost at night, but it requires a certain amount of moisture in the soil. In Europe it is cultivated in Spain, where it was introduced by the Arabs, and where it produces eatable fruit; also on the Hyères islands, the Riviera near Nice, St. Remo, and Genoa, where it attains its northernmost point at 44° 30′ N. L. There is a wood of Date Palms at Bordighera near St. Remo, said to contain over 4,000 stems cultivated mainly to yield palms for Palm Sunday at Rome. In South Italy, Sicily, and Greece, the tree is not uncommon, but the fruit is small and poor.

FLOWERS in March and April; fruit ripens in August, September, and October.

HISTORY.—We do not feel competent to write a better account of the history of the Date Palm than DeCandalle in his "Origin of Cultivated Plants." His arguments are the following :—

"The Date Palm has existed from prehistoric times in the warm dry zone, which extends from Senegal to the basin of the Indus, principally between parallels 15 and 30. It is seen here and there further to the north, by reason of exceptional circumstances and of the aim which is proposed in its cultivation. Far beyond the limit within which the fruit ripens every year, there is a zone in which they ripen ill or seldom, and a further region within which the tree can live, but without fruiting or even flowering. These limits have been traced by de Martius, Carl Ritter and myself.

"As regards the Date Palm we can hardly rely on the more or less proved existence of really wild indigenous individuals. Dates are easily transported; the stones germinate when sown in damp soil near the source of a river, and even in the fissures of rocks. The inhabitants of oases have planted or sown Date Palms in favourable localities where the species perhaps existed before man, and when the traveller comes across isolated trees at a distance from dwellings, he cannot know that they did not spring from stones thrown away by caravans. Historical and philological data are of more value here, though doubtless from the antiquity of cultivation they can only establish probabilities.

"From Egyptian and Assyrian remains, as well as from tradition and the most ancient writings, we find that the Date Palm grew in abundance in the region lying between the Euphrates and the Nile. Egyptian monuments contain fruits and drawings of the tree. Herodotus in a more recent age (fifth century before Christ), mentions the wood of the Date Palms of Babylonia, and still later Strabo used similar expressions about those of Arabia, whence it seems that the species was commoner than it is now, and more in the condition of a natural forest tree. On the other hand, Carl Ritter makes the ingenious observation that the earliest Hebrew books do not speak of the Date Palm as producing a fruit valued as a food for man. David, about one thousand years before Christ, and about seven centuries after Moses, does not mention the

Date Palm in his list of trees to be planted in his gardens. It is true that except at Jericho dates seldom ripen in Palestine. Later, Herodotus says of the Babylonian Date Palms that only the greater part produced good fruit which was used for food. This seems to indicate the beginning of a cultivation perfected by the selection of varieties and of the transport of male flowers into the middle of the branches of female trees, but it perhaps signifies also that Herodotus was ignorant of the existence of the male plant.

"To the west of Egypt the Date Palm had probably existed for centuries or for thousands of years when Herodotus mentioned them. He speaks of Libya. There is no historical record with respect to the oases in the Sahara, but Pliny mentions the Date Palm in the Canaries.

"The names of the species bear witness to its great antiquity both in Asia and in Africa, seeing they are numerous and very different. The Hebrews called the Date Palm tamar, and the ancient Egyptians beg. The complete difference between these words, both very ancient, shows that these peoples found the species indigenous and perhaps already named in Western Asia and in Egypt. The number of Persian, Arabic, and Berber names is incredible. Some are derived from the Hebrew word, others from unknown sources. They often apply to different states of the fruit, or to different cultivated varieties, which again shows ancient cultivation in different countries. Webb and Berthelot have not discovered a name for the Date Palm in the language of the Guanchos, and this is much to be regretted. The Greek name phœnix refers simply to Phœnicia, and the Phœnicians, possessors of the Date Palm. The names dactylus and date are derivations of dachel in a Hebrew dialect. No Sanskrit name is known, whence it may be inferred that the plantations of the Date Palm in Western India are not very ancient. The Indian climate does not suit the species. The Hindustani name kharma is borrowed from the Persian.

"Further to the East the Date Palm remained long unknown. The Chinese received it from Persia, in the third century of our era, and its cultivation was resumed at different times, but they have now abandoned it. As a rule, beyond the arid region which

lies between the Euphrates and the south of the Atlas and the Canaries, the Date Palm has not succeeded in similar latitudes, or at least it has not become an important culture. It might be grown with success in Australia and at the Cape, but the Europeans who have colonized these regions are not satisfied, like the Arabs, with figs and dates for their staple food. I think, in fine, that in times anterior to the earliest Egyptian dynasties the Date Palm already existed, wild or sown here and there by wandering tribes, in a narrow zone extending from the Euphrates to the Canaries, and that its cultivation began later as far as the north-west of India on the one hand and the Cape de Verde Islands on the other, so that the natural area has remained very nearly the same for about five thousand years. What it was previously, palæontological discoveries may one day reveal."

USES.—The importance of the Date Palm is very extensive. A considerable part of the inhabitants of Egypt, Arabia and Persia subsist almost entirely on its fruit. They make a conserve of it with sugar, and even grind the hard stones in their hand-mills for their camels. "All Fezzan and half of Tripolitania satisfy most of their wants with the products of it. The huts of the poorer classes are entirely made of its leaves, and the more substantial habitations of the rich chiefly consist of the same material; every door, every post is made of its wood, and the ceilings of the rooms are formed by its trunks. The footstalks furnish the most common fuel, and they are often brought on men's backs from a distance of six to eight miles. The fruit is the common food of both man and beast: camels, horses, dogs, all eat dates. Even the stones are soaked in water, and when they have thus become soft are given to the cattle. The number of the Date Palms cultivated is enormous. When Abdel-Gelil besieged Suckna, in 1824, he cut down no fewer than 43,000 trees, to compel the town to surrender; nevertheless there are still at least 70,000 left. Their produce is comparatively small, a hundred full-grown trees yielding about forty cwts. of dates. These, after having been gathered, are dried in the sun, and quite hard buried in the sand. They may thus be preserved about two years, but generally after eighteen months they are attacked by worms, and in the beginning of the third year nothing remains of

them, save the stones. As an every day food, dates are considered very heating, in consequence of which they are not much used on journeys, as causing great thirst. The most relishing and wholesome way to eat them is, when made into a paste, mixed with barley. When the heart of the leaves has been cut out a sweet thickish fluid collects at that cavity, called lagbi, which is very refreshing and slightly purgative. A few hours afterwards the fluid begins to ferment, becomes acid and very intoxicating. From the ripe fruit a kind of treacle is prepared, used especially for coating leather bags or pipes to render them tight."—(Vogel). In the Punjab dates form an important article of food in certain districts, and they are sold in the bazaar under different names, according to quality and the mode of preparation. Thus, according to Coldstream, the most esteemed kind is called Chirni in the Muzaffargarh district; this is the date of the best palms, split up in the middle and dried in the sun. The second best is called Pind; it is eaten as it comes from the tree, without further preparation. The least esteemed kind is Bugri, taken from inferior trees and boiled in oil and water. The Punjab dates are smaller than those of Arabia and Egypt, but they are very good, and particularly so when there has been little or no late rain. When beginning to get ripe, a piece of matting is often put over the cluster of dates to prevent birds eating them. The kernels are deemed medicinal. The large succulent head, cut from among the mass of leaves, is eaten (Gaddah, Gari, Galli). The tree yields a gum, called Hukm Chil. Attempts have been made, but without much success, to tap the Date Palms of Multan for their sugary sap.

The wood of the Date Palm is lighter than that of Cocos or Borassus. The cellular tissue is soft; the vascular bundles generally show, on a horizontal section, an oval shape with two distinct large pores at one end, the hard woody portion gray; on a vertical section they appear as shining narrow lines. The wood of male trees and of trees past bearing is used for building, water-channels, bridges, and various other purposes.

Of the leaves, mats and the bag-like baskets universally used in the whole Mediterranean region, and in other countries, are made.

In the Punjab mats and fans are made of the leaves; they are called Butra or Pattra in Muzaffargarh, and Khushab in Shahpur. The leaf stalks make excellent light walking-sticks, split up they furnish material for crates and baskets; the fibrous network, which forms the sheathing base of the petiole, is called Kabal or Khajur-ka-bokla in Muzaffargarh, pack-saddles for oxen are made of it, and the fibre separated is made into ropes.

The sap is obtained by cutting off the head of the palm and scooping out a hollow in the top of the stem, where, in ascending, it lodges itself. Three or four quarts of sap may be obtained daily from a single palm, for ten days or a fortnight, after which the quantity lessens, until, at the end of six weeks or two months, the stem is exhausted, becomes dry, and is used for firewood. This liquor is sweetish when first collected and may be drunk as a mild beverage, but fermentation soon takes place, and a spirit is produced, which is distilled, and forms one of the kinds of Arrack, or spirit of eastern countries. Such being the importance and multiplied uses of the Date Palm, it is not surprising that in an arid and barren country it should form so prominent a subject of allusion and description in the works of Arab authors, and that it should be said to have 300 names in their language. Many of these are however applied to different parts of the plant, as well as to these at different ages. The Mahomedans are very proud of the Date Palm, and say that it refuses to grow well in any country which is not consecrated to Islam. There are many varieties, all exactly alike in appearance, but differing in the fruit. In Baghdad alone there are 40 or 50 well-known kinds of dates, some of them bearing romantic names, such as "lady's fingers," and "pretty maiden's eyes." In the Basra district there are even more varieties, as well as a vastly greater number of trees. The palms between Fao at the mouth of the river and Gurna and at the junction of the Tigris and Euphrates are numbered in millions, and each brings in an average income of Rs. 3 or 4 a year.

"The exports of Indian dates are not as yet important; they have averaged about 130 cwt., valued at Rs. 1,215, during the four years ending 1904-5, but in 1905-6 were only 34 cwt., valued at Rs. 364, and in 1906-7, 14 cwt., valued at Rs. 254. The

re-exports, during the same period, were as follows:—1900-1, 34,444 cwt., valued at Rs. 1,69,263; 1901-2, 27,632 cwt., valued at Rs. 1,41,939; 1902-3, 47,041 cwt., valued at Rs. 2,18,455; 1903-4, 25,330 cwt., valued at Rs. 1,27,277; 1904-5, 22,260 cwt., valued at Rs. 1,24,684; 1905-6, 23,542 cwt., valued at Rs. 1,31,373; and in 1906-7, 27,945 cwt., valued at Rs. 1,69,639.

"The foreign supplies, on the other hand, are large and important; in 1900-1 they came to 871,272 cwt., valued at Rs. 41,94,972; 1901-2, 901,006 cwt., valued at Rs. 42,11,091; 1902-3, 633,390 cwt., valued at Rs. 31,43,967; 1903-4, 725,003 cwt., valued at Rs. 36,27,590; 1904-5, 812,284 cwt., valued at Rs. 40,96,034; 1905-6, 867,229 cwt., valued at Rs. 44,87,709; and in 1906-7, 814,781 cwt., valued at Rs. 48,37,461. The largest quantities come usually from Turkey in Asia, *viz.*, 479,200 cwt. in 1906-7; Arabia, 238,101 cwt.; and Persia, 73,863 cwt., and are received chiefly by Bombay and Sind, which took as their shares 562,335 cwt. and 205,571 cwt. respectively."—(Watt).

I think it is not out of place to say a few words about the so-called "date-marks" or "Baghdad boils," as some wanted to find a connection between these boils and the eating of dates. The boils make their appearance in July or August as a small pimple, which grows very slowly for several months, and then becomes tender and swollen, continues as an open sore for some months more and slowly dries up. Considering the virulence of the sore, it is remarkably little painful, unless it happens to come on a joint or a part much exposed to knocks. Children are the greatest sufferers, and are always attacked on the face. Scarcely any resident of Baghdad, either European or Native, escapes from these boils, which in severe cases may cause the loss of the sight of an eye or carry off a bit of the nose or lip. Why the name "date-marks" should be given to these boils is not easy to understand; many explanations are offered but none seem satisfactory. Some say that they come from eating dates, but this is certainly untrue. Others maintain that they are so called because they afflict people in date-bearing countries; but this explanation does not hold good either, for Basra is far more the region of Date Palms than Bagh-

dad, and yet is free from the plague of boils. Another theory is that they are called date-marks, because they almost always begin during the season of the ripening of the dates, and yet another that the name comes from the shape of the scar left, which is generally a long oval, not unlike the shape of the fruit. Some people boldly, casting aside any connection between the boils and dates, lay the blame on the unprotesting mosquito (*cf.* Journal, B. N. H. S., XVIII, 700). And they are right in doing so. Dr. Wright discovered in 1903 a small protozoon, called Leishmania tropica Wrightii, which is transferred to man by mosquito bites. This parasite causes first an inflammation, then a swelling and, finally, a boil.

CULTIVATION.—In the "Agricultural Ledger" (1906, No. 1), Mr. Fletcher gives a full account of the conditions under which successful cultivation of this valuable tree is carried out in countries other than India. He ascribes the uniform failure of the many attempts that have been made in this country to improve and extend the very limited cultivation of the Date Palm, to a lack of appreciation of those conditions. We give in the following some extracts from Mr. Fletcher's article :—

"The low relative humidity and rainfall in all typical date-growing regions is very marked, and the lower these factors are the better is the quality of the dates grown. Excessive humidity probably acts indirectly by tempering the heat of the sun, while rain at the time of flowering spoils the pollen and during the ripening season causes fermentation in the fruit. The general time of flowering in almost all regions of the date belt is March to May and that of ripening August to November."

On an average, rainfall during the flowering and fruiting period should not much exceed 5 inches. In addition to this, irrigation is an essential accompaniment to the cultivation of the Date Palm. When the trees are in a dormant condition they can stand a temperature as low as 20° F., but for the formation of flowers and fruits a mean temperature of more than 64° F. is required; early varieties of dates will ripen fruit, if the mean temperature for the fruiting season (May to October) is above 70° F. and for one

month at least above 80°. For the moderately late varieties these temperatures must be above 75° and 85° respectively, and for the best and latest varieties 84° and 94°. The tree must, moreover, be exposed to the direct rays of the sun; it will not grow under shade even when young.

The physical character of the soil, whether sand, loam or heavy clay, seems to have little influence on the growth and productiveness of the tree, except, perhaps, that on light soils flowers and fruits develop earlier than on heavy ones. On the whole sandy loams appear to be best suited for the cultivation of dates.

The Date Palm is equally indifferent to the quantity of alkali in the soil. The United States Department of Agriculture investigating the soils of the Algerian palm-bearing tracts came to the conclusion that this plant, although it can grow in soils containing 3 to 4 per cent. of their weight of alkali, does "not produce fruit, unless its roots reach a stratum of soil where the alkali content is below 1 per cent. and does not yield regular and abundant crops unless there are layers in the soil with less than 0·6 per cent. of alkali."

Propagation may take place in two ways by seeds and offshoots. Mr. Fletcher describes the method of rearing seedlings as follows:—"The seeds should be sown in a seed-bed that has been specially prepared on sweet soil by ploughing in a mixture of ordinary farmyard manure and on oil-cake at the rate of about 10 tons of the former and 400 lbs. of the latter per acre. Suitable oil-cakes for India are those obtained from the castor-oil plant (*Ricinus communis*), *Eruca sativa* or any of the mustard family; these cakes have the property of more or less preventing the attacks of white ants. Emphasis is laid on the fact that the soil of the seed-bed should be sweet and not impregnated with alkali soils (reh or usar lands), since, though offshoots and adult plants will tolerate large amounts of such salts, a very small percentage of these in the soil will suffice to kill the seedlings soon after germination, if not actually to prevent germination.

"After this preparation, the seed-beds should be irrigated in March or April and two or three days later the seeds sown in it at a depth of 1 or 2 inches in rows, 3 feet apart with intervals of 3 feet

between seeds in the rows. The bed should then be watered every second day or so for the first three or four months and after that every week for a second period of similar duration; thenceforward the palms should be irrigated every month in the hot weather and every two months in the cold weather.

"The seedlings may be transplanted from April to September after reaching the age of three years. Preferably they should be left in the seed-bed until they flower. This in good soil may occur six to ten years after sowing—the shorter period being sufficient in a locality where the average temperature is high. When the flowers appear and then only the sex can be determined with certainty; the superfluous males may, therefore, now be weeded out and abandoned. During the process of transplantation the largest leaves of the seedlings should be cut off at a distance of about 2 feet from their bases. Special attention is called to the fact that though the adult palm requires water of irrigation only at long intervals or not at all if the subsoil is kept constantly moist by natural sub-irrigation, the seed will not germinate or the seedling survive unless water is present in abundance."

As one male tree will, under cultivation, suffice for the fertilization of about 100 females, it is evident that propagation by seeds is not to be recommended. The only rational method is by means of offshoots.

These are suckers arising from the base of the stem when the tree is between about 6 and 16 years old. Offshoots borne on male trees will give rise to male trees, and on female trees, females. The fruit will be of the same quality as that of the parent palm.

When the offshoots are from 3 to 6 years old they are separated from their parent with an ordinary hatchet by means of a cut parallel to the stem. The large leaves are removed and only the bud and young leaves are left on the rootless stump. April to September is probably the best time for the removal of the suckers in India. "The offshoots should be planted in rows 25 feet apart with similar intervals between plants in the row. For this purpose holes 3 feet deep and the same distance in diameter are made in the soil; half of the excavated earth is mixed with its own volume of farmyard manure with 4 or 5 lbs. of oil-cake and

filled in, the offshoot being set in the centre of this hole. In doing this it is most important that the bud in the centre of the leafstalks and young leaves should not be choked by being covered with soil. For this reason the offshoot should be planted with the bud two or three inches above the general level of the ground and a circular trench a foot in width be dug round it for the purpose of irrigation. The offshoots should be watered every day for the first month, twice a week for the second month, and thenceforward every month for at least a year." No general rule can be given with regard to the amount of water required. This depends on local conditions; further, the palm needs more water during certain seasons of the year than others. Generally, at the time of flowering (February to March) little or no water should be given; from May till the fruit ripens water should be given liberally.

The time of flowering is determined by climate and soil, and the amount of water applied to the trees. Generally speaking, eight years in the case of propagation by seed, and four or five years after being detached from the parent stem in the case of propagation by offshoots, may be considered to be the age at which appreciable quantities of fruit are produced. The male inflorescence with its enclosing spathe is cut from the tree usually immediately before, but sometimes immediately after the splitting of the spathe. One inflorescence consists of over 100 slender branches, of which one or two bear sufficient pollen to fertilize a whole female inflorescence. When the female inflorescence becomes visible between the separating parts of its spathe, one or two branches of the male inflorescence are inserted among its branches. The enclosing branches of the female inflorescence are then loosely bound together with a thin strip of a palm leaf or string. This is regularly done in Arabia, but not in Sind.

About the beginning of June it is advisable to remove some clusters of fruit from the tree in order to increase the supply of good material to the remainder. One inflorescence will develop from 10 to 40 lbs. of ripe dates; a whole tree yields from 50 to 500 lbs., on the average 120 lbs.

The dates of one bunch do not ripen at the same time. In spite of this the bunch is usually cut off bodily when about half of the

dates are ripe and is hung in a dry shady place until the rest ripen; but if the variety is a valuable one, the dates are picked singly as they ripen.

The varieties of dates number some thousands in all. According to Mr. Fletcher they may be classed as belonging to three types :—

Class I.—"Soft Dates."—These are the kind sold in the European and American markets. The percentage of sugar they contain is so high (60 per cent.) as to preserve or candy them naturally. In some cases it is necessary to allow some of the syrup to drain off before packing.

Class II.—"Medium Dates."—These, too, are soft, but do not contain enough sugar to preserve them naturally. They do not dry readily and are, therefore, generally eaten fresh from the tree.

Class III.—"Dry Dates."—These are hard and not sticky even when ripe and may be allowed to dry on the tree. They can be stored without special preparation. They are esteemed in date-growing tracts for local consumption though not so sweet as the preceding classes.

Mr. Fletcher gives an instructive table of some well-known varieties of dates, which might be of interest to many who have no access to the publications of the Agricultural Department :

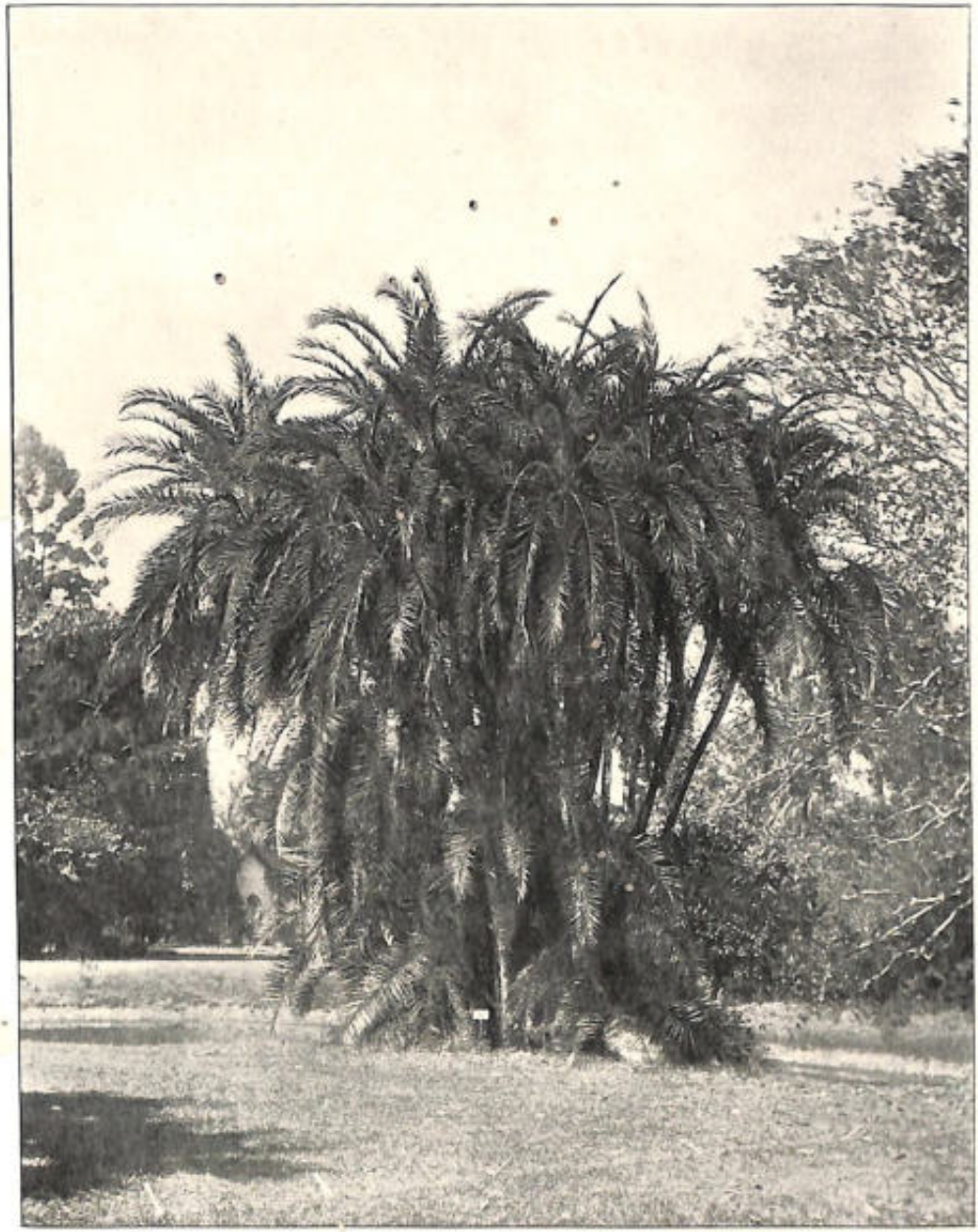
SOME WELL-KNOWN VARIETIES OF DATES.

Type.	Country.	Centre.	Name of Variety.	Date of ripening.	Soil required.	Market.	Remarks on character of fruit.
Class I.	Morocco	Tafilet Oases	Tafilet	October	Sandy	England	Darker than the Deglet Noor.
		Tougourt	Deglet Noor	"	"	America and England	Medium size and dark brown.
	Algeria	M'zab	Teddala	September	"	Local	Long and yellow.
		Biskra	Ghars	"	Clay	"	
	Tunis	.....	Monakhir	October (end)	Sandy	"	Said to be superior even to Deglet Noor.
	Egypt	Seewah Oases	Wahi or Sewi	August	"	Fayum (Egypt)	Plump and yellow.
		Lower... Sharkiah	Amri	September	Clay	Europe	Large and black.
		Lower... Gizeh	Ambat	"	Sandy	Local	" " "
	Arabia	El. Hassa	Khalasi	August	"	"	Medium size and golden brown.
		Muscat (Semail Valley)	Fard	"	"	America	" " " dark brown.
	Mesopotamia	Bussorah	Berhi	September	Heavy clay	Local	" " " golden brown.
			Hevesi	"	"	"	" " " " "
			Helwi	"	"	America and Europe	" " " dark brown. Superior quality.
			Khdravi	"	"	" " "	Like Helvi, but darker and not so good.
			Sayer	"	Sandy	America	Medium size, dark brown, not very good.
		Bagdad	Maktum	August	Heavy clay	Local	Medium size and golden brown
			Kustawi	"	"	"	Like Maktum, but not so good.
			Taberzal	Sept. (end)	"	"	Small, dark brown, very good.
	Persia	Minab	Murdasing	.....	.....	.....	.....
	Baluchistan	Pangh Gurh	Mozati	.....	Sandy	Local	Medium size, dark brown, excellent.
Class II.	Egypt	Upper Bedrashen	Ambat	August	"	"	Medium size, yellowish brown
		Lower. Rosetta	Rachidi, Samani	September	"	South Europe	Large and yellow.
		Lower. Marg	Hayani	July	Clay	Local	Red and coarse.
		Lower. Alexandria	Ramli	September	Sandy	"	Long and black.
	Arabia	Muscat	Nagal	June	"	"	Small and light coloured
			Mubsali	August	"	India	Large " " "
			Khaseab	"	"	Local	Medium size and red.
	Mesopotamia	Bagdad	Burni	"	Heavy clay	India and Local	Small and light coloured.
Class III.	Egypt	Upper Oases	Sultani	September	Sandy	Egypt	Short and brown.
		Upper Berber	Ibrimi	"	"	"	Long " "
			Gondalla	"	"	"	Large and yellowish brown.
	Mesopotamia	Bagdad	Bedraihe	"	Heavy clay	Local	Small and yellowish.
			Zehedi	Sept. (end)	"	.....	" " "

ILLUSTRATION.—Plate VIII. The photograph, supplied by Mr. Phipson, shows a well developed specimen of *Phœnix dactylifera*, and at the foot of the stem two young specimens which took their origin from the present plant. The habit of the whole tree differs considerably from that of the Wild Date Palm; the crown is less dense, the leaves are spreading and form an acute angle with the stem. The lower part of the stem is not covered with the bases of the petioles.

PHŒNIX RECLINATA, Jacq. Fragm. Bot. (1809) 27, t. 24; Willd. Sp. Pl. IV. 731; Spreng. Syst. Veg. II. 138; Klotzsch in Kunth, Enum. Pl. III. 256. Mart. Hist. Nat. Palm. III. 272, 321, t. 164, 124, f. 1. Becc. Males. III. 349.—*P. spinosa*, Thonning in Videnskabernes Selskabs Afhandl, IV. (1829), p. 211; Hornemann, De ind. plant. Guineens. 11; Klotzsch in Kunth Enum. Pl. III. 257; Mart. in Gel. Anzeig. der Bayr. Akad. der Wiss. 1839 VIII. 892, IX. 988; Hist. Nat. Palm. III. 275, 320; Kirk in Journ. Linn. Soc. IX. 234; Tchihatchef in Griseb.: La Végét. du Globe II. 193; Drude in Engl. und. Pr.: Die Nat. Pflanz. I. 29, fig. 23; F. v. Mueller, Select Extra-trop. Pl. 263.—*P. leonensis*, Loddiges in Cat. Horti.—*P. farinifera* (non Roxb.) Zolling Pl. Jav. exsicc. No. 3098; Cat. Pl. quæ in hort. Bot. Bogor. col. (1866) p. 72.—*Fulchironia senegalensis*, Leseb. in Desf. Cat. Hort. Paris., ed. III. p. 29.

DESCRIPTION.—Stem soboliferous, 25 feet high, sometimes even 30-40 feet. Leaves long, armed with solitary or paired spines on the sides and lower surface. Segments narrow ensiform, very numerous, in fascicles of two or three. In young leaves the segments are covered with a white tomentum on the under surface of the midrib. A similar tomentum covers the whole central bud. Spathes of spadices fusiform, furfuraceous or glabrous, compressed, thinly coriaceous, with two sharp keels. Male spadix ovate in outline, consisting of a great number of thin, flexible branches. Male flowers trigonous, lanceolate, distinctly acuminate, about 4 lines long; calyx 3-dentate; petals lanceolate, acuminate or acute and often ciliate at the apex, but never cucullate. Stamens shorter than the corolla. Female spadix composed of 25-35 rigid



Phœnix reclinata, Jacq.

branches ; fruiting branches patent or horizontal, or also reflexed. Fruit small, ovate-elliptic, mucronate. Perianth (in fruit) cupular, a little more than 2 lines long and 4 lines broad ; calyx 3-dentate, a little less than half the length of the corolla. Petals not striate externally. Staminodes 6, dentiform, narrow, not united at the base. Seed oblong or subterete-cylindric, equally rounded at the two extremities ; in a median transverse section the process of the raphe is not seen, or is scarcely dilate, obtuse or superficially lobulate ; longitudinal groove of seed pretty long.

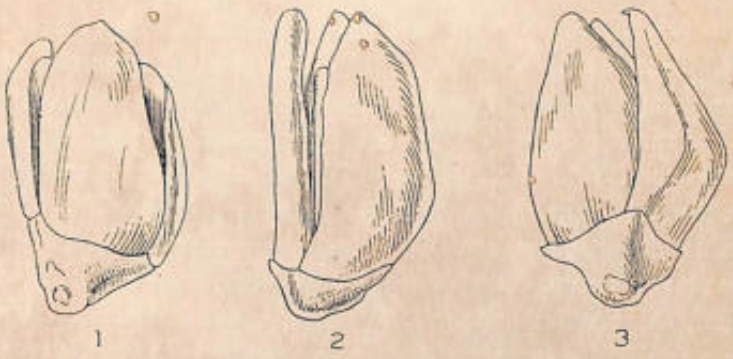


FIG. 4.

Male flowers of *Phœnix reclinata* (5×). (After Beccari).

HABITAT.—Throughout Tropical Africa from Senegal to Kaffirland : Sansibar (rare), Pemba, Usambara (on the coast), Uganda.

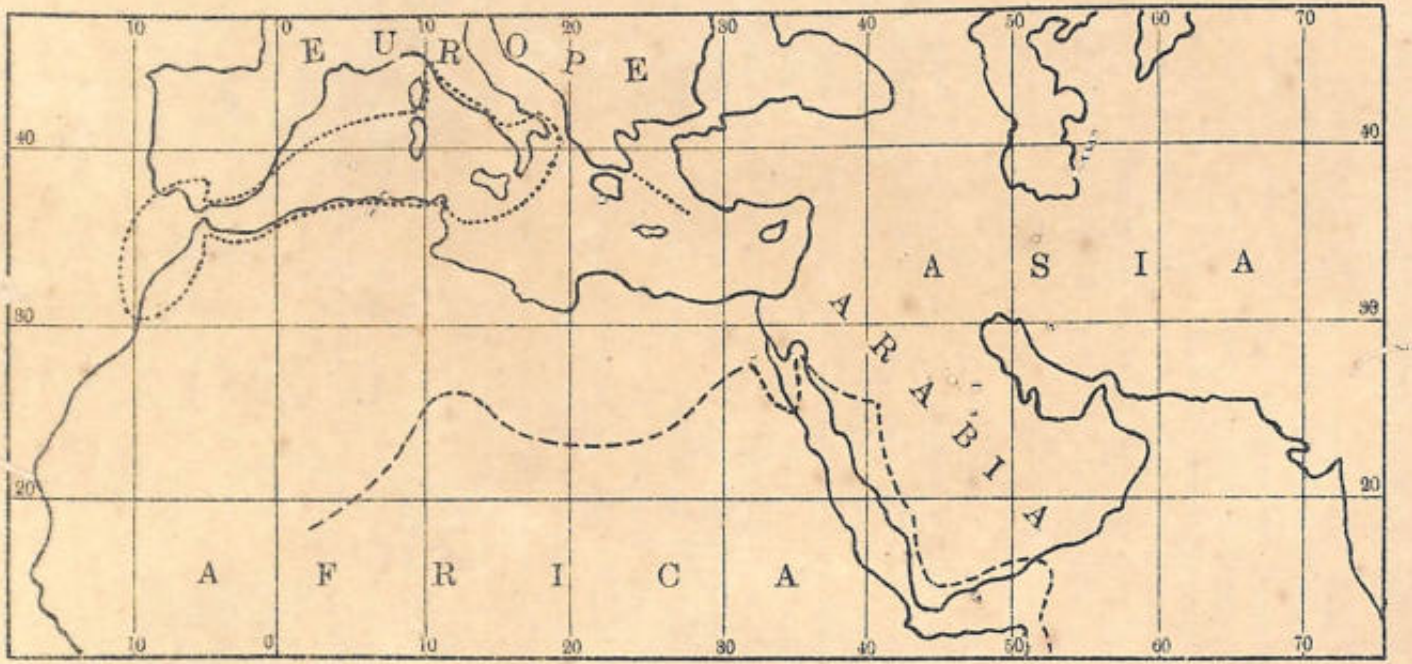
USES.—The split leaf is made into fine mats and caps which take colour easily, and are worked of many patterns. The green bunches of fruit, if immersed for 12 hours in water, suddenly assume a rich scarlet hue, and the astringent pulp becomes sweet. Wine is also obtained from this palm.

ILLUSTRATION.—Plate IX. The photograph, supplied by Major Gage, shows a characteristic tuft of specimens of *Phœnix reclinata*. The leaves which touch the ground belong to younger plants that have been produced by the parent stems.

PHŒNIX CANARIENSIS, Hort. Chabaud, La Provence agricole, No. 19 (Oct. 1882) p. 293, fig. 66-68. Naudin in Revue Horticole 1885, p. 541, et 1888, p. 180 ; Illustr. Hort. XXXIII, 8 ; Becc. Males. III. 371.—*P. dactylifera* β. *jubæ*, Webb. et Berth. Hist. Nat. des Canaries, III. 289 ; Christ

in Engler's Bot. Jahrb. VI. 469.—*P. judae*, Christ in Engl. Bot. Jahrb. IX. 170.—*P. tenuis*, Hort.—*P. vigieri*, Hort, Revenue Hort. 1888, p. 180.

DESCRIPTION.—Stem solitary, when young covered with the petioles of fallen leaves and then very often forming a bulbiform mass, in old plants cylindric, columnar and stout, reaching a height of 40-50 feet. The crown exceedingly large, hemispheric, dense, consisting of about 200 leaves. Leaves 17-20 feet long, the base of the stalk thick and turgid, more so than in *Phœnix dactylifera*; the stalk is very short, armed with strong, long spines. On each side of the rhachis there are 150-200 segments, of the same green colour on the upper and lower surface, straight but not rigid, those lowest and next to the spines in fascicles of 2 or 3, above these they are less fascicled, but turned in various directions, those of the upper half of the leaf equidistant, not aggregate and almost opposite to each other. Male panicle on the whole ovate, with strongly angular branches; the longer branches 1 foot long. Male flowers alternate, often in pairs, ovate-asymmetrical, angular by mutual pressure, 6 lines long; calyx cup-shaped-obconic, trigonous, sharply 3-dentate; petals densely striate, thinly coriaceous, obtuse or slightly acute. Stamens slightly shorter than the petals; pistillode very small, papilliform, acute. Female flowers globose-depressed, 2-3 lines in diameter; calyx cupular, 3-ribbed, very acutely 3-dentate. Corolla by $\frac{1}{4}$ longer than the calyx; staminodes tooth-shaped, very small, perfectly free; petals twice as broad as long, subreniform, obtusely apiculate in the centre, sometimes the petals are shorter than the sepals. Branches of fruiting spadix 1-2 feet long, semiverticillate or spreading, erect patent, stout and rigid. Fruit ovate-elliptic or subglobose-ovate, equally rounded at both extremities, slightly apiculate at the apex, yellow when ripe, smooth, $\frac{3}{4}$ inch long, 9 lines broad, pericarp thin, crustaceous, fragile. Seed ovate-elliptic or ovate-oblong, rounded at the two extremities, terete, or in a transverse section perfectly round, convex on the ventral side. Dorsal groove quite straight and deep; process of the raphe, as seen in a median transverse section, very narrow in the beginning, getting broader and deeply lobed at the base; albumen horny, fragile, very hard; embryo almost in the middle of the ventral side.



[AFTER FISCHER]

Distribution of *Chamaerops humilis* shown thus .....

Northern limit of *Hyphaene thebaica* shown thus _ _ _ _ _ _ _

HABITAT.—Canary Islands.

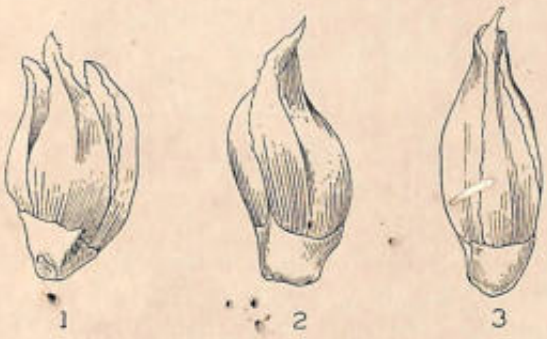


FIG. 5.

Male flowers of *Phœnix canariensis* (4×). (After Beccari.)

2. SABALEÆ.

Polygamous. Several or numerous half-complete spathes or such as cover only the peduncle of the spadix, often also on the branches of the panicle. Leaves fan-shaped, induplicate.

DISTRIBUTION.—The *Sabaleæ* have, after the *Arecineæ*, the greatest geographical distribution:

On the eastern hemisphere: *Chamærops* L., *Trachycarpus* Wendl., *Rhapis*, L., *Corypha*, L., *Nannorhops* Wendl., *Licuala* Thunb., *Livistona*, R. Br., *Pritchardia*, Wendl. Seem, *Theysmania*, R. f. Zoll.

Southern Europe, Northern Africa, Asia, south of the northern limit of the region of palms including all the islands from Ceylon to the Sandwich Islands, north and east coast of Australia to the south coast (37½° S. Lat.).

On the western hemisphere: *Sabal*, Adans., *Rhapidopyllum*, Wendl., *Acanthorrhiza*, Wendl., *Trithrinax*, Mart., *Brahea*, Mart., *Serenœa*, Hook, f., *Colpothrinax*, Wendl. Griseb, *Erythea*, S. Wats., *Copernicia*, Mart., *Thrinax* L., *Crysophila*, Bl..

America, from the northern limit of the palms to almost the southern limit (36° N. Lat.—32° S. Lat.), but are not found in the tropical region of the Amazonas.

Key to the genera described below :—

A.—Fruit with a smooth pericarp. *Gynœcium* of 3 free carpels ; each carpel with its own style or stigma.

a. Perianth of 3 sepals and 3 petals alternating with the sepals.

[1] Seed erect elliptic ; albumen ruminate ... *Chamærops.*

[2] Seed curved-reniform ; albumen with a single excavation near the raphe ... *Trachycarpus.*

[3] Seed flat-globular ; albumen with a deep excavation filled with a corky substance, otherwise uniform ... ... *Rhapis.*

b. Perianth of 6 bristles, or of 6 leaves grown together ... ... *Thrinax.*

B.—Fruit with a smooth pericarp. *Gynœcium* of 3 appressed carpels, or carpels united where they meet ; stigma one.

a. Spadix terminal ; remains of stigma at the base of the fruit.

[1] Embryo apical, spiral ... ... *Corypha.*

[2] Embryo dorsal or subbasilar ... ... *Nannorhops.*

b. Spadix axillary, lateral ; remains of the stigma apical (except in Sabal).

α Berry drupaceous ; endocarp hard, brittle.

[1] Filaments on a fleshy urceolus which is united with the corolla ... ... *Licuala.*

[2] Filaments free, slightly coherent at the base ... ... *Livistona.*

β Berry drupaceous on a cylindrical stalk. *Pritchardia.*

γ Berry with a soft membranous endocarp.

[1] Albumen uniform, except for an excavation near the umbilicus or raphe ... *Sabal.*

[2] Albumen deeply ruminate ... ... *Copernicia.*



Dwarf Fan Palm (*Chamærops humilis*, L.).

CHAMŒROPS, L. GEN. NOT. 1219.

(From the Greek "Chamœrops": "chamai" = on the ground, and "rops" = bush. Plinius called it Chamœrepes, which means "creeping on the ground.")

Mart. Hist. Nat. Palm. III. 248, t. 120, 124 (sp. 1).—Kunth Enum. Pl. III. 248.—Drude Bot. Zeitg. 1877, 638.—Benth and Hook. Gen. Pl. 924, 86.

Stem mostly low, bushy-cæspitose, covered with the remains of the petioles, leaves terminal, stiff, fan-shaped, regularly divided; petioles slender, spinous. Spadix short, erect, with mostly 2 leathery spathes, flowers diœcious or polygamous on the short branches of the simply-branched spadix, small, yellow. Petals broadly ovate-acute. Stamens 6 (—9); filaments short, situated on a fleshy cup. Carpels thick-fleshy with sessile stigmas, each flower developing 3 berries, rarely more, sometimes less. Berry elongateerect, with the remains of the stigma slightly lateral, reddish-brown or yellowish. Seed elliptic or ovate. Albumen ruminate.

Species 2.—In the western part of the Mediterranean region.

CHAMAEROPS HUMILIS, L. Hort. Cliff. 482; Willd. Spec. Pl. IV. 1154, n. 1; Houttuyn Pflanzensyst I. 55; Giseke Prael. Ord. nat. 27; Savigny in Lam. Encycl. IV, 714, et. Illustr. gen. t. 900; Spreng. Syst. Veg. II. 137, n. 1; Roem. Schult. Syst. Veg. VII. 2. 1488, n. 1; Mill. Diction. I. 669; Brotero Fl. Lusit. I. 605; Cambess. Plant. Balear. in Mèm. du Mus. XIV. 321; Herrera Agricultura general (1818) II. 389; Allion. Fl. edemont. II. 363, n. 866; P De Cand, Fl. Franc, III. 723; Moris Elench. Stirp. sard. I. 47; Sebast. et Mauri Prodr. Fl. Roman. 135; Tenore Sylloge Fl. Neapol. 535; Philippi in Linnæa VII. 759, 760; Poiret Voy. en Barbar. II. 273; Desfont. Fl. Atlant. II. 436; Viviani Fl. Lib. specim. 62; Fraas Synops. plant. flor. class. 278.

NAMES:—Dwarf Fan Palm, European Palm; Palmeira, Palma das Vassouras (*Portug.*); Palmito, Margallonera (*Span.*); Palma (*Andal.*); Palmiste (*French*); Palmito (*Ital.*); Palmetta, Piumara, Giummara, Curina (*Sicily*).

DESCRIPTION.—Grows in hot-houses to the height of 15 feet and more; but in Spain and Barbary it is not more than 4 or 5 feet

high, and in Italy it is much dwarfer, stem 5-6 inches in diameter closely covered with triangular hard scales, the bases of the old leaves. The new leaves grow in a tuft at the top of the stem, and have smooth flat stalks, with rigid spines proceeding from the edge; blade deeply palmate, with from 12-15 narrow sword-shaped divisions, which are slightly glaucous and downy. Spadix short compresed; spathes 6-8 inches long, compressed, downy at the edge.

This palm is too well-known as to need a detailed description.

C. humilis is a very variable palm. We mention only the following varieties: *C. humilis var. arborescens*, Mart (=*C. arborescens* Pers., *C. elata* and *tomentosa*, Hort.) of N. Africa; var. *bilaminata*, Wendl.,—*conduplicata*, Kickx.; *glaucescens*, Rgl.; *gracilis*, Lodd.; *inermis*, Rgl.; *melanacantha*, Rollis; *robusta*, Van Houtte, etc.

HABITAT.—This is the only palm indigenous to Europe. It is found as far up as Nice in Italy, but thence southward it has a great range, being met with in all the countries bordering the Mediterranean Sea.

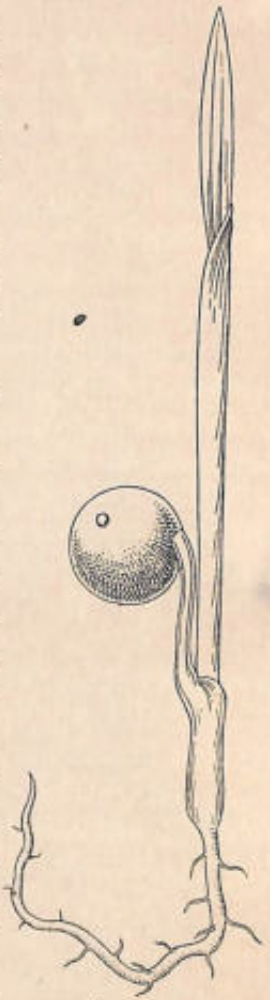


FIG. 6.
Germination of seed of *Chamaerops humilis*.
(After Martius.)

USES.—The fibres furnished by the stem mixed with camel's hair are used for making tent covers. Of the leaves they make baskets, and cordage from all parts of the plant. The palm also affords materials for paper-manufacture. The tree furnishes a fibre resembling horse-hair, which is firm and elastic, and is used in great quantities in the manufacture of carpets, under the name of vegetable or African hair. The sails made from it are better than those prepared from the Spanish broom (*Genista*

scoparia, Lam.). The fibres, divested of the glutinous matter which binds them together, are extremely divisible, as fine as flax, and can be used, in spite of their inferior length (10-16 inches), in the preparation of flax cotton.

CULTIVATION IN EUROPE.—The Dwarf Fan-Palm is a greenhouse tree of very easy culture in a compost of rich strong loam, to which is added a small portion of vegetable mould and sand. Perfect drainage and copious supplies of water throughout the summer, are most essential to success. Propagation may be effected by suckers or by seeds.

If the palm is employed in sub-tropical gardening, it should have a situation sheltered from strong winds.

ILLUSTRATION.—Plate X shows a clump of Dwarf Fan Palms which are growing in the Government Horticultural Gardens of Lucknow. The leaves of two specimens have been badly attacked by insects.—We have to thank Mr. H. J. Davies who kindly supplied us with the photograph.

TRACHYCARPUS, H. Wendl. Bull, Soc. Bot. Franc. VIII. 429. From the Greek "Trachys"=hard, rough, and "carpos" fruit, probably in allusion to the rough, hairy fruit.

Mart. Hist. Nat. Palm. III. 251 (spec. 3, 4, 7), t. 125.—Wall. Pl. Asiat. Rar. III, t. 211.—Bot. Mag., t. 5221 (excl. fig. 6, 7.)—Griff. Palms Brit. Ind., 133, t. 227 A, B.—Kurz For. Fl. II. 526.—Benth. & Hook. Gen. Pl. III. II. 928, 98.

Tall, unarmed palms. Leaves suborbicular or reniform, plicately multifid; segments narrow, rhachis Q. Spadices many, interfoliar, stout, branched; spathes many, sheathing, embracing the peduncle and branches of the spadix, coriaceous, compressed, tomentose; bracts and bracteoles minute. Flowers small, polygamo-monoecious. Sepals 3, ovate; petals 3, broadly ovate, valvate. Stamens 6, filaments free; anthers short, dorsifixed. Carpels 3; stigmas 3, recurved; ovules basilar. Drupes 1-3, globose or oblong; style subterminal. Seed erect, ventrally grooved; hilum basilar; albumen equable; embryo dorsal.

Species 3.—Himalaya, China, Japan.

CULTIVATION IN EUROPE.—All the species of this genus are easily cultivated; they are greenhouse or half-hardy palms. They

grow well in a compost of rich, strong loam with a small portion of vegetable mould and sand. Perfect drainage, and copious supplies of water throughout the summer are essential. They may be propagated by suckers or by seeds.

TRACHYCARPUS MARTIANA. H. Wendl. in Bull. Soc. Bot. Fr. VIII. (1861) 429; Hook. Fl. Brit. Ind., VI. 436.—*T. khasiana*, H. Wendl. l. c; Hook. f. Bot. Mag. t. 7128.—*Chamaerops martiana*, Wall. Cat. n. 8621; Mart. in Wall. Pl. Asiat. Rar. III. 5, t. 211; Hist. Nat. Palm. III. 251, 320; Royle Ill., 394, (-73-9); Griff. in Calc. Journ. Nat. Hist. V. 339; Palms Brit. Ind. 133.—*Chamaerops griffithii*, Lodd. Cat. Palm. 1841; Hort. Par. ex Rev. Hortic. 1879, 212, f. 43, ed. 1881, 143.—*Ch. khasyana*, Griff. in Calc. Journ. Nat. Hist. V. 341; Palms Brit. Ind., 134; t. 227 A, B, C; Brand. For. Fl. 546; Kurz in Journ. Asiat. Soc. Beng. XLIII. 204; For. Fl. II. 526; Gamble Man. Ind. Timb. 418; Houllet in Rev. Hortic. 1879, 272.

NAMES.—Jhangra, Jhaggar, Tal, Takil (Kumaon); Pakha (Ass.); Taggu (Newar name in Nepal).

DESCRIPTION.—A tall, slender tree, 20-50 feet high, often stunted on dry ground or in otherwise unfavourable localities, with a globose crown of dark shining leaves, clothed beneath the crown with persistent leaf-sheaths; young parts furfuraceously hairy. Petioles 3 feet long, the sheathing base consisting of two layers, the inner layer, which separates from the outer, being composed of a net-work of brown tough fibres, crossing each other at oblique angles, forming a close network of rhomboid meshes; upper part of petiole half-round, woolly, edges slightly denticulate. Blade orbicular, consisting of 30-40 linear segments, 15-20 inches long, connate to one-third or one-half their length, emarginate or shortly bifid at the top, rigidly coriaceous. Spadix a drooping compound panicle, 1-1½ foot long, covered with dark rust-coloured down, with several stout main branches, each in the axil of a large coriaceous sheathing bract; basal spathes 1 foot long. Petals ovate, concave whitish; stamens 6; filaments subulate, nearly free, longer than the anthers. Ovary and the rudiments of ovary in male flowers, hairy. Drupe 1, oblong, at first yellow, dark glossy blue when ripe.



A.—MARTIUS' CHUSAN PALM (*Trachycarpus martiana*, H. Wendl).



B.—FORTUNE'S CHUSAN PALM (*Trachycarpus excelsa*, H. Wendl).

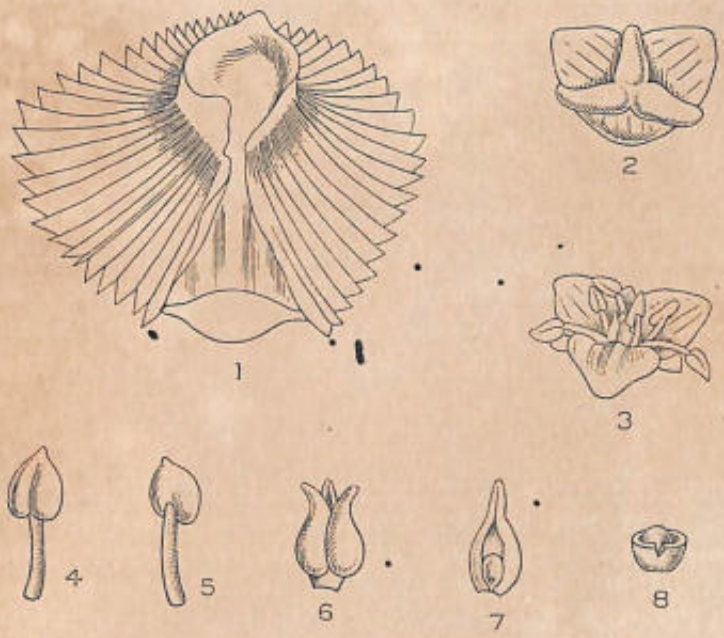


FIG. 7.

Trachycarpus martiana

1. Base of lamina of leaf and ligule.
2. Back view of flower.
3. Flower.
4 and 5. Stamens.
6. Carpels.
7. The same dehising when still young
8. Transverse Section of the same showing the ovule. (2—8 magnified)
(After Hooker).

HABITAT.—Central Himalaya, Kumaon and Nepal, 5-8,000 feet; Khasia Hills, 4-5,000 feet; Manipur 6,000 feet; Upper Burma, Kachin Hills, 4-6,500 feet. (Grows in great numbers, forming clumps and rows, on the Thakil Mountain in Eastern Kumaon, in the Fork between the Sarju and Kali rivers, between 6,500 and 7,800 feet, where snow generally covers the ground from November till March above the zone of *Pinus longifolia* in the region of Quercus, Rhododendron, Andromeda, and Taxus, in damp shady glens on the north and south-east, but chiefly on the north-west side. Also on Dhuj Mountain, north-east of the Thakil, on the Kalimoandi range between the Ramgunga and Gori rivers, and in the

Sarju valley near Bagesar. Dwarf specimens were found at the base of the Satbunga Mountain, south-east of the Gagar Pass, in very dense forest at 6,500 feet elevation, and on the Berchula, a spur of the Bhatkot Mountain, considerably farther in the interior, and at about 8,000 feet elevation, which probably is its western limit).

ILLUSTRATION.—Martiu's Chusan Palm which is figured on Plate XI A, is kept in a hot house of the Kew Gardens, whilst Fortune's Chusan Palm (Plate XI B) is growing in the same garden in the open. We owe the two photographs to the kindness of Mr. A. W. Hill, the Assistant Director of the Royal Botanic Gardens in Kew.

TRACHYCARPUS EXCELSA, H. Wendl. in Bull. Soc. Fr. VIII, 429; Hook. f. Fl. Brit. Ind. VI, 436.—*Trachycarpus fortunei*, Wendl. l.c.—*Chamaerops excelsa*, Thunb. Fl. Jap. 130 (not var. β); Mart, Hist. Nat. Palm. III. 251; Miquel Fl. Jap. 329; J. Gay in Bull. Soc. Bot. Fr. VIII. 410; Franch. et Sav. Enum. Pl. Jap. II. 1; Carrière in Rev. Hortic. 1877, 223.—*C. fortunei*, Hook. Bot. Mag., t. 5221.

NAME.—Fortune's Chusan Palm.

DESCRIPTION.—Stem of considerable height, clothed throughout with old leaf sheaths and a good deal of course transverse fibre, which also abounds among the perfect foliage. Leaves forming a handsome, more or less spreading crown. Petioles 1½ foot or more long, convex below, nearly plain above, the margin quite unarmed or very obscurely toothed. Lamina semiorbicular, flabellate, 1½ foot long and broad, deeply plaited, cut for about a half or more of the way down into numerous linear segments, which are ¾-1 inch broad, pendulous towards their apices. Spadix small in proportion to the plant, and consequently not very conspicuous, emerging from several imbricating leafy bracts, and constituting a dense thyrsoid panicle, more than a span long and clothed with yellow flowers. Flowers clustered, 2-4 on a tubercle, sessile. Calyx small, of 3 sepals. Corolla of 3 orbicular petals. Stamens inserted on the base of the petals. Ovaries 3, ovate, hairy, tapering upwards into a thick subsulate style. Drupe reniform, deeply hollowed on one side; embryo opposite the umbilicus.



1 2 3

FIG. 8.

1. Female flower of *Trachycarpus excelsa* 3. Ovaries of the same.
2. Petal and stamen of the same. All magnified.
(After Hooker.)

HABITAT.—Upper Burma, Yunan; China, Japan.

USES.—The brown fibre surrounding the trunk is very strong; the Chinese employ it for many domestic purposes. It is made into ropes and cables for the junks and wrought into bed bottoms, used by all classes of the population. Labourers and coolies in Northern China make hats from the leaves. Also their "so-e," or garment of leaves, which they wear in wet weather, is manufactured from the leaves of this palm.

CULTIVATION IN INDIA:—It needs protection from strong sunshine when grown in the plains.

(To be continued.)

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

XIII.

(*Continued from page 462 of this Volume.*)

GELECHIADÆ.

Lecithocera, Hs.

To this genus I would now also refer *signifera*, Feld.

Lecithocera deltospila, n. sp.

♂. 21 mm. Head whitish-ochreous, tinged centrally with purplish. Palpi ochreous-whitish, second joint dark fuscous except apex. Antennæ 1, rather stout, whitish-ochreous, ciliations 1½. Thorax whitish-ochreous, shoulders narrowly dark fuscous. Abdomen pale ochreous. Posterior tibiæ fuscous, apex ochreous-whitish, tarsi whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen sinuate, oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; whitish-ochreous; a blackish-fuscous streak along basal sixth of costa; a flattened-triangular blackish-fuscous blotch representing plical and first discal stigmata, extending from near base to middle; an inverted-triangular blackish-fuscous blotch representing second discal stigma; between these blotches are two fuscous spots; dorsum suffused with fuscous from near base to tornus; posterior ⅔ of wing dark fuscous suffusedly irrorated with ochreous-whitish, tending to form streaks on veins, and cut by a nearly straight whitish-ochreous subterminal line parallel to termen, slightly indented above middle: cilia whitish-ochreous with two fuscous shades. Hindwings light grey; cilia whitish-ochreous, with two faint fuscous shades.

Khasis; one specimen. Allied to *trigonopis*, but antennal ciliations longer, termen of forewings more sinuate, more oblique.

Onebala eremotæ, n. sp.

♂ ♀. 15-17 mm. Head pale ochreous or brownish-ochreous. Palpi whitish-ochreous, second joint greyish-ochreous except apex. Antennæ whitish-ochreous, ciliations in ♂ 1, fasciculated. Thorax greyish-ochreous. Abdomen pale grey, anal tuft pale greyish-ochreous. Forewings elongate, costa moderately arched, apex rounded-obtuse, termen rounded, somewhat oblique; 2 and 4 stalked, 3 absent, 7 absent, 8 and 9 stalked; light glossy bronzy-fuscous, veins slightly darker: cilia pale ochreous tinged with fuscous. Hindwings pale grey; cilia pale greyish-ochreous.

Matale, Ceylon (Pole); in April and August, two specimens. Closely allied to *myadelpha*, but lighter-coloured, forewings less dilated posteriorly, termen more rounded, stigmata wholly absent, in ♂ without hair-pencil.

Pachnistis, Meyr.

Allied to *Brachmia*, from which it differs in having vein 7 of forewings absent, 8 and 9 stalked. Besides *cephalochra*, Meyr., which is the type of the genus, I refer here *diluticornis*, Wals., *cherandra*, Meyr., *continctella*, Walk., and the two following species.

Pachnistis exæma, n. sp.

♂ ♀. 13-17 mm. Head and thorax dark purplish-fuscous, sides of head pale ochreous or whitish-ochreous. Palpi pale whitish-ochreous, second joint suffused with dark fuscous except towards apex, terminal joint variably suffused on anterior edge and towards apex. Antennæ pale whitish-ochreous, in ♂ simple. Abdomen light grey, anal tuft whitish-ochreous. Posterior tibiæ rather dark purplish-grey, apex ochreous-whitish, tarsi ochreous-whitish more or less banded with dark grey. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen nearly straight, rather oblique; 2 and 3 stalked, 4 sometimes out of 2; dark purplish-fuscous; a pale whitish-ochreous cloudy rather irregular streak crossing wing before middle; small whitish-ochreous costal and dorsal spots at $\frac{2}{3}$: cilia purplish-grey. Hindwings pale grey, darker posteriorly; cilia pale grey, sometimes darker round upper part of termen, base whitish-ochreous.

Kegalle, Matale, Peradeniya, Maskeliya, Haputale, Ceylon (Green, Pole, Alston); Cuddapah, 4,000 feet (Campbell); in March, April, and from July to September, twelve specimens. Very like *cherandra*, but in that species there is no entire antemedian line, and the antennæ of ♂ are ciliated.

Pachnistis lygaea, n. sp.

♂. 24 mm. Head brownish. Palpi pale ochreous, second joint dark brown, anterior edge of terminal joint dark fuscous. Antennæ pale ochreous, ciliations 2. Thorax and abdomen dark fuscous. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, somewhat oblique; 2 and 3 stalked; rather dark purplish-bronzy-fuscous; discal stigmata rather small, cloudy, blackish; cilia bronzy-fuscous. Hindwings dark fuscous; cilia fuscous.

Dalhousie, Kashmir; in July, one specimen.

Brachmia, Hb.

Head with appressed scales, side-tufts loosely raised; ocelli present; tongue developed. Antennæ $\frac{1}{2}$-1, not stout, in ♂ simple or variably ciliated, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint thickened with appressed scales, seldom loosely expanded towards apex above, terminal joint about as long as second or rather longer, slender, acute. Maxillary palpi very short filiform, appressed to tongue. Posterior tibiæ rough-scaled above. Forewings with 2 and 3 stalked or seldom coincident, 4 sometimes out of 2, 7 to

apex or near below it, 7 and 8 stalked, 9 often out of 7, rarely 10 also out of 7. Hindwings 1 or over 1, trapezoidal, termen more or less sinuate, cilia ½-1; 3 and 4 connate or stalked, 5 more or less approximated, 6 and 7 ftalked.

A considerable genus, most numerous in the Indian region, but fairly represented in Europe and Africa. The species are obscure in appearance, and require careful attention. The stalking of vein 9 with 7 in the sorewings is proved to be variable in some species (as *gerœa*), but in others it seems to be constant. The colouring of the antennæ and posterior tibiæ sometimes furnishes good characters. *Torodora*, Meyr., and *Apethistis*, Meyr., cannot be maintained as distinct genera in view of the variability of neuration above-mentioned, and are therefore merged. I describe now 39 new species, and include also in their proper position the other species of the Indian fauna already described, which may assist the comprehension of the genus.

It is difficult to draw a clear line between *Brachmia* and *Lecithocera*, but impossible to unite them. I have included in *Lecithocera* those species in which the antennæ are longer than the forewings, and those in which they are only as long as the forewings but distinctly stout or thickened but there appears to be nearly every degree of transition. *Onebala* differs from *Brachmia* essentially in the absence of vein 3 of hindwings; *Autosticha* in having 7 of forewings absent, 9 separate. These four genera are nearly related together, and all extensively developed in the Indian region, of which they are characteristic.

Brachmia philosopha, n. sp.

♂ ♀. 13-15 mm. Head and thorax fuscous, face paler. Palpi white, second joint externally fuscous except apex, anterior and posterior edges of terminal joint black. Antennæ 1, white ringed with dark fuscous, in ♂ simple. Abdomen fuscous, beneath dark fuscous, in ♂ with a whitish anteapical band. Posterior tibiæ grey, extreme apex whitish, tarsi whitish broadly banded with dark fuscous irroration. Forewings elongate, rather narrow, costa slightly arched, apex round-pointed, termen concave, rather oblique; 3 absent, 7 to termen, 8, 9, and 10 out of 7, 11 in ♂ anastomosing with 12; rather dark fuscous; an irregularly triangular blotch of dark fuscous suffusion on dorsum before middle, reaching more than half across wing; costa suffused with dark fuscous from ⅓ to apex; a small whitish spot on middle of costa, beneath which is a patch of whitish irroration; two small blackish spots edged with a few whitish scales placed transversely in disc at ⅔; an indistinct bisinuate whitish line at ¾, sharply marked towards costa; a black terminal line: cilia fuscous with four ochreous-whitish lines, basal third on termen yellow-ochreous. Hindwings grey; cilia whitish-ochreous with two broad pale fuscous shades.

Khasis; in March, three specimens. The peculiar neuration marks this as an extreme form, but it does not seem necessary to separate it generically.

Brachmia compsophila, n. sp.

♂ ♀. 13-17 mm. Head and thorax light ochreous-brown or sometimes fuscous, face whitish-tinged. Palpi whitish, second joint externally suffused with fuscous except towards apex, terminal joint with two black lateral lines. Antennæ 1, white, sharply ringed with dark fuscous, ciliations in ♂ 2. Abdomen light ochreous or greyish. Posterior tibiæ dark fuscous, apex white, tarsi white with dark fuscous basal bands on first three joints. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen sinuate, oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; light ochreous-brown or sometimes fuscous, somewhat infuscated or darker-suffused posteriorly; traces of a white oblique strigula from costa before middle, sometimes obsolete; stigmata faintly darker, plical rather obliquely beyond first discal, second discal forming a transverse mark, but all sometimes quite obsolete; a fine oblique white strigula from costa at $\frac{2}{3}$, whence a faint angulated whitish line proceeds to tornus; a black apical dot, more or less edged with white above and beneath; an interrupted blackish terminal line: cilia ochreous-brown or lilac-fuscous, apical third on termen white preceded by a darker line. Hindwings fuscous, sometimes paler towards base; cilia light brownish-ochreous or fuscous.

Madulsima, Kurunegala, Diyatalawa, Ceylon (Green, Vaughan, Pole, Fletcher); from July to November, eight specimens. The characteristic apical dot separates it from all allied species.

Brachmia isocrypta, n. sp.

♀. 15 mm. Head and thorax rather dark fuscous, face paler. Palpi whitish, second joint dark fuscous except apex, anterior edge of terminal joint blackish. Antennæ 1, white ringed with dark fuscous. Abdomen fuscous, apex ochreous-tinged, beneath whitish with anal tuft blackish. Posterior tibiæ white, basal third and a præapical mark dark fuscous, tarsi white with three dark fuscous rings. Forewings elongate, rather narrow, posteriorly slightly dilated, costa gently arched, apex obtuse, termen slightly sinuate, rather oblique; 3 and 4 out of 2, 7 to apex, 8 and 9 out of 7; rather dark fuscous; second discal stigma obscurely darker; a cloudy fuscous-whitish dot on costa at $\frac{2}{3}$, whence a very faintly indicated very obtusely angulated pale line runs to dorsum before tornus: cilia fuscous with two darker shades, on termen with pale basal line. Hindwings and cilia grey.

Maskeliya, Ceylon (Pole); in June, one specimen.

Brachmia iresia, n. sp.

♂ ♀. 9-14 mm. Head ochreous-whitish, crown in ♀ sometimes grey. Palpi ochreous-white, second joint more or less suffused with fuscous or dark

fuscous except towards apex, anterior edge of terminal joint dark fuscous. Antennæ 1, ochreous-whitish, in ♀ dotted with dark grey on basal half, in ♂ simple. Thorax purplish-grey. Abdomen grey, beneath whitish. Posterior tibiæ ochreous-white, basal half dark grey, tarsi ochreous-white, more or less marked or banded with dark fuscous. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen slightly sinuate, oblique; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7; dark purplish-grey; stigmata represented by small obscure darker spots, sometimes nearly obsolete, plical somewhat beyond first discal, second discal transverse-oval; a small whitish mark on costa at ⅔, whence sometimes a faint slightly curved line of whitish scales runs to tornus: cilia on costa and tornus dark purplish-grey, on termen white, in ♂ with a black basal line, in ♀ with base purplish-grey and a blackish subbasal shade. Hindwings grey; cilia light grey, in ♂ suffused with whitish on upper part of termen.

Madulsima, Trincomali, Puttalam, Ceylon (Pole, Fletcher); N. Coorg, 3,500 feet (Newcome); in February and from June to November, nine specimens. *B. orbata*, Meyr., from Borneo is a very similar species, but has posterior tibiæ wholly grey.

Brachmia argocrossa, n. sp.

♂ ♀. 16-18 mm. Head pale whitish-ochreous, crown sometimes suffused posteriorly with light brownish or fuscous. Palpi ochreous-white, second joint dark fuscous except apex, anterior edge of terminal joint blackish. Antennæ 1, pale whitish-ochreous, in ♂ simple. Thorax purplish-fuscous. Abdomen whitish-ochreous. Posterior tibiæ whitish, somewhat sprinkled on sides with dark fuscous, tarsi whitish with slight dark grey dots at base of joints. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex obtuse, termen somewhat sinuate, rather oblique; 3 and 4 out of 2, 7 to apex, 8 and 9 out of 7; purplish-fuscous; stigmata black, plical rather obliquely beyond first discal; a whitish dot on costa at ⅔, whence sometimes a very faint pale curved or bent line runs to ⅓ of dorsum; a blackish terminal line: cilia ochreous-white, on costa dark purplish-fuscous, on tornus fuscous. Hindwings grey; an oblique dark grey discal mark; cilia whitish-ochreous. Undersurface of hindwings ochreous-whitish irregularly mottled with dark fuscous, with an oblique dark fuscous discal mark.

Maskeliya, Ceylon (Pole); in January, February, June, July, and October, six specimens.

Brachmia arcifera, Meyr.

Palni Hills (Campbell); Bhotan (Dudgeon). The abdomen should be described as dark fuscous.

Brachmia bracculata, n. sp.

♂ ♀. 15-17 mm. Head and thorax rather dark lilac-fuscous, face suffused with ochreous-whitish. Palpi ochreous-whitish second joint sprinkled

and on basal half suffused with dark fuscous, anterior edge of terminal joint dark fuscous. Antennæ dark fuscous, dotted with whitish, ciliations in ♂ ¾. Abdomen rather dark fuscous, tinged with ochreous, beneath yellow-whitish except anal segment. Posterior tibiæ ochreous-whitish, basal ⅔ dark fuscous, tarsi dark fuscous, ringed with whitish. Forewings elongate rather narrow, slightly dilated posteriorly, costa gently arched, apex obtuse, termen sinuate, rather oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; rather dark purplish-fuscous; second discal stigma obscurely darker; ochreous-white wedge-shaped strigulæ on costa at ⅔ and dorsum before tornus, connected by a faint sinuate whitish line: cilia bronzy-fuscous, base on termen white followed by a dark grey shade. Hindwings rather dark grey; cilia pale grey, on upper part of termen with base ochreous-whitish.

Khasis; in May and September, three specimens.

Brachmia deleastra, n. sp.

♀. 15-17mm. Head and thorax rather dark fuscous, face paler or whitish-tinged. Palpi whitish, second joint fuscous except apex, with a dark fuscous subapical ring, anterior and posterior edges of terminal joint blackish. Antennæ 1, ochreous-white ringed with dark fuscous. Abdomen fuscous. Posterior tibiæ dark fuscous, apex yellowish-white, tarsi yellowish-white spotted with dark fuscous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa gently arched, apex round-pointed, termen concave, rather oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; moderately dark purple-fuscous; stigmata obscurely darker, plical, hardly beyond first discal, second discal forming a transverse mark; a somewhat oblique ochreous-whitish mark on costa at ⅔, whence a faintly indicated very obtusely angulated pale line runs to dorsum before tornus; a dark terminal line: cilia rather dark purplish-fuscous, with pale basal line. Hindwings and cilia fuscous.

Kandy and Arawa, Ceylon (Green, Pole, Fletcher); in August and December, three specimens.

Brachmia storestis, n. sp.

♂. 10 mm. Head pale whitish-ochreous, centre of crown pale fuscous. Palpi ochreous-whitish, second joint suffused with dark fuscous except towards apex. Antennæ almost 1, ochreous-whitish, serrulate, simple. Thorax rather dark fuscous. Abdomen fuscous, beneath dark fuscous, anal tuft pale whitish-ochreous. Posterior tibiæ rather dark fuscous, apex whitish, with an expansible pencil of yellow-whitish hairs from base above, tarsi ochreous-white. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen almost straight, oblique; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7; dark fuscous; stigmata represented by small cloudy blackish spots, plical elongate, rather before first discal; a small oblique

whitish mark on costa at ⅔; a cloudy blackish terminal line: cilia fuscous mixed with dark fuscous, base suffused with pale ochreous on termen. Hindwings grey; cilia light grey, base ochreous-whitish.

Maskeliya, Ceylon (Alston); in December, one specimen.

Brachmia metasaris, n. sp.

♂ ♀. 17-18 mm. Head and thorax rather dark purplish-fuscous, crown with a white line above eyes, face suffused with whitish-ochreous. Palpi whitish, second joint suffused with dark fuscous except towards apex, anterior edge of terminal joint blackish. Antennæ 1, whitish, basal joint with a dark fuscous line, ciliations in ♂ ½. Abdomen light fuscous, beneath darker fuscous, anal tuft in ♂ ochreous-whitish, internally yellowish. Posterior tibiæ fuscous, apex whitish, in ♂ clothed above with expansible brush of very long whitish hairs, tarsi whitish. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex round-pointed, termen sinuate, rather oblique; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7; rather dark fuscous, faintly purplish-tinged; an ochreous-whitish dot on costa at ⅔; a dark fuscous terminal line: cilia fuscous, on termen with basal line whitish-ochreous and tips whitish. Hindwing fuscous; cilia whitish-ochreous, with two more or less marked fuscous shades.

Khasis; in May, two specimens.

Brachmia corsota, n. sp.

♂ ♀. 20-22 mm. Head and thorax rather dark purplish-fuscous, face and sides of crown more or less suffused with whitish-yellowish. Palpi pale ochreous-yellowish, second joint suffused with dark fuscous except towards apex, anterior and posterior edges of terminal joint blackish. Antennæ 1, whitish-ochreous, basal joint with a dark fuscous line, ciliations in ♂ minute. Abdomen light fuscous, beneath dark purplish-fuscous, anal tuft ochreous-yellowish. Posterior tibiæ dark fuscous, apex ochreous-whitish, tarsi ochreous-whitish banded with dark fuscous irroration. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa gently arched, apex round-pointed, termen sinuate, rather oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; rather dark fuscous, faintly purplish-tinged; an ochreous-whitish dot on costa at ⅔: cilia fuscous, on termen with apical fourth white. Hindwings fuscous; cilia pale ochreous-fuscous.

Khasis; in March and September, three specimens. Very like *metasaris*, but larger and pale colouring yellower; structurally different by minute ciliations of antennæ in ♂, and absence of brush of hairs on posterior tibiæ.

Brachmia thraneuta, n. sp.

♂ ♀. 15-19 mm. Head and thorax rather dark bronzy-fuscous, face paler. Palpi ochreous-whitish, second joint dark fuscous except towards apex, anterior and posterior edges of terminal joint dark fuscous. Antennæ

1, ochreous-whitish ringed with dark fuscous, ciliations in ♂ 1. Abdomen fuscous, beneath dark purplish-fuscous. Posterior tibiæ dark fuscous, apex whitish, tarsi whitish banded with dark fuscous. Forewings elongate, rather narrow, slightly dilated posteriorly, costa slightly arched, apex round-pointed, termen sinuate, rather oblique ; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7 ; rather dark fuscous, faintly bronzy or purplish-tinged ; stigmata obscurely darker, plical rather beyond first discal, second discal forming a transverse mark ; an ochreous-whitish dot on costa at $\frac{2}{3}$, whence a very faint somewhat curved pale line runs to dorsum before tornus ; a blackish terminal line : cilia rather dark fuscous. Hindwings rather dark fuscous ; cilia fuscous.

Maskeliya, Madulsima, Haputale, and Haldamulla, Ceylon (Pole, Vaughan, de Mowbray, Alston) ; N. Coorg, 3,500 feet (Newcome) ; Nilgiris, 3,500 feet (Andrews) ; Palni Hills (Campbell) ; from February to August, fifteen specimens.

Brachmia pellax, n. sp.

♂ ♀. 16-20 mm. Head purplish-fuscous, sides of crown ochreous-yellow. Palpi dark fuscous, apex of second joint and base of terminal pale yellowish. Antennæ 1, pale yellowish faintly ringed with fuscous, ciliations in ♂ 4. Thorax dark purple-fuscous. Abdomen rather dark fuscous. Posterior tibiæ rather dark fuscous, apex yellow-whitish, tarsi yellow-whitish banded with fuscous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen somewhat sinuate, rather oblique ; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7 ; dark purplish-fuscous, stigmata, cloudy, blackish-fuscous, plical beneath first discal, sometimes suffused with it into an undefined cloudy blotch, second discal forming a transverse somewhat 8-shaped mark ; a small cloudy ochreous-whitish spot on costa at $\frac{2}{3}$, whence a slightly curved obscure ochreous-whitish line runs to dorsum before tornus : cilia rather dark purplish-fuscous, base on termen pale ochreous. Hindwings and cilia grey.

Khasis ; from June to September, three specimens. The unusually long antennal ciliations are a noticeable feature.

Brachmia lavata, n. sp.

♂ ♀. 18-22 mm. Head light violet-fuscous, sides suffused with ochreous-yellowish. Palpi light yellowish, second joint suffused with fuscous except towards apex, terminal joint sometimes variably sprinkled with fuscous. Antennæ 1, pale ochreous, ciliations in ♂ $\frac{3}{4}$. Thorax rather dark purplish-fuscous. Abdomen fuscous, beneath dark purple-fuscous, anal tuft pale ochreous. Posterior tibiæ dark fuscous, apex whitish-yellowish, tarsi whitish-yellowish, basal joint thickened. Forewings elongate, rather narrow, costa slightly arched, apex round-pointed, termen concave, oblique ; 3 very short, out of 2 or absent, 4 out of 2, 7 to termen, 8 and 9 out of 7 ;

dark purple-fuscous; a large irregular patch of darker suffusion resting on dorsum before middle, sometimes followed by more or less extensive pale ochreous suffusion in disc and towards dorsum, plical and first discal stigmata sometimes indicated on margin of this patch; second discal stigma and an additional spot beneath it distinct in paler-suffused specimens, or confluent and obscure in darker ones; wedgeshaped pale yellow-ochreous costal and dorsal marks near termen, sometimes connected by a faint curved line: cilia dark purple-fuscous, on termen with a pale ochreous basal line. Hindwings fuscous; cilia brownish, in ♀ mixed with dark fuscous towards tips round apex.

Khasis; from July to September, five specimens.

Brachmia sortilega, n. sp.

♂ ♀. 21-23 mm. Head and thorax light brownish-ochreous, face and sides of crown pale yellow-ochreous. Palpi pale yellow-ochreous, second joint suffused with fuscous except towards apex, anterior edge of terminal joint more or less infuscated. Antennæ $\frac{3}{4}$, whitish-ochreous, ciliations in ♂ $\frac{3}{4}$. Abdomen light yellow-ochreous. Posterior legs pale ochreous-yellowish, tibiæ and basal joint of tarsi externally suffused with fuscous. Forewings elongate, posteriorly somewhat dilated, costa slightly arched, faintly sinuate in middle, apex round-pointed, termen sinuate, somewhat oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; light brownish-ochreous, somewhat sprinkled with fuscous; costal edge ochreous-yellowish except towards base, where it is dark fuscous; stigmata blackish, first discal well-marked, plical obsolete, absorbed in a transverse mark of dark fuscous suffusion from dorsum, second discal represented by two transversely placed sometimes connected dots; a small spot of dark fuscous suffusion on costa somewhat beyond first discal; a wedgeshaped mark of blackish suffusion on costa, whence a rather pale obscure anteriorly fuscous-edged somewhat curved line runs to $\frac{2}{3}$ of dorsum; an interrupted blackish terminal line: cilia light ochreous-fuscous, on termen with broad postmedian dark fuscous shade, on costa ochreous-yellowish. Hindwings pale ochreous tinged with fuscous; cilia light ochreous-yellowish, sometimes more or less strongly infuscated.

Khasis; from May to July, fourteen specimens.

Brachmia octavana, n. sp.

♂ ♀. 22-23 mm. Head and thorax rather dark purplish-fuscous, sides of crown ochreous-yellowish. Palpi pale yellowish, basal $\frac{2}{3}$ of second joint dark fuscous, anterior edge of terminal joint dark fuscous. Antennæ nearly 1, whitish-yellowish, ciliations in ♂ $\frac{3}{4}$. Abdomen grey, anal tuft greyish-ochreous. Posterior legs whitish-ochreous, tibiæ and base of tarsi externally suffused with dark purplish-fuscous. Forewings elongate, posteriorly dilated, costa gently arched, apex round-pointed, termen

sinuate, rather oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; brown, sprinkled with dark fuscous, with a strong purplish gloss; costal edge ochreous-orange; plical and first discal stigmata indicated by two very obscure somewhat lighter ochreous-brown spots, second discal by a similar 8-shaped spot centered with two dark fuscous dots; an obscure ochreous-brown subterminal line, central third somewhat curved outwards: an interrupted blackish terminal line: cilia brownish-ochreous. Hindwings grey; cilia greyish, base pale ochreous.

Khasis; in June, July and October, four specimens.

Brachmia ancylota, Meyr.

Fort Stedman, Burma; Khasis.

Brachmia paralluctis, Meyr.

Mone, Burma.

Brachmia characteris, Meyr.

Koni, Burma.

Brachmia spilotella Walk. (*tripustulata*, Wals.)

Peradeniya, Diyatalawa, and Galle, Ceylon.

Brachmia typhlopis, n. sp.

♂ ♀. 22-30 mm. Head and thorax dark purplish-fuscous, sides of head ochreous-yellowish. Palpi whitish-ochreous, basal half of second joint dark fuscous. Antennæ ♂, whitish-ochreous, ciliations in ♂ ¾. Abdomen fuscous. Posterior tibiæ fuscous, apex whitish-ochreous, tarsi dark fuscous with whitish-ochreous rings at apex of joints. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen slightly rounded, almost vertical; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7; glossy dark purplish-fuscous; stigmata represented by black spots, first discal small, round, confluent with large trapezoidal plical beneath it, second discal moderate, transverse: cilia fuscous. Hindwings fuscous, in ♀ rather darker; cilia fuscous.

N. Coorg, 3,500 feet (Newcome); in February and September, two specimens. Very near *spilotela*, but antennal ciliations much shorter (in *spilotella* 2), ground colour of forewings darker, and immediately separated by absence of black sub-costal dot near base.

Brachmia syrphetodes, Meyr.

Maskeliya and Namunukuli, Ceylon.

Brachmia artiasta, n. sp.

♀. 22 mm. Head and thorax rather dark purplish-fuscous, sides of crown ochreous-whitish. Palpi ochreous-whitish, second joint fuscous except apex, terminal joint mixed with fuscous except towards extremities. Antennæ ½, ochreous-whitish. (Abdomen broken.) Posterior tibiæ purplish-fuscous, apex ochreous-whitish, tarsi ochreous-whitish. Forewings elongate somewhat dilated posteriorly, costa slightly arched, faintly sinuate in

middle, apex obtuse, termen nearly straight, somewhat oblique ; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7 ; rather dark purplish-fuscous ; stigmata blackish, plical beneath first discal : cilia light fuscous, tips paler. Hindwings grey ; cilia light grey.

Nilgiris, 3,500 feet (Andrewes) ; in August, one specimen.

Brachmia juridica, n. sp.

♂ ♀. 13-17mm. Head in ♂ whitish-ochreous, in ♀ pale grey sprinkled and on sides suffused with whitish-ochreous. Palpi ochreous-whitish, second joint suffused with dark purplish-fuscous except towards apex, terminal joint in ♀ sprinkled with dark fuscous. Antennæ $\frac{2}{3}$, dark fuscous, in ♂ minutely ciliated. Thorax purplish-grey. Abdomen whitish-ochreous, in ♀ infuscated. Posterior legs pale whitish-ochreous, in ♂ externally sprinkled with fuscous, in ♀ suffused with rather dark fuscous. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, rather oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; purplish-grey, sprinkled with dark fuscous, more strongly in ♀ ; stigmata dark fuscous, plical somewhat before first discal ; a spot of dark fuscous suffusion on dorsum before tornus : cilia purplish-grey, sprinkled with dark fuscous towards base. Hindwings grey darker in ♀ ; cilia light grey.

Trincomali, Ceylon (Fletcher) ; in June, three specimens.

Brachmia elephantopa, Meyr.

Purneah, Bengal ; Konkan ; N. Coorg, 3,500 feet ; Nilgiris, 3,500 feet.

Brachmia hamylopis, n. sp.

♂ ♀. 15-17 mm. Head and thorax dark fuscous, sides of crown slightly sprinkled with grey-whitish points. Palpi whitish, second joint dark fuscous except apex, terminal joint more or less sprinkled or mixed with dark fuscous. Antennæ $\frac{2}{3}$, dark fuscous, in ♂ simple. Abdomen fuscous. Posterior tibiæ pale whitish-ochreous, externally suffused with dark fuscous, tarsi pale whitish-ochreous more or less banded with dark fuscous. Forewings elongate, rather narrow, somewhat dilated posteriorly, costa slightly arched, apex obtuse, termen slightly rounded, rather oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; dark fuscous, slightly purplish-tinged ; stigmata black, plical slightly beyond first discal, both these edged posteriorly with a few white scales, second discal mixed with white scales ; an obscure pale whitish-ochreous dot on costa at $\frac{4}{5}$, with traces of a very faint sinuate transverse line from it : cilia fuscous, base on termen pale greyish-ochreous. Hindwings and cilia grey.

Madulsima, Ceylon (Vaughan, Green) ; in April, and from September to December, seven specimens. The mixture of black and white in second discal stigma is a characteristic feature.

Brachmia puteolata, n. sp.

♂. 21-23 mm. Head and thorax dark fuscous, sides of head sprinkled

with pale points. Palpi dark fuscous, terminal joint ochreous-whitish suffused with dark fuscous at base and sometimes partially on sides, Antennæ 1, dark fuscous, simple. Abdomen whitish-ochreous tinged with fuscous. Posterior tibiæ whitish-ochreous, externally suffused with dark fuscous, tarsi dark fuscous with whitish-ochreous rings at apex of joints. Forewings elongate, rather dilated posteriorly, costa gently arched, apex obtuse, termen slightly rounded, little oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; dark fuscous, slightly purplish-tinged; stigmata represented by small blackish spots, plical rather obliquely before first discal, both these edged posteriorly with ochreous-whitish suffusion, second discal similarly edged on both sides: cilia purplish-fuscous. Hindwings whitish-fuscous, becoming fuscous towards termen and apex; cilia whitish-ochreous with two fuscous shades.

Cuddapah, 4,000 feet (Campbell); two specimens.

Brachmia gerœa, n. sp.

♂ ♀. 16-19 mm. Head whitish-ochreous. Palpi ochreous-whitish, basal half of second joint dark fuscous, terminal joint more or less wholly dark fuscous from below middle to near apex. Antennæ almost 1, dark fuscous, in ♂ simple. Thorax dark fuscous. Abdomen fuscous tinged with yellowish, anal tuft whitish-ochreous, beneath suffused with whitish-ochreous. Posterior tibiæ ochreous-whitish, externally suffused with dark fuscous, tarsi ochreous-whitish, more or less banded with dark fuscous. Forewings elongate, rather dilated posteriorly, costa slightly arched, apex obtuse, termen slightly rounded, rather oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex, 9 often out of 7; dark fuscous, faintly purplish-tinged; stigmata cloudy, blackish, plical somewhat beyond first discal, both more or less edged posteriorly with pale fuscous or ochreous, second discal and an additional dot beneath it more or less edged with pale fuscous or ochreous so as to form an 8-shaped mark; an obscure pale ochreous mark on costa at $\frac{2}{3}$, whence sometimes a faint sinuate pale line indented above middle crosses wing: cilia fuscous, basal line on termen pale ochreous. Hindwings and cilia grey.

Madulsima, Ceylon (Vaughan, Green); in April, May, and from September to November, thirteen specimens. Of these seven have vein 9 of forewings out of 7, and six have it separate. The whitish-ochreous head distinguishes this species from those most like it.

Brachmia lycopis, n. sp.

♂ ♀. 19 mm. Head dark fuscous, sides suffused with brownish-ochreous. Palpi pale whitish-ochreous, sprinkled with dark fuscous, lower half of second joint suffused with dark fuscous, terminal joint with median and subapical dark fuscous bands. Antennæ 1, dark fuscous, in ♂ simple. Thorax dark fuscous. Abdomen grey. Posterior tibiæ dark fuscous, apex

pale whitish-ochreous, tarsi pale whitish-ochreous banded with dark fuscous. Forewings elongate, costa gently arched, apex obtuse, termen rounded, rather oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; dark fuscous, slightly purplish-tinged ; stigmata brownish or pale brownish-ochreous edged with some blackish scales, plical slightly beyond first discal, both these small, second discal rather large : cilia purplish-fuscous, base mixed with darker. Hindwings and cilia grey.

Maskeliya and Madulsima, Ceylon (de Mowbray, Green) ; in November, January, and May, three specimens.

Brachmia isomila, n. sp.

♂. 20-22 mm. Head and thorax dark fuscous. Palpi pale ochreous, second joint dark fuscous except extreme apex, anterior edge of terminal joint suffused with dark fuscous. Antennæ almost 1, dark fuscous, simple. Abdomen fuscous, anal tuft pale ochreous. Posterior legs pale ochreous tibiæ externally suffused with fuscous or dark fuscous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen nearly straight, oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; dark bronzy-fuscous ; stigmata obscurely darker, plical slightly beyond first discal, second discal forming a transverse-linear mark : cilia fuscous, with two darker shades. Hindwings fuscous ; cilia as in forewings.

Maskeliya, Ceylon (Pole) ; in April, two specimens.

Brachmia paroristis, n. sp.

♂. 24-25 mm. Head and thorax dark fuscous, sides of crown pale-sprinkled. Palpi ochreous-whitish, second joint dark fuscous except towards apex, terminal joint sprinkled with dark fuscous. Antennæ 1, dark fuscous, simple. Abdomen rather long, fuscous. Posterior tibiæ whitish-ochreous, externally suffusedly mixed with dark fuscous, tarsi whitish-ochreous somewhat sprinkled with dark fuscous. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex rounded-obtuse, termen slightly rounded, rather oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; dark fuscous, faintly purplish-tinged, towards middle third of costa more or less suffused with pale ochreous-fuscous ; stigmata blackish, first discal forming a small oblique spot, plical a larger irregular spot beneath it, both these more or less edged posteriorly with pale ochreous, second discal represented by two transversely placed dots edged with pale ochreous so as to form an 8-shaped mark ; a cloudy pale ochreous-fuscous rather curved subterminal line, thicker and more distinct on costa, indented beneath costa : cilia fuscous, with rows of pale points. Hindwings fuscous-grey ; cilia light fuscous.

Madulsima, Ceylon (Vaughan) ; in May and June, two specimens. Much like *epomia*, which however has termen of forewings somewhat sinuate, and antennæ of ♂ distinctly ciliated (½).

Brachmia epomia, Meyr.

Maskeliya and Patipola, Ceylon.

Brachmia capnaula, n. sp.

♂ ♀. 20-22 mm. Head pale ochreous, face brownish-tinged. Palpi ochreous-whitish, second joint dark fuscous except apex, with scales rather roughly expanded above towards apex, terminal joint with subapical band of dark fuscous suffusion. Antennæ ¾, fuscous, ciliations in ♂ ⅔. Thorax purplish-fuscous, shoulders darker fuscous. Abdomen pale greyish-ochreous. Posterior legs ochreous-whitish, tibiæ externally suffused with dark fuscous. Forewings elongate, rather dilated posteriorly, costa slightly arched, apex obtuse, termen nearly straight, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; brownish, variable in depth, veins usually more or less marked with irregular streaks of coarse dark fuscous irroration; stigmata dark fuscous, plical beneath first discal, second discal larger, transverse-oval, but these are sometimes merged in more or less developed thick cloudy dark fuscous longitudinal streaks through middle of disc and along fold; a pale cloudy subterminal line formed by interruption of dark streaks on veins, somewhat indented above middle, terminal area beyond this often suffused with dark fuscous: cilia light greyish-ochreous, with two dark fuscous shades. Hindwings grey; cilia as in forewings.

Patipola, Newera Eliya, Maskeliya, and Haputale, Ceylon (Pole, Green, Alston); from February to April, eleven specimens. The structure of the palpi is peculiar, but in all other respects the species clearly belongs here and cannot be separated.

Brachmia fornacalis, n. sp.

♂ ♀. 17-19 mm. Head bronzy-fuscous, more or less suffused with whitish-ochreous on sides. Palpi ochreous-whitish, second joint suffused with dark fuscous except towards apex, terminal joint with subapical band of dark fuscous suffusion. Antennæ almost 1, dark fuscous, in ♂ simple. Thorax dark purplish-fuscous. Abdomen fuscous. Posterior legs whitish-ochreous, tibiæ externally suffused with dark fuscous, tarsi banded with dark fuscous suffusion. Forewings elongate, posteriorly dilated, costa slightly arched, apex obtuse, termen faintly sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to termen; rather dark purplish-fuscous, in ♂ lighter in disc; stigmata represented by blackish-fuscous spots, first discal small, roundish, plical beneath it, larger, irregular, these two edged with whitish-ochreous posteriorly and sometimes confluent, second discal represented by two small transversely placed spots, connected and upper edged laterally with whitish-ochreous; in ♂ a distinct whitish-ochreous slightly curved transverse line at ⅔, dilated on costa, indented above middle, in ♀ represented by costal spot only: cilia fuscous, in ♂ with whitish-ochreous basal line on termen. Hindwings and cilia fuscous.

Kandy, Ceylon (Mackwood); in January, two specimens.

Brachmia exophthalma, n. sp.

♂ ♀. 17-21 mm. Head and thorax rather dark purplish-fuscous, sides of head suffused with pale ochreous. Palpi ochreous-whitish, second joint dark fuscous except apex. Antennæ 1, rather dark fuscous, in ♂ simple. Abdomen pale ochreous, in ♀ infuscated. Posterior legs whitish-ochreous, tibiæ externally suffusedly mixed with dark fuscous. Forewings elongate, rather narrow at base, posteriorly dilated, costa gently arched, apex obtuse, termen almost straight, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; purplish-fuscous, rather darker in ♀; an elongate black dot beneath costa near base; plical and first discal stigmata united into a transverse-oval blackish blotch, edged posteriorly with whitish-ochreous, and second discal represented by a quite similar blotch, edged on both sides; a black dot lying between upper extremities of these; an indistinct pale ochreous somewhat curved subterminal line, dilated and distinct on costa, indented beneath costa: cilia in ♂ whitish-ochreous with two obscure fuscous shades, in ♀ fuscous. Hindwings in ♂ light grey, in ♀ grey; cilia as in forewings.

Maskeliya, Ceylon (Pole, de Mowbray); in January, April and October, four specimens.

Brachmia cordata, n. sp.

♂. 18 mm. Head dark fuscous, sprinkled with pale points. Palpi ochreous-whitish, second joint suffused with dark fuscous except apex, terminal joint mixed with dark fuscous. Antennæ nearly 1, dark fuscous, simple. Thorax dark fuscous. Abdomen pale ochreous. Posterior legs whitish-ochreous, tibiæ externally suffused with dark fuscous, tarsi banded with dark fuscous. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen somewhat rounded, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; purplish-fuscous, irrorated with blackish, more strongly and suffusedly towards base, along costa, and on terminal area; a streak of ochreous-whitish suffusion along dorsum from $\frac{1}{5}$ to $\frac{3}{4}$; stigmata represented by cloudy blackish spots, first discal roundish, plical beneath this, larger, irregular, both these irregularly edged posteriorly with white, second discal transverse-oval, edged posteriorly and slightly anteriorly with white; a strong whitish-ochreous subterminal line, indented on upper half: cilia fuscous, with rows of whitish points, and a darker antemedian shade. Hindwings fuscous-whitish, gradually more infuscated posteriorly; cilia fuscous-whitish, with fuscous subbasal shade.

Palni Hill (Campbell); one specimen.

Brachmia nubigena, n. sp.

♂. 17 mm. Head ochreous-whitish, face fuscous. Palpi ochreous, whitish, second joint dark fuscous except towards apex, terminal joint sprinkled with dark fuscous towards apex. Antennæ nearly 1, dark fuscous,

minutely ciliated. Thorax dark purplish-fuscous. Abdomen pale greyish-ochreous. Posterior legs ochreous-whitish, tibiæ externally suffused with dark fuscous. Forewings elongate, rather dilated posteriorly, costa gently arched, apex obtuse, termen faintly sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; dark purplish-fuscous; stigmata cloudy, blackish, plical slightly beyond first discal; a small pale ochreous spot on costa at $\frac{2}{3}$, and a minute dot on dorsum before tornus: cilia fuscous, with darker subbasal shade. Hindwings light fuscous; cilia fuscous-whitish, with two light fuscous shades.

Haputale, Ceylon (Fletcher); in August, one specimen.

Brachmia citrostrota, n. sp.

♂ ♀. 15-17 mm. Head dark purplish-fuscous, face and sides of crown ochreous-yellowish. Palpi ochreous-yellowish, second joint sprinkled with dark fuscous, terminal joint with a suffused dark fuscous streak on each side. Antennæ 1, ochreous-yellowish, suffusedly spotted with dark fuscous, in ♂ simple. Thorax dark purplish-fuscous, with an ochreous-yellowish line on each side of back. Abdomen rather dark fuscous, in ♂ with margins of segments towards apex spotted with pale yellowish, anal tuft light yellowish. Posterior tibiæ dark fuscous with basal, median, and apical pale yellowish marks, tarsi pale yellowish more or less variably sprinkled with dark fuscous. Forewings elongate, rather narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to termen; rather dark fuscous mixed with blackish, faintly purplish-tinged; undefined longitudinal streaks of ochreous-yellowish suffusion or irroration above and below middle, confluent posteriorly into a moderately broad irregular subterminal transverse fascia: five small pale yellowish spots on posterior half of costa; stigmata represented by round spots of blackish suffusion, plical rather obliquely beyond first discal: cilia purplish-fuscous mixed with darker, on termen with basal and apical pale yellowish lines, basal third narrowly barred with pale yellowish. Hindwings rather dark grey; cilia grey with basal and apical ochreous-whitish lines.

Khasis; in May, eighteen specimens.

Brachmia cenchritis, n. sp.

♂ ♀. 16 mm. Head and thorax light ochreous-yellowish sprinkled with dark fuscous except on face. Palpi whitish-ochreous sprinkled with dark fuscous. Antennæ 1, whitish-ochreous, sprinkled or spotted with dark fuscous, in ♂ simple. Abdomen whitish-ochreous, sprinkled with dark fuscous on sides. Posterior legs ochreous-whitish suffusedly sprinkled with dark fuscous. Forewings elongate, rather narrow, costa gently arched, faintly sinuate in middle, apex round-pointed, termen sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; ochreous-whitish, irregularly strewn

with ochreous or brownish scales with black tips; stigmata represented by spots formed of accumulations of similar scales, first discal round, second large, roundish, plical elongate, somewhat before first discal; four small spots of similar scales on posterior half of costa, and a suffused streak close before termen: cilia ochreous-whitish sprinkled with blackish, basal third pale yellowish. Hindwings ochreous-whitish, somewhat sprinkled with grey, especially towards apex; cilia as in forewings.

Khasis; in April, two specimens.

Brachmia strangalistis, n. sp.

♂ ♀. 16 mm. Head light ochreous-yellowish, centre of crown tinged with purplish-fuscous. Palpi pale ochreous-yellowish, anterior edge of terminal joint dark fuscous. Antennæ 1, whitish-yellowish, obscurely dotted with fuscous, in ♂ simple. Thorax lilac-brownish. Abdomen light ochreous. Posterior tibiæ fuscous, apex pale yellowish, tarsi pale yellowish suffusedly banded with fuscous. Forewings elongate, rather narrow, costa slightly arched, slightly sinuate in middle, apex round-pointed, termen faintly sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to termen; brownish, sprinkled with dark fuscous; stigmata represented by spots of dark fuscous suffusion, first discal round, second transverse-oval, plical smaller, beneath first discal; posterior half of costa suffused with dark fuscous, interrupted by an ochreous-yellowish patch towards apex, the obscure dark suffusion extending along upper part of termen: cilia whitish-ochreous tinged with brownish, with a dark fuscous postmedian shade. Hindwings ochreous-whitish-grey, becoming grey towards apex; cilia whitish-ochreous, with two faint greyish shades.

Khasis; in April, August, and October, three specimens.

Brachmia phryganitis, n. sp.

♂ ♀. 16-18 mm. Head whitish-ochreous. Palpi ochreous-whitish, second joint sprinkled with fuscous. Antennæ ¾, fuscous, ciliations in ♂ 1. Thorax whitish-ochreous, patagia more or less infuscated. Abdomen whitish-ochreous. Posterior legs ochreous-whitish, more or less sprinkled with fuscous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa gently arched, apex obtuse, termen slightly rounded, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; ochreous-whitish irregularly mixed with fuscous, suffusedly streaked with brown between veins, these streaks in disc and towards base marked with lines of black scales; a blackish dot towards costa before middle; stigmata black, discal connected by a black streak which is extended to apex, thickest posteriorly, plical represented by an elongate mark; a patch of blackish irroration about fold beyond middle: cilia ochreous-whitish mixed with pale fuscous, at apex with a blackish bar, on termen with basal third spotted with blackish. Hindwings pale grey; cilia ochreous-whitish.

Maskeliya and Madulsima, Ceylon (Pole, Alston, de Mowbray, Vaughan); from November to January, and May to August, eleven specimens.

Brachmia arotræa, Meyr.

Maskeliya and Ambulangoda, Ceylon; Palni Hills, 6,000 feet; N. Coorg, 3,500 feet; Khasis; Koni, Burma.

Brachmia xerastis, Meyr.

Mooltan, Punjab.

Brachmia aruritis, n. sp.

♂ ♀. 11-13 mm. Head fuscous sprinkled with pale greyish-ochreous. Palpi ochreous-whitish irrorated with dark fuscous. Antennæ ⅘, dark fuscous, ciliations in ♂ 1. Thorax fuscous. Abdomen grey, anal tuft whitish-ochreous. Posterior legs pale whitish-ochreous, externally mixed with fuscous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen rounded, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; rather dark purplish-fuscous, veins marked by lines of black irroration, partially and variably edged with whitish-ochreous dashes and lines, especially subcostal and plical lines towards base, and a subterminal series of dashes; stigmata obscure, blackish, partially edged with whitish-ochreous, plical elongate, all tending to be merged in the dark streaks: cilia dark fuscous with rows of whitish-ochreous points, base barred with whitish-ochreous. Hindwings grey; cilia light grey.

Maskeliya, Matale, Puttalam, and Trincomali, Ceylon (Pole, de Mowbray, Fletcher); in December and January and from April to August, nine specimens.

Brachmia percnobela, n. sp.

♀. 17-19 mm. Head, palpi, antennæ, and thorax dark fuscous, antennæ ⅘. Abdomen fuscous. Posterior tibiæ light greyish-ochreous, externally suffused with rather dark fuscous. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen slightly rounded, rather oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; dark ashy-fuscous, veins obscurely marked with blackish; stigmata obscure, blackish, plical dash-like, rather before first discal, which is also rather elongate: cilia dark ashy-fuscous. Hindwings and cilia grey.

Nilgiris, 3,500 feet (Andrewes); in August, two specimens. Specially characterised by the wholly dark fuscous palpi.

Brachmia lochistis, n. sp.

♂ ♀. 12-13 mm. Head and thorax fuscous, face paler, margins of eyes pale ochreous. Palpi pale whitish-ochreous, second joint sprinkled with fuscous, anterior edge of terminal joint fuscous. Antennæ ⅘, rather dark fuscous, ciliations in ♂ 1. Abdomen fuscous, anal tuft mixed with ochreous-whitish. Posterior legs grey-whitish. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen nearly straight, oblique; 2 and 3

stalked, 7 and 8 stalked, 7 to apex; rather dark fuscous, faintly purple-tinged; stigmata cloudy, blackish, plical beneath first discal, larger, suffused, preceded by some white scales; a pale whitish-ochreous spot on costa at $\frac{3}{4}$; a terminal series of indistinct dark fuscous dots: cilia pale brownish with rows of whitish-ochreous points, basal third whitish-ochreous, barred with rather dark fuscous on costa, tips and a patch beneath tornus mixed with dark fuscous. Hindwings grey; cilia light grey.

Maskeliya and Puttalam, Ceylon (Pole); N. Coorg, 3,500 feet (Newcome); from December to February and in May, five specimens.

Brachmia hapalyntis, n. sp.

♂ ♀. 10-12 mm. Head and thorax pale ochreous, sometimes tinged or sprinkled with fuscous. Palpi ochreous-whitish, second joint sprinkled with fuscous. Antennæ $\frac{4}{5}$, pale ochreous suffusedly ringed with dark fuscous, in ♂ simple. Abdomen light grey. Posterior legs pale whitish-ochreous, sprinkled with fuscous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen very obliquely rounded; 2 and 3 stalked, 7 and 8 stalked, 7 to apex, 9 sometimes out of 7 near base; pale ochreous, irregularly clouded with brownish and sprinkled with dark fuscous; stigmata moderately large, round, black, edged with white, plical beneath first discal; a terminal series of black dots: cilia whitish-ochreous, basal half obscurely barred with brownish. Hindwings pale grey; cilia pale whitish-ochreous tinged with grey.

Puttalam, Ceylon (Pole); N Coorg, 3,500 feet (Newcome); in May and December, six specimens.

Brachmia sigillatrix, Meyr.

Cochin; Kanara.

Brachmia autonoma, Meyr.

Cochin; Purneah, Bengal; Chagos Island.

Brachmia epistricta, Meyr.

Maskeliya, Ceylon.

Brachmia carphodes, Meyr.

Khasis.

Brachmia dolosa, n. sp.

♂ ♀. 10-12 mm. Head whitish-ochreous. Palpi ochreous-whitish, second joint suffusedly irrorated with dark fuscous except apex. Antennæ $\frac{4}{5}$, whitish-ochreous suffusedly dotted with dark fuscous, ciliations in ♂ $\frac{1}{2}$. Thorax whitish-ochreous sprinkled with fuscous and dark fuscous. Abdomen whitish-ochreous. Posterior legs ochreous-whitish sprinkled with dark fuscous. Forewings elongate, costa moderately arched, apex round-pointed, termen faintly sinuate, very oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to termen; whitish-ochreous, more or less sprinkled with brownish and dark fuscous; stigmata formed of blackish irroration, plical rather

obliquely before first discal; a small transverse spot of blackish irroration on dorsum somewhat before second discal; an acutely angulated series of cloudy black dots close before posterior third of costa and termen: cilia whitish-ochreous, sprinkled with dark fuscous points. Hindwings with upper part of termen hardly sinuate, very oblique, median curve gentle and little prominent, cilia 1; light grey; cilia whitish-ochreous.

Peradeniya, Ceylon (Green); in February, four specimens. Extremely like *alienella*, but smaller and paler, termen of forewings more oblique; best distinguished by form of hindwings, which in *alienella* are broader, more trapezoidal, with upper part of termen distinctly sinuate and less oblique, median curve stronger and more prominent, cilia $\frac{3}{4}$.

Brachmia alienella, Walk.

Maturatta and Madulsima, Ceylon.

Brachmia metæca, Meyr.

Maskeliya, Diyatalawa, Madulsima, and Trincomali, Ceylon.

Brachmia custos, n. sp.

♀. 19 mm. Head pale yellow-ochreous. Palpi pale yellowish, second joint dark fuscous except apex, terminal joint slightly sprinkled with dark fuscous. Antennæ $\frac{1}{3}$, rather dark fuscous. Thorax dark fuscous. Abdomen fuscous, apex light yellow-ochreous. Posterior tibiæ ochreous-whitish, externally somewhat sprinkled with fuscous, tarsi whitish-yellowish. Forewings elongate, costa gently arched, apex obtuse, termen nearly straight, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; dull ochreous-brown; a basal fascia of rather dark fuscous suffusion; costa infuscated from this to beyond middle; a broad fascia of rather dark fuscous suffusion beyond middle, second discal stigma forming small round dark fuscous spot on inner edge of this: cilia fuscous sprinkled with dark fuscous, with series of whitish-ochreous points, basal third suffused with whitish-ochreous. Hindwings grey; cilia whitish-grey-ochreous with several obscure fuscous lines.

Nilgiris, 6,000 feet, in May (Andrewes); one specimen.

Autosticha vicularis, n. sp.

♂ ♀. 9-12 mm. Head and thorax pale ochreous, sometimes sprinkled with dark fuscous. Palpi whitish-ochreous, second joint sprinkled with blackish, with a more distinct subapical ring, terminal joint with supramedian band of blackish irroration. Antennæ whitish-ochreous dotted with blackish, ciliations in ♂ $\frac{3}{4}$. Abdomen whitish-ochreous tinged with grey. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; pale ochreous, more or less sprinkled with dark fuscous; stigmata black, plical rather obliquely before first discal, second discal sometimes rather large; a small spot of blackish suffusion on dorsum beneath second discal; a row of cloudy blackish dots close before posterior third of costa

and termen: cilia pale ochreous, with a few dark fuscous points. Hindwings grey; cilia whitish-ochreous tinged with grey.

Galle, Ceylon (Fletcher); in June, thirteen specimens. Extremely like *Brachmia dolosa*, but (besides the generic difference of neuration) apex of forewings more obtuse, termen less oblique, terminal joint of palpi with blackish supramedian band. The species are so similar in size, colour, and markings that they are scarcely distinguishable if these points are not noticed.

Ischnodoris, n. g.

Head with appressed scales, sidetufts loosely spreading; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ shortly ciliated, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint with appressed scales, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with rough scales above. Forewings with 2 and 3 stalked, 6 absent, 7 and 8 stalked, 7 to termen, 11 from middle. Hindwings 1, elongate-ovate, cilia $1\frac{1}{4}$; 3 and 4 connate, 5 somewhat approximated, 6 and 7 stalked.

Allied to *Brachmia*, of which it is a development.

Ischnodoris sigalota, n. sp.

♂ ♀. 11-12 mm. Head ochreous-whitish, more or less sprinkled and sides of face suffused with fuscous. Palpi whitish, second joint fuscous except apex, apex of terminal joint more or less suffused with dark fuscous. Antennæ grey ringed with whitish, in ♂ shortly ciliated. Thorax whitish closely irrorated with brownish. Abdomen grey, anal tuft ochreous-whitish. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; pale whitish-ochreous closely irrorated with brownish; stigmata rather large, black, plical smaller, slightly beyond first discal; a spot of blackish suffusion on dorsum slightly before second discal; row of cloudy blackish dots or groups of scales close before margin round termen and posterior part of costa: cilia whitish-ochreous sprinkled with brownish, on costa slightly ferruginous-tinged. Hindwings grey; cilia pale greyish.

Maskeliya, Ceylon (Pole, Alston); in February, May, July and from October to December, twelve specimens.

Strobisia, Clem.

Head smooth-scaled, glossy; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ simple, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint smooth-scaled, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ with rough scales above. Forewings with 2 and 3 stalked, 7 and 8 stalked, 7 to costa or sometimes apex or rarely absent, 9 seldom out of 7, 11 from middle. Hindwings 1 or over 1,

elongate-trapezoidal, termen somewhat sinuate, cilia ½-1; 3 and 4 connate or stalked, 5 somewhat approximated, 6 and 7 stalked or approximated towards base.

This genus closely approaches *Brachmia* in structure, differing in the smooth glossy head, the more generally costal termination of vein 7 of forewings, and the presence of metallic markings; the last-mentioned character, though apparently trivial, is constant and easy of appreciation, and the separation is undoubtedly natural, the two genera being not in fact very closely allied. I describe 10 new species, and include also in their places those already known from the Indian region.

Strobisia aurantiaca, Wals.

Kandy, Galle, Colombo, and Yatiyantota, Ceylon; N. Coorg, 3,500 feet.

Strobisia amethystias, Meyr.

Peradeniya, Kandy, Kegalle, and Galle, Ceylon.

Strobisia augusta, n. sp.

♂. 13 mm. Head and thorax dark fuscous, lower part of face whitish-ochreous. (Palpi broken.) Antennæ dark fuscous, beneath whitish-ochreous, spotted on sides. Abdomen dark fuscous, beneath whitish, with lateral series of oblique dark fuscous bars, anal tuft whitish. Forewings elongate, rather narrow, posteriorly slightly dilated, costa almost straight anteriorly, gently arched towards apex, apex obtuse, termen faintly sinuate, little oblique; 7 absent; dark fuscous, anteriorly tinged and somewhat streaked towards base with orange-ochreous; markings pale violet-blue-metallic, dark-edged; costal and median streaks from base to ½; an oblique irregular streak from beyond apex of costal streak to disc beyond middle, followed by an oblique fulvous streak from costa; a spot above dorsum before middle; an oblique striga towards dorsum beyond middle; a straight fascia before ¾, interrupted above middle, followed by a transverse somewhat lighter fuscous line; terminal area beyond this tinged with fulvous and obscurely streaked longitudinally with blackish-fuscous, the streaks terminated in irregular pale violet-blue-metallic spots before margin; cilia bluish-leaden-metallic. Hindwings blackish-fuscous, somewhat lighter anteriorly; cilia grey-whitish, basal third blackish.

Khasis; in September, one specimen.

Strobisia uranopis, Meyr.

Koni, Burma.

Strobisia victrix, n. sp.

♂ ♀. 10-12 mm. Head dark fuscous, lower part of face bronzy-whitish. Palpi bronzy, terminal joint whitish with two black lines. Antennæ ochreous-whitish, spotted with dark fuscous. Thorax dark fuscous, with three metallic-blue stripes. Abdomen dark fuscous, beneath ochreous-whitish except towards base of segments. Forewings elongate, rather narrow,

posteriorly slightly dilated, costa slightly arched, apex obtuse, termen sinuate, little oblique; 7 and 8 long-stalked, 7 to apex; blackish-fuscous; markings violet-blue-metallic; a streak along costa from base to $\frac{1}{3}$, thence continued obliquely downwards to below middle of disc; a subdorsal streak from base to near middle; a spot on dorsum at $\frac{2}{3}$; a somewhat oblique slightly curved irregular fascia from $\frac{2}{3}$ of costa, reaching $\frac{3}{4}$ across wing; an irregular fascia immediately before termen, tending to be broken into three or four spots; termen tinged with fulvous, with a black marginal line: cilia bluish-leaden-metallic. Hindwings dark fuscous; cilia fuscous, with dark fuscous subbasal shade.

N. Coorg, 3,500 feet (Newcome); in May, July and November, five specimens.

Strobisia armata, n. sp.

♂ ♀. 10-11 mm. Head bronzy, lower part of face whitish. Palpi whitish, second joint suffused with dark grey towards apex anteriorly, terminal joint with two blackish lines. Antennæ dark fuscous, beneath whitish. Thorax fulvous, with three leaden-metallic stripes. Abdomen dark leaden-grey, apex whitish, beneath ochreous-whitish except towards base of segments laterally. Forewings elongate, slightly dilated posteriorly, costa slightly arched, apex obtuse, termen slightly sinuate, little oblique; 7 and 8 long-stalked, 7 to apex; rather bright fulvous; markings bluish-leaden-metallic edged with blackish scales; a streak from base along costa to $\frac{1}{3}$, thence obliquely across wing to $\frac{2}{3}$ of dorsum, where it meets a slightly curved rather narrow fascia from $\frac{2}{3}$ of costa; a subdorsal streak from base to $\frac{2}{3}$; a small white mark on costa beyond postmedian fascia; posterior area beyond this fascia wholly black, except an irregular blue-leaden-metallic fascia close before termen, leaving a fulvous black-edged terminal line: cilia bluish-leaden-metallic. Hindwings blackish-fuscous; cilia dark fuscous.

Khasis; in September, two specimens. I regard the following as probably a seasonal form:—

var. *obscurata*. ♂ ♀. 11-16 mm. Differs from the type in having the fulvous ground-colour duller and more or less largely mixed and suffused with dark fuscous, sometimes mostly obscured, usually forming a more or less defined dark fuscous sometimes pale edged blotch on dorsum about middle; sometimes an obscure pale oblique transverse line from the white costal spot.

Khasis; in November, six specimens.

Strobisia enoptrias, n. sp.

♀. 14-16 mm. Head and thorax dark prismatic-bluish-fuscous. Palpi bronzy-fuscous, anterior edge of terminal joint dark fuscous. Antennæ dark fuscous. Abdomen dark fuscous, beneath whitish except towards

base of segments on sides. Forewings elongate, rather narrow, hardly dilated, costa slightly arched, faintly sinuate in middle, apex obtuse, termen somewhat rounded, oblique; 6 to apex, 7 and 8 stalked; dark bronzy-fuscous; a very broad leaden-metallic streak along costa from base to $\frac{1}{3}$, and one less broad along dorsum from base to near middle, confluent at base, and with their posterior extremities connected by an angulated bar; a broad slightly curved leaden-metallic fascia from middle of costa to $\frac{2}{3}$ of dorsum; an oblique white strigula on costa at $\frac{2}{3}$; a broad leaden-metallic terminal fascia narrowed to tornus, marked with a whitish-ochreous dash from apex: cilia leaden-metallic, on costa with basal third whitish-ochreous, marked with black at extreme base. Hindwings dark fuscous, more blackish-fuscous posteriorly; cilia dark fuscous.

Khasis; four specimens.

Strobisia brabylitis, n. sp.

♀. 12 mm. Head and thorax dark bronzy-fuscous, lower part of face ochreous-whitish. Palpi pale greyish-ochreous, towards base more whitish-ochreous, anterior edge of terminal joint dark fuscous. Antennæ fuscous ringed with black. Abdomen dark purplish-fuscous, central third of ventral surface whitish-yellowish except on anal segment. Forewings elongate, rather narrow, posteriorly dilated, costa slightly arched, apex obtuse, termen somewhat sinuate, little oblique; 7 and 8 long-stalked, 7 to apex; bronzy-blackish; markings leaden-bluish-metallic; a streak along costa from base to near middle; four rather narrow transverse fasciæ, first at $\frac{1}{3}$, expanded on dorsum as a suffused patch to base, second oblique, from extremity of costal streak to dorsum beyond middle, third from a triangular white spot on costa at $\frac{2}{3}$, slightly curved, confluent with second on dorsum, fourth terminal: cilia dark fuscous. Hindwings blackish-fuscous; cilia dark fuscous, with blackish subbasal shade.

N. Coorg, 3,500 feet (Newcome); in December, one specimen.

Strobisia leucoplecta, n. sp.

♂ ♀. 8-9 mm. Head fuscous, face paler or whitish-fuscous. Palpi fuscous-whitish, second joint more infuscated towards apex, terminal joint with dark fuscous line on each side. Antennæ dark fuscous. Thorax dark leaden-fuscous. Abdomen dark grey, apex whitish. Forewings elongate, rather narrow, somewhat dilated posteriorly, costa slightly arched, apex obtuse, termen slightly sinuate beneath apex, little oblique; 7 and 8 long-stalked, 7 to just above apex; olive-ochreous suffusedly mixed with blackish, towards posterior half of costa and entire terminal area wholly suffused with blackish; markings leaden-metallic edged with black; a broad streak along costa from base to middle, thence continued across wing to $\frac{3}{4}$ of dorsum, connected also at $\frac{1}{4}$ with a blotch on basal portion of dorsum; a rounded-transverse white spot on costa at $\frac{3}{5}$ touching a leaden-

metallic spot in disc beneath it; an irregular thick transverse streak close before termen, leaving termen olive-ochreous edged with a black marginal line: cilia leaden-metallic. Hindwings rather dark grey; cilia grey.

Puttalam, Trincomali, and Galle, Ceylon (Pole, Fletcher); in June and from October to January, five specimens.

Strobisia immeritella, Walk.

Madulsima, Ceylon.

Strobisia epicentra, n. sp.

♂ ♀. 7-10 mm. Head and thorax bronzy-fuscous. Palpi white, with a black line on each side throughout. Antennæ whitish lined with blackish. Abdomen grey, apex ochreous-whitish. Forewings elongate, rather narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen somewhat sinuate beneath apex, little oblique; 7 to costa, 8 and 9 out of 7; blackish-fuscous; a fine white line immediately beneath costal edge from base almost to middle; an irregular yellow-ochreous patch on basal portion of dorsum, sending a very oblique streak to extremity of this line, receiving a yellow-ochreous line from base above middle, and continued to upper extremity of a strongly inwards-oblique very elongate-oval yellow-ochreous ring in disc beyond middle, this latter portion edged beneath by a white streak; two oblique slightly curved yellow-ochreous streaks from dorsum before middle to lower margin of this white streak, united at tips by a bar, second followed by more or less white suffusion; a yellow-ochreous streak from a white mark on costa at $\frac{2}{3}$ to dorsum before tornus, obtusely angulated in disc, separated on upper half from preceding markings by a white streak, and on lower portion by more or less white suffusion, and followed by a slightly curved leaden-metallic streak running from three short whitish striguläe on costa to tornus; terminal space beyond this yellow-ochreous, cut by three black bars, of which the median is thickest, upper linear: cilia pale ochreous, on upper part of termen leaden-metallic, on costa dark fuscous with whitish base, somewhat prominent at apex. Hindwings grey or dark grey; cilia ochreous-whitish more or less tinged with grey, becoming greyer round apex.

Maskeliya, Ceylon (Pole); in January, February, May, June, and October, eight specimens. This species, with the preceding and three following, forms a group requiring close attention as their markings are complex and superficially very similar; they can however easily be recognised if note is taken of the neuration, the markings of the palpi, and the character of the black marks preceding and following the subterminal metallic streak.

Strobisia rhabducha, n. sp.

♂ ♀. 11-12 mm. Head bronzy-fuscous, face paler or whitish-bronzy. Palpi fuscous-whitish, second joint dark fuscous towards apex anteriorly, terminal joint with a black line on each side. Antennæ dark fuscous,

extreme apex whitish. Thorax dark bronzy-fuscous. Abdomen grey, apex whitish. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen sinuate beneath apex, somewhat oblique; 7 absent, 8 and 9 stalked; blackish-fuscous; a pale grey supramedian streak from base to beyond middle, surmounted by an ochreous-yellow streak, both terminated by upper portion of a strongly inwards-oblique elongate-oval ochreous-yellow ring; two oblique white streaks from costa anteriorly running into subcostal yellow streak; an ochreous-yellow dash beneath supramedian streak near base; an irregular oblique-transverse blotch of ground-colour margined with ochreous-yellow extending from dorsum to supramedian streak before middle of wing; dorsal area before and beyond this somewhat mixed with whitish, area between oblique discal ring and tornus suffused with white mixed with grey; a pale leaden-grey oblique streak from near costa in middle to disc at $\frac{2}{3}$ more or less edged on both sides with ochreous-yellow, and shorter white oblique streak from costa adjacent to this posteriorly; three short white strigulæ on costa posteriorly, from third a straight leaden-metallic streak runs to tornus, preceded on lower $\frac{2}{3}$ by four anteriorly confluent ochreous-yellowish longitudinal marks appearing to enclose three wedgeshaped marks of ground-colour, and margined posteriorly by an ochreous-yellow terminal streak enclosing a black terminal line thickened beneath apex: cilia fuscous, outer half becoming whitish-ochreous towards tornus, on upper part of termen shining leaden-grey, on costa dark fuscous with base whitish, forming a somewhat prominent apical hook. Hindwings grey; cilia pale grey.

Maskeliya, Ceylon (Pole); in January, from March to June, and in September and October, twelve specimens. Five examples from N. Coorg, 3,500 feet (Newcome), are smaller, 9-10 mm., more sharply marked, terminal black line of forewings forming a more abrupt subapical spot; three from Nilgiri Hills, 3,500—6,000 feet (Andrewes) are 10-12 mm., subapical spot as well-marked as in these, but hindwings more or less suffused with whitish, especially in the specimen from 6,000 feet; the palpi and neuration are alike in all these, and I consider them all specifically identical.

Strobisia bicunea, n. sp.

♂ ♀. 9-10 mm. Head and thorax dark bronzy-fuscous, face bronzy-whitish. Palpi whitish, terminal joint with a dark fuscous line. Antennæ dark fuscous, extreme apex white. Abdomen grey, in ♂ with segmental margins and anal tuft whitish. Forewings elongate, rather narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen sinuate beneath apex, somewhat oblique; 7 to costa, 8 and 9 out of 7; blackish-fuscous; a somewhat arched yellow-ochreous subcostal streak from base to disc beyond middle, edged beneath by a shorter leaden-grey streak not reaching either extremity; two oblique white streaks from costa anteriorly

running into subcostal streak; an incurved yellow-ochreous line from ⅓ of dorsum to before apex of leaden-grey streak, and a fine white S-shaped line from beyond middle of dorsum to its apex; an oblique leaden-grey line from middle of costa to beyond apex of subcostal streak, nearly obsolete at origin, continued as a fine white S-shaped line parallel to the preceding one to dorsum, between these parallel lines is a yellow-ochreous dot; an oblique white striga from costa beyond middle, becoming yellow-ochreous beneath, and two short direct white strigulæ from costa posteriorly; a straight leaden-metallic streak from costa beyond these to tornus, margined anteriorly below middle by two wedgeshaped black marks surrounded with yellow-ochreous suffusion, and posteriorly above middle by a small black spot reaching termen, remainder of terminal area yellow-ochreous: cilia pale ochreous, basal third shining leaden-grey, tips dark fuscous on upper part of termen, on costa dark fuscous with base whitish, forming a somewhat prominent apical hook. Hindwings in ♂ grey-whitish or whitish-grey, darker posteriorly, cilia whitish; in ♀ rather dark grey, cilia grey.

Khasis; in April and from July to November, eighteen specimens.

Strobisia gradata, Meyr.

Khasis; Karsiang, 5,000 feet, E. Himalayas.

Strobisia hibisci Stt.

Maskeliya and Puttalam, Ceylon; N. Coorg, 3,500 feet; Pusa, Bengal; Calcutta; Khasis. Larva on *Hibiscus*.

Strobisia lamprostoma, Zell.

Yala, Ceylon (Fletcher); in February. Widely distributed in Africa and S. Europe.

Strobisia balteata, n. sp.

♀. 13-14 mm. Head bronzy-fuscous, face paler, becoming whitish-ochreous beneath. Palpi pale whitish-ochreous, second joint tinged with yellowish, anterior edge of terminal joint dark fuscous. Antennæ dark fuscous. Thorax dark bronzy-fuscous. Abdomen dark fuscous. Forewings elongate, slightly dilated posteriorly, costa slightly arched, more strongly posteriorly, apex obtuse, termen nearly straight, oblique; 7 and 8 stalked, 7 to apex; dark shining purplish-leaden-grey; a blackish-fuscous trapezoidal blotch on dorsum before middle, reaching ⅔ across wing, edged with whitish-ochreous; an oblique whitish-ochreous strigula from costa before middle, edged posteriorly with dark fuscous; second discal stigma small, transverse-linear, whitish-ochreous; a nearly straight double whitish-ochreous streak from about ⅔ of costa to dorsum before tornus, somewhat dilated on costa, followed by a fascia of blackish-fuscous suffusion; a whitish-ochreous streak round apex and termen to near tornus, thickened at apex, edged with a blackish marginal line: cilia shining dark leaden-grey. Hindwings blackish-fuscous; cilia dark fuscous.

Khasis; in October and November, two specimens.

Nosphistica, n. g.

Head smooth; ocelli present; tongue developed. Antennæ $\frac{2}{3}$, in ♂ with long fine ciliations (4), basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint smooth-scaled, terminal joint as long as second, slender, acute. Maxillary palpi short, filiform, appressed to tongue. Posterior tibiæ rough-scaled above, basal joint of tarsi tufted at apex. Forewings with 3 and 4 out of 2, 7 absent, 8 and 9 stalked. Hindwings over 1, trapezoidal, termen irregularly sinuate, cilia $\frac{1}{3}$, costa with projecting scale-teeth; 3 and 4 connate, 5 absent, 6 and 7 stalked.

A genus of peculiar facies and uncertain affinity, but probably allied to *Strobisia*; specially characterised by the costal scale-teeth of hindwings.

Nosphistica erratica, n. sp.

♂ ♀. 15-17 mm. Head dark fuscous, face pale whitish-ochreous, collar tinged basally with whitish-ochreous, probably expansible. Palpi pale whitish-ochreous, second joint with submedian and apical blackish bands, anterior edge of terminal joint blackish. Antennæ dark fuscous, towards base ringed with whitish-ochreous, apex and a band towards apex whitish. Thorax dark fuscous, in ♀ with posterior extremity mixed with pale ochreous. Abdomen dark fuscous, segmental margins more or less marked with pale ochreous-yellowish, segment 4 with pale ochreous-yellowish spot on sides. Posterior legs whitish, banded with blackish. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen nearly straight somewhat oblique; dark purplish-fuscous; a whitish-ochreous strigula on costa near base, and a transverse series of irregular marks about $\frac{1}{4}$; an irregular transverse spot from dorsum about middle, reaching nearly half across wing, in ♂ whitish, in ♀ yellowish; an obscure darker spot in disc at $\frac{2}{3}$, more or less edged laterally with whitish; a small white triangular spot on costa towards apex, and another at tornus; cilia dark fuscous, white on these spots. Hindwings with projecting blackish scale-teeth on costa at $\frac{1}{3}$ and $\frac{2}{3}$, termen with an irregular excavation above middle; dark fuscous; a white spot on middle of costa, and another before apex; two rather large blackish spots longitudinally placed in middle of disc, more or less whitish-edged; cilia dark purplish-fuscous, on lower half of termen pale whitish-ochreous with a blackish basal line which is much thickened at tornus with broad scales, dorsum also with rough projecting blackish and whitish scales.

Maskeliya and Kandy, Ceylon (Pole, Green); in March and September, two specimens.

Hyptiastis, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ 1, somewhat thickened towards base, in ♂ with short very fine widely

scattered cilia towards base, basal joint elongate, without pecten. Labia palpi very long, curved, ascending, second joint thickened with appressed scales, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ densely hairy above. Forewings with 2 and 3 short-stalked, 7 and 8 stalked, 7 to costa. Hindwings over 1, trapezoidal, apex obtuse, termen not sinuate, cilia $\frac{1}{2}$-$\frac{3}{4}$; 3 and 4 stalked, 5 approximated, transverse vein absent between 5 and 6, 6 and 7 stalked.

Probably a development of *Brachmia*, distinguished by the costal termination of vein 7 of forewings; the dilated hindwings of ♂ suggest relationship to *Tinyra*.

Hyptiastis clematias, n. sp.

♂ ♀. 17-19 mm. Head and thorax whitish-ochreous, shoulders dark fuscous. Palpi whitish-ochreous, second joint and base of terminal suffused with rather dark fuscous. Antennæ whitish-ochreous, indistinctly ringed with dark fuscous. Abdomen whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen in ♂ nearly straight, rather oblique, in ♀ slightly rounded and more oblique; dark purplish-fuscous; a whitish-ochreous dorsal stripe from base to tornus, in middle with a broad-triangular prominence reaching half across wing, before tornus with another triangular projection which is more or less, suffused posteriorly: cilia whitish-ochreous, on costa dark purplish-fuscous. Hindwings in ♂ considerably broader and more oblong than in ♀, whitish-ochreous, deeper-tinged and with somewhat modified scales towards base, veins 6 and 7 and a streak along posterior $\frac{2}{3}$ of costa and apical portion of termen suffusedly dark fuscous; in ♀ light grey, dorsum suffused with whitish-ochreous, dark markings indicated as in ♂ but indistinct; cilia whitish-ochreous, on costa dark fuscous.

Nilgiris, 6,000 feet; in May (Andrewes), three specimens.

XYLORYCTIDÆ.

Paradoris, Meyr.

Head with loosely appressed scales, side-tufts roughly spreading; ocelli present; tongue developed. Antennæ $\frac{3}{4}$, in ♂ simple, basal joint moderately elongate, without pecten. Labial palpi long, recurved, second joint much thickened with dense scales, sometimes somewhat projecting at apex beneath, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with long rough hairs above. Forewings with 2 from towards angle, 3 from angle, 7 and 8 stalked, 7 to apex or termen, 11 from middle. Hindwings 1, elongate-ovate, more or less pointed, cilia 1-1$\frac{1}{4}$; 3 and 4 connate, 5 parallel, 6 and 7 long-stalked.

Type *P. anaphracta*, Meyr. Although indicated, this genus has not been fully characterised before.

Paradoris amphicalyx, n. sp.

♂ ♀. 11-13 mm. Head white, lower part of face fuscous. Palpi white, second joint dark fuscous, except apex. Antennæ blackish. Thorax white, posterior extremity blackish. Abdomen whitish-ochreous suffused with pale grey. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; ochreous-white; a moderate blackish basal fascia, posterior edge nearly straight; plical and first discal stigmata minute, black, plical beneath first discal; a moderate blackish fascia about $\frac{3}{5}$, constricted in middle; several undefined dots or groups of blackish scales round apical part of costa and upper part of termen: cilia ochreous-whitish. Hindwings grey; cilia ochreous-whitish.

Cuddapah, 4,000 feet (Campbell); four specimens.

Paradoris rhodota, n. sp.

♂ ♀. 12-14 mm. Head and thorax dark fuscous, face paler. Palpi whitish mixed with blackish, second joint blackish except apex. Antennæ blackish. Abdomen light grey, apex ochreous. Forewings elongate, costa moderately arched, apex obtuse, termen very obliquely rounded; light rosy-pink; a narrow blackish basal fascia; plical and first discal stigmata minute, black, first discal sometimes placed in a small yellowish spot, plical beneath it; second discal represented by a black transverse mark, sometimes surrounded with yellowish, resting on apex of a transverse blackish dorsal spot; a small blackish spot on costa slightly beyond this; a row of small black dots round apex and termen: cilia light grey, towards base light rosy-pink, with some blackish points. Hindwings grey; cilia pale greyish.

Cuddapah, 4,000 feet (Campbell); five specimens.

Paradoris stesichora, n. sp.

♂ ♀. 11-13 mm. Head and thorax whitish-ochreous tinged with pink. Palpi brownish-ochreous irrorated with dark fuscous, terminal joint and apex of second whitish. Antennæ fuscous. Abdomen pale ochreous tinged with grey. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; whitish-ochreous tinged with rosy-pink, with some scattered fuscous and dark fuscous scales; a small blackish spot on base of costa, and one on dorsum near base; stigmata blackish, first discal forming a small round spot, plical dot-like, beneath it, second discal absorbed in a transverse blotch from dorsum; a small blackish spot on costa slightly beyond this, in one specimen little marked; some cloudy undefined blackish dots round apex and upper part of termen: cilia whitish-ochreous, towards base slightly pinkish-tinged and somewhat sprinkled with fuscous and dark fuscous. Hindwings grey; cilia whitish-ochreous.

Palni Hills (Campbell); Nilgiris, 3,500 feet, in March (Andrewes); two specimens.

Paradoris palacta, n. sp.

♀. 13 mm. Head white, lower part of face dark fuscous. Palpi white, second joint dark fuscous except apex, scales rather projecting at apex beneath. Antennæ dark fuscous. Thorax whitish-ochreous sprinkled with dark fuscous. Abdomen grey. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; whitish-ochreous irregularly sprinkled with dark brown; an elongate black mark along base of costa; a transverse blackish spot from dorsum near base; first discal stigma dot-like, black, second represented by a roundish black spot resting on a transverse-oblong blackish dorsal blotch; a moderate semi-circular blackish spot on costa rather beyond this; a row of cloudy blackish dots round apical portion of costa and termen: cilia ochreous-whitish, sprinkled with dark brown and blackish towards base. Hindwings grey; cilia pale whitish-ochreous tinged with grey.

N. Coorg, 3,500 feet (Newcome); one specimen.

Paradoris acatharta, n. sp.

♂ ♀. 13-14 mm. Head pale yellowish somewhat sprinkled with dark fuscous, in one specimen centrally suffused with blackish. Palpi whitish-yellowish, second joint more or less suffused with blackish irroration except apex, terminal joint somewhat sprinkled with black. Antennæ fuscous, obscurely pale-ringed towards base. Thorax pale purplish-grey spotted with pale yellowish, and suffusedly irrorated with black. Abdomen in ♂ whitish-ochreous-grey, anal tuft whitish-ochreous, in ♀ grey. Forewings elongate, costa moderately arched, apex round-pointed, termen extremely obliquely rounded; whitish-ochreous, irregularly marbled with light purplish-grey suffusion irrorated with black; the dark colouring forms a basal patch containing two short ochreous-yellow streaks from base and limited by a pale yellowish-tinged line from before $\frac{1}{3}$ of costa to $\frac{2}{3}$ of dorsum, somewhat angulated and tending to be interrupted on fold; it also covers dorsal $\frac{2}{3}$ of rest of wing, including two or three small yellowish spots beyond middle, and extending as a fascia to costa at $\frac{3}{4}$, and along termen to apex; a small dark spot on costa before apex: cilia pale whitish-ochreous sprinkled with black. Hindwings grey; cilia whitish-ochreous.

N. Coorg, 3,500 feet (Newcome); three specimens.

(*To be continued.*)

ERRATUM.

Page 439, line 2, for *hotlias* read *tholias*.





THE INDIAN LION (*Felis leo*).

Photographed in captivity at Junagadh, Kathiawar.

THE KATHIAWAR LION.

BY

LT.-COL. L. L. FENTON.

(With an Illustration.)

In an article recently contributed by me to our Journal, on the Kathiawar Lion, I did not give any of my own experiences in hunting it. As these tend in some measure to give an insight into the nature of the animal, I send the following account taken from my *shikar* diary in case it may be acceptable for publication.

It is many years now since I shot my first lion, *viz.*, in 1886, when I first went to Kathiawar. The Gir was then at its best in the matter of games of all kinds, and a *terra incognita* to all except a few local European and Junagadh State officials. Having obtained the readily granted permission of the Darbar to shoot a lion, I moved my camp towards the middle of the hot weather to the Talala *Ness* or hamlet, which besides being close to the lion country, has a good pitching ground under a magnificent grove of banyan trees which afford perfect protection from the sun during the day time. It lies about 14 miles, as the crow flies, north of Verawal, from which it can be reached by a so-called made-road which, at the time I write of, was never kept in repairs. Mukhbul Mia, one of the Junagadh Sardars, and the then Superintendent of the Gir, accompanied my camp for the purpose of rendering me all the assistance I required in attaining my object. The best of the State *pagis* or trackers were also placed at my disposal. The latter had already been sent out to mark down the lions some days previous to my arrival.

A few days before, lions had been heard close to Talala, but they had moved away. On the day following my arrival, I heard that there had been a "kill" at Borwao—a *Ness* about 8 miles distant from Talala, and that the *pagis* were tracking up the lion or lions which were responsible for it. I may here mention that the Gir lion rarely if ever returns to its "kill," which is probably owing to its food being so plentiful. The following day the expected *khubber* did not arrive, but on the 14th May—the next day—the *pagis* sent in word to say that there had been a fresh kill near

Borwao, and the lions, two in number, had been marked down in an adjoining jungle, about 10 miles away from my camp. The *khubber* reached us at about 11 A.M., and a few minutes later Mukhbul Mia and I and as many of our men as we could mount, were on our way to Borwao. After a scorchingly hot ride, we reached our destination, which was the well at Borwao, in about an hour, to find the beaters and *pagis* quite ready for an immediate start. Leaving our horses at the well, and delaying them only long enough to make the final arrangements for the drive, we all started together. After accompanying the beaters for about a mile, Mukhbul Mia and I left them to take up our position for the drive, leaving Hebat, the head *pagi*, to look after the beaters. I had been accustomed to use a bamboo ladder with broad rungs for sitting upon, when, tiger shooting in North Kanara, and had brought one with me on this occasion, but owing to the trees being small and stunted, it could not be used, and we had to be content with sitting on the sloping trunk of a tree with our feet resting on the ground. We had not very long to wait before the drive commenced. The lions were lying under a *wadh* or banyan tree, about two hundred yards distant from our tree. The beaters know beforehand exactly where the lion is lying and keeping fairly close together do not utter a sound, as a rule, until they are pretty close to its lair, when they shout for all they are worth. On the present occasion, almost immediately after the first shout, the lions made their appearance going through the jungle one behind the other at full tilt. I let them each have the contents of one barrel at about 30 yards distance, before they were out of sight. Neither of them gave tongue or seemed to flinch at my shots, and I made sure I had scored a miss; but almost immediately afterwards Gunoo, an old Mahratta retainer of mine, who happened to be seated in the direct line of flight of the lions and only just managed to escape being knocked over by them, by hastily clambering up into a tree, shouted out that the leading lion was wounded with a large patch of blood on its side. I was using an 8-bore smooth bore with a spherical ball. On hurrying down to him we found plenty of blood on the tracks. After waiting half an hour we commenced following up, and very soon

came upon the lion lying dead, which was a relief as I had some difficulty in keeping the men quiet, and the Darbari sepoys who would keep their muskets on full cock, were just as much a source of danger as the wounded lion! My 8-bore bullet had gone clean through the lion, touching up its heart and lungs, in spite of which it had managed to cover over 150 yards before falling. It measured 9 feet 1 inch in length, carried a short mane and was very fat. It was no good going after the second lion, as when once disturbed, lions clear out of the neighbourhood. Hebat, the *pagi*, informed me that when the beaters got up to the lions under the *wadh* tree, one of the latter was lying down, while the other one was walking backwards and forwards. Owing to the shade they afford, lions are very partial to these trees in the hot weather. I omitted to mention that the "kill" was a buffalo. On my way back to camp, I met the owner of the buffalo who informed me that it had been done to death by three lions, but one of them had been seen breaking away in the early morning.

A few days later, I moved my camp to Sasan, about 12 miles north of Talala, and the headquarters of the Gir Officials, whose offices are contained, for the sake of safety, in a kind of miniature fort on a commanding position. There is no village to speak of, only a few woodcutters' and Rabaris' huts erected just outside the fort walls.

My *pagis* were out everyday, but up to the 29th May had not succeeded in locating any more lions. In the meantime I had varied luck with smaller game, such as sambur and spotted deer locally known by the name of *Pasu*. The season was advancing; there had been some heavy rain, which was followed, as usual, by a good deal of fever amongst my followers. Moreover, with fresh water in all the *nalas*, the lions moved about more than they would otherwise have done, and were in consequence difficult to mark down; so giving up all hope of another lion during this season, I issued instructions for an early move out of the Gir, when luck befriended me again on the following day—the 30th May. I had arranged to stalk sambur and spotted deer in the Khokra jungles between four and five miles due east of Sasan, and to finish up with a drive for anything that would turn up in the middle of

the day, and had made an early start with Hebat, the *pagi*, and a few coolies. After half an hour's ride along the Khokra track, I sent my horse and tiffin cooly on to Khokra or where Khokra once stood, for it is only a deserted site now, to await my arrival there, while Hebat, I and the rest of the coolies entered the jungle for our stalk. It is unnecessary to enter into any details of this, it is sufficient to say that, although I saw a good deal of game, it was difficult to get a shot, owing to the dead leaves and the dryness of the jungle, and I only bagged a stag chital, when I happened to chance upon a large patch of burnt jungle. By the time I had done this, the sun was well up in the sky, so we turned our faces in the direction of Khokra and commenced walking at our usual place without attemping to preserve silence. After we had been going for about half an hour, Hebat, who was leading in his capacity of guide, suddenly stopped and drew my attention to a crow, which seated on the topmost bough of a tree near the summit of a low wooded hill, which we happened to be passing at the time, was cawing in the way in which crows always caw when something out of the common has attracted their attention.—" Perhaps a lion, saheb " remarked Hebat—and he was right, for the words were hardly out of his mouth before a fine lion sprang out of the jungle, on to a large rock below the tree, and then as suddenly disappeared with a bound into the jungle beyond, and was almost immediately followed by two others. We at once held a council of war as to how we could best circumvent them. As it was almost midday, it was unlikely that the lions, whch had not seen us, would travel very far, especially as it was more than probable they had been feeding off a recent " kill." To send for the coolies, which we were expecting to find collected for the " drive " at Khokra, would have been waste of time, so we decided to track them down with the few men that were with us; and as my breakfast and the men's food was away at Khokra, we lost no time in making a start. The tracking turned out to be a longer job than I had anticipated owing to the ground being baked quite hard.

There was nothing whatever to guide the men except the slight disturbance made by the lion's feet amongst the dead leaves which

was quite unnoticeable to ordinary eyes. It was wonderful how the men were able to make any progress at all, but they did do so slowly but surely; only one little bit of excitement did we have when Hebat coming to a sudden halt pointed towards a large clump of bamboos and whispered the word "*Sávaz*" (lion) into my ears! With some difficulty I made out what had attracted his attention, but this after all turned out to be a doe chital. After keeping up the tracking for a good two hours without success, we got into more open country. Down in a valley below us, we could see a large banyan tree towering above its neighbours, and Hebat at once declared that, if the lions were in the neighbourhood, we should find them under that tree. To save time, he, I and Kutchra made a bee line for it, leaving the others to follow up the tracks. The lions were there sure enough! As we cautiously approached the tree, Hebat's keen eyes spotted them lying in some coarse long grass at the foot of it, and of almost the same colour as themselves. We could just make out the form of one of them, but the others were certain to be somewhere near. The intervening ground was quite open and devoid of jungle, but about 50 yards on our side of the banyan, stood a small mimosa bush. Keeping this between us and the lions Hebat and I managed to crawl up to it without attracting their attention, although the one we could see was apparently quite wide-awake When, after a rest of a few seconds to steady myself, I rose to my feet to fire, it struck me that the animal we were stalking looked very much like a lioness. I could not make out a mane, whereas the lion we had seen on the top of the hill had an uncommonly good one. Hebat, however, insisted I was mistaken, and as it was difficult to make out much in the glare and the grass, I gave way to his greater experience and fired with the 8-bore. She rolled over with the shot; there was no doubt about her sex now, I was right after all, but she recovered herself immediately and was off. With the left barrel I rolled her over again, but she got to her feet once more, and was out of sight before I could get in another shot. Then, I heard several shots accompanied by excited shouts in the direction she had gone. Thinking some one was being mauled, I re-loaded the 8-bore as I ran along and exchanging it for the 500

express as being the lighter weapon, soon found myself in the middle of all the excitement. I had only time, however, to see the lioness growling ominously at the foot of a tree, and on the point of charging a *passaeta* or village policeman, who was doing his best to fire off a rusty old matchlock at her. I ran up, he stepped aside, and taking his place, I fired at her chest; but I was the reverse of steady from running and my ball, as I afterwards ascertained, only struck her in the muscles of her shoulder. She did not wait for more, but charged at once with the usual short angry cough—they cannot be called roars. I kept her covered with my rifle as she came on and gave her the contents of the left barrel when she was about twenty paces off. I aimed at her head and by a fluke the bullet went true and effectually doubled her up. However I did not realize this at the moment, for immediately after firing I turned round for my other gun, when to my horror, I saw my man Kutchra running away with it. It is needless to add that I flew after him expecting at every moment to be pulled down by the enraged lioness. It was a welcome shout, indeed, from one of the men which stopped me "*Margaya Saheb, Margaya*!"

She was a full-grown lioness, but not an old one, judging from the spots on her flanks. My first two shots from the 8-bore had both taken effect too high up and had touched no vital part. The men who had fired the shots I had heard, turned out to be a party of my own sepoys who were looking for me and by the merest chance had turned up just in the nick of time. They explained that the lioness nearly ran into them almost immediately after they had heard my shots, they had fired in self-defence and one of their shots had hit her in the body and made her come to a standstill.

In the excitement of the moment I had not noticed what became of the other two lions, but Hebat said he saw them making off in another direction as soon as I had fired. Having had nothing to eat since the early morning, we were about famished by this time, and our water had given out long before, so slinging the lioness on to a pole we made our way back to Khokra where the men's food as well as my own, had been left. On arrival there we found near the spot, where our men were waiting for us,

the remains of a buffalo, the lions' "kill" in fact. It had, evidently, only been killed on that very morning which would account for the lions being on the move so late in the day, long past their usual hour.

I believe it is a general idea that, *as a rule*, tigers avoid attacking a full grown buffalo. My experience of tigers is somewhat limited; but I can safely state, as regards the lion, that it has no hesitation in attacking a buffalo, when it comes in its way. I was once shown a huge buffalo, which had been attacked by a solitary lion, and which according to the owner, a *Rabari*, had sprung upon it from behind. The buffalo had succeeded in shaking it off, but the poor beast was dreadfully clawed and slowly dying when I saw it. On another occasion I came upon a *Rabari* lamenting over one of several buffaloes he was grazing at the time. He explained that not half an hour before my arrival a lion, whose tracks I had noticed on the road as I came along, had, in spite of his having tried to drive it away by shouting, wantonly attacked this particular buffalo and torn away its udder. It had made no attempt to kill the beast in the usual way, and had bolted without doing any further damage, but the buffalo, a full grown animal, was done for.

To continue, I very nearly succeeded in shooting another lion in these same Khokra jungles a short time afterwards. I came upon it, by the merest chance one morning when out-stalking with one of the Gir *pagis*. We were first made aware of its presence by its suddenly starting to roar, not one hundred yards away from us. Thinking, quite wrongly as it turned out, that it was roaring over a "kill," I tried to stalk it, the *pagi* following me; but we had not advanced very far before the latter touched my arm and pointed in the direction of a thick clump of bushes not twenty yards away. It was all very fine of him to whisper "*Maro, Sahib!*" I could see nothing until there was a rustle, and the lion was off without giving me a shot. I ran after it, but the chance was gone, and I never saw it again. There was no "kill." It was probably calling to its mate, but its roar had the effect of attracting all the animals in the jungle to the spot, for spotted deer and sambur were calling in every direction!

On another occasion, I chanced upon two lions in much the same way. On this occasion, my attention was attracted by the belling of a sambur. Thinking that it must have seen a panther, I was peering about the jungle, looking for the latter, when up got a couple of young lions from under a large corunda bush, and trotted away quite unconcernedly, stopping every now and again to have a look at the intruders. It was with difficulty that I resisted the temptation of shooting one or both, but I had shot my share of lions for the season and besides these animals were hardly more than half grown.

During the year 1890, H. R. H. the late Duke of Clarence, paid the Gir a short visit, at the invitation of H. H. the Nawab of Junagadh, for the express purpose of shooting a lion. Everything that was possible to ensure success was done by the Nawab, but in the end the Prince had to leave without a lion having been bagged either by him or one of his party. It was almost a case of too much *bandobast*.

The shooting camp was pitched, as usual, at Sasan. A party of three lions had been tempted by nightly feeds of buffalo, to remain in the neighbourhood, and on the morning succeeding the Prince's arrival, they had been safely marked down in a good position for "driving." The tree on which His Royal Highness was stationed had been selected after much deliberation ; and, if all had gone well, the lion should have passed, within a few feet of it. Of course, the unexpected happened! Far too many beaters had been provided by the Darbar. The men responsible for the "drive" were unable to control them properly, with the consequence that they commenced to shout at the wrong end of the line and far too soon. The result was what would be expected under the circumstances : the lions, on being disturbed, bolted in the wrong direction, nowhere near the Prince's tree. They passed, it is true, close to the tree occupied by one of the officers of his staff, but he failed to bag one, and the gun in the next tree also failed in a long shot. The lions cleared out of the neighbourhood and unfortunately no others were marked down before the Prince's visit came to a termination and every one except myself left the Gir.

Some days later, *khubber* was brought in to me late one afternoon that a lion had been marked down about 4 miles away from camp. It was almost too late to make any use of it, especially as I heard at the same time that only some half a dozen beaters could be got together at that hour, but it was worth the attempt. I started at once, and taking my rifle with me galloped to the spot, where my man was waiting for me, arriving just as it was beginning to get dark. After all there were only two or three men to do the driving. The lion was lying, as usual, at the foot of a large banyan tree and would soon be on the move—there was no time to be lost. I scrambled into the first tree which was at all suitable, and my man Oomar went off to assist in the driving. All might have turned out well, but almost as soon as Oomar had gone, I realized I should have the greatest difficulty in firing out of my tree without being knocked out of it. There was not a single branch to hang on to, and it was impossible to get down the smooth trunk with my rifle. I had to make the best of a bad job. I had not long to wait. A couple of shouts, and the lion was in evidence in the now fast increasing dusk.

It looked a magnificent beast in the uncertain light. If only I could get in a straight shot! But it was not to be. The lion started by making directly for my trees, but had not gone far before it turned off to the light and made up a hill. I balanced myself with much difficulty as I got in two snapshots before it disappeared over the brow of the hills. The result, as might have been expected, was nil. How I regretted I had not stood at the foot of the tree, or at any rate, tried to stalk it, but one always knows what one *ought* to have done after it is all over!

On the 1st May of the same year, I moved my camp to Moduka, a more pretentious *Ness* than the generality of them, in the very heart of the lion country. As I was leaving Sasan, I heard a lion roaring in the distance which I hoped portended good luck! My men had some difficulty in finding a suitable tree for my camp, owing to the best site being so overgrown with jungle, and when I arrived I found I had to share my camp with the grave of a Mahomedan Pir, which almost blocked up one of the entrances to my tent. An ancient worn-out black goat, which some days

before had been dedicated as an offering to the departed, by some devotee, was quietly grazing outside, and soon became very tame. A few days afterwards it was carried away in broad day-light by a Panther. I was busily engaged at the time inside the tent, when I heard a suppressed gurgle from the goat just outside, but thought nothing of it until a short time afterwards, the servant came running in to say what had happened. True enough the handful of black hair and the patches of blood told their own tale—the goat had gone—bodily carried away. I followed up the track until we lost them on the hard ground, my best *pagis* being away at the time. I sat up for the panther with a live goat in the evening, but although I heard it calling, it never came near me and I never heard of it again in the neighbourhood.

On the 8th May the *pagis* sent in *khubber* to say that they had found a lion. They had been looking for them ever since my arrival at Moduka. At the same time *khubber* was also sent to a brother officer and his friends who were then occupying my old camp at Tálálá. We all met at Khokra, where again the lion or lions had been marked down. It was not certain how many there were, but only one had been actually seen. The *pagis* advised a drive, but after past experiences we decided in the end to walk it up. One of us, if not all, was bound to get a shot in this way, whereas it was impossible to say what would be the result of a drive. The lion had been last seen on the brow of a low hill covered with small jungle, lying down in the shade of a small tree. My friends had quite an army of *darbarsi* sepoys, with them, all armed with antiquated muskets, besides the usual paraphernalia of swords, knives, daggers, etc. It certainly would have been *safer* to have left them all behind, but we did not wish to hurt their feelings; they were all so eager to come with us, so we allowed them to follow close behind us, on the express understanding that they were only to fire in the event of being charged, not otherwise. All being ready, we commenced our stalk, under the guidance of the *pagi* who had last seen the lion. We reached the top of the hill in dead silence, expecting to see the lion at any moment. It was disappointing, therefore, to find it had moved. However, while

peering about, I caught sight of it lying down under another tree, and after signalling to the others to be on the lookout I fired from a sitting position, the only one in which I could see the lion from where I happened to be. This was the signal for everyone, including the sepoys to empty their rifles! How any one escaped being hit was a wonder. The lion, in the meantime, was bolting away, though not at any great pace, as my first shot had struck it in the body, my second went anywhere, but I managed to get in a third shot with the 8-bore which my man thrust into my hands just in time, and this was followed by the welcome thud and the appearance of a red patch on the lion's side. With the left barrel, fired as it was disappearing, I missed. While we were all reloading, a second lion, which must have been lying somewhere near, suddenly appeared and stood growling at us for a few seconds but followed in the wake of its companion before anyone was ready to fire. All this took place within the space of a few seconds. The wounded lion with an 8-bore bullet through its body was unlikely to go very far. We gave it about twenty minutes law and then commenced to follow up, taking care not to run any further risks from the sepoys by leaving them behind. The *pagis* did the tracking, while we three kept a sharp lookout ahead. We very soon came up on the lion. It was lying on the ground. I got in the first shot, when it went off again without attempting to charge; but only to fall again a few yards further on, where another shot killed it outright. "What a cur" was the first remark, made by one of my companions, when it was all over, and he was right. Temperaments vary amongst all animals as much as they do amongst human beings. It was a fine lion with a good mane.

I got *khubber* of two more lions on the next day, but they had moved before I reached the jungle in which they had been marked down.

A few mornings later, I found the tracks of a lion just outside my tent. It had sauntered up during the night to within fifty yards of it, with no evil intentions I am sure, and then turned abruptly off into the jungles. We tried but did not succeed

in finding it. On the 13th May, I again got *khubber* of a lion which had been tracked into a *bhoira* or water-hole in the Jawantri jungles, about 5 miles away. I arrived at the spot long before sunset, intending to watch over the mouth of it, as the lion was certain to come out in the evening; but as I had promised my Tálálá friend to await his arrival before commencing my watch, I hung about the place—the very soul of impatience (!)—until it was reported to me that the lion had gone. My friend never turned up at all. Never again, I made up my mind, would I wait for anyone, under similar circumstances! On the following day, again, *khubber* came that four lions had been tracked into another *bhoira* near the first one. This *bhoira* had two entrances, about fifty or sixty yards apart from each other. I rode out and took up my position in a tree over one of them, while my friend, who turned up on this occasion, guarded the other entrance when he arrived. Yesterday's lion had emerged from its *bhoira* in broad daylight, but it was nearly dark before I heard a shot from my friend, with what result I did not learn until later. I waited on patiently at my post until it was too dark to see anything, much less the sight of my rifle. When matters had reached this stage, I heard a yawn below me followed by the rustling of dead leaves; the lions were out and apparently lying about at the mouth of the *bhoira* with no intention of moving away at once; but of course, it was impossible to see anything, although they were so close to me. This went on for some time, and as the lions gave no signs of moving and nothing was to be gained by remaining any longer up in my perch, I precipitated matters by firing off my rifle in the direction in which I heard the most rustling, with no results of course, beyond driving the lions away. As soon as all was quiet again, I descended from my tree; my friend it seemed had fired at a single lion. It was found dead on the following morning and turned out to be a half-grown cub.

Bad luck on the whole so far, but I had not long to wait for better! Only two days in fact, when my men sent in word to say that they had found the remains of a freshly killed buffalo, and were following up the lion which had killed it, and would let

me know by a *sowar* as soon as they had found it. I did not hear from them again on that day, but on the following a *sowar* came galloping into camp bringing the welcome news that the lion had been marked down and the *pagis* were keeping a watch over it from a distance. It was a long ride to the spot, but I reached it at the very best time, *viz.*, at the hottest part of a very hot day. The lion on this occasion had been tracked down by a fine young Sidi from the Jambûda *Ness* who generally worked under the directions of the head *pagi* Hebat whom I have already mentioned. With him was one Ismail, a Mekrani Jemedar in the Jûnágadh State service, also a good staunch man for a tight corner. The lion had not moved and was lying down under a shady tree on the tip top of a small conical hill where the cool breeze direct from the sea could reach it. The ground all around was very rough and hilly and a drive with any certainty of getting a shot was out of the question, especially with the very few men we had with us—only about half a dozen—so I decided on a stalk. The hill was covered with small loose stones, so in order to run no risk of disturbing the lion, we divested ourselves of our boots and shoes at the foot of the hill where we left them with the extra men. Ismail, who was armed with a D. B. muzzle-loading rifle, and I, with the 500 Express, led the way closely followed by the *pagi* who acted as guide and Kutchra with my spare gun. It was painful work getting over the rough ground without boots, but fortunately we had not a long climb. When we were about twenty-five yards from the top of the hill, the *pagi* pointed in the direction we were to look for the lion, and I soon made out the contour of the upper part of its body through the bushes—the lower part of it not being visible owing to the slope of the grounds. To fire from where I was standing was to court a failure as no vital part of its body could be seen, and again it seemed hardly possible to advance any more without disturbing the lion. It was an anxious moment and there was no time to be lost, for the lion might discover us at any moment and be off down the opposite side of the hill for ever. By good luck, however, just at my side, there happened to be an old stump of a tree about a yard high and with a flat top. Once on that—and I saw—it would be

all plain sailing. The only difficulty was how to mount it without making some slight noise and disturbing the lion in its slumbers, but the *pagi* was equal to the occasion. It was all done by signs—he stooped down; I stepped on his back, and as he gradually raised himself, I was able to step off on to the stump without the lion being a bit the wiser! There was no difficulty about a shot now. The lion was lying on its side with its legs towards us. The others were very quickly behind me, and when Ismail nodded to show that he was quite ready I fired, I only just had time to get in a second shot, which I think must have glanced off a bough as I could find no signs of it afterwards on the lion, before the latter was charging down upon us. I could of course do nothing with an emptied rifle in my hands, but fortunately for us, one of Ismail's two shots fired at uncomfortably close quarters, saved the situation! It struck the lion in the back and the latter instead of charging home, swerved, and just missing us, went tearing down the hill. Its race was however run, for as I looked round to watch it, it turned a complete somersault and after rolling over and over again lay perfectly still.

It was dead. My first shot had broken up in its chest, but if it had not been for Ismail's lucky one, some of us would have fared rather badly.

It was an old lion and its total length was 9 feet 5 inches, the length of its tail being 2 feet 11 inches.

A few days afterwards I shot a 7'-4" panther, and then left the Gir, nearly every soul in my camp being down with malarious fever.

Two years later when I was encamped at Háthina Mália, a *Garassia* village on the borders of the Gir country, H. H. the Nawab was kind enough to grant me permission to shoot another lion. I rode the 22 miles to Sásan, on the 1st June, and as I had only a few days at my disposal, I had already sent out the *pagis* to look out for lions. For two days there was not a vestige of *khubber*, but on the third, when I had already mounted my horse for the purpose of returning to Mália, a *sowar* rode in to say that two lions had broken during the night into a *zareba* at the Nandwao *Ness*, about 4 miles distant from Sásan, and done a lot of

damage amongst the cattle. Countermanding my orders for striking camp, I rode off at once to the *Ness*, taking my guns with me. On arrival there I found that three cows had been killed by the lions, two of them only had been partially devoured, the third being intact; two more had been badly mauled and a sixth was missing. The *pagis* were already on the tracks and I soon caught them up and kept with them for several hours. We made but slow progress over the hard ground and I was not sorry when they suggested that I should halt for a rest whilst they went on with their work, as I could catch them up again later on when they would call me. I had waited quite two hours and was beginning to think that after all the lions had eluded us, when the messenger came to say that they had been tracked down. The lions were as usual resting under a large banyan tree, at the foot of a rocky hill, known as the Kadlidhar. Ismail was not with me on this occasion. The ground was too open, the *pagis* declared to walk up the lions, so on their advice I decided to try a drive. I only had eleven men with me. I took up my position in a low tree overlooking a shallow *nala* leading past it, and coming direct from the banyan tree under which the lions were lying up and which they were likely to follow. The coolies were instructed not to shout until they were close to the lions. All was done as arranged, but the lions, instead of following the *nala* right up to my tree, only did so for a short distance and then turned off, up the hill just opposite me.

I managed, however, to get in two rather long shots at them as they were leisurely trotting away. I missed the leading lion, but dropped the second one. It immediately recovered itself but instead of following its companion, came wheeling round in my direction in a dazed kind of way and I had no difficulty in killing it with another shot.

The missing cow was found quietly grazing in the jungle close to where the lions were lying up. The *pagis* had noticed its tracks when following up the latter.

The lion measured 9 feet and had a medium-sized mane. The one which got away was a much finer beast. This was the last lion I shot, although I have since assisted others to get one. In my

subsequent excursions into the Gir, I principally devoted myself to shooting panthers. The largest of over forty shot by me in and around the Gir was almost a record. Its total length was 7'-8½" and its weight 160 lbs.

The two photographs on the accompanying plate are those of a Kathiawar lion in captivity at Junagadh. It shows the name well grown, and we have to thank Mr. C. H. Hill, I.C.S., and Major J. R. Carter for obtaining these interesting photographs.

NOTES ON SOME BUTTERFLIES FROM THE INDIAN REGION.

By

G. W. V. DeRhé-Philipe, F.E.S.

The following notes are the result of observations made and notes jotted down during the last two years, in the course of which I have done a good deal of personal collecting in the Sikkim and Bhutan Terais, the Khasi and Naga Hills and Assam generally. I have recently had an opportunity of putting these into form and of comparing my specimens with those in the Indian Museum and de Nicéville collections; and have confirmed, as far as possible, the observations I had previously made. The results may be of interest to the entomological members of the Society.

Danais aglea. Cramer.

Danais melanoides. Moore.

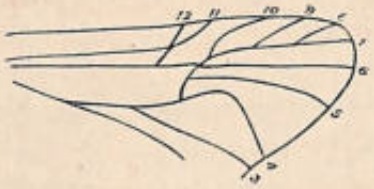
These two are usually considered as distinct species, or, at any rate, as well differentiated races; but my experience has been that none of the distinguishing characteristics are constant. I have taken the species in the Western Ghats, Kumaon, the Sikkim and Bhutan Terais, the Naga Hills and the Chittagong Hill Tracts; and have very carefully examined a long series consisting of specimens from each of these localities. Though extremes can be named readily enough, there are numbers of intermediate forms which it would be impossible, were the locality labels removed, to place either as **aglea** or **melanoides.** My own opinion is that all represent one somewhat inconstant species, **aglea.**

Another characteristic, which has been used to separate **aglea** and its allies from the rest of the genus—the anastomosis of vein 11 with vein 12—is also not constant. The extent of anastomosis varies very considerably. In some cases, a large proportion of vein 11 is anastomosed; in others, the two veins just touch and separate again: while frequently they only approach each other and do not actually touch. Speaking generally, the anastomosis is greatest in the extreme **aglea** form from Western India; and least, if at all existing, in the **melanoides** form from Assam.

D. agleoides. Felder, from Burma and the Malayan region, has been separated from **aglea** mainly on the absence of anastomosis, which, as has been pointed out, fails as a satisfactory test. I have only a small series of this last form; but it seems to be constant in respect of the great reduction of the hyaline markings on both wings, and is thus a distinct local race.

I have, in my collection, a curiously aberrant male of the **melanoides**

form taken by myself at the foot of the Naga Hills in Assam. The neuration of the forewing in respect of veins 10, 11 and 12 is peculiar as the following sketch will show :—



The hindwing is distinctly rectangular, being bluntly angled at the apex of vein 4. The fuscous border on both wings is broader and almost entirely without the usual hyaline spots, the subterminal row on the forewing being very small and markedly lunular. So different is the facies of the insect that, at first sight, one is inclined to consider it quite a distinct species.

Euploea core. Cramer.

A female of this species from Khandala in the Western Ghats has the apical white spots of the subterminal series on the forewing greatly enlarged and very prominent. It is practically the variety **vermiculata** described by Butler, but so far only recorded from the submontane tracts of Northern India.

Euploea diocletiana. Fabricius.

Euploea ramsayi. Moore.

As far as my experience goes, only one species is to be found in North-East India, and it is impossible to separate the Sikkim insect from that found in various parts of Assam. It is remarkable how very uncommon the females are everywhere. Males are fairly plentiful wherever the species occurs ; but of the dozens of insects I have captured or had brought to me by native collectors, only one has been a female. The same remark applies, in a somewhat lesser degree, to the female of **E. alcathoe,** Godart, a species found fairly commonly in some parts of Assam. Several writers have already remarked on the comparative scarcity of females of many of the species of **Euploea** ; but the disparity in the numbers of the sexes of these two forms is extraordinarily great.

Euploea mulciber. Cramer=**E. midamus.** Linnæus. var. nov. duarseri.

This is not a species which varies very much, but a male taken by me in the Duars is so distinct as to merit description. The insect is comparatively small ; and the forewing instead of being marked with the usual numerous violescent spots, is all but immaculate, a tiny dot beyond the cell and a few minute terminal spots being the only *lacunæ* in the intensely rich purple gloss of the wing. On the upperside of the hindwing, the patch of light coloured scales near the base of the cell forming part of the sex

mark is so reduced as to barely noticeable. There is no similar insect in the series of **E. mulciber** in the Indian museum and de Nicéville collections, but a few specimens in the latter from Borneo, named **E. basilissa,** Cramer, (now sunk as a synonym) approach the Duars insect in the paucity of violescent spots—though even these are far more numerously spotted. In the absence of material showing constancy, my variety can hardly be considered a distinct species; and it is probably a highly melanised example of what is usually a very constant species.

LETHE (Genus). Hübner.

A few remarks with respect to the altitudinal range of the different species of this extensive genus may be interesting. Though the type species—**L. europa,** Fabricius—is a plain's butterfly, the genus is essentially one of the hill country. Only one other species—**L. mekara,** Moore—appears to occur at all generally in the plains. This is in Sylhet where it is rather common in bamboo jungle. It is true that other species such as **L. chandica** and **L. latiaris** have been reported from 'Sylhet,' but it is almost certain that the insects on which these records were based came from the lower Khasi hill country below Cherrapunji, which abuts on the Sylhet plains. This locality is a favorite hunting ground of the native collectors who often speak of it as Sylhet. It is to be noted that **L. europa** and **L. mekara** are the only species of the genus to be found in the plains country of Sumatra (Butt: of Sumatra, de Nicéville, Journ., Asiatic Soc. of Bengal, Vol. LXIV, No. 3, 1895).

Going a little higher in elevation, we come to the next group, one composed of more or less closely connected species. This group includes—

L. bhairava. Moore.
L. latiaris. Hewitson.
L. kansa. Moore.
L. vindhya. Felder.
L. sinorix. Hewitson.
L. chandica. Moore.

and is essentially one of the foot hills. Its range may be said to be between 500 and 3,000 feet. With the single exception of **L. kansa,** none of the species is common anywhere. **L. kansa** is to be found fairly plentifully at low elevations in the Sikkim hills and is very common on the northern edges of the Khasi hills. I have also taken a single specimen at Naini Tal—the only case I know of its occurrence above 2,500 feet, and also, so far, the only record of its existence west of Sikkim.

The rest of the Lethes are, almost without exception, insects of the higher hills. Of these—

fem **rohria.** Fabricius.
Mus **nilgiriensi.** Guerin.

L. insana. Kollar.
L. confusa. Aurivillius.
L. verma. Kollar.
L. sidonis. Hewitson.
L. vaivarta. Doherty.
L. nicetas. Hewitson.
L. maitrya. deNicèville.

form one connected group. They range from 3,000 feet to 8,000 feet being best represented between 5,000 feet and 7,000 feet. **L. rohria** and its western form **L. nilgiriensis** and **L. confusa** come down as low as 500 feet, and are, in some localities, common in the foot hills. They form a sort of connecting link with the previous group, and are the only exceptions to the general rule.

Finally, there are the groups separated by Westwood and Butler under the genera **Zophoessa** and **Neope** and including—

L. atkinsonia. Hewitson.
L. jalaurida. de Nicéville.
L. baladeva. Moore.
L. goalpara. Moore.
L. sura. Doubleday.
L. bhadra. Moore.
L. pulaha. Moore.
L. yama. Moore.

Speaking generally, this group belongs to the higher ranges from 5,000 feet to 10,000 feet. I have taken a **pulaha** (local form **pulahoides**) at 3,500 feet in the Naga hills; **goalpara** has been recorded from 'Sibsagar,' but this is a wide term and, from the usual distribution of the species, I am inclined to think the specimen must have come from the higher hill ranges on the borders of the Sibsagar district; **sura** is recorded from a low elevation in Tenasserim and **bhadra** probably goes down to 2,000 feet in the Khasi hill and Burma. The rest appear absolutely limited to altitudes above 5,000 feet.

Aulocera brahminius. Blanchard.

I cannot help thinking that the record of the '**scylla**' variety of this species from Sylhet by Butler is a mistake. Sylhet is a very low-lying district intersected by rivers and dotted with extensive swamps or 'bheels,' absolutely the last place from which one would expect an **Aulocera**, a genus essentially of the higher mountain ranges. If the specimens on which the record is based came from anywhere outside the Himalayas, they must have been from the higher ranges of the Khasi, North Cachar or Naga Hills country on the northern and eastern confines of the Sylhet district.

Elymnias undularis. Drury.

A male of this species from the Namba forest in Assam is strikingly unlike the normal type and shows to what extremes the species may vary. The subterminal blue markings, so prominent in the type form, are here so reduced as to be hardly noticeable; the usual bright chestnut margin to the hindwing is replaced by a dark brown margin of almost the same tint as in **E. cottonis,** Hewitson from the Andamans; and on the underside the purplish white triangular preapical patch and subterminal fascia and the white spots are all absent. The insect looks entirely different though there is no doubt as to its identity.

Charaxes raidhaka. mihi.

This new species was described by me in the Records of the Indian Museum, Vol. II, Part III, October 1908, page 285 (see also Jour., Bom. Nat. Hist. Soc., Vol. XIX, No. 1, page 270). It subsequently occurred to me that the new form might be a melanised specimen of **C. fabius**; and I have therefore since examined and compared it further with a long series of the latter species. It is always rather dangerous to describe a new species from a single example; but, though I have not obtained any more specimens of **raidhaka,** my further examinations would seem to confirm my separation of it as a new species. The difference in the outline of the wings, noticed in my original description, has held absolutely good in all my later comparisons; and I now add the following further slight differences in markings which I have found very constant in **fabius.**

Upperside.—The deep black colour has, in some lights, a beautiful indigo blue reflection, somewhat similar to that in **E. athamas,** Drury. In **C. fabius** this colouring is sometimes found in *fresh* specimens over a very limited posterior area of the hindwing. *Underside.*—There is at the base of interspace 2 of the forewing a rounded black spot almost filling up the angle between the veins, instead of the very well defined straight transverse line always found in **fabius.** Finally there is in **fabius,** in the precostal cell of the hindwing, a prominent black linear mark, which is entirely absent in the new form.

Eulepis athamas. Drury.

The localisation of the two sub-species **athamas** and **agrarius** as the Northern and Eastern and South Indian forms, respectively, does not always hold good. I have a typical **agrarius** from Dehra Dun at the foot of the Himalayas.

Apatura ambica. Kollar.

There is another species in which the numbers of the sexes taken are very disproportionate. The male is exceedingly common throughout Sikkim and Assam at low elevations near the hills, but I have never yet seen a female there. Curiously enough, the only female I have ever taken was in Lhoorie, where I never saw a male.

Euripus consimilis. Westwood.

Dimorphic female, form **torsa,** var. nov.

Only one form of the female has hitherto been recorded from India. I now describe a second taken in November 1908 in the Bhutan Duars, which shows that this species, like others of the genus, is also at least dimorphic in the female.

Upperside.—Forewing, deep blue black. A short, outwardly diffuse streak in cell from base and touching the subcostal vein, a large, quadrate, transverse spot near the end of the cell, and a broad preapical band from vein 9 to vein 3, consisting of elongate spots divided by the veins, all white. The cell streak and spot near the end of the cell are thickly powdered with bluish scales. The preapical band is continued into interspaces 2 and 1 by very ill-defined spots. A long streak in interspace 1, a short dorsal streak, and terminal spots in pairs between the veins from tornus to vein 4, obscure white densely covered with dark blue scales. Hindwing, a light creamy white, veins black. Costal area thickly powdered with dark scales, and a subterminal fascia extending from costa to vein 2, very diffuse anteriorly and developing into saggitate spots posteriorly, blue black. Margin as in form already described, but very distinctly defined. *Underside.*—As above, markings more defined. Apical area of forewing and subterminal fascia of hindwing deep brown. The usual crimson patches at base of hindwing.

The form is not represented in the Indian Museum or de Nicèville collections. The insect, on the wing, was an excellent mimic of **Euplœa diocletiana** which is also found in the locality.

Dophla sahadeva. Moore.

Bingham's remark that the antennæ of this species are "dark brown with the apex ochraceous" does not sufficiently describe them and is somewhat misleading. In the male, the inside edge of the anterior third of the antennæ is ochraceous and the tip a bright yellow; in the female, only the tip is yellow. These brightly coloured antennal tips are a very noticeable character of the species.

Dophla patala. Kollar.

The real distribution of this species has long been something of a puzzle to me. Years ago, when I had just started butterfly work, the late Mr. de Nicèville kindly named a small collection for me; and amongst others were two Dophlas which I had taken in Lower Burma, and which he identified as **'Euthalia' patala.** Now **Dophla patala,** according to both Mr. de Nicèville and Col. Bingham, is confined to the Western Himalayas; while the latter ascribes **D. taoona** to the hill ranges of Lower Burma. I have since taken and closely examined a long series of the true **patala** from Mussoorie and Naini Tal, and have endeavoured to work out the differences

eyes large, rounded; antennæ of male ciliated; head and thorax clothed; chiefly with scales, the vertex of thorax with broad ridge-like crest; tibiæ moderately scaled; abdomen with dorsal crests on basal segments. Forewing short and narrow, the apex rounded, the termen somewhat excised towards tornus, the inner margin lobed near base and with slight scale tooth at tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the orbicular and reniform with whitish annuli defined by black .. .. *tenebrosa.*

B. Forewing with the orbicular and reniform indistinctly defined .. .. *subcurva.*

1725*a*. STENOPTERYGIA TENEBROSA, Hmpsn. Cat. Lep. Phal., B. M., vii., p. 61, pl. 109, f. 11 (1908).

♂. Head and base of tegulæ ochreous mixed with black-brown; thorax black-brown with a few ochreous scales; palpi black at sides, pale in front; frons with lateral black bars; pectus and legs ochreous irrorated with brown, the tarsi slightly banded with black; abdomen ochreous dorsally suffused with brown, the crests and anal tuft blackish. Forewing red-brown mostly suffused with black-brown; subbasal line represented by two black striæ from costa filled in with ochreous; a blackish patch above inner margin before the antemedial line, which is double at costa filled in with ochreous, then rather oblique, waved; claviform slightly defined by black; orbicular and reniform with brown centres and slight greyish annuli defined by black; the former rounded, the latter constricted at middle; postmedial line double at costa and filled in with ochreous, bent outwards below costa, then dentate, at vein 3 bent inwards to below angle of cell, some ochreous points beyond it on costa, subterminal line represented by some pale points defined on inner side by black-brown suffusion, excurved below vein 7 and at middle and bent inwards at vein 3; a terminal series of minute white points; cilia black-brown. Hindwing whitish suffused with fuscous brown, especially on terminal area, the veins dark; cilia whitish chequered with brown; the underside whitish irrorated with brown, the terminal areas suffused with brown, a slight discoidal spot.

Habitat.—MADRAS, Godavari District, Rajamahendri. *Exp.* 28 mill.

1725. STENOPTERYGIA SUBCURVA.

Hadena subcurva, Wlk., xi, 592 (1857).

„ *postica*, Wlk., xi, 594 (1857).

Xylina calida, Wlk., Journ. Linn. Soc. Zool., vi, p. 195 (1862).

Dipterygia sikkima, Moore, Lep. Atk., p. 105 (1882).

Opigena monostigma, Saalm. Lep. Madag., p. 287, f. 104 (1891).

Genus DIPTERYGIA.

A. Forewing with whitish patch on tornal area extending to postmedial line.

a. Forewing with the postmedial line incurved below vein 4.

*a*¹. Forewing with the postmedial line strongly incurved below vein 4 and slightly angled outwards at vein 1 .. .. *indica.*

*b*¹. Forewing with the postmedial line much less incurved below vein 4 not angled outwards at vein 1 .. .. *cristifera.*

b. Forewing with the postmedial line excurved to vein 3 and angled outwards at vein 2 to near termen.. *umbrifera.*

B. Forewing without whitish patch on tornal area extending to postmedial line .. .. .. *nicea.*

1800. DIPTERYGIA INDICA.

1801. DIPTERYGIA CRISTIFERA.

1804. DIPTERYGIA UMBRIFERA.

2052*a*. DIPTERYGIA NICEA.

Genus PARASTICHTIS.

	Type.
Parastichtis, Hübn. Verz., p. 212 (1827)	*hepatica.*
Septis, Hübn. Verz., p. 243 (1827)	*lithoxylea.*
Xylophasia, Steph., Ill. Brit. Ent. Haust., ii., p. 174 (1829)..	*lithoxylea.*
Xylena, Hübn., Tent. ined. (*nec.* Treit.)	*lithoxylea.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and rather broadly fringed with hair, the 3rd short; frons smooth, with tuft of hair; eyes large, round; antennæ of male ciliated; thorax clothed with hair and scales mixed, a divided dorsal ridge-like crest, larger on pro and metathorax; tibiæ fringed with hair; abdomen with dorsal series of crests and lateral fringes of hair. Forewing rather long and narrow, the apex rounded, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with more or less prominent dark streak below base of cell.

a. Forewing with dark streak in submedian interspace between ante and postmedial lines.

*a*¹. Forewing with the orbicular large, oblique elliptical .. .. *strigidisca.*

*b*¹. Forewing with the orbicular small, round .. *flavistigma.*

b. Forewing without dark streak in submedial interspace between ante and postmedian lines.
*a*¹. Forewing with the orbicular narrow and rounded.
*a*². Forewing without whitish lunule on outer edge of reniform .. .. .. *sodalis*.
*b*². Forewing with small whitish lunule on outer edge of reniform .. .. .. *funerea*.
*b*¹. Forewing with the orbicular rounded .. .. *boopis*.
B. Forewing without dark streak below base of cell.
a. Forewing with large whitish lunule on outer edge of reniform .. .. *leucostigma*.
b. Forewing with white points on outer edge of reniform .. .. *purpurina*.

1710*a*. PARASTICHTIS STRIGIDISCA.

Apamea strigidisca, Moore, P. Z. S., 1881, p. 346, pl. 38, f. 9. Hmpsn., Cat. Lep. Phal. B. M., vii, p. 92, pl. 110, f. 3.

♀. Head and thorax greyish tinged with rufous and mixed with some dark-brown and black; tarsi blackish with pale rings; abdomen greyish suffused with brown. Forewing greyish ochreous and rufous, the basal half suffused with black except the inner margin, the terminal area blackish except at apex; subbasal line double, black filled in with rufous, waved, from costa to submedian fold; antemedial line double, indistinctly filled in with rufous, angled outwards below costa, oblique to submedian fold, then angled inwards on vein 1; claviform large, indistinctly defined by black; orbicular rufous defined by black at sides, oblique elliptical; reniform ochreous white defined by black on inner side and below and slightly by brown on outer, somewhat angled inwards on median nervure; and with irregular outer edge; an indistinct medial line, oblique from costa to below cell; the area beyond the reniform rufous to postmedial line which is blackish defined on outer side by ochreous, slightly bent outwards below costa then very minutely waved, oblique to vein 5, inwardly oblique to below angle of cell and sinuous to inner margin; postmedial area ochreous suffused with rufous and brown on costal half, the veins with slight dark streaks, the costa with pale points; subterminal line ochreous defined on inner side by brown suffusion, angled outwards to near termen at veins 7, 4·3; a terminal series of small black lunules; cilia blackish with a fine ochreous line at base. Hindwing fuscous brown, the cilia ochreous white with a slight dark line through them. Underside of both wings ochreous, the costal areas tinged with rufous to postmedial line which is nearly straight on forewing, minutely waved on hindwing; a broad fuscous subterminal band, forewing with small discoidal lunule, hindwing with small annules.

Habitat.—SIKHIM. *Exp*. ♂ 42, ♀ 50 mill.

1717. PARASTICHTIS FLAVISTIGMA.

Xylophasia flavistigma, Moore, P. Z. S., 1867, p. 50; Hmpsn., Cat. Lep. Phal. B. M., vii., p. 93, pl. 110, f. 5.

Apamea basalis, Moore, P. Z. S. 1881, p. 346.

,, *denticulosa*, Moore, Lep. Atk., p. 109, pl. 4, f. 13 (1882).

1717. PARASTICHTIS SODALIS.

Xylophasia sodalis, Butl, A. M. N. H. (5) i., p. 83 (1878); id. Ill., Het. B. M., ii., p. 24, pl. 29, f. 2.

Apamea obliquiorbis, Moore, Lep. Atk., p. 109 (1882).

1710*b*. PARASTICHTIS FUNEREA.

Hadena funerea, Hein. Schmett. Deutsch., I., p. 828 (1859); Snell Tijd. v., Ent. xi., p. 299, pl. 12♀ f. 1; Hofm. Gr. Schmett. ed. ii., pl. 39, f. 27; Staud. Cat. Lep. pal p. 191.

Head and thorax black mixed with purplish red and some grey, frons with lateral black basers; tegulæ with black medial line; patagia with black line near upper edge; tarsi black ringed with pinkish; abdomen fuscous, the lateral fringes and sides of anal tuft purplish, the ventral surface irrorated with purplish. Forewing fuscous black more or less tinged with purplish; sub-basal line represented by double oblique black striæ from costa; a sinuous black streak in base of submedian fold and an oblique streak above inner margin near base; antemedial line indistinctly double, angled outwards below costa, then oblique and slightly waved, retracted to inner margin; clavifrom narrow or small, defined by black; orbicular very oblique elliptical, defined by black; reniform defined by black, with a little white in centre and some white points on upper and outer edges and slight black streaks beyond it in the inter spaces; an indistinct curved minutely waved medial line; postmedial line double at costa, bent outwards below costa, then indistinct, minutely dentate, excurved to vein 4, then incurved, some white points beyond it on costa; subterminal line indistinct, reddish, defined on inner side by faint dentate dark marks, excurved below vein 7 and at middle, the area beyond it rather darker except at apex; a terminal series of slight black points; a fine pale line at base of cilia. Hindwing fuscous with a slight greyish tinge; cilia pale brown at base with fuscous line at middle and whitish tips; the underside whitish irrorated with fuscous, the costal area tinged with purplish, the terminal area suffused with fuscous, a black discoidal spot and curved postmedial line.

Habitat.—HOLLAND; N. W. GERMANY; E. SIBERIA; JAPAN; C. CHINA; W. CHINA; KASHMIR, Narkunda; PUNJAB, Dharmsála; ASSAM, Khásis.

Exp. 40-48 mill.

Larva, Kirby. Butt. and Moths Eur., p. 237; Hffm., Raup., p. 96.

Palerosy grey to reddish brown; dorsal line ochreous whitish, dark-edged; subdorsal line pale; spiracular line broad, pale greyish ochreous

dark-edged above; head reddish brown or dark brown; thoracic plate blackish with whitish lines. Food plant: *Grasses*.

1710c. PARASTICHTIS BOOPIS, Hmpsn., Cat. Lep. Phal. B. M., vii., p. 102, pl. 110, f. 12 (1908).

Head and thorax greyish tinged with red-brown and slightly irrorated with black; palpi blackish at sides; frons with lateral black bars; tegulæ with black medial line and black line on prothorax; tarsi black with pale rings; abdomen grey-brown, the crests tipped with black, the anal tuft and ventral surface rufous. Forewing red-brown slightly irrorated with dark brown, the costal half on antemedial and medial areas suffused with dark brown, a dark brown costal patch on postmedial area and the terminal area dark brown except at apex; subbasal line double, waved, from costa to submedian fold; a slight black streak below base of cell and another above inner margin before the antemedial line, which is indistinct, double, oblique, waved; claviform moderate, defined by black; orbicular rufous defined by black, round or oblique elliptical; reniform defined by black on inner side and with large grey lunule on outer edge defined by black on inner side; an indistinct medial line oblique from costa to below the cell; postmedial line indistinctly double, slightly bent outwards below costa, then minutely dentate and produced to black streaks with grey points on them on the veins, excurved to vein 4, then incurved, some pale points beyond it on the dark costal patch; subterminal line very indistinct, pale, excurved below vein 7 and at middle and angled inwards at discal and submedian folds; a fine waved dark terminal line; cilia chequered greyish and fuscous, with punctiform rufous line at base. Hindwing fuscous, the cilia pale rufous; the underside pale rufous irrorated with brown, a black discoidal spot, sinuous postmedial line and traces of diffused subterminal line.

Habitat.—W. CHINA; PUNJAB, Kulu, Sultanpur, Dharmsàla; ASSAM Khàsis. *Exp*. 40-44 mill.

1764. PARASTICHTIS LEUCOSTIGMA.

Xylophasia leucostigma, Moore, P. Z. S., 1867, p. 51.

Hadena constellata, Moore, Lep. Atk., p. 130, pl. iv., f. 21 (1882).

Euplexia oxydata, Hmpsn., J. Bomb. N. H. Soc., xiv., p. 199 (1902).

1717*b*. PARASTICHTIS PURPURINA, Hmpsn., J. Bomb. N. H. Soc., xiv., p. 199, (1902); *id*. Cat. Lep. Phal. B. M., vii., p. 106, pl. 110, f. 17.

Genus EURABILA.

Type.

Eurabila, Butl., Ill. Het. B. M., vii., p. 39 (1889) .. .. *lignea*.

Proboscis fully developed; palpi obliquely upturned, moderately scaled, the 2nd joint reaching about to middle of frons, the 3rd short; frons smooth; eyes large, round; antennæ of male ciliated and somewhat laminate; head

and thorax clothed chiefly with scales, tegulæ produced to a slight dorsal ridge, thorax with single broad ridge-like dorsal crest; tibiæ moderately fringed with hair; abdomen with complete series of dorsal crests, the crests of 3rd and 4th segments large, some rough hair at base and lateral fringes of hair. Forewing triangular, the apex rounded, the termen crenulate; veins 3 and 5 from angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1718. EURABILA LIGNEA.

Genus EUPLEXIDIA.

Euplexidia, Hmpsn., Moths. Ind., iv., p. 461 (1896); Swinh., A. M. N. H., (6) xix., p. 165 (1897) .. .. *Type. noctuiformis.*

314*b*. EUPLEXIDIA NOCTUIFORMIS.

Genus CHECUPA.

Checupa, Moore, P. Z. S., 1867, p. 60 .. .. .. *Type. fortissima.*

Proboscis fully developed; palpi upturned, the 2nd joint thick, hardly reaching to middle of frons, and smoothly scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the pro- and metathorax with small divided crests; tibiæ thickly fringed with long hair in male; abdomen dorsally flattened and with small crests on two basal segments and lateral fringes of hair, the male with large ventral tufts of hair from base, and paired lateral tufts from penultimate segment. Forewing very long and narrow, the apex rounded, the termen obliquely curved and crenulate, the cell clothed with long hair on underside; veins 3 and 5 from near angle of cell; 6 from below upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only; male with some long hair on upperside in cell and on inner area, on underside with fringes of hair from basal half of costa, median nervure and base of vein 4, and submedian fold.

1782. CHECUPA FORTISSIMA.

(To be continued.)



A. *Phœnix humilis*, Royle; *var. typica*, Becc.



B. *Phœnix humilis*, Royle; *var. pedunculata*, Becc.

THE PALMS OF BRITISH INDIA AND CEYLON INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S. J.

PART III.

(With Plates VI, VII, VIII, IX, X & XI and Map B.)

(Continued from page 360 of this Volume.)

PHŒNIX HUMILIS, Royle, Ill. 394, 397, 399; Becc. Males. III, 347 373; Hooker Fl. Brit., Ind. VI. 426; Brandis Ind. Trees 645.

DESCRIPTION.—Stems short tufted (and bulbiform?), rarely elongate. Leaves sub-glaucous; leaflets scattered interruptedly fascicled. Fruiting spadix long-peduncled; branches spreading, rather slender. Fruit oblong, pericarp thin.

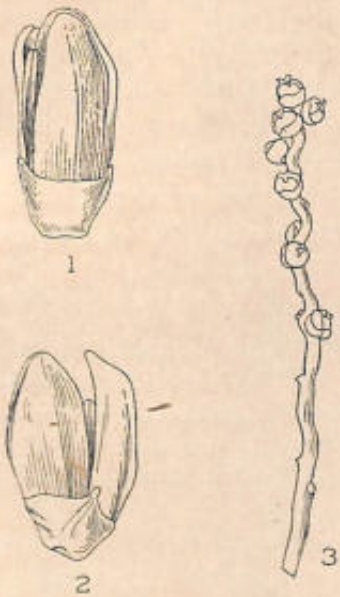


FIG. 1.
Phœnix humilis.
1 and 2 male flowers (× 4).
3. Branch of female spadix with flowers not yet quite open (nat. size). (After Beccari).

HABITAT.—Hilly districts of India, from Kumaon eastwards to Burma, and southwards to Malabar.—China, Cochin-China.

This species requires further examination. In the meantime we give the Indian varieties referred to as *P. humilis* by Beccari, and follow Hooker in treating Beccari's variety γ. *robusta*, as a separate species.

VAR. α. *TYPICA*, Becc. Males. III. 347, 379, t. 44. and II. f. 22-24; Hook. Fl. Brit. Ind. VI. 427—*P. humilis*, Royle, l. c.—*P. ouseleyana*, Griff. in Calc. Journ. Nat. Hist. V. 347; Palms. Brit. Ind. 139.

NAMES.—Thakal (Kumaon); Khajur (Hind.).

DESCRIPTION.—Stem short or moderately long; leaflets elongate, pale green, in usually remote fascicles. Fruiting peduncle usually very long, fruit rather long, groove of seed very short.

Griffith gives the following description of *P. ouseleyana* "Bulbous stems ovate, imbricated conspicuously with the hardened scale-like bases of the petioles, about a foot in length and six inches in diameter. The rete consists of a few rigid fibres. Leaves 2½ or 3 feet long. Pinnules entirely conduplicate, about 1 foot long, from the conduplication 2, or 2½ lines broad, subulate-acuminate; lowermost degenerated into short spines. Male spadices about 1 foot long, the ends of the uppermost spikes rather longer than the bivalved carinate spathe. Female spadices 2, or 2½ feet long with a few short flexuose spikes towards the apex, much longer than the spathes, which appear to be about a span long. Peduncle of both spadices much flattened."



Fig. 2.
Branch with ripe fruits of *Phœnix humilis* (nat. size).
(After Beccari)

HABITAT.—Outer Himalaya, 1-5,000 feet, from Kumaon east-wards; Assam; Khasia Hills; Central India; Chota Nagpur.

VAR. β. LOURIERII, Becc. Males. III. 348, 379, t. 44, II. f. 16, 17; Hook. Fl. Brit. Ind. VI. 427.—*P. loureirii*, Kunth Enum. III. 257—*P. pusilla*, Lour. Fl. Cochinch. 614 (non Gaertn.)—*P. roebelinii*, O'Brien, in Gard. Chron. (1889) II. 475, 758, fig. 68.

DESCRIPTION.—Stem short, or very short. Leaflets subglaucous, often approximate, mostly falciform. Fruiting peduncle elongate. Fruit ovoid.

HABITAT.—Assam; Khasia Hills; Burma; Munipore; Cochin-China.

VAR. δ. PEDUNCULATA, Becc. Males. III. 379, 387, t. 44, II. 13-15, 18-21, 25-27; Hook. Fl. Brit. Ind. VI. 427; Woodr. in Journ. Bomb. Nat. Hist. Soc. XII, 526; Talb. Trees Bomb. ed. 2, p. 342. Cooke, Fl. Bomb. Pres. II. 802.—*P. pedunculata*, Griff. Palms Brit. Ind. 139.—*P. acaulis*, Miq. Pl. Hohen. Nilg. n. 1243.

DESCRIPTION.—Soboliferous; stem ½-10 feet high, 9 inches in diameter, densely covered with the bases of the fallen petioles, more or less spirally arranged; root suckers developing when the primary stem has been burnt or injured. Leaves 4-8 feet long; leaflets pliable, 10-20 inches long, ⅛-½ inch broad, fasciculate, more or less quadrifarious, the uppermost sometimes confluent, base not thickened and not decurrent into the common petiole; petioles 1 inch broad at the base, with spines reaching 3 inches long. Spathe about 8 inches long, with fringed margin. Spadix scarcely exceeding the spathe. Fruiting spadix 3-4 feet long, the compressed peduncle much elongate. Fruit ½ inch long, at first orange then black.

HABITAT.—Western Ghats, from the Konkan southwards, ascending to about 6,000 feet on the Nilghiris; common on the Ghats of N. Kanara.

FLOWERS from December to February.

USES.—The fruit is edible. The leaflets are made into mats commonly used for covering bales of red pepper in the Dharwar district.

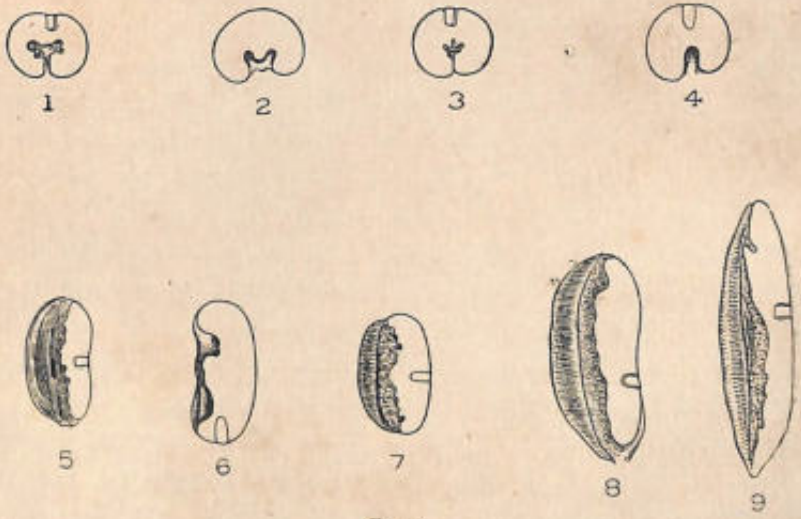


FIG. 3.

Transverse section of seed of—
1. *Phœnix sylvestris* (Nat. size).
2. *Phœnix paludosa* (2×).
3. *Phœnix canariensis* (Nat. size).
4. *Phœnix reclinata* (2×).

Longitudinal section of seed of—
5. *Phœnix sylvestris* (Nat. size).
6. *Phœnix paludosa* (2×).
7. *Phœnix canariensis* (Nat. size).
8. *Phœnix humilis* (2×).
9. *Phœnix dactylifera* (Nat. size).
(After Beccari).

ILLUSTRATIONS.—Plate VI. A. The photograph supplied by Major Gage, shows five old specimens of *Phœnix humilis, var. typica.* The short stems are conspicuously covered with the spirally arranged bases of the petioles.

Plate VI. B. The photograph, supplied by Mr. Roscoe Allen, shows *Phœnix humilis, var. pedunculata.* We selected this photograph (in preference to others, which showed the leaves much better) on account of the long fruiting spadices, which come out distinctly in our picture.

PHŒNIX PALUDOSA, Roxb. Hort. Beng. 75; Fl. Ind. III. 789; Mart. Hist. Nat. Palm. III. 272, 320, t. 136; Kunth Enum. III. 256; Wall. Cat. 8603; Griff. in Calc. Journ. Nat Hist. V. 353; Palms Brit. Ind. 144, t. 229 A. B; Kurz in Journ. As. Soc. Beng. XLIII. II. 202; For. Fl. II. 536; Brandis, For. Fl. 556; Ind. Trees 646; Gamble Man. Ind. Timb. 419; Hook. Fl. Brit. Ind. VI. 427.—*P. siamensis* Miq. Palm. Archip. Ind. 14.

NAMES.—Hintal, Golpatta (Beng.); Thinboung (Burm.); Giruka tati (Tel.); Hintala (Sanscr.); Dangsa (in Penang).

DESCRIPTION.—Subarboreous, gregarious, forming elegant impenetrable tufts. Trunk 8-25 feet high, 3½ inches in diameter, often inclined, soboliferous, annulate at the base, higher up covered with the brown petioles. Leaves 8-10 feet, gracefully spreading. Petiole covered with scurf, brownish-glaucescent, armed in the lower three feet with irregularly spreading hard, brown, triangular, channelled, long spines, sheath fibrous. Leaflets 1-2 feet long, opposite and alternate, bifarious, spreading, then curved downwards, not rigid, 8 lines broad, very acuminate, conduplicate at the base, otherwise flat, whitish or farinose underneath, the lowest being both the longest and the narrowest. Male spadix with peduncle about 1½ foot long, compressed; spathe as long, coriaceous, 2-keeled, orange-brownish; keels with irregular edges; flowers ¼ inch long, yellow; calyx cup-shaped, not as regularly 3-toothed as in *P. sylvestris*; petals 3; filaments 6, short. Female spadix about 1½ foot long; flowers subglobose, greenish; calyx as in the male; petals roundish, concave; staminodes 6. Carpels 3, free; styles recurved. Fruiting spadix 3-4 feet long, erect, yellowish orange, with branches at the apex; spikes of the



Phœnix paludosa, Roxb.

between typical **patala** and **taoona** as noted by those authors. All have failed at some time or other. An examination of the de Nicéville collection series only serves to confirm this. The small oval white spot in interspace 1 of the forewing said to be characteristic of **taoona** occurs singly or in pairs in more than one Himalayan insect and is not invariably present in those from Burma. The number of spots making up the white band on the hindwing varies (being either two or three) in specimens from both places. Nor are the other characteristics of **taoona** constant in the Burma insects.

It seems to me either that **patala** is to be found in Burma or that the two species are synonymous. In any case it is strange that there is no record of the species from the regions between Nepal and Upper Burma. Sikkim, the Naga Hills and the North Chin Hills have all been worked without any trace of the species being found.

Euthalia lubentina. Cramer.

The descriptions of this species in de Niceville's and Bingham's works make no mention of the rather prominent tufts of hair at the base of the hindwing of the male on the upperside. It belongs to the section having secondary sex marks of specialised scales; but in this species the tufts are prominent enough to call for notice in the description. These hair-like sex marks are also to be found in **E. phemius, E. garuda, E. jama** and **E. kesava**, but are less developed in those species.

Euthalia garuda. Moore.

The females of this species, as is well known, show a good deal of variation, but no mention has, as far as I can ascertain, been made of the fact that the various types are, to a large extent, localised. Except in the case of specimens from Northern India, I have not a sufficiently long series to make absolutely definite statements on, but my observations during collecting in various parts of India were extensive enough to justify the following remarks:—

Type I.—A very bright light-greenish brown on upperside, the basal half of both wings a shade darker than the outer half. The white discal spots on the forewing comparatively small, not extending below vein 4, and very indistinct. Submarginal row of black spots on hindwing small. Underside ochraceous throughout, not powdered with dark scales. Markings as on upperside. This type is the only one found in Northern India, and is probably the dry tract form. It also occurs occasionally in Bengal.

Type II.—Upperside of same general tint as in Type I., but richer and darker. Discal spots on forewing very white and distinct, consisting of an almost unbroken band to vein 4 and two well-separated spots in interspaces 3 and 2. Beyond the band a diffuse creamy powdering, and a whitish streak along costa from the uppermost spot to another very white spot halfway to apex. Subterminal black spots on hindwing very small, obsolescent.

Underside greenish grey dusted with black scales, dark brown discal fascia, and terminal lilac shading very prominent. White spots as on upperside. This is the variety which very largely predominates in Bombay and Western India, and is possibly an approach to the **vasanta** form of Ceylon.

Type III.—Upperside a dark greenish brown, basal area still darker but not so regularly delimited from the lighter portion as in the other two types. The discal markings consist of three distinct white, well-separated spots beyond the cell, the two upper quadrate and moderately large, the lower very variable, and a fourth spot in interspace 3. A distinct white costal spot beyond the white band, and a well-marked dark subterminal fascia. Subterminal black spots on hindwing large and distinct. Underside basal half of wings much as in Type II.; outer half up to pale lilac edging darker brown, but no distinct fascia. White markings as on upperside but less distinct. This variety is the one most generally taken in Bengal and Assam; and some sent me from Maymyo in Upper Burma were of the same type.

Neptis eurynome. Westwood.

Indian lepidopterists are under a great debt of gratitude to Col. Bingham for his labours in overhauling and revising the numerous named varieties of the common Indian Neptis. His decision to sink all the inconstant varieties given specific rank into one species has cleared the air immensely. No one who has dealt with any number of these Neptes can have failed to observe the extent of variation and the utter impossibility of referring any but extreme types to any particular one of the many so-called species. Among all the forms now sunk under **eurynome** there is, however, one which perhaps deserves to be kept distinct, if only as a local race. This is the dark form with narrow white bands and chocolate coloured underside. It is more or less constant (the underside has sometimes a rusty or ochreous tinge, but is always quite different from the yellow or true **eurynome**) and is easily distinguishable both on the wing and in the cabinet. It is, moreover, essentially a hill insect, confined to the higher ranges of the Himalayas and Assam hills, and not occurring below 4,000 or 5,000 feet; whereas **eurynome** is found both in the plains and in the hills to 5,000 feet and more. As far as I can identify it, the hill form is the true **N. astola** of Moore.

Neptis mahendra. Moore.

Neptis yerburyii. Butler.

The differentiation of these two species is, in my experience, a far more difficult matter than, for instance, the separation of **N. eurynome** and **N. astola**. I have a long series before me, taken at various places from Mussoorie on the west to Shillong in the east; and were the prolongation or otherwise of the detached apical spot of the discoidal streak to be

made the basis of separation, I really do not think it would be possible to arrive at any definite results. Indeed, the specimen in which the prolongation is least marked is a very yellowish one from Sikkim, where **mahendra** is not supposed to be found. All the points of difference noted by de Nicéville (**N. nandina**) and Bingham appear to me to break down at times, the only one of moderate constancy being the complete separation or otherwise of the spot and streak on the underside.

Neptis soma. Moore.

The numerous varieties collected by Bingham under this name form another difficult group. An examination of some scores of specimens collected in Assam and in the Sikkim and Bhutan Terais have led me to make the following note. Of those insects placed under true **soma** there appear to be two more or less constant and distinct varieties. The first and more common has very narrow and heavily sullied markings, the subterminal band in the hindwing so much so that it is only a shade lighter than the ground colour. This appears to be the species referred to **soma** by de Nicéville (Butt. of India, Vol. II, page 102). The second variety has all the markings pure white though narrow and small, and the submarginal row of the hindwing is made up of distinct, very clear white quadrate spots. It is probably the **adipala** of Moore. The undersides are practically identical. Both forms have been taken both in the dry season and at the height of the rains, so the differences cannot be altogether due to climatic dimorphism.

Neptis clinia. Moore.

According to Bingham, this local race of **N. soma** s confined to the Andamans. I have taken a couple of specimens, quite indistinguishable from others from the Andamans, in the Brahmaputra valley in Assam.

Neptis nashona. Swinhoe.

Hitherto only recorded from the Khasi Hills. I took an unmistakeable specimen in April this year in the forest country below Buxa, Bhutan.

Doleschallia bisaltide. Moore.

Doleschallia malabarica. Fruhstorfer.

Doleschallia andamanensis. Fruhstorfer.

The impossibility of satisfactorily separating, on the lines laid down by Bingham, a fairly long series of the genus in my collection from the Sikkim and Bhutan Terais, Assam, the Naga Hills and the Andaman Islands, led me to make a critical examination of the different species as represented in the Indian Museum and de Nicéville collections. These show that the character ascribed by Bingham to the race **malabarica**, (Fauna of India, Butt., Vol. I, page 392) *viz.*, the termination of the preapical fulvous band in interspace 5 of the forewing, holds good only in specimens from the Malabar Coast; and in these it seems absolutely constant. In the long series in the

de Nicéville collection and in my collection from N. E. India and from the Andamans, the shape and extent of this preapical band vary enormously, though no clear dividing line is possible, the band always extends more or less into interspace 4, and, in the case of a female from near Gauhati, is so lengthened as to coalesce with the fulvous discal area in interspace 3. The only constant characteristic I can find in the insular race is that the truncate portion of the apex of the forewing is cut off square or slightly convex, while in all the N.-E. India specimens it is distinctly excavated or concave.

It seems to me that the N.-E. India form should stand as **D. bisaltide,** Moore, or **D. polibete,** Cramer ; the Andamans form should be sunk or, at best treated as a slightly differentiated local race **andamanensis;** and the Malabar insects placed as another well marked local race **malabarica.**

CYANIRIS, (genus). Dalman.

This is a very widely distributed genus, some representatives being found in every hill tract in India, Burma and the Indo-Malayan region. The Khasi Hills in Assam may, however, in some ways, be considered its stronghold in India, no fewer than ten of the twenty hitherto recorded Indian species occurring in or near Shillong ; and an eleventh and new one is now described. A few notes on each, with special reference to its appearance in these hills, are appended.

C. marginata. de Nicéville. Only taken July to September but common then. It has not so far been recorded from the tract between Sikkim and the hills of Upper Burma, but will probably be found at suitable elevations in all the Assam hills.

C. albocærulea. Moore. Local but fairly common, August to October. The first record of its occurrence east of Sikkim.

C. transpecta. Moore. Decidedly rare ; a spring or early summer species.

C. puspa. Horsfield. Very rare in Shillong but common at lower elevations in the hills all the year round.

C. placida. de Nicéville. Male very common but only taken in August to early October. Female very rare. One taken in company with a number of males is described, as no description appears in Bingham's work. Costa, termen and tornal area of forewing very broadly fuscous. Lower part of the cell dull blue but shining in certain lights. Hindwing, upperside, generally fuscous but with a small basal patch of the same dull blue and a slight irroration of blue scales over disc almost to termen. Underside as in the male.

C. chennelli. de Nicéville. Very common. A succession of broods from April to October.

C. victoria. Swinhoe. Recorded from the locality but not taken by me.

C. imbata. Moore. Fairly common but very local. There are apparently

two distinct broods—one in April and May and the other in October. It disappears in the interval.

C. dilecta. Moore. Common. Apparently distinct broods in the spring and autumn.

C. jynteana. de Nicéville. Occasionally, April to July.

Cyaniris parishii. n. sp.

A new form, the only one of its kind among some hundreds of Cyaniris taken by Mr. H. M. Parish and myself in and round Shillong in 1909, and quite distinct from all the species of the genus in the Museum and de Nicéville collections. The specimen is a male and belongs to the group in which the costal margin is broadly edged with black. The description is as follows:—

Upperside.—Forewing, costa and termen broadly black, this black edging, except for about one-third from base of costa where it is narrower, and at apex where it is a trifle broader, being of almost exactly the same width all round and very regularly and evenly defined. The rest of the wing shining lavender blue, slightly deeper at base. There is just an indication of a black tooth on the discocellulars. Hindwing, costa broadly fuscous, termen narrowly but very evenly edged black, with a subterminal series of dark lunular markings. The rest of the wing of the same shade of blue as the forewing. Cilia dirty bluish white. *Underside.*—Ground colour dull white, markings small and delicate, of the usual Cyaniris pattern.

Expanse—1·2 inches.

Habitat—Shillong, Khasi Hills, 5,000 ft., August.

The species appears to be allied to **C. akasa,** Horsfield, from S. India, but has no trace of white on the upperside of the wings. It is also apparently close to **C. shelfordi,** de Nicéville, from Sarawak. This latter is of a somewhat deeper shade of blue, the black margins are not so even, and the markings on the underside are very much heavier and coarser.

Orthomiella pontis. Elwes.

Hitherto only recorded from Sikkim and Upper Burma. Also taken at Kohima, Naga Hills, 5,000 ft., April.

Lycænesthes emolus. Cramer.

I have a male of this species from the Bhutan Terai which is a striking aberration from the type in respect of the markings on the underside. In the forewing, the band on the discocellulars is not defined with white lines, and the discal band is very broad and regular. The hindwing is remarkable. All the irregular bands have coalesced into a uniformly brown patch, on which is placed a very light coloured greenish white discal fascia broken only by the brown nervures and a short brown band on the discocellulars. Subterminally there are prominent light coloured conical markings, and the usual black and orange crowned spot in interspace 3.

Talicada nyseus. Guerin.

Specimens from the hills north of Sylhet have the red area on the hindwing much smaller in extent than those from Western India, and of a much deeper red.

Nacaduba ardates. Moore . nov. var. ? **dima.**

I have not been able to satisfactorily place a male Nacaduba taken by myself near the foot of the Naga Hills in April 1909. It is very near **N. ardates** (which is common in the locality) with which form it agrees in the basal striga on the underside of the forewing being extended below the median vein, in its small size (1'), and in being tailless. Its appearance above is, however, very distinct and quite different from any of the hundreds of **ardates** I have examined both in the course of my own collecting and in the Museum and de Nicéville collections; and there are, moreover, some points of difference in the markings on the underside. **N. ardates,** on the upperside, is always some dark shade of brownish purple-brown when looked at direct, a dull purple when seen at an angle. The variety is a bright bluish purple, somewhat like that of **Cyaniris jynteana,** with a shining, slightly frosted appearance in some lights. The underside is a dull dark brown, with all the transverse strigæ very indistinct, the basal one of the forewing being traceable only half across interspace 1. The large orange crowned black spot in interspace 2 of the hindwing, so prominent in all forms of Nacaduba, is here replaced by a small, inconspicuous black spot, subequal in size to that at the extreme tornal angle, the orange halo and metallic scales being altogether absent.

The form may be new; but **ardates** does vary somewhat, and pending further material and research, it is best treated as a well marked variety of that species.

Thecla leechii. de Nicéville.

The female of this rare species was described but not named by de Nicéville in the Journal of the Bombay Natural History Society, Vol. VI, page 374, as belonging to the genus **Satsuma,** Murray, and was named in a later article in Vol. VII, page 335 of the Journal. I have to record three more captures—all females—in Shillong, two by Mr. H. M. Parish now in his collection, and one by myself. Mr. de Nicéville's description, which is very clear, does not mention the small triangular patch of grey scales about midway up the dorsal margin on the underside of the hindwing, or the well developed lobe at the tornus. The species, the female at any rate, is tailless. It is decidedly rare and only appears very early in the spring, all the specimens having been taken in March or early April. It is curious that the male has not yet been discovered in the Khasi Hills.

Ilerda epicles. Godart.

The usual colouring of the male of this very common species is a some-

what dull purple or brown with a purple reflection, with often an orange spot just beyond the cell of the forewing. Two specimens from 3,000 ft. in Sikkim and one from Shillong, however, show a reflection of an intenser, much purer *blue*, quite unlike the tint of typical **epicles**, and there is no trace of the orange spot. A female taken in company with one of these males also differs from the ordinary females of **epicles** in having the preapical orange band on the forewing narrow, and the lunular red terminal border on the upperside of the hindwing very linear and reduced. The undersides of the two forms are identical.

There are a few insects of the same colouring in the de Nicéville collection under the name **phœnicoparyphus**, Holland, also from Sikkim. This latter species has not been included in the genus in de Nicéville's Butt. of India, and I cannot say whether he finally decided to keep it distinct. An examination of the genital organs will settle the matter.

Ilerda viridipunctata. de Nicéville.

Ilerda brahma. Moore.

Both these species are fairly common in Sikkim, but the dividing line in the altitudes at which they are respectively found is rather striking. **I. viridipunctata** is never found below 6,000 ft.; below this one seems to come at once into the **brahma** habitat. In Kumaon, the latter ranges higher, having been taken at about 7,000 ft.

Camena ister. Hewitson.

de Nicéville, in Butt. of India, Vol. III, page 344, only describes the female: and in the Journal of the Bombay Nat. Hist. Soc., Vol. VII, page 335, and pl. H, fig. 10, he describes and figures the male of a new species as **C. carmentalis**, remarking that the latter "is not improbably the latter sex of **C. ister**." The examination of a fairly long series of both brought in by native collectors from Cherrapunji in the Khasi Hills leaves no doubt in my mind that **C. carmentalis** *is* the hitherto undescribed male of **C. ister**; and the former name must therefore be sunk.

Tajuria istroidea. de Nicéville.

So far only recorded from Sikkim. Also occurs rarely in the neighbourhood of Cherrapunji.

Zeltus etolus. Fabricius.

This is one of those species in which the male is extremely common while the female is very rare. The former may be taken literally by hundreds all over the Sikkim and Bhutan Terais and near the foot of the Assam hills; but in all my collecting I have never yet seen a female.

LOXURA (genus). Horsfield.

I have species of this genus from the North-Western sub-Himalayas, the Sikkim and Bhutan Terais, Assam, the Western Ghats and from the Andaman Islands; and have endeavoured to trace the characteristics on

which the species **surya,** Moore, and **prabha,** Moore, were founded. I have failed completely. **L. arcuata** from Ceylon I have not seen. There seems to be no doubt, as de Nicèville surmised, that all the Indian insects represent only one inconstant species.

Deudorix epijarbas. Moore.

An aberrant specimen from Shillong has all the fasciæ on the underside of both wings placed on a white ground.

Papilio mayo. Atkinson.

A very distinct variety from the type of the male is to be found. In this the internervular streaks on the upperside of the forewing and the red basal patch on the underside of the same wing are completely absent ; and the red basal patch on the underside of the hindwing is very much reduced. The most striking variation is, however, the absence, on the underside of the hindwing, of the red subterminal ocelli in interspaces 1 and 2 and the red scaling on the disc. In place of the latter there is a very prominent set of pure blue lunular markings, set on a deep blue black ground, and extending in a curve from the costa to the dorsum. Of five males received from the Andamans, three were of this type, the other two being normal.

Col. Bingham was slightly in error when he stated that the cilia of the forewing were black throughout. They are touched with white between the veins, though not nearly so conspicuously as in the hindwing—in fact, the white cilia cannot be seen at all, unless the wing is looked at edgewise.

Papilio axion. Felder.

Bingham places all the North-East India and Andaman insects under **axion** ; but the forms from the two localities are clearly distinct. His description of **axion** applies properly only to specimens from the Andaman Islands ; insects from Sikkim and Assam (where the species is very common) are, as a rule, rather smaller and differ somewhat in facies. The discal pale green band is, in the N. E. form, always narrower and less compact, and very irregular exteriorly ; and there are always present, along veins 6 and 7 on the upperside of the hindwing, one or two pale linear streaks interior to the submarginal row of spots, which are not present in any of the Andaman insects I have seen, either in my own collection or in the long series in the Indian Museum collections. On the underside of the hindwing, the pearly sub-basal streak from the costa is always extended evenly to coalesce with the discal band in typical **axion** this streak is somewhat irregular, macular and invariably well separated from the discal band ; the crimson markings beyond the discal band are small and variously shaped—in **axion** they are fairly large and regularly quadrate ; the black discal spots are also very small and placed *on* the red markings, and never completely fill up the base of the interspaces, separating the red

markings from the pale discal band as is the case in all the Andaman examples.

These differences are constant in all the specimens I have examined ; and I have no doubt as to the distinctness of the two. The insular race is undoubtedly **axion** ; the N. E. India form is either the race **jason,** Linnæus, or the parent form **eurypylus,** Linnæus.

Huphina nadina. Lucas.

Huphina andamana. Swinhoe.

Several males I have received from the Andaman Islands are absolutely indistinguishable from typical **nadina,** the lacuna of pale colouring in and beyond the cell on the underside of the hindwing being exactly the same as in **nadina.** This is the characteristic on which **andamana** has been given specific rank, but it does not appear to be constant.

Appias lagela. Moore.

This race of **A. lalage,** Doubleday, has hitherto only been recorded from the Arakan Coast, Lower Burma and Tenasserim. A male, agreeing exactly with the description of the form in Bingham's Fauna, Butt., Vol. II, page 209, and with the specimens in the de Nicéville collection, was taken by me on the Peak, above Shillong, 6,000 feet, in October.

The dry season form of **A. lalage** is exceedingly common on the higher ranges of the Khasi Hills at this period of the year ; and it may be that **A. lagela** occurs more frequently than a single capture would indicate, but is overlooked in its resemblance to **lalage.**

Terias silhetana. Wallace.

I have a very quaint aberration of the wet season variety of this species, taken in the Bhutan Terai. The ground colour on the upperside is a very light cream—almost white—but patches and specks of the ordinary rich citron yellow are scattered irregularly and sparingly about the wings, giving the insect a most bizarre appearance.

Celænorrhinus spilothyrus. Felder.

In a short paper on the Butterflies of the Konkan some time ago (Journ., Bom. Nat. Hist. Soc., Vol. XVIII, page 884), I mentioned **C. fusca,** Hampson, as being found in the Western Ghats. I have recently been analysing and working out a key to the genus, and find that the Khandala insect is **C. spilothyrus.**

Similarly the **Coladenia tissa,** Moore, I recorded from Khandala turns out to be **C. indrani,** Moore.

Coladenia fatih. Kollar.

Watson sinks this to **C. dan,** Fabricius, as do other writers ; Mr. de Nicéville considered it distinct. I have examined a fairly long series of both forms and find that the one from the Western Himalayas (true **fatih**) has the hyaline spot at the base of interspace 3 of the forewing subtrian-

gular and constantly wider than high, thus  ; in the eastern form (**dan**), this spot is always quadrate and higher than wide, thus  . The western insect is also appreciably larger and lighter coloured. **C. fatih** seems sufficiently distinct to be treated as a local race.

SATARUPA (genus). Moore.

DAIMIO (genus). Murray.

Watson in his Key to the Asiatic Hesperidæ (Journ., Bom. Nat. His. Soc., Vol. IX, page 421) separates **Satarupa** from **Daimio** on the strength of the pencil of hairs on the hind tibiæ of the male of **Daimio.** This, however, is not a satisfactory division ; for in **gopala,** the type of **Satarupa,** this pencil of hairs is strongly developed. It is absent only in **sambara,** Moore, and its allied form **dohertyi,** Watson, which two also differ from all the other Indian species of the genus in having white palpi.

TAGIADES (genus). Hubner.

Watson, in his paper already quoted, gives the strongly arched lower margin of the cell between veins 2 and 3 of the forewing as a constant characteristic ; but it does not always appear to hold good and is often very hard to distinguish. A more constant feature (though facies is never a very satisfactory one for the discrimination of genera) is the colouring of the hindwing, which, in one group, is broadly white on both sides ; and in another and more soberly coloured group, is always suffused with white or bluish white scales on the underside.

Caprona ransonnettii. Felder.

Caprona saraya. Doherty.

The distinctness of these two is doubtful. The latter was described from a single male, and separated from **ransonnettii** on the presence of a basal hyaline spot in the cell of the forewing (which **ransonnettii** has not got) and the absence of all white on the disc of the hindwings below. As records of distribution go, **ransonnettii** is the southern and eastern form and **saraya** the north-western one ; but four specimens taken by me at different places at the foot of the N.-W. Himalayas *are* suffused with white below and have no basal spot in the cell of the forewing. They are thus indentical with typical **ransonnettii,** and, in fact, de Nicéville himself diagnosed two of them as this species. **C. ransonnettii** does, therefore, extend to the Western Himalayas, and **saraya** was possibly a casual aberration.

Parnara (genus). Moore.

Any analysis of the species of this difficult genus depends very largely on the markings on the male insect, and it is therefore important to be

able to discriminate between the two sexes not always an easy matter without dissection and microscopical examination, as my own experience has proved. There are no secondary alar sex marks, nor do the leg characters furnish much help. It was therefore with considerable satisfaction that I observe one feature of the male which is easily found with a good lens and which, being absolutely characteristic of the male only, affords quick recognition. This is a peculiar appendage, consisting of a brush-like ring of very fine hairs or bristles, radiating from an oval or circular head, placed *in* the anal orifice and always more or less clearly visible. It very probably is an appendage of the genital organs.

An exactly similar organ is to be found in the males of the closely allied genera *Baoris*, Moore, and *Chapra*, Moore, which have, in addition, alar sex marks. It was the discovery of these in the males of *Baoris* that led me to make a close examination through the *Parnara* species.

FURTHER NOTES ON SNAKES FROM THE CHIN HILLS.

BY

CAPTAIN F. E. W. VENNING.

(WITH NOTES BY MAJOR F. WALL, I.M.S., C.M.Z.S.)

During the present year (1910) only one addition was made to the number of species obtained from this locality, namely a specimen of the genus *Typhlops*, but the writer was fortunate enough to procure several more specimens of the new *Tropidonotus* described last year by Major Wall. Such other notes as are thought to be of interest are added under the various species.

Typhlops diardi.—One gravid female (No. 52-10) was captured on the main road near Minkin (5,600 ft.) on the evening of 13th June at dusk. When first handled this little creature lashed backwards and forwards head to tail very rapidly and with sufficient force to raise its body completely from the ground, in much the same way that some earthworms will do when touched. It is not perhaps unreasonable to suppose that this performance, which looks as if it must be uncommonly unpleasant for the actor, is a protective device of nature evolved from a simple instinctive shrinking or wriggling effort to regain liberty after capture. The writer well remembers the uncanny appearance presented by a large millipede in the Malay States, which adopted the same tactics when disturbed and seemed to be seized with a bad fit, thereby producing in the mind of the would-be captor an unwillingness to touch it, even though it was known to be quite harmless. The length of the snake was 14 inches including the stumpy tail which was broader than long. There were 26 rows of scales round the body anteriorly, and 28 rows at midbody. Colour shining brown above, each scale with a paler submarginal crescent; beneath whitish. It contained some well developed eggs.

[Many of the snakes to which these notes refer have been submitted to me by Capt. Venning for my examination. The specimen referred to as *Typhlops diardi* exactly agrees with the small specimen I obtained in the Khasi Hills which I made the type of a distinct species under the name

tephrosoma (Bomb. N. H. Jourl., Vol. XVIII, p. 314). In Capt. Venning's specimen I find the costal rows 28 anteriorly, and in the whole body except before the vent for a short space where they are 26. The rostral does not reach back as far as the eyes, and these organs are very indistinct. The colour dorsally is dark brown, belly lighter with a series of distant, irregularly spaced, white, ventral, median spots. I notice that the præfrontal is nearly twice as long as the other superior shields. The frontal is rather the smallest shield. The supraocular is rather broader than the other shields. There are two enlarged temporals, and the parietal touches one scale behind on the left side, two on the right. The lateral breadth of the body is $\frac{1}{5\frac{1}{4}}$ that of the total length. I still think that this form (*tephrosoma*) deserves to rank as a species very closely allied to *diardi*. It is noteworthy that *diardi* is a very common snake, and up till now no single specimen has been recorded with $\frac{28}{?}$ scale rows. The specimen is further interesting in that it is gravid. It contains now 5 (I think) eggs. Capt. Venning had extracted one, and I extracted another, so the full complement appears to be 7. Capt. Venning called my attention to the presence of a small embryo within the egg, and I am able to confirm his observation. The egg I examined measured 17mm., in length, and 10mm. in breadth. On the vertebral aspect a small chamber was discovered in the yolk just beneath the investing membrane. This measured 5mm., in diameter and contained a small embryo, the head, and eye, and a bulbous process (the heart?) being very distinctly visible, the body behind being spirally twisted. The whole might have measured $1\frac{1}{2}$ inches unravelled. The condition is exactly that noted and figured by me in this Journal (Vol. xix, p. 784) with reference to the eggs of the tree snake *Dendralophis tristis* and suggests the probability that the eggs may be discharged as such. Further observations are however necessary to negative the idea of a viviparous habit.

F. WALL.]

Blythia reticulata.—Three specimens are perhaps noteworthy. No. 55/10 was an immature specimen taken on 19th June under a heap of stones on the rifle range (6,600 ft.), where also another small one was seen but managed by its remarkable agility to escape minus the tip of its tail. The specimen captured was 5·75 inches long (tail ·7 inch) and was coloured similarly to all the adult specimens seen here. On the other hand one taken last year in April at Fort White was smaller in size (4·4 inches) and was white beneath. These facts coupled with the undeveloped state of the embryos in the next specimen which was taken in July

seem to point to the hatching season being some time in the cold weather or early spring.

No. 58/10 taken at dusk on 9th July was a gravid female of remarkable size, measuring 20·25 inches of which the tail was 2·5 inches. It contained six, large creamy eggs placed in a single longitudinal row and measuring about ·8 by ·4 inch. The two nearest to the vent were in the left ovary, the remainder in the right. The two examined showed no signs of any embryonic development. No. 63/10 captured on 26th July was also a large one (18·9 inches in length), and contained an earthworm in gastro.

Oligodon dorsalis.—One immature specimen (54/10) was found under a flowerpot stand against the wall of my house on 17th June. Its length was 6 inches including the tail, which accounted for ·9 inch. The ventrals were 162 and the subcaudals 40. A full-grown specimen (No. 61110) taken on 16th July was 17·75 inches long, tail 2·75 inches, and had 182 ventrals and subcaudals 41 pairs. The costal rows in all the specimens from this locality diminish to 13 posteriorly by the absorption of the 3rd and 4th rows above the ventrals as remarked by Major Wall in Vol. XVIII of the Society's Journal.

In all the specimens collected here the nostril has been found to be pierced in an undivided nasal, and not as stated in the "Fauna of British India" volume on Reptilia. All the specimens have had the bright yew-berry red colour beneath the tail, and the vertebral stripe chestnut.

Pseudoxenodon macrops.—Four specimens as below :—

No.	Date.	Length.	Tail.	Ventrals.	Subcaudals.
47/10	20th May	29·5	6·5	160	62 pairs
49/10	26th ,,	31·5	6·25	175	67 ,,
62/10	18th July	26	5	155	60 ,,
66/10	31st ,,	39·25	8	177	78 ,,

The costals are reduced from 19 to 17 rows at midbody by the union of the 3rd and 4th rows as remarked by Major Wall in Volume XVIII, page 321, the next reduction to 15 occurring in the same rows quite close behind midbody. No. 62/10 is abnormal in the number of labials, having six on the right and seven on the left instead of the usual eight. No. 47/10 was a gravid female

embryos undeveloped in the eggs which were six in number and of a creamy-white colour the largest measuring 1·5 by ·5 inch. The usual colouring of this species here is a rich chestnut rather than olive with a dorso-lateral series of black spots, the opposite pairs connected across the back by a pale (buff) saddle or bar.

Tropidonotus subminiatus.—Two were captured, both gravid females. No. 48/10 was taken on the 23rd May and contained some eggs, less than half an inch long, while No. 53/10 caught on 16th June had much larger eggs, six being found in each ovary. In both these specimens only two supralabials touch the eye, and this is so common an aberration that it fails entirely as a distinguishing feature from the nearly allied *himalayanus*. No. 53/10 had nearly all the supralabial sutures black. It was first seen lying on its back having swallowed the right hind-leg of a toad (*Bufo melanostictus*) which was making every endeavour to escape and had evidently dragged the snake down a low bank overturning it in the fall. The victim measured three inches from snout to vent and some two and-a-half inches across. The snake had already made a meal on a lizard, the remains of which were found in gastro. The ventrals and subcaudals in the two specimens were as follows :—

No. 48/10	Ventrals 165	Subcaudals 92 pairs.
No. 53/10	„ 162	„ 61 „

No. 48/10 had four postoculars on right.

Tropidonotus himalayanus.—Two specimens.

No.	Date.	Length.	Tail.	Ventrals.	Subcaudals.
59/10.	12th July.	27·25.	7·25.	157	85 pairs.
65/10.	29th „	29·5.	4·75.	154	87 „

The latter had eaten a frog. In both all the supralabials were black sutured. No. 65/10 had a beautiful yellow collar, while the other had only traces of it in a few yellow spots on the nape.

Tropidonotus venningi. (Wall.)—Five specimens.

No.	Date.	Length.	Tail.	Ventrals.	Subcaudals.
41/10	12th March	29·5	9	164	108 pairs.
43/10	20th April	25·5	7·4	169	100 „
57/10	26th June	22·75	7·75	162	126 „
64/10	27th July	25·75	7·5	161	110 „
68/10	8th August	27	8·25	166	121 „

No. 43/10 is anomalous in the costals, the rows being reduced to 15 posteriorly owing to the occurrence of some enlarged scales in the lowest rows on either side. At a point nearer to the vent than two heads' lengths there are 16 rows, the absorbed rows reappearing and disappearing again. No. 41/10 was a female with some six eggs, the largest measuring ·5 inch long by nearly ·25 inch across. Nos. 57/10 and 68/10 were also gravid females. Two of the specimens struck fiercely when being captured and one (No. 68/10) progressed in leaps by raising the anterior half of its body and throwing it forward in its attempts to avoid capture. The secretion of the anal glands was found to be white of the consistency of white enamel paint. No. 64/10 and perhaps No. 43/10 have the tip of the tail broken. In No. 68/10 the second subcaudal from the vent is entire. In the region of the vent all the costals, even the outermost rows, showed traces of keels.

[I have disected out the skull of one of these specimens, and find the dentition as follows:—

Maxillary.—There is no gap in the series behind, and the teeth number 29 on each side. The last 3 are very slightly enlarged, and compressed. *Palatine.*—16, subequal. *Pterygoid.*—19 on right side, 20 on left, subequal. *Mandibular.*—32 on the left side, 29 on the right, from which a fragment is broken posteriorly that would probably support 3 teeths.—F. Wall.]

Psammodynastes pulverulentus.—No. 44/10 found under a boulder on 2nd May was a female containing eggs without any distinct traces of development. Length 24 inches, tail 4·25 inches. The costals were 17-17-15, ventrals 161 and subcaudals 58 pairs. An anomaly is the divided anal shield. There are three postoculars. Two loreals, the lower small, and the upper large subtriangular and nearly reaching the eye. The general colour was dark brown, the head vermiculated with white and grey and having a broad ivory white band from the rostral passing below the eye but not on the labial margin. This band disappears actually on the sides of the neck and reappears as small widely separated white spots on the ends of the ventrals and subcaudals. A row or three or four white spots on the infralabials on both sides and some similar spots on the sublinguals. Beneath it is whitish anteriorly, darker posteriorly powdered with bluish grey and having two longitudinal bluish lines.

Ingested was found the remains of a large "*Ophisaurus gracilis*," swallowed head foremost as seems usual.

Callophis macclellandi. (var: typica).—One specimen (51/10) was found in a nullah with its head much battered on 2nd June. Its length was 27·5 inches, tail 2·25 inches. The ventrals were 200, and subcaudals 20. The head had the usual ivory white band; the black bands were 25, of which 2 were on the tail. In addition there was a dorso-lateral series of black spots intermediate between the black bands. These spots commence after the 5th band and occur after each band except the 8th and 9th and the last on the tail, but the spot on the left after the last band but two and the last but one on the body has disappeared, and in these two places the intermediate black blotch of the belly has become distorted upwards on to the flank.

Lachesis monticola.—Three specimens—

No.	Date.	Length.	Tail.	Costals.	Ventrals.	Subcaudals.
50/10	29th May	12·5	1·5	25-25-21	150	39 pairs
56/10	23rd June	15·75	1·75	27-25-21	151	35 „
60/10	15th July	12	1·75	23-23-19	147	46 „

In the two first cases a shrew had been swallowed. The last had some abnormalities in the subcaudals as follows:—the 1st to 6th from the vent are entire, the 7th to 15th divided, and the 16th to 22nd entire. The supracaudals were in even rows unaffected by these anomalies.

Lachesis jerdoni—

No.	Date.	Ventrals.	Subcaudals.	Supralabials.
42/10	17th April	172	58 pairs.	7 on right, 8 on left.
46/10	17th May	164	55 „	7
67/10	31st July	181	23 „	8, 4th on left minute.
67/10	had tail broken.			

[*Reprinted with corrections from the* "IBIS" *of* 1909 *by permission.*]

ON THE BIRDS OF KOHAT AND THE KURRAM VALLEY, NORTHERN INDIA.

BY

LIEUT. C. H. T. WHITEHEAD, Indian Army.

With an Introduction by MAJOR H. A. F. MAGRATH, Indian Army.

PART II.*

(*Continued from page 197 of this Volume.*)

[558.] HEMICHELIDON SIBIRICA. The Sooty Flycatcher.

Fulton, J. B. N. H. S. xvi., p. 50 (Chitral, 4,000 ft.); Rattray, t. c. p. 427 (common above 8,000 ft. on Murree Hills); Ward, op. cit. xviii, p. 479.

250. ♂ ad. Kohat, 1,768 ft., 9th May.

Capt. Keen shot this bird in our garden on the 8th of May. In the course of the following week I came across several more. It nests commonly in the forests of the Safed Koh up to tree-limit.

[561.] SIPHIA PARVA. The European Red-breasted Flycatcher.

Marshall, J. B. N. H. S. xiv., p. 603 (Quetta: common in April); Fulton, op. cit. xvi., p. 50 (common in Lower Chitral in winter, leaving in mid-April).

715. ♂ ad. Kohat, 1,768 ft., 20th March.

Major Magrath has made the following notes on this species:—"A winter visitor abundantly reinforced during the spring migration. The rush north-west is at its height in the middle of April and continues till the end of the month. The last birds remain till well into May. The adult males are the first to leave, the females and immature birds following two or three weeks later. The return migration commences in October. Few examples with chestnut breasts are to be seen at this season. This Flycatcher constantly descends to the ground to take its prey."

In autumn I have seen it as early as Sept. 13th. We did not meet with a single adult male in winter, the first appearing about the middle of March.

[567.] CYORNIS LEUCOMELANURUS. The Slaty-blue Flycatcher.

Ward, J. B. N. H. S. xvii., p. 480 (very plentiful in Kashmir).

627. ♂ ad. Kohat, 1,850 ft., 1st March.

This solitary example was the only one met with. Its alarm-note (*tit-it-it*) attracted my attention.

[568.] CYORNIS SUPERCILIARIS. The White-browed Blue Flycatcher.

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* The arrangement and nomenclature followed are those of Oates and Blanford's "Birds" in the 'Fauna of British India.' The numbers in square brackets before each name are the same as in that work.

Rattray, J. B. N. H. S. xvi. p. 427 (common in Murree Hills); Ward, op. cit. xvii. p. 480 (plentiful).

528. ♂ ad. Kurram Valley, 7,500 ft., 24th April.

A rare bird. I shot one near Kohat on the 13th of April, and this was the only example seen in the plains. A second I got near the Peiwar Kotal, and believe that I heard one or two more close by.

[*Culicicapa ceylonensis* (Sw.). Major Magrath shot an example of this species, which is now in the National Collection, in Bannu, in October, and has since found it a fairly common winter visitor.]

[589.] Alseonax ruficaudus. The Rufous-tailed Flycatcher.

Fulton, J. B. N. H. S. xvi. p. 50 (shot two in April); Ward, op. cit. xvii. p. 480 (breeds at high altitudes in Kashmir).

Abundant in summer on the Peiwar Spur, and in the Spin Khwar Nullah of the Safed Koh, from 8,000 to 11,000 feet. As Major Magrath has pointed out, it is quite likely that this species occurs in Kohat in winter, but from its remarkable likeness to the female *Ruticilla rufiventris*, has been overlooked. It may be distinguished from the latter by its not shaking its tail. It is a good songster with a great variety of notes.

[598.] Terpsiphone paradisi. The Indian Paradise Flycatcher.

Marshall, J. B. N. H. S. xiv. p. 606 (shot one in May near Quetta); Fulton, op. cit. xvi. p. 50 (an uncommon summer visitor up to 5,000 ft.); Ward, op. cit. xvii. p. 480 (common in summer).

A fairly common summer visitor, arriving early in April, leaving towards the end of September, nesting freely in the shady orchards of Kohat.

[608.] Pratincola caprata. The Pied Bush-Chat.

Rattray, J. B. N. H. S. xii. p. 339 (Thall: scarce); Marshall, op. cit. xiv. p. 603 (Quetta: common in summer); Fulton, op. cit. xvi. pp. 50 & 744 (resident in Chitral); Cumming, t. c. p. 687 (Seistan: a scarce summer visitor); Betham, t. c. p. 750 (common); Ward, op. cit. xvii. p. 480 (rare in Kashmir).

A fairly common summer visitor from the second week in March till October, but not found much above 3,000 feet in the Kurram Valley.

[610.] Pratincola maura. The Indian Bush-Chat.

Rattray, J. B. N. H. S. xii. p. 339 (abundant at Thall in April); Marshall, op. cit. xiv. p. 603 (a few at Quetta in April); Fulton, op. cit. xvi. pp. 50 & 744 (shot one at 6,000 ft.); Rattray, t. c. p. 467 (common in Murree); Ward, op. cit. xvii. p. 480 (common up to 7,000 ft.).

722. ♂ ad. Kohat, 1,768 ft., 21st March.

Passes through Kohat in force from February till mid-May, returning in small numbers in August and September; a few stragglers remain for the winter. Nests freely on the Samana and in the Kurram Valley from 5,000 to 7,000 feet. I have shot a recently fledged young bird as high as 9,000 feet.

[618.] Saxicola picata. The Pied-Chat.

Marshall, J. B. N. H. S. xiv. p. 480 (Quetta: common summer visitor);

Betham, op. cit. xvi. p. 750 (nests freely); Ward, op. cit. xvii. p. 480 (scarce Kashmir); Perreau, op. cit. xviii. p. 186 (occurs in Chitral).

A fairly common winter visitor to the District from October till the end of March, chiefly frequenting stony wastes and hill-sides, and particularly common between Lachi and Latammar. Nests freely on the Samana. Capt. Keen found a nest on the 14th of May containing six fresh eggs. A beautiful songster, singing both on the wing and on the ground.

[619.] Saxicola capistrata. The White-headed Chat.

Rattray, J. B. N. H. S. xii. p. 339 (common in winter at Thall: many young birds seen at Parachinâr in July); Marshall, op. cit. xiv. p. 603 (shot one at Sibi, 5,000 ft., in Feb.); Fulton, op. cit. xvi. p. 50 (occurs in Chitral in summer from 7,000 to 11,000 ft.); Cumming, t. c. p. 687 (shot one in March: Seistan).

302. ♂ juv. Parachinar, 5,700 ft., 7th July.

435. ♀ ad. Banda, 1,900 ft., 27th January.

A cold-weather visitor to the District and very abundant from the third week in August till April, frequenting both desert country and open cultivated lands and especially common by the roadside. In the Kurram Valley it nests freely round Parachinar from 4,500 to 6,500 feet, and rarely as high as 9,000 feet. The nest, a neat grass structure, is usually placed in a hole in the bank of a nullah or under a stone in the nullah-bed, occasionally in a cairn of stones. The eggs are pale blue, varying a good deal in shade, marked with red spots also varying much in shade, and distribution, and average ·79 in. × ·53 in. The full clutch is five. Two broods at least are reared in the season.

[620.] Saxicola opistholeuca. Strickland's Chat.

Fulton, J. B. N. H. S. xvi. p. 50 (the commonest bird in Chitral, moving up or down according to season); Ward, op. cit. xvii. p. 480 (migrates through Baltistan).

433. Ad. Hangu, 2,700 ft., 27th December.

A fairly common cold-weather visitor from September to the middle of April, keeping chiefly to stony ground. It migrates through the Kurram Valley in April.

Saxicola morio, Hempr and Ehr. The Eastern Pied-Chat.

702. ♀. Kohat, 1,768 ft., 18th March.

This was the only example secured, but, owing to its close resemblance to *S. capistrata* the bird has probably been overlooked.

[625.] Saxicola isabellina. The Isabelline Chat.

Rattray, J. B. N. H. S. xii. p. 339 (Thall: found a nest at 4,000 ft.); Marshall, op. cit. xiv. p. 603 (common in summer, nesting down holes); Cumming, op. cit. xvi. p. 688 (Seistan: fairly common in spring); Betham, t. c. p. 748 (Quetta: numerous, nesting in rat-holes); Ward, op. cit. xvii. p. 481 (Baltistan).

A common cold-weather visitor to the desert parts of the District from August till April.

[626.] SAXICOLA DESERTI. The Desert Wheatear.

Marshall, J. B. N. H. S. xiv. p. 603, & xv. p. 355 (Quetta: found a nest with young in a bank); Cumming, op. cit. xvi. p. 688 (one shot in January); Ward, op. cit. xvii. p. 481, & xviii. p. 462 (occurs in Kashmir in spring and in Ladak in summer).

618. ♀ ad. Kohat, 1,760 ft., 28th February.

Fairly common from November till the third week in March, but not such an exclusive haunter of the desert as some of its allies, being frequently met with about cultivated lands.

[628.] SAXICOLA CHRYSOPYGIA. The Red-tailed Chat.

Watson, J. B. N. H. S. xv. p. 145 (shot in September near Chaman); Perreau, op. cit. xviii. p. 186 (Chitral).

Common in the cold weather from September to mid-April about low stony hills.

[638.] CHIMARRHORNIS LEUCOCEPHALUS. The Whitecapped Redstart.

Rattray, J. B. N. H. S. xii. p. 340 (January); Fulton, op. cit. xvi. p. 744 (rather rare); Ward, op. cit. xvii. p. 481 (common in Kashmir).

Occurs in the Miranzai Valley from Raisan upwards from October to the middle of April, but is somewhat rare. Abundant, however, in summer along the torrents of the Safed Koh up to tree-limit.

[642.] RUTICILLA ERYTHRONOTA. Eversman's Redstart.

Marshall, J. B. N. H. S. xii. p. 603 (common in winter); Ward, op. cit. xvii. p. 481 (occurs in spring).

51. ♀ ad. Raisan, 2,360 ft., 25th December.

100. ♂ ad. Kohat, 1,760 ft., 4th February.

Fairly common, especially in the Miranzai Valley, from December till March, and on the Samana from October till the end of March, chiefly frequenting scrub-jungle, olive-groves, and avenues. The call is a peculiarly croaking note sounding like *gre-er*. The male assumes nearly full breeding-plumage before leaving. Not observed in the Kurram Valley.

[644.] RUTICILLA RUFIVENTRIS. The Indian Redstart.

Marshall, J. B. N. H. S. xiv. pp. 603, 606 (a common resident up to 11,000 ft. in summer); Fulton, op. cit. xvi. p. 51 (common from 9,000 to 14,000 ft. in July); Ward, op. cit. xvii. p. 481 (nests in Ladak).

A winter visitor, abundant from September to mid-April, but only occurring on the Samana on passage. A few pairs nest on the Safed Koh above 10,000 feet. The nest is usually well concealed under a stone or sometimes in a hollow in a bank, and is made of bents and grass lined with hair. The eggs are very pale blue without markings, and vary much in size. The full clutch appears to be five.

[646.] RHYACORNIS FULIGINOSUS. The Plumbeous Redstart.

Fulton, J. B. N. H. S. xvi. p. 51 (a common resident in Chitral from 4,000 to 7,000 ft.); Rattray, t. c. p. 428 (common in the Galis); Ward, op. cit. xvii. p. 481 (very common on all hill-streams).

660. ♀. Kachai, 2,700 ft., 9th March.

Major Magrath observed this Redstart by the Khanki River at Raisan in October 1905; this is the only example of the species we have noted except for the above one which I procured at Kachai.

[647.] CYANECULA SUECICA. The Bluethroat.

Marshall, J. B. N. H. S. xiv. p. 603 (common in March and April at Quetta); Fulton, op. cit. xvi. p. 51 (common in September and October); Ward, op. cit. xvii. p. 481 (common in Kashmir).

Passes through the District and up the Kurram Valley in large numbers from March till the end of May. The return passage, commencing in the last week of August, is at its height in September. A certain number of immature birds winter in Kohat, and are then chiefly found in the reed beds.

[654.] IANTHIA RUFILATA. The Red-flanked Bush-Robin.

Ward, J. B. N. H. S. xvii. p. 481 and xviii. p. 462 (breeds in Kashmir).

95. ♀ ad. Kohat, 1,760 ft., 21st January.

669. ♂ ad. Kachai, 2,700 ft., 12th March.

A rare winter visitor to the Samana and the orchards of Kohat and Miranzai. Capt. Keen was the first to meet with it. Fairly numerous on the wooded slopes of the Safed Koh from 8,000 to 10,000 feet in summer. The alarm note resembles the syllable *prot*, the mate answering *ee* (both notes are used by the two sexes). The short song is one of the familiar sound of the forest, it may be rendered "*Pray did he then?*"

[657.] ADELURA CÆRULEICEPHALA. The Blue-headed Robin.

Fulton, J. B. N. H. S. xvi. p. 51 (resident: Chitral); Rattray, t. c. p. 428 (very rare, nests in holes in stumps: Murree Hills); Ward, op. cit. xvii. p. 481 (occurs in April; Kashmir).

A winter visitor to the District from December till mid-March, and to the Samana from the first week in November till the end of March, but in varying numbers. In 1906 and 1907 it was fairly common but in 1908 I only met with one specimen. Usually frequents olive-groves and gardens, and on the Samana scrub-jungle. In the woods of the Safed Koh, however, it is abundant in summer from 7,500 to 12,000 feet. It has the tame and confiding habits of the Redbreast, and the same way of quivering the tail. The alarm-notes, too, are very similar. The two nests that I came across might well have been those of the Redbreast. The first was placed on the ground under shelter of a juniper-root (not in a hole) at 11,000 feet, and contained three eggs just hatching; they were cream-coloured, with a darker zone near the larger end, and differed a good deal in size. The second was in a similar position at 8,000 feet, and had four eggs of similar type, but very faintly tinged with green and slightly smaller, averaging ·68×·48".

[661.] THAMNOBIA CAMBAIENSIS. The Brown-backed Indian Robin.

Rattray, J. B. N. H. S. xii. p. 340 (a common resident); Ward, op. cit. xvii. p. 481.

686. ♂ ad. Kohat, 1,760 ft., 16th March.

A fairly common resident in the plains. As Major Magrath notes, it differs from its down-country relatives in shunning gardens and cultivated spots, preferring arid stony localities, and shewing a marked partiality for graveyards. It does not ascend the hills to any height, and in the Kurram Valley we did not find it above 3,000 feet.

[666.] MERULA MAXIMA. The Central Asian Blackbird.

Ward, J. B. N. H. S. xvii. p. 482 (breeds in Kashmir at high altitudes).

295. Juv. Safed Koh, 10,500 ft., 1st July.

Bill, gape, and eyelid brownish yellow; tarsus fleshy brown; iris brown.

Apparently very rare, this example being the only one met with.

[In July 1908 I found this fine bird fairly common outside our limits near the head of the Kaghan Valley (Hazara, N.-W. F. P.) between 12,000 and 13,500 feet, in parties of from three to ten, or occasionally alone. It was very wild, and it was with difficulty that I procured three examples (now in the British Museum). On revisiting this valley in May and June 1909, I found it nesting freely in the juniper-scrub between 10,000 and 12,000 ft. Altogether 8 nests were found; they were very similar to those of *M. vulgaris*. The nest was usually built in a juniper but on 2 occasions in a hollow in a cliff. The song seems to lack the quality and variety of that of the Blackbird but was not often heard. The call and also the alarm note resembles *tchut-ut-ut* rapidly repeated. The rattling alarm so freely used by the latter was only heard when the eggs or young were in danger. The males were very wary and were seldom seen near the nest except when there were young. The majority appear to breed in immature plumage, only 2 were observed in the glossy black dress with orange bill of the adult.]

[672.] MERULA CASTANEA. The Grey-headed Ousel.

Rattray, J. B. N. H. S. xvi. p. 657 (abundant in the Murree Hills). Ward, op. cit. xvii. p. 482 (occurs in Kashmir in varying numbers).

598. ♀ ad. Kohat, 1,760 ft., 18th February.

657. ♂ ad. Hangu, 2,600 ft., 8th March.

Fairly common from November till April in the wooded nullahs of the Samana in company with flocks of *M. atrigularis*. A few individuals occur in the Miranzai Valley and in the orchards of Kohat in February and March.

I met with a family-party on the 9th of August on the Safed Koh at 8,000 feet.

[674.] MERULA FUSCATA. The Dusky Thrush.

Major Magrath shot a specimen of this Thrush on the 7th of April in his garden at Bannu; the skin is now in the British Museum. On seeing it I

was struck by its resemblance to one which Capt. Keen shot for me at Kohat the previous winter (22nd March, 1906), about which I made the following notes at the time: "Differs from *H. atrigularis* in the throat and cheeks being light brown tinged with red, turning to blackish on the upper breast." Unfortunately I had no time to skin it.

Major Magrath has sent me the following extract from his pocket-book made near Kohat and dated April 6th, 1905:—"A Thrush, upper parts like *M. atrigularis*, abdomen and vent white; the throat I could not see; a *broad buff supercilium*." So it seems probable that it is also a winter visitor to Kohat. Oates records it as a rare winter visitor to North-eastern India only.

[677.] MERULA ATRIGULARIS. The Black-throated Ousel.

Marshall, J. B. N. H. S. xiv. p. 603 (very common); Fulton, op. cit. xvi. p. 51 (one shot in April); Ward, op. cit. xvii. p. 482 (abundant in winter).

578. ♂ ad. Kohat Pass, 3,000 ft., 12th February.

These birds are abundant on the Samana and in the Miranzai Valley from October to the middle of April, but their further movements towards the plains depend a good deal on the weather. In the severe winter of 1904-05 Major Magrath noted them at Kohat in large numbers as early as December, but in the following year, which was mild, we did not observe them till February, and then only a few.

Not met with in the Kurram Valley.

[691.] PETROPHILA CINCLORHYNCHA. The Blue-headed Rock-Thrush.

Fulton, J. B. N. H. S. xvi. p. 51 (shot one in May: Chitral); Rattray, t. c. p. 657 (nests freely round Murree); Ward, op. cit. xvii. p. 482 (plentiful, in Kashmir).

A rare cold-weather visitor to the District from September till May. A few nests on the Safed Koh.

[693.] PETROPHILA CYANUS. The Western Blue Rock-Thrush.

Marshall, J. B. N. H. S. xiv. p. 603 (a fairly common summer visitor); Fulton, op. cit. xvi. p. 51 (a summer visitor, not common); Rattray, t. c. p. 657 (rare: Murree Hills); Ward, op. cit. xvii. p. 482 (occurs in summer).

A rather scarce winter visitor from October till mid-April, keeping almost entirely to low rocky hills and generally seen singly or in pairs. Breeds on the Samana and in the Kurram Valley from 5,000 to 12,000 feet.

[694.] MONTICOLA SAXATILIS. The Rock-Thrush.

Marshall, J. B. N. H. S. xiv. p. 603 (one in January and one in April); Fulton, op. cit. xvi. p. 52 (shot two in autumn); Ward, op. cit. xvii. p. 482 (occurs in Baltistan in summer).

I have only once met with this species, and that was on the 6th of September in a stony valley near Kohat, when the autumn migration was at its height. I got a good view of it through my glasses, but unfortunately did not secure it.

[695.] TURDUS VISCIVORUS. The Missel-Thrush.

Marshall, J. B. N. H. S. xiv. p. 604, & xv. p. 355 (a resident in the hills round Quetta); Fulton, op. cit. xvi. p. 52 (resident in Chitral); Ward, op. cit. xviii. p. 482 (resident and common).

In the severe weather of January 1905, Major Magrath observed one in an orchard at Kohat, and Mr. Donald's bird-catchers caught two on the grass-farm about the same time. None have been seen there since.

In the Kurram Valley it nests not uncommonly amongst the firs and Deodars of the Peiwar spur, and in the Spin Khwar Nullah from 7,000 to 9,000 feet.

[697.] TURDUS ILIACUS. The Redwing-Thrush.

Mr. Oates writes (Fauna Brit. Ind., Birds, ii. p. 156):—"I have not been able to examine any specimen of Redwing obtained in India, and I admit the species on the authority of Jerdon, who states that at the time he wrote it had been lately found in the Himalayas, though very rarely. But at Kohat," he adds, "as I am assured by Mr. Blyth, according to a very good observer, the late Lieut. Trotter, it is a regular winter visitant in large flock." Major Magrath and I have looked in vain for this species for the last three winters. Possibly the flocks of Calandra Larks (*Melanocoryphla bimaculata*) were mistaken for Redwings.

[709.] CINCLUS ASIATICUS. The Brown Dipper.

Fulton, J. B. N. H. S. xvi. p. 52 (not uncommon from 4,000 to 10,000 ft.); Ward, op. cit. xvii. p. 482 (very common in Kashmir).

Occurs along the larger streams of the Safed Koh up to 9,000 feet, but is scarce. I shot a strong flying young bird on the 27th of June.

[712.] ACCENTOR RUFILATUS. The Red-sided Accentor.

Accentor rufilatus Sharpe, Cat. Birds B. M. vii. p. 664 (1882).

Accentor nepalensis (part.) Oates, Faun. Brit. Ind., Birds, ii. p. 166.

Ward, J. B. N. H. S. xvii. p. 482 (occurs in Ladak and Baltistan); Perreau, op. cit. xviii. p. 186 (Chitral).

274. Sex? Samana, 6,500 ft., 5th April.

296. Sex? Safed Koh, 12,300 ft., 1st July.

A rather rare winter visitor to the Samana from the beginning of November till April, generally found singly about cliffs or on steep stony slopes, but never much below 6,000 feet.

Nests freely on the Safed Koh above 12,000 feet. I came across the first nest on the 1st of July 1906; it was placed under a rock on a steep slope and contained three fresh eggs closely resembling those of our Hedge-Sparrow, but larger, averaging ·88″×·57″. The nest was beautifully made of grass and roots, lined with moss and a little fur. On the 28th of July I came on two more nests built in crevices in cliffs each containing two young ones, the most noticeable feature about them being their bright red gapes. This is not the first record of the nest. Mr. Stuart Baker writes that he has

an authenticated clutch of eggs in his collection from Ladakh, taken previously to mine, though he adds that his is that of *A. nepalensis*, as he does not recognise *A. rufilatus* as a good species.

[713.] ACCENTOR HIMALAYANUS. The Altai Accentor.

Ward, J. B. N. H. S. xvii. p. 482 (large flocks pass through Kashmir in spring).

132. ♀ ad. Samana, 6,500 ft., 7th March.

361. Sex ? „ „ 5th April.

A visitor to the Samana from December till the middle of April. Usually to be seen in large flocks, busily feeding amongst stones, near the Fort. Major Magrath procured the first examples of both this and the last species.

[716.] THARRHALEUS ATRIGULARIS. The Black-throated Accentor.

Marshall, J. B. N. H. S. xiv. p. 604 (shot one in January); Fulton, op. cit. xvi. p. 744 (shot two in March); Ward, op. cit. xvii. p. 482 (common in spring).

66. ♀ ad. Kohat, 1,760 ft., 5th January.

A common winter visitor arriving in October and leaving towards the middle of March. It closely resembles the Hedge-Sparrow in habits, but is somewhat gregarious.

[719.] THARRHALEUS JERDONI. Jerdon's Accentor.

Watson, J. B. N. H. S. xv. p. 145 (small flocks occur in January and March: Chaman); Ward, op. cit. xvii. p. 482 (breeds in Kashmir).

407. Ad. Samana, 6,000 ft., 2nd December.

A winter visitor to the Samana (above 4,000 feet) in small numbers; it frequents scrub-jungle, and is generally solitary; it is perhaps commoner than it appears to be, but is such a terrible skulker that one rarely gets more than a glimpse of it.

Nests fairly commonly on the Safed Koh, between 9,000 and 12,000 feet, both in the forest and in Juniper-scrub. The alarm-note resembles the syllable *tir-r-r*.

[722.] PLOCEUS BENGALENSIS. The Black-throated Weaver-bird.

Rattray, J. B. N. H. S. xii. p. 340.

We have not met with this species in Kohat, but Col. Rattray records it from Thall, and writes as follows:—"Appeared suddenly about the beginning of June in all the reed-patches on the river-banks; they fly about in flocks of twenty or thirty birds. On 25th June 1898, I found a nest containing three eggs much incubated . . . ."

Mr. Donald, the Political Officer, observed a flock in the reeds near Thall in March. Probably a resident species, moving locally up and down the river.

[734.] UROLONCHA MALABARICA. The White-throated Munia.

Rattray, J. B. N. H. S. xii. p. 340 (not common); Fulton, op. cit. xvi.

p. 52 (summer visitor up to 4,000 ft.: Chitral); Ward, op. cit. xvii., p. 483 (occurs in Kashmir).

A resident in the plains; abundant in summer, but becoming scarce in winter.

[758.] SPORÆGINTHUS AMANDAVA. The Indian Red Munia.

Rattray, J. B. N. H. S. xii., p. 340; Ward, op. cit. xvii., p. 483 (occurs in Jammu).

Colonel Rattray met with a few flocks of this species on the jheels (marshes) and amongst high grass near Thall. Mr. Donald, the Political Officer, who passes through Thall monthly on tour, tells me that he has observed flocks in the reeds there at all seasons, and in August has seen parents going about with newly-fledged families.

[740.] COCCOTHRAUSTES HUMII. Hume's Hawfinch.

Fulton, J. B. N. H. S. xvi., p. 52 (shot 2 in May at 4,000 ft.: Chitral).

50. ♂ ad. Raisan 2,360 ft., 25th December.

85. ♂ ad. Kohat, 1,760 ft., 14th January.

638. ♂ ad. Hangu, 2,700 ft., 3rd March.

A winter visitor in fair numbers from October till mid-April, being especially common in the Miranzai Valley, but rare on the Samana. It generally occurs in small parties about wild olive-groves, orchards, and gardens, feeding on berries, seeds, and the kernels of fruit-stones. The call-note, which is frequently uttered, is a shrill *tee*, not at all what might be expected from such a big bird.

I met with a party of five on the 5th of May at 9,600 feet on the Peiwar Spur; possibly the bird nests about there.

[741.] PYCNORHAMPHUS ICTEROIDES. The Black-and-Yellow Grosbeak.

Rattray, J. B. N. H. S. xvi. p. 657 (common: Murree Hills); Ward, op. cit. xvii. p. 484 (abundant); Perreau, op. cit. xviii. p. 186 (Chitral).

671, 672. ♂ ♂ ad. Hangu, 2,700 ft., 12th March.

A common bird on the wooded slopes of the Safed Koh from 7,000 to 11,000 feet, but shy, and its loud call-note, *préter-pre*, is more often heard than the bird seen. A few occasionally descend to the Miranzai Valley in winter.

[743.] PYCNORHAMPHUS CARNEIPES. The White-winged Grosbeak.

Marshall, J. B. N. H. S. xiv. p. 604 (common in the hills round Quetta) Ward, op. cit. xvii. p. 486, & xviii. p. 462 (resident, but scarce).

301. ♂ ad. Safed Koh, 8,500 ft., 7th July.

Not nearly so common as the last species, but much bolder and less of a forest-bird, keeping more to the Juniper-scrub between 8,000 and 12,000 feet. Frequently to be seen perched in some prominent position, uttering its familar notes *wil-ye-go-ame* or *croak-et-et*. The flight is whirring and dipping like that of a Woodpecker. I found a nest containing two hard-set eggs on the 7th of July. It was beautifully made of twigs and bents, well lined with fresh strips of Juniper-bark. The eggs were of the Hawfinch

type, of a French-white colour with strong reddish-brown markings, and averaged 1·18″ × ·72″.

[754.] Propasser dubius (Prjev.). The White-browed Rose-Finch.

Fulton, J. B. N. H. S. xvi. p. 52 (April, 9,000 ft.: Chitral); Ward, op. cit. xvii. p. 484, & xviii. p. 463 (common in spring, breeding in August near source of Sind River).

288. ♀. Safed Koh, 10,000 ft., 29th June.

Not uncommon on the Safed Koh in summer from 8,000 to 11,000 feet. Apparently an early breeder. I came on a family very strong on the wing on the 29th of June. Its loud-call *pwit, pwit* may be constantly heard, recalling somewhat the Paroquet's (*Palæornis*) screech, especially when a party wing their way overhead and all call together.

[757.] Propasser grandis. The Red-mantled Rose-Finch.

Marshall, J. B. N. H. S. xiv. p. 604 (9,000 ft. in May); Fulton, op. cit. xvi. p. 744 (fairly common in spring from 7,000 to 9,000 ft.); Ward, op. cit. xvii. p. 484 (Kashmir).

133. ♂ ad. Chikarkot, 2,000 ft., 2nd March.

628. ♀ ad. Kohat, 1,850 ft., 1st March.

649. ♂ ad. Hangu, 2,700 ft., 6th March.

A winter visitor in small numbers to the Miranzai and Kohat Valleys It is usually met with singly or in small parties about wild olive and camel-thorn (*Acacia machata*) groves, gardens, and cultivated spots, feeding on various tree seeds, dandelion-flowers, &c. Call-note, *wir*. It was also observed on several occasions on the Safed Koh in July between 10,000 and 11,000 feet.

Tame and confiding in its habits.

[761.] Carpodacus erythrinus. The Common Rose-Finch.

Marshall, J. B. N. H. S. xiv. p. 604 (Quetta: common at 9,000 ft. in May); Fulton, op. cit. xvi. p. 52 (common from 10,000 to 15,000 ft. in July, and at 5,000 ft. in winter); Ward, op. cit. xvii. p. 484 (found everywhere).

179. ♂ ad. Kohat, 1,760 ft., 3rd April.

Major Magrath has made the following notes on this species:—"Visits the district in considerable numbers on the spring and autumn migrations, passing through on the former in March and April, and on the latter in September and October, when mostly young birds are seen. A good deal of damage is done by this species to the fruit-trees, which it attacks by eating the buds after the manner of Bullfinches. The song may be rendered thus, *to-weet-tew*."

In the summer I found the bird abundant in several of the valleys of the Safed Koh from 6,500 to 8,500 feet, where in the early morning the loud though rather monotonous song resounds on all sides.

[763.] Erythrospiza githaginea. The Desert-Finch.

Perreau, J. B. N. H. S. xviii. p. 186 (one shot: Chitral).

88. ♂ ad. Kohat, 1,760 ft., 18th January 1906.

This example was procured by Major Magrath out of a small flock at the foot of the hills. Subsequently I frequently met with the birds, generally feeding on stony ground, but once in young crops. They are probably resident. I came across a pair near Thall on the 19th of May which, I believe, had a nest, but failed to find it.

[764B.] RHODOSPIZA OBSOLETA. The Persian Desert-Bullfinch.

Watson, J. B. N. H. S. xv. p. 145 (common in gardens in August and September and again in March: Chaman, 4,450 ft., near Quetta).

74. ♂ ad. Kohat, 1,760 ft., 8th January.

Oates (Fauna Brit. Ind., Birds, ii. p. 233) wrote that this species was likely to be found within Indian limits. Capt. Watson procured, I believe, the first authenticated examples in India, at Chaman. Subsequently Capt. Marshall and Major Betham found it common round Quetta, and the latter discovered a number of nests (*vide* Rep. of Baluchistan Nat. Hist. Soc. in J. B. N. H. S. xviii. p. 521). From the 8th of January till the 1st March 1906, a flock frequented a Mohamedan cemetery near Kohat which was much over-grown with weeds, on the seeds of which they used to feed. The males had started singing by the 1st of March; the call-note may be rendered *worr*.

[767.] CARDUELIS CANICEPS. The Himalayan Goldfinch.

Marshall, J. B. N. H. S. xiv. p. 604 (Quetta: scarce); Fulton, op. cit. xvi. p. 53 (very common in summer up to 13,000 ft.); Ward, op. cit. xvii. p. 484 (the majority migrate through Kashmir, but a few stay to nest).

625, 626. ♀ ♀ ad. Kohat, 1,760 ft., 29th February.

A winter visitor, occurring in large flocks from November till the middle of April. Its confiding habits are taken advantage of by the local bird-catchers, who snare large numbers, retailing them at 2*d*. or 3*d*. each.

One of the commonest birds on the Samana in winter. Capt. Keen tells me that a few stayed there all through the summer, and he believes nested in the neighbourhood.

We also observed a few in the Upper Kurram Valley in spring and summer.

[768.] CALLACANTHIS BURTONI. The Red-browed Finch.

Fulton, J. B. N. H. S. xvi. p. 53 (Chitral: summer visitor); Ward, op. cit. xvii. p. 484, & xviii. p. 463 (nests in Kashmir).

Not uncommon on the Safed Koh in summer between 8,000 and 9,000 feet. Its loud whistling call-note—*chew-ee*—is very striking. It is usually uttered from high up on a bare branch.

Colonel Ward describes a nest taken from a fir-tree at 9,000 feet as being very small and made of pine-needles; the eggs measured ·88″ × ·65″, and were of a greenish blue marked with dark brown spots at the larger end.

[771.] METOPONIA PUSILLA. The Gold-fronted Finch.

Marshall, J. B. N. H. S. xiv. p. 604 (Quetta: common on passage); Fulton, op. cit. xvi. p. 54 (resident in Chitral: nest at 12,000 ft. in July in birch-scrub); Ward, op. cit. xvii. p. 484, & xviii. p. 463 (breeds in Kashmir and Baltistan).

414. ♂ ad. Samana, 5,600 ft., 13th December.

A rather rare winter visitor to the Samana, occurring in small parties, and sometimes in flocks of forty or fifty, from December till April. The flocks may be easily located by their incessant twittering (which resembles the syllables *bri-i*).

Fairly common in summer between 8,000 and 9,000 feet on the Peiwar Spur.

[772.] HYPACANTHIS SPINOIDES. The Himalayan Greenfinch.

Rattray, J. B. N. H. S. xvi. p. 658 (nests fairly common in the Murree Hills); Ward, op. cit. xvii. p. 484 (Kashmir: common up to 8,000 ft.).

409. Juv. Samana, 6,500 ft., 6th December.

A few individuals are to be found in December and January in company with the flocks of Goldfinches on the Samana near Fort Lockhart, but the bird is not at all common.

[774.] FRINGILLA MONTIFRINGILLA. The Brambling.

Ward, J. B. N. H. S. xvii. p. 484 (passes through); Perreau, op. cit. xviii. p. 186 (one shot in Chitral).

134. ♀ ad. Hangu, 2,700 ft., 3rd March.

Migrates through the District in small numbers early in March, associating with big flocks of Buntings. Not observed on the autumn passage.

FRINGILLA CŒLEBS. The Chaffinch.

135. ♀ ad. Hangu, 2,700 ft., 3rd March.

I came across a pair of this species in an orchard near Hangu in March 1906 and secured one specimen. The following February I saw what I feel certain was another (a male), but in the excitement of the moment I missed it and never saw it again.

[775.] GYMNORHIS FLAVICOLLIS. The Yellow-throated Sparrow.

Rattray, J. B. N. H. S. xii. p. 340 (Thall: rather rare).

777. ♂ ad. Kohat, 1,760 ft., 2nd April.

A common summer visitor to the District, arriving about the 1st of April. It usually breeds in trees, but the demand for nesting-sites seems to be greater than the supply, one nest that I found being built after the fashion of that of *Passer domesticus*, and placed conspicuously in the top of a thorn-bush. It contained four fresh eggs. I shot the hen on her return, to make quite sure of her identity.

[776.] PASSER DOMESTICUS. The House-Sparrow.

Rattray, J. B. N. H. S. xii. p. 340 (common); Marshall, op. cit. xiv. p. 604 (Quetta: very common, but in summer only); Fulton, op. cit. xvi. p. 54 (summer visitor only); Ward, op. cit. xvii. p. 485.

791. ♂ ad. Kohat, 1760 ft., 16th March.

755. ♂ ad. „ „ 27th „

Major Magrath writes of this species in Kohat as follows :—"The usual pest and only too common. In April and early in May vast flocks of a migratory race of this species pass through the District in company with the next and the flocks of *Pastor roseus* already mentioned. Numbers of them are slaughtered along with the two latter. Does not winter on the Samana."

The above two examples belong to a melanistic variety not uncommon round Kohat.

[778.] PASSER HISPANIOLENSIS. The Spanish Sparrow.

Watson, J. B. N. H. S. xv. p. 145 (large flocks from October till December: Chaman); Fulton, op. cit. xvi. p. 54 (passes through Chitral in April and October); Ward, op. cit. xvii. p. 485 (met with in July).

676. ♂ ad. Thall, 2,550 ft., 14th March.

I will again quote from Major Magrath's excellent notes :—"Mixed up with flocks of the last species, numbers of the present occur on the spring migration. At the height of the migration vast flocks of Sparrows in company with flocks of *Pastor roseus* pour into the station at sundown to roost. The combined noise of these birds before they have settled down to sleep is indescribable, and the smell of them becomes quite appeciable and rather offensive. Gardens, hedges, and trees are disgustingly soiled by the rain of their excreta. Shooting the birds is encouraged in Cantonments at this time, and every sepoy who can procure a gun slaughters to his heart's content. But notwithstanding these drastic measures little mitigation of the nuisance is effected."

The spring migration sets in about the second week in March and continues till the middle of May, the return passage commencing early in August and continuing till October, but comparatively few are seen in autumn. A few stay the winter, being fairly common then in the reed-beds and scrub round Lachi. None appear to breed in the Kurram Valley, but a large number pass through.

An example picked up by Major Magrath near Peiwar (6,500 feet) had evidently been strangled by getting its head inextricably fixed between the primaries when preening itself.

[779.] PASSER MONTANUS. The Tree-Sparrow.

Rattray, J. B. N. H. S. xii. p. 340 (nests freely: Upper Kurram); Marshall, op. cit. xiv. p. 604 (a very common resident: Quetta); Fulton, op. cit. xvi., p. 54 (a common resident: Chitral); Cumming, t. c. p. 688 (abundant in April: Seistan); Ward, op. cit. xvii., p. 485.

714. ♂ ad. Kohat, 1,850 ft., 20th March.

Common in winter in the Miranzai Valley, a few individuals occurring as low as Kohat and Banda. Mr. Donald found a nest with young in Doaba

Station (3,000 feet) in May and says that the bird nests regularly at Shinauri (3,800 feet). It possibly also does so at Thall (2,550 feet), where I observed a solitary example on the 18th of May. In the Upper Kurram this species and *P. domesticus* are present in about equal numbers in summer, and build alongside one another in houses; but the former, as noted by Capt. Fulton in his paper on "The Birds of Chitral," get the pick of the nesting-sites before the latter's arrival, and in many cases *P. domesticus* has to put up with holes in cliffs.

[782.] PETRONIA STULTA. The Rock-Sparrow.

Ward, J. B. N. H. S. xvii. p. 485 (winter visitor to Gilgit).

599. Ad. Banda, 2,000 ft., 19th February.

Major Magrath first met with a flock of this species in February 1906 feeding in a stubble near Kohat. It is apparently a regular winter visitor, more common in the desolate country south of Banda than elsewhere. I found it very wary and generally feeding in young crops in flocks of fifteen or twenty.

[785.] MONTIFRINGILLA ADAMSI, Moore. Adams's Mountain-Finch.

[I came on a small flock of Mountain-Finches on the 2nd of August on a grassy knoll at an altitude of 10,000 feet in the Safed Koh. From their markings and colouring I attribute them to this species, but they were rather wild and I did not secure one, and do not therefore feel justified in entering the species on the list.]

[787.] FRINGILLAUDA SORDIDA. Stoliczka's Mountain-Finch.

Fulton, J. B. N. H. S. xvi., p. 55 (common in summer from 10,000 to 14,000 ft.); Ward, op. cit. xvii. p. 485 (breeds in Kashmir).

136. Ad. Samana, 6,500 ft., 7th March.

642, 645. ♂ ♂ ad. Samana, 6,500 ft., 5th March.

243, 644. Ad. Samana, 6,500 ft., 5th March.

During the intense cold in March 1906, when the snow was lying deep round Fort Lockhart, Major Magrath noticed small flocks of these birds picking up scraps round the cook-house door and shot one. They left when the snow melted. The following winter I was stationed there, but did not meet with a single specimen. In March 1908, however, I spent a couple of days there and found large flocks feeding on fallow land; curiously enough, the weather was comparatively warm then and there was no snow lying.

[789.] EMBERIZA SCHŒNICLUS. The Reed-Bunting.

Watson, J. B. N. H. S. xv. p. 145 (December: Chaman); Ward, op. cit. xvii. p. 485, & xviii., p. 463 (Gilgit and near Srinagar).

126. Sex? Kohat, 1,760 ft., 20th February.

593. Sex? „ „ 17th „

Fairly common from November to March in reed-beds and irrigated crops and on the grass-farm, or occasionally in dry stubble and scrub-jungle. Varies much in size and colouration.

[792.] EMBERIZA LEUCOCEPHALA. The Pine-Bunting.

Marshall, J. B. N. H. S. xiv., p. 604 (common in winter); Ward, op. cit. xvii., p. 485 (occurs in early spring): Perreau, op. cit. xviii., p. 186 (specimen shot: Chitral).

52. ♀ ad. Raisan, 2,300 ft., 25th December.

103. ♂ ad. Kohat, 1,700 ft., 5th February.

640. ♂ ad. Hangu, 2,700 ft., 3rd March.

A winter visitor, occurring in small flocks from December till March about cultivated places, often in company with *E. stracheyi*.

[793.] EMBERIZA STEWARTI. The White-capped Bunting.

Marshall, J. B. N. H. S. xiv., p. 604 (Quetta: common in summer); Fulton, op. cit. xvi., p. 55 (Chitral: very common from 5,000 to 12,000 ft.); Rattray t. c. p. 672 (Murree Hills: common); Betham, t. c. p. 832 (nests round Quetta); Ward, op. cit. xvii. p. 485 (rare).

648. ♂ ad. Darband, 2,800 ft., 6th March.

725. ♂ ad. Kohat, 1,760 ft., 22nd „

778. ♂ ad. Kachai, 2,700 ft., 1st April.

A common resident on the Samana and in the Kurram Valley, nesting up to 10,000 feet. In winter it is found in varying numbers throughout Kohat above 3,000 feet, wherever there is a good supply of grass and other seeds. During cold spells, however, and on migration large numbers appear in the plains, but they keep chiefly to scrub-jungle, olive-groves, and rocky valleys, avoiding cultivation.

[794.] EMBERIZA STRACHEYI. The Eastern Meadow-Bunting.

Watson, J. B. N. H. S. xv. p. 145 (one shot in November: Chaman): Fulton, op. cit. xvi., p. 55 (abundant from 4,000 to 14,000 ft., according to season); Rattray, t. c. p. 672 (nests freely in the Murree Hills); Ward, op. cit. xvii., p. 485 (resident: Kashmir).

53. ♀. Raisan, 2,300 ft., 25th December.

60. ♀. Kohat, 1,760 ft., 2nd January.

124. ♀. „ „ 19th February.

A winter visitor to Kohat and by far our commonest Bunting from the second week in October till April, occurring at all elevations and on all sorts of ground, though more commonly about cultivated places than elsewhere. On the Samana it quite takes the place of *Passer domesticus* in winter. It nests fairly commonly on the Safed Koh up to 11,000 feet.

[795.] EMBERIZA BUCHANANI. The Grey-necked Bunting.

Marshall, J. B. N. H. S. xiv., p. 604 (common in April near Quetta); Ward op. cit. xvii. p. 485 (a rare spring migrant); Perreau, op. cit. xviii., p. 186 (Chitral).

Not an uncommon species on the spring passage from the middle of April to the middle of May. It frequents stony ground covered with patches of scrub, usually singly or in pairs. On the autumn migration I only observed

it once, *viz.*, on the 16th of September. An example was forwarded from Bannu to the British Museum by Major Magrath.

[800.] EMBERIZA LUTEOLA. The Red-headed Bunting.

Marshall, J. B. N. H. S. xiv. p. 604 (a few seen in May in Chitral); Fulton op. cit. xvi., p. 744 (a spring migrant).

534. ♂. Kurram Valley, 6,800 ft., 27th April.

Passes through the District and up the Kurram Valley in force from mid-April till mid-May, returning in August and September. Major Wardlaw-Ramsay found this species nesting in the Hariob Valley, which drains into the Kurram Valley just west of our limits.

[802.] EMBERIZA STRIOLATA. The Striolated Bunting.

Marshall, J. B. N. H. S. xiv., p. 604 (not rare in summer: Quetta).

Rare. I met with a party of six or seven in some very desolate country between Lachi and Dhand on the 23rd of February 1907 and shot one bird which corresponded well with Oates's description.

[804.] CHELIDON URBICA. The House-Martin.

Rattray, J. B. N. H. S. xii., p. 340 (Thall: rare); Marshall, op. cit. xiv., p. 604 (Quetta: May); Ward, op. cit. xvii., p. 483 (breeds in Ladak).

Colonel Rattray shot a specimen at Thall on the 14th of May 1898, out of a small flock. We have seen one or two flocks of what appeared to be this species, on spring migration, but have never shot an example.

[805.] CHELIDON KASHMIRENSIS. The Kashmir Martin.

Fulton, J. B. N. H. S. xvi., p. 55 (Chitral: common in summer); Rattray, t. c. p. 659 (common in the Galis, nesting freely in verandahs: Murree Hills); Ward, op. cit. xvii. p. 483 (breeds in Kashmir).

Fairly numerous in summer along the Safed Koh Range, nesting either singly or in small colonies under overhanging crags from 6,000 to 8,000 feet. The nest resembles that of the last species, but varies considerably in size and shape according to the situation.

[808.] COTILE RIPARIA. the Sand-Martin.

Fulton, J. B. N. H. S. xvi., p. 55 (Chitral: common in summer); Ward, op. cit. xvii. p. 483 (Kashmir).

The large Sand-Martin which migrates through Kohat in April and May must, I think, be of this species, though I have not shot an example. Major Magrath shot one out of a large flock on the autumn passage at Bannu, just south of our limits.

[808A.] COTILE DILUTA. The Pale Sand-Martin.

Sharpe and Wyatt, Monogr.—Hirundinidæ, p. 63.

437. ♀ ad. Khushalgarh, 1,200 ft., 16th February.

679. ad. Thall, 2,550 ft., 14th March.

This species is distinguished from *C. riparia* by its paler colour, smaller size, and less sharply defined pectoral band.

It is probably widely distributed in India, but owing to its resemblance

to the last-named species, has been overlooked. In Kohat it is common enough and resident, large colonies nesting in the banks of the Indus and Kurram Rivers in February and March. The specimen, shot at Thall in March, was one of a breeding-colony. Major Magrath also found a large colony in March, nesting in the banks of the Kurram River (south of our limits), and secured two typical examples.

Besides these there are five specimens in the British Museum, *viz.*, a doubtful one obtained by Jerdon at Madras, two from Afghanistan, and two from Central Asia.

[809.] Cotile sinensis. A resident species in the District.

[810.] Ptyonoprogne rupestris. The Crag-Martin.

Marshall, J. B. N. H. S. xiv. p. 604 (nests freely round Quetta); Fulton op. cit. xvi. p. 55 (Chitral: summer visitor, found up to 13,000 ft.); Rattray, t. c. p. 659 (nests in the Murree Hills); Ward, op. cit. xvii. p. 483 (nests in Ladak).

277. Ad. Samana, 6,500 ft., 12th April.

A winter visitor from October till April. Probably resident on the Samana. Nests fairly common in the precipices of the Safed Koh.

[812.] Ptyonoprogne obsoleta. The Pale Sand-Martin Major Magrath shot an example out of a flock at Bannu in December 1907 and I found it quite common in the precipitous hills of southern Kohat in March. A few were then in pairs so perhaps it nests there.

[813.] Hirundo rustica. The Swallow.

Rattray, J. B. N. H. S. xii. p. 341 (Murree Hills: a common resident); Marshall, op. cit. xiv. p. 605 (abundant in summer: Quetta); Cumming, op. cit. xvi. p. 688 (Seistan, 1,700 ft.: summer visitor); Ward, op. cit. xvii. p. 483 (summer visitor: Kashmir); Perreau, op. cit. xviii. p. 186 (Chitral).

A fairly common resident in the Miranzai Valley, nesting freely at Thall (2,550 ft.) and at Doaba, but becoming scarce in winter and temporarily disappearing in severe weather. A summer visitor to the Kurram Valley in small numbers.

Major Magrath has found this highly migratory species to be resident even in the hot plains of Bannu (1,200 ft.) (*vide* 'Field,' March 28th, 1908).

[818.] Hirundo smithi. The Wire-tailed Swallow.

Rattray, J. B. N. H. S. xii. p. 341 (common); Ward, op. cit. xvii. p. 483 (summer visitor: Kashmir).

A summer visitor and abundant from April till October, the first birds arriving in the middle of March.

Occurs in the Kurram Valley up to 6,000 feet, but only in small numbers.

[822.] Hirundo nepalensis. Hodgson's Striated Swallow.

Marshall, J. B. N. H. S. xiv. p. 605 (summer visitor: Quetta); Rattray, op. cit. xvi. p. 659 (nests freely in the Galis).

Numbers pass up the Miranzai Valley in the first half of April. I shot an

example at Hangu on the 9th, and found a retort-shaped nest under a bridge close by, though whether it belonged to this species or the next I did not discover, as I was only passing through.

[823.] HIRUNDO ERYTHROPYGIA. Sykes's Striated Swallow.

Rattray, J. B. N. H. S. xii. p. 341 (great numbers passed through Thall in the middle of May).

A small party of these Swallows arrived on the Samana towards the end of March 1907. On the 4th of April I shot one, its beak and forehead were plastered with mud; it had evidently started nesting-operations.

[826.] MOTACILLA ALBA. The White Wagtail.

Marshall, J. B. N. H. S. xiv. p. 605 (Quetta: common in winter); Fulton op. cit. xvi. p. 55 (Chitral: resident from 4,000 to 10,000 ft., according to season); Ward, op. cit. xvii. p. 723 (rare in Kashmir).

Large numbers arrive in Kohat early in September, and a few stay through the winter; the majority pass on and return about the middle of February, again to disappear towards the middle of May.

[829.] MOTACILLA PERSONATA. The Masked Wagtail.

Watson, J. B. N. H. S. xv. p. 145 (fairly common in winter: Chaman, 4,450 ft.); Fulton, op. cit. xvi. p. 56 (Chitral: resident from 6,000 to 12,000 ft., according to season); Cumming, t. c. p. 688 (Seistan: April); Ward, op. cit. xvii. p. 723 (breeds from 6,000 to 8,000 ft.).

First arrivals at Kohat noted in the last week of August. Many remain through the winter. Leaves about the same time as the preceding. Nests commonly along the Kurram River from Thall (2,550 ft.) upwards.

[831.] MOTACILLA MADERASPATENSIS. The Large Pied Wagtail.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: common, many stay to nest) Ward, op. cit. xvii. p. 723 (Kashmir).

A resident in Kohat, but scarce. A few pairs were noted along the Siau Nullah and the Kohat Toi.

[832.] MOTACILLA MELANOPE. The Grey Wagtail.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: rare); Marshall, op. cit. xiv. p. 605 (Quetta: a few seen at 7,000 ft. in May); Fulton, op. cit. xvi. p. 56 (Chitral: March); Cumming, t. c. p. 688 (Seistan: very common); Ward, op. cit. xvii. p. 723 (common, and breeds in Kashmir).

A familiar cold-weather visitor, arriving in the plains towards the end of August. Nests freely along the streams of the Safed Koh from 6,000 to 8,000 feet.

[833.] MOTACILLA BOREALIS. The Grey-headed Wagtail.

Marshall, J. B. N. H. S. xiv. p. 605 (Quetta: a few seen in April); Cumming, op. cit. xvi. p. 688 (common; Seistan): Ward, op. cit. xvii. p. 723 (Kashmir).

760. ♂ ad. Kohat, 1,760 ft., 29th March.
771. ♂. „ „ 31st March.
782. ♂ ad. Kohat, 1,760 ft.. 3rd April.

Occurs on passage from March till mid-May, but not so commonly as the next species.

[835.] MOTACILLA BEEMA. The Indian Blue-headed Wagtail.

Fulton, J. B. N. H. S. xvi. p. 56 (common in April); Ward, op. cit. xvii. p. 723 (breeds in Ladak).

770. ♂ ad. Kohat, 1,760 ft., 31st March.
783. ♂ ad. „ „ 3rd April.
68. ♂ ad. „ „ 17th April.

Passes through Kohat in fair numbers from the second week in March till nearly the end of May, being very common in April; the return passage lasts from August till well into October.

[836.] MOTACILLA FELDEGGI. The Black-headed Wagtail.

Marshall, J. B. N. H. S. xiv. p. 605 (Quetta: fairly common in April); Cumming, op. cit. xvi. p. 688 (common in Seistan in April); Ward, op. cit. xvii. p. 723 (migrates through Kashmir).

768. ♂ ad. Kohat, 1,760 ft., 31st March.
769. Juv. „ „ „

Small numbers appear towards the end of March and early in April, in company with the last species.

[837.] MOTACILLA CITREOLA. The Yellow-headed Wagtail.

Ward, J. B. N. H. S. xvii. p. 723 (common on migration: a few nest in Kashmir).

727. ♂ ad. Kohat, 1,760 ft., 23rd March.

Occurs fairly commonly from February till nearly the end of May. This species and the next are more usually to be found about marshes than the preceding, and commonly roost in reed-beds, when available. None were seen in autumn.

[838.] MOTACILLA CITREOLOIDES. Hodgson's Yellow-headed Wagtail.

Fulton, J. B. N. H. S. xvi. p. 56 (Chitral: saw a pair at 10,000 ft. in July); Ward, op. cit. xvii. p. 723 (breeds in Kashmir).

775. ♂. Kohat, 1,760 ft., 2nd April.

The same may be said of this species as of the last, but it is rather more common.

It may be of interest to add that this year (May and June 1909) I found this species nesting freely from 8,800 to 13,000 feet in the Kaghan Valley (Hazara, N. W. Frontier), north of our limits.

Oates says of *M. citreola*, "the young probably assume the *adult plumage at the first spring moult*"; and of the present species, "the young do not appear to differ *in any respect* from those of *M. citreola*." This, however, appears not to be the case for I came across a number of nests and only about

half of those breeding were in full plumage. The remainder were of two forms :—

(1) Grey above, with black feathers here and there; supercilium and under surface yellowish-white.

(2) Dark grey above with some black feathers; head and under surface deep yellow, sullied on the flanks and crown.

I have sent two examples, namely a nesting pair, the male of type (2) and the female of type (1), to the British Museum.

[840.] ANTHUS TRIVIALIS. The Tree-Pipit.

Marshall, J. B. N. H. S. xiv. p. 605 (common near Quetta in winter); Fulton, op. cit. xvi. p. 56 (a few resident between 5,000 and 10,000 feet); Betham, t. c. p. 832 (found two nests near Quetta in June).

712. ♀ ad. Kohat, 1,760 ft., 19th March.

Large numbers pass through Kohat and the Kurram Valley from mid-March till mid-May, returning in August, September, and October, but comparatively few halting.

[840A.] ANTHUS PRATENSIS. The Meadow-Pipit.

708. ♀ ad. Kohat, 1,760 ft., 19th March.

Major Magrath was the first to meet with this species in N. W. India, and in January and February 1908 secured four examples at Bannu. I only met with one at Kohat, but possibly it has been overlooked, owing to its resemblance to *A. trivialis*.

[844.] ANTHUS SIMILIS. The Brown Rock-Pipit.

Marshall, J. B. N. H. S. xiv. p. 605 (summer visitor); Ward, op. cit. xvii. p. 723 (occurs: Kashmir); Perreau, op. cit. xviii. p. 186 (specimen shot: Chitral).

566. ♂. Kohat, 1,760 ft., 6th February.
569. ♂. „ „ 8th February.
736. ♂ ad. „ „ 24th March.
743. ♂ ad. „ „ 27th March.

A common resident in the District, nesting on the Samana in summer, and occurring from August till April along the foot of the hills and on stony ground generally. From January till the end of March it is also found commonly about cultivated lands. It perches readily in trees. It varies a good deal in size and colour. In February 1908 there were flocks of peculiarly dusky individuals on the grass-farm. Nos. 566 and 569 are examples of this dark-coloured Pipit.

[845.] ANTHUS RICHARDI. Richard's Pipit.

61. ♀ ad. Kohat, 1,760 ft., 4th January.
582. ♂ ad. „ „ 14th February.

A rare winter visitor, these being the only examples met with. Both were procured on the grass-farm.

[847.] ANTHUS RUFULUS. The Indian Pipit.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: common in winter); Ward, op. cit. xvii. p. 723.

140. ♀ ad. Kohat, 1,760 ft., 11th March.
145. ♀ ad. „ „ 15th March.
151. ♂ ad. „ „ 17th March.

A summer visitor, arriving early in March and breeding in numbers on the grass-farm and other suitable places. Colonel Rattray must, I think, have mistaken *A. campestris* (which I have shot at Thall) for this species.

[848.] ANTHUS CAMPESTRIS. The Tawny Pipit.

Marshall, J. B. N. H. S. xiv. p. 605 (Quetta: winter visitor).

69. ♀ ad. Kohat, 1,760 ft., 7th January.
142. ♂ ad. „ „ 13th March.
485. ♀ ad. Thall, 2,500 ft., 14th April.
492. ♂ ad. „ „ 16th April.

Fairly numerous from the middle of September till the middle of April, chiefly frequenting dry open country, and not found much about cultivated ground. Not observed on the Samana or in the Kurram Valley.

[850.] ANTHUS ROSACEUS. Hodgson's Pipit.

Ward, J. B. N. H. S. xvii. p. 723 (breeds freely in Kashmir).

298. ♂. Safed Koh, 12,000 ft., 2nd July.
486. ♂ ad. Thall, 2,550 ft., 14th April.
586. Juv. Kohat, 1,850 ft., 15th February.

Flocks composed chiefly of immature birds visit the District from January till mid-April, frequenting, for the most part, marshes and irrigated land. This species nests freely on the Safed Koh, from 11,000 to 13,000 feet. I found two nests in June, both under stones, perfectly concealed, and well and solidly constructed of roots and grass. In one case I surprised the bird excavating the hollow under a stone for the nest. Not noted in autumn.

ANTHUS SPIPOLETTA CLAKISTONI (Hartert Vog. Pal. Fauna I. p. 228.) The Central Asian Water-Pipit.

387. ♀. Samana, 28th October 1906.
568. ♂ juv. Kohat, 1,760 ft., 7th February.
622. ♂ ad. „ „ 29th February.
632. ♂ ad. „ „ 1st March.
636. ♂ ad. „ „ 2nd March.
646, 647. ♂ ♀ ad. Samana, 6,500 ft., 5th March.

A winter visitor, and by far our commonest Pipit from early in October till about the 18th of March. It moults into the beautiful summer plumage before leaving. A few individuals are to be found on the dry rocky summit of the Samana all the winter. No. 568 is a dusky specimen.

[852.] ANTHUS JAPONICUS. The Eastern Water-Pipit.

84. ♂. Kohat, 1,760 ft., 14th January.
155. ♂. „ „ 22nd March.
184. ♂. „ „ 4th April.
581. ? sex. „ „ 14th February.

A somewhat scarce winter visitor, occurring singly, with the flocks of *A. spipoletta blakistoni*, or in small parties by itself.

[853.] OREOCORYS SYLVANUS. The Upland Pipit.

Rattray, J. B. N. H. S. xvi. p. 654 (common in the Murree Hills); Ward, op. cit. xvii. p. 723.

398. ♂ ad. Samana, 4500 ft., 14th November.

A resident on the Samana from 4,000 feet upwards, but not common.

[859.] MELANOCORYPHA BIMACULATA. The Eastern Calandra Lark.

Fulton, J. B. N. H. S. xvi. p. 56 (plentiful in Chitral at the end of February and beginning of March); Ward, op. cit. xvii. p. 724 (one shot in December).

Large flocks visit Kohat in February and early in March.

[860.] ALAUDA ARVENSIS. The Sky-Lark.

Marshall, J. B. N. H. S. xiv. p. 605 (common round Quetta in winter, a few stay for the summer); Fulton, op. cit. xvi. p. 56 (a resident between 5,000 and 11,000 feet); Ward, op. cit. xvii. p. 724 (a resident).

577. ♂ ad. Jamrud, 2,000 ft., 11th February.
615. ♀ ad. Lachi, 1,540 ft., 26th February.
704. ♀ ad. Kohat, 1,760 ft., 18th March.
737. ♀ ad. „ „ 25th March.

A winter visitor, abundant from November till March. By the end of the latter month it is entirely replaced by the next species, which arrives in the second week in March.

[861.] ALAUDA GULGULA. The Indian Sky-Lark.

Ward, J. B. N. H. S. xvii. p. 724 (reported from the Jammu plains).

695. ♂. Lachi, 1,540 ft., 17th March.
728. ♂. Kohat, 1,760 ft., 23rd March.
752. ♂. „ „ 27th March.

A summer visitor, nesting freely on the grass-farm. It can be distinguished from *A. arvensis* by the harsh note uttered on rising and by the song which is not so rich as that of the latter.

862. CALANDRELLA BRACHYDACTYLA. The Short-toed Lark.

Marshall, J. B. N. H. S. xiv. p. 605 (abundant from winter till May 1st); Fulton, op. cit. xvi. p. 56 (Chitral: many pass through in October).

Occurs commonly in Kohat and the Kurram Valley from the last week in February till the middle of April (last seen on the 19th), and returns in small numbers in September.

[864.] CALANADRELLA TIBETANA.—

613. ♀. Lachi, 1,540 ft., 26th February.

621. ♂. Kohat, 1,760 ft., 29th February.

730, 731. ♀ ♂. Kohat, 1,760 ft., 23rd March.

Major Magrath shot an example of this species at Bannu in December 1907. It has now been found to occur in Kohat and is fairly common in spring.

[869.] MIRAFRA CANTILLANS. The Singing Bush-Lark.

266. ♂ ad. Kohat, 1,760 ft., 19th May.

Fairly numerous from the middle of May till September about grassy and bushy places. Not observed in the Kurram Valley, though fairly common at Thall at the entrance. A most energetic songster; many of its notes seem to be borrowed from *Argya caudata*.

[874.] GALERITA CRISTATA. The Crested Lark.

Rattray, J. B. N. H. S. xii. p. 341 (very common at Thall); Marshall, op. cit. xiv. p. 605 (Quetta: a very common resident); Cumming, op. cit. xvi. p. 689 (Seistan: abundant); Perreau, op. cit. xviii. p. 186 (Chitral).

610. ♀. Lachi, 1,540 ft., 26th February.

687. ♀. Kohat, 1,760 ft., 16th March.

723. ♀. „ „ 21st March.

754. ♂. „ „ 27th March.

This species is abundant everywhere and resident up to 3,000 feet. In the Kurram Valley it occurs up to 7,000 feet in summer. It is a great mimic, as Major Magrath has noted, its rendering of the notes of *Sarcogrammus indicus* and *Totanus calidris* being particularly good.

[878.] AMMOMANES PHŒNICUROIDES. The Desert Finch-Lark.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: rather rare); Marshall, op. cit. xiv. p. 605 (Quetta: common in the low hills); Cumming, op. cit. xvi. p. 689 (fairly common in Seistan); Ward, op. cit. xvii. p. 724 (Kashmir).

609. ♂. Lachi, 1,540 ft., 25th February.

761. ♀. Kohat, 1,850 ft., 30th March.

Resident and abundant on stony waste sand hill-sides up to 3000 feet.

The song reminds one somewhat of that of *Anthus similis*, being often uttered on the wing.

[879.] PYRRHULAUDA GRISEA. The Ashy-crowned Finch-Lark.

196. ♀ ad. Kohat, 1,760 ft., 8th April.

The above example was one of the only pair met with. The male, a fine black-breasted bird, I failed to secure.

[895.] ARACHNECHTHRA ASIATICA. The purple Sun-bird.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: common in summer).

A common summer visitor, arriving in the middle of March, the males about a week ahead of females and disappearing towards the middle of September. It occurs up to 5,000 feet on the Samana.

(*To be continued.*)

PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

BY

Lieut.-Colonel C. J. BAMBER, F.L.S.,

Indian Medical Service.

PART VI.

(Continued from page 502 of Volume XX.)

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Antirrhinum Orontium, Corn Snap Dragon.
SCROPHULARIACEÆ.
F. B. I. iv. 253.
The Plains to 6,000 ft.
Simla in fields (Collett).
Dharmpur (Bomford).
Kahuta (Douie).

small, annual or biennial, slender smooth below, glandular above, branched from below; leaves opposite below, alternate above, ½ in., linear, rarely oblong lanceolate; flowers pale pink, with purple streaks, ½ in. long, solitary and sessile in the axils of the upper leaves, calyx lobes 5, linear, overtopping the corolla, corolla ½ in. long, flattened, bulged at the base, 2-lipped, upper erect, 2-lobed, lower lip horizontal, 3-lobed, base broad, bearded, closing the throat, which is forced open by bees, stamens 4 in unequal pairs, within the corolla, style threadlike, stigma 2-lobed; capsule ½ in. long, ovoid, velvety, 2-celled, many seeded, anterior cell opening by one pore, posterior by two toothed pores, or both cells by one pore, seeds minute, oblong, abruptly ended, wrinkled or pitted.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Mimulus gracilis, Monkey Flower,
SCROPHULARIACEÆ.
F. B. I. iv. 259.
The Plains to 3,000 ft.
Kashmir.
Hazara.
Rawalpindi (Douie).

small, annual, stem stout, 4-angled, branching from the base; leaves 1½-2½ in. linear oblong, sessile, half stem-clasping, rather fleshy, blunt, sometimes slightly toothed; flowers ½ in. long, white or pale blue, spotted with yellow, solitary on axillary stalks, longer than the leaves, calyx ¼ in. long, tubular, 5 short lobes, 5-keeled, corolla ½ in. long, tube cylindric, 2-lipped, upper lip erect, 2-lobed, lower lip horizontal, 3-lobed, throat with two ridges, stamens 4, in unequal pairs within the corolla, style slender, stigma 2-lobed, flat; capsule less than ¼ in. ovoid with one end broader, flattened, opening by valves, enclosed in the calyx, seeds many, minute, oblong.

Herpestis, Hamiltoniana,
SCROPHULARIACEÆ.
F. B. I. iv. 272.
The Plains to 3,000 ft.

small, annual, smooth, stem very stout, much branched; leaves ½-1 in., linear-lanceolate, sometimes slightly toothed, often minutely dotted; nerves barely visible, short-pointed; flowers blue, minute, sessile in the axils of the leaves, calyx ⅛ in., lobes 5, unequal, upper ovate heart-shaped, corolla tube ⅛ in., cylindric, lips 2 spreading, upper notched or 2-lobed, lower 3-lobed, stamens 4, in unequal pairs within the corolla, anthers close together, style linear dilated at the top, stigma 2-lobed; capsule round, 2-grooved, opening by 2 or 4 valves, seeds many, very minute.

Vandellia crustacea,
SCROPHULACEÆ.
F. B. I. iv. 279.
The Plains to 3,000 ft.
Sutlej Valley (Collett).

small, annual, found in marshes, much and widely branched from the root in threes, smooth or slightly hairy; leaves ½-1 in., sometimes toothed, ovate or lanceolate, shortly stalked; flowers ⅛ in. long, pale purple, solitary on axillary straight slender stalks, ½-1½ in. long or crowded towards the ends of

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

branches, calyx $\frac{1}{10}$ in. and in fruit $\frac{1}{8}$ in., shortly 5-lobed, longer than the capsule, nearly bell-shaped, not angled, corolla 2-lipped, upper lip erect notched, lower broader, horizontal, 3-lobed, stamens 4, in unequal pairs, 2 anterior longer with curved filaments spurred near the base, 2 posterior, usually included, anthers touching or joining in pairs under the upper lip, style curved, stigma flat 2-lobed; capsule shorter than the calyx, oblong-ovate, blunt, opening through the lines of junction, seeds wrinkled.

Vandellia erecta, SCROPHULARIACEÆ. F. B. I. iv. 281. The Plains.

very like the last species, but smaller, and more erect, quite smooth, leaves sessile oblong with rounded ends, flower stalks twice as long as the leaves, calyx lobes shorter than the rounded ovoid capsule.

Ilysanthes parviflora, SCROPHULARIACEÆ. F. B. I. iv. 283. The Plains.

small, annual, usually much branched, found in marshes; leaves $\frac{1}{4}$-1 in., ovate with ends rounded or linear oblong, sessile, usually untoothed; flowers $\frac{1}{6}$-$\frac{1}{4}$ in. long, white or blue, on threadlike stalks $\frac{1}{4}$-$\frac{1}{2}$ in. long in the axils of leaves or at the end of branches in racemes, calyx half the length of the corolla, lobes narrowly lanceolate, corolla 2-lipped, $\frac{1}{8}$-$\frac{1}{4}$ in. tube cylindric, upper lip erect, concave, notched, lower larger, spreading, 3 lobed, stamens 4, two upper perfect, enclosed in the corolla, filaments threadlike, anthers meeting, two lower, two lobed, one lobe glandular, the other smooth, style single, stigma round consisting of two plates; capsule ovate, oblong, short-pointed, longer than the calyx.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Striga lutea,
SCROPHULARIACEÆ.
F. B. I. iv. 298.
The Plains to 6,000 ft.
Valleys below Simla (Collett).
Dharmpur (Bomford).

small, annual, rough or hairy, slender, branched or not, leaves $\frac{1}{2}$-$1\frac{1}{2}$ in. long, linear, sessile, upper alternate sometimes reduced to floral bracts; flowers yellow, sometimes white, scarlet or purple, $\frac{1}{2}$ in. long, sessile, solitary, axillary forming terminal spikes, calyx tubular, ten, rarely fifteen ribbed, 5-toothed, corolla variable in size, tube slender, twice as long as the calyx, bent in at the top, two lipped, upper lip usually short notched or deeply cut, lower divided into three, stamens 4 in unequal pairs, within the corolla, anthers one-celled, vertical, fixed at the back portion of the stamen behind the anther, sometimes pointed, style thickened above, stigma undivided; capsule nearly round, splitting through the cells, seeds very many, netted.

Striga euphrasioides,
SCROPHULARIACEÆ.
F. B. I. iv. 299.
The Plains to 4,000 ft.
Chakwal (Douie).

small, slender to stout, branched, rough or covered with stiff hairs; leaves $\frac{1}{4}$-2 in., often 1 to 2-toothed, linear; flowers $\frac{1}{2}$-$\frac{3}{4}$ in. long, white at distant intervals in a terminal spike, calyx $\frac{1}{4}$ in., 15-ribbed, lobes as long as the tube, bell or funnel-shaped in fruit, corolla $\frac{1}{2}$-$\frac{3}{4}$ in., tube velvety at the bend; otherwise like the last species.

Sesamum indicum,

see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed, Corolla Two-lipped, Stamens Four.

Hygrophila salicifolia,
ACANTHACEÆ.
F. B. I. iv. 407.
The Plains.

small to medium size, found in wet places, nearly smooth; leaves $2\frac{1}{2}$ by $\frac{1}{2}$-$\frac{3}{4}$ in., lanceolate, smooth, nearly sessile, narrowed at both ends, marked in lines by raphides; flowers $\frac{1}{2}$-$\frac{3}{4}$ in., pale purple, sessile in bractate and bracteolate axillary circles, bracts $\frac{1}{4}$-$\frac{1}{3}$, ovate or oblong, round at the end, bracteoles $\frac{1}{4}$-$\frac{1}{3}$ in., lanceolate, short pointed, half as long

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

as the calyx, calyx ½-½ in., divided half way down in flower, all the way down in fruit, lobes 5, linear, covered with bristly hairs, corolla tube dilated near the mouth, 2-lipped, upper lip erect, concave, notched or 2-lobed, lower broad, 3 lobed, stamens 4, in equal or unequal pairs, style long, hairy, stigma linear, undivided ; capsule ½-⅔ in., narrowly oblong, 20-28 seeded, seeds ovoid, flattened, white-hairs spring up when wetted.

Hygrophila spinosa,
Talmakhana gokula kanta, gokshura.
ACANTHACEÆ.
F. B. I. iv. 408.
The Plains to 3,000 ft.

medium size to large, found in wet places, stout, hairy, stems in clusters ; leaves 3-7 in. long, lanceolate or oblong-lanceolate, pointed at both ends, nearly sessile, covered with scattered white hairs ; flowers 1 in. long, pale blue or purple to white in large dense hairy axillary clustered circles with 6 straight stout spines ½-1½ in., bracts ½-1 in., lanceolate, bracteoles ¼-⅓ in., narrow, calyx 4-lobed, lobes ⅓-½ in. lanceolate, upper one largest, lower blunt, toothed or divided into two, corolla 1 in. long, upper lip 2 lobed, stamens as in the last species ; capsule ½ in., shorter than the calyx, 4-8 seeded.

Lepidagathis purpuricaulis,
ACANTHACEÆ.
F. B. I. iv. 519.
The Plains.
Hoshiarpur (Aitchison).

small to medium size, leafy, branches many, smooth or hairy, often purple ; leaves 1-5 in., lanceolate or ovate-lanceolate, sometimes in unequal pairs, larger narrowed at both ends, smooth, smaller, nearly ovate, somewhat velvety ; flowers ¼ in., white with brown spots at the base of the lower lip, sessile, in axillary sessile solitary or clustered oblong hairy spikes, ½-1½ in. long, bracts ⅛ by ⅛ in., marked with longitudinal lines, lanceolate or ovate lanceolate with a bristle point, bracteoles ¼ in., linear curved, calyx nearly divided to the

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

base into 5 segments, one segment large, ½-⅔ by ⅓ in. broad, the others ⅛ in. linear, corolla ¼ in., tubular, suddenly dilated in the middle, 2-lipped, upper lip erect, notched, lower 3-lobed, longer, stamens 4, in unequal pairs, anthers 2-celled, cells oblong blunt, stigma round; capsule ⅓ in., 4-seeded, oblong, seeds flattened, hairs rise upon being wetted.

Lepidagathis hyalina,
ACANTHACEÆ.
F. B. I. iv. 521.
The Plains to 4,000 ft.

medium size, perennial; leaves 3 by 1½ in., ovate or oblong, stalked, upper narrow, hanging down, stalk ½ in.; flowers white with brown spots at the base of the lower lip, crowded in oblong or ovoid, one-sided, terminal or axillary spikes ½-1½ in. long, bracts nearly ½ in., lanceolate long-pointed with an abrupt point, bracteoles ½ in., linear-lanceolate with an abrupt point, calyx nearly divided to the base in 5 segments, segments linear lanceolate, ½ in. with scattered hairs, outer segment larger, corolla, stamens, style capsule and seeds as in last species.

Ocimum basilicum,
Sweet basil,
Furunj, mushk, tulsi, baburi, niyazbo, pasur.
LABIATÆ.
F. B. I. iv. 608.
The Plains to 2,000 ft.
Cultivated, but indigenous in the low hills (Aitchison).
Baluchistan (Hughes-Buller).

medium size, strongly scented, many oil glands, smooth or velvety; leaves 1½-2 in., ovate, sometimes toothed, stalk very slender, usually slightly hairy; flowers ⅛-½ in. long, in clustered circles, 6-10 flowered, in bracteate spikes and racemes, bracts stalked, ovate, minute, soon falling off, calyx 5-toothed, upper tooth rounded, shorter than the others, two lower teeth ovate-lanceolate with a bristle point, two lateral shorter than the lower; corolla ⅛-⅓ in. long, white, pink or purplish, 2-lipped, tube short, upper lip nearly equally 4-lobed, lower lip curved down, not lobed, stamens 4, protruding, twice as long as the corolla, bent, hairy at the bend, stigma bifid; nutlets 4, $\frac{1}{16}$ in. each, very black,

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

oblong with rounded ends, minutely dotted, convex on one side and flattened on the other, when wetted become coated with mucilage. These seeds form one of the ingredients of Char tukm, a preparation well-known to native druggists. They are used as a demulcent in genito-urinary diseases. The dried leaves are used as a substitute for cloves, and as a seasoning for culinary purposes.

Ocimum sanctum, Sacred basil.
Kala tulsi, ban tulsi.
LABIATÆ.
F. B. I. iv. 609.
The Plains to 6,000 ft.
Baluchistan (Boissier).

medium size, perennial, cultivated, doubtfully indigenous, often woody below, much branched, bushy, often with a purplish tinge; leaves 1-2½ in., oblong, blunt or sharp pointed, sometimes almost toothed, base narrowed, floral leaves sessile, ovate lanceolate or heart-shaped; flowers very small, white, pink or purplish on small stalks in very slender bracteate racemes, bracts as in the last species, calyx short, two lower teeth with very long bristle points, longer than the upper which is broadly oblong, lateral broadly ovate, shorter than the lower, corolla scarcely extending beyond the calyx, calyx in fruit ⅛ in. long, on a slender stalk, widely bell-shaped, thin, nutlets nearly round, nearly smooth, pale reddish brown; other characters are like the last species. The leaves and seeds are used for the same purposes as the last species. It is worshipped by the Hindus and a plant is to be found in every Hindu's garden.

INNER PAIR OF STAMENS LONGEST.

Nepeta linearis,

see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Nepeta connata,

see Herbs, Prostrate, Opposite, Exstipulate, Simple.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR LONGEST.

Origanum vulgare, Wild marjoram.
Mirzanjosh, sathra.
LABIATÆ.
F. B. I. iv. 648.
Himalaya, 7-12,000 ft.
Simla (Collett).

medium size, scented, covered with hairs to some extent; leaves ½-1 in., broadly ovate, stalked, sometimes toothed; flowers very small, pink, crowded in many 4-sided spikes ½-1 in. long, in clusters or heads at the end of branches or forming terminal branching racemes, floral leaves like bracts lanceolate, longer than the calyx, overlapping often tinged with purple; calyx bell-shaped, 5-toothed, 10-13 nerved, throat hairy, corolla barely 2-lipped, upper lip erect, nearly flat, notch lower spreading, 3-lobed, stamens 4, in unequal pairs, just protruding, style divided; nutlets 4, smooth. This plant is used as a pot herb, it yields a volatile oil which is aromatic and stimulant.

Thymus serpyllum,

see Shrubs, Opposite, Exstipulate, Simple Corolla Two-lipped.

Hyssopus officinalis,

see Shrubs, Opposite, Exstipulate, Simple, Corolla Two-lipped.

Micromeria biflora and hydaspidis,

see Shrubs, Opposite, Exstipulate, Simple Corolla Two-lipped.

Calamintha clinopodium, Wild basil.
LABIATÆ.
F. B. I. iv. 650.
Himalaya, 4-12,000 ft.
Simla, Mashobra (Collett).
Changlagaili (Douie).

medium size, rootstock woody, stems slender, nearly unbranched, hairy; leaves 1-2 in., ovate, just pointed, hardly toothed; flowers ⅜-1 in., purple or pink in large crowded compact circular clusters each surrounded by many long, linear, hairy bracts, equal in length to the calyx, calyx ¼ in., 2 lipped, curved, hairy, 13-nerved, upper lip 3-toothed, lower bifid, teeth nearly equal, very slender,

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR LONGEST.

corolla hairy, tube straight, 2-lipped, upper lip erect, flattish, lower spreading, 3-lobed, stamens 4, in unequal pairs under the upper lip, style lobes equal; nutlets 4, minute, nearly round, smooth.

Brunella vulgaris, Self-heal,
Aústakhadús.
LABIATÆ.
F. B. I. iv. 670.
Himalaya, 4-11,000 ft.
Simla, common on road sides (Collett).
Kashmir.
Murree (Douie).

small, perennial, rootstock creeping, stem erect or partially so, thinly hairy; leaves 1-2 in., stalked, ovate or oblong, sometimes toothed, pointed or blunt, upper leaves sessile; flowers ½-¾ in. long, violet purple, rarely white, in clustered circles of 6 crowded in erect, terminal spikes 1-2 in. long, with a pair of sessile leaves at the base; floral leaves bract-like hairy, purple-edged, broadly ovate, short pointed; calyx tinged with purple, bell-shaped, 2-lipped, upper lip broad, 3-toothed, lower lip deeply bifid, mouth closed after flowering, corolla tube longer than the calyx, 2-lipped, upper lip erect; hoodlike, notched, lower spreading, 3-lobed, midlobe largest, minutely toothed, stamens 4 in unequal pairs under the upper lip, with a small projection below the anthers, style lobes awl-shaped; nutlets 4, oblong, smooth. The plant is used in Native medicine as an expectorant and antispasmodic.

Stachys parviflora,

see Herbs, Opposite, Exstipulate, Simple, Toothed.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED

STAMENS FOUR.

OUTER PAIR LONGEST.

Leucas hyssopifolia,
LABIATÆ.
F. B. I. iv. 690.
The Plains at the foot of the Himalaya, to 3,000 ft.
Valleys below Simla (Collett).

small, perennial, hairy, rootstock stout, woody branches many; leaves 1-2½ by ¼ in., linear, blunt, often stiff, margins turned in; flowers ⅜ in. long, white in small axillary and terminal circular clusters, ½-¾ in. diam., bracts few, slender, awl-shaped, calyx ⅛ in., an inverted cone, smooth, mouth wide, abruptly cut off, smooth, teeth 10, very minute, erect, corolla tube cylindric, within the calyx, 2-lipped, upper lip erect, hood-like, very hairy, lower much longer, 3-lobed, mid lobe the largest not toothed, stamens 4, in unequal pairs, under the upper lip, outer or anterior pair longer, style awl shaped, undivided; nutlets 4, ovoid, blunt, three cornered.

Leucas aspera,
Chota-kal-kúsa.
LABIATÆ.
F. B. I. iv. 690.
The Plains.

small, annual, stem stout hairy or bristly, much branched; leaves 1-3 in. linear or oblong, sometimes larger and ⅔ in. broad, also minutely toothed; flowers ½-1 in. white in terminal and axillary clustered circles, often 1 in. diam., hairy, bracts long linear and thread like, calyx ⅛-⅜ in., tubular, curved, smooth below, green, rough, ribbed above, teeth 10, short, triangular, upper lip produced; corolla, stamens, style and nutlets as in the last species. The plant is fragrant and used as a pot herb, and in chronic skin diseases and painful swellings the juice is useful.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Silene apetala,
CARYOPHYLLACEÆ.
F. B. I. i. 218.
The Plains.
Peshawar (Vicary, Stewart).

medium size, stem branched or not, annual, grey velvety; leaves 1-1½ in., linear oblong, long-pointed; flowers ¼-⅓ in., long, green (as the petals, if present, are enclosed within the green calyx), in irregular clusters in one-sided racemes, bracts sharp pointed, calyx ¼-⅓ in., bell-shaped base, a reversed cone with 5 short teeth, and 10 green hairy ridges, petals none or if any, minute, red, stamens 10, styles 3 (rarely 5); capsule round, shortly stalked, 3-6 valved, seeds flat grooved with a double corrugated margin.

Ammania pentandra,
LYTHRACEÆ.
F. B. I. ii. 568.
The Plains, in moist places.

small, annual, smooth, much branched with many flowers; leaves 1 in. long, oblong with rounded ends, sessile, floral leaves bract like, oblong, broad based; flowers small, solitary, sessile in the axils of leaves, bracteoles awl-shaped as long as the calyx, calyx teeth 10, 5 of which are accessory, lanceolate long pointed, petals, if any, pink, 5, stamens 8, inserted about the middle of the calyx tube, style thread like or short; capsule round, depressed, 3-celled, seeds many black, half round, hollowed on the flat side.

Ammania baccifera,
Dadmari, pampa.
LYTHRACEÆ.
F. B. I. ii. 569.
The Plains, in moist places.

small, annual, rarely large, smooth; leaves 2-5 in. long, narrow, but blunt pointed, narrow at the base; flowers small in dense clusters forming knots on the stem, bracts thread like, shorter than the flower stalks, calyx widely bell-shaped, teeth 4, broadly triangular, accessory folds or teeth very small, petals none, or very minute, stamens and style as in the last species, capsule like the last, but opening all round, about the middle, seeds like the last. The leaves are used for blistering.

Ammania salicifolia,
LYTHRACEÆ.
F. B. I. ii. 569.
The Plains.

medium size, annual, smooth, branched; leaves 2 by ½ in., lanceolate, rounded at the base, sessile; other characters like the last species.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Ammania senegalensis,
LYTHRACEÆ.
F. B. I. ii. 570.
The Plains to 5,000 ft.
Common in rice fields.

medium size, annual, smooth branches 4-angled ; leaves 1-2 in. long, lanceolate, sessile, nearly ear-lobed at the base ; flowers minute in small shortly stalked clusters, calyx bell-shaped, 4 short teeth, petals, if any, 4, pink, stamens 6 or 8, capsule—$\frac{1}{12}$ in. diam., round, larger than the calyx tube, red when ripe, seeds as in the last species.

Ammania multiflora,
LYTHRACEÆ.
F. B. I. ii. 570.
The Plains.

very like the last species, but the flowers and capsule are smaller.

Oxybaphus himalaicus,
Punac, bhans.
NYCTAGINACEÆ.
F. B. I. iv. 708.
Himalaya, 6-9,000 ft.
Kulu (Edgeworth).

large, glandular hairy, sticky, branched ; leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in. ovate, short pointed leaf, stalk $\frac{1}{2}$-1 in. long; flowers pink, small, solitary on long slender axillary stalks forming a loose cluster, one bract forming a 5-toothed cup, $\frac{1}{4}$ in. long, surrounding the calyx, calyx pink, tube short lobed, lobes soon falling off, stamens 4, united below, enclosed within the calyx tube; fruit $\frac{1}{8}$ in. long, ovoid, rough black. This plant is used for fodder.

Bœrhaavia elegans,
Sant.
NYCTAGINACEÆ.
F. B. I. iv. 709.
The Plains.
Kahuta (Douie).
Baluchistan.

large, shrubby, much branched, leaves 1-$1\frac{1}{2}$ in. long, few, linear oblong or oblong lanceolate, blunt, fleshy with a hoar frostlike bloom ; flowers minute, in very large two or three times divided clusters on very long slender main and minor stalks, calyx funnel-shaped, 5-lobed, petals none, stamens 1-5, projecting; fruit $\frac{1}{10}$ in. long, narrowly oblong with rounded ends, strongly ribbed, quite smooth. The seeds are eaten. The leaves are used as a diuretic.

Cyathula tomentosa,
AMARANTACEÆ.
F. B. I. iv. 722.
Himalaya, 2-6,500 ft.
Simla (Collett).

large, felted or woolly, branches nearly 4-angled; leaves 2-10 in. long, oblong, pointed at both ends rarely round, shortly stalked, $\frac{1}{4}$-$\frac{1}{2}$ in. ; flowers white shining in small clusters crowded in round heads forming terminal spikes, each cluster

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

containing one or two perfect flowers and many imperfect ones consisting of hooked sepals, spikes 2-6 in. long, stalked, calyx 5-fid, segments narrowly lanceolate, 2 or all ending in hooked extremities, lengthening with age, stamens 5, alternate with 5 fringed staminodes united below, style slender, stigma rounded; fruit dry, bladder shaped, 2-nerved, seed one, ovate shining.

Cyathula capitata,
AMARANTACEÆ.
F. B. I. iv. 722.
Himalaya, 6-9,000 ft.
Simla (Collett.)

very like the last, only more slender and flowers collected in heads about one inch in diam.

Pupalia lappacea,
AMARANTACEÆ.
F. B. I. iv. 724.
The Plains to 3,000 ft.
Baluchistan.

large, straggling, felted, branches rounded; leaves 2-4 in., broadly ovate to lanceolate and short pointed, base sharp pointed, leaf stalk $\frac{1}{4}$-$\frac{1}{2}$ in.; flowers in small distant or adjacent clusters $\frac{1}{4}$ in. diam., calyx of 5 sepals, green, 3-nerved, densely woolly, reduced in imperfect flowers to a process, bearing stellately spreading hooked bristles, petals none, stamens 5, nearly free below, staminodes none, style slender, stigma roundish, fruit ovoid, flattened, seed one.

Kothosæua brachiata
AMARANTACEÆ.
F. B. I. iv. 726.
The Plains.

medium size, annual, branched from the base, branches slightly velvety, spreading; leaves 1-2 in. ovate, blunt or short pointed, thin, green, stalk 0-$\frac{1}{4}$ in.; flowers very minute, woolly, in axillary solitary or clustered little spikes, $\frac{1}{4}$-$\frac{1}{2}$ in. long, white, calyx of 3-5 thin, colourless sepals $\frac{1}{20}$ in. long, silky, one nerved, petals none, stamens 1-2, ununited, staminodes none, stigma nearly sessile; fruit minute, oblong, flattened, seed one.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Achyranthes aspera, The Prickly Chaff Flower. *Latjira, chichra, kutri.* AMARANTACEÆ. F. B. I. iv. 730. The Plains to 7,000 ft. Simla (Collett). Rawalpindi. Baluchistan (Boissier). large, straggling, branched or not, branches long and rambling; leaves 3-5 by 2-3 in., ovate or round, thick, leathery, velvety or felted, shortly stalked; flowers shining, dull green or purplish, soon bending down, crowded in long rigid terminal unbranched spikes, 6-18 in. long, bracts and bracteoles somewhat spiny, calyx $\frac{1}{6}$-$\frac{1}{4}$ in. long, 5-fid, segments stiff, lanceolate, short pointed, longer than the bracteoles, petals none, stamens 5, alternating and united below with 5 fringed staminodes, style long, stigma rounded; fruit oblong enclosed in the calyx, seed one oblong. This plant is used as a diuretic, the ash contains much potash.

Achyranthes bidentata, AMARANTACEÆ. F. B. I. iv. 730. Himalaya, 4-6,000 ft. Simla (Collett). very much like the last species, but much larger, leaves long pointed with a slender tip, bracteoles usually reduced to a spine, and staminodes toothed, not fringed.

Atriplex hortensis, Atriplex crassifolia, see Herbs, Alternate, Exstipulate, Simple.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Dianthus cachimiricus, CARYOPHYLLACEÆ. F. B. I. i. 214. Kashmir. small, perennial, stem jointed, much branched from the base, slender, smooth; leaves 1-1$\frac{1}{2}$ in., very narrow, grooved, midrib stout, margin slightly toothed, thickened; flowers terminal, solitary, bracts 4, lanceolate with long slender or leafy points, calyx 5-toothed, 1 in. long, teeth ovate-lanceolate, long-pointed, margins thin, petals 5, long-stalked, smooth, blade $\frac{1}{2}$-$\frac{2}{3}$ by 1 in., margin toothed, stamens 10 and ovary one-celled, all on a long stalk, styles 2; capsule opening by 4 teeth.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Dianthus Jacquemontii, CARYOPHYLLACEÆ. F. B. I. i. 214. Kashmir.

small, stems many, slender from a woody stock; leaves 1-1½ in., narrow, leathery, flat above, short pointed, radical slightly toothed, stem leaves hardly toothed, with thickened margins; flowers usually solitary, bracts 4, very broad, suddenly contracted into a thickened and blunt point, calyx ¾-1 in., teeth long with sharp stiff points, petals 5, long stalked, blade broad, rather deeply toothed; otherwise like the last species.

Dianthus angulatus, CARYOPHYLLACEÆ. F. B. I. i. 215. Himalaya, 7-13,000 ft.

small, stems many, stiff, much branched, from a stout woody stock; leaves radical, 3-6 in., stem leaves ½-1½ in., linear, short-pointed; flowers pink, solitary, terminal, bracts 4-6, pointed, calyx ½-⅝ in., tubular, long and sharp pointed, petals 5, long-stalked, blade fringed; otherwise like the last species.

Silene inflata, Bladder campion. CARYOPHYLLACEÆ. F. B. I. i. 218. Himalaya, 5-11,000 ft. Simla, Mashobra Narkanda (Collett).

large, greenish blue, jointed, smooth or velvety, perennial; leaves 1-2 in. long, ovate or oblong, stem leaves sessile, margins minutely toothed, short pointed; flowers ½-¾ in. diam., white in drooping many-flowered clusters, bracts thin, dry, calyx ¾ in. long, ovoid, puffed out, base indented, 5-toothed, 10-or 20-veined, teeth broadly triangular, petals 5, stalked, blade deeply 2-lobed with pouch-like enlargement, stamens 10, styles 3; capsule round, opening above by 6 teeth, seeds many, concave in front, convex on the base, with lines of excrescences.

Silene Falconeriana, CARYOPHYLLACEÆ. F. B. I. i. 220. Himalaya, 3-9,000 ft. Simla on grassy slopes (Collett).

large, perennial; stems several from the woody stock, branched, velvety and sticky below; leaves 1½-2½ in., linear lanceolate, narrow, velvety or smooth, minutely toothed; flowers white in loose opposite axillary clusters, flower stalks slender, bracts minute, calyx ½ in. tubular, narrow, teeth short, blunt, petals 5, very narrow stalked, blade blunt without scales, stamens 10, styles 3; capsule ovoid, seeds minute, many, sides flat or convex, back grooved.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Epilobium angustifolium see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

Epilobium latifolium, see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

Epilobium hirsutum,
ONAGRACEÆ.
F. B. I. ii. 583.
The Plains to 7,000 ft.
Kotgarh, Sutlej and Giri Valleys in wet places (Collett).
Shahpur Dist. (Douie).

large, robust, covered with soft white hairs; leaves 1-3 by ¼-½ in., lanceolate stem-clasping, teeth small, sharp; flowers ½ in. long, pink-purple, axillary, forming long or short terminal leafy racemes, calyx tube on the ovary, linear 4-angled, teeth 4, short pointed, falling off after flowering, petals 4, erect or spreading, notched, stamens 8, ⅜ in. long, alternate ones shorter, stigmas 4, distinct, spreading; capsule 2-3½ in., hairy, 4-celled, valves 4 splitting and curving down from the seed-bearing column, seeds very many, small, crowned by a tuft of long silky hairs.

Epilobium parviflorum,
ONAGRACEÆ.
F. B. I. ii. 584.
Himalaya, 5-7,000 ft.
Simla, Sutlej Valley (Collett).

very like the last species, but the stigmas do not curve down and the leaves are not stem-clasping.

Epilobium roseum, var. cylindricum, and Dalhousianum,
ONAGRACEÆ.
F. B. I. ii. 584.
Himalaya, 6-10,000 ft.
Simla (Collett).

large, stem round, hairs sometimes in lines, the bases of the leaves sometimes passing down the stem in lines, leaves stalked, linear-lanceolate, capsules long stalked, seeds ovoid with the top broad, flowers ¼ in., stigmas combined; in other respects like the previous species.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Circæa lutetiana, Enchanters, Nightshade,
ONAGRACEÆ.
F. B. I. ii. 589.
Himalaya, 7-10,000 ft.
Mashobra in woods (Collett).

medium size, perennial, velvety; leaves 2 by 1-1¼ in., ovate lanceolate not transparent. long stalked, narrow to the base, short pointed, widely toothed; flowers ⅛ in. diam., white or pinkish in terminal and lateral racemes, calyx ovoid, 2-lobed, hardly produced above the ovary, lobes reflexed, falling off after flowering, bracts none, petals 2, notched, stamens 2, style thread like, stigma almost 2-lobed; capsule ⅛ in., pear shaped with the broad end uppermost, 2-celled, rough with hooked bristles, seeds one in each cell.

Circæa cordata,
ONAGRACEÆ.
F. B. I. ii. 589.
Himalaya, 7-9,000 ft.
Simla in woods (Collett).
Dalhousie, Chamba (C. B. Clarke).

like the last species, but stouter and more hairy, the leaves are long pointed, capsule ovoid.

Circæa alpina,
ONAGRACEÆ.
F. B. I. ii. 589.
Himalaya, 7-11,000 ft.
Mashobra, Mahasu (Collett).

small, smooth; leaves ½-1 in. across, broadly ovate, blunt or short pointed, thin; capsule hardly hairy, very small, seed one, otherwise like the last species.

PETALS UNITED.

Bryophyllum calycinum,
Zukm-haiyat,
CRASSULACEÆ.
F. B. I. ii. 413.
The Plains to 3,000 ft.
Sutlej Valley (Collett).

large, perennial, smooth, stem hollow, sprouts on damp ground from the notches on the margin of leaves; leaves 3-6 in. long, ovate or oblong, fleshy toothed, stalked, blunt, rarely compound with 3 leaflets; flowers reddish green, 2. in. long, drooping cylindric in a large terminal branching raceme, calyx tubular, swollen, green tinged with red and spotted with white, 4-toothed, corolla tubular,

HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

twice as long as the calyx, green, lobes 4, tinged with red, short pointed, spreading, stamens 8, in two series on the corolla-tube, styles 4; fruit of four carpels, many seeded, enclosed in the persistent calyx and corolla. The leaves applied to wounds. Roxburgh states that the plant was introduced into the Calcutta Botanical Gardens and has spread from there.

Kalanchoë spathulata,
Tatara, rungru, kaiza-ka-patti.
CRASSULACEÆ.
F. B. I. ii. 414.
Himalaya, 1-3,000 ft.
Valleys below Simla (Collett).

large, perennial, stout, smooth; leaves 4-8 in. (upper 3-4 in.,) fleshy, toothed, oblong narrowed to the stalk; flowers yellow ¾-1 in. long in a large terminal branched flat topped cluster, calyx 4-lobed, divided nearly to the base, lobes triangular, short pointed, corolla tubular, tube flask-shaped, twice the length of the calyx, lobes 4, spreading, short-pointed, stamens, style and capsule as in the last species. This plant is said to be a cure for cholera, it acts as a strong purge and is poisonous to goats and cattle.

Morina persica,
Bekh-akwar.
DIPSACEÆ.
F. B. I. iii. 216.
Himalaya, 6-9,000 ft.
Simla (Collett).
Hazara (Barrett).
Baluchistan (Lace).

large, like thistles from the spiny leaves; leaves 6 by 1 in., oblong or linear, sessile, doubly spinous toothed, velvety or smooth; flowers 1½ in. long, pinkish-white, sessile, crowded in the axils of the upper leaves forming a terminal interrupted spike, bracteoles few among the flowers, spinous, also united bracteoles forming a tubular cup (involucel) round the base of the flower, calyx tubular, 2-lipped, notched, corolla 1-1½ in., tube long slender, mouth oblique 5-lobed, stamens 2, fertile, as long as the corolla lobes, style nearly protruding, stigma disc-like; fruit an achene in each flower, enclosed within the persistent involucel, tip free.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

Morina longifolia,
DIPSACEÆ.
F. B. I. iii. 216.
Himalaya, 9-14,000 ft.
Mahasu Theog, Hattu (Collett).

very like the last species, but with larger leaves, flowers more pink, calyx lobes not spinous, and stamens shorter.

Morina coulteriana,
DIPSACEÆ.
F. B. I. iii. 216.
Himalaya, 9-13,000 ft.
Patarnala (Clarke).

very like the last species, but smaller, flowers yellow, leaves singly, not doubly spinous, toothed, calyx lobes spinous.

FLOWERS, MINUTE, IN HEADS.

Scabiosa olivieri,

see Herbs, Erect, Opposite, Exstipulate, Lobed.

Scabiosa Candolliana, Scabious.
DIPSACEÆ,
F. B. I. iii. 219.
Himalaya, 3-5,000 ft.

medium size, rootstock perennial, stems tufted, little branched; leaves 1½ by ½ in., linear, slightly toothed, flowers ¼-½ in. long, purple in terminal half round small heads, ½ in. diam. surrounded by short overlapping ovate bracts, ⅛-½ in., calyx mouth with 5 short teeth, barbed, bristles ½ in. long, corolla tubular, 5-toothed or in some expanded into long rays, stamens 4, styles threadlike, stigma round; achenes crowned with the involucel and the persistent calyx bristles.

Scabiosa speciosa,

see Herbs, Erect, Opposite, Exstipulate, Lobed.

Ageratum conyzoides.
COMPOSITÆ.
F. B. I. iii. 243.
The Plains to 5,000 ft.
Sutlej Valley (Collett).

medium size, annual, softly hairy; leaves 3 by 1½ in., lanceolate or ovate, stalked, minutely round-toothed; flower heads many, all the flowers alike, ¼ in. diam., in dense rounded clusters, bracts round, the flowers narrow, nearly equal, ribbed, short-pointed in 2 series, flowers tubular, pale blue, calyx (pappus) of 3-5 linear, short pointed, minutely barbed scales, united in a toothed cup-like ring, corolla tube dilated upwards, lobes 5, short, style arms short; achenes ⅛ in., angled black, sticky.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

Siegesbeckia orientalis, COMPOSITÆ.
F. B. I. iii. 303.
The Plains to 5,000 ft.
Simla (Collett).
Murree.

medium size, sticky with crisped hairs, a common weed near cultivation, much branched, often purplish; leaves 1-5 in. long, triangular ovate, deeply toothed, upper leaves almost without teeth, leaf stalks winged, flowers yellow, rarely white, radiate with ray flowers, in heads ¼ in. diam., arranged in leafy branching racemes, bracts sticky in 2 rows outer five long, narrow, spreading, inner shorter erect, receptacle flat covered with small concave scales, calyx hairs (pappus) none, outer corollas with rays (ligules) 2 or 3-lobed, inner corollas 3-5 lobed, achenes curved, angled, blunt at the base.

Blainvillea latifolia, or rhomboidea.
COMPOSITÆ.
F. B. I. iii. 305.
The Plains to 5,000 ft.
Below Sipi (Collett).

medium size, stiff, much branched, roughly hairy annual; leaves stalked, 2-4 in. long, ovate or ovate lanceolate, hairy on both surfaces, short or long pointed, slightly round toothed, upper leaves sometimes alternate; flowers yellow or white, outer rayed in heads ½-½ in. diam., terminal at the end of branches or axillary, bracts few in two rows, outer broad, leaf-like, inner passing into scales, receptacle covered with rigid concave scales each holding a flower, pappus of 2-5 unequal bristles joined into a ring, rays of outer flowers 2 or 3-toothed, corolla of inner (disk) flowers 5-toothed; achenes 3-angled, inner ones often flattened.

Schlerocarpus africanus, COMPOSITÆ.
F. B. I. iii. 305.
The Plains to 5,000 ft.
Valleys below Simla in cornfields (Collett).

medium size, annual, roughly hairy, leaves 1½-3 in., ovate, short pointed, toothed, stalked; flowers yellow in sessile or stalked heads in the forks or at the end of branches, heads ½-½ in. diam., bracts few, leaf-like, outer spreading, receptacle covered with large ribbed scales, rays of outer flowers broad, notched, spreading, corolla of disk flowers 3-5 toothed, pappus (calyx hairs) none; achenes curved, ribbed, enclosed by the rough boat-shaped scales of the receptacle.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

Spilanthes acmella,
Akarkarha, pokar-mal.
COMPOSITÆ.
F. B. I. iii. 307.
The Plains to 5,000 ft.
Dharmpur.

medium size, annual, velvety or hairy; leaves ¾-1½ in., ovate, lanceolate, stalked, toothed, sometimes entire, flowers white or yellow in discoid or rayed conical heads, ½-¾ in. long, solitary on long stalks, bracts of the heads green lanceolate in two rows, receptacle conical, covered with concave scales, pappus none or 1 or 2 bristles, outer ray flowers one row, female, white or yellow, ligule short; inner disk flowers 2-sexual, tubular, 4-5 toothed; achenes flattened, enclosed in a scale. The seeds are pungent and are used medicinally for toothache and as a pot herb.

Guizotia abyssinica,
COMPOSITÆ.
F. B. I. iii. 307.
The Plains east of the Sutlej (Gurgaon.)

medium size, annual, velvety, leafy upwards, stout; leaves 3-5 in., upper often alternate, ovate-lanceolate, or lanceolate-oblong, or linear, sessile, half stem-clasping, blunt-pointed, sharply toothed, flowers inner tubular, outer ligulate, yellow in stalked axillary or terminal heads ½-1 in. diam., bracts of heads 5, almost in two series, outer almost leaf-like, broadly oblong or ovate, blunt, green, inner like the scales of the floor of the head, pappus hairs none, outer corollas ligulate, few, 2-3-toothed, inner tubular 5-toothed, anther bases abrupt, entire, style arms hairy, achenes smooth, flattened, tip rounded.

Bidens cernua,
COMPOSITÆ.
F. B. I. iii. 309.
Kashmir.
Chamba, 5-6,000 ft. (Thompson.)

medium size, stout, annual, smooth; leaves 3-5 in., toothed, base sometimes nearly united; flowers yellow in drooping clustered or nearly solitary discoid heads, ⅔-1 in. diam., bracts in 2 rows, united below, outer green, inner dry, thin, receptacle scales narrow, flat nearly as long as the flowers, pappus of 2-4 stiff, barbed bristles, flowers tubular, 5-toothed, achenes flattened, slender, black, sometimes thickened and armed with recurved spines.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

Scrophularia calycina, SCROPHULARIACEÆ. F. B. I. iv. 253. Himalaya, 9-12,000 ft. Narkanda, Hattu, Chor (Collett).

medium size, annual, stem stout, angular, smooth below, sticky from glands above; leaves 1-4 in., upper alternate, ovate, ovate and heart-shaped or oblong, shortly stalked, short pointed, coarsely toothed; flowers greenish-purple, small in opposite stalked crowded clusters forming erect stiff terminal branching leafless racemes, calyx 5-fid, segments lanceolate, long-pointed, corolla tube globular, lobes 5, short, flat, 4 upper equal, erect, lowest spreading, stamens 4, in unequal pairs, turned downwards, enclosed in the corolla, staminode one, ovate, sharp-pointed, style long, stigma minute; capsule ¼-⅓ in., ovoid, long-pointed, seeds several, oblong.

Scrophularia Scopolii, SCROPHULARIACEÆ. F. B. I. iv. 254. Himalaya, 6,000 ft. Kashmir, Murree, Hazara (Fleming, Clarke).

large, stout, smooth or slightly velvety, branched; leaves 1-3 in., upper alternate, ovate, oblong, or heart-shaped ovate, coarsely toothed, stalk ½-1 in.; flowers small, greenish in loose-flowered erect clusters, lower axillary, upper alternate, forming long straight narrow leafless branching racemes 12 in. or more in length, main flower stalk and lesser flower stalks short, stout, erect, calyx lobes 5, rounded, margins thin, dry, two upper corolla lobes longer than the others, stamens enclosed in the corolla, staminode round; capsule ovoid, beaked, seeds wrinkled, in other respects like the last species.

Scrophularia polyantha, SCROPHULARIACEÆ. F. B. I. iv. 255. Himalaya, 4-11,000 ft.

large, annual, stout and smooth below, velvety sticky above, stem slightly 4-angled; leaves 2-8 in., upper alternate, ovate or ovate and heart-shaped, round toothed, sometimes lobed at the base, leaf stalk ½-1 in. long, sometimes with projections; flowers greenish, very small in stiff erect very large branched leafless racemes, flower stalks

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

short, calyx 5-fid, segments rounded, margins thin, dry, corolla 5-lobed, very short, 2 upper lobes much longer than the lateral, stamens 5, in unequal pairs, far protruding, staminode broad, style thread like; capsule round, seeds somewhat wrinkled.

Buchnera hispida,
SCROPHULARIACEÆ.
F. B. I. iv. 298.
The Plains to 9,000 ft.
Valleys below Simla (Collett).
Dharmpur.

small to medium size, annual, stiff, slender, bristly, often branched above; leaves 1-2 by $\frac{3}{4}$-$1\frac{1}{2}$ in., lower oblong or ovate broad at the apex, upper linear oblong or lanceolate, toothed or not, blunt pointed; flowers white or pale purple, $\frac{1}{3}$ in. long, sessile, solitary, in the axils of leaves forming terminal spikes, 6-10 in. long, calyx $\frac{1}{8}$ in., tubular 5-toothed bristly, corolla lobes 5, spreading, nearly equal, stamens 4 in unequal pairs, enclosed in the corolla, style short, stigma round; capsule oblong, shorter than the calyx, seeds very many, oblong, netted.

Verbena officinalis,

see Herbs, Erect, Opposite, Exstipulate, Lobed.

Hemigraphis latebrosa, var. rupestris,
ACANTHACEÆ.
F. B. I. iv. 423.
Koti above Kalka.

medium size, branches many, spreading velvety; leaves $2\frac{1}{2}$ by 1-$1\frac{1}{2}$ in. long, pointed at both ends, ovate, toothed, leaf stalk 1-$1\frac{1}{2}$ in., on the secondary flowering branches much smaller, bracts ovate, scarcely longer than the calyx, except in the outermost flowers where they are stalked; flowers $\frac{3}{4}$-$\frac{3}{4}$ in., blue, sessile in dense heads terminal or nearly axillary on short branchlets, bracteoles none, calyx 5-fid, segments linear lanceolate, nearly equal, $\frac{1}{2}$-$\frac{1}{4}$ in., whitish, hairy, corolla narrowly tubular funnel-shaped, tube white or yellowish, lobes blue, 5, rounded, stamens 4, in unequal pairs, just enclosed in the corolla, longer pair bearded in the upper half, shorter pair smooth, anthers triangular, sharp-

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

pointed, style long, unequal lobes; capsule ¼ in., linear, hairy, seeds 6, hairy when wet.

Strobilanthes atropurpureus,
ACANTHACEÆ.
F. B. I. 472.
Himalaya, 6-10,000 ft
Simla, Matiana Hattu (Collett).
Murree (Douie).

small to medium size, perennial, flowering at intervals of several years, growing in forests and swampy ground, velvety, sometimes sticky, stem 4 angled or furrowed; leaves 2-4 by 1½-2 in., ovate or ovate lanceolate smooth, round or sharp toothed, tapering into a winged stalk; flowers blue, 1¼ in. solitary or in pairs at intervals on spikes 1-6 in. long, bracts leaf-like, persistent, bracteoles linear, calyx 5-fid, segments linear, corolla-tube curved, cylindric below, dilated above, pale blue, lobes 5, dark blue, nearly equal, rounded, ½-¾ in. across, stamens 4, in unequal pairs on the corolla tube alternate with the lobes, anther bases blunt, style tip curved back; capsule ¾ in. long, oblong, sticky, seeds ⅛ in., 4 or less.

Acrocephalus capitatus,
LABIATÆ.
F. B. I. iv. 611.
The Plains to 5,000 ft.
In moist places.

small, annual, slightly velvety, branched from the base or not; leaves ½-1 in., ovate or lanceolate, coarsely toothed, narrowed to the stalk; flowers ⅛ in. pale purple, sessile, crowded in stalked terminal round heads, ½ in. diam., with 2 spreading leaves at the base, calyx 2-lipped, upper lip undivided, flat, lower shorter 4-toothed, corolla tube very short, nearly equally 4-lobed, stamens 4, nearly equal, enclosed in the corolla, toothless, style 2-fid; nutlets smooth.

Pogostemon plectranthoides,
LABIATÆ.
F. B. I. iv. 632.
Himalaya, 1-5,000 ft.
Sutlej Valley.
Surai (Collett).

large, perennial, strongly scented, velvety, bushy, branches round, often purple; leaves 3-6, ovate, stalked, long-pointed, coarsely and irregularly toothed; flowers ¼ in., pinkish-white, in large circular clusters in many cylindric spikes, forming terminal erect branching racemes, floral leaves

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

bract-like, hairy, glandular, ovate, short-pointed; calyx tubular, 5-toothed, teeth nearly equal, corolla tube-curved, longer than the calyx, 4-lobed, lobes nearly equal, blunt, stamens 4 nearly equal, protruding far, lilac, bearded with long lilac beaded hairs, style 2-fid; nutlets smooth.

Dysophylla crassicaulis,
LABIATÆ.
F. B. I. iv. 640.
Himalaya, 2-4,000 ft.
Kashmir.
Chama, Kulu.

medium size, annual, smooth, strongly smelling, found in swamps; leaves 4-6 in a circle, 1-2 in. long narrowly oblong or lanceolate, toothed, blunt; flowers minute, blue purple, in large circles crowded on slender cylindric terminal spikes 1-4 in. long, bracts lanceolate broad towards the tip, calyx minute, ovoid, 5-toothed, teeth erect or converging, corolla minute, 4-lobed, upper lobe 2-fid or undivided, lower spreading, stamens 4, protruding, very long, bearded, style 2-fid; nutlets very small, circular, flattened, pale, shining.

Elsholtzia incisa,
LABIATÆ.
F. B. I. iv. 644.
Himalaya, 3-5,000 ft.

medium size to large, branches 4-angled; leaves 1-2 in., broadly ovate, blunt pointed, coarsely round-toothed, stalk long, winged above; flowers very small, white in very slender cylindric spikes 2-4 in. long, bracts small, slender, calyx sessile, sticky, 5-toothed, bell-shaped, enlarged in fruit, corolla 4-lobed, upper lobe nearly erect, notched, the others spreading, stamens 4 in unequal pairs, protruding, not bearded, style 2-lobed, lobes awl-like; nutlets smooth, shining.

Elsholtzia strobilifera,
LABIATÆ.
F. B. I. iv. 645.
Himalaya, 5-10,000 ft.
Simla (Collett).

small to medium size, slightly hairy; leaves ½-1 in., ovate, stalked, round or sharp-toothed; flowers minute, pale purple on cylindric hairy or velvety cone-like spikes ½-1½ in., bracts broad, thin, fringed, forming cups nearly concealing the flowers, calyx

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

thin, transparent, tubular, corolla-tube slender, longer than the calyx, lobes 4, stamens and style as in the last species; nutlets red brown, shining.

Elsholtzia cristata,
LABIATÆ.
F. B. I. iv. 645.
Himalaya, 1-9,000 ft.
Simla (Collett).
Changlagalli (Douie).

small to medium size, nearly smooth, fragrant; leaves 1-4 in., lanceolate, coarsely toothed, long-stalked, long-pointed, thin;, gland-dotted beneath; flowers very small, pink purple in broad velvety one-sided spikes 1-2½ in., bracts stalked leaf-like, round with a sharp abrupt point, calyx tubular, hairy, corolla tube curved, stamens style and nutlets as in the last species.

Perilla ocimoides,
Bhanjiri.
LABIATÆ.
F. B. I. iv. 646.
Himalaya, 2-5,000 ft.
Valleys below Simla (Collett).

medium size, annual, aromatic, shaggy; leaves 3-5 in., ovate or rounded, blunt, sharp or round-toothed, stalk 1-3 in.; flowers white, small in pairs on long one-sided erect axillary and terminal simple or branching racemes, bracts lanceolate as long as the flowers, calyx bell-shaped, 5-toothed, becoming much larger 2-lipped in fruit, corolla 5-lobed, stamens 4, hardly protruding, style 2-fid; nutlets nearly round, netted.

Mentha sylvestris,
Horse Mint,
LABIATÆ.
F. B. I. iv. 647.
Himalaya, 4-12,000 ft.
Simla in wet places (Collett).
Baluchistan (Aitchison).

medium size, strongly scented, perennial; leaves 1-3 in., lanceolate, ovate or oblong, sharply-toothed, nearly sessile, short-pointed, grey velvety above, white-felted below; flowers lilac, small in large clusters, crowded on axillary and terminal cylindric tapering spikes 1-3 in., bracts lower leaf-like, upper smaller, lanceolate, calyx sharply 5-toothed, bell-shaped, hairy, corolla 4-lobed, lobes erect nearly equal, stamens 4, equal, protruding not bearded, style arms short; nutlets netted: *var. incana* is generally grey-felted.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

Mentha arvensis,
LABIATÆ.
F. B. I. iv. 648.
Kashmir, 5-10,000 ft.
Baluchistan (Maynard).

medium size, hairy or smooth; leaves 1-2 in., flowers in round axillary head-like clusters, in other respects like the last species.

Micromeria biflora and hydaspidis,

see Shrubs, Opposite, Exstipulate, Simple, Corolla Two-lipped.

COROLLA ONE-LIPPED.

Blepharis sindica,
ACANTHACEÆ.
F. B. I. iv. 479.
The Plains.

small, rough or prickly; leaves 1-2 in., linear or narrowly oblong, velvety, toothed or spinous; flowers $\frac{1}{2}$-$\frac{3}{5}$ in., blue in few or many-flowered, 2-3 in. long spikes, bracts 1 in. or more, ovate with spreading lanceolate tips, prickly, hairy within and without, bracteoles $\frac{1}{4}$ in., linear, hairy, shorter than the bracts, calyx 4-lobed, two outer lobes $\frac{3}{5}$ in., ovate, 2 inner $\frac{1}{3}$ in. narrowly ovate, corolla-tube ovoid, horny, one-lipped, the lower broad, 3-lobed, stamens 4, in unequal pairs, thick, rigid, anterior pair have a process above the anthers, anthers densely bearded, style linear, very shortly 2-fid; capsule $\frac{1}{7}$ in. oblong with rounded ends, flattened, shining brown, seeds 2, $\frac{1}{4}$ in., prickly.

Blepharis edulis,
ACANTHACEÆ.
F. B. I. iv. 479.
The Plains.
Baluchistan (Stocks.)

very like the last, but larger with large leaves and larger corolla.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA ONE-LIPPED.

Teucrium quadrifarium, Germander,
LABIATÆ.
F. B. I. iv. 701.
Himalaya, 4-8,000 ft.
Simla (Collett).

large, stout stem square, nearly round below, hairy; leaves 2-3 in., ovate or oblong ovate, shortly-stalked, base heart-shaped, short-pointed, toothed, often wrinkled, flowers purple, ½ in. long, sessile in pairs on one side of erect branching racemes, bracts ½ in., broadly ovate, abruptly ending in a long point, hairy near the base, concealing the flowers, red purple, calyx ¼ in., upper lip rounded, 2 lower short pointed or blunt, corolla 1-lipped, upper lip none, lower lip 5-lobed, long, broad, lateral lobes tooth-like, short pointed, terminal lobe broad, concave, stamens 4, in unequal pairs, protruding from the corolla-tube, style undivided; nutlets minute, wrinkled.

COROLLA TWO-LIPPED.

STAMENS TWO.

Bonnaya brachiata,
SCROPHULARIACEÆ.
F. B. I. iv. 284.
The Plains to 5,000 ft.
Valleys below Simla (Collett.)

small, erect or prostrate, rigid, annual, quite smooth; leaves ½-1½ in. oblong, blunt or short-pointed, sessile, sharply deeply toothed; flowers ¼ in. long, white, spotted or tinged with pink, bracteate, on short axiliary stalks, forming terminal racemes, calyx 5-lobed, segments linear, corolla 2-lipped, upper lip erect, undivided, lower broad, 3-lobed, stamens 2 only, as one pair are aborted, stigma flat, 2-lobed; capsule narrow cylindric, much longer than the calyx, seeds many, wrinkled.

Mosla dianthera,
SCROPHULARIACEÆ.
F. B. I. iv. 647.
Himalaya, 1-6,000 ft.
The Plains to 6,000 ft.

medium size, annual, strong scented, slender, slightly velvety; leaves 1-1½ in., ovate, short-pointed, toothed, stalked; flowers ¼ in. long, white or purplish in twos on one-sided terminal and axillary racemes, bracts very minute or the lower leafy, calyx bell-shaped, 5-toothed, nearly equal

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

or 2-lipped, base pouched, corolla 2-lipped, upper lip notched, lower 3-lobed, lips short, stamens 2 on the posterior side, short, erect, apart, staminodes 2; nutlets 4, round, smooth or netted.

Salvia glutinosa, Sage,
LABIATÆ.
F. B. I. iv. 653.
Himalaya, 6-9,000 ft.
Simla (Collett).
Baluchistan (Lace).

large, perennial, very sticky, hairy, strongly scented; leaves 4-7 by 2-4 in., ovate oblong, two processes sticking out at the base, like a barbed arrow head, toothed, leaf stalk 1-3 in.; flowers 1-1½ in., yellow, shortly stalked in large branched erect spreading racemes, floral leaves very small, calyx widely bell-shaped, ½ in., upper lip ovate, short pointed, corolla-tube longer than the calyx, 2-lipped, upper lip dotted with purple, long, curved, flattened from side to side, concave, lower wide, 3-lobed, stamens 2, wide apart, each dividing into two horns, upper horn with a perfect anther, lower with none, style long curved projecting from the concavity of the upper lip, 2-fid; nutlets 4, triangular, ⅛ in., smooth.

Salvia hians,
LABIATÆ.
F. B. I. iv. 653.
Himalaya, 8-11,000 ft.
Kashmir (Falconer).

very like the last species, but leaf-stalk much longer, often 10 in., leaves broader, calyx much wider, corolla 1½ in., blue, lips shorter, nutlets larger.

Salvia asperata,
LABIATÆ.
F. B. I. iv. 654.
Himalaya, 5-6,000 ft.
Kashmir (Falconer).

medium size, perennial, rough, branched, somewhat glandular and hairy; leaves 3-6 by 2-3 in., oblong ovate, heart-shaped, blunt, round-toothed, leaf-stalk long, floral leaves 1 in. diam. or less, rounded, bristly, tipped with a sharp hard point; flowers ¾ in. long, white, arranged in distant 6-10-flowered circles on an erect spike, calyx ⅓ in. long, widely bell-shaped, hairy, stiff, 2-lipped, upper lip

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

3-toothed, corolla tube short slender, otherwise like the last species, stamens 2, as in the last species, but the horns connected by hard projections, bent backwards and the imperfect anther abruptly dilated, style and nutlets as in the last species but smaller.

Salvia Moorcroftiana,
LABIATÆ.
F. B. I. iv. 654.
Himalaya, 4-9,000 ft.
Shali, Solon (Collett).
Sanawar.
Rawalpindi.
Hazara (Donie).

medium size to large, stout, woolly; leaves 6-12 by 3-5 in. oblong or rounded, heart-shaped, blunt, round-toothed, upper surface nearly smooth or cottony, closely wrinkled, under surface white-felted, thick, stalk green bordered and veined, round and abruptly pointed; flowers 1 in. long, pale blue, lilac or whitish in distant 6-10-flowered circles round an erect spike, calyx $\frac{1}{2}$ in., bell-shaped, teeth spinous, upper lip 3-toothed, rough, corolla, stamens, style and nutlets as in the last species, but larger.

Salvia lanata,
LABIATÆ.
F. B. I. iv. 654.
Himalaya, 5-8,000 ft.
Simla (Collett).
Murree.

very like the last species, but rather smaller, more woolly, leaves not stalked, flowers blue-grey, $\frac{3}{4}$ in. long.

Salvia dumetorum,
LABIATÆ.
F. B. I. iv. 655.
Kashmir, 6,000 ft.
(Falconer, Clarke).

large, perennial, very stout, much branched, hairy, felted or velvety; leaves 3-4 by $1\frac{1}{2}$-$2\frac{1}{2}$ in., ovate or oblong heart-shaped, doubly round-toothed, somewhat wrinkled above, leaf-stalk 1-4 in., floral leaves small, rounded with a hard sharp point $\frac{1}{8}$ in. long; flowers $\frac{1}{2}$-$\frac{6}{8}$ in. long, blue in sticky distant 6-flowered circles round an erect-spike, calyx $\frac{1}{4}$ in., nearly sessile, ovate bell-shaped, 2-lipped,

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

upper lip curved back with 3 converging teeth, lower abruptly 2-toothed, corolla, stamens, style and nutlets as in the last species.

Salvia plebeia,
LABIATÆ.
F. B. I. iv. 655.
The Plains to 5,000 ft.
Sutlej Valley, Suni (Collett).

medium size, annual, stem stout, roughly velvety; leaves 1-3 in., ovate or oblong, toothed, blunt, stalked, floral leaves small, upper lanceolate; flowers ¼ in. long, lilac or nearly white in numerous small circles in several slender branching racemes, calyx ⅛ in. stalked, upper lip not toothed, corolla 2-lipped, upper lip short, nearly straight, stamens, style and nutlets like the last species but smaller.

Salvia ægyptiaca,
LABIATÆ.
F. B. I. iv. 656.
The Plains, 1-2,000 ft.
Chakwal, Jhelum Dist. (Douie).
Baluchistan (Hughes-Buller).

small, perennial, hairy, stiff, much branched from the base; leaves hardly 1 in. long, linear or lanceolate, short-pointed, rigid, round-toothed; flowers small, ¼ in. in distant 2-3-flowered circles, calyx with hairy glands, upper lip round, minutely 3-toothed, lower lip, 2 awl-shaped teeth, corolla, stamens, style and nutlets as in the last species.

STAMENS FOUR.

Sesamum indicum,
Gingelly,
Til.
PEDALIACEÆ.
F. B. I. iv. 387.
The Plains.
Baluchistan.

medium size, annual, velvety; leaves 3-5 in., oblong or ovate toothed, upper alternate, lower opposite, often lobed; flowers 1¼ in., white o purplish, sometimes marked with yellow, axillary, solitary or a few clustered together on short stalks, calyx ¼ in., 5-fid, segments lanceolate, corolla 2-lipped, velvety, tube swollen out, nearly pouched

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

at the base, lobes 5, rounded, stamens 4, in unequal pairs, enclosed in the corolla, anthers divided at the base, style thread-like, stigma 2-lobed; capsule 1 by $\frac{1}{4}$ in., erect, rough, 4-angled, oblong, pointed, seeds many, brown, oblong. This plant is cultivated for the oil which is expressed from the seeds.

Mimulus gracilis, see Herbs, Erect, Opposite, Exstipulate, Simple Entire.

Lindenbergia macrostachya,
SCROPHULARIACEÆ.
F. B. I. iv. 261.
The Plains to 4,000 ft.
Sutlej Valley.
Suni (Collet).

large, smooth or velvety, stem stiff, stout, or slender; leaves ovate, smooth, toothed; flowers $\frac{1}{2}$ in. long, yellow crowded in terminal or axillary, one-sided, rigid spikes, bracts shorter than the calyx, calyx 5-fid, bell-shaped, corolla 2-lipped, upper lip recurved, 2-lobed, lower lip much larger, 3-lobed with 2 permanent folds at the base, stamens 4, in unequal pairs, enclosed in the calyx, style slender, stigma 2-lobed; capsule lanceolate, 2-grooved, seeds many, minute.

Lindenbergia polyantha,
SCROPHULARIACEÆ.
F. B. I. iv. 262.
The Plains to 6,000 ft.
On walls and banks.

medium size, coarsely velvety, stout or slender; leaves $\frac{1}{2}$-$\frac{3}{4}$ in. long, ovate, blunt, round-toothed, stalk short; flowers yellow, $\frac{1}{2}$ in. long, on one-sided axillary and terminal leafy spikes, 2-6 in. long, bracts ovate, longer than the calyx, calyx $\frac{1}{8}$ in. long, 5-fid, lobes blunt, corolla, stamens and style as in the last species; capsule smooth above, hairy below, otherwise capsule and seeds as in the last species.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Lindenbergia urticæfolia,
SCROPHULARIACEÆ.
F. B. I. iv. 262.
The Plains to 6,000 ft.
Simla, Mashobra.
Common on walls (Collett).
Choa Saidan Shah (Douie).
Baluchistan (Boissier.)

small, annual, slender, rough from glands or nearly smooth; leaves 1-1½ in. long, ovate, blunt, round-toothed, thin, stalk ¼-¾ in.; flowers ¼ in., yellow, shortly stalked one-sided all axillary, and solitary, or in pairs, or in leafy slender spikes, bracts longer than the calyx, calyx ⅛ in., lobes turned back, corolla slightly hairy, capsule hairy above the middle, other characters like the last species.

Herpestis hamiltoniana,

see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Torenia cordifolia,
SCROPHULARIACEÆ.
F. B. I. iv. 276.
The Plains to 6,000 ft.
Valleys below Simla (Collett).
Kothi.

small, annual, stems and branches 4-angled; leaves 1-1½ in., ovate, sharply toothed, stalked; flowers ¾ in. long, lilac or blue purple solitary on axillary stalks, crowded at the end of branches, calyx ½ in., ovoid or oblong, winged, base rounded or heart-shaped, corolla 2-lipped, upper lip erect, concave, notched, lower larger, spreading, 3-lobed, tube cylindrical, dilated above, stamens 4, in unequal pairs, style linear curved, stigma flat, 2-lobed; capsule oblong, short-pointed, seeds many, wrinkled.

Vandellia crustacea,

see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Vandellia erecta,

see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Vandellia nummularifolia,
SCROPHULARIACEÆ.
F. B. I. iv. 282.
Himalaya, 2-7,000 ft.
Valleys below Simla (Collett).
Kasauli.

small, smooth, annual, stem 4-angled; leaves ⅛-¾ in., nearly round, round toothed, sessile or nearly so; flowers ¼ in. long, red-purple, edges white on axillary stalks or few-flowered racemes, calyx 5-toothed, ⅛ in., corolla 2-lipped, upper lip erect, broad concave, notched, lower spreading 3-lobed, stamens 4, lower pair with a broad tooth, stigma 2-lobed; capsule ¼ in. long, much longer than the calyx, long, pointed, seeds wrinkled.

Vandellia sessiliflora,
SCROPHULARIACEÆ.
F. B. I. iv. 282.
Himalaya, 2-7,000 ft.
Kashmir.

like the last species, except that the flowers are sessile as the specific name implies.

Euphrasia officinalis, Eyebright,
SCROPHULARIACEÆ.
F. B. I. iv. 305.
Himalaya, 7-13,000 ft.
Mahasu, Fagu, Hattu (Collett).

small, velvety, glandular, branching, slender; leaves ¼-½ in. ovate, sessile, sharply toothed; flowers ¼-½ in., white or lilac, purple-veined, throat tinged with yellow in terminal spikes, bracts leaf-like, calyx 4-lobed, tubular, corolla 2-lipped, tube cylindric, longer than the calyx, upper lip erect, 2-lobed, lower spreading, 3-lobed, lobes notched, stamens 4, in unequal pairs, anthers hairy, lower pair long-spurred, style long, stigma round; capsule oblong, flattened, seeds many, oblong, grooved.

Bartsia Odontites,
SCROPHULARIACEÆ.
F. B. I. iv. 303.
Kashmir, 7-8,000 ft. (Clarke).

medium size, annual, rough, wiry, 4-angled, branched, branches ending in leafy spikes; leaves ¼-2 in., lanceolate, somewhat toothed, sessile; flowers ⅛ in., pink in nearly one-sided spikes, lower bracts leafy, calyx 4-fid, bell-shaped, lobes ovate, short-pointed, equal to the tube, corolla 2-lipped, velvety, tube slender, upper lip erect, long, entire, lower

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

convex, 3-lobed, stamens 4 in unequal pairs, under the upper lip, anthers yellow, spurred, protruding; capsule ¼ in., longer than the calyx, seeds many, narrowly oblong.

Phryma leptostachya,
VERBENACEÆ.
F. B. I. iv. 561.
Himalaya, 3-7,000 ft.
Valleys below Simla (Collett).

medium size, thinly hairy; leaves 2-4 in., ovate or ovate-lanceolate, stalked, toothed; flowers ⅛-⅓ in. long, pink in long slender terminal or axillary spikes 6-15 in. long, bracts linear, small, bracteoles minute, calyx ¼ in., tubular, teeth 3, linear, with purple hooks, corolla small, tubular, 2-lipped, upper lip erect, concave, notched, lower larger, spreading, 3-lobed, stamens 4 in unequal pairs, enclosed in the corolla, style 2-lobed; capsule dry, oblong, enclosed in the reflex calyx, seed solitary, loose.

Ocimum basilicum,

see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Ocimum sanctum,

see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Orthosiphon pallidus,
LABIATÆ.
F. B. I, iv. 613.
The Plains to 5,000 ft.
Kashmir.

small, perennial, smooth or slightly velvety, stout, woody stock, branches many; leaves ½-2 in., ovate, blunt, coarsely sharp or round-toothed, stalk ¼-½ in., the length of the leaf blade; flowers white, ⅛ in. long, in long or short, stout or slender racemes, bracts minute, calyx ovoid, fruiting calyx turned down, upper tooth broad, thin, lateral and lower awl-shaped, corolla-tube equal to the calyx, 2-lipped, upper lip 3-4-fid, lower undivided concave, stamens 4, curved forward, enclosed in the corolla, nutlets nearly round, flattened, pale, nearly smooth.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Orthosiphon rubicundus,
LABIATÆ.
F. B. I. iv. 615.
Himalaya, 2-5,000 ft.

medium size, perennial, felted, velvety or smooth, stems 4-angled; leaves 2-4 in. long, corolla white or pink, twice as long as the calyx, nutlets minutely pitted, otherwise like the last species.

Plectranthus, Gerardianus,
LABIATÆ.
F. B. I. iv. 617.
Himalaya, 3-9,000 ft.
Simla (Collett).

large, perennial, smooth; leaves 3-7 by 1-4 in., ovate, long-pointed, round-toothed, lower leaves stalked, floral leaves and bracts small; flowers white and purple, dotted, ¼ in. long, in small clusters forming axillary or terminal branched racemes, calyx bell-shaped, elongated and curved in fruit, gland-dotted, corolla 2-lipped, upper lip short, broad, recurved, 3 or 4-lobed, lower longer, boat-shaped, undivided, stamens 4, in unequal pairs along the lower lip of the corolla, ununited, projecting, style nearly equally divided; nutlets oblong with rounded ends.

Plectranthus striatus,
LABIATÆ.
F. B. I. iv. 618.
Himalaya 4-8,000 ft.
Simla (Collett).

small and roughly velvety, otherwise like the last species.

Plectranthus coëtsa,
LABIATÆ.
F. B. I. iv. 619.
Himalaya, 3-8,000 ft.
Simla.

large, perennial, velvety, strong smelling; leaves 2-4 by 1-2½ in., ovate or ovate-lanceolate, sharp or round-toothed, corolla lavender-blue, tube abruptly bent, much longer than the calyx, otherwise like the last species.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Plectranthus ternifolius,
LABIATÆ.
F. B. I. iv. 621.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

large; densely white-felted; leaves sometimes in threes round the stem or branches, corolla white, nutlets 3-angled, otherwise like the last species.

Plectranthus incanus,
LABIATÆ.
F. B. I. iv. 621.
The Plains from 1-6,000 ft.
Valleys below Simla (Collett).

medium size, velvety; leaves 2-4 in., broadly ovate, calyx 2-lipped, lower lip with 3 long-pointed teeth, corolla pale lavender-blue, tube nearly straight, lower lip very long nutlets large nearly round, otherwise like the last species.

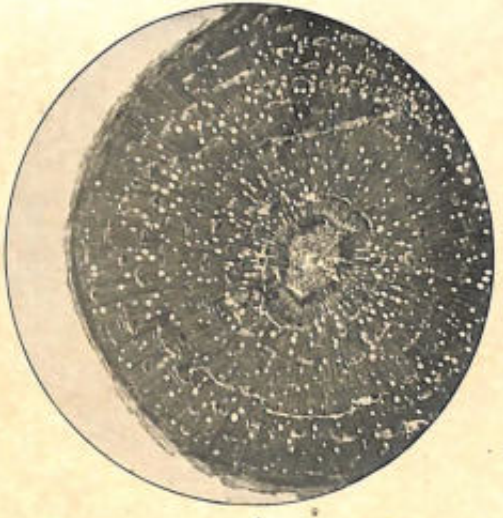
Coleus barbatus,
LABIATÆ.
F. B. I. iv. 625.
Himalaya, 2-7,000 ft.
Valleys below Simla (Collett).

medium size, stem stout, hairy; leaves 3-5 in., ovate, blunt, round-toothed, stalked, upper surface hairy, lower felted, flowers ¾-1 in. long, pale blue in circular clusters of 6-8 forming long, leafless, spike-like racemes, bracts ovate, soon falling off, upper calyx-lip rounded, ovate, short-pointed, 5-toothed stamens united below, other characters like those of the last species.

Coleus aromaticus,
LABIATÆ.
F. B. I. iv. 625.
The Plains cultivated.

medium size, very aromatic; leaves broadly ovate, corolla pale purplish, stamens shortly protruded, other characters like those of the last species.

(*To be continued*).



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3

SECTIONS OF *CALYCOPTERIS FLORIBUNDA.*

A NOTE ON THE STRUCTURE OF THE GIANT CREEPER *CALYCOPTERIS FLORIBUNDA.*

BY

PROFESSOR V. N. HATE, B. SC.

(With a Plate.)

The plant *Calycopteris floribunda*, also called *Getonia floribunda* is fully described morphologically in all works on Bombay Flora. But this morphological description will not assist us in understanding the phenomenon of the dripping of water exhibited by the plant, when a piece of the stem, nearly a foot in length and stout as one's wrist, is cut off from the entire plant, to which attention has been drawn by Mr. Wallace, C. E.

In connection with this phenomenon a little consideration will tell us that it resolves itself into two factors, namely, that there must be a mechanism for readily absorbing and retaining large quantities of water in the body of the plant and that there must be the means for preventing free evaporation or escape of water from the body of the plant. To understand properly these two things we must examine microscopically, the structural details of the plant and study its surroundings. We shall consider the latter first. This plant grows more or less upon rocky soils, exposed to great heat, subject to great variations of temperature during 24 hours and long periods of drought. In short the plant grows in such conditions that it may be called a xerophyte. Now all xerophytes show a definite response in their structure to their environment, and thus we are led to examine closely the structural details of this plant to make out any special adaptations, and we find we are not disappointed in that.

The stem has the general structure of a Dicotyledonous plant, being monostelic and having open fibrovascular bundles. A section of a very small twig examined microscopically shows a closely packed arrangement of numerons fibrovascular bundles with medullary rays reduced merely to radial lines. The secondary formations of wood or xylem are very peculiar indeed. They are almost formed of closely packed lignified wood-fibres or prosenchymatous fibres with pitted walls (called Tracheids),

including here and there large pitted vessels, with very little wood-parenchyma (Fig. 1). One cannot help observing here the marked resemblance, this secondary wood bears in general to the secondary wood of the Coniferæ most of which are xerophytic. The wood fibres of this plant show (in transverse and longitudinal sections) a definite cavity, so that we have here a tissue made up of numerous closed capillary tubes. This peculiarity of the wood is itself a special adaptation to conserve large quantities of water in the body of the plant, and at the same time affords facilities to the transport of the cell-sap or watery solution towards the leaf. How the cell-sap travels through the root and stem and arrives at the leaves is not the question at issue. The transport of cell-sap through lofty woody stems is one of the ill-solved problems of vegetable physiology. Opening that question here in connection with the phenomenon to be explained would avail us nothing.

A concomittant feature resulting from this abundance of wood-fibres thus closely packed, and lessening of the wood-parenchyma is the great reduction of the intercellular space system in the body of the plant. The effect of it is that very little quantity of water must be evaporating internally.

The microscopic structure of a sufficiently grown older branch which may be taken as the type of the structure obtaining in all parts of the grown stem of any width, presents, in addition, still further special features. The wood goes on increasing under the action of the vital region. Cambium in rings, and is formed, as before, of abundance of closely-packed wood-fibres with fitted walls and of numerous fitted vessels comparatively of small diameter (fig. 2). The wonder is not that there are so many pitted vessels of the ordinary kind, but the wonder is that there are not more of these. The most important special structural feature of the stem, as it advances in age, is the formation in it by the Cambium in a regular order of the large calibred ducts or conduits filled with phlœm tissue called the Interxylem Phlœm. The phlœm tissue is made up of sieve-tubes and phlœm parenchyma and contains large quantities of cell-sap (Fig. 3). These conducts of inter-xylem phlœm are not running as continuous tubes in their longitudinal extent, but are short tubes interrupted at both ends and placed one over the

other at different levels. Here, again, we have in the stem of this plant, an adaptation in the form of these conduits of inter-xylem phlœm for storing large quantities of water in the stem. The thin cells in these conduits, when fully turgid, must be holding large quantities of water which they draw by osmosis from the neighbouring wood-fibres and wood-vessels in connection with which these ducts and the number of them formed in this plant (Fig. 2), these reservoirs of water appear to be the special provision of water by Nature in the plant to be drawn upon in emergency.

Coming to the leaf, the size of the leaf (to my mind) appears to be comparatively small for such a giant woody creeper, taking into consideration other climbing plants belonging to the same Natural Order, *e.g.*, *Quis-qualis*, *Combretum*, &c. This reduction of the leaf area appears in the first instance calculated to reduce transpiration which means reservation of water in the stem. In the microscopical examination the leaf appears to belong to that type known as the dorsiventral. The epidermis appears to be one cell deep. On the upper surface it is strongly cuticularised and devoid of stomata having conical hairs. On the lower surface the epidermis is thin, and is made up of flat sinuous cells round about the stomata which are on the same level with them, and of somewhat cylindrical cells in the regions of the principal veins. The cylindrical epidermal cells give rise to conical hairs, whilst very peculiar watch glass shaped reddish glandular hairy scales are seen freely distributed but symmetrically arranged in small pits in connection with the sinuous epidermal cells. Some allusion to these peculiar hairy scales is found in Gibson's Bombay Flora, 1861, where the leaves are described as "resinous dotted beneath the young ones tomentose." Also in Theodore Cooke's Bombay Flora of recent date, where he says "both surfaces more or less tomentose, the lower rusty and pitted." The development in pits of these numerous hairy scales and their symmetrical arrangement must have some significance. The resinous excretions of these hairy scales must absorb dew at night-time, and thus the turgidity of at least the cells of the leaves is insured during the night-time after the exhausting work performed by them during the day. These hairy scales must be, therefore, absorbing some quantity of water in the

form of dew, though it may not lead to any great storage of it in the stem. At any rate, these scales must be denoting a special mechanism for providing some water to the plant, which means a prevention of the loss of initial water.

In conclusion, it may be said that all the structural peculiarities of the plant point towards the storage of large quantities of water in the stem.

In connection with the dripping of water from the cut portion of the stem, the chief agency concerned in this phenomenon is the presence of those numerous conduits of inter-xylem phlœm. The turgid parenchymatous cells and the tubes cut through must shrink and bleed, and in doing so must be drawing upon the water locked up in similar cells above and in the surrounding woody tissue, so that a sort of current of water must be set up towards these dripping points from every direction as lignified woody tissue parts with its water readily and at the same time affords the easiest passage for the transit of water through it.

REVIEWS.

FAUNA OF INDIA.

COLEOPTERA LAMELLICORNIA, I.

Cetoninæ and Dynastinæ.

BY

G. F. Arrow.

This volume is the third dealing with the beetles of India and covers two groups of beetles, the Cetoniids and Dynastids, familiar to all collectors of beetles in this country. The Editor, Mr. A. E. Shipley, writes a short preface, as does the author. There is a useful glossary of technical terms, and an extremely good introduction which not only enables any one to understand and use the volume but which deals with biology. There is a marked absence of anything to do with zoo-geography, which is inevitable perhaps when both authors and editor are wholly unfamiliar with India, but which greatly mars the value of the work.

One other defect, due again to the disregard of India and workers in India, lies in the absence of altitude indications and the failure to indicate the sources of the specimens. *Anthracophera crucifera*, for instance, is recorded from no altitude higher than 2,000 feet, *A. dalmanni* from none lower than 5,000 feet, but there is nothing to indicate this. It would also have helped Indian workers to indicate which species were in the principal collections in India, as is done in some other volumes. These defects will be removed, we hope, in later volumes, by the simple expedient of associating with the editor or author some worker who has collected in India and knows it, and by adding in a bracket the collection from which the specimen on which locality is recorded came.

The species described number 241 Cetoniids and 46 Dynastids. The classification adopted is the usual one, but we regret that the author has not separated the dung-feeding (Laparostict) Scarabaeids from the vegetable-feeding (Pleurostict) Melolonthids as a distinct family. Of the *Cetoniini*, the first division of the *Cetoniinæ* or rose-chafers, 11 are peculiar to Ceylon, 32 to Burmah, 9 to the Western Himalayas, 16 to the Eastern Himalayas, 16 to Assam, 32 to Southern India (mainly the Nilgiris) and 4 to Sind and Baluchistan. Of the rest, 8 occur in Ceylon and South India, 7 in Burmah and Assam, 12 in Burmah, Assam and, the Eastern Himalayas, 8 only in the Eastern and Western Himalayas, 13 only in the Eastern Himalayas and Assam. Taking tropical India or the plains, 27 species are recorded, of which two are from the Deccan only, a few from Chota Nagpur, and the remainder from localities in the plains and also in the hills. Very few species are general over India in any sense at all, taking only the sub-tropical hill areas and the group are, so far as the records go, localised into

district areas more than some other groups are. This is perhaps not so marked really as the records would show, as the editors and authors have been at very small pains to secure material on which to base good locality records. While they have taken immense pains to secure types, they have only drawn on half a dozen collections or collectors in India and have apparently disregarded the many other private collectors and collections. This is the weak point of this as of other volumes, and the work would be of far greater value and far more complete if the editor relied more on existing collections and made a better effort to secure them. The work will be valuable but could have been considerably more so.

The two remaining divisions of the *Cetoniinæ* are curiously localised; the *Valgini* have 20 peculiar to Burmah, 1 in Kulu, 2 peculiar to the Eastern Himalayas, 2 to Assam, 1 in Chota Nagpur, 1 in Ceylon and 5 in South India only. The *Trichiini* have 2 in Burmah and 5 in Assam.

Of the *Dynastinæ*, 1 occurs only in the Western Himalayas, 1 only in the Eastern Himalayas, 1 only in Assam, 12 only in Burmah, 1 only in Ceylon, 3 only in South India, 5 only in localities in the tropical plains and 4 in Sind or other holarctic non-oriental localities. The remainder are mainly common to the Eastern Himalayas, Assam, Burmah, either in all or in two or in any of them and in plains localities also. It is useless to analyse too far, but the plains species are nearly one-third of the total and the head-quarters of the group are the sub-tropical tracts of Burmah, Assam, Bhutan and Sikkim. Here again the locality records are shockingly scanty seeing how common Dynastids are in collections and how many amateurs have collected them.

We congratulate both editors and author on the volume, which will immensely help work at the group and which will make possible further work on the many biological problems connected with these forms. We would also urge amateur collectors and naturalists in India to turn their attention to the group, now that their identification is possible. These beetles are in every way attractive, whether for collections or as objects of observation and study, and the author has collected the recorded information on habits and biology in a very useful way. The volumes of this series are mainly intended to promote the work of naturalists in India, whether professional or amateur, by giving them the means of identifying their insects and being able to systematise their collections and record their observations. We venture to think that the needs of the Indian worker might be taken into account better and that the work might be a little more associated with the country. Such a volume takes time to prepare; Indian workers want to know that it is being prepared; that material will be appreciated and that their collections will be of use. So long as the work is wholly done in England, the important thing being to secure types and the Indian worker being neglected, so long will the volumes lack the complete-

ness they might have. Since India pays for them, the Indian worker might have a say in the matter, which he does not. We believe that the bulk of collectors in India do not use these volumes to the extent they might and that the stimulus to work that they might afford is largely lost. For this reason, we would draw the attention of members of the society to this volume which will be of use and which will enable any one with a liking for collecting to do useful and pleasant work with these beetles.

H. M. L.

CATALOGUE OF ORTHOPTERA.

Part III.—Acridiidæ

BY

W. F. Kirby.

This is the concluding volume of the Catalogue of *Orthoptera* issued by the British Museum. It embraces the *Acridiidæ* (here called *Lecustidæ*) which include the Locusts and Grasshoppers. We congratulate the author on having brought to a conclusion this arduous work, the product of much research and delving in literature. Such catalogues, if authoritative, are invaluable to those unfortunate workers who have to deal with nomenclature and literature, and the present volume is fully up to the standard one would expect of our National Museum. The volume has, of course, no interest to any but entymologists, being purely a catalogue of species and references. Nominally such a catalogue lists the described species of the world. Actually it must include many species whose descriptions are extant, but which are practically lost for want of full descriptions and types.

Like all such catalogues, this adds to the welter of confusion that reigns in entomology by still more muddling up the nomenclature. *Acridium* or *Acrydium*, known hitherto as the designation of the old-world Locusts and allied large grasshoppers, is now transferred to a genus of *Tetrigine* grasshoppers; our locusts become *Cyrtacanthacris* and *Orthacanthacris*. Volumes have been written on *Schistocerca* (*Acridium*) *peregrinum*. Oliv., which has now become *Schistocerca tatarica*, Linn. Our old friend *Epacromia dorsalis* is become *Acolopus tamula*. The last is very typical of the silly meddling with names now going on in all groups. *Epacromia* is a genus characterised by Fischer in November 1853 in his *Orthoptera Europæa*; our author finds that he can identify the genus with *Aiolopus* of Fieber in Lotos of May 1853. On that ground (6 months only) the generic name must change. All these changes are doubtless right, if we follow the international rules and if the author's identification of the genus is accurate; but the whole thing is bringing entomology and entomologists into contempt and disrepute with those who have to work in it and not simply tinker with nomenclature and old books. Why could not *Acridium* stand seeing what a literature there is about it under that name?

This volume is an authoritative work issued by our National Museum and naturally workers try to follow such guides; if we cannot follow them, of what use are they; but if we do follow them, we fall ourselves and lead all our students and co-workers into a bog of nomenclature and confusion. If there were an end in sight one might hope, but there is none.

We find one other defect in this work: the author appears unable to tolerate the work of Brunner, for so many years a master of this group, and omits practically all the species he records from Burmah and India presumaably because he doubts his identification. This is a pity and one may perhaps doubt the wisdom of so many of Walker's obscurely described species being given as valid with no special authority. Walker using we believe a bit of bottle-glass as a lens, vaguely described many species in the 1870 Catalogue of the British Museum Orthoptera, these species being like many of Motschoulsky's beetles, tacitly ignored as hopeless. Here they revive, we hope, on the strength of the good specimens found in the British Museum, though we fear not.

The following is a summary of the recorded Indian, Burmah and Ceylon grasshoppers and locusts as derived from the publications quoted:—

Tetriginæ, 59, Hancock. *Genera Insectorum.*
Pneumorinæ. O.
Eumastacinæ, 22, Burr, *Genera Insectorum.*
Proscopiinæ. O.
Tryxalinæ, 37 species. This Catalogue.
Oedipodinæ, 28 „ „ „
Pyrgomorphinæ, 21 species. Boliver. *Genera Insectorum.*
Pamphaginæ, 1 species. This Catalogue.
Acridiinæ, 103 „ „ „

The group has received very little attention in India, though grasshoppers abound in the plains particularly, and their collection and study might well be an interesting work for naturalists. H. M. L.

INDIAN BIRDS. *

Judging from the frequent enquiries we receive, there is a great opening for a popular book on the common Indian Birds. It is true that there are already several books, but all of them either deal with a certain class of birds or with those belonging to a particular district.

The author in his preface tells us that "the object of this little book is to enable people interested in our Indian birds to identify at sight those they are likely to meet with in their compound or in their excursions into the jungles." The book is divided into two parts, the first contains—

(*a*) Hindustani names.

* "Indian Birds" being a key to the "Common Birds of the Plains of India" by Douglas-Dewar.—London, John Lane.

(*b*) Classification according to external structural peculiarities.
(*c*) Classification according to colour.
(*d*) Classification according to habits.

Of the first classification there is not much to remark and the user cannot go far wrong with it. We are afraid, however, that many mistakes will be made in using the second classification, though not through any fault of the author; but simply because people have such different ideas as to colour and also many seem to have a difficulty in remembering the colours and their arrangement on a bird, unless they have had the bird itself in their hand. There is such an immense variety and arrangement of colours amongst the birds found in India that it would seem almost impossible to classify them under any satisfactory headings, but nevertheless Mr. Dewar has managed to reduce them to order by dividing up the different colours under ten headings with numerous sub-headings. For instance, under "Grey" we have "prevailing hue grey," "the head only grey," "grey and red," &c. In many cases the same bird is found under several different colours.

The second part of the book consists of a short description of the common birds of the plains, but for the sake of brevity Mr. Dewar has, we think, spoilt what might have been a very useful list. In the first place the descriptions are all too short and secondly the geographical distribution when given, is so brief as to frequently give a wrong impression. Take the White-eyed Buzzard Eagle (*Butastur teesa*), we are told that it is "very common in N. India; rare in the south," but it is a common bird in the Deccan and near Bombay. The Red-headed Bunting (*Emberiza luteola*) is given as "a winter visitor to N.-W. and Central India" although it is also found commonly at Belgaum and Dharwar and we do not think the residents in Eastern Bengal would call *Aquila vindhiana* "abundant." We mention these few instances to show that the distribution given is too brief and indefinite. It is true the author intends this book to be used along with the bird volumes of the "Fauna;" but how many of his readers will also have the "Fauna" "or" Jerdon at hand to refer to?

The omission of many of the game birds and ducks because separate works have already been written on them is, to say the least of it, unfortunate since many people do not want to be bothered with more than one book on birds.

To many, Mr. Dewar's book will be very useful, but the want of a popular book on the Common Birds of India will still be felt.

RECORDS OF THE INDIAN MUSEUM.

The discovery of the connection between insects and disease has, within the last few years, given a great impetus to the study of Diptera. We al-

ready are indebted to Mr. E. Brunetti for much of our knowledge of Oriental blood-sucking flies and in Vol. IV, Part IV of the Records he makes an another important addition under the title of a "Revision of the Oriental Blood-sucking Muscidæ." In this paper he describes several new species belonging to the group *Stomoxinæ* and also gives the original descriptions of species described, adding where necessary redescriptions.

Dr. Annandale's energy in having the vast material under his charge classified and described is most praiseworthy and the first three parts testify to his zeal. In Part I of Volume V we have the first of a series of papers on the Hydroids in the Indian Museum by Mr. James Ritchie; this is followed by some notes on fresh water sponges, a paper on the Phylactolaematous polyzoa of India and a description of a new frog allied to *Rana tigrina*, all by Dr. Annandale himself. Under "Miscellanea" Mr. Stuart Baker records the occurrence of *Vultur monachus* in Calcutta.

In Part II Professor R. Koehler describes some new *Ophiurids* and *Holothurians* collected chiefly during the voyages of the "Investigator," while Mr. H. B. Preston writes on new marine shells brought up by the trawler "golden crown" in the Bay of Bengal.

Captain Lloyd in a short paper on Indian Rats produces some fresh evidence in favour of the opinion that discontinuous variation plays an important part in the production of new races. This is an important paper and we recommend it to all interested in variation. Besides the description of new species from Baluchistan and other places and a list of marine fish from the Karachi Market Dr. Travers Jenkins gives some interesting notes on the Spawning of Hilsa and the parental care in Siluridæ.

A new genus of Psychodid Diptera (moth flies) is described by Dr. Annandale in Part III. This genus is based on specimens taken in the Himalayas and Travancore and is named *Brunnetia* in honour of Mr. E. Brunnetti. Mr. F. H. Gravely gives a useful list of the Oriental Scolopendridæ consisting of a list of the specimens in the Indian Museum, which have been identified by Dr. Karl Kraepelin and he also describes a new subspecies of centipede taken in Calcutta. While working through the Decapoda in the Museum Collections, Mr. S. Kemp found several new species and these he has described, along with some notes on certain species, under the title of "Notes on Decapoda in the Indian Museum." There are some interesting notes on the larvæ of the mosquito *Toxrhynchitis immeserucus* which are contributed by Mr. C. A. Paiva, while Mr. B. L. Chaudhuri gives description of a new species of *Nemachilus* from Northern India. During 1909 and 1910 Mr. J. Coggin Brown of the geological survey collected on behalf of the Indian Museum in Yunnan and in the present part he gives a description of the country in which the collections were made, while Dr. Annandale deals with the sponges and polyzoa brought back from that country.

MISCELLANEOUS NOTES.

No. I.—HYÆNA WITH DEFORMED FEET.

I have been asked to describe the feet of a striped Hyæna (*Hyæna striata*) which were sent to the Society's Museum by Mr. A. H. A. Simcox, I.C.S., of Jalgaon, E. Khandesh. The animal was a full grown female and judging from the fact that the ends of the bones were not united with the shafts, it is evident that it was a young adult. The feet are deformed and present a remarkable appearance. At first sight they gave rise to the notion that the animal was suffering from some disease akin to leprosy, in which there is atrophy of the fingers and toes. However this idea was seen to be erroneous when it was found that the bones showed no signs of disease.

The outward appearance of the feet is shown in the diagrams. There



Fore foot
3 pads.



Hind foot
1 pad.



Normal Abnormal
phalanges of
first row.

are no toes and the claws cannot be seen superficially. The fore feet have 3 pads, the hind feet only one. When examined from the inside, it was found that the claws were present but were buried deep within fissures of the skin. The terminal and middle row of phalangeal bones were missing from all four feet. This constituted the basis of the deformity. The first or proximal row of phalangeal bones were present, but some of these bones

were malformed, their distal ends tapering to a point instead of ending in an articular knob. Between the ends of these phalanges and the nails were a number of small oval pieces of bone about the size of rice grains which evidently represented the distal phalanges. The metacarpals and metatarsals as well as all other bones were normal.

The deformity of the feet is evidently due to a congenital peculiarity closely resembling the condition known as brachydactyly in Man. Congenital absence of finger bones occurs rarely in Man, but it is known to be heritable in a definite manner. Drinkwater has published an account of an English family in which this peculiarity could be traced through seven generations. The history of this deformed Hyæna is very interesting. Mr. Simcox who sent the specimens makes a special note of the fact that the animal was as active as any other of its kind in spite of its deformity. He mentions specially that he was asked by the villagers to kill the animal in order to put an end to its depredations. According to the selection theory a species is not only brought into being by natural selection but after its arrival is kept constant by the same means; that is to say, it is believed that any individuals which differ appreciably from the type of the species must die out because they are less suited to the circumstances of life than their fellows. But in the case of this hyæna we have an example of an animal which differed very widely from the type and yet seemed to be at no conspicuous disadvantage. We should naturally expect that such an animal would be inactive and able to obtain its food only with difficulty. The history however shows that it met its death because of its activity and boldness.

R. E. LLOYD, Capt., I.M.S.

Calcutta, *September* 1910.

No. II.—PORCUPINES (*HYSTRIX LEUCURA*) FOUND IN THE HILLS.

The question has been asked "are Porcupines found in the Hills?" In my own small place, 55 miles from Simla towards the interior, they are quite common. In 1908 I was at "Shongtong," some 140 miles beyond Simla, when the villagers remarked to me that up till lately they had never seen a Porcupine, but that now they were becoming common.

Looking up the copy of the Society's Journal I find the question raised was with regard to Hedgehogs and not Porcupines. I would ask the editors to let this note stay as it is written, because Porcupines are quite new invaders of the far interior. This on the authority of the natives themselves.

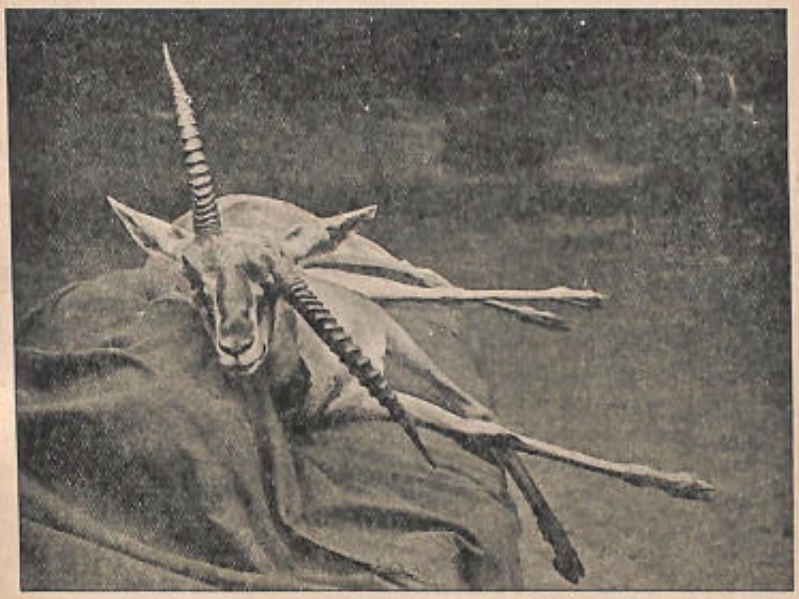
C. E. FENDALL.

Serhan P. O., Bussahir State, Simla District, *August* 1910.

No. III.—AN ABNORMAL CHINKARA HEAD.

(*With an Illustration.*)

Since anything out of the ordinary always attracts notice, I am forwarding photographs of a Chink (*Gazella bennetti*) with an abnormal head which I shot on the 21st August last, not far from a village called Ramania in Kutch. The left horn had grown downwards and had, evidently owing to its pressure, entirely destroyed the animal's eye; the eyelids were also closed



but were quite intact. This horn was not firm at its base and shook a little, but one cannot say at what stage of its growth it had taken the unnatural twist, though I think it probable that it had been injured at its root during its early growth. The right horn measured 11¾ inches and the left (abnormal) one 12⅜ inches and it will be noticed that although the latter had taken a wrong direction, it had still otherwise kept its natural shape. The Chinkara was in good condition.

BHUJ, *30th September* 1910. R. K.

No. IV.—HARDWICKES HEDGEHOG (*ERINACEUS COLLARIS*) AT FATEHGARH.

I find the following entry in my notes and as it is interesting I send it for record.

At Fatehgarh, U. P., on 18th June 1905, I was brought in a live male specimen of *E. collaris* by my grass-cutter. He got it on the left bank of

the Ganges while cutting grass. I intended to keep it alive but it escaped during the night. Blanford states (*Fauna of British India—Mammalia*) that it is found as far east as Fatehgarh. As this specimen was obtained across the Ganges it is probable that it ranges further east. Members in the Hardoi district should keep a lookout for it.

H. FULTON, MAJOR.

DEHRA DUN, 1*st November* 1910.

No. V.—KING CROWS AND BUTTERFLIES.

On the 14th instant I was with Mr. C. B. Antram in a very small patch of wood surrounded by grass downs within a few miles of Ootacamund. Running through this wood was a footpath, and this path was in one place a few feet long thickly strewn with the wings of butterflies; and on either side of this for some yards along the path, were scattered wings. Just above this place three drongos (*Dicrurus*) were to be seen on the trees. The weather was during my visit misty, cold and rainy, and hardly any butterflies were on the wing; consequently I had not the opportunity of seeing the birds hawking them. Dragonflies were abundant, and the drongos made frequent excursions after them, all unsuccessful so far as I saw. On examination the wings were found to belong to the following species:—*Danais limniace* (or *septentrionis*, or both), *Danais aglea*, *Danais chrysippus*, *Euploea core*, *Euploea coreta*, *Hypolimnas bolina* ♀, and *Catopsilia crocale*. At least 90 per cent. of the wings belonged to *D. limniace* or *septentrionis*. There were several wings of *Euploea*, amongst which I found those of the males of both *core* and *coreta*. The remaining species were each represented by only one or two wings. These *Danainae* are common in those parts, and in sunny weather would be passing in numbers through and over the wood, and the most common would almost certainly be *limniace*, *septentrionis*, *core* and *coreta*. *D. chrysippus* would be commoner probably on the outskirts of the wood. The only other butterflies about in any numbers when I was there, were *Argynnis castetsi* and *Colias nilgiriensis*, both eminently insects frequenting the open country, and they would seldom or never be found in anything heavier than scrub-jungle. Some of the wings were obviously quite fresh, others had been beaten on the ground by rain. The three drongos were almost the only birds about, and no other birds that we saw were likely to be capable of capturing these butterflies. It appears to me that the drongos were certainly the cause of this extensive shower of wings; the only other possibility is a lizard or mantid; but no lizard, I should imagine, has either the activity or voracity to make away with such a great number of butterflies, even assuming that they settled within its reach. A mantid is even less probable, and I much

doubt if there is one large enough to tackle *Danainæ* or *Hypolimnas* in the Ootacamund region.

One would not be surprised to find an occasional *Danais* or *Euplæa* sampled by a bird, but to see evidence of a systematic onslaught on butterflies which are so universally looked upon as leaders of the army of distasteful insects, and which are so widely mimicked by numerous "unprotected" butterflies and moths, tends to make one rather sceptical of the accepted theories founded on the alleged value of this distastefulness. It is true that they may disagree with other birds, lizards, etc., but if one enemy alone can effect such wholesale destruction upon them, their immunity from death by violence is so seriously impaired that it seems to me that their numerous imitators amongst the "swallowtails," etc., are simply asking for trouble.

There was no lack of other food for the drongos, and it can only be assumed that they found the *Danainæ* very much to their taste. One can hardly think of a morsel more apparently unpalatable than *Telchinia violæ* yet I saw a bulbul feed its young with one within a few feet of me. It would be interesting if members of the Society would give any evidence in the matter which they can. I have seen the wings of *Hypolimnas misippus* sometimes scattered on the roads near trees in considerable numbers, and on two occasions I have seen the wings of *Charaxes imna*; this I imagine was not caught on the wing; if so, I must congratulate the bird on its powers of flight.

H. LESLIE ANDREWES.

BARWOOD ESTATE, NILGIRIS, *20th October* 1910.

No. VI.—THE SPOTTED-WING (*PSAROGLOSSA SPILOPTERA*).

Blanford states (*Fauna of British India, Birds*, Vol. I, p. 248), "the Genus *Psaroglossa* contains one bird which has been universally considered a starling, but in my opinion erroneously so. Neither its structure, its habits nor the colour of its eggs show any affinities to the Sturnidæ."

My experience may be interesting, as it tends to confirm the view that the Spotted-wing is a starling in its habits and general appearance.

In March 1910 flights of birds which I took to be *Pastor roseus* could be seen every evening. I did not take much notice of them as I had quite made up my mind that the rose-coloured starling was passing through on migration. Every evening some 400 to 500 birds could be seen at dusk flying exactly like *P. roseus*. They settled in the *tun* trees in the next compound. Every morning at dawn parties of 10 to 15 would pass overhead flying west. I generally saw them therefore too late at night or too early in the morning to be able to see what species they were. But from their flight and general form I was certain that they were *P. roseus*.

They disappeared for a time but returned in the beginning of June in increased numbers. As I could not understand *P. roseus* being present at that time I decided to secure some specimens. On obtaining the birds I was surprised to find it was not what I expected. However, being certain from its habits and appearance that it was a starling and that I could easily identify it I was further surprised when I found I could not place it in the Sturnidæ. I then tried the Turdidæ but again without success.

The birds remained till 20th June. During that month there must have been between two and three thousand in the flocks. They came in from the west in small flights at dusk and collected in the trees. They would become startled and suddenly a large flock of thousands of birds would be flying at great speed. In a few minutes they would return to settle and their movements and twittering were exactly like those of the rose starling.

On June 18th I was surprised to see them hawking white ants with the drongos and crows.

Rictal bristles are weak. The measurements of some 20 birds agree with those of Blanford. Irides bright yellow, bill horny, yellowish at gape. Legs, feet and claws horny, light horny in the young.

The young bird (*male*) resembles the male more than the female, but wants the chestnut throat of the male. There are distinct shaft streaks on the throat. (I got no young female.)

Locality.—Dehra Dun, height 2,200 feet.

On dissection I found their stomachs full of the berries of a species of *Ficus* (? *religiosa*), white ants and two or three hymenopterous insects.

They would appear to breed in April as the young birds were flighting in the beginning of June.

I forward the skins of a male, female and young male birds for our Museum.

H. FULTON, Major,
2nd K. E. O. Goorkhas.

Dehra Dun, *3rd November* 1910.

No. VII.—THE HIMALAYAN GREENFINCH (*HYPACANTHUS SPINOIDES*).

The fact that the Himalayan Greenfinch (*Hypacanthus spinoides*) is a local migrant, appears not to be generally known, but there is no doubt that it is so. These birds are common around the hill stations of Chakrata, Naini Tal and Darjeeling from April till October where they breed between 7,000 and 8,000 feet and probably at similar elevations throughout the outer Himalayan ranges. They nest chiefly in the months of July and August.

In November they begin to move down the hills and in January and February they may frequently be seen in fairly large flocks of from 10 to 20 or more birds in the plains at the foot of the Himalaya. This is especially the case in Dehra Dun and eastwards through Bijnor as far as Pilibhit. I have no personal knowledge of the plains below Darjeeling, but it is very probable that the Darjeeling birds winter down below like their North-Western brethren.

B. B. OSMASTON.

CAMP, DEHRA DUN, 10*th November* 1910.

No. VIII.—ROLLER CATCHING ITS PREY IN THE WATER.

In reference to a note by your correspondent Major H. Delmé Radcliffe on the "Roller catching its prey in the Water" (*vide* p. 225, Vol. XX, No. 1), I would draw attention to a note by myself in the "*Field*" for 1901 where, as I said, "I saw a roller (*Coracias indica*) hover over the water like a kingfisher. It then plunged headlong in where it remained for a few seconds and then flew off." This occurred in Tirhoot, Bengal. Again, in my little book '*Familiar Indian Birds*,' page 17, referring to this I put forth the following theory:—"The roller is very kingfisher-like in many of its ways, and might not this taste for water have been inherited by a bird whose ancestors descended from kingfisher-like birds?"

GORDON DALGLIESH.

MIDHURST, SUSSEX, 10*th August* 1910.

No. IX.—AN ALBINO HOOPOE (*UPUPA INDICA*).

About the middle of last July, whilst out riding in the vicinity of Ambala Race Course, I noticed a strange looking white bird in the distance. On closer inspection it turned out to be an albino Indian Hoopoe. It was in company with three other ordinary coloured Indian Hoopoes, two of which, along with the white one, appeared to be this year birds, whilst the remaining one was probably the parent bird.

On returning with a gun on the following day, I had no difficulty in finding the specimen in identically the same place and conditions, and in procuring it.

I now send the skin for the Society's Museum. It appears to be an exceptionally complete albino, with pink eyes and even its bill, tarsus and feet are devoid of colour.

Although the Indian Hoopoe is a common enough bird, I have never noticed, or heard of, any trace of albinism occurring amongst them: and

consequently considered that you might perhaps care to record its occurrence in the Journal.

A. T. BROOKE, R.H.A.

AMBALA, *7th September* 1910.

No. X.—NESTING HABITS OF THE COMMON PARIAH KITE (*MILVUS GOVINDA*).

On page 985 of Volume XIX of the Society's Journal, Mr. Inglis notes on his friend having seen the Brahminy Kite pull twigs off growing trees, while the ordinary kite picks them up from the ground. I have on several occasions, while in Behar, observed the ordinary kite do the same. The method adopted being that it hangs on to the dry twig with its claws and works its wings till the twig comes away.

E. A. D'ABREU, F.Z.S.

KURSEONG, DARJEELING DIST., *5th September* 1910.

[Common kites in Bombay may also at times be seen breaking rotten twigs off trees, but the usual way is for them to take them off the ground.—N. B. K.]

No. XI.—NIDIFICATION OF THE SARUS CRANE (*GRUS ANTIGONE*).

With reference to Capt. A. H. Mosse's note in Journal No. 1, Vol. XX, *re* the Nidification of the Sarus Crane (*Grus antigone*), and also that of Capt. O'Brien's in Vol. XIX, No. 2, it may be interesting to note that I found a nest of this species containing 1 egg on a large jheel about 10 miles from Hardoi, N. W. P., on the 23rd December 1901. The bird left the nest on my approach.

It would appear from these observations that the Sarus Crane is in the habit of breeding after the monsoon.

STANLEY PERSHOUSE,

2nd Border Regiment.

BRADFORD, ENGLAND, *11th August* 1910.

No. XII.—WOODCOCK SHOOTING IN THE NILGIRIS.

The following notes on the Woodcock shooting in the Nilgiris were kindly provided by Mr. Edward Hadfield, one of the oldest shikaris in these hills, who quotes not only from his own experiences but also from the records of his father, the late Major-General Hadfield.

Woodcock invariably arrive on the Nilgiris during the month of October and never has this month gone by without a bird being bagged. The 9th

of October is the earliest date on which the first bird was seen and killed, but the third week in October is generally the earliest that the first cock is accounted for. The October flight is as a rule very small and the birds that put in an appearance can be numbered on the fingers of one hand.

December and January are the months when cock drop in in larger numbers and by the end of March there is not a bird to come across.

In the early sixties a single gun is known to have bagged 250 cock during the season. At present a sportsman is lucky if he bags from 30 to 40 birds during the same period. This great decrease can only be accounted for by the large herds of cattle that now frequent the plateau which have destroyed all the undergrowth in the sholahs usually frequented by cock and by puddlering the marshy ground whence the birds derived their food.

Early in the season the weight of a cock seldom exceeds 8 ounces; later on they increase in size and from 10 to 12 ounces could be put down as the average weight of a bird. The heaviest bird that has been known to have been killed turned the scale at 14½ ounces and was bagged in March.

The largest bag of Woodcock made by two guns within the last 35 years in one day was 7 couple, all the birds that were flushed having been accounted for. In these days one has to be satisfied if one picks up 3 or 4 cock in the course of a day's shoot.

G. C. LAMBTON, CAPTAIN,
Worcester Regiment.

S. P. M. R., OOTACAMUND, *September 28th*, 1910.

No. XIII.—THE LESSER WHITE FRONTED OR DWARF GOOSE ON KABUL RIVER.

I think that perhaps the record of the killing of a Lesser White Fronted Goose (*Anser erythropus*) on the Kabul River here may be of interest to members of the Society. The bird was shot by a friend on 23rd October 1910 a few miles up the river. When first seen it was in the company of a flock of duck.

I identified it from the larger and commoner species by the white on the forehead extending between and just beyond the line of the eyes, and by the size of the bill which measured barely 1·5″ as opposed to the 2″ given for the White Fronted Goose in the *Fauna of India*. I am sending the record, as in the book above referred to, the Lesser White Fronted Goose is described as "a very rare cold weather immigrant to Northern India." I have not heard of any more being shot here.

J. D. G. WIGNALL, LIEUTENANT.

NOWSHERA, N. W. F. P., *1st November* 1910.

No. XIV.—DUCKS IN OKHAMANDAL.

The Okhamandal District is a small strip of outlying territory containing the holy city of Dwarka and belonging to the Baroda State, situated on the Kathiawar Coast immediately South of the Runn of Cutch. It is less than 40 miles in length and nowhere extends more than 12 miles inland. The following list of ducks shot in this area by a single gun during the past cold weather (November 1909 to March 1910 inclusive) may be of interest as recording approximately the proportionate abundance of the different species in Western Kathiawar :—

Number.	*Species.*	*Number.*	*Species.*
2	Whistling Teal.	23	Pintail.
16	Mallard.	3	Garganey.
33	Spot-bill.	39	Shoveller.
58	Gadwall.	8	Pochard.
26	Wigeon.	18	White-eye.
72	Common Teal.	5	Tufted Pochard.

Total 303 head.

Perhaps the most interesting item on this list is the Mallard, regarding which it is stated in "*Indian Ducks and their Allies*" that South of the Punjab and Oudh "it is decidedly rare. It has been shot occasionally in Rajputana, and also in the Central Provinces and in Bombay." It has certainly not been rare this season in this district, occurring, though in small numbers, in any suitable place. The Red-Crested Pochard is not included in the above list, as I did not shoot any, but once saw a little party of half-a-dozen of this species.

One piece of flooded land about a mile long and half-a-mile broad held, in March, from 150 to 200 Shovellers. They were scattered in small flocks but the total number struck me as an unusually large one to find of this species in a single place. The shoveller seems in no hurry to depart and undertake family responsibilities; only to-day (1st May) I counted 14 on a small tank. Other belated birds were a dozen common Teal and five or six tufted Pochards on the 17th April.

I do not think there were fewer Pintail than Gadwall in the district; the former's well-known objection to making the acquaintance of the cooking-pot accounts for the smaller proportion in the bag.

A. H. MOSSE, Captain, S. A.

Dwarka, 1*st May* 1910.

[This note was kept back as it was intended to include it in the Small Game Shooting returns for 1909-10, but owing to so few members having sent in returns it is impossible to publish any information. It is hoped that members will respond more freely at the completion of the present shooting season.—Eds.]

No. XV.—DO SMEWS (*MERGUS ALBELLUS*) GO IN PAIRS?

I was looking over some copies of our Journal when I saw the question mooted "Do Smews go in pairs?" Lieut. Francis, from Derajat, says he saw a couple, of which he obtained one. Many years ago in 1880 or thereabouts I was shooting over the Machiwara Jheel near Ludhiana in company with a friend (E. W. T.). Returning one evening to our camp we saw a flock of some white birds on the other side of a small stream that drains the jheel. E. W. T. creeping cautiously up got within range and dropped a bird. Neither of us could identify it until reference was made to "Jerdon" when it proved to be a Smew. There were quite 8 birds in that flock. The time was Xmas week. Up till then I thought Smews were pelagic only.

C. E. FENDALL.

SERAHAN P. O., BUSSAHIR STATE,
SIMLA DISTRICT, *August* 1910.

No. XVI.—THE BRONZE-BACKED TREE SNAKE (*DENDRELAPHIS TRISTIS*) AT BINA, C. P.

A few days ago I killed a Bronze-Backed Tree Snake (*Dendrelaphis tristis*) at Dhaura which is about 2 miles beyond the boundary of the Central Provinces. I think it may be of interest to record this as Major Wall in Vol. XIX, No. 4 of our Journal, says it has not been recorded from Central India nor from the Central Provinces.

I have the specimen in spirit and can send it for identification if necessary.

E. BERNARD COOKE.

BINA, 25*th October* 1910.

[We have seen the specimen which is an example of *D. tristis*. Mr. Cooke has kindly presented it to the Society's Museum.—EDS.]

No. XVII.—EXTENSION OF THE HABITAT OF *LYCODON FASCIATUS*.

On the 25th August 1910, I obtained a specimen of *Lycodon fasciatus*, from the Goomtee Tea Estate near Kurseong, at about an altitude of 4,000 feet.

This snake appears originally to have been recorded from Yunnan and

recently from Burma and Assam by Majors Wall and Evans. As I am not aware of its being recorded previously from the Darjeeling Himalayas, it might be worthy of record in our Journal and I enclose a description.

The specimen measured 3 feet including the tail which was 8½ inches long. The body was encircled by 52 broad black bands with irregular margin separated by yellowish green intervals; 16 of these band encircled the tail. The black bands were broadest on the neck; the first two failed to encircle the body and the third just did so. The seventh black band and onward were ornamented with irregularly shaped yellow spots which disappeared on the tail. The yellow interspaces were likewise marked with black. Upper parts of head black with a yellow spot on each internasal, præfrontal, præocular, supraocular, loreal, temporal and a spot on the parietal suture. Labials yellowish, the sutures black. The scales were in 17 rows at a point two-head lengths behind the head, at midbody 17 and two head-lengths before the vent 15; the scales were feebly keeled but more pronounced posteriorly. The ventrals were 214, the subcaudals in 98 pairs. Anal entire. One præocular and one postocular on the left while there were two on the right. Supralabials 8, the 3rd, 4th and 5th entering the eye on the left side and only the 3rd and 4th on the right side. The infralabials in contact with the anterior chin-shields were 4 right and 5 left. The anterior chin-shields shorter than the posterior The loreal though tapering to a point anteriorly did not appear to enter the eye.

E. A. D'ABREU, F.Z.S.

KURSEONG, DARJEELING DISTRICT,
5th September 1910.

XVIII.—NOTES ON A BROOD OF YOUNG SEA-SNAKES (*DISTIRA SPIRALIS*, SHAW).

I am indebted to Dr. J. R. Henderson for the opportunity of examining a brood of the Sea-snake *Distira spiralis* (Shaw), variety *typica*. The parent, which is the largest recorded Sea-snake I have any knowledge of, measured 8 feet 3 inches, and on being skinned proved to be gravid containing 14 embryos apparently just ready for discharge. She was captured on the 1st June 1910 in Madras. The Sea-snakes have hitherto proved such a confusing group, and the opinions of herpetologists have been so much at variance with regard to the species, that notes on a brood are of much value.

I have arranged the most important features observed in each in tabular form, as follows:—

	Sex.	Length.	Ventrals.	Costals.			Labials touching eye.	Marginals.	Rings.		Vertebral Spots.	
				Anterior.	Midbody.	Posterior.			Body.	Tail.	Anterior.	Posterior.
1	♂	11½″	353	28	32	31	3rd & 4th.	1 after 3rd infralabial.	43	3	In first 9 spaces.	In last 6 spaces, including tail.
2	♂	11¼″	345	29	33	31	Do. ..	2 after 3rd ..	43	4	In first 4 spaces and 6 midbody.	None.
3	♂	11¼″	346	27	31	30	Do. ..	All after 3rd ..	45	4	In first 2 spaces..	8, not in a continuous series.
4	♂	11⅜″	336	27	30	31	Do. ..	1 after 3rd ..	51	4	None	None.
5	♂	11½″	334	28	29	31	Do. ..	2 after 3rd ..	44	3	6th to 9th spaces.	9 continuous.
6	♀	11″	362	30	34	35	3rd, 4th & 5th, the 5th divided.	All after 3rd (R), all after 2nd (L).	43	3	7th to 11th spaces	11 continuous.
7	♂	11¼″	331	28	31	30	3rd & 4th.	2 after 3rd ..	43	5	2nd, 5th and 6th, 10th and 11th and 14th.	3 continuous.

L implies left. R right.

	Sex.	Length.	Ventrals.	Costals.			Labials touching Eye.	Marginals.	Rings.		Vertebral Spots.	
				Anterior.	Midbody.	Posterior.			Body.	Tail.	Anterior.	Posterior.
8	♂	11½″	341	27	28	30	3rd & 4th	2 after 3rd ..	41	3	None	7 continuous.
9	♂	11⅝″	328	27	31	32	Do. ..	Do. ..	46	5	1 faint in 1st ..	2 faint in last.
10	♂	10½″	?	26	?	?	?	? ..	46	5	8th, 9th, and 10th.	None.
11	♀	11¼″	370	30	34	36	3rd & 4th.	2 after 3rd ..	42	3	In first 20 spaces..	16 continuous.
12	♀	11″	344	29	33	34	Do. ..	2 after 3rd (R), 1 after 3rd (L).	39	2	1st to 8th, and 11th to 18th.	7 continuous.
13	♂	11¼″	319	28	31	30	Do. ..	2 after 3rd ..	47	4	1 in first	1 supra-anal.
14	♀	10¾″	355 ?	30	35	35	Do. ..	Do. ..	47	5	1st, 8th to 19th ..	3 continuous.
								Parent.				
15	♀	8′-3″	?	?	?	?	?	? ..	45	4	12th, 13th, 20th, 21st.	None.

L implies left. *R right.*

It will be seen that the males, all of which had their genitals extended and were therefore easily sexed, considerably outnumbered the females, there being 10 of the former to 4 of the latter.

Sexual differences are apparent. The ♂♂, which measured from 11 to 11¾ inches, show a very slight tendency to exceed the ♀♀ in length, the latter ranging from 10¾ to 11¼ inches. Males again usually exhibit a decidedly smaller number of ventrals, these varying from 319 to 353, as compared with 344 to 370 in the females. The number of these shields between the anal and navel is of no account, there being from 23 to 27 in the ♂, and 24 to 25 in the ♀. Females tend to have a larger number of costals in all parts of the body length but especially behind. Anteriorly (2 headslengths behind the head) they number 29 to 30, against the male 27 to 29, in midbody they are 33 to 35 against the male 28 to 33, and posteriorly (2 headslengths before the anus) they are 34 to 36 against the male 30 to 32.

Lepidosis.—All the specimens agreed in having the praefrontal in contact with the 2nd superlabial (except on the left side of No. 14 where it just failed to touch), one praeocular, one postocular, and the posterior sublinguals in contact.

Markings.—The markings of the brood show considerable variation. The rings are mostly of very even width and complete. Some show a slight, and others a more decided tendency for the rings to dilate vertebrally. In some they are discrete ventrally, in others dilated, especially anteriorly, and in others more or less connected by a ventral black band. The vertebral spots that occur in the interspaces are very variable. In one specimen they are quite absent, in another there is one faint spot in front and two faint behind, in others they form a fairly continuous series. In the majority there are no ventral spots in the interspaces, in some these are distinct, and in one the ventral band connecting the rings dilates in each interspace. In all the rings are all or mostly complete, on the other hand in some they are incomplete ventrally, especially behind.

In the parent the rings are not connected ventrally but are interrupted posteriorly, and there are but two vertebral spots.

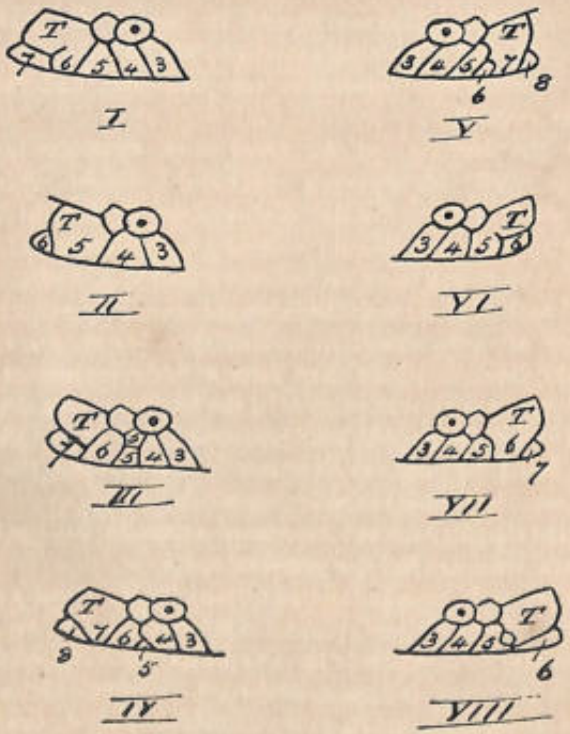
The differences to be seen in the individuals of this brood are very instructive, and entirely support opinions expressed by me in my monograph of the Sea-snakes* with regard to the two forms *Hydrophis spiralis* (Shaw) and *Distira brugmansi* (Boie), which Boulenger considered distinct.†

In my monograph (page 210) I gave reasons for believing that these two forms were not species distinct from one another. The former was placed in the genus *Hydrophis* by Boulenger on the assumption that the post maxillary teeth are not grooved, whereas in the latter, which he placed as a

* Mem. Asiat. Soc., Bengal, 1909, p. 177 and 178. † Cat. Vol. III.

Distira, they are. By the discovery of grooves in these teeth in specimens of the former in the British Museum, the chief reason for considering the two forms distinct was removed, and I went on to show that the only apparent differences that remained, judging from Boulenger's detailed descriptions, affected the number of the supralabials (6 or 7 for *spiralis* and 7 only for *brugmansi*) and ventrals (270 to 334 for *spiralis* and 300 to 354 for *brugmansi*). I remarked that I found specimens labelled *brugmansi* in the British Museum with 6 supralabials, and that the range of ventrals given me for 65 specimens I had examined which I considered alike, was 282 to 373.

As regards markings I showed that there was at least one specimen labelled *brugmansi* in the British Museum with vertebral spots in some of the interspaces, similar to those characteristic of the form labelled *spiralis*.



DISTIRA SPIRALIS.

To show variations in the posterior labials (1 to 8) and temporal (T).

An examination of the brood now before me confirms the above stated opinions, for it will be seen (1) that the supralabials are variable, (2) the

ventrals range from 319 to 370, and (3) whilst some specimens have many vertebral spots, one at least has none at all, and another a single faint one anteriorly and two behind.

It seems to me absolutely conclusive that *spiralis* and *brugmansi* should be considered a single species for which the former name having precedence should hold.

Another opinion expressed by me in my monograph* is that individuals of the same species show so much variation in the number and disposition of the supralabial and temporal shields that with few exceptions these shields are of very dubious, if any, value in assisting the classification of the group. Reference to the figures I append taken from the brood before me strongly support this statement.

I think it is obvious in figures I and VI that the temporal is confluent with a subjacent labial, but even in figures II and VII, I think it better to record the condition as (figure II) supralabials 6th, 5th confluent with temporal, and (figure VII) supralabials 7, 6th confluent with temporal, instead of saying temporal reaching labial margin, and not including this shield in the supralabial series, as some authors do.

A careful search for the fœtal tooth in these specimens was unavailing.

I take this opportunity of appealing to those members of our Society residing on our coasts, to send any specimens of gravid sea-snakes to our Secretary. The study of a brood may lead to most important conclusions, and may materially reduce the difficulty in classifying the group.

F. WALL, C.M.Z.S., MAJOR, I.M.S.

CHITRAL, 18*th August* 1910.

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* Loc. Cit., p 178.

No. XIX.—KRAIT AND LANDRIA (*D. TRIGONATUS*).

I send you two snakes which were the actors in a grim tragedy on October 21st, 1910, at the Residency, Bhuj. The one I have little hesitation in calling the Common Krait (Cutchi-*Padamnag*) as it seems to tally with Major Wall's description. It is not full grown, being 31 inches only. The other yellowish-green with coffin-shaped head and white semi belts edged with black scales down its back is called *Landoria* by some Deccani and Konkani sepoys. H. H. the Maharao Sahib says its Sindhi name is *Landria*, and Cutchi *Kodia*. We have usually considered this to be the Phoorsa, but it does not seem to be scientifically correct to do so for it appears to differ largely from the *Echis carinata* of Major Wall's book. This snake measures 38½ inches.

At 7 a. m. Col. H. M. Abud, the Resident in Cutch, found the Landria hanging by a twist in its tail to a twig of the bougainvillia growing over his porch. Hanging on to its head was the krait, the krait having the

landria's head in its mouth. The landria was struggling violently to shake off its foe, so much so that its own hold of the twig slipped and it fell with its tail still knotted. The krait edged backwards dragging the still struggling landria half way up a small bank sloping to the Residency wall. When I arrived at about 7-15 the landria's struggles were getting faint and they ceased altogether before long. The krait was meanwhile gradually swallowing the landria; it was slow work. We noted the time taken between the engulfing of two white spots about an inch apart; it took 3¾ minutes. It was a puzzle to us to guess what would happen later on, for the landria was the longer reptile and it was not likely that its head would get much beyond the krait's middle without serious consequences to the krait, the more so as the twist in the landria's hind-quarters would have to be negotiated. One of the servants, Uka Bhil, suggested that the krait would probably bite off the end part of the landria and thus avoid the difficulty. He had seen a big snake do that to a small fellow before.

The krait's progress grew slower as it reached the more swollen part of the landria. For quite an hour the latter had been motionless and we thought it must be dead; but suddenly it began to give spasmodic twitches and wriggles.

For two and three-quarter hours the struggle had been going on and we computed that 18 inches of the landria were still outside though the twist in the tail which had in the struggle worked upwards to a higher point, made accuracy impossible. The krait then gave some violent twitches and elevated his upper jaw almost perpendicularly and began to disgorge slowly at first, then rapidly drawing himself back in order to do so, in a few seconds he was clear and back in his normal dimensions. He proceeded to make off, but seeing people about, he lay under shelter of a flower pot and was then despatched.

The landria seemed unharmed in body except for glazed eyes, distorted jaw, frayed scales and the broken part in his midbody.

The landria was still living. Uka Bhil says the landria lives in roofs and trees; the krait in holes in the ground. The scene was witnessed by H. H. the Maharao, Col. H. M. Abud, M. N. S. Vijayarajji and myself besides numerous servants.

J. H. SMITH.

[The Landria proved to be the Common brown Tree Snake (*Dipsadomorphus trigonatus*). The Kraits are well known to feed on other snakes and frequently are found in the roofs of houses.—EDS.]

No. XX.—CASE OF SNAKE BITE FROM HIMALAYAN VIPER.

Having read several letters in the Journal about snake bite, I send you a few notes on a case which I was called on to treat last August, hoping they may prove of interest. About 9 a.m. on 24th August 1910 the

sweeper of the Cantonment Hospital, Chietoo by name, was brought to me and stated that he had been bitten by a snake about 8-30 a.m. whilst he was cutting grass. He had two pairs of small incisions on the left index finger, there was considerable swelling of the finger and back of the hand. He had been to see the mali at the Station Hospital as he said he could cure snake-bite, however the Hospital Assistant thought otherwise and brought him to me. A tight ligature was placed round the wrist, both bites were deeply incised, crystals of permanganate of potash rubbed in, and two tubes each containing 20 c. c. of antivenine were injected into his forearm by Capt. W. R. Galway, R.A.M.C., and myself. Whilst the injections were being given the man collapsed. His pulse being very rapid and running, his body profusely wetted by a cold sweat. There was no vomiting or diarrhœa. The man was put to bed and when seen in the afternoon stated he felt fairly well except for severe burning pain in the left arm. His evening temperature was 100·6, next morning it was normal, after this his progress was satisfactory and in three days he returned to duty. I enclose the skin of the snake which is, I think, a common hill Viper of which I have caught several specimens.

J. E. M. BOYD, Capt., R.A.M.C.

Silverton, Dalhousie, *25th October* 1910.

[The skin is that of a Himalayan Viper *Ancistrodon himalayanus*.—Eds.]

No. XXI.—THE FOOD OF A BULL-FROG.

One of the most interesting facts of animal life is the variety of measures adopted by animals to ward off their enemies. The familiar Bag-worm or Lictor-insect, the caterpillar of a Psychid moth which forms a case of Babool spines bound close together like the fasces of the Lictors of ancient Rome, may be supposed to have hit upon an effective plan to protect itself, but one was discovered within the stomach of a frog which I dissected at the Poona Agricultural College before half a dozen persons. The spines were about three-fourths of an inch in length with the sharp points intact. The frog was a good sized female and besides the Psychid larva there were several small fresh-water shrimps.

H. M. CHIBBER.

Agricultural College, Poona, *October* 1910.

No. XXII.—FISHING IN BURMA.

With regard to Mr. Adam's query in Miscellaneous Note No. XXII in Vol. X, No. 2, of the Journal, as to the Burmese name for the mahsir :—the boatmen I have employed while fishing in the Irrawady in the neighbourhood of Myitkyina use the names Nga Shu, Nga Dauk and Nga Ni for the

three kinds commonly caught by anglers in that part of the river. The Nga Shu is a long fish with a long head, a large and very telescopic mouth and heavy shoulder; all the fish over 30 lbs. in weight that I have caught or seen belonged to this variety. The Nga Dauk is a thicker, deeper fish than the last and has a comparatively small head and mouth. The Nga Ni on leaving the water is as red as a boiled lobster except on the belly, which is white. I have heard it said that the Nga Ni is the male of the Nga Dauk, I do not know with what truth; I have found it to be much more 'overhung' than either of the other varieties and to take a spoon less frequently, from which one may perhaps infer that it is more of a bottom feeder. I once saw a large shoal of red fish ascending a small river just before the rains. I do not know if mahsir migrate in shoals of one sex or in mixed parties.

J. H. WHITEHEAD, MAJOR.

S. S. "STAFFORDSHIRE," *5th November* 1910.

No. XXIII.—*ARGYNNIS HYPERBIUS*, VAR. *CASTETSI*: AN APPEAL.

I am asking for the co-operation of entomologists in S. India to assist me in investigating the area and distribution (including elevation) of the dimorphic female of *Argynnis hyperbius* form *castetsi*, more particularly that form which is without the purple apex and white subapical band which is so distinctive of *castetsi*. My reason for asking assistance is to throw further light on the evolution of the *Argynnidæ*.

Dr. F. A. Dixey, F.R.S., in his classical paper, "On the phylogenetic significance of the wing markings in certain genera of the Nymphalidæ" Trans., Ent. Soc., London, 1890, gives his reasons for the view that the wing markings of the *Vanessidæ* have been derived from an ancestor with wing markings very distinctive of the *Argynnidæ*, and further that the dark females of many *Argynnidæ* retain the ancestral features of that family.

He shows that this is most marked in the North American species *A. diana*, which is almost entirely of a deep blue black colour, and well marked also in the Chinese species *A. sagana*, which has the male very similar to *A. hyperbius* but the female of a dull uniform brown with a white subapical band. These ancestral features are less clearly shown in the European *A. pandora* which has the wings, more particularly the bases, olive-green, and in the form *A. valezina* the dimorph of *A. paphia*, which is found not uncommonly in the New Forest. In India *A. hyperbius* female retains the dark colouring. But at the time Dr. Dixey wrote his paper he was unaware that in S. India this species has a dimorphic female, the one representing the ancestral type (*castetsi*), the other (*martini*??) representing the newer development, *i.e.*, by more closely resembling the male. The

interest attaching to these insects is therefore manifest. *Martini* is, I believe, a high range insect; it certainly does not occur at Coonoor where *A. castetsi* is common, and which I have bred freely. I should be extremely grateful to entomologists residing, or who have collected, in these localities for any information they can send me. I should wish for a large number of specimens from various localities to ascertain whether the two forms show any intermediate features. It is a species quite easy to breed; and for this purpose a fresh, not a worn, female should be captured and placed under muslin over a pot of wild or garden pansies (they will *not* feed on the common violet) with a slice of orange soaked in sugar and water, or for that matter any available fruit will do.

The usual habit of butterflies is to lay a few eggs, go off and feed and then lay again and much disappointment may be avoided by enabling the captive to feed freely. The whole of the brood should be kept. I hope to publish the results at a future date.

N. MANDERS, Lieut.-Colonel, F. Z. S.

Colombo, Ceylon, 1*st November* 1910.

[*Argynnis hyperbius*, var. *castetsi*, was described by Oberthür in 1889.—Eds.]

No. XXIV.—NOTES ON *COLOTIS* IN SIND.

No less than six forms of the genus *Colotis* are found in Sind: *Colotis amata*, *Colotis protractus*, *Colotis vestalis*, *Colotis fausta*, *Colotis etrida* and *Colotis danæ*. Of these the first three are invariably found in close association and not uncommonly all six may be taken in one small area. All down the lower basin of the Indus, in the extensive acaciæ forests which line its banks, the first three of the above list, literally swarm in hundreds and this for practically the whole year round. *Colotis etrida* may be found anywhere and at any time of the year; *Colotis danæ* and *fausta* only appear in August and September, the latter appearing to be comparatively uncommon. In July of this year, I took *C. amata* and *C. vestalis in cop*, a female of the former being connected with a male of the latter. A week later I again saw these two in connection, the same sexes respectively being engaged and on the same day I netted and bottled a male *protractus in cop* with a female *amata*. All three pairs were killed without causing separation so that I was able to satisfy myself as to the forms and sexes engaged. Since then I have time and again seen these three forms breeding thus promiscuously. Unfortunately I have not so far been able to obtain eggs from a female thus impregnated so am unable to say what the resulting hybrids would appear like. I find that eggs laid by the typical forms breed true, this being the conclusion I arrived at after breeding from the egg some hundreds of all three forms. No difficulty was met with

in collecting the eggs of *C. amata* as it lays its eggs in large batches of five to as many as forty; *C. protractus* and *vestalis* on the other hand always lay singly so that specimens had to be followed round patiently until a dozen or so eggs had been secured, after which the parent would be netted, killed and laid aside to compare with the children when they finally emerged from the pupa. *Amata* differs from all other forms of its genus, in thus laying its eggs in batches and as one would suspect, the resultant larvæ are gregarious. The larvæ of all other forms feed singly. Although *C. protractus* and *vestalis* are often seen *in cop* with *C. amata* yet curiously enough the two former have never been seen by me in connection. The affinities between the two is so close and on the other hand both diverge so widely from *amata* that one would suspect a different state of affairs. On the wing I have taken a female *vestalis* with the discal and juxta-discal areas beautifully suffused with the salmon-buff colour of *protractus* and this I regard as a hybrid of these two forms, although, as I have already mentioned above, I have never seen them *in cop*. I have another form of *C. protractus* in which the salmon-buff ground colour is almost entirely replaced by the creamy white of *vestalis* and this too may be regarded as a hybrid between the same forms. All three forms show wide variations, in fact a whole series may be obtained of such. *Colotis* is pre-eminently noted for the extreme variations which are seen amongst its various forms and these are rightly ascribed to influences of climate, temperature and perhaps food, it may be, however, that hybridism plays a greater part than hitherto suspected.

I append a description of the larvæ of *C. protractus* and *vestalis* as I believe they have not hitherto been described.

C. protractus.—Ovum pure white, ampulliform in shape, strongly ribbed. Hatch out on the third day.

Larva.—Grass green, at first a crimson stippling along the sides but this gradually fades in successive moults until finally lost in the last. The final skin has a peppering of white minute dots and tiny bristles covering the skin. There is a white dorsal line along the back which may or may not have a yellow edging. In shape, cylindrical like that of *T. hecabe*. This larva is interesting in that it is the only one of its genus (so far as the Indian forms are concerned) that has not got a black head when first emerging from the ovum.

Pupa.—Creamy, flesh-coloured or pale green with no markings; body stout, with a stunted point at the head. Suspended upright by waist-belt and anal attachments.

C. vestalis.—Ovum pure white, ampulliform in shape, strongly ribbed. Hatching on the third day.

Larva.—First skin bears a shiny, jet-black head, body grass-green with crimson-stippling latterly which in the posterior three segments spreads

upwards and meets that of the opposite side, so as to form a more or less prominent crimson patch. This stippling fades during successive moults and is entirely lost after the last. The black colour of the head gradually passes off also; after the first moult, it is present as a black crown to the green head, this crown grows smaller and is entirely lost after the final moult. The final skin is identical with that of *protractus*; when mixing the two together I have been quite unable to say which was *vestalis* and which *protractus*.

Pupa identical with that of *protractus*, usually flesh-coloured and without markings.

The larvæ of the whole of this genus, so far as the Indian forms are concerned, bear characteristic bristles. These are seen to perfection in *C. etrida* and in the early skins of all. Under a high power of the microscope, an individual bristle is seen to be mounted on a whitish, nipple-like process and to bear a transparent club or bead at its free end. Under certain lights this bead is highly refractive and often gives off a brilliant gleam like the glow of red-hot charcoal. The bristles are six in number on each segment, arranged in an unequal-sided sexagon. The two anterior are placed close to either side of the dorsal line, the two medial, well down the sides, the two posterior not quite so near the median dorsal line as the anterior pair. A similar arrangement is met with throughout all the larvæ of this genus and forms a most important binding link for purposes of classification. In *protractus* the beads are often lost after the final moult but the bristles persist; in *etrida* they are seen to perfection after the final moult.

Lately being interested to see this characteristic spread to the allied genus, I examined the larva of *T. hecabe* and find that the same bristles with the same arrangement is to be seen in it, the only difference being that the major bristles are reinforced by a host of smaller ones which do not however hide the arrangement of the former.

F. C. FRASER, Capt., I.M.S.

Hyderabad, Sind, *September* 1910.

No. XXV.—THE OCCURRENCE OF *ATELLA ALCIPPE*, Cramer, IN NORTH MALABAR.

Mr. T. R. Bell describes this species as occurring very locally in North Canara and as having been obtained recently in Travancore. Whilst in North Malabar I went twice up what is known as the Tambracheri ghat, between Pudupadi and Lakkadi, in April and noticed considerable numbers of this species flying about. On a third occasion I took my net and captured as many specimens as I required. At the foot of the ghat (about 500 feet) it was comparatively scarce but from about 1,000 to 2,000 feet

elevation I saw them literally by hundreds. There are some peculiar little marshes here and there on the ghat covered with grass or sedge of a particularly dark green colour, and as the butterflies were hovering over these in large numbers, I imagined that the food plant was to be found there.

The rainfall on this ghat is particularly heavy and, on the only other occasions I had of traversing the ghat, there was so much rain that no self-respecting butterfly would have shewn itself. I have not seen this species anywhere else either in Malabar or in the Anaimalai Hills of Coimbatore.

P. M. LUSHINGTON, I.F.S.

COIMBATORE, 27*th October* 1910.

No. XXVI.—FOOD PLANTS OF *ATELLA PHALANTHA*.

Mr. Bell in his paper in the last issue of the Journal gives the food plants of *Atella phalantha* as all belonging "as far as is known" to the genus *Flacourtia*. I have bred it from larvæ found on *Salix tetrasperma*, Roxb. The young shoots of this tree in swamps here are almost defoliated by it in spring, and the butterflies may be seen in scores flying round the lower branches and laying their eggs.

H. LESLIE ANDREWES.

BARWOOD ESTATE, NILGIRIS, 20*th October* 1910.

No. XXVII.—LARVA OF *VANESSA INDICA*.

On page 282 of the last number of this Journal (Vol. XX, No. 2), the author of the paper on "Common Butterflies of the Plains of India," speaking of *Vanessa indica*, remarks:—"This butterfly has not been bred as far as is known."

I have repeatedly reared *Vanessa indica*, in Ceylon, from larvæ feeding upon the foliage of the large "Nilgiri Nettle" (*Girardinia heterophylla* var. *palmata*). Moore also, in the "Lepidoptera of Ceylon," records its food plant as *Urtica neilgherriensis*, which is presumably a synonym of the same plant.

The larva has habits similar to those of its European relative, spinning the edges of a leaf together and resting within the shelter so formed. It frequently pupates within the larval shelter. In appearance the larva is very like that of *atalanta*, but is usually rather darker.

The Nilgiri Nettle is a formidable plant. Its stinging spines are long and sharp, and can penetrate ordinary clothing without any difficulty. The sting is very painful at the time, but its unpleasant effects pass off more rapidly than do those of the common European nettle.

E. ERNEST GREEN.

PERADENIYA, CEYLON, 26*th October* 1910.

No. XXVIII.—BUTTERFLIES OF THE KONKAN.

By the time this note is published in the Journal most residents of Bombay will probably have forgotten the heavy downpour of rain in the forenoon of Sunday, 21st August 1910. Let it suffice therefore to say that for an hour or so it was coming down about as hard as it could. At the time it set in, I was in a steam launch with a friend lying off Sunk Rock lighthouse in Bombay harbour with the intention of angling for our local sporting fish, the Ravas (*Polynemus plebeicus*). The wind was blowing fresh from W. N. W. Such are hardly the conditions or locality to encourage one to anticipate observations on butterflies worth recording. In the thick of the storm however and evidently with the hope of obtaining shelter, two specimens hovered round the launch which I have never previously observed in Bombay Island. The first was an *Arhopala*, presumably *amantes*, and apparently a more or less perfect specimen. The species is however known in the hilly jungles of Thana and Colaba Districts. Presently there appeared a large and very battered butterfly that at once attracted my attention as a stranger. It settled on the launch and I was then able to recognise it as *Parthenos virens*. I tried to catch it in order to establish its identity beyond all question of doubt, but it was restless and I failed. It is not however a species there is any difficulty in recognising. This species inhabits southern India as far north as Kanara and in our Journal (Vol. XV., p. 48) Mr. E. H. Aitken and I recorded that he had once seen it at Vingorla.

E. COMBER.

BOMBAY, 28*th August* 1910.

No. XXIX.—BUTTERFLIES OF KUMAUN.—ADDENDUM.

372. **Parnassius epaphus,** *Oberthür.*

Two males were brought in by a native catcher who accompanied Mr. S. L. Whymper to the Niti Pass in June 1909, presumably taken at about 14,000 ft.

In size and markings they resemble very closely race *sikhimensis*, Elwes, as figured by Bingham (Vol. II., pl. XV); the two distal crimson spots on the upperside of the forewing are, however, larger and fused into a short bar. They have no resemblance to the forms *nirius* or *cachemirensis* as figured by Dr. Seitz (Macrolepidoptera Palaearctica, plate 15).

HESPERIIDÆ.

373. **Pamphila avanti,** *Moore.* A single male from the Niti Pass, 15,000 feet, in July.

ERRATA.

In Part II of this paper (No. 2, Vol. XX), the following *errata* occurred :—

Page 363, No. 193 for **Synchlœ**....*Euchlœ* read **Synchlœ**....*Euchlœ*.
„ 364, „ 213 for *pubella* read *rubella*.
„ 364, „ 224 for **Iains** read **Iaius.**
„ 365, „ 237 for **Ialmora** read **zalmora.**
„ 367, „ 273 for *L. liba* read *Z. ziha* and '*Z*' for '*L*' as the generic initial throughout.
„ 370, „ 315 for **Rupala** read **Rapala.**
„ 370, „ 332 for 24,000 *ft.* read 2,400 *ft.*
„ 371, „ 339 for **angiades** read **augiades.**
„ 371, „ 354 insert **syricthus** after **Caprona.**

F. HANNYNGTON.

FELPHAM, SUSSEX, *September* 1910.

No. XXX.—NOTES ON LIFE HISTORY OF *VANESSA INDICA* AND *KASHMIRENSIS.*

Larvæ.—Found between 1st and 7th May 1908 feeding on the large Himalayan nettle near Naini Tal at 7,000 feet.

(Larvæ of *V. kashmirensis*, found at the same time and elevation, were all feeding on the common nettle (*U. dioica*).

When young the larva is reddish black with black spines and pale yellow sub-spiracular line. At the second moult, the spines on 2nd and 3rd segments are yellow and at the third moult the spines assume the pale lemon-yellow tint of the full grown larva. The spines on the head and subspiracular line are lemon-yellow throughout life.

The legs are black, the claspers and ventral surface pale-yellow. Larva sluggish in habits and rolls in a ball when disturbed.

Pupa.—Identical in shape with that of *V. atalanta*, but much darker in colour. Wing-cases dull smoky green. Body brownish green with whitish stripe down spiracles. Anterior thoracic protuberance and 12 ventral spines tipped with golden bronze. Pupal state lasted from 10 to 12 days; the first butterfly hatching out on 21st May 1908.

Imago.—The butterfly is apparently double-brooded in Kumaun, the second brood appearing in September and hibernating.

Vanessa kashmirensis.

Eggs.—Laid early in April, larvæ appeared on 20th April 1908, and were full fed on 7th May 1908. Butterflies hatched out between 20th and 30th May 1908.

Two of the pupæ failed to hatch out and, on examination, the entire pupal case was found to be occupied by a large white grub which apparently developed after the change to pupa instead of hatching out from the full-fed larvæ. In habits and appearance larvæ and pupæ almost exactly similar to those of *V. urticæ*.

F. HANNYNGTON.

RICHMOND, S. W., 16*th November* 1910.

No. XXXI.—SOME BUTTERFLIES TAKEN AT FATEHGARH.

As records of the distribution of species are often of interest I append a list of butterflies taken by me in a garden at Fatehgarh during portions of 1908 and 1909, *Lycænidæ* and *Hesperiidæ* being omitted for want of identification.

1. *Danais plexippus*, Linn.—Common.
2. *Danais chrysippus*, Linn.—Very common. Seemingly not distasteful to mantis as I saw a mantis devouring one, and it only discarded the remains when it had eaten all the body.
3. *Danais limniace*, Cramer.—Fairly common.
4. *Euploæa core*, Cramer.—Common in rains.

Although oleander plants were numerous in the garden, probably some more attractive food-plant was there too, as I never found any larvæ or pupæ nor any of the butterflies about the oleanders though I often searched; whereas in a garden in the Central Provinces some years ago where there were few oleanders I found both larvæ and pupæ on them, and saw the butterflies depositing eggs on the underside of the leaves.

5. *Euploæa mulciber*, Bingham.—Two ♂ ♂ and one ♀ taken in the rains.
6. *Mycalesis perseus*.—Fairly common.
7. *Melanitis ismene*.—Very common in the rains, but much less in evidence during the dry season.
8. *Junonia lemonias*.—Common.
9. *Junonia orithya*.—Fairly common.
10. *Junonia hierta*.—A few taken.
11. *Junonia almana*.—Several taken.
12. *Vanessa cardui*.—One taken.
13. *Hypolimnas bolina*.—Common. At several places about the garden males took up each his position and drove away all intruders.
14. *Hypolimnas misippus*.—Common.

The '*dorippus*' variety and some intermediate between it and the ordinary form of the ♀ were taken, though I did not there meet with the '*dorippus*' variety of *D. chrysippus*.

15. *Atella phalantha*.—Common in the rains.
16. *Argynnis hyperbius*.—Common.

17. *Cirrochroa mithila.*—Two of each sex taken and one more of each seen. The wings of this species seem to be very brittle.

On page 644 of Vol. XIX of the Journal, "was taken at Lucknow" seems to imply this to be the only record so far of the capture of this species in the plains. So the taking of four specimens and two more being seen at Fatehgarh would seem worth recording.

18. *Telchinia viola.*—Three taken.

19. *Abisara echerius.*—One taken.

20. *Papilio aristolochia.*—Very common in November.

21. *Papilio demoleus.*—Abundant.

22. *Papilio polytes.*—Common. '*cyrus*' form, two ♂ ♂ taken. One '*romulus*' ♀ taken, another seen.

23. *Papilio clytia.*—One worn specimen taken in August. '*dissimilis*' form fairly common.

24. *Delias eucharis.*—Abundant, especially in October.

25. *Anaphæis mesentina.*—Abundant in November.

26. *Pieris brassicæ.*—Common in early spring.

27. *Huphina nerissa.*—Common.

28. *Ixias pyrene.*—One taken and another seen.

29. *Ixias marianne.*—Very common.

30. *Appias hippo.*—One taken in July.

31. *Appias lalage.*—One ♀ taken in the hand 1st December 1909.

32. *Appias albina.*—Two ♀ ♀ and one ♂ taken, and a few others seen.

33. *Catopsilia crocale.*—In the dry season var. *catilla* only was met with and was fairly common; in the rains both *crocale* and var. *catilla* very common in company, the latter in greater number.

34. *Catopsilia pyranthe.*—Very common.

35. *Catopsilia florella.*—Very common, especially in the autumn.

36. *Colias croceus*, var. *fieldi.*—One ♂ taken.

37. *Terias venata.*—Very common in August.

38. *Terias libythea.*—Very common in August.

39. *Terias laeta.*—Not common.

40. *Terias hecabe.*—Very common.

41. *Colotis amata.*—Two males taken.

42. *Colotis etrida.*—Fairly common.

43. *Pareronia hippia.*—Three ♂ ♂ and two ♀ ♀ taken in October and November.

While on the subject of butterflies I may mention that on August 11, on a Hampshire moor, I came upon a Peacock butterfly (*V. io*) adherent by one hindwing to a leaf of the round leaved sun-dew. It seemed to have been struggling for a considerable time, as the scales were rubbed off some of the veins, and the hairs of the leaf were already turned inwards securing their hold upon the wing. The butterfly was otherwise in perfect condition,

being the first seen by me of this season's brood, and seems a large insect to be securely held by so small a plant.

I also saw a white admiral become entangled in a web, and the spider rush upon the butterfly to secure it. But the spider was deprived of this 'bonne bouche' by a hand quickly but gently releasing the victim, for the white admiral is now very local in England.

A large tortoise-shell (*V. polychloros*) taken on August 12, has well marked blue lunules on the forewings, which is unusual and due perhaps in this case, as mentioned by South, to the very cold summer this year in England.

H. D. PEILE.

August 1910.

No. XXXII.—NOTES ON LIFE HISTORY OF *PAPILIO RAVANA*, Moore.

Larva semi-gregarious found feeding on *Aristolochia sp.* at 8,000 ft. on Lirnja Kanta near Naini Tal on 25th July 1909.

Description. Cylindrical, tapering slightly towards each end. Ground colour varies from dark grey to creamy white marbled with oblique blackish lines. Two lateral and two sub-dorsal rows of fleshy tubercles with an additional pair on segments 3 and 4, the subdorsal pair on segment 2 elongate, giving the appearance of horns; all the tubercles black tipped with red except on segments 7, 8 and 11 on which they are creamy white, which colour on segments 7 and 8 is continued obliquely over almost entire segment forming a jagged white patch; segmental incisions dull brown. The black on the subdorsal tubercles forms two interrupted lines between which is a dorsal row of blackish spots.

Head naked, shining black or in the lighter specimens, dark brown; clypeus divided from lobes by a prominent yellow line; legs black, claspers velvety brown, anal claspers tipped with red, ormeterium orange.

Pupa.—Carinate, stout and laterally dilated. Greenish yellow with lilacine stripes, head truncate, an orange protuberance on back of thorax which is dorsally conical. Each abdominal segment with a pair of prominent tubercles on the back.

The first larva to pupate was one found already spun up on a twig of *Viburnum* close to the good plant with little or no attempt at concealment. This remained quiescent for 48 hours before pupating and the interval between spinning up and pupating was generally 3 days. Like all the known pupæ of this group, this species attached itself vertically with a black silken body band and an anal pad. By 6th August 1909 all had been spun up. First butterfly appeared on 20th April 1910.

F. HANNYNGTON.

Felpham, Sussex, 10*th May* 1910.

No. XXXIII.—HAWK-MOTH AND SPIDER.

I have this moment witnessed the following occurrence in my garden. Probably it is a common one but on the chance of it being worth recording, I describe it. I was watching a bee-hawk moth, with clear wings, darting about over a bed of zinnias. As it hung over one flower it suddenly was caught as if in a trap, and beat its wings violently. I took it by one wing, put it in the palm of my hand, where, in a moment or two, it died. I then looked at the zinnia, and found squatting on it a lemon-coloured spider with a triangular body and long yellow legs. I lowered the dead moth near it when the spider caught at it with its fore legs, pulled it down, buried its face in the moth's chest, and doubtless started sucking the moth's juices. The amazing thing was the strength of the spider in comparison to its small size.

It had a smaller brownish spider on its back. Everyone knows what a vigorous creature the hawk-moth is. This was a very fine specimen, yet in under 15 seconds it was moribund.

The spider was on one of those virulent mauve zinnias and there was no effect whatever of any protective coloration.

C. G. C. TRENCH, I.C.S.

DAMOH, C.P., *30th July* 1910.

No. XXXIV.—THE FOOD OF DRAGON-FLIES.

I have on many occasions seen, in New Zealand, dragon-flies catch cicadas. The cicadas were generally caught when on the wing though sometimes when on the trees. These insects (cicadas) are very common in the *ti-tree* scrub and especially so near water. They are one to one and a half inches in length.

The dragon-flies appeared to hold the cicadas between the two front pairs of legs, and were able to continue their flight with the cicadas though the latter appeared to be a great deal heavier than the dragon-flies.

On 12th October 1910 while shooting in the Lissoo Nallah, Naoboog District, Kashmir, I watched with interest a dragon-fly try to catch what appeared to be a small may-fly about ½ inch long. I got a good view as the sun was setting, the insects almost between me and the sun with a dark back ground of cedars.

The dragon-fly swooped down like a king crow on a moth, missed, turned and tried again.

This was done five or six times and every time at the same may-fly though three may-flies were within three or four inches of each other.

The dragon-fly eventually gave up the chase.

DEHRA DUN,
3rd November 1910.

H. FULTON, MAJOR,
2ND K.E.O., GOORKHAS.

No. XXXV.—AN ANT GRANARY.

During the month of June very heavy and continuous rain fell for two whole days. At its termination, the weather cleared and hot sun-shine was recorded. On the morning that the weather cleared, the food contractor, who keeps a large store-yard in the Jail here—Hyderabad, Sind—reported to me that some prisoners had stolen a large quantity of grain from the godown and had maliciously thrown it about the yard. On going to see into the matter myself, I found a series of twenty or more heaps of grain in various parts of the yard. I at once noticed that each heap was crateriform in shape and that from the crater of each, a large number of black ants were issuing. Stooping over one of these heaps, the phenomenon was soon explained; each ant was carrying in its jaws a single grain of corn which it bore to the lip of the crater and hurriedly depositing it there, returned to the central hole for another load. I gave orders that the grain, which I observed to be made up entirely of bajri, was to be gathered up and weighed and was not a little astonished to find the total came to three maunds (240 lbs.). In the godown, sacks of wheat, jowari and bajri are stored; why then was only the bajri stolen? The explanation is simple. The first two grains are too large and cumbersome to be taken away without excessive labour whereas the bajri grain is of a size, nicely adapted to form a single load for each ant. What extraordinary economy of labour and what industry and providence? The grain had never been missed; no shortage had ever been noticed. The theft of the grain had gone on insidiously through the long months of drought; borne by devious underground highways and bye-ways to numerous chota granaries, there to afford ample food for the community of the ant-kingdom. Bye and bye comes the rain and soaking down, floods the granaries. The extraordinary sagacity of the ant tells him that unless he can quickly dry his stores, the grains will sprout and the whole be lost. Perchance the grain did begin to swell in the heated, moist ground and the pressure in the granaries and underground channels threatened to annihilate many of the community. Either of these two reasons prompted the ant to rush his stores above ground and to lay them in the sun to dry again. That this stupendous task was urgently called for, was clearly proved as I noticed most of the grain was already bursting. Incidentally an interesting legal question arose out of this. A new contractor had just come on and claimed the grain. I pointed out that the grain must have been stolen during the late contractor's regnum and was therefore really his. The dispute is still undecided, meanwhile I conjecture the ant quite undisturbed by the pettiness of human affairs, still stealthily "creeps in and carries off another grain of corn."

HYDERABAD, SIND,
11th August 1910.

F. C. FRASER, CAPT., I.M.S.

No. XXXVI.—THE FOOD OF A MANTIS.

The other evening my attention was drawn to a mantis on the wall of my tent which had caught a cricket. The capture had only just been effected; but the cricket, to my surprise, was apparently already dead and must, I suppose, have been killed by a single bite. The mantis held the body of its prey firmly clasped between its fore-legs and proceeded to cut through the neck and decapitate the cricket. This achieved it commenced its meal upon the severed head. It struck me as a feat in itself, the way the jaws combined the two functions of devouring and of retaining the head without ever letting it drop. When the whole of the head had disappeared, the mantis began on the thorax, but had made little progress before my attention was unfortunately diverted. After an interval of between ten and fifteen minutes I came back. The mantis was in the same place, but the whole of the cricket had disappeared, with the exception of the extreme tip of the abdomen with its pair of caudal appendages which projecting from between the jaws of the mantis and was speedily demolished. There were two fragments of legs on the table against the wall below where the mantis was resting, but no sign of any other fragments, so that appearances unquestionably pointed to the mantis having steadily eaten through that cricket from head to tail and disposed of the whole. I much regret having been unable to verify this but have no doubt that it did occur. But the performance seems a remarkable one in view of the comparative bulk of the two insects. The mantis, it is true, was about 3 inches in length, but a slender species, brownish-grey in colour: while the cricket at least ¾ inch long, was more than twice as thick in body. It must be remembered too what a considerable portion of the mantis' 3 inches of lengths is taken up by its long neck. A mantis of the same species which I captured with a view to sending to the Society for identification unfortunately came to grief, but the species is a common one.

It was its stowage capacity, without any obvious tightening of the waist-belt, that especially interested me in this mantis, rather than the size of its prey, for these insects will sometimes successfully attack surprisingly large creatures. Three years ago in the Aden Hinterland I came across a large green mantis on a cornstalk, and securely grasped between its legs a large green grasshopper of locust of about the same size as *Acridium peregrinum*. Here again the mantis had commenced on the head of which it had devoured about one-third, but the unfortunate locust was still alive and capable of some movement—and yet some people say there is no cruelty in nature. In this instance, but for the evidence of my own eyesight, I should certainly have considered the locust too powerful an insect for any mantis to tackle with success.

That the love passages of certain spiders have at times a tragic ending

for the male is well-known. But has a similar crime ever been recorded of the mantis family? Some years ago in the Empress Gardens at Poona I found a mating pair of a large green species and the female was quietly dining off her lord and master! This may seem incredible, but is nevertheless absolute fact. Could the suffrage have been in question?

A. H. MOSSE, CAPT., I.A.,
Assistant Resident, Okhamandal.

DWARKA, *4th November* 1910.

No. XXXVII.—A NEW INDIAN GRASS-HOPPER INJURIOUS TO AGRICULTURE (*COLEMANIA SPHENARIOIDES*, BOL.).

In October 1909 specimens of a grass-hopper were sent to the Entomological Laboratory in Bangalore from Davanagere in the northern part of Mysore with the statement that they had been noticed for the first time and that they were doing some damage to crops, chiefly to cholam (*Andropogon sorghum*). Later in the same season specimens of the same form were collected at Honnali about 30 miles west of Davanagere where the damage to cholam had in cases been very severe.

This grass-hopper was identified provisionally as a species of Orthacris and specimens of it were sent to Prof. Ignacio Bolivar of Madrid, the leading authority on the sub-family *Pyrgomorphinæ* to which this genus belongs. Professor Bolivar informed me that the grass-hopper was not an Orthacris but belonged to a new genus. In the mean time a note by Mr. Maxwell Lefroy on the same grass-hopper appeared in this Journal, No. 4, Vol. XIX, (1910), page 1007, in which he proposes for it the name "Deccan grass-hopper" on account of its distribution. He also notes its growing importance as a pest and identifies it as an Orthacris, probably a new species.

Prof. Bolivar has now published the descriptions of the new genus and species in the Boletin de la Real Sociedad Española de Historia natural, July 1910 (page 319) under the title "Nuevo Locústido de la India, Perjudicial á la Agricultura (*Colemania sphenarioides*, Bol.)." As it seems probable that this Spanish journal is inaccessible to most of those interested in Entomology in India and as this insect is likely to prove of increasing importance from a practical standpoint, I have thought it advisable, with Prof. Bolivar's permission, to communicate his descriptions to this Journal. I retain the descriptions in their original latin form. As the rest of Prof. Bolivar's paper is written in Spanish and is largely based upon the notes sent by me I have translated those parts of it which are of particular interest.

"*Colemania, gén. nov.*

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longius. Frons valde reclinata a latere visa subsinuata. Antennæ . .? basi cylindricæ; costa frontalis tota sulcata, basi tantum compressa denique deplanata parum distincta ante epistomatem obsoleta, carinis lateralibus sinuatis ab antice visis antrorsum parum divergentibus. Genæ linea granulosa parum expressa sed distincta instructæ. Oculi parvi parum longiores quam latiores postice truncati. Ocelli parum distincti, ocello medio inter oculos, ocellis bassalibus ante oculos positis. Pronotum conicum præcipue in ♂, in ♀ fere cyclindricum postice obtusissime sinuatum, sulcis in dorso oblitteratis, tantum sulco typico longe pone medium sito percurrenti; lobis lateralibus elongatis, marginibus integris, margine antico obliquo, inferiore recto, postico subindistincte sinuati, angulo antico obtuso, postico subrecto. Elytra, angustissima, linearia, elongatissima, pronoto longiora. Alæ nullæ.

Prosternum tuberculo acutissimo aciculato instructum, lobi mesosternales elongati, postice truncati ♂ contigui, in ♀ spatio antrorsum ampliato, his angustiore sejuncti, angulo postico rotundato. Foveolæ metasternales in ♂ quam in ♀ magis appropincuatæ. Pedes breves; femora antica in ♂ incrassata; femora postica gracilia area media externa angusta rugulis pinnatis subindistinctis, lobo geniculari angulato producto. Tibiæ posticæ, graciles in tertia parte apicali tantum ampliatæ et superne planatæ intus extusque spina apicali armatæ, extus 9 intus 11 spinosæ. Tarsi postici graciles; articulus primus secundo duplo longiore. Abdomen cyclindricum, apice haud clauatum. Segmentum ultimum dorsale ♂ transversum postice trisinuatum. Lamina supra-anali trigona-elongata cercis longiora, sulcata, acuta, in ♀ subæquilatera. Cerci breves, curvati, apice fere subulati, in ♀ minuti, recti. Lamina subgenitali, compressa, postice compresso carinata. Valvulæ ovipositoris breves sinuatæ."

"*Colemania sphenarioides, sp. nov.*

Straminea vel lutea. Caput pone oculos fascia lata carneo cœrulea vittæ flava ab antennas usque angulum anticum pronoti extensa terminata. Frons carneo cœrulea. Vertex convexus, linea media nigrocœrulea ante oculo latiora, tempora inferne fascia angusta nigrocœrulea. Antennæ articulis primis pallidis articulis sequentibus nigro cœruleis inferne fascia pallida longitudinali ornatis, Pronotum dorso sublævi, medio rufescente, lateribus fascia lutea intus linea nigra apposita; lobis lateralibus callosis punctato impressis, trifasciatis, fascia ab dorsum sita rufa, intermedia nigra, inferiore flava, margine inferiore subsinuato, meso-et metanotum in ♂ valde incrassata dorso lævia, lateribus fasciis protoracicis continuatis, fascia externa impresso punctata. Elytra apicem versus lævissime subampliata apicem segmenti primi abdominis subattingentia, rufescentia venis pallidoribus. Pedes pallidi. Tibiæ posticæ rufescentres, spinis pallidis apice nigro armatæ. Abdomen dorso pallido, lateribus fusco et griseo vittato; segmento primo tympano instructo.

Long. corp. ♂ 39; fastig. ante oculos, 3; pron. 6, 5; elytr. 8, 5; fem. post., 15 mm.

Long. corp. ♀ 36; fastig. ante oculos, 2, 8; pron. 6; elytr. 6, 5; fem. post. 12 mm.

Loc. Honnalli, 6, 10, 09, L. C. Coleman et K. Kunhi Kannan."

The above description is incomplete as far as the antennæ are concerned as the specimens sent arrived with these organs broken. Prof. Bolivar has therefore added some notes sent by me which were based on the examination of a large number of specimens in the collection here. As the notes he gives are a Spanish translation of my communication to him, I can do no better than give the original English.

"In the antennæ I find the first and second segments pallid with a bluish streak along the outer edge or angle. The rest of the antennæ seems to me to be "nigro-cærulea" with the exception of a pallid streak which extends along the inferior angle of segments 3-8. The antennæ possesses 19 segments and tapers gradually from the third segment to the apex.

I find further that the femora and coxae of the hind legs in good specimens both male and female show a yellow fascia on the external face which is continuous with the lateral yellow fascia of the cheeks and thorax. This fascia narrows to a point towards the apex of the femur; it is, however, indistinct in some of my specimens. I find the hind tibiæ in a few of my specimens reddish throughout their entire length but in the majority of them it is only the apical half that is colored red, the basal half being pallid."

"I append herewith measurements made on 5 females and 5 males:—

Long corporis.	Fastigi ante-oculos.	Pronoti.	Elytrorum.	Fem. post.
Females.				
1. 39	3	6·8	8	13·8
2. 39·5	2·8	7·5	6·5	14·5
3. 35·0	2·8	6·5	7·0	12·5
4. 36·0	3·0	6·8	7·0	13·2
5. 37·5	3·0	8·0	Broken.	14·0
Males.				
1. 40·0	3·0	6·2	9·0	14·2
2. 38·0	2·8	5·8	7·8	14·2
3. 33·0	2·6	5·8	5·2	11·8
4. 31·0	2·5	5·0	6·8	Lacking.
5. 33·0	2·8	5·2	7·5	12·8

In connection with the erection of the new genus Prof. Bolivar notes in

the introductory paragraph of his paper that the new genus belongs to the section Orthacres (*vide* his Pyrgomorphinæ, p. 44, Genera Insectorum 90 me Fascicule) and differs from the genus Orthacris chiefly in that the body has an enlarged or inflated appearance in the thoracic region (meso- and metathorax. In this respect it resembles the genus Sphenarium (*vide* same paper, p. 9) from which, however, it differs in the absence of wings.

The above description should enable any one interested to recognise the grass-hopper. Rearing work on a fairly large scale is being carried out here and extensive observations have been made in the field, so that it is proposed later to publish a fairly exhaustive account of its life-history and habits.

LESLIE C. COLEMAN, M.A., PH.D.,
Mycologist and Entomologist.

BANGALORE, *August* 31*st*, 1910.

No. XXXVIII.—REMARKABLE MIMETIC RESEMBLANCE BETWEEN A CICADID AND AN ARCTIID MOTH.

During a recent visit to the Nilgiris (in April of the present year), I noted a remarkable instance of mimetic resemblance between the Cicada *Gaeana atkinsoni* and an Arctiid moth (*Pangora* sp.).

I must confess to an attitude of scepticism towards a considerable percentage of the supposed cases of mimicry which have been exploited, of late years, in ever-increasing abundance. Many of them have appeared to me to be fanciful, the resemblance requiring an exceptionally vivid imagination for its appreciation, and the imaginary mimics being sometimes dragged together from widely separated habitats. But in the present case, both insects were to be seen on the wing at the same time and in the same place. Mr. H. L. Andrewes, of Barwood Estate (himself an enthusiastic entomologist and careful observer), was with me at the time, and can corroborate my statements. He was, indeed, the first to observe the occurrence and to draw my attention to the extraordinary resemblance between the two insects when on the wing. We were both of us, at first completely deceived, mistaking the flying Cicadas for the brightly coloured moths that we had just captured. It was not merely a general similarity of colouration, but the effect was enhanced by the heavy flight of this Homopteron, so unlike the rapid progression usual to the ordinary Cicadas.

It is not to be expected that a detailed examination of the two insects should show an identical colour pattern; but the general scheme of colouration is close enough to produce an effect of similarity sufficient to deceive the eye when the wings of the insects are in motion.

The moth was either *Pangora erosa*, Walk., or *P. rubelliana*, Swinh., both

of which species occur in the Nilgiris. The exact determination of the species is unimportant, as they differ only in a slight modification of the paler markings of the forewing, and either would form an equally good model of the *Gaeana*. In the moth, the frontwing is deep brown, crosset by sub-basal and medial irregularly maculate bands of a creamy white tint, and with submarginal spots of the same pale colour. The hindwing is crimson, with a broad, blackish outer border containing some crimson spots near the anal angle. In *Gaeana atkinsoni*, the tegmina are black, with a transverse medial fascia and submarginal spots of a pale ochreous tint: the black ground colour relieved by ochreous venation, so producing a general brownish effect. The hindwings are described by Distant as "bright carmine red, apical and posterior margins and subapical transverse spot black." I think that mental pictures evolved from the descriptions of these two insects would not differ very widely.

The brightly coloured Arctiids are generally believed to exhibit warning colours and to be protected from attack by a distasteful odour or flavour. Little is known as to the immunity or otherwise of the Cicadas. I have, however, observed the capture of *Terpnosia psecas* by an 'Orange Minivet' (*Pericrotus flammeus*). On that occasion the Cicada was evidently uncomfortably strong for its captor. I was attracted to the episode by the scream of the Cicada, which was held by one leg only, and appeared to be flying away with the bird. The minivet could make no headway against the vigorous flight of its captive. The combination looked rather like a badly-balanced aeroplane with an erratic propeller in front.

E. ERNEST GREEN.

PERADENIYA, CEYLON, 20*th August* 1910.

No. XXXIX.—THE OCCURRENCE OF THE GIANT WATER-BUG *BELOSTOMA INDICA* IN THE EASTERN HIMALAYAS.

On the 9th June 1910, I obtained a pregnant specimen of the Giant Water-Bug (*Belostoma indica*), at an altitude of 6,000 feet on the Eastern Himalayas; as I have never seen it at this altitude before, I thought its occurrence here might be worthy of record.

E. A. D'ABREU, F.Z.S.

KURSEONG, DARJEELING DISTRICT,
5th September 1910.

No. XL.—A NEW METHOD OF MAKING PERMANENT PREPARATIONS OF MOSQUITOES.

Entomologists and medical men engaged in the study of Malaria frequently have occasion to make collections of mosquitoes. But those who

have attempted to preserve these insects in the manner usually recommended namely as dry pinned specimens, are often disappointed at the result.

As it is by no means a pleasant thing to have to watch the gradual deterioration of a collection over which much time and trouble has been spent, we are sure that there will be many who will welcome the description of a new and simple method of mounting mosquitoes which provides specimens that are absolutely permanent.

Mosquitoes preserved in the manner described below will be found to show all the points necessary for identification ; they can be mounted without great difficulty ; can be easily stored and handled, and are ideal for demonstration purposes.

Most people who have worked with mosquitoes have at one time or another attempted to preserve them in balsam. This, of course, is quite hopeless, as directly the balsam touches the specimen, the scales float off, and the specimen is rapidly cleared and becomes almost transparent.

In this new method the specimen is primarily fixed and coated with a thin covering of celloidin, which protects the mosquito from the clearing action of the balsam and prevents the dislodgment of the scales and hairs. The natural appearance of the insect is thus preserved.

Method.

The materials required are—

Cover slips—No. 2 Circles.
Hollow ground slides.
Fine forceps.
Mounted needles—two.
Alcoholic solution of celloidin—1 per cent. to 2 per cent.
Emulsion of zinc oxide in Xylol Balsam.

The mosquitoes to be mounted should preferably be bred-out specimens, which have been allowed to harden for some hours before killing.

A live specimen should be transferred to a test-tube or small bottle, and this should be inverted upon a small board upon which a little chloroform has been dropped.

The mosquito should be merely stupefied, and if too much chloroform has not been used, it will frequently fall upon its back with the wings spread out. The absorption of chloroform by the wood will prevent actual wetting of the specimen which would damage the scales.

A drop of the celloidin solution is now placed on a cover slip and the mosquito is picked up with the forceps by one of its legs and dropped back downwards on to the cover slip. If the wings are still closed, they are gently drawn out at right angles to the body, using two needles for this

purpose and making traction upon both wings at the same time. The legs are now carefully arranged and put down into the celloidin solution on the cover slip, more solution being added if necessary.

If the legs have fallen into the celloidin solution before the wings have been arranged in their proper places, a little careful manipulation with the needles will enable one to pass the wings under the legs or *vice versa* and a few final touches to the antennæ, etc., will bring all the parts into their proper relation.

Another drop of celloidin solution is now put over the specimen, which is then allowed to dry. After about half an hour a further drop of the solution is placed over the thorax, and this again is allowed to become nearly dry.

This specimen is then ready for mounting, either in ordinary balsam, or in the mixture of zinc oxide and balsam, which is less liable to penetrate the celloidin than ordinary balsam, and at the same time shows up the points of the specimen to advantage.

To prepare this zinc balsam, the zinc oxide should be sifted through fine muslin and a sufficient quantity added very gradually to xylol balsam until a thick uniform opaque white mixture has been obtained.

A big drop of this zinc balsam is placed in the hollow of a slide, which is then inverted upon the specimen ready prepared on the cover slip. The hollow of the slide prevents the crushing of the specimen and saves the bulky thorax from damage.

Although an advantage, hollow slides may be dispensed with, if the thorax of the fixed mosquito is carefully snipped off by means of a pair of fine iris scissors.

As zinc balsam takes some time to harden, specimens should be kept face downwards for several days until hardening has taken place.

Precautions.

Strength of celloidin solution to be used.—This will depend largely upon the atmospheric conditions, a weaker solution being necessary when drying is rapid. The point to be aimed at is to obtain a solution which will allow sufficient time for manipulating the specimens with needles, and at the same time will afford an adequate coating.

The tendency at first will be to use too strong a solution of celloidin. Ethereal solution should on no account be used, as the rapid evaporation leads to the formation of air bubbles which ruin the specimen.

Drying of the specimen before mounting.—If the specimen be allowed to dry for too long before the final mounting, the contraction of the celloidin will result in the formation of cracks through which the balsam will subsequently penetrate, or it may be found that separation of the mosquito from the surface of the cover slip is taking place.

The method described above will be found useful for preserving many other small-bodied flies besides mosquitoes, and will, we think, be welcomed by all those who wish to make collections under tropical conditions.

CHAS. A BENTLEY, M.B., D.P.H.,
J. TAYLOR, CAPT., I.M.S.

BOMBAY BACTERIOLOGICAL LABORATORY, PAREL,
BOMBAY, 11*th August* 1910.

No. XLI.—OBSERVATIONS ON THE SPIDER *GALEODES INDICUS.*

But little is known about the group of arachnids to which the subject of this note belongs. The *Cambridge Natural History* contains but 8 pages on the whole order (*Palpigradi*). A few notes made with a captive female under observation, therefore, may be of interest.

All Indian *Galeodes* are, I believe, nocturnal in habit; although sometimes met with during the day time, it is generally because they have been disturbed out of some dark retreat.

They are very nimble and course rapidly about at night in search of prey, insects of practically all descriptions, and sometimes come within the circle of one's lamp in pursuit.

From an external casual examination, armed as they are with two pairs of formidable toothed mandibles, one would suppose that these creatures tear and bodily devour their prey. This, however, is not the case. The terrifying jaws are but the portals to a narrow beak or tube formed by the fusion of the labium and labrum and capable of admitting fluids alone. The mandibles perform the duties of seizing and crushing the insects fed upon.

If the jaws are separated laterally, the beak can be seen protruding shortly between them.

These powerful mandibles are capable of great lateral and vertical motion so that comparatively large insects can be seized. There is marked muscular development of the basal portion of the mandibles, which, at first sight, seem to form part of the cephalothorax, and they are capable of exerting considerable crushing force. Owing to this large development, when the jaws are working, the whole head seems to take part in the movement.

The possession of poison by members of this family is still in doubt; the work already quoted states:—"Several investigators have allowed themselves to be bitten without any special result" (Vol. IV, p. 424). I regret that I have no very positive fact to give on this subject, but I noted that every insect firmly seized seemed immediately paralysed, and I could never detect the smallest movement of leg or antenna after the first bite.

The appetite of the *Galeodes* seemed quite insatiable; my specimen was ever eager for a meal. The insects and others consumed consisted of a number of moths, several small beetles, such as are attracted to the lamp in the evenings, two spiders, an Asilid fly, a large locustid at least twice the bulk of its captor, and a blister beetle.

On the hard integument of one of the common light-brown cock-chafer like beetles, she could make no impression, though she attacked it repeatedly with great vigour and wide extended jaws.

Unfortunately, I did not see the locustid actually assailed as the *Galeodes* seemed overawed at first. They were left together one night and only the arachnid and some *debris* were to be seen in the morning.

The blister beetle gave most trouble as might well be expected. It was attacked at once on being inserted in the jar, but the *Galeodes* dropped it at once on the first slight nip. The bite was not driven home and the beetle curled itself up in the posture of object humility they are addicted to on being molested and exceeded a drop of its acrid secretion. *Galeodes* had evidently received a taste of it and found it unsavoury, for she backed away and seemed to be scraping her cheliceræ on the floor of the jar, gaping the two pairs wide apart, for all the world as if she were about to vomit up the nauseous draught. This manœuvre was reiterated several times, but evidently the jaws never really closed, for the beetle seemed little the worse.

At last the aggressor seemed to have come to the sour-grapes frame of mind and desisted from further attempts. However, I left the uncongenial morsel with her for the night and lo! the morning revealed that the pangs of hunger had overcome the hatefulness of the fare, for all that was left of the beetle were scarcely recognisable mangled fragments.

As before stated *Galeodes* do not eat their victims bodily, but suck out their juices. The carcase of the prey is crushed and deftly manipulated round and round by the mandibles going over each section again and again till all the sap is expressed. The suctorial beak lies handy for being applied to the battered framework the while. Within the beak there is a muscular sucking chamber which draws in the fluids.

C. E. C. FISCHER.

COIMBATORE, *3rd October* 1910.

No. XLII.—FURTHER NOTE ON THE SPIDER *NEPHILA MACULATA*, FABR.

Two notes on the above-named spider were printed on pages 526-528 of No. 2, Volume XX of the *Journal*. In the first I noted that the female was in no way aggressive during pairing. I have recently observed another incident where the female was not so complacent.

In this case there were five males in the web. Just after I caught sight of the structure with its occupants in an open grass area, depending from a tall grass stem and a bush, one of the males was seen to descend rather deliberately towards the female, the latter resting head down in the centre of the snare. On reaching the extremity of one extended hind leg of the female, he paused and then advanced again very slowly till he reached the posterior end of her abdomen. After another short pause, he crept very cautiously on to and along it towards the vulva. While so doing one of his legs brushed along the female's side and she pushed it away with the short 3rd leg of that side. This again caused a pause and progress was resumed once more with redoubled caution, but again a leg passed over the side and was again brushed away, but this time there were further quick movements of the other legs of the female. Instantly the male flung himself to the bottom of the web, out of reach of his spouse. The incident passed so extremely rapidly, that I was unable to follow the exact movements, but had no doubt that an attack had been contemplated, and it was obvious the little male was of the same mind, or, at least, was taking no chances. There was no attempt at pursuit.

No further developments taking place for some considerable time I left the spot.

At this late date (19th October), it is probable that the female had already paired, which might account for the repulse of unwelcome attentions.

This occurrence took place at about 30 miles from the location of the other two reported and at an elevation of about 1,800 feet on the banks of the Bhavani river.

C. E. C. FISCHER.

ATTAPADI VALLEY, SOUTH MALABAR, 24*th October* 1910.

No. XLIII.—THE COURTSHIP OF WHIP-SCORPIONS.

Some years ago, when in Ganjam, I witnessed the antics of two whip-scorpions (*Thelyphonus sepiaris*, Butler), which I quite failed to interpret, but which, since reading Fabre's observations on scorpions, I unhesitatingly ascribe to amorous dalliance.

Fabre describes what he terms the *promenade a' deux*, in which the male scorpion seizes the chelæ of the female in his own and walks backwards, the female following usually without reluctance.

In the case of *Thelyphonus*, I noticed that one of the pair seized the antenniform first pair of legs with its chelæ inserted and held their tips between its mandibles. The pair then moved, more or less, as described by Fabre in the case of scorpions. The captive seemed, however, somewhat reluctant to follow, but still made no effort to escape when released;

I should describe the altitude as tolerant. This latter was evidently the female.

When I separated the couple, the male, the aggressor as I thought at the time, seemed much distressed and dashed about in search of the other, without concern or fear of the compulsive interfering agency, and as soon as he found her again, repeated his previous actions. The female made no real attempt to evade the other or prevent her legs being pinioned. So far as I saw the caudal flagellum of either never came into play.

Not knowing what was afoot, I did not wait for final developments, but after watching the couple for a short time, and what I took for an engagement being apparently somewhat in the nature of a "Tweedledum" combat, I stopped further display in good spirits.

C. E. C. FISCHER.

COIMBATORE, *3rd October* 1910.

No. XLIV.—CURIOUS GROWTH OF THE PALMYRA PALM *BORASSUS FLABELLIFER*, LINN.

Mr. Douglas in his interesting book about "*Bombay and Western India*" in alluding to a visit he once paid to the Tansa Valley in the Thana District, writes as follows, regarding the numerous Palmyra Palm trees (*Borassus flabellifer*, Linn.) which he noticed on the way (pages 293-294 Volume II):—

"The only noteworthy objects are hybrid trees, which are remarkable enough even in India. Grafting, as a rule, applies to trees of the same order, but this is not without exception. But what do our readers think of a *ficus* with a palm which, as a friend observes, must be the centaur of the vegetable world?

"The first specimen met with I set down as a *lusus naturæ*, but further on they became as thick as blackberries.

"Take one of the pollard willows of Oxfordshire, or a tufted elm from Richmond Hill, lop its head off 20 feet from the ground and *join on* the upmost 40 feet of a palmyra palm, and you have our friend of the Tansa Valley. Not weakly either, but strong and vigorous specimens of the palm tree flourishing. We were told that these are not cultivated, and the line of contact is not visible to the naked eye. We throw out this nut to crack by some of our Bombay botanists or others interested in Indian arboriculture."

The phenomenon which Mr. Douglas observed is probably one which could be explained by most District Officers interested in the study of the Natural History of Plants. The so-called hybrid trees, mentioned by him, are very common in the Western parts of the Thana District, in the

Salsette snd Bassein Talukas especially, and they may be seen also in the Kalol Taluka of the Panch Mahals, Gujarat. In Bassein in the neighbourhood of the villages of Shirgaon and Kaman and Paye, almost every other tree is a so-called hybrid. The curiosity of growth occurs by the seeds of the various kinds of *Ficus* being deposited in the axils of the foot stalks of the leaves of a young Palmyra Palm by Crows and Mynas (*Achridotheres ginginianus*) chiefly and by the *Dicaeum erithrorhynchus* (Tickell's Flowerpecker), who feed on the fruits of the latter. The birds after plucking the fruits of the *Ficus* fly away and alight on the summit of the Palmyra, where they indulge in their meal without fear of molestation. After eating the fruit, the seeds are voided undigested in a very short space of time (in some instance 7 minutes from the time of eating *), and they fall on the ground, perhaps at the base of the tree or in the axils or petioles of the old leaves, which may commonly be observed surrounding the trunk in a decayed state muffling the stem as it were (Photograph No. 1). It is



No. I.

* *N.B.*—I had the birds under observation in captivity.

only stems of 15 to 25 years old that are seen in this state; for after this, most trees become fertile and are tapped either for toddy or exploited for fruit. To facilitate climbing up the bole therefore the sheaths are usually at this period removed, if the tree be a female and good fruit bearer, or a male and good toddy producer. The seeds once so deposited in the axils of the foot stalks germinate, and the *Ficus*, whose roots are epiphytic in habit, proceeds to extend the latter in Octopus like fashion downwards in all directions until the thin strands encircling the base form such a close network that they cohere, forming a thin plaster as it were, almost entirely concealing the black cylindrical trunk of the Palmyra. An illustration of such a case will be seen in Photograph II.



No. II.

Here, as will be observed, the roots of the *Ficus* (in this case the tree is the common Banyan (*Ficus bengalensis*, Linn.) have not completely concealed the Palmyra trunk. Until such roots reach the ground, very little, if any, vegetative activity of the plant is maintained upwards, *i.e.*, few, if any, leaves are borne on the stem. All, or mostly all, the vegetative activity and energy are displayed in a downward direction to reach the moist earth; and when the latter has been attained, the Ficus begins to grow with increased vigour upwards and downwards and to completely embrace the stem. In a few years, under such circumstances, the sight presents itself of the Palmyra trunk being completely concealed and the Palmyra tree ultimately appears to be growing out of the centre of a Banyan (as in

Photograph III). The ordinary traveller passing hurriedly along as



No. III.

Mr. Douglas did, might well be excused for being deceived by this phenomenon under the circumstances.

It may be interesting to mention that at the northern extremity of the Vehar Lake, I came across a young Palmyra, whose bole was in the process of being embraced by four different Figs, such as *Ficus bengalensis*, *Ficus Tsiela*, *Ficus religiosa* and *Ficus glomerata*. Tickell's Flower-pecker, I magine, is mainly responsible for this phenomenon, as this pretty little bird is very common round the Vehar Lake catchment area forest.

KARACHI, 29th *September* 1910. G. M. RYAN, F.Z.S.

No. XLV.—THE VARIETIES OF HIBISCUS CULTIVATED IN GARDENS.

Mr. O. V. Bosanquet, I.C.S., the Resident of Baroda, in a letter recently asked for information in regard to the different varieties of Hibiscus in cultivation in gardens on this side of India, and this inquiry induced me to try and ascertain how many could be found. No one appears to have

a collection at the present time, although, I learn, that Mr. Krumbiegel, the Superintendent of the Lal Bagh Gardens, Bangalore, is starting one. Many years ago, Mr. Robert Campbell had a considerable number of varieties at his garden on Malabar Hill, Bombay, and a Parsee gentleman, the late Mr. Framji Nanabhoy Davar, also possessed some 25 different varieties at his garden at Tardeo, Bombay.

The difficulty of distinguishing clearly between varieties has been somewhat increased by the hybridisation of some, so that I can only describe the colours of the flowers and cannot give names, except in a very few instances. The following varieties were shown at our meeting on the 29th September 1910, and it may be of interest to put them on record.

DOUBLE VARIETIES.

1. Double white changing to red (*Hibiscus mutabilis*).
2. Salmon with dark crimson eye.
3. Scarlet with dark crimson eye.
4. Scarlet with no eye.
5. Scarlet and white, mixed stripes.
6. Dark maroon (the flower of this variety frequently does not open properly).
7. Double white (*H. syriacus*).

SINGLE VARIETIES.

1. Pale biscuit with white eye.
2. „ „ with crimson eye.
3. Salmon with crimson eye.
4. „ „ (semi-double).
5. Deep salmon or apricot, with crimson eye.
6. Pink with white stripe on inside of petal, crimson and white striped eye.
7. Pale pink with crimson eye.
8. Pale pink with no eye.
9. Pink with red eye.
10. Pink (*Hibiscus mutabilis*).
11. Rose pink with cerise eye.
12. Rose pink with no eye.
13. Light crimson with small dark eye.
14. Light crimson with large dark eye.
15. Scarlet with crimson eye.
16. Crimson (*H. rosa sinensis*) normal.
17. „ „ „ with recurved petals and darker eye.
18. Cut-petalled (*H. schizopetalus*). There appear to be 2 varieties of this.
19. Mauve lilac with red eye (*H. syriacus*).
20. Yellow, small flower.

21. Reddish orange, small flower.
22. Tree variety : white or flesh-coloured small open flowers with dark reddish eye (*H. collinus*).
23. Tree variety : large yellow flowers with maroon eye, flowers turning red when old. Leaves three lobed (*H. tricuspis*).
24. Tree variety : large tawny red flowers with dark crimson eye, thick fleshy leaves, cordate to almost circular (*H. tortuosus*).

H. rosa sinensis cooperi with variegated leaves and *H. tiliaceus*, a tree with yellowish flowers, although not amongst the specimens exhibited, are also to be found in our Bombay gardens.

If any members have specimens of any other varieties, I shall be glad if they will communicate with me.

BOMBAY, *October* 1910. W. S. MILLARD.

No. XLVI.—NOTE ON SUBMERGED TREE STUMPS DISCOVERED IN BOMBAY HARBOUR.

(*With an illustration.*)

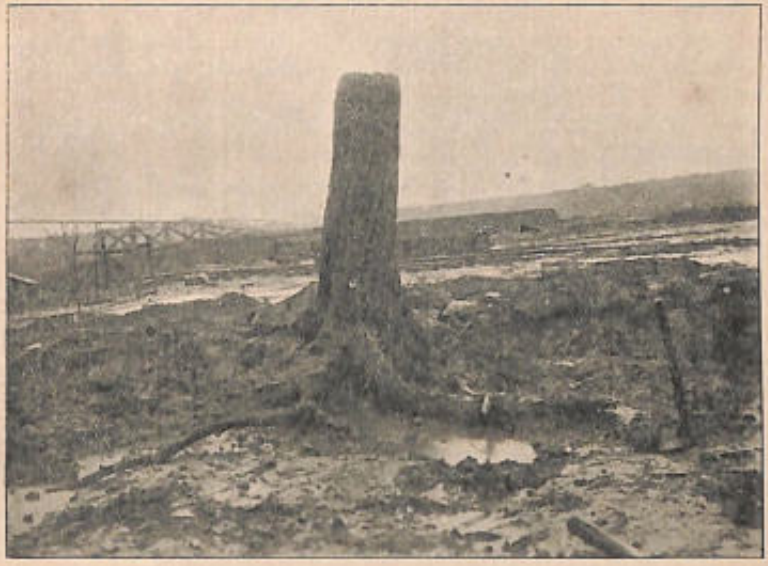
In a paper published in our Journal, Vol. V, No. 2, 1890, entitled "Prehistoric Bombay" by W. E. Hart, an account is given of the various evolutions of nature that took place before our present Bombay as a single Island, to quote Mr. Hart's words, "rose, as did of old, the Goddess of Beauty from the sea."

To shortly summarise Mr. Hart's paper, he deduces from the evidences of marine and land fossils in the deposits on the flats and at Byculla and the discovery of a submerged forest in the excavation of Prince's Dock, that after the various flows of the trap had completed the general formation of this portion of Western India, an area of some 1,000 square miles, including what is now Bombay, broke off from the Coast and was submerged in the sea ; and that subsequently in the area that includes Bombay there were at least 2 upheavals and the subsequent subsidences, the last of which left Bombay as a succession of Islands which were eventually joined together by the silting up of the deposits brought down by the neighbouring creeks.

The purpose of the present note is to place on record the finding of some additional trees in somewhat similar circumstances to those mentioned in Mr. Hart's paper, as having been found by Mr. George Ormiston in the excavation for the Prince's Dock. Mr. Ormiston states that he discovered some 400 trees, 223 of which were still standing at a depth of about 33 feet below high water. Of those fallen several showed signs of having been burnt, from which he deduces the presence of man.

The trees or rather tree stumps discovered during the excavation for the New Docks were only 4 in number, 3 of which were standing. Their position is nearly half a mile from what was a few years ago the foreshore

and 40 feet below high water o.s.t. The largest of the stumps is 6·3 in height and 5 feet diameter.



These trees appear to have been growing on the side of a creek which is filled with a light blue clay. In this blue clay, a lot of drift wood, containing fossils of the *Toredo navalis* was found. The illustration is of one of the largest of the stumps found standing, the roots of which are seen spreading out over the rocky moorum. This tree was embedded in the blue clay with a very thin layer of moorum between the clay and the rock. Specimens of two of the three stumps were exhibited at our meeting in the hope that some of the botanical members present might be able to identify them. The trees found in the Prince's Dock were stated to have been a specimen of Acacia (*Acacia catechu*). I have compared this timber with some of that taken from the Prince's Dock, and as far as I can tell it is the same. Some of the drift wood which, it will be noticed, has quite perished, although the toredo and portion of the wood has been fossilised, was also exhibited. Two of the tree stumps are still standing, and I should be glad to show them to any members who are interested in the subject. The finding of these trees does not throw any new light on the conclusion arrived at by Mr. Hart, but simply shows that the last subsidence was one of over 40 feet and that there was dry land at least ½ mile from the foreshore opposite St. George's Hospital: also that in these ancient times our present fine harbour was one of a very much reduced size, if it existed at all.

BOMBAY, *29th September* 1910. L. H. SAVILE.

PROCEEDINGS

OF THE MEETING HELD ON 29TH SEPTEMBER 1910.

A Meeting of the Members of the Bombay Natural History Society took place on Thursday, 29th September 1910, at the Society's Rooms, 6, Apollo Street, Fort, Mr. John Wallace, C.E., presiding.

The election of the following 11 new members since the last meeting was duly announced :—

Mr. C. H. Hearsey, S.F.S. (Kaubalu, Burma) ; Hon'ble Surgeon-General H. W. Stevenson, I.M.S. (Poona) ; Mr. A. S. Campbell (Jalgaon) ; Mr. C. E. Pargeter (Balaghat, C.P.) ; Mr. H. S. G. Vidal (Bombay) ; Major A. S. Teed (Multan) ; Mr. P. M. D. Sanderson (Bombay) ; Major J. Frizelle (Multan) ; Mr. C. E. Fendall (Seraham, P.O., Bussahir State, Simla District) ; Mr. G. E. C. Wakefield (Hyderabad, Deccan) ; and Mr. B. H. Backhouse (Itarsi, C.P.)

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donor.
1 Flying Fox (*Pteropus medius*) ..	Nasik ..	L. H. Savile.
2 Red-breasted Paroquets (*Palæornis fasciatus*).	Assam ..	E. O. Shebbere.
4 Eggs of Pheasant-tailed Jacana (*Hydrophasianus chirurgus*).	Kashmir ..	Major J. W. L. Elgee.
13 Houbaras, (*Houbara macqueeni*), 3 Black Partridge (*Francolinus vulgaris*) 9 Rain (*Cortunix coromardelisa*) and Grey Quail (*Cortunix communis*), 4 Squirrels (*Funambulus sp.*)	Mirpurkhas ..	E. Priestley.
1 Snake (*Simotes juglandifer*) ..	Ootacamund ..	H. C. Jeddere-Fisher.
Dark-coloured Dhaman (*Zamenis mucosus*).	Bombay ..	E. R. H. Jackson.
11 Snakes	Kognole, Belgaum.	Vasuvada.
Chameleon (*Chamæleon calcaratus*) (alive).	Dharwar ..	T. H. Abraham.

Contribution.	Locality.	Donor.
1 Young Saw-fish	Bombay ..	Capt. Hussells Yates.
20 Beetles and a few Hymenoptera.	Darjeeling ..	S. G. Wood.
39 Beetles	Kurseong ..	E. A. D'Abreu.
18 Land crabs of 9 species ..	Various ..	In exchange with Indian Museum.
Series of shells showing development of the Pearl Oyster, (*Margineferа* sp.)	Jamnagar ..	J. Wilson Pace.

Minor contributions from Colonel Penton, R.A.M.C., Captain Lawson, Mrs. Monteath, Messrs. E. R. Jardine, H. S. Wise, F. C. Purkis, S. G. Wood, C. E. Dunford, W. S. Millard, S. D. Smith, S. H. Prater, P. Gerhardt, L. H. Savile and B. D. Richards.

SMALL GAME SHOOTING SEASON, 1910-11.

The Honorary Secretary mentioned that it was intended to again issue in the next number of the Journal a "Small Game Shooting Return," and he appealed to all members to either fill in the schedule themselves or get their friends to do so.

In the number of the Journal about to be issued (No. 2, Vol. XX), there was a short report on the shooting season of 1908-09, which was based on only 28 returns, and was therefore very incomplete. From various causes, this report had been delayed, but it is hoped, in future, to issue it in the first number of the Journal which comes out after the shooting season. The schedule had been enlarged to enable fuller information to be given, which would add to the interest of the report. The Honorary Secretary drew the attention of those present to the fact that not a single return had been made by a Bombay member for the season 1908-09; and, therefore, he regretted to say the Bombay district was not mentioned in the Report.

He added that, considering there must be at least 500 members of the Society who shoot regularly, more schedules should be returned, and he hoped that there would be a much larger number sent in at the end of the coming season.

Actual dates are required particularly for Snipe, Duck and Grey Quail, arrivals and departures; and members are specially requested to note whether the Snipes are "Fantail" or "Pintail."

LIBRARY.

The Honorary Librarian, Mr. B. D. Richards, acknowledged amongst recent additions to the Library :—

The "Ibis" 1890—1902 presented by Mr. E. Comber.

Catalogue of Birds' Eggs—4 Volumes presented by Trustees of British Museum.

"Rhopalocera Malayana," by W. L. Distant, purchased,

and certain back parts of the "Avicultural Magazine," presented by Major Rodon.

EXHIBITS.

Mr. L. H. Savile exhibited specimens of a tree stump from the Bombay Harbour and enlarged photographs of the trees *in situ*.

Mr. W. S. Millard exhibited a few new plants introduced into Bombay, namely, *Gloriosa rothschildiana, Odontodenia harrisii, Clerodendron urticaefolia, Tecoma smithi* and *Musa coccinea*, all in flower; and the foliage plants *Dieffenbachia majesticus* and *splendens, Tococa latifolia, Nepenthes mastersiana, Phœnix rœbelini, Dracaena sanderiana* and *broomfieldi, Musa vittata, Cissus cantserlii, Heliconia Edwardus Rex*, and young specimens of the handsome flowering tree *Gliricidia maculata* and the candle-tree *Parmentiera cereifera*, the last two having been raised from seeds received from Peradeniya.

PAPERS READ.

Note on Prehistoric Tree-stumps discovered in Bombay Harbour.

Mr. L. H. Savile said :—The note on prehistoric tree stumps discovered in the Bombay Harbour records the finding of 4 trees of a species of Acacia, embedded in the blue clay which overlies the rock moorum at a depth of 40 feet below the level of high water spring tides. The position of these trees, which was shown on a plan, is nearly half a mile from what a few years ago was the foreshore opposite St. George's Hospital.

Reference was made to a paper by W. E. Hart on "Prehistoric Bombay," which mentions the finding of similar trees in the excavation from Prince's Dock, and the present discovery goes to confirm the conclusion arrived at by Mr. Hart that our present Bombay has experienced at least two upheavals and subsequent subsidences before as a single Island—

"She rose, as did of old, the Goddess of Beauty from the sea!"

Note on the varieties of Hibiscus cultivated in Gardens.

Mr. W. S. Millard said he need hardly apologise for introducing an Horticultural subject, as it was impossible to separate Horticulture from Botany or from Agriculture. It was recognized almost everywhere now that these sister subjects must advance hand-in-hand, and it was only on

this side of India that the branch of Horticulture had been so woefully neglected, although in Agriculture we had the reputation of being in advance of the rest of India. Mr. Millard said he had frequently been beseeched to start a Horticultural Society for Bombay, but he could not see how any material advantage was to be gained by such a Society without a Horticultural garden in which experiments could be carried on. Once possessing such a garden, he believed that the large amount of interest, which was taken by residents of Bombay, would ensure a flourishing Horticultural Society.

He said from information he obtained, he believed that various persons had from time to time made collections of the different varieties of Hibiscus. Mr. Robert Campbell, many years ago, had a good collection at Malabar Hill, and he remembered hearing of a Parsee gentleman living, he thought, at Tardeo, who possessed some 25 different varieties; some of these varieties seemed to have disappeared, and as the European's residence in India could never be more than a temporary one, it was greatly to be desired that Native enthusiasts in horticulture should try and establish collections of these and other flowers (which might almost be called indigenous now to India) and thus guarantee continuity.

Mr. Millard said that his attention had been drawn to this subject by Mr. O. V. Bosanquet, I.C.S., of Baroda, who was trying to start a collection there. He then referred to different varieties, of which 24 single and 7 double were shown.

The following gentlemen were thanked for sending specimens :—

Mr. C. M. Cursetjee, Dr. R. F. Seervai, the Superintendent, Victoria Gardens, Mr. W. P. Pechey (Byculla Club), Col. K. R. Kirtikar, I.M.S. (Retd.), Lt.-Col. J. G. Hojel, I.M.S., Capt. Haymes (R. A.) and Mr. John T. Fry.



THE PAINTED SNIPE.

Rostratula capensis.

Full size.

JOURNAL
OF THE
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MAY 1911. VOL. XX. No. 4.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART IV.

(With Plate IV)

(Continued from page 602 of this Volume.)

Family—CHARADRIIDÆ.

Genus—GALLINAGO.

GALLINAGO GALLINULA.

The Jack Snipe.

Scolopax gallinula.—Linn., Syst. Nat., i, p. 244 (1766); Seebohm, Charadriidæ, p. 480.

Gallinago gallinula.—Blyth, Cat. p. 272; Jerdon, B. of I., iii., p. 676; Hume, Str. Feath., i, p. 235; Adam, *ibid*, p. 395; Butler, *ibid*, iv, p. 15; Fairbank, *ibid*, p. 263; *id.*, *ibid*, v, p. 410; Hume Dav., *ibid*, vi, p. 459; Dav. and Wendon, *ibid*, vii, p. 88; Ball, *ibid*, p. 228; Cripps, *ibid*, p. 302; Hume, *ibid*, p. 484; *id*, Cat. No. 872; Scully, Str. Feath., viii, p. 356; Legge, B. of Ceylon, p. 828; Hume and Marsh., Game B., iii., p. 373; Vidal, Str. Feath., ix, p. 89; Butler, *ibid*, p. 428; Reid, *ibid*, x, p. 69; Eden, *ibid*,

p. 165; Davidson, *ibid*, p. 320; Davison, *ibid*, p. 314; Taylor, *ibid*, p. 465; Oates, B. of B., ii, p. 384; Barnes, B. Bom., p. 346; Hume, Str. Feath., xi, p. 321; W. Gaye, Journal, B.N.H.S., vi, p. 418; Stuart Baker, *ibid*, xii, p. 501; A. L. Butler, *ibid*, xiii, p. 149; Inglis, *ibid*, xiv, p. 771; Marshall, *ibid*, xv, p. 354; Wall, *ibid*, p. 72; Macdonald, *ibid*, xvii, p. 500; Dresser, Pal. Birds, ii, p. 763; Blanford, F. of B. I., iv, p. 292; Bahr, *Ibis*, 1907, p. 29; Dresser, "Eggs of Eur. Birds," p. 690; Finn. Ind. Waders, p. 150; Bahr, Proceedings Z. S., June 1907, p. 28.

Limnocryptes gallinula.—Sharpe, Cat. B. M., xxiv, p. 665; *id*., Hand List, i, p. 166; Oates, Game Birds, ii, p. 131; *id*., Cat. Eggs, B. M., ii, p. 66.

Vernacular Names.—*Chota Chaha* (Hin.); *Chota Bharca* (Nepal); *Olan* (Tamil); *Tibad, Pan Kawa* (Mahrati); *Daodidaj, Gajiba* (Cachari).

Description.—*Adult male*.—Crown to nape velvety black, stippled with rufous, a very broad supercilium pale buff; sides of the head dull white marked with rufous brown, two broad brown streaks running from the bill, the upper through the eye, the lower under the ear-coverts. Hindneck rufous stippled with white and dark brown; back, scapulars and rump black, glossed with purple and green varying in different lights, the outer webs of the scapulars buff, forming two bands and the inner more or less barred with rufous; upper tail coverts and tail dark brown with rufescent buff borders. Lesser and median wing-coverts deep brown or black, with very pale buff or white bars, greater coverts dark brown tipped white, wing quills dark brown, the first primary pale on the base of the outer web and the secondaries tipped with white. Chin white, neck, breast and flanks mixed white, brown and rufous, the brown predominating; abdomen and lower breast white, undertail coverts with dark shaft streaks. Underwing coverts white barred with brown on the edge of the wing; axillaries white, sometimes slightly barred with brown but generally pure white.

Adult Female.—Similar to the male.

Winter Plumage.—"Scarcely to be distinguished from the

summer plumage, except by the greater amount of blackish mottling on the hinder neck and the generally more rufescent colour. The pale bands on the back are lighter" (*sic* brighter ?) "but soon fade with exposure, and wear the paler tints of the spring and summer dress." (Sharpe).

There appears to be no difference in size between the sexes or in the colouration of the soft parts. Hume thus writes of this little snipe :—"I cannot discover any constant or average difference in the sizes of the two sexes; they vary a great deal according to age, but equally large and small birds of both sexes appear to occur. The following is a resumé of my measurements" :—

"Length 7·75 to 9·0; expanse 13·25 to 14·80; wing 4·1 to 4·67; tail from vent 1·87 to 2·5; tarsus ·89 to ·95; bill from gape 1·5 to 1·7; at front 1·57 to 1·74; weight 1·53 to 2·48 oz."

"The legs and feet are pale greenish, at times with a bluish or greyish shade, generally more or less olive or yellowish; the claws blackish brown; the irides deep brown; the bill is blackish brown at tip, and darkish brown on nares and along the commissure; the rest paler, sometimes a pale grey brown, sometimes with a fleshy tinge, and sometimes with a dull bluish or slaty tinge, especially towards the base of the lower mandible. Butler calls the colour of the feet "pale olive green."

Distribution.—The latest synopsis of the distribution of the Jack Snipe is that given by Oates in the Second Volume of his Game Birds. He writes :—"The Jack Snipe is found over the whole peninsula of India from the Himalayas to the extreme South and also in Ceylon. It has not yet been obtained in the Andamans and Nicobars and probably does not occur in these islands. To the East it ranges from Assam down to Pegu and to the latitudes of Moulmein, but I cannot discover that it has ever been shot in the Shan States."

"This Snipe, in summer, is found in Northern Europe and Asia up to, and within, the Arctic Circle from the Atlantic to the Pacific Oceans. In winter it migrates to the British Isles, Central and Southern Europe, Northern Africa, Palestine, Persia, India, Burma and China."

To this we must now add a few other places. Osmaston records it as having been shot by Capt. Turner in 1896 at Port Blair in the Andamans. I have received specimens from the Shan States, and others again from the Federated Malay States. Specimens have also been received by the British Museum from Taiwan (Formosa), Yokohama and Hakodadi.

As Hume says, its distribution in the non-breeding season is very perplexing and the thirty years which have passed since he wrote this have added very little to our knowledge as to its Winter haunts. It breeds, as has already been said, practically right across Northern Asia and Europe but whilst in Winter it is recorded as comparatively common all through Northern Africa and through Asia as far East as Bengal, eastward of this it becomes rare in Burmah and almost unknown in China. It may be that its alleged extreme rarity in China is partly due to the fact that sportsmen are not scattered throughout its whole length and breadth as they are in India and so we have not the same number of sporting records. This is not, however, a satisfactory explanation as there are several European settlements, all with their quota of sportsmen and field naturalists who would almost certainly have come across and shot Jack Snipe had they been there to shoot. Again paucity of sportsmen and naturalists is no reason for the few records of Jack Snipe obtained from Burmah and there can be no doubt that East of the Bay of Bengal the Jack Snipe at once becomes very much more uncommon than it is to the immediate West of it. The only record I can find which shews this bird to be anything but rare East of Bengal is made by Oates in his "Game Birds," p. 479, where he remarks :—"In Upper Burmah where the Jack is fairly common, six may occasionally be bagged in one day. Hume suggested that all our birds were possibly Western migrants, but as he himself added, this is hardly possible as the birds arrive in Eastern India earlier than they do in the West. It seems probable, therefore, that the migration of the Jack Snipe when leaving their breeding haunts is Western and South-Western and on the return journey Eastern and North-Eastern We have already shewn that the trend of migration of

the Pintail Snipe on its southern migration and on entering its winter resorts is decidedly Western and it would appear that the Jack in Asia carries this Western trend to an extreme.

Within Indian limits the distribution of the Jack Snipe is very irregular and they are not nearly as common as either the Pintail or Fantail though on rare occasions they may be come across in considerable numbers. It is to be found more or less all over the Indian continent at different times during the cold season, but there are few places in which one can rely on obtaining more than an odd bird or two with any certainty.

Tickell says "on one or two occasions, in very jungly places of bog and rank weeds interspersed among rice cultivation, I have found the "Jacks" almost monopolizing the ground, to the exclusion of the Common Snipe, but this is very rare; I think I have met with more to the Southward, on the borders of Orissa, than in any part of Central India, on either side of the Ganges. In the Calcutta markets, where the Common Snipe is to be seen in heaps, dead and alive, the Jacks are seldom to be met with. They seem to me to take to the more retired parts of the country such as Singh Boom, where, especially in the *ghat purrum* (beyond the Ghats) the rice cultivation struggles for mastery with the swampy jungle."

In regard to this note Hume remarks: "He is quite wrong, however, about the Calcutta market, to which thousands are yearly brought."

It is, however, very doubtful whether Tickell was really wrong in his estimate, as Finn says, when discussing this same point, there is no doubt that the numbers do fluctuate considerably year by year, but he watched the Calcutta markets very carefully for nine years and in the year 1882, 83 and 84 I did the same and never did either of us see the Jack Snipe exposed for sale in any quantities. Certainly in no year did the Jack Snipe number on an average one in a hundred of the various snipe thus exposed.

No very careful record was kept in Hume's day as to the comparative number of the various species obtained and all estimates made were very rough and in many cases possibly not quite

reliable. Fortunately we are now in a position to give actual figures showing the proportion of Jack Snipe to other Snipe shot in many parts of India, sufficient to allow us to give a very close general estimate of their numbers as compared with the Fantail and Pintail.

The most carefully compiled table I have received up to the present is one sent me by Mr. R. F. Stoney of the P. W. D. who has been good enough to let me have a complete account showing the snipe shot by him during the last ten years, 1901-2 to 1910, in the districts of Chingleput, Nellore, Madura, Bezwada, Villapuram, Ellore and Tanjore. From this most interesting table we find that out of 7,131 snipe shot only 60 were Jack and that these were distributed fairly equally throughout the various districts of the Province. Shooting in Cannanore Major Wall, I.M.S., was even less fortunate in coming across this little snipe, for, out of 427, snipe shot, he records that there was only one Jack (B. N. H. S., xv., p. 722).

Again Mr. H. Sauders, sending me notes on the comparative numbers of the different species of snipe shot by him, says that he got no Jack in Ceylon and that in Bangalore out of 274½ couple of snipe only four couple were Jack, but that shooting round about Lucknow Jack Snipe actually numbered no less than 40½ couple in a total bag of 74½ couple of snipe. It seems, therefore, that although Tickell records them as being more plentiful in Orissa than elsewhere, the same does not obtain further South.

From the Deccan also we have regular statistics compiled by Mr. W. Gaye and given in this Journal, (Vol. vi, p. 418) for the years 1888-90. There the total number of Snipe bagged is given as 621 of which only 28 were Jack.

In Bengal in 1883-84 I kept an account of 2,000 snipe shot and amongst these there were no more than 19 Jack of which 8 were bagged in one day. In Behar, Inglis and others report them as "rather scarce" and "rare."

In Upper Burmah, as we have seen, Oates reports them as comparatively common but Mr. K. C. Macdonald in writing on the birds of Myingyan records that Mr. Prideaux shot only three birds

during the season 1898-99 and that he himself only shot one Jack out of 461 Snipe shot by him in 1899-1900.

In Cachar and Sylhet, as elsewhere, the numbers varied considerably in different seasons. One year Capt. (now Col.) Melville and myself shot 94 couple of Snipe in three days in a bheel near the station of Silchar and got 15 couple of Jack amongst them and that season we must have shot forty couple of Jack at least. One day I got 8 to my own gun. Most years however saw only ten to a dozen killed during the whole cold season and some times the number fell to two or three.

In the Brahmapootra Valley I found them very rare and I do not remember even seeing more than a couple in one day.

The above statistics suffice to show, I think, that the Jack Snipe when compared with the Pintail and Fantail in India is a very much less common bird, though in particularly attractive spots it may occasionally be met with in some numbers. It is also possibly more common West and North of Allahabad than it is to the South and East and gets rare again in the further North and North-West, but our records from the extreme North-West are very meagre.

As to the time of arrival of the Jack Snipe in India and the average date of its departure therefrom, we have not yet sufficient data on which to declare anything very definite. The *probability* is that it arrives much the same time as does the Fantail and also departs with that bird, possibly arriving a little later and never staying on quite so late as the latest Fantails and Pintails do. Mr. Stoney's records are the only ones we have upon which one can work out a theory of any value. During the ten years these records cover, he notes, the earliest Pintail as being shot on the 27th August and the average date of the first bird as about the middle of October. The Fantails also arrived in early October, but no Jack Snipe were shot until the 3rd of November. Whereas, also, his last Pintails and Fantails were shot in April, the last Jack was killed on the 10th March.

The Jack Snipe is a very particular bird in his choice of an abode, and when shooting over a large tract of country the sportsman will find that but few spots are affected by the Jack,

but that these few places are resorted to again and again, by the same bird if it is missed when first put up, or by another if the original occupant is killed. Hume's description of this little snipe's favourite haunts cannot be improved upon, and I again indent on that much-quoted author. He writes:— "Now, these pet abodes have a character of their own; they may always be correctly described as *corners*, sometimes they are corners of paddy fields, surrounded on two out of three sides by a low earthen embankment; sometimes they are in an angle formed by a little scrub, or a couple of bushes, often just at the corner of a bed of bulrushes or high reed; they are always sheltered in secluded spots, where the ground is thoroughly moist or marshy and where the cover is pretty high."

This curious affection for 'corners' exhibited by the Jack Snipe struck me very forcibly when shooting in Cachar. Our ground was a vast expanse of rice cultivation interspersed here and there with higher land, here and there with deeper pools or stretches of swamp, but for the most part dead-level riceland stretching field after field in every direction. In places, however, small patches of land had been left uncultivated, and in these patches, generally extra swampy and muddy, grew a dense, bushy grass mixed with weeds, always thicker and higher near the banks which divided the uncultivated patch from its neighbours. It was in these places that we found the Jack Snipe, and we noticed also that they rose almost invariably from the corners where the vegetation was most rank. Shooting over this ground in the morning we put up Jack, sometimes two or three, out of each of these scraps of grass which we worked through, sometimes killing, sometimes missing. Returning again in the afternoon over the same ground, the same thing occurred, and that whether we had missed or killed in the morning. We shot over these fields on three consecutive days and each day we must have put up from 15 to 20 Jack Snipe killing about 10 of them. As far as I remember on no single occasion did we put up a Jack from the ordinary cultivated rice land, though we bagged one or two from corners of the swamps and in cosy little jungly corners running up into the higher land.

As a rule the Jack sits very close and requires a good deal of persuasion to make it rise. Nor does it run after alighting as the Common Snipe so often does, and if after being flushed it again settles, it will, if looked up at once, be found at the exact spot where it has dropped. It is said to have an extremely strong smell, so that shooting with dogs, as at home, Jack are not often passed over, but out here, where dogs are, and can be, but seldom used, many Jack must be passed over as they lie snug in their cover.

Jack rise silently and very vertically, and once up and away, their flight is exactly like that of a butterfly. It may be slower than that of either the Pintail or Fantail, but it is a very disconcerting bird to fire at after one has been shooting for some time at the bigger birds. Hume says that it is probably one of the easiest bird in the world to shoot if you reserve your fire to the proper moment, but I must personally confess that I have never yet quite made up my mind as to which this proper moment is. The bird's whole flight is so erratic that one can never tell what its next movement is going to be; it rises, drops, dodges to one side or another irrespective of all ordinary rules of flight and then when you think it has steadied down to a flight in one definite direction, it falls to the earth as if already shot, and you then walk it up to have the same performance repeated.

Directions as to how to shoot the Jack Snipe are plentiful, and two may be quoted. Booth says:— "A Jack Snipe . . . . was almost invariably missed through firing too quickly, and . . . . I was forced to repeat aloud one, two, three, four, five, six before bringing my gun to the shoulder . . . now . . . ill-luck invariably attends the bird that is patiently waited for."

Colonel Hawker, however, gives the following advice:—"Nothing teases a poking shot worse than a Jack Snipe, but to one who has the knack of pitching and firing his gun in one motion, they are generally speaking not much worse to shoot than other small birds."

Its curious flight seems also to be too much even for the powerful winged birds of prey, for Finn records that Mr. Jesse "recently saw one pursued by quite an assortment of Raptorial birds, and

yet evade the whole villanous combination, which included a pair of Lugger falcons, two kites, a tawny eagle and two ruffians unidentified."

It is however a gamey little bird well worth expending one or more shots on, as there is no daintier morsel of food obtainable than a Jack Snipe, generally a little ball of fat and in flavour excelling any of his larger relatives.

The Jack Snipe has been accused of being unable to swim, but this is quite incorrect, for I have seen a winged Jack fall into a clear pool in a swamp, right itself at once and swim straight to the edge where it promptly concealed itself in the weeds.

The Jack Snipe breeds from the Atlantic to the Pacific throughout Europe and Asia in the far North and is perhaps most common during the breeding season in Finland, where its nests were first taken by Wolley. Buturlin found it numerous on the Kolyma Delta in 1905. It is reported to breed in considerable numbers throughout Russia, north of the latitude of St. Petersburg and extends throughout Northern Europe to Great Britain, in which country it is said to have bred or been shot in the breeding season, as far south as Yorkshire.

During the breeding season the Jack Snipe makes a curious sound whilst on the wing, but it is very doubtful whether this sound is "drumming" in the true sense of the word and the best observers still consider the sound a vocal one.

Dr. Bahr thus writes about *Gallinago gallinula* "The Jack Snipe has 12 tail-feathers, of which the outer three are markedly shorter than the three central ones. Their texture is soft and the rami are easily separated, in contradistinction to those of the species we have already considered. On experiment these feathers produced no sound at all.

"The structure of the outer web of the outer feathers more nearly approaches that of the inner—a marked difference to that found in the other feathers we have been considering; that is, the rami of the outer web are provided with distal and proximal rows of radii and thus adhere together. The distal radii are provided with 4 hamuli both in the outer and inner webs."

Buturlin writing to Dr. P. H. Bahr on the "drumming" of the Jack Snipe says:—"I heard it every day in the summer of 1905, when on the Kolyma. The bird usually flies so high that even with the aid of the midnight sun and good Zeiss binocular it is often quite invisible, nevertheless the sound 'top-toppy, top-toppy' is quite clearly heard."

Wolley's description of the breeding of this little Snipe still remains the best and the most interesting and is therefore quoted *in extenso*. He writes: "I scarcely like to tell you about the Jack Snipe; anything I can say must be so poor an expression of my real exultation at the finding of this long-wished-for egg. It was on the 17th of June 1853, in the great marsh at Muonioniska that I first heard the Jack Snipe, though at the time I could not at all guess what it was. An extraordinary sound unlike anything I had heard before. I could not tell from what direction it came, and it filled me with a curious surprise. My Finnish interpreter (Theodore) thought it was a Capercally, and at that time I could not contradict him; but soon I found that it was a small bird gliding at a wild pace at great height over the marsh. I know not how better to describe the noise than by likening it to the cantering of a horse in the distance over a hard hollow road: it came in fours, with a similar cadence and a like clean yet hollow sound. The same day we found a nest which seemed to be of a kind unknown to me. The next morning I went to Khartoum with a good strength of beaters. I kept them as well as I could in line, myself in the middle, my Swedish travelling companion (Herr Salomon) on one side and the Finn talker on the other. Whenever a bird was put off its nest the man who saw it was to pass on the word, and the whole line was to stand whilst I went to examine the eggs, and take them at once, or observe the bearings of the spot for another visit, as might be necessary. We had not been many hours in the marsh when I saw a bird get up before Herr Salomon, and I marked it down. In the meantime the nest was found, and when I came up the owner was declared to have appeared striped on the back and not white over the tail. A sight of the eggs as they lay raised my expectations to the

highest pitch. I went to the spot where I had marked the bird, put it up again, found that it was indeed a Jack Snipe, and again saw it after a short, low flight drop suddenly into cover; once more it rose a few feet from where it had settled, I fired and in a minute had in my hand a true Jack Snipe, the undoubted parent of the nest of eggs. I walked as composedly as possible back to my friend; he said: "A common bird, I suppose?" I replied "yes, very"; but I shook him warmly by the hand and told him that common birds sometimes lay very rare eggs. As usual I took measures to let the whole party share in my gratification before I again gave the word to advance. In the course of the day and night I found three more nests, and examined the birds of each. One allowed me to touch it with my hand before it rose, and another got up when my foot was within six inches of it. It was very fortunate that I was thus able satisfactorily to identify so fine a series of eggs, for they differ considerably from one another. I was never afterwards able to see a nest myself, though I beat through numbers of swamps. Several with eggs, mostly hard sat upon, were found by people cutting hay in boggy places in July. I have spent a good many hours this present year (1854) in the same Kharta-uoma without finding one, though I had plenty of men and boys in good working order. There have been certainly few Jack Snipes in the country this season. The nest of the 17th and the four of the 18th of June were all alike in structure, made loosely of little pieces of grass and *Equisetum* not at all woven together, with a few leaves of the dwarf birch, placed in a dry sedgy or grassy spot close to more open swamp. I found them generally at the best time for finding birds by walking them up from their nests, that is in rainy weather or about midnight. The gnats are, however, there so terrible voracious—destructive—no word is too strong—that tar oil, Templar caps, veils and thick leather gloves are indispensable.

"It was not long after I first heard it that I ascertained that the remarkable hammering sound in the air was made by the Jack Snipe; but I have not yet quite satisfied myself whether the *keet-koot keet-koot* on the ground, and the *Baa-aa-aa* in the air, which

are constantly to be heard in the same place, are made by one and the same bird at different times. At a considerable height it is not easy to distinguish a Jack Snipe from another Snipe, and the clicking and bleating seem to my ears exactly like the Common Snipe's. However, I did not find a single one of the latter bird in Iso-or Kharto-uoma, though I have met with one or two elsewhere in the neighbourhood. Few of the country people recognise two kinds; they consider that all the sounds proceed from the same bird, the "Ram of the Heavens"; they take them for signs of the weather, or they adapt them to words pretending to be the lamentations of transmigrated girls, who have died in their maidenhood and are bewailing their hard fate; but the lads generally get the worst of it in a trial of wit with their fair companions."

"(The above, written by Mr. Wolley from Muonoiovara, 27th November 1854, to Mr. Hewitson, was by him printed, with a few omissions (now restored) in the Third Edition of his work.")

"Mr. Wolley," adds Prof. Newton, "subsequently satisfied himself that the Jack Snipe did not bleat in the air or utter the *keet-koot* call-note on the ground, those noises being exclusively due to the common species; but both are called indifferently the *Jeivaar Jaure*, meaning the 'Ram' or, I believe, more strictly, the 'Wether of the Heavens.'"

The Jack Snipe commences breeding a good deal later than the Fantail, and appears seldom to lay before the end of May, though I have a clutch or eggs taken in Finland on the 21st of that month. The majority of birds do not lay until the second or even third week of June and eggs may be found (*vide* Wolley above-quoted) until well on into July. Naturally the further North the breeding grounds the later the Jack Snipe lays, and in the most Southern portion of its breeding area, late eggs of *Gallinago cœlestis* may be taken on the same ground, and at the same time as the earliest eggs of *Gallinago gallinula*.

The nest consists merely of a few blades of grass, weeds or leaves in some natural depression in the ground, but in a few instances they are said to collect together a considerable amount of material, more especially when the site selected is a wet one.

As a rule, the nest is placed in some wide-stretching fen on a small tussock or patch of ground slightly higher than the surrounding fen-land, and several pairs of birds may be found breeding on the same swamp. Sometimes, however, the Jack Snipe lays its eggs at a considerable distance from any actual swamp, and they have been found in hay-fields or in strips of grassland which contain soft and muddy patches.

The full complement of eggs laid is always four, as with other snipes, and the eggs themselves are typical snipes' eggs in shape, colouration and texture, but are extraordinarily large in proportion to the size of the bird. A hen Jack Snipe after laying her last egg, seldom weighs more than 2 oz., yet the weight of the four eggs is, roughly speaking, about an ounce-and-a-half.

As regards the few eggs in my collection, I can see no difference in colouration between the eggs of *Gallinago coelestis* and those of *Gallinago gallinula*, but it has often been claimed for the latter that they are more richly coloured on an average, and this may be the case when a large series is taken into consideration. The ground colour is generally a yellowish stone colour, often tinged with green or grey, or, less often, with reddish and the markings consist of broad blotches and spots of deep brown, many almost black, with others underlying them of dark purplish grey. Occasionally these secondary markings are paler and more washed-out in character and are then rather a lavender than purple-grey. The markings, both primary and secondary, are generally more numerous at the larger end, being sometimes almost entirely confined to this. In one pair in my collection, which comes from Finland, the blotches form a broad ring about the larger third of the eggs, the markings on the smaller two-thirds and inside the ring being but few in number and very small.

The texture is smooth and close, and usually there is a decided gloss ; the shape is the ordinary pyriform or peg-top.

Oates gives the measurement of the Jack Snipes' eggs as varying between 1·4" and 1·65" in length and between 1·05" and 1·13" in breadth. Dresser gives the average as 1·55" by 1"·05", and those in my collection average 1·52" by 1·09".

Genus Rostratula.

The genus *Rostratula* is perhaps more nearly allied to certain of the Sandpipers than to the true snipe, and is certainly nearer the former in anatomy. The bill is long, as in the Snipes, but is curved gently downwards, and is swollen at the tip, and the upper mandible does not overlap the lower as in *Gallinago*. The retractile muscles are also absent, so that in the dry bill no pits show, though both mandibles are grooved. The eyes, though very large and snipe-like, are placed well forward; the legs are rather long and very sturdy, the toes long and the tibia naked for some distance above the joint.

The general plumage is more lax than in the snipes and the wings are broad, but rather short. The tail contains 14 feathers. The sexes are quite different in plumage, whilst the windpipe of the female Painter is longer than that of the male and curves into one full loop.

The genus contains three species, our Indian bird, which also extends to Africa and two others which inhabit Australia and South America respectively.

The sportsman can confound the Painted Snipe with no other bird; for, as soon as it is in his hand, he sees that it is a snipe or snippet of some kind with wonderfully painted plumage; and there is no other species of the *Charadriidæ* which can compare with it in colouration, though some of the Sandpipers in their rufous breeding plumage are very handsome.

Rostratula capensis.

The Painted Snipe.

Scolopax capensis.—Linn., Syst. Nat., i., p. 246 (1766).

Rostratula capensis.—Vieill, N. Hist. Nat., vii, p. 1; Sharpe, Cat. B. M., xxiv, p. 683; *id.*, Hand. L., i., p. 167; Oates, Game Birds, ii, p. 489; Finn., Ind. Waders, p. 155; Blanford, Avi. B. I., iii, p. 293; Stuart Baker, Jour. B. N. H. S., xii., p. 501; Bourdillon, *ibid*, xvi, p. 10; Macdonald, *ibid*, xvii, p. 500; Oates, Cat. Egg. B. M., ii, p. 68.

Rhynchæa capensis.—Butler, Str. F., ix, p. 428; Legge, B. of Ceylon, p. 800; Reid, Str. F., ix, p. 69; Hawkins, *ibid*, p. 172;

Davidson, *ibid*, p. 320 ; Oates, B. B. B., ii, p. 386 ; Hume, Str. F., xi, p. 322 ; Seebohm, Charadriidæ, p. 456 ; Oates, Hume's "Nests and Eggs," iii, p. 350 ; Munn, *Ibis*, p. 894, p. 73.

Rhynchœa bengalensis.—Gray, Cat. Nepal Pres. Hodg, p. 140 ; Blyth, Cat. B. Mus. A. S., p. 273 ; Jerdon, B. of In., iii, p. 677 ; Stoliczka, J. A. S. B., xxxvii, p. 20 ; King, *ibid*, p. 217 ; Hutton, *ibid*, xvi, p. 790 ; Hume, "Nests and Eggs," p. 586 ; *id*, Str. F., i, p. 235 ; Adam, *ibid*, p. 396 ; Ball, *ibid*, ii, p. 431 ; Oates, *ibid*, iii, p. 346 ; Blyth and Walden, B. of B., p. 157 ; Butler, Str. F., iv, p. 15 ; Fairbank, *ibid*, p. 263 ; Hume, *ibid*, v, p. 46 ; Butler, *ibid*, p. 223 ; Hume and Davis, *ibid*, vi, p. 459 ; David and Wen., *ibid*, vii, p. 89 ; Ball, *ibid*, p. 228 ; Cripps, *ibid*, p. 302 ; Godwin Aus., J. A. S. B., xlvii, pt. II, p. 21 ; Butler, Cat. Birds of Scind, p. 61 ; *id*, Str. F., vii, p. 187 ; Ball and Hume, *ibid*, p. 228 ; Cripps, *ibid*, p. 302 ; Hume, *ibid*, p. 484 ; *id*, Cat. No. 873 ; Hume, Str. F., viii, p. 112, 957 ; Doig, *ibid*, p. 371 ; Butler, Cat. B. S. Bom. Pres., p. 76 ; Hume and Marsh, Game B. of In., iii, p. 381 ; Vidal, Str. F., ix, p. 84 ; Bingham, *ibid*, p. 197 ; Davidson, *ibid*, p. 230 ; Dawson, *ibid*, x, p. 414 ; Murray, Fauna, Scind, p. 242 ; Barnes, B. of Bom., p. 347 ; *id*, Jour. B. N. H. S., i, p. 59 ; *et*, vi, p. 130.

Vernacular names.—Ohari, Nepal ; Kone, Konebatta, Singhboom ; Tibud, Pan-lawa, (Mahrati) Ratnagiri ; Mail-ulan, (Tamil) Madras ; Baggajee, (L. Bengal) ; Rajakaeswatuwa, (Cing.) ; Daonidap Gajao, (Cachari.)

Description.—*Adult male*.—Crown olive-black, with very fine bars of white and a broad medium band buff ; feathers round the eye and short, but broad, streak behind it, over the ear-coverts, buff, the feathers next the buff darker than elsewhere on the head ; lores grey brown, very finely barred with black and more or less stippled with white. Upper back and scapulars a more olive brown with patches of dark metallic olive green and the outer webs of the scapulars buff, forming two lines down the sides of the neck similar to those in true snipes ; lower back, rump and upper tail coverts a vinous grey, very narrowly barred with black and with a few white dots, the last named also with buff circular spots ; tail the same with buff edges to the tips. Wing

coverts and inner secondaries metallic olive-brown, finally barred with black, and buff and with broad buff bars and spots on the outer part of the wing; quills blue or vinous, grey finely barred with black, the outer primaries with broad alternate bands of black and buff on the outer webs, the inner primaries and secondaries with broad buff marks only, which become oval spots on the inner secondaries. Chin and neck mottled brown and white; breast and flanks brown, the latter mottled with white and the breast edged with dark brown next the abdomen which, with the under tail coverts, is white; a buff or white band passes up from the breast to form a shoulder girdle which connects with the buff scapulary lines, the borders to this band are black or darker brown than the adjoining parts. Under wing-coverts vermiculated grey, black and white; axillaries pure white and there is a broad white band formed by the tips of the medium under wing coverts.

"Length, 9·25 to 10·0; wing 4·9 to 5·2; tail from vent 1·5 to 1·8; tarsus 1·65 to 1·83; bill *at front* 1·65 to 1·85; weight 3·5 to 4·9 oz." (Hume).

"The legs and feet are generally greenish, usually a pale yellowish green, or greenish yellow, often greyer and duskier, or somewhat hoary on the joints and toes; sometimes however they are a deep olive, sometimes pale bluish overlaid with a greenish tinge, and sometimes simply dull pale green; the claws are brown, sometimes paler, sometimes darker.

"The irides vary from hazel to very deep brown, and have sometimes a greenish or olive tinge.

"The bill is very variable; typically it is a pale fleshy brown, darker or purer brown towards the tip, and with a greenish tinge towards the base; it is subject however to a good deal of variation" (Hume).

The above description of the soft parts as given by Hume refers to both male and female.

Adult female.—The circle round the eye and the band behind it are pure white. The chin, throat, neck and extreme upper breast a rich chestnut, with a broad pectoral band of blackish brown running up as far as the scapulars and succeeded by a pure white band which is again followed by another brown band, intercepted

in the centre with white; the scapulars and back have not the buff markings of the male but the underlying scapulars are pure white, forming a tuft of white feathers which show up through the others. The wing-coverts and inner secondaries are a rather bright olive green closely barred with black and more or less tinged reddish. The general aspect of the closed wing is thus green in the female whilst it is a game-bird vermiculated brown in the male. The remainder of the plumage is like that of the male.

"Length 9·75 to 10·89; wing 5·25 to 5·6; tail from vent 1·6 to 2·9; tarsus 1·75 to 1·96; *bill at front* 1·8 to 2·05; weight 4·4 to 6·42 oz." (Hume).

"Bill greenish, yellow fleshy at the tip of both mandibles; feet pale green; iris dark drown" (A. E. Butler).

"The bill is olive brown throughout in the cock, in the hen brown at the base shading into flesh colour at the tip" (Finn).

I have not personally been able to discriminate between the sexes as regards the colouration of the soft parts and think the variations are individual and not sexual.

"The young birds of both sexes resemble the male in plumage *but the female may be known at all stages by the presence of some white scapular feathers.* Females in every phase of plumage between that of the male and that of the adult female are very common in collections" (Oates).

"*Young male.*—Resembles the old male almost exactly, but has the throat entirely white, the lower throat and fore neck washed with brown, with some dusky streaks" (Sharpe).

Young females who have just acquired adult plumage have the chestnut of the head and neck very dull and the feathers are margined with dusky.

Nestling.—Dull grey, or buff grey, with a broad coronal streak and eye streak of rich brown. The centre of the back is rich rufous with a band of black on either side and there are also lateral bands of purplish brown, running from under the wings as far back as the thighs. The wings are banded buff and brown.

There is no seasonal change of plumage in the female.

Distribution.—Africa, South of the Sahara, but extending East to Egypt, Madagascar; throughout Southern Asia, though it

appears to be very rare, if existing at all, in Arabia and Persia; in all parts of India, Burmah and in the Malayan Peninsula, throughout Southern and Central China to Japan and also in Sumatra, Java, Borneo, Philippines and Formosa.

In India it is to be found in practically every part of the Continent where there is suitable country for it and, in the same way, it is to be found at a considerable elevation in the Himalayas and other mountain ranges where there are swamps, lakes, etc., for it to live in. In Kashmir it is often met with as late as September, but seems to migrate to lower elevations in the winter. In the Khasia Hills it is found upto 5,000 feet in summer and up to nearly 2,000 feet in winter. I have also records of its ascending the Nilgherries to about the same height and in Travancore it seems to be found up to 3,000 feet as I have had eggs sent me for identification taken at that elevation.

Naturally, though not migratory in the true sense of the word, the Painted Snipe, being dependent on a water supply, becomes locally migratory in those places in which the water at one season completely dries up. Thus, Adam reported that in the vicinity of the Sambhur Lake, the birds were only seen during the rains but migrated elsewhere in the approach of the hot weather when the lakes dried up. Reid and others note that they are more or less migratory in the Lucknow Division; and, doubtless, this local migration obtains in many of the drier portions of the N.-W. Provinces, Oudh and Rajputana. Hume thought that an excess water supply, such as is found in Lower Bengal, also affected their movements; but this is probably not the case, as they have been shot, and are common, at all seasons of the year in the Sundarbands, the most watery of all parts, even of watery Bengal.

Nowhere within its habitat is the Painted Snipe ever found in such vast numbers as is the Common Snipe; but in certain parts of the country, such as the Sundarbands of Khulna and Jessore, some 30 or 40 birds may be seen in a day's trudge; and this although the birds do not *pack* in these districts as they are said to do elsewhere. Thus in Stray Feathers Butler speaks of whisps or flocks of 20 birds, and Hume in *Game Birds* records that he has seen flocks of a dozen or more birds together at the same time.

The Painted Snipe scarcely deserves a place amongst the Game Birds; if in anatomy he is more near the sandpipers than the snipe, in many of his habits and manners he is nearer the rails than to either the sandpipers or real snipe. Hume, with his powers of accurate observation, of course noticed this, and gives a very characteristic little anecdote to illustrate it. He writes :—"On one occasion . . . . I saw three running about on a tiny patch of short, close moist turf, just outside the rushes and not 20 yards from where I was, and picking up something rapidly from the ground. After watching them for several minutes, I made a slight clicking sound, and they instantly sneaked into cover with lowered heads." I was once staying in a house in the garden hedge of which a pair of Whitebreasted Water Rails had their nest. When all was quiet, the two adult birds, and later on the parents with their brood, used to come out and wander about on the lawn; directly, however, they found out that they were being watched simultaneously down went the 8 heads of parents and children, as if suddenly filled with the deepest shame, and they all sneaked off into the shelter of the hedge. If they were disturbed by a dog they took to their wings, and here too they showed how closely the Painted Snipe is like the Rails. Both birds fly in exactly the same manner, though the larger wings of the Painter flap more slowly and laboriously. In starting both Rail and Painted Snipe drag their legs as if it was an effort to lift them up and for some yards after they get under way, the legs hang and then, with an effort, are pulled up and tucked away in proper position under the tail.

This bird, as a rule, haunts swamps, old watercourses and even ravines and banks of running rivers where there is ample cover; a long day's shoot in rice-fields is not likely to produce a single bird, though where there are adjacent marshes with thick vegetation, these may contain them in numbers. Even, however, in the larger stretches of water frequented by them, they seem to haunt special patches more than others, apparently preferring those which combine pools of water of some depth with plenty of soft, muddy land covered with a tangle of vegetation.

Such patches as these they are very loth to leave; they refuse to rise, unless closely pressed and soon return after the cause of their

disturbance has gone. Even, when shot at and missed, they may often be found again in exactly the same place within a very few hours, and this may occur several times before they are induced to quit.

A curious exception to this predilection for thick cover came under my experience in Cachar, where both Mr. H. A. Hole and I found these birds in July and August very numerous in recently ploughed fields. Painted Snipe are very common in Cachar, and especially so in the many bheels which run along the foot of the North Cachar Hills. The ploughed fields where we found the birds were small in area and consisted of the narrow strips of level ground which ran up into the foot Hills themselves, whilst the other ends terminated in swamp or jungle. The fields had in these months no crops yet growing on them and though often surrounded with jungle were quite bare themselves, except for the small amount of vegetation growing in the boundary ditches. Nor were these fields muddy and moist, except after heavy rain, though there was generally water in the ditches, yet the birds appeared not only to live and to feed in the fields but to make their nests in the ditches instead of in the swamps as would be expected.

The Painted Snipe is a strong, sturdy walker, and when, as is often the case, it inhabits cane bushes, beds of reeds or extensive jungle, it will often run great distances when it alights after being flushed. It is also an excellent swimmer, and I once saw an unwounded bird, disturbed by the near approach of a line of shooters, slip into a wide ditch of clear water and swim to the opposite side. Wounded birds have often been seen to swim either to escape capture or when shot at and dropped in open water. Legge also, quoting Layard, writes about two young Painted Snipe:—"On his giving chase, the chicks took to the water and swam like ducklings."

Finn in his "Indian Waders" has much to tell us of interest about this bird in captivity, and his remarks must be quoted at length. He writes:—"I have kept many and found them not very lovable pets. The words used by Palgrave to describe the camel's character will describe the 'Painter' exactly, 'never tame, but not wide-awake enough to be exactly wild.' I once even reared

a half-fledged young bird and got no further towards conciliating it then I did with adults. Yet these will let one pick them up with far less trouble than much tamer birds would give. In captivity can be studied with advantage the curious display by which the species seeks to terrorize an enemy. When slightly alarmed, it raises the wing furthest from the intruder; if pressed, this wing is fully expanded, while in desperation the bird faces its adversary with both wings and tail spread so that their beautiful spotted markings are fully shown. Meanwhile, a hissing or swearing note, like hot iron plunged into water, is given off. The similarity of this last attitude to that adopted by owls when on defence is, however, very striking, and I believe the Painted Snipe is at least as nocturnal as most owls, judging from the behaviour of captive specimens. Like owls, also, this bird has a singularly expressive countenance. When in its ordinary diurnal attitude crouched against the wall of its prison, with tail up and head down, so as to look as much as possible like a lump of mud, the head-feathers all lie flat, giving their owner a singularly stupid appearance. On the rare occasions, however, when one sees the bird walking about at ease, the feathers over the eyes are raised so as to be higher than the crown, which gives quite a wide-awake expression. In moving about thus, the head is carried high, and the bird looks tall and graceful, and moves its hind quarters up and down like some Sandpipers, but much more slowly. It will search for food in water something like a Spoonbill, and can swim, but this latter is not an exceptional accomplishment, being common to waders generally. The spreading of the wings undoubtedly has a terrifying effect in some instances, as I have seen a Golden Plover frightened by it, as also a Bantam hen; but some birds—a Rail, Ruff, and Pitta, did not seem alarmed at the Snipe's demonstrations. I was told, however, of a Squirrel which was seen to be scared thereby, when it came across one of these birds in one of the aviaries in the Calcutta Zoo, and I know of a case in a private aviary where a 'Painter' escaped destruction when some other birds were killed by a rat. It seems, therefore, that this gesture is a protective one. At the same time I have no doubt that the natives who told Mr.

Hume that the birds showed off to each other in this way in the breeding-season were quite correct in their statements, as I have more than once noted cases in which various birds used the same gestures to express anger or fear as they display in courtship."

Finn in the above quotation says that he thinks these birds must be as nocturnal as owls and Hume says that they certainly move about much more at night than by day. It is probable, however, that they feed freely in the early mornings and evenings and are crepuscular rather than nocturnal in their habits. Certainly Mr. Hole and I found them constantly feeding in the ploughed fields I have referred to already during all excepting the hottest hours of the day when they retired to the ditches and were only roused with great difficulty.

They are very omnivorous in their diet and eat both grain and animal food. An examination of the stomachs of a fairly large series of birds has given the following mènus of a Painter's daily fare. On many occasions exclusive meals of fat little field crickets, sometimes the same mixed with grass seeds or, less often, with unripe paddy; often meals of many courses including snails and tiny shell-fish, worms of all sorts and sizes, grass-hoppers, seeds, paddy and rarely millet. At other times they seem to have taken nothing but vegetarian food and once or twice I found nothing but paddy in their stomachs mixed with the green blades of paddy leaves.

The crickets were found in the stomachs of those which had been feeding in the open fields and it may have been the extraordinary abundance of these insects which induced the birds to forsake their ordinary habits and haunts.

I have remarked in the beginning of this article upon the difference in the length of the trachea of the male and female Painted Snipe, the latter having it long and convoluted and the former shorter and straight. This appears to correspond with a difference in voice and we find that the female has a rather deep, mellow note contrasting with the squeaky note of the male. Finn says he has noticed no difference in the notes of the two sexes, but says nothing further.

Wood-Mason describes the call of the female as "a low, regular, hoarse, but rich purr." Tickell considers it "low and mellow, a

single soft note frequently repeated, kone, kone, kone," and Hume says that to his ears it "most resembles the sound produced by blowing into the neck of a phial." Hume's description of the call seems to me to describe it well, but the reader must not imagine that the note is a whistle. A strong blow into the neck of a phial of course produces a whistle, but the call of the female Painter resembles the blow when it just falls short of this. It is a common enough call and every sportsman must get to know it if he does much snipe-shooting as the birds repeatedly call up to 9 or 10 A.M. in the cold weather and again commence calling in the evening a hour before sunset.

There is, I think, little doubt, but that, like the bustard-quails, the female Painted Snipe is polyandrous, and that like the bustard-quails also, it falls to the lot of her many husbands to hatch and rear the young. There are many points about their habits which have led me to this belief. Reference has already been made to the parties, or flocks, of these birds which certain observers have recorded as having seen. Now in every case in which such records have been made (Butler who recorded female flocks afterwards corrected his statement) the person recording it has stated that these parties consisted entirely of males, that is to say, of birds in the male plumage. Hume says that the larger of such flocks as he has seen have appeared to him to consist of two or more families of parents and young, but again it will be noticed that he makes no mention of any bird in the female garb and indeed infers, by the context, that they were all in the male plumage. It appears therefore that these parties consist of one or more adult cocks with their young and the only inference we can draw from this is that the cocks are left to look after the nestlings and bring them up.

As regards the hatching of the eggs, all I can say at present is that every bird that I have shot off the nest, or have had sent me as being trapped or shot off the nest, has been a male. Hume writes on this point "in no less than three cases in which old birds have to my knowledge been captured on the eggs, such old birds have proved to be males."

Against this theory is Capt. E. A. Butler's experience which

appears to be that both birds take part in incubation. He says in describing the nidification, that "the old birds are almost always near the nest" and all through this note he uses the plural number for the parents although he does not definitely say that he has ever shot a female off the nest, though in one paragraph he speaks of the bird as a female. The conclusion I have arrived at that the male alone carries out the duties of incubation has been further corroborated by other observers and sportsmen, some of whom did not even know that the more gaudy bird of the two was the female, and had, 'until they were told this, stoutly asserted that the female always sat on the nest and the male never. The fact that the female of the two sexes is provided with the more powerful voice apparatus and does the calling, to which it must be presumed the male replies in person, certainly looks as if she were the dominant factor in their matrimonial arrangements.

Yet again we find that the breeding season of the Painted Snipe extends practically the whole year round, ceasing in different localities only when the state of the country renders the food supply precarious, and when the scanty meals and constant work necessitated to obtain even these suffice to quell for the time being all desires to nest. Now this continuous laying of eggs by the female would prove far too great a strain on any bird's constitution if the time between the laying of each clutch of eggs was taken up in hatching them and then rearing the young but, given this time in which to recuperate, each female might well lay four or even more clutches in the year. Doubtless, too, sportsmen have noticed that they kill two or three adult males to every adult female and this fact, that the males should be far more numerous than the female, is what is to be expected in a polyandrous species.

There is also some proof that the females fight for the possession of the males for the Cachar Mahomedan Shikaries, who reverse the sexes, all say that the males are great fighters and constantly fight over the females.

Nidification.—The breeding season of the Painted Snipe begins on the 1st of January and ends on the 31st December, being shortened, as already mentioned, merely by local limitations, such as failure

of water-supply and consequently of suitable habitation and, to a less extent, of sufficient food. In places where there are swamps well supplied with water and cover all the year round we shall find that eggs of the Painted Snipe may be found during any month of the twelve, being naturally most numerous during those months in which the food supply is most plentiful and the birds are consequently in the best condition.

Legge says in Ceylon—the evergreen—that this bird breeds throughout the year and he mentions having records of eggs or young in every month of the year except January, February, August and October. As, however, he got an oviduct egg on the 31st December and young birds in March his records practically cover the whole year.

In Cachar and Sylhet it is the same, though but few birds breed in March and April when water is comparatively scarce; in the Sunderbunds they breed all the year round but seldom in August and September when their favourite breeding grounds are flooded.

Almost any site near water will do for a Painted Snipe's nest. It may be a tiny isolated pool with a few sedges and a sheltering bush or it may be some equally tiny islet just above flood level and placed in the middle of a sea of water and jungle stretching for miles on every side. I have taken them from dense tangles of cane and jungle growing on the borders of the morasses which stretch, in their lonely wildness, for miles along the foot of the Himalayas far from all signs of civilization, and I have taken a nest from a ditch actually in the station of Silchar and within 30 yards of an house. Nor is it necessary that the nest should be placed in uncultivated swamp land, for in parts of India it is often found (*vide* Butler) in or near rice fields. He writes: "The nests, all of which were in the vicinity of rice fields, were, in most instances, on the ground; but in one or two cases they were raised as high as eight or ten inches from the ground, and supported by the grass in whic' they were built.

"Of the various situations they were found in, I may mention as one of the most common the raised foot-paths which so often intersect these rice fields. In the rains the sides of the path become overgrown with grass, and in this grass the nest is often

built. Another favourite place is the short, dark green rushy grass that grows by the side of tanks and in swampy ground. This perhaps is the most favourite place of all, and in many of the nests found in this situations, the blades of grass were drawn together over the top of the nest, so as to form a sort of canopy as in some nests of *Porzana akool*. Another favourite spot is a rice field which has been ploughed up and left unplanted for some time until the grass begins to grow over it."

It does not always wait, however, ever until the grass has begun to grow, for during three seasons Mr. H. A. Hole found nests placed in fields which had been so recently ploughed that there was practically no growth on them and the nest had been placed merely under the shelter of a clod of earth larger than the average. Two or three such nests were shewn to me by him and others I myself found when staying with him. Some nests, the majority perhaps, were placed in the jungle which covered the sides of the ditches, but a very large number were taken from the bare fields well away from the sides. A very curious fact we noticed here was that we repeatedly came across single eggs dropped casually by the hen bird on the ground with no sign of a nest and, apparently, with no thought for its incubation.

The nest itself is a fairly compact pad of grass, straw, rushes or weeds, measuring about 6" across and from one to three inches in depth. When placed in a deeper hollow than usual the nest may be almost cup-shaped, but as a rule is merely a flat pad which has a depression less than an inch in depth. It is nearly always placed actually on the ground but occasionally a few inches off it in a tuft of grass thicker than usual, even more rarely, it may be found placed on a tangle in a cane brake just above the water or mud. Nearly always a wet situation is chosen or one just close to mud and water, but this is not invariably so and, as already narrated, I have taken nests from quite dry fields some distance from any water or wet ground. So also, though most nests are fairly well concealed by cover of some sort, others are placed conspicuously in the open or in stunted grass or stubble in positions in which it seems impossible they should escape the unwelcome attentions of vermin, winged or otherwise.

The number of eggs laid is almost invariably four, five is an abnormal clutch and three only quite exceptional.

They are very beautiful but do not in the least strike one as being eggs of any of the Snipe tribe.

The ground colour is generally yellowish, ranging from a pale stone-yellow to a bright yellowish *café-au-lait*, the tint is nearly always bright and the dominant colour is nearly always yellow but the actual tint varies much and there may be a grey, green, olive or even a pink tinge in it. The markings are always very bold in character and generally consist principally of very large blotches with a varying number of specks, spots and lines of deep vandyke brown. The centres of the larger blotches and where they overlap one another are almost black, but the outer edges are sometimes paler and more of a sienna brown. The secondary markings are but few in number and of the same shape as the others, but in colour are a grey brown or sienna brown, more or less washed out in appearance.

In some eggs the superior markings are paler in colour than usual and now and then one comes across a clutch in which all the markings are a light sienna brown.

In all eggs normally marked, the markings are most numerous towards the larger end, often forming there an irregular cap, sometimes a broad, irregular zone.

I have one clutch of eggs in which the markings consist mainly of twisted lines, long and short, with but few blotches or spots. In this the ground colour is the usual yellow, but an even more abnormal clutch has the ground colour a pink, almost purplish stone colour with the usual markings of vandyke brown. This is a very beautiful clutch and I have never seen another at all like it.

In shape the eggs shew some similarity to Snipe eggs but are, what one might call, of a modified character, the true peg-top egg being quite exceptional and ordinary ovoid or elliptical eggs quite common. Between these two extremes eggs may be found in every shape, the slightly peg-top shape being the most common.

The texture is hard and close, but not so fine as in the eggs of *Gallinago* and though there is generally a slight gloss, and sometimes a good deal, they are on an average not nearly so glossy as

the eggs of that genus, nor do they retain their fine surface and colouration for nearly so long a time.

All my eggs come within the limits of size given by Hume, 1″·29 to 1″·49 in length and from 0″·89 to 1″·05 in breadth, but the 120 eggs which I have measured average 1″·36 by 0″·97 as against his 1″·39 by 0″·99.

THE PLATE.—The colouration is on the whole good though our clever artist, Mr. Grönvold, may have been less happy than usual in clothing his birds in *feathers*. In fact the feathering of this bird should be more than usually pronounced as it is more lax and soft than in the true snipes.

Both bills and legs are correctly coloured but depict, of course, only one type. In most birds the legs will be found to be a less vivid green and with a decided touch of grey a plumbeous, more especially about the joints.

The female, which is shown in an active position, should have had the feathers above the white loreal patch slightly erected.

The white scapulars give one the impression in the picture of peering out from under the tertiaries or inner secondaries, as a rule, however, these show through between the upper scapulars and the adjoining wing coverts.

(To be continued.)

"THE PALE WEASEL" OF BLANFORD'S "MAMMALIA" AND A NEW HIMALAYAN VOLE.

BY

R. C. WROUGHTON.

Capt. Whitehead has recently presented to the National Collection two specimens of a weasel taken by him in the Upper Sutlej Valley. On comparing these with other weasels in the collection it appears that they, together with a specimen taken by Dr. T. G. Longstaff which evidently is the same form, differ from any other described Indian weasel.

Blanford in his Mammalia (No. 84, p. 168) adopts the name *alpinus* (it has been definitely agreed to restrict the generic name *Putorius* to the Polecats, using *Mustela* for the Stoats and Weasels) for the pale weasel of Nepal, Sikhim and adjoining Thibet, which Hodgson gave the name of *temon*. *Alpinus* was originally described from the Altai Mountains; and specimens from that locality show that it is a distinctly larger and stouter animal than *temon*, judging by the skulls, for unfortunately no specimens with reliable body measurements are available. In colour *alpina* is much paler, above than *temon*, and fades gradually to cream buff on the belly, in *temon* the contrast between the two shades is more sudden, though not in all specimens, showing a defined line of demarcation. In the specimens from the Upper Sutlej Valley and Ladak the pale yellowish white of the belly is quite sharply demarcated from the colour of the back and flanks, and this last is much nearer to that of the pale *alpina* than to that of the darker *temon*.

Under the circumstances, it is clear that the name *alpina* must be restricted to the northern Mongal-Siberian form, that *temon* must be revived for the Nepal Sikhim species, and that a new name is required for Capt. Whitehead's specimens. I propose to call them—

Mustela longstaffi, sp. n.

A weasel of the *alpina* type with a stout skull, showing little sagittal crest in the male and a large swollen brain case.

Fur short and close (8-10 mm. on back). General colour above a pale shade of 'clay colour,' below pale yellowish white. Head

slightly darker than tail, same colour as the back. Hands and toes white.

Skull stoutly made, the brain case much swollen, the sagittal crest not strongly marked, teeth less stout than in *alpina*.

Dimensions of the type recorded by the Collector:—

Head and body 250; tail 147; hindfoot 46; ear 25.

Skull.—Greatest length 50; basilar length 46; greatest breadth 28; post orbital constriction 10; brain case breadth 24 length of, carnassial 6; bullæ 14.

Habitat.—Western Himalaya (Type from Upper Sutlej, Valley Alt. 14,000).

Type.—Adult male. B. M. No. 10, 12, 2, 1. Original Number 168. Collected 16th September 1910, and presented to the National Collection by Capt. C. H. T. Whitehead.

At the same time as the weasel, Capt. C. H. T. Whitehead sent 3 specimens of a vole which, though closely resembling a species from Lhassa, differs from it in several skull characters and seems to deserve a name at any rate as a distinct Geographical Race. It may be described as follows:—

Microtus (Phaiomys) waltoni petulans, sub-sp. n.

A local race closely resembling *M. waltoni* externally. The latter, however, shows a well marked pale area on the flanks and its feet are distinctly whiter. Size as in *waltoni*.

Skull as in *waltoni* but more lightly built, especially noticeable in the lower jaw. Upper incisors narrower and white-tipped anteriorly; nasals shorter, extending less far back, broader in front, more abruptly narrowed backwards; anterior palatal foramina longer; bullæ smaller.

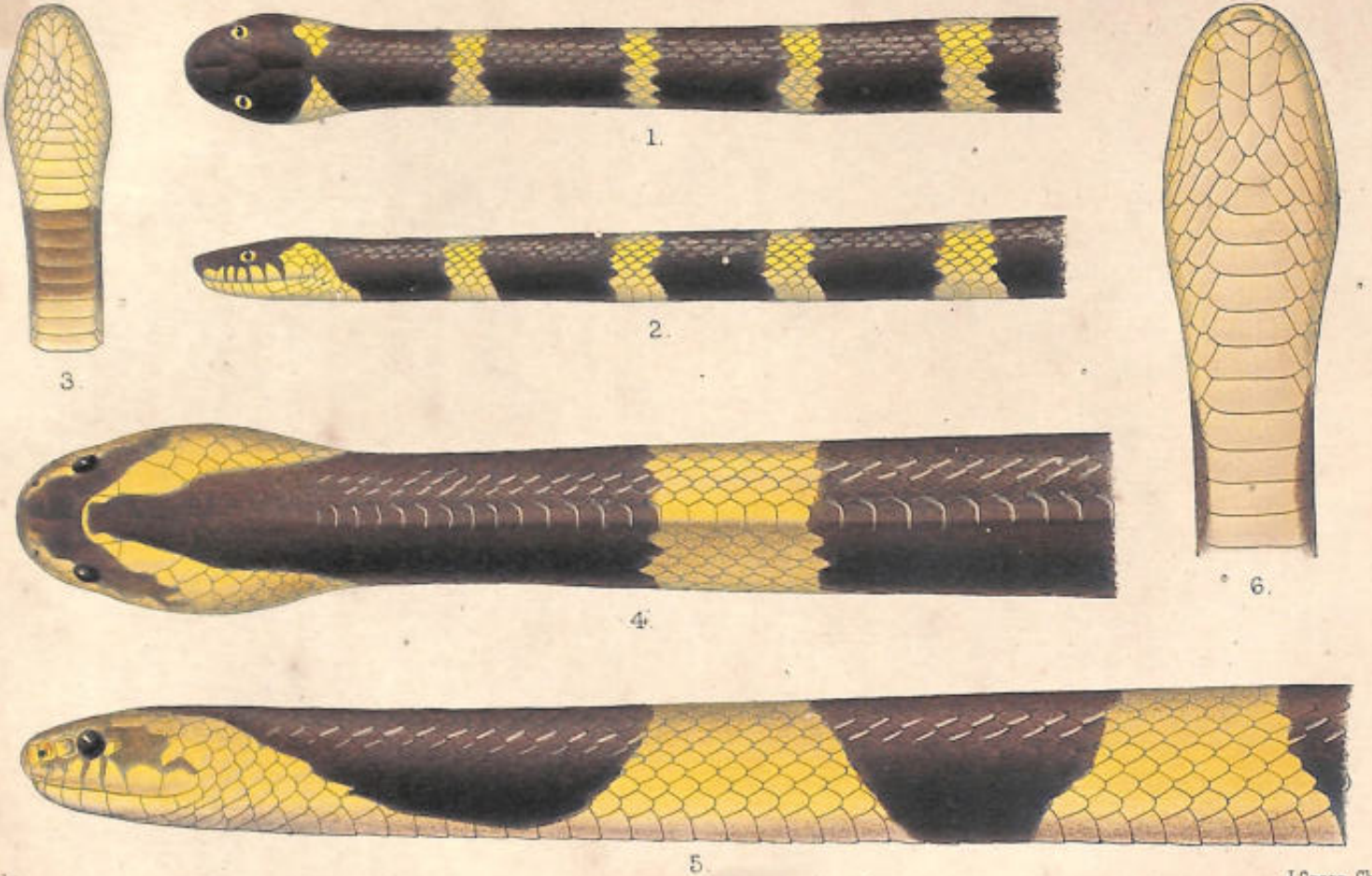
Dimensions of the type, taken in the flesh:—

Head and body 102; tail 33; hindfoot 16; ear 10.

Skull.—Greatest length 26·5; basilar length 23; zygomatic breadth 16; inter-orbital breadth 4; length of nasals 6·5; diastema 8·5; palatilar length 14; length of molar series 7.

Habitat.—Teza, Upper Sutlej Valley.

Type.—Young male. B. M. No. 10, 12, 2, 27. Original



J. G. del.

J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall).

1–3 *Lycodon fasciatus, harmless, nat. size.* 4–6. *Bungarus fasciatus, poisonous, nat. size.*

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATE AND DIAGRAMS

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XV with Plate XV., Plate A, 2 Diagrams and Map.

(*Continued from page 633 of this Volume.*)

BUNGARUS FASCIATUS.

THE BANDED KRAIT.

Proteroglyphons colubrines—or colubrines with tubular fangs in the front of the maxilla—are divided into two sub-families, (1) *Hydrophiniæ*—Sea snakes—all of which are poisonous, and (2) *Elapinæ*—poisonous terrestrial colubrines. The latter sub-family is divided into 69 genera, one of which *Bungarus* includes the species which forms the subject of this article. The genus *Bungarus* contains, according to my ideas, twelve distinct species,* but only six were described by Mr. Boulenger in his catalogue in 1896, and one subsequently by the same authority. The type of the genus is *Bungarus fasciatus*.

BUNGARUS FASCIATUS (Schneider).

History.—The first to allude to this snake was Seba who in 1735 figured it. Sixty-one years later it was again figured, and described by Russell. †

Nomenclature (*a*) *Scientific.*—The generic name was introduced by Daudin in 1803, and is a latinised rendering of the name by which it is known according to Russell to the natives in Orissa. The specific title from the latin "banded" was applied by Schneider in 1801.

(*b*) *English.*—To all Anglo-Indians the snake is known by the name of "banded Krait."

* See my article in this Journal, Vol. XVIII, p. 711.

† Ind. Serp. 1796, Vol. I, Plate III.

(*c*) *Vernacular.*—The name applied to it in Orissa—"bungarum pamah" is Telugu and means "gold snake." In Bengal it is usually called "rajsamp," a name probably suggested by the golden belts which encircle it, also "sankni." This latter appears to be connected with the word pronounced like our English "sunk" which is applied to the couch shells blown in Temples. If I am correctly informed these large shells are sometimes cut into several pieces by cross sections so as to make bracelets which are worn by Bengali women, and there is a street in Dacca where many craftsmen engaged in this occupation have congregated, and given to the street the name of "sunkaree." "Sankni" then appears to be a wearer of bracelets. Mr. E. Muir tells me about "kalna" (Bengal) it is usually called "sankni," but by the Hindus "dumukha" or two-mouthed. Also, he says, that the Santhals call it "bangphora" meaning two-mouthed, and "beeng."

In the North-West of Bengal, Fayrer* says it is called "kochlia krait." In Burma it has many names, "mywe min" (king snake), "ngan-wa" (yellow snake), "ngan-daw-ja" (banded royal snake), "nat mywe" (spirit snake), and "ngan-than kwinsyut" (or "ngan-than-gwin-zok" as Theobald has it) which means literally a cylinder with bands or rings on it.

General characters.—The banded krait when adult is a snake of respectable dimensions which attracts attention by its very distinctive, and highly ornamental, colouration. The head is broad and depressed, the snout short, and bluntly rounded. The eye is moderate in size, and blackish throughout, the pupil being usually invisible, but if looked at closely, sometimes an inconspicuous yellowish rim is seen to indicate its outline. The neck is barely apparent, the body smooth and glossy with a conspicuous ridge down the spine, and the tail short and ending abruptly in a finger-like extremity.

Colour.—The whole snake is broadly and alternately banded with canary-yellow and black. These bands involve from 5 to 7 scales in the length of the snake, completely encircle the body, and are of wonderfully even width, like a broad bracelet. The black

* Thanatophidia, p. 11.

are usually rather broader especially in front, and number from 16 to 27 on the body, and 2 to 5 on the tail.* On the nape is a large, elongate, black patch rounded behind, and ogival in front where it reaches the frontal shield, and this does not extend on to the belly. On the top of the head there is a large yellow V, the arms of which diverge backwards and pass over the temples to the throat. Except the lips and lore which are yellow, the rest of the crown is black. The chin and throat are yellow.

Dimensions.—It grows to 6 feet, but specimens over 5 feet are exceptional. I had one of 5 feet 3 inches in Berhampore (Orissa) and Evans and I had one 5 feet 9 inches in Rangoon. Vincent Richards† records one 6 feet long, Talbot Kelly in his book on Burma (1905, p. 110) mentions one just over 6 feet, and Major Leventon, I.M.S., told me of a large gravid ♀ he saw at Sibsagar in Assam that measured 6 feet 1½ inches. Fayrer‡ says on the authority of Mason that it grows to 8 feet, but I very much suspect there was some guess work in this estimate. I have had over 50 specimens from Bengal, Orissa, Assam, Burma and China.

Identification.—Though the colour and banding is so distinctive those who trust to these only may be deceived by the similarity in this respect shown by some specimens of the harmless snake *Lycodon fasciatus*. It is best in this instance as in every other to identify your snake by scale characters. The enlarged vertebrals, and entire subcaudals will proclaim the snake a Krait for certain, and the ridged spine, blunt tail or the yellow bands will distinguish this from all the other kraits.

Haunts.—It is usually found in open tracts of country, grass land, crops, or low sparse jungle but not, I think, so much in dense jungle. It is no infrequent visitor or inhabitant of Cantonments, and is often to be encountered in well populated localities, getting into the bazaars, native huts, and Cantonment houses. In my early Indian days the rustling of something, one night across the mat in a dak bungalow proved when a lantern had been lit to have proceeded from a large banded krait in the room which was

* In a specimen I killed in Hongkong there was a large black blotch ventrally in many of the yellow bands.

† Landmarks of snake poison, p. 5. ‡ Thanatophidia, p. 11.

duly despatched, and I have heard of other similar experiences. About the Jail at Insein near Rangoon, it was very commonly disturbed by convicts, and I used to get one or two a week with great regularity in the rains. Instead of retiring to some place of security by day, many specimens seem to lie up in grass or shallow depressions in the ground or open drains and are often very badly concealed. Their bright yellow bands make them very conspicuous, and they are not likely to escape the notice of the village urchins at their games, or the chance wayfarer.

Many of them show a special attachment to damp places, and are to be met with in paddy fields, and even in pools of water, or river sides. I had one brought to me in Assam that was reported in the water, devouring a fish. Another in Burma took refuge in a pool of water during the day. Captain Kelsall* encountered one in a hole in a bank which escaped him by taking to the water, and diving. Theobald†, too, mentions its frequenting moist places, and the vicinity of water, and the Revd. E. Muir says the natives of Jalna tell him it is generally found in flooded rice fields in the rains. A specimen in Assam in seeking to escape was reported to have climbed 10 feet high into a tree, but I have never heard of any other clambering efforts.

Disposition.—The banded krait is a sluggard of the most confirmed type. It is lethargic to a degree that is difficult to understand, and one is very apt at first to think that a snake which is really quite unhurt, is suffering from ill-treatment and severe injuries. If encountered coiled up peacefully in the day-time, instead of taking alarm, and trying to escape the probabilities are that it will remain "in situ," and even when stepped upon, or kicked up it will frequently merely shift its position, and take no further notice. I have seen it picked up by a parcel of noisy urchins, and carried over a stick, from which it fell off every few yards to be picked up again and again without endeavouring to escape or show resentment, a treatment too humiliating for even the defenceless and blind little burrowing snake *Typhlops braminus* to submit to without some struggles, and attempts to defend itself. I have known it take refuge in a pool with a howling and excited mob,

* Jour. Asiatic Soc., Bengal 1894, p. 12. † Report, Cat. Brit. Burma, p 62.

assailing it from all sides with stones, sods of earth, etc., and yet seen it lie inactive unless actually struck by a missile, or immersed by a wave from one when it simply re-appeared at the surface, and maintained a dignified unconcern.

I have known it again when discovered swallowing another snake, take no notice of a ring of spectators, but continue engulfing its victim. Many specimens have been brought to me alive and quite unhurt, and I have never succeeded in making one angry, never seen one bite at anything nor raise itself in menace, though provoked in a most outrageous manner. What it usually did was to sulk; sometimes it flattened itself to the ground, but more usually lay still, and hid its head beneath its body. Sometimes if an eye was still visible, and an object pushed towards it, it made a slight spasmodic movement and withdrew its head still further so as to avoid seeing the coming danger. If the tail was smartly rapped, it merely shook it, and moved its position. I have sometimes thought that this singularly apathetic behaviour which strongly suggests that of an animal that has been drugged, is merely evinced during the day-time is, perhaps, due to its being dazed by the sun, or strong light, but an incident which occurred to a friend some years ago shows that, even at night the creature is naturally slothful and stupid. My informant, Colonel Evans, came across one when riding over an open piece of ground. He could clearly see the snake in the moonlight so dismounted, and having no weapon of offence, called to his servants to bring a stick. For several minutes Colonel Evans walked round the snake, which instead of trying to escape, merely altered its direction as he confronted it. It moved in a lazy way, and offered no menace, and was eventually killed.

Its movements are in keeping with its phlegmatic disposition. I have never seen one in the least degree active, and it is doubtless due to these traits in its character that no casualties in the human subject have hitherto been reported.

I have never heard one hiss, but Colonel Evans remarked that the ♀ that was found lying up with hatching eggs did so. The same observer mentioned the intolerance shown by the young brood to the sun.

Habits.—This krait is in the main of nocturnal habit. When encountered at night it is always on the move. In Assam the planters who owned motor-cars frequently saw it by the brilliant light of their lamps crossing the roads, and on most of the occasions when it was killed in or about habitations, it was seen at night. The specimens met with in the day-time were for the most part disturbed from some insecure quarter where they were lying inactive. It evidently, though is sometimes abroad during daylight in quest of food for the specimen reported above as eating a fish, was seen in the day. Mr. Jacob observed one which he shot in the day-time in conflict with a large tree snake, and Major Evans' record of one eating a chequered kulback was also in the day.

It is most frequently about in the rains, in fact, no less than 13 of the 17 specimens, Evans and I collected in Rangoon, were killed in June, July and August. At other times of the year, it was decidedly scarce.

Food.—From my remarks upon its disposition, one might, with reason, expect that it usually preys upon small and defenceless creatures, such as frogs and toads, but this is not so. It shows a very great partiality for an ophidian diet, and in its choice by no means picks out the weaklings, but will attack snakes as large or larger than itself, and overcome such formidable species as the dhaman (*Zamenis mucosus*) and the Himalo-Malayan rat snake (*Zamenis korros*), as I have seen myself. Mr. Jacob, too, found one in conflict with a large tree snake of a very truculent nature, *viz.*, *Dipsadomorphus cynodon*; and Colonel Evans records it having swallowed that vicious reptile the chequered keelback (*Tropidonotus piscator*). Blyth says that its usual fare is cobras, and we must, therefore, assume, that he has observed it swallowing this species. I once found a lizard of the Skink family (*Mabuia multifasciatus*) had been eaten, and once a clutch of snake's eggs, which were probably of the buff-stripped keelback (*Tropidonotus stolatus*). Three of these eggs were intact, and I could discover no injury done to them, though I examined them closely with a lens. This seems remarkable when one reflects that there are two long rows of teeth in the roof of the mouth, and many opposed to them in the lower jaws. On one occasion in Assam, one was reported to

be swallowing a fish. In every other instance where I have found anything in the stomach a snake had been devoured, and in many other examples, where the stomach was empty, an examination of the cloacal contents made it certain that a snake had previously been victimised as the very distinctive ventral shields floated up to the surface after softening the mass in water.

The victim in every instance lay fully extended within the krait, and, even when small, was never folded or collected into a mass. Although the stomach is remarkably elongate in this, and other kraits being 9½ inches long in one which measured 4 feet and ½ an inch, it is not long enough to accommodate most of the snakes preyed upon. Often a considerable length of the victim lies in the gullet, and may even protrude for some distance beyond the mouth; in fact, inevitably must do so when the quarry is of a length nearly equal to its vanquisher, or as sometimes happens even greater. A specimen I had in Assam, probably about 5 feet long, had been pickled in the act of eating a dhaman (*Zamenis mucosus*), which from the length of its tail must have been about 5 feet long and no less than 1 foot 4¾ inches were protruding from the mouth. In another instance, a banded krait measuring 4 feet 2½ inches was killed in the act of swallowing an Indo-Malayan rat-snake (*Zamenis korros*), which measured 4 feet 2½ inches. In such cases, a considerable length of the victim must remain unswallowed until that portion already in the stomach is liquified by digestion, and this organ capable of accommodating a further instalment. It is probable that there is some protrusion beyond the jaws for a day or two, and that the whole length of a relatively large snake is not completely digested for a week.

The victim is at first seized anyhow, often being grasped in the middle of the body, but as its struggles grow feebler under the masterful grip of its captor, and the more powerful influence of its poison, it is released and siezed by the head. It would appear that sometimes the quarry is seized at first by the head, and swallowing commenced forthwith, for the most violent struggles ensue, in which the overpowered snake, although partially swallowed, has wreathed itself around its foe with a strength that refutes any idea of being enfeebled by the paralysing action of the krait's venom.

These conflicts are very disagreeable to watch, the strenuous though futile contortions which are to be seen even to the last inch or two of the victim's tail, must arouse the sympathy of the most callous spectator.

It is rather a pleasing reflection to my mind that the tables are sometimes turned, and the banded krait has itself to suffer from the same treatment it has probably meted out to scores of its weaker relatives. Mr. Primrose has recorded an encounter in this Journal, Vol. XII, p. 589, in which a banded krait had been overcome, and swallowed by its more powerful rival the hamadryad.

The Sexes.—My notes in Assam show that the sexes are evenly balanced, for out of 11 specimens sexed, 5 were males and 6 females. There appears to be no difference in the relative lengths of the body or tail of sexual import. The anal glands in both sexes secrete a blackish material reminding one of the blackened oil caused by machinery in motion.

Breeding.—Although over 50 specimens have passed through my hands I have been singularly unfortunate in gaining any information about the breeding, never having had a gravid ♀. All that is known on the subject is contained in the most interesting record furnished by Colonel Evans which appeared in this Journal.* The ♀ which measured half an inch less than 4 feet had retired beneath the ground where some elephant tusks had been buried, and had here deposited 8 eggs which she had evidently incubated as she was still in attendance when on the 19th of May 4 of them had hatched. She was thin as the result of her self-imposed imprisonment, but though she evidently possessed strong maternal instincts, it is curious that she showed no concern when her young brood were tampered with. The average dimensions of 3 eggs was 2·3 inches in length, and 1·5 in breadth. The young measured from $11\frac{3}{4}$ to $12\frac{1}{2}$ inches but as only two were taped, it is probable that these were not the extremes of length. They are reported as having more pointed tails than adults, and a modified colouring, the yellow being replaced by a dirty-white and the black by a leaden-hue. It is noteworthy, too, that they were remarkably active. Judging from the time of year when those young

* Vol. XVI, p. 519.

appeared it is probable that the mating season is in January or February. A young specimen of 1 foot 2 inches was sent to me last year by Mr. Frere from Tharrawady (Lower Burma) killed in June.

Growth.—It appears from my notes that the young grow about a foot during each of the first three years of life and the female reported above would therefore be completing her third year.

Poison.—Though this snake is a poisonous one, and common in many districts there is no authentic case of toxæmia in the human subject arising from its bite,* and it even seems doubtful if it would prove fatal to man. Rogers by direct experiment on birds fixed the lethal dose as 14 times that of cobra poison. Lamb, however, estimated that it is but 7 times that of cobra poison. In any case since we know that an adult cobra sometimes bites a man severely without injecting a lethal dose of poison, it would seem improbable that a lethal dose would be delivered in the bite of a snake of very similar proportions whose poison is 14 times or even 7 times less virulent. This conclusion seems to receive confirmation by the Burmese who are a very observant race, and knowledgable in Natural History matters. Most of them affirm that the banded krait is not poisonous. If it were otherwise, I think the Burmese of all people would be aware of it, for the snake is very common in their Province. Although it is not an evily-disposed snake it is difficult to believe that it is never the cause of a casualty, and if it ever occasioned loss of life or even serious symptoms, it is not likely to have escaped an evil reputation. Mr. Muir tells me that the natives about Kalna too are very doubtful

* Fayrer records the case of a woman at Tavoy (Thanatophidia, p. 45) who was bitten on the dorsum of the foot by a snake identified as the banded krait by Dr. Paul. The accident happened at 8 p.m. and beyond some local tingling and swelling at the time no ill-effects were noticed, and she was discharged from the hospital next day as recovered. We may assume that if any poison gained access to the wound, the dose was insignificant as no toxic symptoms were noted. The case quoted as such by Calmette (Venoms, Venomous animals, etc., p. 336) is obviously a fallacious record as this snake does not occur in Central India, the locality where the casualty occurred! The fact, too, that the original reporter says that the snake which was 28 inches long was full grown, and talks of a single mark made by an *incisor* tooth, proclaims a lamentable ignorance on his part of the snakes of India, and snakes in general, since no snake has incisor teeth.

as to its poison as it seems very seldom to bite. Mr. C. Gore told me of a bullock he once saw struck at and injured by this snake which succumbed 20 minutes later.

Poison apparatus.—The fangs are like those of other poisonous Colubrines, being much stouter, and shorter than those of a viper of similar length. There are usually two operative fangs placed side by side in each maxilla. The poison glands are relatively smaller than those of the cobra. I know of no special remarks made upon the physical properties of the poison.

Toxic symptoms.—To my namesake A. J. Wall we owe most of our knowledge of the poisonous properties of banded krait venom, indeed since his day further investigations have done little more than confirm his work. As no human records are available, the only picture we can present of the clinical manifestations of the toxæmia is as a result of experiment in the lower animals.

Wall says the local condition produced is the same as that seen in cobra bite. The part becomes swollen and painful, and later discoloured blood or bloody serum oozes from the punctures for some hours, and inflammation sets in later. He says the discolouration is much less than that seen in cobra bite, but if the tissues are cut into the same pinkish effusion of serum is to be observed in the areolar tissue. Lamb says the local reaction is much less than that seen in cobra bite; in fact little or nothing is to be observed at the side of the bite. Constitutionally two very distinct types of disturbance occur, both equally fatal, but each differing in the manner in which death is brought about, and the time that elapses before the fatal issue.

In the first the symptoms are exactly those of cobra poisoning being due to a principle in the venom (neurotoxin) that acts upon the brain and cord. Within an hour or two, or perhaps longer, the bitten subject is prompted to assume a sitting or even a lying posture from a feeling of weakness. This is the beginning of a paralysis that creeps on, affecting first the legs, then the trunk, and last the head, and as time advances the weakness, and loss of control of certain muscles becomes more and more pronounced. Breathing becomes increasingly difficult and hurried, the face

growing livid in proportion to the embarrassment of this vital function. The head droops, the lower lip falls away from the teeth, so that the saliva, which cannot be swallowed owing to paralysis of the throat, dribbles from the mouth. Movements of the tongue become impaired so that speech is rendered difficult, and the eyelids droop. Finally, death is brought about by asphyxia owing to the complete paralysis of the respiratory centre, and the final issue is frequently ushered in by convulsions. Consciousness is retained till the end. The heart is also affected in this form of snake poisoning owing to a synchronous paralysis of the vaso-motor centre, hence fainting with a feeble pulse may occur, directly attributable to the poisoning process quite apart from fright, or pain. In this last respect this poison differs in its effects from those of the common krait, and the cobra in both of which there is an element that by stimulating the heart muscle, and contracting the arterioles, counteracts the effects on the vaso-motor centre. Death may not occur till the 2nd or 3rd day from this type of toxæmia.

In the second type of disturbance symptoms are not evoked till the 5th day or later, and are then the result of a chemical destruction of cells in the central nervous system (due to neurolysin). Though the toxic element responsible for this form of disturbance is met with in common krait and cobra venoms, it only occurs in quantities insufficient to make its presence evident, but in banded krait venom, and in this only of the snakes whose poison has been investigated, serious symptoms are evoked by its presence. There are serious depression of spirits, loss of appetite, high fever, and very rapid and extreme emaciation. The kidneys become diseased, so that the urine contains albumen, and diminishes in quantity. Discharges from the eyes and nose and other mucous surfaces accompany the above, and death occurs in a few days from exhaustion.

Treatment.—In considering the treatment of a bite from this snake it is best to begin by recalling the various methods which have been tested experimentally in animals, and found futile, as well as other orthodox measures. Both Lamb and Rogers have tested the efficacy of Calmette's antivenene, and proved it useless, thereby falsifying Calmette's claims in this direction.

Drugs, such as Ammonia, Strychnia, and Alcohol, are not likely to do any good, but on the contrary harm. They all act on the central nervous system, and to administer them is like adding oil to flame, as they can only accentuate the paralysing effects of the snake venom. In addition Calmette has shown that Alcohol by neutralising any antitoxin that the subject may be forming in his own person, in response to the toxic absorption, acts in opposition to nature's attempts to subdue the toxic process.

It is extremely dubious if ligature, the orthodox measure recommended in every text book, is of the slightest avail, in this or any other snake poisoning process.*

Finally, artificial respiration is quite useless in this form of ophitoxæmia as shown by Lamb and Rogers as the heart shares in the general embarrassment, and tends to fail unlike what occurs in cobra and *cæruleus* poisoning.

The only method, which appears to afford a rational means of success, is the application of permanganate of potash locally. This salt is known to completely destroy the toxicity of all snake venoms. In practice, however, its merits have not met with the success one would expect. It must be remembered that the poison on absorption becomes intimately connected with the tissues at the bitten part, and whether this locking-up is merely a mechanical or a chemical process, it is extremely difficult to dissociate the venom from the tissues so as to allow the permanganate to come into antagonistic relationship with, and destroy it. The success of the treatment, therefore, must depend upon the degree to which the tissues are cut into, and the extent of surface opened up, into which permanganate can be introduced.

The surgeon should excise the bitten parts freely and dissect up all tissues, that show where poison has been absorbed, and then introduce permanganate crystals, and moisten them with water. If the non-professional man uses the knife at all he should cut a series of parallel incisions (as he would operate on a ham) close together, deeply and freely in the *length* of the limb, or member, and then introduce permanganate. As free use of the knife to a

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* *See* Trans. Bombay Medl. Congress 1909, p. 249.

degree that is really necessary seems to me a dangerous proceeding for the layman to adopt, a better plan is to destroy the bitten part freely with red hot iron, or nitric acid and subsequently to apply permanganate.

Fables.—Mr. E. Muir tells me that about Kalna it is said to have two mouths, one at the caudal extremity, and is reputed to be able to move forwards or backwards. Also that it is said to make a noise like the bellowing of a cow, which reminds me of the traveller Chateaubriand's description of a S. American snake he had met which when approached became flat, appeared of different colours, hissed like a mountain eagle and bellowed like a bull!

Uses.—The same informant says that the bones are sometimes made into necklaces, and worn by Hindus.

Parasites.—Entozoa of several kinds infest this snake. I have found two distinct nematode worms in the stomach which were identified by Professor Von Linstow* as *Kalicephalus willeyi*†, and larval and immature forms of an *Ascaris*. One of these, I forget which, anchors itself to the coats of the stomach and is found attached there after death, but the other is free, and though I believe inhabits this organ exclusively in life is often found to have wandered into the intestine after death, or into the gullet, and mouth. The *Pterocercus* or larval form of a tape worm, which Von Linstow suggests may be harboured in its adult form by birds of prey that devour snakes, is a very frequent parasite in the intestine. A fourth parasite is the linguatulid *Porocephalus crotali*‡, a maggot-like, whitish animal half to three-quarters of an inch long, which attaches itself by four hooks to the mesenteric tissues, and does not enter organs.

Distribution.—The Mahanadi Basin, Eastern half of the Ganges System, Brahmaputra, and Irrawadi-Salween Basins, through Indo-China to South China in the East, and through the Malayan Peninsula to the Archipelago as far East as Java. Within our Indian Dominions it is a common snake in Burma, Assam and

* Record, Ind. Mus., Vol. II, Part 1, p. 109.

† Spol. Zeylan, Vol. I, p. 99.

‡ Bombay N. H. Journal, Vol. XIX, p. 837.

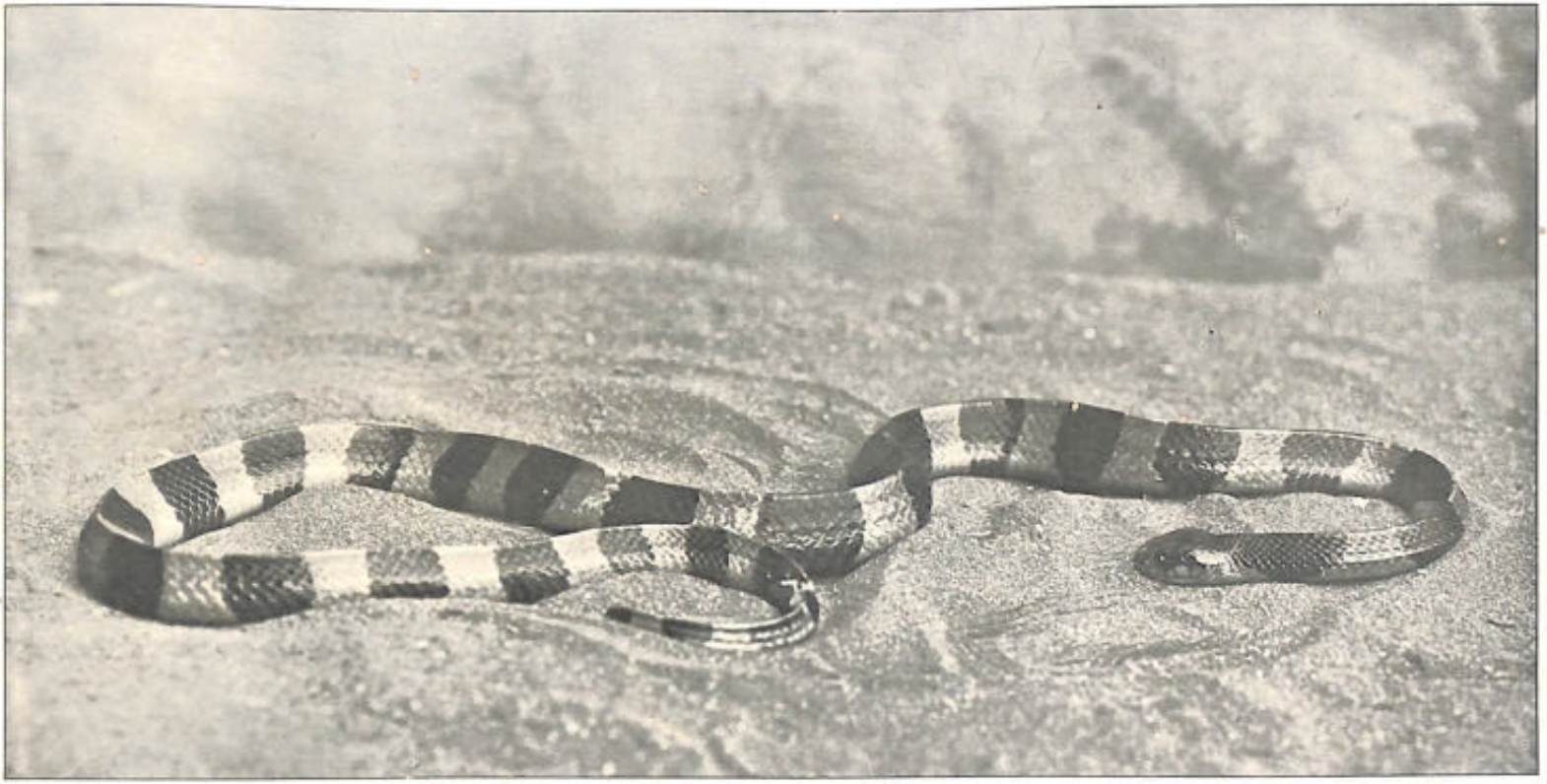
Eastern Bengal, less common in Bengal and Orissa, and not rare, I believe, in the Central Provinces.*

A specimen of Colonel Beddome's collecting said to be from the Anamallays is now in the British Museum, but I do not credit the locality, and have shown good cause to doubt the accuracy of this record.† It is an inhabitant of the Plains, and rarely ascends to any Hills, and then probably not above 3,000 feet. Thus in the Eastern Himalayas in 1908? out of 778 snakes collected between 500 and 7,500 feet, no specimen came to hand. In 1909 Mr. Wright of Tindharia sent me a single specimen collected somewhere between 500 and 2,300 feet, but he had forgotten the exact locality. In the Khasi Hills, Assam, out of 264 snakes collected in Shillong (4,900 feet) I got no banded krait, but saw a dead one on the road somewhere near Nongpho (1,900 feet) which I guessed might have been about 3,000 feet elevation. Mr. Hampton writing from Mogok, Ruby Mines (3,800 feet), though an industrious collector of snakes for many years, had, he told me, never seen this snake there.

Lepidosis—Rostral.—Touches 6 shields, the rostronasal suture longer than the rostro-internasal, and the latter about twice the length of the rostro-labial. *Internasals*—Two, the suture between them equal to or rather less than that between the præfrontal fellows, and about two-thirds the internaso-præfrontal. *Præfrontals*—Two, the suture between them rather greater than the prœfronto-frontal: in contact with internasal, postnasal, præocu-

* A member of our Society addressed the Secretary about February last year asking if he could name a snake which he had killed in Chanda, and he described as being completely banded with broad belts of yellow and black, and with a finger-like tail. I mislaid the letter which was handed to me, and cannot quote the writer's name. Mr. E. H. Young wrote to me last year, and told me he had killed a banded krait in the Sal forest, 40 miles North of Bilaspur. Two Officers told me of a banded krait killed at Raipur some years ago. When on Famine duty in 189?, a friend told me of a yellow and black banded snake he had killed in his verandah the night before near Bilaspur, which I had no doubt at the time was a banded krait. Colonel Bannerman tells me he has known it from Raipur and Sambalpur.

† Terr. snakes, Brit. Ind. Dom. 1908, p. 17.



The Banded Krait (*Bungarus fasciatus*).

lar, supraocular, and frontal. *Frontal*—Touches 6 shields, the fronto-supraocular sutures rather longer than the rest. *Supraoculars*—About half the breadth, and three-fourths the length of the frontal. *Nasals*—Quite divided by a nostril, that is nearly as deep as these shields; in contact with the 1st and 2nd only of the supralabial series. *Loreal*—Absent. *Præoculars*—One. *Postoculars*—Two. *Temporals*—One. *Supralabials*—7 with the 3rd and 4th touching the eye. *Infralabials*—8 4, the 4th much the largest and in contact with 2 scales behind; the 4th (or 3rd and 4th) touching the posterior sublinguals. *Sublinguals*—Two subequal pairs. *Costals*—Two headlengths behind head 15, midbody 15, two headlengths before the vent 15. Smooth with no apical facets. *Vertebrals*—Enlarged, broader than long, hexagonal. *Supracaudals*—In odd rows with enlarged vertebrals. *Ventrals*—200 to 234,* rounded. *Anal*—Entire. *Subcaudals*—23 to 39, entire.

Anomalies.—I have once seen the upper postocular confluent with the supraocular, and once two temporals on one side.

Dentition.†—The maxilla has a pair of tubular fangs placed side by side, behind which are 3 teeth grooved on their outer faces, about one-third the size of fangs.‡ *Palatine*—11 to 13, subequal, about as large as the postmaxillary, and grooved on their inner faces. *Pterygoid*—10 to 12, the anterior as large as the palatine, the posterior slightly diminishing, grooved on their inner faces. *Mandibular*—16 to 17, abruptly decreasing in front, and more gradually behind, the median about as large as the palatine; grooved on their outer faces.

Our coloured plate is good but does not do justice to the glossiness of the scales in life. Plate A is taken from a photograph of a specimen in Parel that came from Raipur, C. P. We are indebted to Sub-Assistant Surgeon C. R. Avari for the photograph which is a good one.

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* In my Rangoon specimens 208 to 221, in Assamese 221 to 231.

† From 4 skulls in my collection.

‡ Similar except in the number of the postmaxillary teeth, to those of *caeruleus* (*See* this Journal, Vol. XVIII, figures C and D of Diagram).

The genus *Lycodon* is one of many into which the Aglyphous series of the family *Colubridæ* is divided. This series is characterised by an absence of either grooved, or tubular fangs, in the maxillæ, and all the representatives are, therefore, non-poisonous.

When treated by Mr. Boulenger in 1893 * it included 15 species. Since this time he has described another, *viz.*, *butleri* from Perak in this Journal†, and I have described two, *viz.*, *mackinnoni* from the Western Himalayas ‡, and *flavomaculatus* from the Deccan.§ Of the 18 species now grouped together under this title, 11 occur within our Indian Dominions.

As shown by Stejneger,¶ the title *Lycodon* is a misapplication to this genus, for the type of *Lycodon* is the S. American snake, now wrongly known as *Lycognathus cervenus* (*i.e.*, the *Coluber andax* of Daudin).

Lycodon then being clearly preoccupied should give place to Wagler's name *Ophites* of which the Malayan *subcinctus* is the type.

In spite of this I adhere to the name with which we have all grown familiar. This is an instance where in order to avoid confusion, custom, whether right or wrong, should be allowed to overrule the ethics of nomenclature. If American systematists, however, adopt the title *Lycodon* to designate their present *Lycognathus*, we have no alternative but to change our generic name to *Ophites*.

LYCODON FASCIATUS (ANDERSON).

Anderson's Wolf-snake.

History.—The species was discovered by J. Anderson during his expedition to Western Yunnan, and was subsequently in 1879 described, and figured by him.**

Nomenclature (*a*) *Scientific.*—The generic name from the Greek "lukos" a wolf and "odous" tooth was given by Ferrusac†† in 1826, on account of the teeth in the maxillæ, and mandible which

* Catalogue, Vol. 1, p. 348.

† Vol. XIII, p. 336.

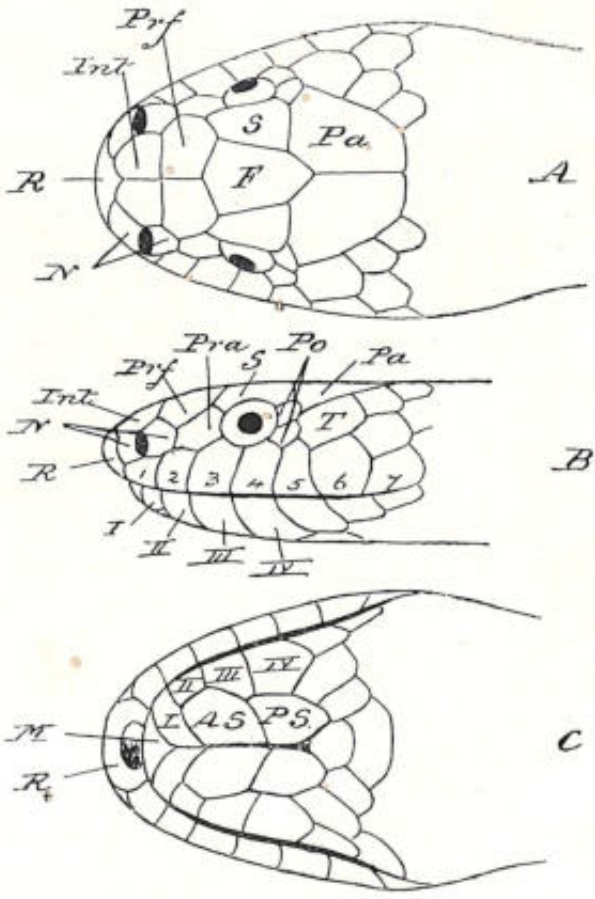
‡ Vol. XVII, p. 29.

§ Vol. XVII, p. 612.

¶ Herp of Japan, 1907, p. 356.

** An. Zool. Res. Yunnan, p. 827, and fig. 4, Plate LXXVIII.

†† Bull. de Science Nat., p. 288.



Bungarus fasciatus (× 1½).

SHIELDING OF FIGURES A, B & C OF DIAGRAM.

A. S.	Anterior Sublinguals.
F.	Frontal.
Int.	Internasals.
M.	Mental.
N.	Nasals.
Pa.	Parietal.
Po.	Postoculars.
Pra.	Præocular.
Prf.	Præfrontal.
P. S.	Posterior Sublinguals.
R.	Rostral.
S.	Supraoculars.
T.	Temporal.
1 to 7.	Supralabials.
I to IV.	Infralabials

from their superior length, and position resemble the canine teeth of dogs and wolves. "*Fasciatus*" is from the Latin meaning banded.

(*b*) *English.*—I think the best name for it is Anderson's Wolf-snake, a literal reference to its specific name being equally appropriate, to many of the species.

(*c*) *Vernacular.*—Mr. Hampton tells me that about the Ruby Mines in Upper Burma it is called Ngan-do-ja. This is the same as one of the Burmese names for the banded krait, and implies "banded royal snake."

General characters.—It is a snake of moderate dimensions, and rather slender proportions, very strikingly and handsomely marked, and on this account likely to attract attention. The head is markedly flattened, and the snout broadly rounded. There is no ridge from the eyebrows forwards. The nostril occupies the whole depth of the suture dividing the nasal shields, but is nevertheless moderate in size, as the suture occurs at the lowest depth of these shields. The eye is rather small, and the iris, unlike all the other species of the genus that I have seen, is heavily flecked with grey so that the vertical shape of the pupil is very apparent. The neck is fairly evident, the body long, round in section, and with glossy scales, and the tail is long, being about one-fourth the total length of the snake. The belly is somewhat abruptly turned up on either side of the ventral shields, *i.e.*, angulate.

Colour and markings.—The head is quite black above, and the edge of the upper lip, the lower lips, and chin are yellow, more or less mottled with black. The body and tail are alternately banded black, and yellow or dove colour with very jagged outlines. The black bands completely encircle the snake anteriorly and posteriorly, but may be more or less incomplete ventrally in the middle of the body. They are broader anteriorly than posteriorly, and number 23 to 33 on the body and 14 to 18 on the tail in my Burmese specimens, 32 to 38 on the body and 15 to 20 in Shillong specimens, the anterior involving 9 to 10 scales vertebrally in the length of the snake. The intermediate bands are yellow, wheat, or dove-coloured, and often more or less subdivided by narrow or broad black crossbars. Such a specimen probably accounts for Ander-

son's description of the type which had 55 bands, or twice the number as counted in my specimens.

The snake should never be confused with the banded krait, even when attention is only paid to colour, but evidently some Burmese confuse the two as already mentioned. Again, Mr. Hampton himself sent me several specimens as kraits, probably being misled by his Burmans. It is for this reason that the two snakes are shown together on our Plate, and discussed together in this article.

Identification.—The dual combination which follows will suffice to distinguish it from all other Indian Snakes up to the present time known, *viz.*, (1) scales two-headslengths, behind the head 17, in midbody 17, and two-headslengths before the vent 15. (2) Loreal touching the eye (*see* fig. D of diagram).

Dimensions.—Specimens over 2½ feet are unusual, but I have had 7 such, the largest being a ♀ 3 feet and ¾ of an inch in which the tail was slightly imperfect, and a ♂ 3 feet and ¼ of an inch, both captured in Shillong. One 3 feet long I got from Burma. I have seen in all 31 specimens. Mr. Hampton tells me the largest he has seen was 3 feet 7 inches in length.

Haunts.—It appears to frequent jungle tracts in hilly situations for choice. Shillong where I got so many is heavily wooded, and it was common inside the station, and more than one was encountered inside a bungalow. Mr. Hampton tells me that they do well in captivity and will live for years. When they died they appeared to be in excellent condition but, perhaps, too fat.

Habits.—From Mr. Hampton I learn that it is essentially a nocturnal snake, never appearing during day light, but he has often noticed them in captivity visible, at 5 and 6 a. m. When people began to move about the house they retired under their blankets unless they were in their bath where they remained in the water until mid-day. He tells me further that they are very quiet, but very quick, striking right, left, or centre without the slightest warning.

The few specimens I have seen alive were active, and plucky resenting interference, and showing it by assuming an offensive attitude.

DISTRIBUTION OF *LYCODON FASCIATUS.*

1 Tezpur (I.M.). 2 Shillong, Khasi Hills, 4,900 feet (I.M. and F.W.). 3 Haka Chin Hills, 6,500 feet (Wall and Evans.) and (F.W.). 4 Mansi, Katha, Upper Burma (Bom. M.). 5 Ponsee (Anderson). 6 Mogok, Ruby Mines, 3,800 feet (B.M., F.W.). 7 Maymyo (Evans). 8 Taounggyi, Shan States (B.M., Wall and Evans).

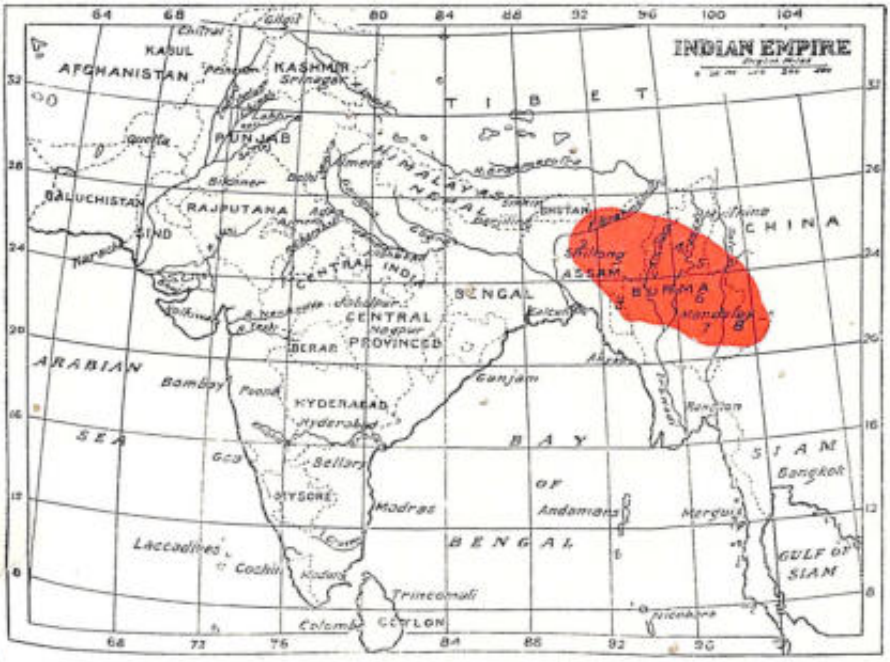
B.M. implies British Museum, I.M. Indian Museum, Bom. M, our Society's Museum, F.W. the author.

DISTRIBUTION OF *B. FASCIATUS.*

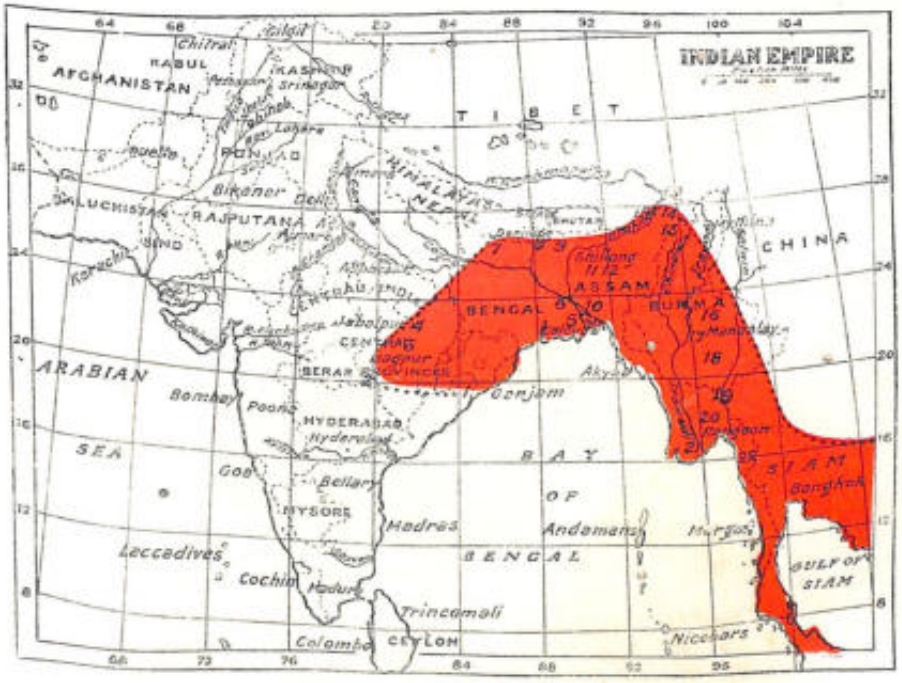
1 Aska (I. M.) and Berhampore (F. W.). 2 Chanda (Record received by letter to Secretary of our Society). 3 Raipur (Information from two Sources received by me). 4 Near Bilaspur (F. W. and E. J. Young). 5 Calcutta (I.M.). 6 Raniganj (I. M.). 7 Bettiah (F. W.). 8 Below Tindharia (F. W.). 9 Jalpaiguri (Information from Mr. W. A. Jacob). 10 Dacca (I. M.) and Silchar (Primrose in this Journal, Vol. XII, p. 589) 11 Near Nongpho, Circa, 3,000 ft., Khasi Hills (F.W.). 12 Samaguting Circa. 2,000 ft., Naga Hills (I.M.). 13 Sibsagar (I. M.). 14 Dibrugarh Tinsukia, Doom Dooma (F. W.). 15 Near base of Daffla Hills, N. Lakhimpur, (F W.); 16 Ruby Mines (B. M.). 17. Mandalay, Sagaing (I. M.). 18. Pyawbwe and Meiktila (Wall and Evans). 19 Toungoo (B. M.). 20 Tharrawaddy (F. W.). 21 Rangoon (Wall and Evans). 22 Moulmein (F.W.)

I. M. implies Indian Museum, B. M. British Museum, and F. W. the author.

The dotted lines in the map imply that the exact limits of its distribution are here uncertain.



Distribution of *Lycodon fasciatus*.



Distribution of *Bungarus fasciatus*.

I found the slough of one in a pine wood adhering some 5 feet nigh to the trunk of a tree that was fully 18 inches in diameter. This shows that it can climb deftly like its near relative *aulicus*, for the irregularities in the bark were very slight, and there were no branches to aid it.

Food.—I have found the skink *Lygosoma indica* in the stomach once, and on another occasion a skink of similar dimensions and probably of the same species. Mr. Hampton says his specimens in captivity readily devoured lizards of the same species, and also the Burmese slow worm *Ophisaurus gracilis*, but took no notice of young rats or sparrows. Further, they evinced serpentivorous tastes, being specially fond of the blind snake *Typhiops diardi*, but if nothing else was handy the big ones practised cannibalism, eating younger specimens of their own species. Another snake which they devoured eagerly was *Coluber porphyraceus*.* On one occasion he saw one in captivity endeavouring to swallow a green pit viper *Lachesis gramineus* not quite so long but far more bulky than itself. It had swallowed half of it, but had to give up the attempt, the victim which was dead proving too large. There were plenty of lizards in the cage when this happened. It wreathes its body round its victim I am told.

Foes.—Mr. Hampton says one of his was eaten by a cobra (*Naia tripudians*). Recently I had one sent to me which had been removed from the stomach of a hamadryad (*Naia bungarus*) by Mr. Venning in Haka (Chin Hills, Upper Burma).

Sexes.—Males and females appear to be equally abundant. Out of 13 sexed in Shillong, 6 were ♂♂, and 7 ♀♀. I can discover no differences of sexual import. The relative lengths of the body and tail seems to be the same in both, and so are the numbers of ventral and subcaudal shields. The secretion from the anal glands is yellowish and custard-like, and as abundant in a young specimen (a hatchling), as in mature examples.

Breeding.—The species is oviparous, for Mr. Hampton has had eggs laid on two occasions, once 10 and once 14. Unfortunately the dates of deposition were not noted. A small example which I

*As Mr. Hampton was uncertain of the identity of the snakes herein referred to he sent me specimens.

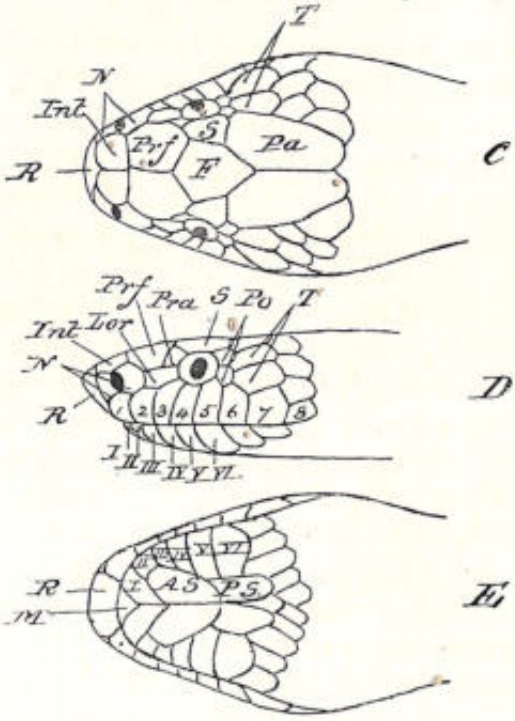
am nearly sure was a hatchling and which measured 8½ inches was found in a child's nursery on the 19th of September in Shillong, and seems to indicate that the breeding season in these Hills is considerably later than in the snakes of the adjoining Plains. I have had two other specimens of similar length—8⅛ and 8¼ inches—from Burma, the dates unknown.

Growth.—The young appear to grow about 6 to 8 inches during the first 4 years of life, when they are about 3 feet in length.

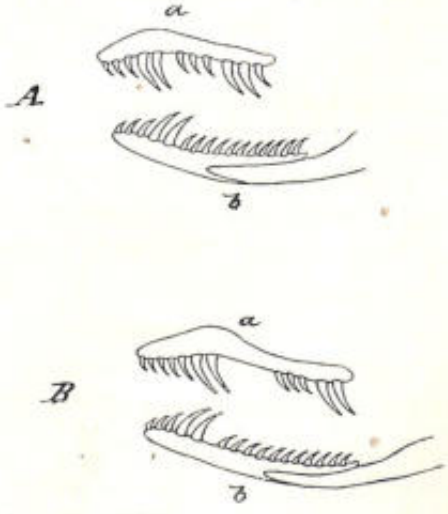
Distribution.—It inhabits Hilly Districts between the Brahmaputra and Salween River Systems, but has once been reported from Tezpur, Assam.* I presume this is the Tezpur on the North bank of the Brahmaputra, but since it was taken by Godwin Austen on the Duffla Hills Expedition it appears to me possible there may be another Tezpur in those Hills, especially as the snake with this exception has always been collected in Hills. It is common in the Khasi Hills about Shillong at an altitude of 4,500 to 5,500 feet, also in the North Shan Hills about the Ruby Mines (Mogok 3,800 feet), and may prove to be equally common in intervening Hills when those have been thoroughly exploited.

Lepidosis—Rostral.—Touches 6 shields, the rostronasal rather greater than the rostro-internasal sutures. *Internasals*—Two, the suture between them about ½ to ⅔ that between the præfrontal fellows, and ½ to ⅔ the internaso-præfrontals. *Præfrontals*—Two, the suture between them rather greater than the præfronto-frontal: in contact with internasal, postnasal, loreal, præocular, supraocular and frontal. *Frontal* touches 6 shields, the fronto-supraocular subequal to or rather smaller than the rest. *Supraocular*—Length about ⅔, and breadth along a line connecting the centres of the eyes, less than ½ the frontal. *Nasals*—Divided, in contact with the 1st and 2nd labials. *Loreal*—One, elongate, not touching internasal, touching eye beneath the præocular. *Præocular*—One. *Postoculars*—Two. *Temporals*—Two, the lower touching the 6th and 7th labials. *Supralabials*—8, the 3rd, 4th and 5th touching the eye. *Infralabials*—6, the 6th largest, and touching 3 scales behind, the 5th and 6th touching the posterior sublinguals. *Sublinguals*—Two pairs, the

* Lately reported from Kerseong in the Eastern Himalayas (Journ. Bomb. N. H. S. Vol. XX, p. 857.)



Lycodon fasciatus (× 2).



A. Maxilla (*a*) and Mandible (*b*) of *Dinodon rufozonatus*.

B. Maxilla (*a*) and Mandible (*b*) of *Lycodon fasciatus*.

posterior rather smaller. *Costals*—Two-headslengths behind the head 17, midbody 17, two-headslengths before vent 15. In the step from 17 to 15 the 4th row above the ventrals disappears, being usually absorbed into the 3rd, sometimes into the 5th. Keels present but rather indistinct, in all rows but the last one or two posteriorly. Apical pits present, in pairs, but often obscure. *Ventrals*—200 to 213, angulate laterally. *Anal*—Entire. *Subcaudals*—74 to 88 (90 Boulenger), divided.

Dentition†—*Maxillary.*—From 3 to 5 progressively increasing teeth followed without a gap by 2 enlarged and subequal which are about twice the length of the last preceding. A gap that would take about 3 small teeth, then 2 (rarely 3), small subequal teeth, followed by 2 large and subequal which are about twice as long as the last preceding. ‡ *Palatine*—13 to 15 subequal, and about the size of the smallest maxillary. *Pterygoid*—19 to 29, small, subequal to smallest maxillary. *Mandibular*—3 or 4, small, progressively increasing teeth followed by two large and subequal, about twice the size of the last preceding. A short gap that would take one small tooth, then from 10 to 12 small subequal teeth.

Anomalies.—I have seen the præfrontal touching the eye below the præocular once, 9 supralabials with the 4th, 5th, and 6th touching the eye once, and the præocular touching the frontal once.

Our coloured Plate might be better. The yellow is too bright, but I have seen examples nearly as bright. The iris is shown much too bright.

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† From 4 skulls in my collection.

‡ The distinction made by Mr. Boulenger between the genera *Lycodon* and *Dinodon* (Catalogues Vol. I pp. 348 and 360) is not tenable. I find that in my skulls of *Dinodon rufozonatus*, *D. septentrionalis* and *D. semicarinatus*, there is no greater gap just before the last enlarged teeth than there is in any of the 5 species of *Lycodon* of which I have skulls. The figure of the dentition of *Dinodon rufozonatus* on page 360 is not correct. On examining my two skulls it is obvious that a tooth has dropped out where the gap is shown in Mr. Boulenger's figure, and has so escaped his notice. I think, however, that the two genera deserve recognition as such on other grounds, for I find in my three species of *Dinodon* there is a smaller tooth behind the last two enlarged ones, and this is represented in Mr. Boulenger's figure. This small third tooth is not present in any of my *Lycodon* skulls, viz., *aulicus*, *striatus*, *fasciatus*, *travancoricus*, *jara*, and *flavomaculatus*.

To be continued.

[*Reprinted with corrections from the* "IBIS" *of* 1909 *by permission.*]

ON THE BIRDS OF KOHAT AND THE KURRAM VALLEY, NORTHERN INDIA.

BY

LIEUT. C. H. T. WHITEHEAD, Indian Army.

With an Introduction by MAJOR H. A. F. MAGRATH, Indian Army.

PART III*

(*Continued from page* 799 *of this Volume.*)

[946.] GECINUS SQUAMATUS. The Western Himalayan Scaly-bellied Green Woodpecker.

Fulton, J. B. N. H S. xvi. p. 57 (common in Chitral from 4,000 to 8,000 ft.); Rattray, t. c. p. 659 (common in the Murree Hills); Ward, op. cit. xvii. p. 724 (widely distributed in Kashmir).

565. ♀ ad. Kohat, 1,760 ft., 6th February.

659. ♀ ad. Hangu, 2,500 ft., 8th March.

713. ♂ ad. Kohat, 1,850 ft., 20th March.

A cold-weather visitor to the District from August to the end of March; fairly common in the Miranzai Valley, but scarce near Kohat. A resident on the Samana. Occurs sparingly in the Kurram Valley up to 9,000 feet. I have several times seen this Woodpecker climbing up a cliff as if it were a tree.

[961.] DENDROCOPUS HIMALAYENSIS. The Western Himalayan Pied Woodpecker.

Fulton, J. B. N. H. S. xvi. p. 57 (Chitral: common from 5,000 to 11,000 ft.); Rattray, t. c. p. 660 (Murree Hills: abundant); Ward, op. cit. xvii. p. 724 (common).

Common on the Samana from 4,500 feet upwards, and on the Safed Koh up to tree-limit.

[963.] DENDROCOPUS SINDIANUS. The Sind Pied Woodpecker.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: not rare); Marshall, op. cit. xv. p. 351 (Quetta: common near Khojak).

655, 656. ♂ ♀ ad. Hangu, 2,500 ft., 8th March.

A fairly common resident throughout the District up to 3,000 feet. Nesting commences early in April, a mulberry-tree being usually selected for the excavation. I have often observed this species in scrub-jungle some distance from trees.

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* The arrangement and nomenclature followed are those of Oates and Blanford's "Birds" in the Fauna of British India. The numbers in square brackets before each name are the same as in that work.

In this and the last species the colouring of the lower parts varies from white to a rich reddish buff, the white parts of the upper surface being also frequently tinged with fulvous. No. 656 represents this ruddy variety.

[969.] DENDROCOPUS AURICEPS. The Brown-fronted Pied Woodpecker.

Fulton, J. B. N. H. S. xvi. p. 57 (fairly common in Chitral from 4,000 to 10,000 ft.); Rattray, t. c. p. 660 (breeds in the Murree Hills up to 7,500 ft.); Ward, op. cit. xvii. p. 725 (rare in Kashmir).

580. ♀. Kohat, 1,760 ft., 13th February.

654. ♀. Hangu, 2,500 ft., 8th March.

716. ♂ ad. Kohat, 1,760 ft., 20th March.

A common winter visitor to the District, including the Samana, from October till April (last seen on the 9th).

[972. LIOPICUS MAHRATTENSIS (Lath.) is fairly common both at Rawal Pindi and Peshawar (an example from the latter place is in the British Museum), but has not been observed in Kohat as yet.]

[1003.] IYNX TORQUILLA. The Wryneck.

Marshall, J. B. N. H. S. xv. p. 351 (Quetta: occurs regularly in April); Fulton, op. cit. xvi. p. 57 (Chitral: one obtained in May); Ward, op. cit. xvii. p. 725 (nests fairly commonly in Kashmir).

80. ♂ ad. Kohat, 1,760 ft., 11th January.

69. ♀ ad. „ „ 18th April.

Not common. The only other examples seen were one on the 23rd of April near Peiwar, 7,000 feet (Kurram Valley), another on the 29th near Kohat, and one more in February 1909 at Kohat.

[986. BRACHYPTERNUS AURANTIUS (Linn.).—Major Magrath observed one individual at Bannu in October 1908. It is common at Jhelum.]

[1022.] CORACIAS INDICA. The Indian Roller.

Ward, J. B. N. H. S. xvii. p. 724 (rare; occurs in the outer ranges).

Resident, but partially migratory, being very common in summer and comparatively scarce in winter.

[1024.] CORACIAS GARRULA. The European Roller.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: common in summer); Marshall, op. cit. xv. p. 351 (Quetta: common in May and early June); Fulton, op. cit. xvi. p. 57 (passing through Chitral early in May); Cumming, t. c. p. 689 (passing through Seistan in April); Ward, op. cit. xvii. p. 725 (summer visitor from May till November).

A fairly common summer visitor to the District and the Kurram Valley, up to 3,000 feet, from early in May till September, being particularly common round Thall, where it nests in colonies in the conglomerate cliffs.

[1026.] MEROPS VIRIDIS. The Common Indian Bee-eater.

Rattray, J. B. N. H. S. xii. p. 342 (not common at Thall); Ward, op. cit. xvii. p. 725.

756. ♂ ad. Kohat, 1,760 ft., 28th March.

Abundant in summer, the majority arriving about the 20th of March and leaving in the middle of October. In a mild year odd birds and even parties of five or six are seen at intervals throughout the winter.

[1027.] MEROPS PHILIPPINUS. The Blue-tailed Bee-eater.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: June.)

We have not met with the Bee-eater in Kohat. Colonel Rattray, however, observed a pair at Thall in June.

Major Magrath has found it not uncommon in Bannu in early autumn and has procured an example. It is very common round Rawal Pindi.

[1028.] MEROPS PERSICUS. The Blue-cheeked Bee-eater.

Major Magrath saw what he took to be this species in large numbers between Basal and the Indus, just outside our limits, in July 1907, and also observed one at Khushalgarh just inside. Another which he obtained in Bannu, where the bird is fairly common in summer, is now in the National Collection.

[1029.] MEROPS APIASTER. The European Bee-eater.

Marshall, J. B. N. H. S. xv. p. 351 (Quetta: common summer visitor); Fulton, op. cit. xvi. p. 57 (a few breed in Chitral); Betham, t. c. p. 749 (nests freely round Quetta); Ward, op. cit. xvii. p. 725 (abundant in summer).

Passes through Kohat in April and the beginning of May, returning in August and September. Possibly a few pairs nest round Thall; several were certainly there up to the time that I left (May 20th), and Capt. Keen informs me that he saw some there in July. This species breeds freely in the Kurram Valley from 3,000 to 7,000 feet. Towards the end of July, when nesting-operations were over, flocks of from ten to forty used to fly up the valleys of the Safed Koh to tree-limit (12,000 feet) every morning, and return at dusk.

[1033.] CERYLE VARIA. The Indian Pied Kingfisher.

Rattray, J. B. N. H. S. xii. p. 342 (common at Thall: nests in March); Ward, op. cit. xvii. p. 725 (very common up to 6,000 ft.).

A resident, but not very common, though found along most of the streams of the District, and in the Kurram Valley at least up to Dandar (4,700 feet).

[1035.] ALCEDO ISPIDA. The Common Kingfisher.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: an uncommon resident); Marshall, op. cit. xv. p. 351 (Quetta: common in spring); Cumming, op. cit. xvi. p. 689 (a common resident in Seistan); Ward, op. cit. xvii. p. 725 (abundant in Kashmir up to 6,000 ft.).

Common in the cold weather.

It nests fairly commonly in the Miranzai and Kurram Valleys, but only a few pairs stay to breed in the plains around Kohat. It may often be seen hovering over water after the manner of *Ceryle varia*, if no perch is available

[1044.] HALCYON SMYRNENSIS. The White-breasted Kingfisher.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: common): Ward, op. cit. xvii. p. 725 (occurs in Poonch).

Abundant in Kohat and up to Sadda (3,500 feet) in the Kurram Valley. A permanent resident. This bird picks up lizards and insects from the ground like a Shrike. In Kohat its favourite food consists of freshwater crabs. Major Magrath has also observed it taking locusts and dragon-flies on the wing.

[1066.] UPUPA EPOPS. The European Hoopoo.

Marshall, J. B. N. H. S. xv. p. 351 (Quetta: summer visitor); Fulton, op. cit. xvi. p. 58 (Chitral: summer visitor, occurring up to 14,000 ft.); Cumming, t. c. p. 690; Ward, op. cit. xvii. p. 726 (common in summer, rare in winter).

Abundant in Kohat in the cold weather, but only a few individuals stay to nest. Occurs in the Kurram Valley up to 8,000 ft., but is scarce.

[1068.] CYPSELUS MELBA. The Alpine Swift.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: May); Marshall, op. cit. xv. p. 351 (Quetta: summer visitor); Fulton, op. cit. xvi. p. 58 (common in Chitral in summer from 5,000 to 16,000 ft.); Rattray, t. c. p. 660 (found two nests: Murree Hills); Ward, op. cit. xvii. p. 726.

Flocks of this fine Swift, often accompanied by the next species, pass through Kohat at intervals from mid-February till the end of May, returning in August and September. They merely pass over and do not stay.

[1069.] CYPSELUS APUS. The Common Swift.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: common in May; shot two); Marshall, op. cit. xv. p. 351 (Quetta: common in summer; found nests in caves); Fulton, op. cit. xvi. p. 58 (Chitral; common in summer up to 14,000 ft.); Ward, op. cit. xvii. p. 726 (summer visitor: nests in cliffs).

Occurs like the last species and often in company with it. Breeds in small numbers in the cliffs of the Safed Koh, occurring up to the summit.

[1073.] CYPSELUS AFFINIS. The Common Indian swift.

Rattray, J. B. N. H. S. xii. p. 342 (rare at Thall); Marshall, op. cit. xv. p. 351 (common in summer); Ward, op. cit. xvii. p. 726.

Abundant from early in March till November, and appearing at intervals throughout the cold weather if the season is mild.

[1089.] CAPRIMULGUS MAHRATTENSIS. Sykes's Nightjar.

Rattray, J. B. N. H. S. xii. p. 342 (Thall); Cumming, op. cit. xvi. p. 690 (abundant in Seistan from April till September).

Nightjars are not common in the neighbourhood of Kohat, but round Thall the country is better suited to their habits and they are plentiful. We did not meet with this species, and are indebted to Col. Rattray for the following notes he made at Thall:—"Fairly numerous. The birds are not permanent residents, but arrive about the middle of May with *C. europæus*.

I always found this species on the open hill-sides, and not amongst jungle. It breeds in the more open nullahs during June and July. I obtained four nests with eggs, the female in each case being shot on leaving the eggs.

Major Magrath procured several examples at Bannu.

[1090.] Caprimulgus monticola. Franklin's Nightjar.

Rattray, J. B. N. H. S. xii. p. 343 (Thall).

The following details are again taken from notes made by Colonel Rattray at Thall:—"Common and a permanent resident. I found it breeding plentifully; all the eggs that I procured from five nests were laid without any depression, and were extremely highly coloured, being almost brick-red."

[1092.] Caprimulgus europæus. The common Nightjar.

Rattray, J. B. N. H. S. xii. p. 343 (Thall: commonest Nightjar in summer; found ten nests); Marshall, op. cit. xv. p. 351 (fairly common at Quetta summer); Rattray, op. cit. xvi. p. (661 not common in the Murree Hills).

Passes through Kohat in spring and autumn, and nests commonly in the scrub-jungle around Thall. I shot several examples.

[1104.] Cuculus canorus. The Common Cuckoo.

Marshall, J.B.N.H.S. xv. p. 351 (Quetta: very common in March and April); Fulton, op. cit. xvi. p. 58 (Chitral: fairly common in summer); Rattray, t. c. p. 661 (abundant in the Murree Hills); Ward, op. cit. xvii. p. 726; Magrath, op. cit. xviii. p. 296 (abundant at Thandiani, 9,000 ft., Hazara District).

The familiar call of the Cuckoo is heard in Kohat from early in April till nearly the middle of May. The bird is found up to the tree-limit on the Safed Koh, but is rather scarce. It continues calling there till well past the middle of July.

Major Magrath (l. c.) records his finding blue Cuckoo's eggs.

[1118.] Coccystes jacobinus. The Pied Crested Cuckoo.

Ward, J. B. N. H. S. xvii. p. 726 (Kashmir: not common, but several specimens were procured in the Valley).

Occurs rarely during the autumn migration. I have met with it on three occasions in August and September.

[1120.] Eudynamis honorata. The Indian Koel.

Ward, J. B. N. H. S. xvii. p. 726.

I cannot do better than quote the following notes made by Major Magrath:—"A summer visitor in small numbers, much to the annoyance of *Corvus splendens*. In the early summer of 1905 there were probably not more than half a dozen birds in the station, but they made enough noise for a hundred. I picked up a dead fledgling in the month of August."

Arrives in Kohat about the middle of May.

[1138.] Palæornis torquatus. The Rose-ringed Parroquet.

Ward, J. B. N. H. S. xvii. p. 727.

The following details are also from Major Magrath's notes:—"A resident, though scarce. There are probably not more than eight or a dozen in the District, all of which frequent cantonments. I know of only two trees where they nest, one a large cotton-tree (Simal) and the other a *Cirrus*. A tame example which I kept in a state of semi-freedom used often to mix with the wild birds, but the females, to whom he made advances, he invariably found, to his cost, appropriated."

[1141.] PALÆORNIS SCHISTICEPS. The Slaty-headed Parroquet.

Fulton, J. B. N. H. S. xvi. p. 58 (Chitral: summer visitor, occurring up to 7,000 ft.); Rattray, t. c. p. 661 (very common in the Murree Hills); Ward, op. cit. xvii. p. 727 (common in summer and autumn up to 7,500 ft.).

Flocks of this Parroquet visit the District during April (noted on various dates from the 8th to the 26th) and stay a few days. I came across a small nesting-colony on the 19th of June near Zeran, 5,800 feet (Kurram Valley); the young birds had just flown.

[1157.] ASIO ACCIPITRINUS. The Short-eared Owl.

Ward, J. B. N. H. S. xvii. p. 727 (occurs in the plains).

456. ♂ ad. Samana, 6,500 ft., 5th March.

Migrates through Kohat in March, but apparently only in small numbers.

[1159.] SYRNIUM BIDDULPHI. Scully's Wood-Owl.

Fulton, J. B. N. H. S. xvi. p. 58 (Chitral: not common, occurs up to 8,000 ft.); Ward, op. cit. xvii. p. 727 (fairly common in Kashmir; eggs taken in April and May).

90. ♂. Kohat, 1,760 ft., 19th January.

637. ♂. Hangu, 2,700 ft., 3rd March.

Fairly common from November till April in the orchards and wild olive-groves of the Kohat and Miranzai Valleys.

This species spends the day in evergreen trees, but without troubling much about concealment, being often mobbed by Crows, Mynas, Bulbuls, &c. An individual so mobbed was rescued and taken to Major Magrath, who kept it till dusk and then let it go. He says that it allowed him to handle it and scratch its head, and it appeared to be of a gentle disposition. He adds that the bird is a not uncommon winter visitor to Bannu.

[1164.] KETUPA ZEYLONENSIS. The Brown Fish-Owl.

668. ♂ ad. Kachai, 2,700 ft., 11th March.

Probably not rare, as the streams of the District are full of small fishes and crabs. The stomach of the above-mentioned example was crammed with fragments of crabs' shells and claws, with a few fish-bone.

Besides this example I shot one of a pair at Kohat in November.

[1168.] BUBO BENGALENSIS. The Rock-Horned Owl.

Rattray, J. B. N. H. S. xii. p. 343 (rare: Thall); Cumming, op. cit. xvi. p. 690 (Seistan: one young bird brought in); Ward, op. cit. xvii. p. 727 (common in Kashmir).

Major Magrath writes as follows on this species :—" A resident and fairly common. An example I shot on the 13th of January, 1906, was put up in broad daylight from a nullah in which it had just pounced on a huge bull-frog. It flew away with its prey some distance and was killed on the ground. The vast flocks of *Pastor roseus* that roosted in the cantonments in August 1905 were much harried by Owls, this species being, as far as I could ascertain, the chief depredator."

This is the common Owl of the District.

[1180.] ATHENE BRAMA. The Spotted Owlet.

Ward, J. B. N. H. S. xvii. p. 727 (Kashmir.)

441. ♂. Kohat, 1,760 ft., 19th February.

549. ♂. Thall, 2,550 ft., 15th May.

A fairly common resident, not found about houses, as is usually the case, but only in cliffs in wild and desolate parts of the District, or occasionally in groves. In the cliffs near Thall it is particularly common, and this must, I think, be the species which Colonel Rattray took for *A. bactriana*. Curiously enough, in the adjoining District of Peshawar it occurs commonly about towns and villages.

[1191.] OTOGYPS CALVUS. The Black Vulture.

Ward, J. B. N. H. S. xvii. 728 (far from common in Kashmir).

Rare. I met with a pair near Siau in November 1905, and a solitary individual on the grass-farm in February 1908. These are the only examples that I have observed.

[1192.] GYPS FULVUS. The Griffon Vulture.

Rattray, J. B. N. H. S. xii. p. 343 (Thall : common) ; Marshall, op. cit. xv. p. 351 (Quetta : very common) ; Ward, op. cit. xvii. p. 728 (breeds in colonies and is resident).

Common throughout the District, especially on the Samana, where it breeds and is resident. Observed in the Kurram Valley up to 8,500 feet.

[1196.] PSEUDOGYPS BENGALENSIS. The Indian White-backed Vulture.

Rattray, J. B. N. H. S. xii. p. 343 ; Ward, op. cit. xvii. p. 728 (rare in Kashmir).

Colonel Rattray recorded this species from Thall, and made the following notes on it :—" Common on the plains round Thall ; they were feeding on the dead transport animals all along the road from Kohat to Thall." This was during the Tirah Campaign of 1897-98, which doubtless attracted them to this part of the country, where in times of peace they are unknown. The nearest place where I have seen them is at Rawal Pindi, a hundred miles east of our limits, where, in October 1905, on the occasion of thirteen mules being shot, a great number, in company with *Gyps fulvus* and *Neophron percnopterus*, assembled in anticipation of the feast.

[1197.] PEOPHRON PERCNOPTERUS. The Egyptian Vulture.

Rattray, J. B. N. H. S. xii. p. 343 (Thall) ; Marshall, op. cit. xv. p. 351

(Quetta: common in summer); Fulton, op. cit. xvi. p. 59 (Chitral: summer visitor from March till September); Rattray, t. c. p. 662 (common in the Murree Hills); Cumming, t. c. p. 691 (occasionally seen in Seistan); Ward, op. cit. xvii. p. 728.

The common Scavenger Vulture of the District. A resident everywhere, except on the Samana and in the Kurram Valley, which it leaves on the approach of winter, returning early in March with *Passer domesticus*. Scarce in the Kurram Valley, though we noted it up to the head (7,000 feet).

[1199.] GYPÆTUS BARBATUS. The Lammergeier.

Rattray, J. B. N. H. S. xii. p. 343 (common at Thall); Marshall, op. cit. xv. p. 352 (Quetta: very common and nests); Fulton, op. cit. xvi. p. 59 (Chitral: a common resident); Ward, op. cit. xvii. p. 928 (common; nests in February and March).

Common and found everywhere from the plains to the summit of the Safed Koh, though seldom seen in the plains from June till October.

[1200.] AQUILA CHRYSÆTUS.

I have now seen the Golden Eagle in its summer-quarters in the Kaghan Valley, and feel fairly certain that the Eagle with the rufous-buff nape, which frequents the low rocky hills in Kohat in winter, is of this species. It is a regular visitor, but not common, and is not seen on the grass farm—the rendezvous of *A. heliaca*, *bifasciata*, *vindhiana*, and *maculata*—nor fighting over carrion, monitor lizards, &c., as these other species do, but is usually found singly in desolate country.

[1201.] AQUILA HELIACA. The Imperial Eagle.

Ward, J. B. N. H. S. xvii. p. 728 (an uncommon winter visitor).

A fairly common winter visitor. Mr. Donald has seen one give chase to a Laggar Falcon, and finally force it to drop its prey. Immature birds of this genus are frequently seen about the grass-farm feeding on offal, mole-rats, &c.

[1202.] AQUILA BIFASCIATA. The Steppe-Eagle.

Ward, J. B. N. H. S. xvii. p. 336 (abundant in Kashmir).

772. ♂ imm. Kohat, 1,900 ft., 1st April.

Fairly common in winter, but those seen were mostly immature birds.

[1203.] AQUILA VINDHIANA. The Tawny Eagle.

Rattray, J. B. N. H. S. xxii. p. 343; Ward, op. cit. xvii. p. 728.

Fairly plentiful in the cold weather and probably resident. Mr. Donald told me that in May 1907, when swarms of young locusts were devastating Kohat, he counted in one spot alone thirty-five of these Eagles which had apparently been gorging on the locusts. Colonel Rattray writes that in the Tirah Campaign he often saw this species feeding in company with Vultures on dead transport animals near Thall.

[1205.] AQUILA MACULATA. The Large Spotted Eagle.

Ward, J. B. N. H. S. xviii. p. 464 (Badarwa, Kashmir).

One pair observed on the grass-farm and another at the Lachi reed-bed in April and May. Probably breeds in the neighbourhood.

[1207.] HIERAETUS FASCIATUS. Bonelli's Eagle.

Marshall, J. B. N. H. S. xv. p. 352 (Quetta: some breed in the hills); Ward, op. cit. xvii. p. 728 (not common in Kashmir).

A fairly common resident, very destructive to game. Mr. Donald, who has trained several of these birds, says that they are most courageous and will hawk anything they are entered to; but that they are wild and difficult to train, even when taken very early from the nest, and that through want of practice in flying they are usually rather unwieldy; added to which, owing to their marked partiality for poultry, they are somewhat unsatisfactory from a falconer's point of view. In the wild state they have a bad reputation for pursuing and killing trained Goshawks when they get the chance, and are said to be the worst enemies of the wild Goshawk. they hunt in pairs; their favourite quarry, if they can be said to have one, is perhaps the Wood-Pigeon, but little comes amiss, and they will snatch up a fowl when opportunity offers, or make off with a wounded duck.

Watched a pair building in a cleft in a cliff on 17th March.

[1216.] CIRCAETUS GALLICUS. The Short-toed Eagle.

Ward, J. B. N. H. S. xvii. p. 728.

Fairly common in winter, and perhaps resident.

[1220.] BUTASTUR TEESA. The White-eyed Buzzard-Eagle.

711. ♂ ad. Kohat, 1,760 ft., 19th March.

A summer visitor, arriving early in March and leaving towards the end of October. Breeds fairly commonly in the Miranzai and Samilzai Valleys.

[1223.] HALIAETUS LEUCORYPHUS. Pallas's Fishing-Eagle.

Cumming, J. B. N. H. S. xvi. p. 691 (Seistan); Ward, op. cit. xvii. p. 728 (Kashmir).

Resident and common along the River Indus. Mr. Donald found four pairs nesting there in March. Rare elsewhere; occasionally seen between Chikarkot and Hangu.

[1229.] MILVUS GOVINDA. The Common Pariah Kite.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: very common); Marshall, op. cit. xv. p. 352 (Quetta: common, scarce in winter); Rattray, op. cit. xvi. p. 642 (common in the Galis); Ward, op. cit. xvii. p. 729.

532. ♀ ad. Peiwar Kotal, 8,000 ft., 25th April.

A very common resident up to 4,000 ft., occurring up to 8,000 ft. in summer. Major Magrath writes: "The numbers of this species were considerably reduced in the winter of 1905 by the excessive cold. The unfortunate birds were induced to breed early in January by the mildness of the weather, and had actually commenced to nest when the intense cold, lasting well into March, fell on us."

[1230.] MILVUS MELANOTIS. The Large Indian Kite.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: rare; shot a female off a nest); Fulton, op. cit. xvi. p. 59 (Chitral: April); Rattray, t. c. p. 663 (rare at Murree); Ward, op. cit. xvii. p. 729 (common in Kashmir).

Not common, more numerous on the Samana and in the Kurram Valley than elsewhere.

[1232.] ELANUS CÆRULEUS. The Black-winged Kite.

Fulton, J. B. N. H. S. xvi. p. 59 (common in Chitral in summer).

Fairly common in Kohat from early in April till October. In a mild year a few stragglers stay the winter. I met with it as high as Dandar (4,700 ft.) in the Kurram Valley.

[1223.] CIRCUS MACRURUS. The Pale Harrier.

Marshall, J. B. N. H. S. xv. p. 352 (Quetta: common in spring); Fulton, op. cit. xvi. p. 59 (Chitral: April).

739. ♂ ad. Kohat, 1,760 ft., 25th March.

This is the common Harrier of the District. Chiefly seen on migration from September till the end of November, and from February till May, only a few remaining for the winter.

[1234.] CIRCUS CINERACEUS. Montagu's Harrier.

Ward, J. B. N. H. S. xvii. p. 729 (winter visitor to Kashmir).

Rare. We both observed this species on the Samana during the spring migration. I also saw one near Lachi in March.

[1235.] CIRCUS CYANEUS. The Hen-Harrier.

Marshall, J. B. N. H. S. xv. p. 352 (occurs at Quetta in spring); Ward, op. cit. xvii. p. 729 (common in winter).

Fairly common on passage in spring and autumn.

[1237.] CIRCUS ÆRUGINOSUS. The Marsh-Harrier.

Marshall, J. B. N. H. S. xv. p. 352 (fairly common in winter); Ward, op. cit. xvii. p. 729 (very plentiful; possibly breeds in Kashmir).

Common about reed-beds and irrigated crops from September till the middle of May, especially in spring and autumn. Dresser, in his 'Manual of Palæarctic Birds' (p. 504), writing of this species, says: "It is doubtful if it dares even to attack a rat." I once disturbed a bird feasting on a freshly-killed adult *Nesokia hardwickii* (a particularly fierce species of field-rat), which I think must have been killed by the bird. I believe that a pair nested on the grass-farm at Kohat in the summer of 1906. They were there up to the 14th of June, when I left for the Kurram Valley. On my return in August I found an immature bird in the same spot.

[1239.] BUTEO FEROX. The Long-legged Buzzard.

Marshall, J. B. N. H. S. xv. p. 352 (common round Quetta in winter, chiefly the dark form; probably breeds close by).

A winter visitor and very common from October till April. I have shot both the light and the dark forms, but the former is much the commoner.

[1241.] Buteo desertorum. The Common Buzzard.

Cumming, J. B. N. H. S. xvi. p. 691 (Seistan: one shot in February).

757. ♀. Kohat, 1,760 ft., 28th March.

A winter visitor, but by no means as common as the last species.

[1243.] Astur palumbarius. The Goshawk.

Ward, J. B. N. H. S. xvii. p. 729 (rare).

This species occurs on passage, but very rarely.

Mr. Donald says that nets are set in four or five gorges in the independent territory north of Kohat. These nets average twelve feet in height, have a two-inch mesh, and are made to fit roughly the bottom of the gorge, while they are so arranged as to collapse when struck by anything. The Goshawk is thus occasionally taken in spring and autumn. Bonelli's Eagle is its chief enemy and pursues both wild and trained birds for its prey. This is the favourite Hawk with the local Khans, but it is an expensive luxury, females costing from Rs. 150 to Rs. 200 and males from Rs. 50 to Rs. 70.

[1244.] Astur badius. The Shikra.

Ward, J. B. N. H. S. xvii. p. 729 (Kashmir: rare).

A summer visitor, arriving towards the end of March. Nests commonly in the Samilzai Valley. Large numbers are snared by means of a light cage formed of fine netting stretched over supports, and covered with nooses; a live Quail is used as a bait. They are used for hawking Quail, and their price varies from 2*d.* to 1*s.*

[1247.] Accipiter nisus. The Sparrow-Hawk.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: occasionally seen; breeds in the Safed Koh); Marshall, op. cit. xv. p. 352 (not common; occurs in spring at Quetta); Fulton, op. cit. xvi. p. 59 (Chitral: shot one in May at 8,000 ft.); Ward, op. cit. xvii. p. 729 (a resident in Kashmir).

Occurs on migration in spring and autumn. Colonel Rattray mentions a young bird in down being brought to Parachinar in July from the Safed Koh. Mr. Donald tells me that this species breeds freely in Tirah, which lies just north of our limits, and that every autumn some thirty or forty individuals are snared along the Kachai stream, by means of a drop-net set up in the open, with a fine network cage containing Sparrows suspended in front. The Hawk seeing the sparrows flutter up makes a dash and gets entangled in the net. The bazaar rate varies from 2*s.* to 10*s.*

[1249.] *Pernis cristatus.* The Honey Buzzard. Occurs on spring migration.

[1254.] Falco peregrinus. The Peregrine Falcon.

Ward, J. B. N. H. S. xvii. p. 729 (common in Kashmir).

This species occurs chiefly on migration in spring and autumn, but is by no means common. Mr. Donald only knows of one instance of its being snared in the District, but has often observed it on passage. The bazaar rate for a good female is about Rs. 30.

[1255.] FALCO PEREGRINATOR. The Shahin.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: common along the foot of the hills); Ward, op. cit. xvii. p. 729 (occasionally caught near Srinagar).

A resident, and after the Laggar the commonest of our larger Falcons. Mr. Donald generally keeps a pair for hawking Chukor, Partridges, Teal, &c. He speaks highly of their courage, and has known one strike and kill a Mallard, but says that, though comparatively easy to train, after a year or two in captivity they deteriorate rapidly. There are many eyries scattered through the District. In June and July Mr. Donald has often seen them taking bats; these he thinks must be young birds practising.

Eggs were being incubated on 16th March. Alarm note, *kráp kráp*.

[1257.] FALCO JUGGER. The Laggar Falcon.

Marshall, J. B. N. H. S. xv. p. 352 (Quetta: fairly common); Ward, op. cit. xvii. p. 729.

Resident and common in open, cultivated country. Mr. Donald says that this species is the most frequent lure for taking other and more valuable Falcons. It is usually trained to take hares, but is not thought very much of, being too slow. The bazaar price is Re. 1.

[1258.] FALCO CHERRUG. The Cherrug or Saker.

The Cherrug occurs in open country like the last species, but is not nearly so common, and is a winter visitor only, arriving about October and leaving in April. Mr. Donald kept two birds which he trained very successfully to take *Milvus govinda* as well as Houbara-Bustards and Hares. After the Goshawk and Peregrine, this is the favourite amongst local falconers. The price ranges from Rs. 7 to Rs. 14 for a good female.

[1260.] FALCO SUBBUTEO. The Hobby.

Fulton, J. B. N. H. S. xvi. p. 60 (Chitral: one specimen obtained in May); Rattray, t. c. p. 663 (rare in the Murree Hills; breeds); Ward, op. cit. xvii p. 729 (breeds in the higher hills of Kashmir).

Mr. Donald states that this species is fairly common in spring and that he has observed it as late as May. I came across three individuals in beautiful adult plumage in February near Lachi; they were flying backwards and forwards, sparring at each other, and occasionally perching in a tree close by, while constantly uttering a cry which sounded like "gyak-gyak."

[1263.] ÆSALON REGULUS. The Merlin.

Ward, J. B. N. H. S. xvii. p. 729 (widely distributed in winter).

This bird is fairly common from October till the middle of March; it is more often seen about the grass-farm and the Sarma and Lachi plains than elsewhere. It migrates over the Samana in March. It is seldom trained in this district.

[1264.] ÆSALON CHICQUERA. The Red-headed Merlin or Turumti.

An occasional visitor, but by no means common. I have only twice seen

it; on one occasion the bird shot down just in front of me to take a Starling flying in to roost, and started to tear it up close by, giving me a splendid view through my glasses. Mr. Donald says that he has met with this species in Kohat in most months of the year. He has a great opinion of its courage, and has trained it to take Rollers (a bird a great deal bigger than itself), while he has known a pair to tackle a Blue Rock-Pigeon. It is a fairly common resident, he says, in the adjoining districts of Peshawar and Mianwali. Major Magrath has also found it not uncommon in Bannu. The wide open plains of these districts are more to its liking than the confined valleys of Kohat.

[1265.] TINNUNCULUS ALAUDARIUS. The Kestrel.

Rattray, J. B. N. H. S. xii. p. 344 (a common resident at Thall); Marshall, op. cit. xv. p. 352 (Quetta: common; found many nests); Fulton, op. cit. xvi. p. 60 (Chitral: a very common resident from 4,000 ft. upwards; one seen at 18,000 ft.); Rattray, t. c. p. 663 (common in the Murree Hills); Ward, op. cit. xvii. p. 729.

753. ♂. Kohat, 1,760 ft., 27th March.
764. ♂. „ „ 23rd March.

Common in winter; a resident on the Samana and in the Kurram and Miranzai Valleys (nesting regularly at Thall, 2,550 ft., and Hangu, 2,700 ft.).

[1292.] COLUMBA INTERMEDIA. The Indian Blue Rock-Pigeon.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: common in winter); Marshall, op. cit. xv. p. 352 (a resident, at Quetta); Fulton, op. cit. xvi p. 60 (Chitral: resident, occurring up to 10,000 ft.); Cumming, t. c. p. 691 (occurs in Seistan); Ward, op. cit. xvii. p. 943 (Kashmir).

Occurs in large flocks in the District from August to April. A few appear to be resident round Thall, but the great majority leave in April. Colonel Rattray, in his article referred to above, says that "they were breeding in hundreds in a cliff near the Fort. About the middle of April they all disappeared suddenly." On the 19th of May, 1907, however, I found some still about the cliffs at Thall.

[1293.] COLUMBA LIVIA. The Blue Rock-Pigeon.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: large flocks occur in winter); Marshall, op. cit. xv. p. 352 (Quetta); Ward, op. cit. xvii. p. 943 (the common Pigeon of Kashmir).

Occurs with flocks of the last species in winter, but is much less common. Never observed in separate flocks.

[1295.] COLUMBA EVERSMANNI. The Eastern Stock-Dove.

Cumming, J. B. N. H. S. xvi. p. 691 (Seistan: April); Ward, op. cit. xvii. p. 943 (Kashmir: rare, occurs on migration).

Migrates through Kohat in the latter half of April in small flocks which feed chiefly on the mulberries that are then ripening. Less wary than

other members of the genus. Appears to be scarce in the Kurram Valley, and probably only passes through, I shot an example at 6,500 feet in Ilex-scrub on the 2nd of May.

[1298.] PALUMBUS CASIOTIS. The Eastern Wood-Pigeon.

Marshall, J. B. N. H. S. xv., p. 352 (common on the hills round Quetta); Ward, op. cit. xvii., p. 943 (Kashmir).

A resident species, collecting in large flocks in autumn in the scrub-jungle above Marai, about Shinauri, and in the wooded nullahs of the northern slopes of the Samana—these being its favourite haunts, but odd birds occur all over the District. Mr. Donald tells me that it nests freely near the Zera Kotal, above Shinauri, and north of the Samana. It occurs also in the Kurram Valley, and probably breeds there, but was still in flocks in May.

[1305.] TURTUR FERRAGO. The Indian Turtle-Dove.

Fulton, J. B. N. H. S. xvi., p. 60 (common in Lower Chitral in summer); Rattray, t. c., p. 663 (common in the Murree Hills); Ward, op. cit. xvii., p. 943 (common in Kashmir).

Small numbers migrate through Kohat from mid-April till the 3rd or 4th of May, returning in September and October. Mr. Donald has found it nesting on the Samana, I shot a specimen there as late as the 4th of November. It is common in summer in the woods of the Safed Koh, from 7,000 feet to tree-limit.

[1309.] TURTUR CAMBAYENSIS. The Little Brown Dove.

Rattray, J. B. N. H. S. xii., p. 344 (Thall: common); Marshall, op. cit. xv., p. 353 (resident at Quetta, largely reinforced in summer); Fulton, op. cit. xvi., p. 60 (Chitral: probably common); Ward, op. cit. xvii., p. 943 (Kashmir).

A resident in the District and abundant at all seasons. Common in the Kurram Valley in summer up to 6,500 feet, and occurring at least up to 8,000 feet, at which height Major Magrath shot an example.

[1310.] TURTUR RISORIUS. The Indian Ring-Dove.

Rattray, J. B. N. H. S. xii., p. 344 (Thall: common); Marshall, op. cit. xv., p. 355 (common summer visitor); Fulton, op. cit. xvi., p. 60 (common in summer); Cumming, t. c. p. 691 (very rare in Seistan); Ward, op. cit. xvii., p. 943 (Kashmir).

Abundant in summer, the majority leaving in autumn, though many stay the winter. In the Kurram Valley the bird is common up to Dandar, but rather scarce higher up. I have met with it, however, as high as 8,500 feet.

[1311.] ŒNOPOPELIA TRANQUEBARICA. The Red Turtle-Dove.

Rattray, J. B. N. H. S. xii., p. 345 (rare at Thall); Ward, op. cit. xvii., p. 943 (rare in Kashmir).

A summer visitor to the District, and fairly numerous from the second week in April till August.

[1316.] PTEROCLES ARENARIUS. The Black-bellied Sand-Grouse.

Rattray, J. B. N. H. S. xii., p. 345 (Thall: passes through in March); Marshall, op. cit. xv., p. 353 (Quetta: common in autumn and spring); Cumming, op. cit. xvi., p. 691 (said to occur in Seistan); Ward, op. cit. xvii., p. 943 (Jummu).

Large flocks occur in the cold weather in the fields around Doaba and occasionally round Kohat, Lachi, and Dhand. I flushed a bird on the 21st of June, 1906, on the stony plain near Dandar in the Kurram Valley, which was possibly breeding in the neighbourhood.

[1317.] Pterocles fasciatus. The Painted Sand-Grouse.

Ward, J. B. N. H. S. xvii., p. 944 (Jummu).

A rare bird, probably resident. Mr. Donald told me that he had frequently flushed a pair of strange Sand-Grouse in the scrub-jungle west of Shinauri (3,800 feet), but that for a long time they managed to escape. Eventually, however, one was brought to bag and on being compared with Hume and Marshall's 'Game Birds of India' was found to correspond exactly with this species. This is not the first record of its occurrence west of the Indus. In 1902, Major Barton, of the Guides, sent a skin to the Bombay Natural History Society, and in a note to the Journal (vol. xiv., p. 606) wrote that the bird was shot every year near Mardan and that it was said to be resident.

[1321.] Pteroclurus exustus. The Common Sand-Grouse.

A resident in Kohat, but not very common. *Pteroclurus alchata* should occur, but we have not met with it, nor has Mr. Donald.

[1342.] Lophophorus refulgens. The Monál.

Fulton, J. B. N. H. S. xvi., p. 61 (common in Lower Chitral); Ward, op. cit. xvii., p. 944 (common in Kashmir).

Fairly numerous on the Safed Koh from 9,000 feet to tree-limit. I came across young ones fairly strong on the wing on the 27th of June.

[1355.] Coturnix communis. The Grey Quail.

Rattray, J. B. N. H. S. xii., p. 345 (Thall: passes through in spring and autumn, a few are resident); Marshall, op. cit. xv., p. 353 (Quetta: a few occur in spring and autumn); Fulton, op. cit. xvi., p. 61 (Chitral: passes through in spring, a few stay); Cumming, t. c., p. 692 (Seistan: fairly common; nests in March and April); Ward, op. cit. xvii., p. 944 (summer visitor, nesting).

Passes through in varying numbers from about the third week in March till the middle of May, and returns in August and September. Forty-six brace to two guns is the best morning's bag that I remember being made. Every year a few pairs stay to nest. Colonel Rattray found four eggs on the 21st of April near Thall. Mr. Donald has come across several nests, on one occasion actually treading on the sitting bird.

[1356.] Coturnix coromandelica. The Rain Quail.

Ward, J. B. N. H. S. xvii., p. 944. (A rare visitor: has been known to nest in Kashmir.)

Two or three examples are yearly shot in Kohat about May; the bird probably nests in the District.

[1370.] Caccabis chucar. The Chukor.

Rattray, J. B. N. H. S. xii. p. 345 (Thall: a common resident); Marshall, op. cit. xv. p. 353 (Quetta: very common); Fulton, op. cit. xvi. p. 61 (very common, ranging up to 12,000 ft.); Ward, op. cit. xvii p. 944 (found everywhere in Kashmir).

662. Sex? Marai, 3000 ft., 9th March.

763. ♀ ad. Kohat, 1850 ft., 30th March.

Resident, and fairly numerous from the plains up to at least 11,000 feet in the Safed Koh.

[1371.] Ammoperdix bonhami. The Sisi Partridge.

Rattray, J. B. N. H. S. xii. p. 345 (Thall: a fairly common resident); Marshall, op. cit. xv. p. 353 (Quetta: very common); Cumming, op. cit. xvi. p. 692 (Seistan: scarce).

A common resident on the stony hills of Kohat and the Kurram Valley up to about 6,000 feet, and abundant in the more remote parts, where it is less persecuted.

[1372.] Francolinus vulgaris. The Black Partridge.

Rattray, J. B. N. H. S. xii. p. 345 (Thall: abundant); Marshall, op. cit. xv. p. 353 (Quetta: occurs about the foot-hills); Cumming, op. cit. xvi. p. 692 (Seistan: abundant).

A resident, and common in the Mazri scrub (dwarf-palm) of the Lower Kurram and Upper Miranzai Valleys, and, in fact, wherever there is plenty of Mazri.

[1375.] Francolinus pondicerianus. The Grey Partridge.

Rattray, J. B. N. H. S. xii. p. 345 (Thall: very common); Ward, op. cit xvii. p. 944 (Kashmir: occurs in the plains).

A resident and fairly numerous, but less so than the Sisi. It is found on much the same ground, though more frequently about cultivated spots, and up to about the same altitude in the Kurram Valley.

[1378.] Tetraogallus himalayensis. The Himalayan Snow-Cock.

Fulton, J. B. N. H. S. xvi. p. 62 (Chitral: found in winter down to 6,000 ft. and in summer up to 16,000 ft.); Ward, op. cit. xvii. p. 945) (common at high altitudes).

This grand bird occurs in summer on the upper slopes of the Safed Koh from about 9,000 feet to the summit, but is rather scarce. Like the Chuko it would often escape notice were it not so noisy.

[1384.] Turnix tanki. The Indian Button-Quail.

A summer visitor in small numbers, breeding on the grass-farm. Major Venour shot one at Christmas 1909, so probably a few are resident.

[1387.] Rallus aquaticus. The Water-Rail.

Ward, J. B. N. H. S. xvii. p. 945 (breeds in the Valley of Kashmir).

402. ♂. Dhand, 1,200 ft., 17th November 1906.

869. Kohat, 1,700 ft., 8th March.

These two were the only ones met with.

[1393.] PORZANA PUSILLA. The Eastern Baillon's Crake.

Rattray, J. B. N. H. S. xii. p. 345 (large numbers pass through about the end of May); Ward, op. cit. xvii. p. 945 (Kashmir).

692, 693. ♀ ♀ ads. Lachi, 1,540 ft., 17th March.

Capt. Keen shot the first example on the 11th of February, 1906, and from then till mid-April single individuals were met with at intervals. About the latter date the main body appeared, and up to the 20th of May large numbers continued to pass through, frequenting the grass-farm, irrigated crops, and cover near water. The bird has not been observed on the autumn migration, though common at Rawal Pindi (120 miles east) at that season.

[1394.] PORZANA MARUETTA. The Spotted Crake.

695. ♂ ad. Lachi, 1540 ft. 17th March.

Passes through Kohat in fair numbers in March and April, frequenting reed-beds and irrigated crops. A great skulker, but may frequently be located by its peculiar loud call-note.

[1398.] AMAURORNIS FUSCUS. The Ruddy Crake.

Ward, J. B. N. H. S. xvii. p. 945 (breeds in Kashmir).

281. ♂ ad. Dandar, 4,700 ft., 23rd June, 1906.

I found numerous nests of this species in a marsh near Dandar, in the Kurram Valley. They were usually fairly well concealed in clumps of reeds or grass and generally mere hollows scantily lined with bits of these plants. The first eggs are laid about the middle of June, the clutch varying from five to seven. In colour they are creamy-white profusely spotted with pale red, and the average measurements are 1·22×·82 in. This species has brought the art of skulking to a high state of perfection, and it is only when the young have emerged from the shell that it shews itself at all.

[1402.] GALLINULA CHLOROPUS. The Water-Hen.

Ward, J. B. N. H. S. xvii. p. 945 (Kashmir).

A rather scarce winter visitor to Kohat; more numerous at Dhand than elsewhere. It occurs chiefly on migration in March and April, when it is frequently caught. It breeds in the Kurram Valley in small numbers. I found a nest at Dandar on the 9th of July.

[1405.] FULICA ATRA. The Coot.

Marshall, J. B. N. H. S. xv. p. 353 (Quetta: common in winter); Fulton, op. cit. xvi. p. 62 (Chitral: shot in March at Drosh); Cumming, t. c. p. 693 (Seistan: a common resident); Ward, op. cit. xvii. p. 945 (Kashmir).

Abundant on Dhand tank throughout the cold weather, occurring also in other suitable places in small numbers. I met with a pair near Lachi as late as the 20th of May, so possibly a few are resident.

[1407.] GRUS COMMUNIS. The Common Crane.

Rattray, J. B. N. H. S. xii., p. 345 (passes over Thall in great numbers: often driven back after storms).

Large flocks pass over from the third week in February till the end of March, returning in August and September, but rarely halting except in the Latammar Nullah or at Dhodha.

Residents at Parachinar say that Cranes on migration fly straight over the Safed Koh Range (lowest point 11,760 feet) and not round the western shoulder, but that they are frequently forced to turn back by storms. Major Magrath, too, has often observed them returning S.E. to Bannu after a storm.

[1411.] ANTHROPOIDES VIRGO. The Demoiselle Crane.

Rattray, J. B. N. H. S. xii., p. 346 (Thall); Cumming, op. cit. xvi., p. 393 (Seistan: a few occur in February and March); Ward, op. cit. xvii, p. 945 (a winter visitor to Kashmir).

This beautiful species passes through in big flocks from the end of March till about the middle of April (last flock seen on the 17th), returning in September.

[1413.] OTIS TETRAX. The Little Bustard.

Ward, J. B. N. H. S. xvii., p. 945 (Kashmir: one shot in December).

Very rare. We have never met with this species, but Mr. Donald says that he has twice flushed the "Butterfly" Bustard, as he calls it, from its peculiar flight, when hawking the Houbara.

[1415.] HOUBARA MACQUEENI. The Houbara Bustard.

Marshall, J. B. N. H. S. xv., p. 353 (passes through Quetta in March and April); Cumming, op. cit. xvi., p. 693 (fairly common in Seistan in spring: said to breed).

A rather scarce winter visitor, but fairly plentiful on the spring migration in March. Mr. Donald frequently takes this Bustard with his trained Cherrug Falcons (*Falco cherrug*).

[1418.] ŒDICNEMUS SCOLOPAX. The Stone-Curlew.

Marshall, J. B. N. H. S. xvi., p. 353 (rare at Quetta); Ward, op. cit. xvii., p. 945 (Kashmir).

I only once met with this species in Kohat and that was near Sheikhan on the 22nd of August, 1906. Mr. Donald says that it occurs commonly in the desert-country between Samrud and the mouth of the Khyber Pass, *i.e.*, about 40 miles N. E. of Kohat.

[1427.] GLAREOLA LACTEA. The Small Indian Pratincole.

Rattray, J. B. N. H. S, xii., p. 346 (Thall); Ward, op. cit. xvii, p. 945 (said to occur in Kashmir).

A summer visitor from April till August. Col. Rattray found it breeding freely on the gravel banks in the Kurram River in April. It was very common when we passed through Thall in April and on our return in May.

Major Venour saw three Swallow Plover at close quarters in spring 1909 which were not of this species but were either *G. orientalis* or *G. pratincola*.

[1431.] SARCOGRAMMUS INDICUS. The Red-wattled Plover.

Rattray, J. B. N. H. S. xii., p. 346 (common at Thall); Marshall, op. cit. xv. p. 353 (only one seen at Quetta, 5,600 ft.); Ward, op. cit. xvii., p. 946 (a few occur at about 5,000 ft. in Kashmir).

A few are resident in the plains; abundant in summer, but scarce in winter.

[1436.] VANELLUS VULGARIS. The Lapwing.

Rattray, J. B. N. H. S. xii., p. 346 (a few pass through Thall); Marshall, op. cit. xv., p. 353 (winter visitor to Quetta); Fulton, op. cit. xvi., p. 62 (Chitral: fairly common up to the end of May; probably breeds); Ward, op. cit. xvii., p. 946 (winter visitor).

Fairly common from October till the third week in March.

[1437.] CHETTUSIA GREGARIA. The Sociable Plover.

Rattray, J. B. N. H. S. xii., p. 346 (large flocks pass through Thall in April); Fulton, op. cit. xvi., p. 62 (Chitral: common in winter; saw some at Drosh, 4,300 ft., at the end of May, probably breeds about there); Ward, op. cit. xvii., p. 946 (scarce in Kashmir).

Small flocks pass through from the last week in February till the end of March: many are then in full plumage, *i.e.*, are black and chestnut on the abdomen (see Blanford, Fauna of B. I. vol. iv., p. 232). A solitary example was shot on the parade-ground at Fort Lockhart (6,500 feet), where it had alighted during parade.

[1438.] CHETTUSIA LEUCURA. The white-tailed Plover.

Cumming N. L., J. B. N. H. S. xvi., p. 694 (Seistan, 6th May.)

Mr. Donald shot a specimen on the grass-farm on the 31st of March 1905, and sent it to Major Magrath for identification. This is the only occurrence in Kohat that I know of. In Bannu, however, it is very common in winter about the larger marshes.

[1446.] ÆGIALITIS ALEXANDRINA. The Kentish Plover.

A somewhat rare spring visitor, arriving towards the end of February and disappearing before the end of March. Major Magrath has found it common in Bannu in spring and autumn.

[1447.] ÆGIALITIS DUBIA. The Little Ringed Plover.

Rattray, J. B. N. H. S. xii., p. 346 (Thall); Marshall, op. cit. xv., p. 353 (common at Quetta in spring); Cumming, op. cit. xvi., p. 694 (fairly plentiful in Seistan); Ward, op. cit. xvii., p. 946 (Kashmir).

This species passes through Kohat in small flocks from about the end of February till the middle of May (last seen on the 20th). The numbers vary a good deal. In the spring of 1905 Major Magrath noticed a great many passing through, but in the following year comparatively few were seen. On the gravelly shores of the Kurram it breeds abundantly from Thall up to

Dandar at least; Colonel Rattray found many nests near Thall, from the end of May onwards.

I once saw an individual trying to escape observation by lying flat on the ground with head and neck extended, after the fashion of the Stone-Curlew.

[1451.] HIMANTOPUS CANDIDUS. The Black-winged Stilt.

Marshall, J. B. N. H. S. xv., p. 353 (Quetta: common in March); Cumming, op. cit. xvi., p. 694 (scarce in Seistan); Ward, op. cit. xvii., p. 946 (breeds in Kashmir).

A rather rare visitor to Kohat from March till May (last seen on the 28th). Major Magrath says that it is very common in Bannu in spring.

[1460.] TOTANUS HYPOLEUCUS. The Common Sandpiper.

Marshall, J. B. N. H. S, xv., p. 353 (Quetta: occurs in April, but is rare); Fulton, op. cit. xvi., p. 62 (Chitral: one shot on May 30th); Ward, op. cit. xvii., p. 946 (breeds in Kashmir).

Occurs on passage in the spring and autumn, a few staying the winter.

[1461.] TOTANUS GLAREOLA. The Wood-Sandpiper.

Fulton, J. B. N. H. S. xvi., p. 62 (Chitral: one shot on the 6th of May). Cumming, t. c., p. 695 (common in Seistan in May); Ward, op. cit. xvii., p. 946 (Kashmir).

Occurs in numbers on the spring migration in the irrigated fields round Kohat.

[1462.] TOTANUS OCHROPUS. The Green Sandpiper.

Marshall, J. B. N. H. S. xv., p. 353 (Quetta: common in winter; Fulton, op. cit. xvi., p. 63 (common in spring; believed to breed in Chitral; many found between 9,000 and 14,000 ft. in July); Ward, op. cit. xvii., p. 946 (Kashmir).

Abundant on migration in April and May, and from the end of August till November; the majority leave about that time, but many stay the winter in the plains, and a few non-breeding birds through the summer. It passes up the Kurram Valley in spring in great force, but does not stay to breed.

[1463.] TOTANUS STAGNATILIS. The Marsh-Sandpiper.

Not at all common, but a few individuals pass through every year between February and the middle of May, being generally found about the irrigated parts of the grass-farm.

[1464.] TOTANUS CALIDRIS. The Redshank.

Cumming, J. B. N. H. S. xvi., p. 695 (Seistan); Ward, op. cit. xvii., p. 946, and xviii.; p. 464 (fairly common in Kashmir in winter; breeds in Ladak).

I have only met with one solitary example, and that was on the 17th of March near Lachi. Major Magrath, however, has found the bird very common in Bannu in winter.

[1466.] TOTANUS GLOTTIS. The Greenshank.

Ward, J. B. N. H. S. xvii., p. 946 (Kashmir).

A fairly common cold-weather visitor, arriving in October and leaving towards the end of April.

[1468.] PAVONCELLA PUGNAX. The Ruff.

Marshall, J. B. N. H. S. xv., p. 353 (Quetta: one shot in February); Ward, op. cit. xvii, p. 946 (a winter visitor to Kashmir).

Occurs in large flocks on the grass-farm and other suitable places from the end of February till the middle of May (I shot a single bird on the 17th).

[1471.] TRINGA MINUTA. The Little Stint.

Fulton, J. B. N. H. S. xvi., p. 63 (common in Chitral in April and May); Ward, op. cit. xvii., p. 946 Kashmir).

Appears in small flocks towards the end of March, and is abundant about irrigated fields and shallow tanks, in company with Sandpipers, till the middle of May. Not met with in autumn.

[1474.] TRINGA TEMMINCKI. Temminck's Stint.

Arrives and leaves about the same time as the little stint, but unlike that species is almost always found singly. I have only once met with it in autumn.

[1482.] SCOLOPAX RUSTICULA. The Woodcock.

Rattray, J. B. N. H. S. xii., p. 354 (Thall: a rare winter visitor); Marshall, op. cit. xv., p. 354 (Quetta: winter visitor); Fulton, op. cit. xvi., p. 63 (resident in Lower Chitral, but scarce); Rattray, t. c., p. 663 (nests freely in the Murree Hills above 8,500 ft.); Cumming, t. c., p. 695 (scarce in Seistan); Ward, op. cit. xvii., p. 946 (breeds in Kashmir).

A winter visitor from November till the middle of March, but not common: there are, however, several favoured spots in the district which can usually be counted on to hold one bird or more. In the gardens of Kohat itself some half-dozen are shot every winter.

[1484.] GALLINAGO CŒLESTIS. The Common Snipe.

Rattray, J. B. N. H. S. xii., p. 346 (Thall: common in March); Marshall, op. cit. xv., p. 354 (Quetta: fairly common); Fulton, op. cit. xvi., p. 63 (Chitral: a few noticed in April); Cumming, t. c., p. 695 (Seistan: abundant from September to April); Ward, op. cit. xvii., p. 947 (breeds in Kashmir).

Passes through in varying numbers from the last week in January till the middle of April. Few stay in Kohat, but in the Kurram Valley, where there is plenty of good feeding-grounds, bags of fifty and sixty couples of this and the next species are often made in a few hours. On the return passage in autumn comparatively few halt.

[1487.] GALLINAGO GALLINULA. The Jack Snipe.

Rattray, J. B. N. H. S. xii., p. 347 (Thall); Marshall, op. cit. xv., p. 354 (Quetta: occasionally met with); Cumming, op. cit. xvi., p. 695 (Seistan: said to be fairly common); Ward, op. cit. xvii., p. 947 (Kashmir).

The same may be said of this bird as of the last, but it is not quite so common.

[1488.] ROSTRATULA CAPENSIS. The Painted Snipe.

Rattray, J. B. N. H. S. xii., p. 347 (Thall in March); Ward, op. cit. xvii., p. 947 (a resident in the Kashmir Valley).

Rare in Kohat. Capt. Keen shot a specimen in April 1904, while Mr. Donald and Major Venour shot several early in July 1907 and saw others. In the Kurram Valley it is a permanent resident, but is not common.

[1498.] HYDROPROGNE CASPIA. The Caspian Tern.

Rattray, J. B. N. H. S. xii., p. 347 (Thall); Cumming, op. cit. xvi., p. 696 (common in Seistan).

Colonel Rattray saw a party of seven near Thall on the 22nd of May and shot one. Capt. Keen and Mr. Boyle observed a large solitary Tern on the Toi near Hangu between the 20th and 26th of March, 1906, and from their description it must, I think, have belonged to this species.

[Major Magrath has also met with *Larus ridibundus* and *L. cachinnans* in Bannu, and as they both occur in Kashmir, they probably also do so in the Kurram Valley.]

[1499.] STERNA ANGLICA. The Gull-billed Tern.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: common in March); Cumming, op. cit. xvi., p. 696 (Seistan: common).

Small flocks pass through Kohat from the beginning of April till May (last seen on the 5th), and are then usually to be met with about the grass farm or feeding in irrigated fields.

[1504.] STERNA MELANOGASTER. The Black-bellied Tern.

Cumming, J. B. N. H. S. xvi., p. 696 (Seistan: not common).

Major Magrath observed this species in some irrigated fields near Doaba on the 18th of May 1907. In Bannu he says that it is common.

[1526.] PHALACROCORAX CARBO. The Common Cormorant.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: a few seen in March).

A fairly common bird on the Indus between Khushalgarh and Makhud. It also occurs occasionally up the Kohat Toi; Capt. Lyall sent me a specimen that he had shot on this stream near Hangu.

[1527.] PHALACROCORAX FUSCICOLLIS. The Indian Shag.

Rattray, J. B. N. H. S. xii., p. 347.

Colonel Rattray shot an example near Thall in February, 1898, after a heavy storm in the Kurram Valley: it was the only one that he saw. We have never met with this species.

[1544.] PLEGADIS FALCINELLUS. The Glossy Ibis.

1. Juv. Kohat, 1,760 ft., 22nd August.

The only example that we have seen was a bird of the year which Mr. Donald shot in his garden on the 22nd of August, 1905, and sent to

Major Magrath, who forwarded the skin to the Secretary of the Bombay Natural History Society. Mr. Donald flushed another on the grass-farm.

[1545.] PLATALEA LEUCORODIA. The Spoonbill.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: a big flock at the end of May).

I came across four Spoonbills on the grass-farm on the 30th of May, 1906. The following year, on the 30th of April, Major Magrath and I were standing on the Peiwar Kotal (8,200 feet) when a flock of about twenty came up from the Kurram and passed close overhead; but apparently not relishing the strong north-west wind which met them as they topped the Kotal (*i.e.* pass), they wheeled round and flew back down the valley.

[1546.] CICONIA ALBA. The White Stork.

Occurs regularly on the spring migration either singly or in small parties. In the Kurram Valley we saw a flock of some two hundred near Dandar on the 20th of April. Single individuals continue to pass through up till the end of May.

[1547.] CICONIA NIGRA. The Black Stork.

Ward, J. B. N. H. S. xvii., p. 947 (occurs early in spring in Kashmir).

Not common; but small flocks are seen every winter from January till the end of March.

[1554.] ARDEA MANILLENSIS. The Eastern Purple Heron.

I flushed three individuals out of the Lachi reed-bed on the 20th of May 1906. Major Magrath and I also came on a small flock in the reeds at Dandar in the Kurram Valley in April 1907. These are the only occasions on which we have met with this Heron.

[1555.] ARDEA CINEREA. The Common Heron.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: one or two always about); Marshall, op. cit. xv., p. 354 (Quetta: common, especially in March); Fulton, op. cit. xvi., p. 63 (only a few seen in Chitral); Cumming, t. c., p. 696 (common in Seistan); Ward, op. cit. xvii., p. 947 (abdundant in the Vale of Kashmir).

Fairly common in suitable places, especially along the Kurram River. Probably a resident species.

[1559.] HERODIAS ALBA. The Large Egret.

Rattray, J. B. N. H. S. xii., p. 347 (Thall); Marshall, op. cit. xv. p. 354 Quetta: fairly common in February); Ward, op. cit. xvii., p. 947 (Kashmir).

Colonel Rattray writes:—"A few birds appeared at Thall in the middle of May for a day or two; one was shot and brought to me, it was in splendid breeding-plumage."

We have not met with this species ourselves in Kohat, though Major Magrath has found it quite common in Bannu in winter.

[1565.] ARDEOLA GRAYI. The Pond-Heron.

Ward, J. B. N. H. S. xvii., p. 947 (breeds in Kashmir).

Abundant in the plains in summer, arriving in the beginning of April, and nesting freely in the cantonments. A few stay through the winter, if fairly mild.

[1568.] NYCTICORAX GRISEUS. The Night-Heron.

Rattray, J. B. N. H. S. xii., p. 347 (rare, but presumably resident at Thall); Ward, op. cit. xvii., p. 947 (breeds in Kashmir).

Personally I have only met with this species in summer from April onwards; but a few individuals appear to be resident, as Colonel Rattray observed it at Thall in winter, and Major Magrath at Bannu. It occurs in Kohat and the Kurram Valley (up to 4,800 feet at least), but is not common.

[1570.] ARDETTA MINUTA. The Little Bittern.

Cumming, J. B. N. H. S. xvi., p. 696 (Seistan: one specimen); Ward, op. cit. xvii., p. 948 (breeds in Kashmir).

I found a nest with seven slightly incubated eggs in a reed-bed near Dandar on the 9th of July, 1906, and shot the male bird. The nest was a flat pad of reeds on a stump, three feet above the water. I have several times put up a Little Bittern, either this species or *A. sinensis*, in the reed beds in the plains in April and May, but have not secured a specimen, so cannot say to which species it belonged.

[1574.] BOTAURUS STELLARIS. The Bittern.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: very rare); Cumming, op. cit xvi., p. 696 (Seistan: one shot in December); Ward, op. cit. xvii., p. 947 (a winter visitor, but not common).

72. Adult. Kohat, 1,600 ft., 7th January.

A fairly common winter visitor, both to Kohat and the Kurram Valley. Leaves early in April (last seen on the 8th).

[1579.] ANSER FERUS. The Grey Lag-Goose.

Cumming, J. B. N. H. S. xvi., p. 697 (common in Seistan in winter); Ward, op. cit. xvii., p. 948 (abundant in winter).

Mr. Donald has shot this species on the grass-farm; but it is very rare in Kohat, though occurring regularly in the Kurram Valley in spring.

[1588.] CASARCA RUTILA. The Brahminy Duck or Ruddy Sheldrake.

Rattray, J. B. N. H. S. xii., p. 347 (rare at Thall); Marshall, op. cit. xv., p. 354 (Quetta: occurs in February and March); Ward, op. cit. xvii., p. 948 (a winter visitor to Kashmir, breeds in Ladak).

Passes through Kohat from the middle of February till the middle of April, but is not common.

[1587. TADORNA CORNUTA (S. G. Gm.). Major Magrath writes that the Sheldrake is a regular spring visitor to Bannu in small numbers.]

[1592.] ANAS BOSCAS. The Mallard.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: common in March); Marshall, op. cit. xv., p. 354 (Quetta: common in winter); Fulton, op. cit. xvi., p. 64

(passes through Chitral) ; Cumming, t. c., p. 697 (Seistan : common) ; Ward, op. cit. xvii., p. 947 (a few nest in Kashmir).

A winter visitor and one of our commonest Ducks ; it disappears towards the end of March.

[1595.] CHAULELASMUS STREPERUS. The Gadwall.

Rattray, J. B. N. H. S. xii., p. 348(Thall : common in March) ; Cumming, op. cit. xvi., p. 697 (not common in Seistan) ; Ward, op. cit. xvii., p. 948 (Kashmir).

Scarce in winter, but becoming fairly numerous in spring. Some stay very late. I shot an individual out of a party of three on one of the reedy tanks near Lachi on the 20th of May, 1906 ; they appeared to fly quite well. I was unable to visit this spot again before autumn, so cannot say whether the bird nests there or not. Colonel Rattray also writes :—" One male was shot out of a party of three in June [at Thall] and brought to me."

[1597.] NETTIUM CRECCA. The Common Teal.

Rattray, J. B. N. H. S. xii., p. 348 (Thall : very common in spring) ; Marshall, op. cit. xv., p. 354 (Quetta : common in winter) ; Fulton, op. cit. xvi., p. 64 (Chitral : common on migration) ; Cumming, t. c., p. 697 (Seistan : abundant and apparently resident) ; Ward, op. cit. xvii., p. 948 (Kashmir : occurs in June and July in the Valley, but no eggs found).

Quite our commonest Duck and the first to arrive. The 9th of September is the earliest date on which I have noted it. As with all Ducks in Kohat, it is much more numerous in autumn and spring than in winter. It leaves towards the end of April.

[1599.] MARECA PENELOPE. The Wigeon.

Fulton, J. B. N. H. S. xii., p. 64 (passes through Chitral) ; Cumming, op. cit. xvi., p. 698 (Seistan : winter visitor) ; Ward, op. cit. xvii., p. 948 (fairly common in winter in Kashmir).

Not common, but usually occurs in March and April.

[1600.] DAFILA ACUTA. The Pintail.

Rattray, J. B. N. H. S. xii., p. 348 (Thall : one flock seen in March) ; Marshall, op. cit. xv., p. 354 (Quetta : fairly common in winter) ; Fulton, op. cit. xvi., p. 64 (Chitral : passes through in February and March) ; Cumming, t. c., p. 698 (Seistan : a winter visitor) ; Ward, op. cit. xvii., p. 948 (common on passage in Kashmir).

Passes through in small numbers in February and March.

[1601.] QUERQUEDULA CIRCIA. The Garganey.

Ward, J. B. N. H. S. xvii., p. 948 (Kashmir : common on passage).

Mr. Donald shot one of a pair (a male) on the grass-farm in October ; this is the only occurrence of the Garganey in the District that I have heard of.

[1602.] SPATULA CLYPEATA. The Shoveller Duck.

Rattray, J. B. N. H. S. xii., p. 348 (Thall : common in spring) ; Marshall,

op. cit. xv., p. 354 (Quetta: fairly common in winter); Fulton, op. cit. xvi., p. 64 (Chitral: passes through in March and April); Cumming, t. c., p. 698 (Seistan: common in winter and probably resident); Ward, op. cit. xvii., p. 948 (Kashmir).

Not common in autumn and winter; but large numbers pass through in spring. Some individuals stay very late, and I have noticed them all through April and up to the 20th of May.

[1604.] NETTA RUFINA. The Red-crested Pochard.

Rattray, J. B. N. H. S. xii., p. 348 (Thall: occurs in March); Marshall, op. cit. xv., p. 354 (Quetta: common in winter); Cumming, op. cit. xvi., p. 698 (Seistan: common in winter, probably resident); Ward, op. cit. xvii., p. 948 (Kashmir: common in February).

Not common, but found throughout the winter at Dhand Tank, and occasionally elsewhere, up till the end of March.

[1605.] NYROCA FERINA. The Pochard.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: common in winter); Cumming, op. cit. xvi., p. 698 (Seistan: common and doubtless resident); Ward, op. cit. xvii., p. 948 (Kashmir).

Next to the Teal this is our commonest Duck in the cold weather.

[1606.] NYROCA FERRUGINEA. The White-eyed or Ferruginous Duck.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: common in February). Cumming, op. cit. xvi. p. 698 (Seistan: common in winter); Ward, op. cit. xvii., p. 948 (Kashmir: a common resident).

Less common than the last species, but fairly numerous on Dhand Tank in the winter. It leaves towards the end of March.

[1609.] NYROCA FULIGULA. The Tufted Pochard.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: common in March); Cumming, op. cit. xvi., p. 698 (a winter visitor in Seistan); Ward, op. cit. xvii., p. 948 (common, especially in March).

I have only met with this Duck at Dhand, where it is abundant and occurs throughout the winter, at least up till the end of March.

[1611.] ERISMATURA LEUCOCEPHALA. The White-headed Duck.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: February); Cumming, op. cit. xvi., p. 699 (Seistan: very common in winter, perhaps resident); Ward, op. cit. xvii., p. 949 (not common, but a regular winter visitor in Kashmir).

Very rare. I observed single birds at Dhand on the 18th of November, 1906, and the 21st of February, 1907, but could not get a shot; it is, however, an unmistakeable species. Capt. MacNab, I.M.S., shot one at Mardan (thirty miles north of our limits) on the 12th of November, 1899 (*vide* J. B. N. H. S. xiii., p. 182).

[1612.] MERGUS ALBELLUS. The Smew.

Rattray, J. B. N. H. S. xii., p. 348 (Thall: February); Marshall, op. cit. xv., p. 354 (Quetta: common in winter); Ward, op. cit. xvii., 949 (Kashmir: often seen on the Wular Lake; breeds on the Shyoh).

An immature bird was brought in to Major Magrath on the 26th of December, 1905. I also observed a big flock on the Indus on the 18th of February, 1907.

[1613.] MERGANSER CASTOR. The Goosander.

Ward, J. B. N. H. S. xviii., p. 949 (shot on the Wular Lake and seen on the Indus).

A rare winter visitor, occurring on the Indus, where Mr. Donald has shot it.

[1616.] PODICIPES NIGRICOLLIS. The Eared Grebe.

403 & 404. Dhand, 1,200 feet, 17th November.

Occurs regularly every winter on Dhand Tank, staying at least up till the end of March.

[1617.] PODICIPES ALBIPENNIS. The Indian Little Grebe.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: common in spring); Cumming, op. cit. xvi., p. 699 (Seistan: resident); Ward, op. cit. xvii., p. 949 (resident in Kashmir).

A very common resident at Dhand, and in one or two other suitable localities.

The following species *not* in the Kohat list were noted by me last March on the River Indus near Kalabagh *(a few miles south of our limits)*, and are of interest as they probably also occur in Kohat:—

[867.] ALAUDULA ADAMSI. The Indus Sand-Lark was common along the sandy shore wherever there were patches of vegetation; it had then paired, and one pair allowed me to watch them building their nest under the lee of some tamarisk shoots.

[1189.] PANDION HALIAETUS. I saw one Osprey fishing.

[1419.] ESACUS RECURVIROSTRIS. I put up four Great Stone-Plovers off a stony bank.

[1503.] STERNA SEENA. The Indian River-Tern, the Black-bellied, and the Caspian were all common, especially the first two.

[1517.] RHYNCHOPS ALBICOLLIS. A flock of about thirty Scissorbills was seen flying up and down the river, occasionally resting on a sand-bank. Cry, a nasal *kap, kap*.

[1583.] ANSER INDICUS. I saw a flock of Bar-headed Geese cropping young beans.



A.—LOW GROUND-RATTAN (*Rhapis humilis*, Bl.).



B.—(*Thrinax radiata*, Lodd).

THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART IV.

(With Plates XII, XIII, XIV, XV, XVI & XVII.)

(Continued from page 705 of this Volume.)

TRACHICARPUS TAKIL, Becc. Webbia I, 52.—Chamærops martiana (non-Wallich) Duthie in Gard. Chronicle 1886, 10th April, p. 457.—Royle, Illustr. of the Bot. of Himal. Mount., pp. 394, 397, 399 (*ex parte?*)—Hook f. Himal. Journ. II, 280 (*quod ad plant. ex Himal. occid. pertinet*).

NAMES.—Takil, Jhangra, Jhaggar, Tal (in Kumaon).

Stem of young plants growing oblique, then ascending, erect, straight and stout, distinctly conical when young (in a young specimen, 12½ feet high, the stem measured 3½ feet in circumference at the base and only 1 foot at the top); when fully developed 30-40 feet high, produces flowers when about 3⅓ feet high, always covered with the permanent leaves and the chestnut-brown fibrous network; the ligular appendages of the sheath erect, similar to those of *T. excelsa*, but much shorter, broad, triangular, remaining erect in the terminal bud. Leaves all permanent, similar to those of *T. excelsa*, but those of the previous year just below the last flowering spadices reflexed, but permanent. Petiole about as long as the limb, slender, subtrigonous, the lower angle rounded; margins very acute, armed with minute irregular subspinescent teeth or crenulations; ligule at the top of the petiole semilunar, irregular, crenate in the upper part. Blade ¾ orbicular, 3⅓-4 feet in diameter, with 45-50 divisions measuring 2⅓-2⅚ feet from the top of the petiole to the apex of the median segments. Segments very irregularly divided, more or less down to the middle, green, rather shining on the upper surface, glaucescent pruinose on the lower; central segments about 1⅛ inch broad from the base to almost the top, where they

are shortly bifid or bidentate with the teeth obtuse and divaricate; lateral segments gradually becoming more narrow and shorter.

Male spadices very similar to those of *T. excelsa* as regards size, ramification and shape of the spathes, but the branchlets are less densely covered with flowers. Flowers glomerulate, 2-4 together with minute yellow fleshy bracts at the base, in the well developed bud obscurely trigonous-globose, $\frac{1}{6}$ inch long; calyx very small, sepals suborbicular, very obtuse and rounded at the apex; petals broadly ovate, concave, obtuse, twice as long as the calyx; stamens 6, equal uniseriate; filaments cylindrical—lesiniform, at least $\frac{1}{4}$ longer than the petals; anthers ovate-oblong, versatile; carpels 3, narrowly conical, slightly incurved and divergent, glabrous, half as long as the petals, with an ovule apparently well developed. Female spadix and flowers not yet described. Fruit similar to that of *T. excelsa*, but more distinctly reniform and somewhat broader. (After Beccari.)

Habitat.—Up to now this palm has been found in the Western Himalaya only. It grows on Mount Takil in Kumaon at a height of 6,600—8,000 feet, where it is annually covered with snow. According to Gamble it prefers the cool narrow valleys to the north-west. Duthie found hundreds of them at a height of 8,000 feet in the moist forests of *Quercus dilatata*.

Cultivation in Europe.—Beccari is probably the first to introduce this palm in Europe. He obtained some plants from seeds in the year 1887. All the young plants showed a marked tendency towards unilateral development, as if they wanted to creep on the ground. In the course of time the stem grew upwards and became quite straight, but the lower part always remained much thicker than the upper portion. After the appearance of the stem this palm seems to grow quicker than *T. excelsa*. The trees are kept in the open in the vicinity of Florence and they did not suffer even during the severest of winters. Only once in an exceptionally cold winter the ice spoilt a few leaves. The heat seems to be more harmful to them than the cold. In 1904 some leaves were so to say burnt by the July sun and, perhaps, also in consequence of the exceedingly dry air.

In April 1902 one of the palms produced 3 male spadices. The same tree measured in November 1904 almost 13 feet, taken from the ground to the top of the central leaves.

ERRATA.—On page 703 of the previous Number it was stated under the heading *Habitat* that *Trachycarpus martiana* was found in Kumaon; this appears to be a mistake as this species does not seem to occur in Kumaon.

RHAPIS, L. f. in Ait. Hort. Kew., III, 473.

(From the Greek "Rhapis": a rod.)

Jacq. Hort. Schœnbr. t. 316.—Mart. Hist. Nat. Palm. III, 253, t. 144.—Kunth, Enum. Pl. III, 251.—Walp. Ann. III, 471.—Bot. Mag. t. 1371.—Miq. Fl. Ind. Bot. III, 61.—Benth. and Hook. Gen. Pl. III. II. 930, 99.

Stem low, cane-like, cæspitose, covered with the remains of the petioles. Leaves alternate, terminal, small, with the segments divided almost to the base; margins of segments denticulate. Spadix long-peduncled; peduncle with 2-3 short, tubular spathes. Flowers dioecious or polygamous on the slender branches of the paniculately branched spadix, yellowish. Calyx cupular, 3-dentate. Corolla in male flowers club-shaped, in female flowers shorter, obovate. Stamens 6, rudimentary in the female flowers. Carpels 3, fleshy, ending in short styles. Berry small, 1-seeded; pericarp fleshy; endocarp soft; seed compressed-globose; embryo ventral.

Species at least 9[1].—Eastern Asia, from China to the Sunda Islands.

CULTIVATION IN EUROPE.—Densely tufted green house palms. The species are of a very easy culture. They thrive in a compost of rich, strong loam to which is added a small portion of vegetable mould and sand; they require perfect drainage and plenty of water throughout the summer. Propagation may be effected by suckers.

RHAPIS FLABELLIFORMIS, Ait., Hort. Kew. ed. I., III, 473.—Mart. Hist. Nat. Palm. III., 253, t. 144.—Kunth, En. Pl. III, 251.—Jacq. Hort. Schœnbr. t. 316.—Bot. Mag. t. 1371.—Franch. et Savat. En. Pl. Jap. II, 2.—Benth. Fl. Hongk. 340.—Bretschn. Hist. Europ. Bot. Disc. 126. —*R. kwanwortsik*, H. Wendl., Ind. Palm. 34.—Seem. Bot. Voy. Herald, 416.

[1] O. Beccari has lately described some new species of *Rhapis*. Cf. Webbia, vol. 3, Firenze, 1910.

NAME.—Dwarf Ground-Rattan.

DESCRIPTION.—Stem about 5-6 feet high, of the thickness of the thumb, sheathed by the reticulate persistent bases of the leaves. Leaves about 8, petioled, palmate, 5-7-parted; segments subplicate, ciliate-spinulous along the edges and keel of the plaits, indented-erose at the end; petiole round-ancipital, naked, very obscurely denticulate. Spadix sparse, paniculately branched, 4-5 inches long; spikelets thick-set with sessile yellowish flowers.

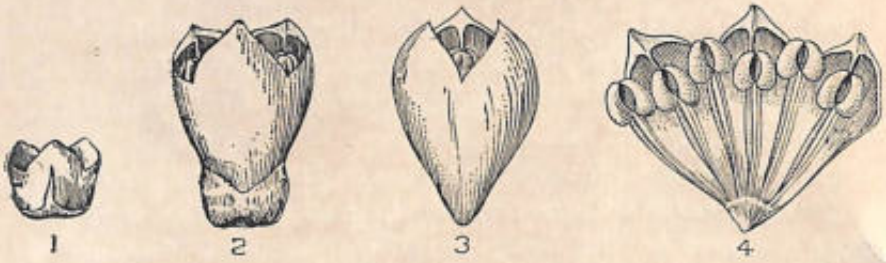


FIG. 9.

Rhapis flabelliformis.

1. Calyx of male flower with bract.
2. Male flower.
3. Corolla of male flower.
4. Open Corolla of male flower with stamens

All magnified. (After Martius).

Male flowers: calyx of one piece, urceolate, fleshy, green, smooth, scarcely 1 line in length, trifid, segments roundish-pointed, upright, with a membraneous border; corolla yellow, coriaceous-fleshy,

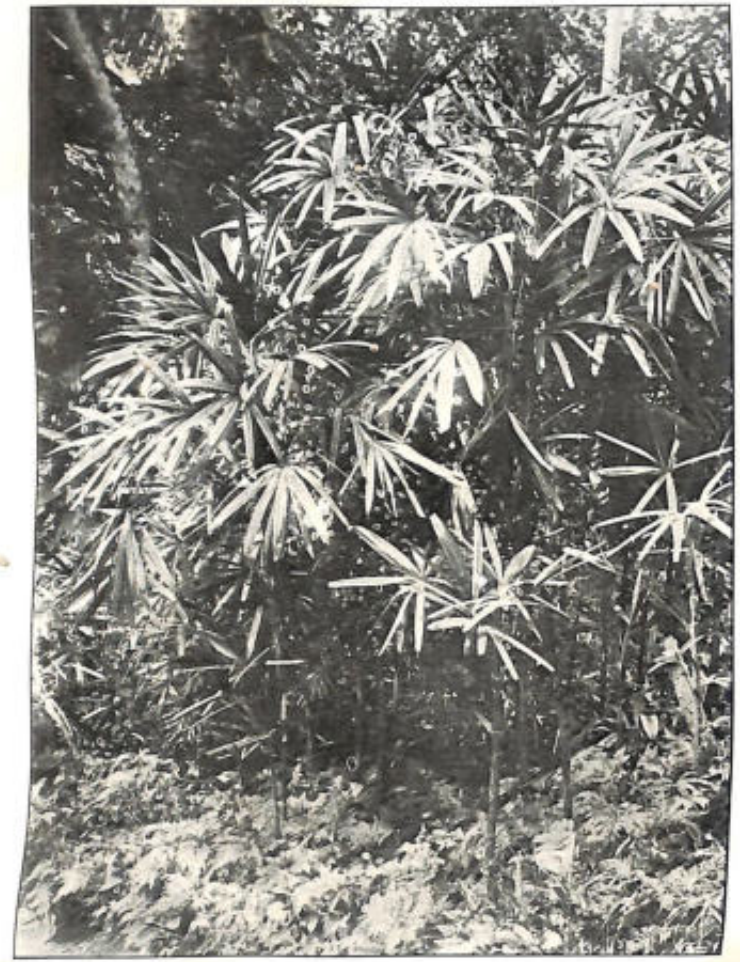


FIG. 10.

Rhapis flabelliformis.

1. Side view of female flower.
2. Female flower seen from above.
3. Part of Corolla of female flower with 3 staminodes.
4. Longitudinal section through ovary.

All magnified. (After Martius).



A.—DWARF GROUND-RATTAN (*Ithapis flabelliformis*, L. f.).



B.—SILVER THATCH PALM (*Thrinax argentea*, Lodd).

obovate-oblong, tube clavate, triquetral, twice the length of the calyx, limb trifid; three times shorter than the tube, segment ovate, acute, subconnivent; filaments 6, filiform-triquetral, shorter than the corolla, adnate to the tube, alternately somewhat thicker and more detached. Fig. 9 and 10.

HABITAT.—S. China and Loochoo, in the Happy Valley Woods.

USES.—This palm yields excellent walking-sticks, called "ground-rattans."

CULTIVATION IN EUROPE.—The Dwarf Ground-Rattan is adapted to room-cultivation and may be kept at a great distance from the window. Of this species there exist varieties with white and golden-yellow leaves.

ILLUSTRATION.—Plate XIII A shows a characteristic group of Dwarf Ground-Rattans as grown in the Royal Botanic Gardens of Peradeniya in Ceylon. Mr. H. F. Macmillan has been kind enough to take the photograph himself.

RHAPIS HUMILIS, Blme. Rumphia, II, 54.—Mart. Hist. Nat. Palm. III, 254.—Walp. Ann. V, 818.—Wright J. Linn. Soc. vol. 36, p. 169. *R. sierotsik*, Sieb.—*Chamærops excelsa*, var. *humilior*, Thbg. Fl. Jap. 130.

NAME.—Low Ground-Rattan.

DESCRIPTION.—Leaves cut into from 7-10 spreading segments; petioles unarmed. Similar in general aspect to *R. flabelliformis*.

HABITAT.—China (cultivated in Japan).

CULTIVATION IN EUROPE.—The Low Ground-Rattan is well adapted to room-cultivation. There exist beautiful garden-varieties with white and golden yellow leaves.

ILLUSTRATION.—The photograph on Plate XII A, taken by the Rev. M. Maier, S.J., shows several specimens of the Low Ground-Rattan growing in the Victoria Gardens of Bombay. The position of the leaves and the greater number of leaf-segments at once distinguish this species from the Dwarf Ground-Rattan on Plate XIII A. The plants are about 5 feet high.

COCCOTHRINAX, Sargent, Bot. Gazette, XXVII, 87, (1899). (The name was given in allusion to the berry-like fruit.)

Thrinax, Endlicher, Gen. Pl. 253 (in part) 1836.—Meissner. Gen. 357 (in part).—Benth. and Hook., Gen. III, 930.—Drude. Engl. and Prantl. Pflanzenf. II, pt. III, 34 (sect. *Euthrinax*).—Baillon, Hist. Pl. XIII, 317 (excl. sect. *Hemithrinax*).—Sargent, Silva N. Ann. X. 49. (sect. *Euthrinax*).

Small unarmed trees, with simple or clustered stems or rarely stemless. Leaves orbicular, or truncate at the base, pale or silvery white on the lower surface, divided into narrow obliquely-folded segments acuminate and divided at the apex; rhachises narrow; ligules thin, free, erect, concave, pointed at the apex; petioles compressed, slightly rounded and ridged above and below, thin and smooth on the margins, gradually enlarged below, into elongated sheaths of coarse fibres forming an open network covered while young by thick hoary tomentum. Spadix interfoliar, paniculate, shorter than the leaf-stalks, its primary branches furnished with numerous short slender pendulous flower-bearing secondary branches; spathes, numerous, papery, cleft at the apex. Flowers solitary, perfect, jointed on elongated slender pedicels; perianth cup-shaped, obscurely lobed; stamens 9-12, inserted on the base of the perianth, with subulate filaments enlarged and barely united at the base, and oblong anthers; ovary 1-celled, narrowed into a slender style, crowned by a funnel-formed oblique stigma; ovule basilar, erect. Fruit a subglobose berry raised on the thickened torus of the flower, with thick juicy black flesh. Seed free, erect, depressed-globose, with a thick hard vertically-grooved shell deeply infolded in the bony albumen; hilum basilar, minute: raphe hidden in the folds of the seed-coat; embryo lateral or apical.

Species about 15.

Distribution.—*Coccothrinax* is confined to the tropics of the New World. Two species, of which one is stemless, inhabit southern Florida, and at least eleven other species are scattered over several of the West Indian Islands.

Cultivation in Europe.—All the species of this and the next genus are stove-palms. When young they should be kept in a compost of loam, peat and sand; as they get older, turfy loam and sand is preferable. Propagation is effected by seeds. These



High Thatch Palm (*Thrinax excelsa*, Lodd & Griseb).

should be obtained when freshly imported, sown in well-drained pots or pans of sandy loam, and plunged in bottom heat.

COCCOTHRINAX ARGENTEA, Sargent in Bot. Gaz. XXVII (1899), 89.—Beccari, Webbia, II (1907), 317.—*Thrinax argentea*, Lodd. in Desf. Cat. ed. 3, 31; Roem. et Schult, Syst, Veg. VII, 1300.—Mart. Hist. Nat. Palm., III, 256, t. 103, III.—*Th. multiflora*, Mart. Hist. Nat. Palm. III, 255, t. 103, I, a.—*Th. excelsa*, Hart., Bot. Mag. t. 7088?

NAMES.—Silver Thatch Palm, Silver-leaved Palmetto, Guano.

DESCRIPTION.—Stem reaching up to 40 feet high. Leaves peltate radiate, suborbicular, green above, whitish or almost silvery below, in adult plants divided into about 60 segments down to a little below the middle, in young plants much deeper. Petiole very long and slender, depressed-biconvex with very acute margins; ligule glabrous, subligneous, broadly subcordate, prolonged in the centre into a triangular acuminate point; larger segments of adult plant up to $3\frac{1}{3}$ feet long and $1\frac{1}{5}$—$1\frac{2}{5}$ inch broad at the point where the segments divide, then narrowing into a very acuminate point which is shortly split at the apex; lateral segments gradually becoming narrower, longer acuminate and more deeply divided. Spadix shorter than the leaf, with a few partial inflorescenes; primary spathes papery, reddish brown or cinnamon-coloured, delicately striate, more or less acuminate at the apex, on the ventral side of the upper part open, with the margins entire or slightly filamentous fibrous; partial inflorescences forming panicles which are broadly ovate, 6-8 inches long with many flowering branchlets inserted irregularly on the principal axis; flowering branchlets filiform, about $\frac{1}{24}$ inch thick, the lowest ones $3\frac{1}{3}$—4 inches long, the upper ones a little shorter, with numerous flowers spirally arranged and borne on pedicels $\frac{1}{24}$—$\frac{1}{6}$ inch long. Perianth low-cupular, divided almost to the base into 6 narrow subulate teeth; stamens usually 9, anthers linear, $\frac{1}{12}$ inch long, spirally contorted, obtuse at the apex; ovary ovate-globose, very abruptly constricted into a short neck which widens into a large infundibuliform stigma.

Fruiting perianth disc shaped, depressed. Ripe fruit $\frac{3}{8}$-$\frac{5}{12}$ inches in diameter, spherical, black-violascent; pericarp fleshy. Seed $\frac{1}{4}$-$\frac{7}{24}$ and even $\frac{1}{3}$ inch in diameter, cerebriform. Embryo exactly apical.

HABITAT.—San Domingo.

NOTE.—It is good to remember that the specific name "argentea" has been applied, not only in gardens and hothouses, but also by many authors, to all the species of *Thrinax* and *Coccothrinax* which show a silvery white on the underside of their leaves.

ILLUSTRATION.—Plate XIII B shows a well grown specimen of the Silver Thatch Palm (under the synonymous name of *Thrinax argentea*) in the Royal Botanic Gardens of Peradeniya in Ceylon. The stem is about 12 feet high. We owe the photograph to the kindness of Mr. H. F. Macmillan.

THRINAX s.w., Prodr., 57 (1788).

(From the Greek 'Thrinax,' a fan, alluding to the form of the leaves).

Schreber, Gen. 772.—Mart. Hist. Nat. Palm, III, 254, 320, t. 103, 163.—Endlicher, Gen. 253.—Meisner, Gen. 357.—Drude, Engl. and Prantl. Pflanzenf. II, pt. III, 34. (sect. *Porothrinax*).—Sargent, Silva N. Am. X. 49. (sect. *Porothrinax*); Bot. Gaz. XXVII, 83. Becc. Webbia, II, 247.

Small unarmed trees, with stems covered with pale-grey rind. Leaves orbicular, or truncate at the base, thick and firm, usually silvery white on the lower surface, divided to below the middle into narrow acuminate parted segments with thickened margins and midribs; rachises narrow borders, with thin usually undulating margins; ligules thick, concave, pointed, lined while young with hoary tomentum; petioles compressed, rounded above and below, thin and smooth on the margins, with large clasping bright mahogany-red sheaths of slender matted fibres covered with thick hoary tomentum. Spadix interfoliar, stalked, its primary branches short, alternate, flattened, incurved, with numerous slender rounded flower-bearing branchlets; spathes numerous, tubular, coriaceous, cleft and more or less tomentose at the apex. Flowers solitary, perfect; perianth 6-lobed; stamens six inserted on the base of the perianth, with subulate filaments thickened and only slightly united at the base, or nearly triangular and united into a cup adnate to the perianth, and oblong anthers; ovary 1-celled, gradually narrowed into a stout columnar style crowned by a large funnel-formed flat or oblique stigma; ovule basilar

erect. Fruit a globose drupe with juicy bitter flesh easily separable from the thin-shelled tawny brown nut. Seed free, erect, slightly flattened at the ends, with an oblong pale conspicuous subbasilar hilum, a short-branched raphe, a thin coat, and uniform albumen more or less deeply penetrated by a broad basal cavity; embryo lateral.

SPECIES.—At least ten are now generally recognized.

DISTRIBUTION.—*Thrinax* is confined to the tropics of the New World and is distributed from Southern Florida through the West Indies to the shores of Central America.

NOTE.—Several beautiful and ornamental species of this genus are cultivated in European hot-houses and Indian gardens; but with regard to their names mentioned in books, herbaria and tickets of living specimens it is difficult to imagine a greater confusion. Though the number of species is not great, Beccari does not hesitate to say that "a critical revision of the literature on *Thrinax* would be a bold, if not an impossible undertaking." "There are, besides," he continues, "numerous horticultural species which are only known by name or which have been described from the leaves of young specimens and which cannot be recognized anymore."

If an authority like Beccari speaks in these terms, nobody will expect us to identify all the different species which, at present, are growing in Indian gardens, sometimes without name, sometimes with names not to be found in any book, and very often with wrong names.

The only way of clearing up the many doubts and uncertainties and to arrive at a correct nomenclature will be to describe accurately and with every possible detail the morphological structure of flowering and fruiting specimens, to preserve leaves, flowers and fruits, and wherever practicable, to take good photographs of young and adult plants.

We reproduce in our series the photographs of two evidently different species, without adding the description, because we have not seen the flowers of those plants.

Plate XII-B shows a palm which is known in Indian gardens under the name of *Thrinax radiata*, Lodd. The photograph was taken by Rev. M. Maier in the Victoria Gardens of Bombay.

Very incomplete descriptions of *Thrinax radiata* are to be found in the following books: Roem. et Schult., Syst., Veg. VII, 2, 1301; Desf. Cat. h. Paris ed. 3, 31; Mart. Hist. Nat. Palm, III, 257; but they will not help much towards establishing the identity of our specimen.

We hope the Superintendent of the Victoria Gardens will be kind enough to furnish us, after some time, with a detailed description of the flowers.

Plate XIV represents a beautiful specimen of the High Thatch Palm, which is called in Indian gardens *Thrinax excelsa*, Griseb. (or Lodd. et Griseb.). Mr. Phipson has taken the photograph in a Bombay garden. This palm is a favourite with amateurs on account of its ornamental character.

There are many palms which received the name of *Thrinax excelsa* in the course of time. One of them is described and figured in Hooker's Botanical Magazine (t. 7088); but even so Beccari was not able to establish its exact identity.

THRINAX PARVIFLORA, Sw. Prodr. 57 (1788); Fl. Ind. Occid. I, 614, t. 13—Ait. Hort. Kew. III, 473—Willd., Spec. Pl. II, pt. I, 202.—Pers. Syn. I, 383.—Lunan, Hort. Jam. II, 28.—Poiret, Lam. Dict. VII, 635.—Titford, Hort. Bot. Am. 112.—Spreng. Syst. Veg. II, 20.—Roem. & Sch. Syst. Veg. VII, pt. II, 1300.—Mart. Hist. Nat. Palm, III, 255, t. 103.—Kth. Enum. Pl. III, 253.—Dietrich, Syn. II, 1091.—Walp. Ann. V, 818.—Grisebach, Fl. Brit. W. Ind. 515.—*T. pumila*, Lodd. ex Roem et Sch., Syst., Veg. VII, 2, 1301.—*T. excelsa* (Lodd.?) Griseb. Fl. Brit. W. Ind. 515.

NAMES.—Silk-Top Palmetto; Thatch Palm; Palmetto Royal; Palmetto Thatch.

DESCRIPTION.—A tree, from 10-20 feet in height, with a slender stem 4 or 5 inches in diameter, covered with thin smooth blue-grey rind. The leaves are orbicular, from 3-4 feet in diameter, thin, bright green on the upper surface, paler and coated while young on the lower surface with pale caducous tomentum, and, except at the base, where they are split nearly to the ligula, divided for about two-thirds of their diameter into laciniate lobes, with stout yellow midribs prominent on the upper side, and with much thickened reflexed margins; the lobes near the middle of the leaf



THATCH PALM (*Thrinax parviflora*, Sw.).

are 1-1¼ inch broad, diminishing in width towards the base of the leaf, where they are not more than ¼ inch wide. Rhachis of leaf reduced to a thin truncate undulate border, and the ligula is crescent-shaped, about ⅛ inch long, ¼ inch thick, and 1 inch wide, and is furnished near the middle with a flat nearly triangular point ½ inch long, petiole thin and flexible, ¾ inch wide at the base of the blade, rounded and ridged on the upper and lower sides, about as long as the blade of the leaf, and enlarged below into the elongated sheath, which is coated while young with a thick felt-like hoary tomentum. Three or four panicles of flowers, from 2-5 feet in length, usually appear each year; secondary branches much flattened, recurved, and 4-6 inches in length, the slender flower-bearing branchlets being from 1½-8 inches long, and in the axils of ovate acute scarious brownish bracts about ¼ inch long and ⅛ inch wide; spathes coriaceous, pubescent above the middle, and often ciliate on the margins at the apex. Flowers raised on rigid spreading pedicels ⅛ inch in length; perianth cup-like, 6-lobed; stamens usually 6, with slender exserted filaments slightly united below and large oblong light yellow anthers; ovary subglobose, dark orange-coloured, surmounted by an elongated style dilated into a broad oblique stigma (Fig. 11). Fruit dark chestnut-brown or nearly black, rather less than ⅝ inch in diameter, with a thin somewhat fleshy outer coat closely

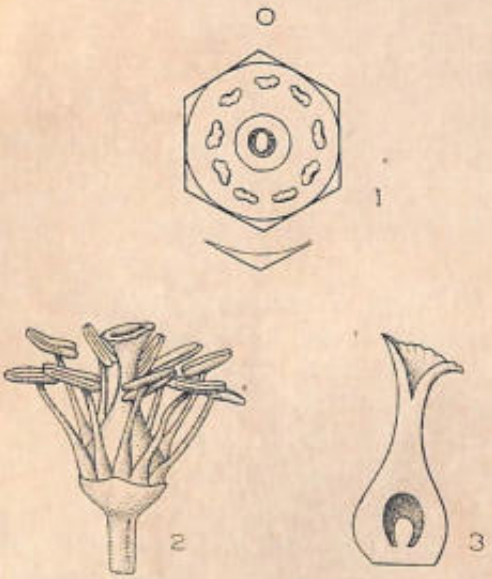


FIG. 11.

Thrinax parviflora.

1. Diagram of flower. 2. A flower (enlarged).
3. Longitudinal section of pistil (enlarged).
(After Sargent.)

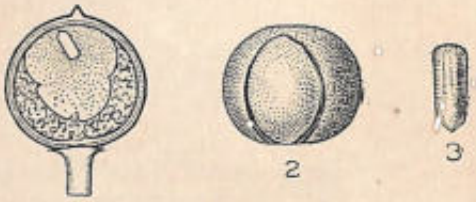


FIG. 12.
Thrinax parviflora.
1. Vertical section of fruit.
2. A seed (enlarged).
3. An embryo (much magnified).
(After Sargent).

investing the rather thicker crustaceous light brown inner coat, and a deeply furrowed depressed globose tawny brown seed ¼ inch in diameter, with ruminate albumen. (Fig. 12).

HABITAT.—Up to now the Thatch Palm has been found in Jamaica only. *A Thrinax* from Florida, which was formerly included in this species, is now known under the name *Thrinax floridana*, Sargent.

USES.—The wood of the Silk-Top Palmetto is light, soft, and pale brown, with a hard outer rim about ⅛ inch in thickness, and contains numerous hard inconspicuous fibro-vascular bundles. The specific gravity of the absolutely dry wood is 0·5991, a cubic foot weighing 37·34 pounds.

ILLUSTRATION.—Major A. T. Gage has kindly supplied me with a photograph of *Thrinax parviflora* as shown on Plate XV. The specimen is growing in the Calcutta Botanic Gardens.

THRINAX BARBADENSIS, Lodd., in Mart. Hist. Nat. Palm, III, 257.—Griseb. Fl. West. Ind. Isl. 515.—Duss, Guadel. et Martinique, in Ann. Instit. Col. de Marseille, vol. III, 1896.—*T. parviflora*, Maycock, Fl. Barbad. 146.—*Copernicia barbadensis*, Hort.

NAMES.—Thrinax de la Barbade, Latanier, Palmier à balai.

DESCRIPTION.—A very ornamental tree; stem up to 50 feet high and more, cylindric, 5-7 inches in diameter. Leaves large, flabelliform, palmatifid, glabrous; segments numerous, lanceolate, acuminate; ligule obsolete, truncate; petiole not armed, compressed-convex on both sides, about as long as the leaf-blade, covered at the base with a fibrous network. Spadix large, 10-20 inches long, consisting of about 4-10 partial panicles on a common axis, glabrous; each partial panicle enclosed in a membranous sheath which is closed up to the middle, upper part acuminate, concave.



An Avenue of Talipot Palms in Ceylon (*Corypha umbraculifera*, L.).

Flowers hermaphrodite, whitish, with a strong disagreeable odour which attracts a great number of bees; pedicel short, a little longer than the stamens; stamens 8-12, hypogynous; filaments subulate, thickened, compressed and united at the base, slightly shorter than the ovary; anthers erect, bilocular, basifixed, bifid at both ends; style slightly shorter than the ovary, stout, funnel-shaped at the top; ovary 1-celled, 1-ovuled. Fruit globose, of the size of a pea or small cherry, pulpy, flesh black, containing a reddish-black juice.

HABITAT.—Barbadoes; Guadeloupe, on limestone hills.

FLOWERS.—Twice a year and often five times in two years, (Duss).

USES.—When young the palm is well adapted for room-decoration.

Note: Beccari has changed the old name of this species into *Coccothrinax barbadensis*. Cf. Webbia, II, 328.

CORYPHA, L. Gen. Nat. 1221.

(From the Greek "Corypha," crown of the head, vertex. The palm is called so on account of its beautiful crown of leaves.)

Gaertn., Fruct., I.,t.7.—Lam. Illustr., t. 899.—Bl., Rumph. II. 57, t. 97, 98, 105.—Roxb. Corom. Pl. t. 255, 256.—Kunth Enum. Pl. III, 235.—Mart. Hist. Nat. Palm. III, 231, 318, t. 108, 127. —Griff. Palms Brit. Ind. t. 220 D, E, F, append. 23.—Miq. Fl. Ind. Bat. III, 49.—Kurz For. Fl. II, 524.—Benth. et Hook. Gen. Pl. III, II, 922, 84.

Tall, stout, unarmed palms, dying after once flowering and ripening their seed at the age of between 20 and 80 years. Leaves very large, orbicular or lunate, flabellately multifid; segments in duplicate in vernation; petioles stout, concave, spinous at the edges. Spadix a very large, terminal, erect, decompound panicle. Spathes many, tubular. Flowers small, hermaphrodite; calyx cupular, 3-fid; petals 3, connate below in a stipes, ovate, acute, imbricate or subvalvate; stamens 6; filaments subulate; anthers dorsifixed. Ovary 3-lobed, 3-celled; style short, subulate;

stigma minute. Fruit of 1-3 fleshy, globose drupes; styles basilar; seeds erect, globose or oblong; albumen uniform; embryo spiral.

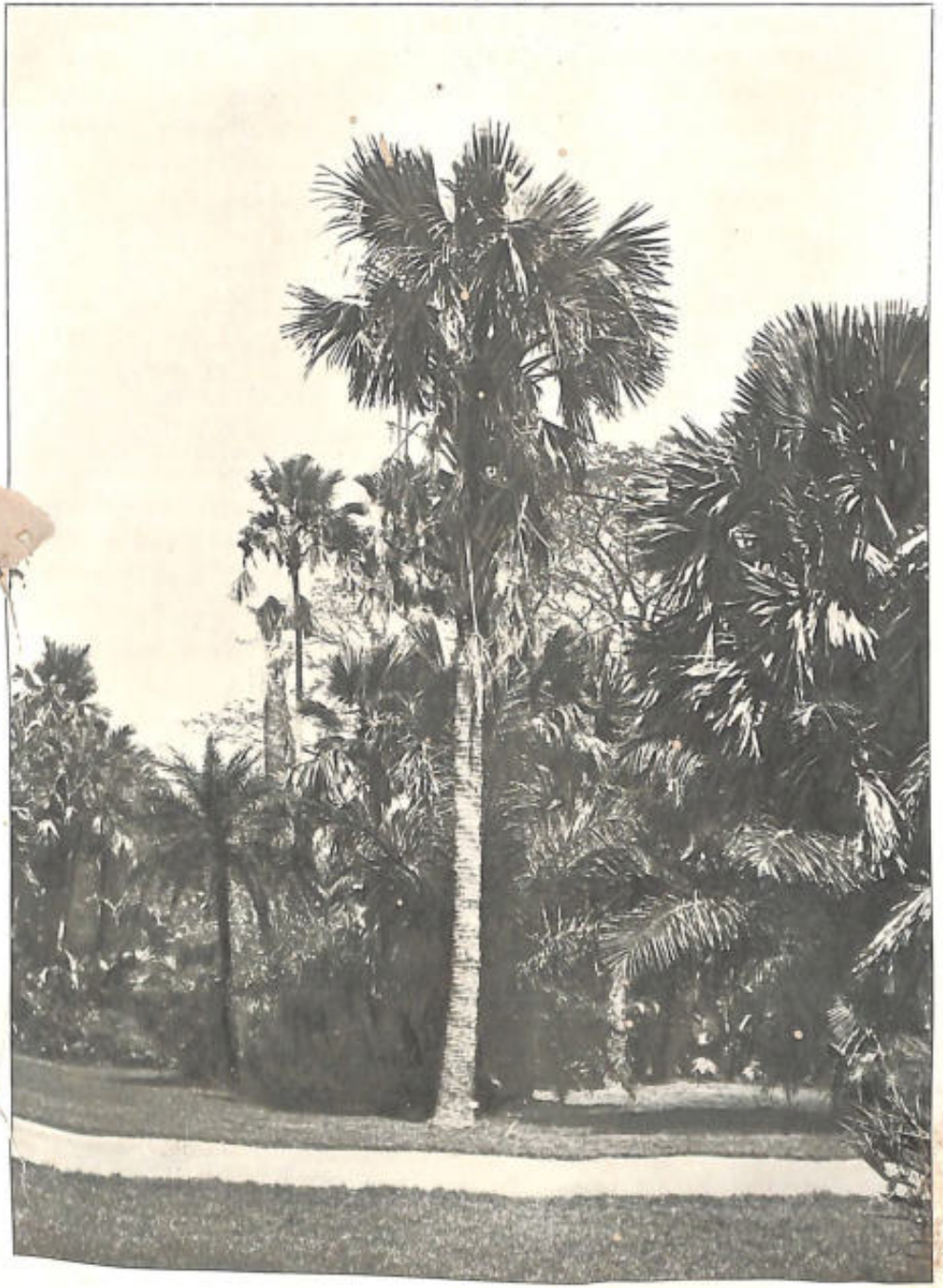
Species about 6; Tropical Asia.

CULTIVATION IN EUROPE.—The species of this genus are stove-plants. They are of somewhat slow growth and thrive best in a compost of two parts of loam, one of peat, and one of sand. Perfect drainage and much water are essential to success.

CORYPHA ELATA, Roxb., Fl. Ind. II. 176; Mart. Hist. Nat. Palm. 233; Kunth Enum. III, 236; Griff. in Calc. Journ. Nat. Hist. V, 314; Palms Brit. Ind. 112, t. 220, D.—Hooker, Fl. Brit. Ind. VI, 428; Brandis Ind. Trees, 658.

NAME.—Bajur (Beng.).

DESCRIPTION.—Trunk straight, often varying in thickness, 60-70 feet high by about 2 feet in diameter, strongly marked with rough, dark coloured, spiral ridges and furrows. Leaves round the top of the tree, immediately under the base of the inflorescence, numerous, lunate, palmate-pinnatifid, plaited, 8-10 feet in diameter; segments generally from 40-50 pairs, united about half their length, ensiform, apices rather obtuse and bifid, texture hard, smooth on both sides. When the tree begins to flower, the leaves wither and fall off, leaving the fructiferous part naked; petioles 6-12 feet long, spirally arranged, auricled, concave above, with the thin, hard, black margins thereof cut into numerous very short, curved spines, spadix about $\frac{1}{5}$ to $\frac{1}{4}$ the height of the trunk, much narrower in span than the foliage, supradecompound; the various and innumerable ramifications are always alternate, smooth, and of a pale yellow colour. Spathes numerous, one at each joint of the various ramifications of the spadix, smooth and when young, of a pale yellowish-green. Flowers small, sessile, collected in little fascicles over the ultimate divisions of the panicle, pale yellow, rather offensive. Calyx small, 3-toothed; petals 3, oblong, reflexed, shorter than the stamens; filaments 6, broad at the base, and there united, towards the apex slender and incurved; anthers ovate, dorsifixed. Ovary superior, round-ovate, suddenly contracted into the short style, 3-lobed, 3-celled, with 1 ovule in each cell, attached to the bottom of the cell; style short, 3-grooved;



BAJUR (*Corypha elata*, Roxb.).

stigma 3-lobed. Drupe about 1 inch in diameter, stipitate, olive-coloured, smooth when fresh, but soon becoming dry and wrinkled, 1-celled; the two abortive lobes of the ovary are always to be found at the base; pericarp friable; endocarp adnate to the testa; seed solitary, subglobular; perisperm equable, hard, horny, pale grey; embryo simple, short, apical.

HABITAT.—Bengal and Burma.

FLOWERS.—In March and April; fruit ripens after about 12 months.

ILLUSTRATIONS.—The photograph reproduced on Plate XVI was kindly supplied by Major Gage and represents a fully developed specimen of *Corypha elata*. The spiral furrows on the stem at once distinguish this species from *Corypha umbraculifera* and *Corypha taliera*.

To the left of the Bajur is a young specimen of *Phœnix sylvestris* and to the right the huge crown of a young *Corypha umbraculifera*.

The photograph has been taken in the Calcutta Botanic Gardens.

We reproduce on Plate XVII a photograph of the Talipot avenue in the Royal Botanic Gardens of Peradeniya. It is one of the most striking features of the garden, its shades of colour in green and gold affording delight to the artistic eye. This species (*Corypha umbraculifera*) will be described in the next number of the Journal. The photograph has been taken by Messrs. Plâté & Co.

(To be continued.)

A NEW MURINE GENUS AND SPECIES FROM SIND, WITH DIAGNOSES OF THREE OTHER NEW GENERA BASED ON PREVIOUSLY KNOWN SPECIES OF "MUS."

BY

OLDFIELD THOMAS, F. R. S., BRITISH MUSEUM.

(*Published by permission of the Trustees of the British Museum.*)

I owe to the kindness of Mr. R. C. Wroughton the opportunity of examining and describing a highly interesting mouse obtained in Sind by Mr. E. Priestley for the Natural History Society of Bombay, and now presented by the Society to the British Museum.

Mr. Wroughton has himself given a note on the other species obtained by Mr. Priestley, among which is a *Leggada* so like the new species as to be readily mistaken for it.

PYROMYS, g.n.

External proportions about as in *Leggada platythrix*. Fur profusely mixed with spines, but not, as in *Acomys*, wholly spinous. Ears rather small. Thumb with a small triangular nail, other digits with normal sized claws; soles naked, smooth; pads six in number, large, rounded, the last one not elongated. Fifth hind toe long, reaching nearly to end of the first phalanx of the fourth. Mammæ 4—2= 12.

Skull strongly bowed, its profile convex above. Supra-orbital ridges broad and strongly developed, but disappearing posteriorly half way across the parietals, the interorbital space narrow anteriorly, rapidly broadened posteriorly. Anterior palatine foramina very long, extending to level of the anterior internal root of m^1; posterior palatine foramina also long, extending from the level of the hinder cusp of m^1 to the front cusp of m^2. Posterior palate continued backward some way behind m^3, the narial opening narrowed, and the middle part of the palatal edge thickened into a median palatal spine. Bullæ unusually large.

Incisors normal, their edge not notched. Molars of the same

general type as in *Acomys*, not hypsodont as in the more typical *Epimys*, and m^1 not disproportionally large as in *Mus* and *Leggada*. But their pattern is more zigzagged, so as to look more complicated, though the size, number and position of the cusps is the same. Antero-internal cusp of m^2 very large, antero-external very small. M^3 well developed, with three distinct cusps on its inner edge.

Type.—*Pyromys priestleyi*, sp. n.

The most striking point about this genus is its unique mammary formula, no other known Murine having four pectoral pairs.

PYROMYS PRIESTLEYI, sp. n.

General external appearance almost exactly as in *Leggada platythrix sadhu*, brought from the same locality. Fur thickly mixed with spines, those of back about 6 mm. in length. General colour above, uniform pale grey ("drab-grey") without any buffy suffusion. Under surface white, the hairs and spines white to their roots; line of demarcation well defined. Face like back. Ears short, greyish-brown. Fore limbs, from elbows downwards, and hands white. Hind limbs greyish externally to ankles; feet white. Soles naked, pads large and rounded; fifth hind toe, without claw, reaching to middle or end of the first phalanx of the fourth. Tail shorter than head and body, well haired; pale greyish above, white below, not shapely defined; scales small, about 16-18 to the centimeter.

Skull and teeth as described above.

Dimensions of the type, measured in the flesh:—Head and body 98; tail 73; hindfoot 16; ear 13.

Skull.—Greatest length 26·2; basilar length 21; zygomatic breadth 12·3; nasals 10; interorbital breadth 3·5; breadth of brain case 11; palatilar length 12·5; diastema 7·6; anterior palatal foramina 6; posterior palatal foramina 1·9; length of upper molar series 4·3.

Habitat.—Virawah, Thar and Parkar, Southern Sind.

Type.—Adult female. B. M. No. 11. 3. 13. 9. Collected 25th September 1910, and presented by Mr. E. Priestley, D. S P., through the Bombay Natural History Society.

This most interesting species, which I have named in honour of its captor, is remarkable for its striking resemblance to the local race of *Leggada platythrix*, an example of which was taken at the same time and place by Mr. Priestley. Before their skulls were examined, the two animals would have been supposed to belong to one species, had it not been that the unusual mammary formula of the *Pyromys* showed clearly on the skin.

In working out the generic position of this pecular animal it has become evident that, although the unwieldy genus *Epimys* cannot yet be satisfactorily broken up into natural groups, certain peripheral species may, as a preliminary, be separated from it. Such are the species that have been called "*Mus*" *mettada*, (more strictly *meltada*) *gleadowi* and *humei*, no one of which should be in a genus whose type is so essentially different an animal as the Black Rat (*Epimys rattus*, L.)

The following are the chief characters of the groups I propose to form :—

MILLARDIA,* g. n.

Sole pads 4 or 5, the fifth pad of *Epimys* always, and the sixth generally, suppressed. Fifth hind toe short, not reaching to base of fourth. Tail of medium length. Mammæ 2—2=8.

Skull generally as in *Epimys*. Palatal foramina very long. Posterior nasal opening of average breadth, close behind m^3.

Molars decidedly brachyodont, broad.

Type.—Millardia meltada (*Golunda meltada*, Gray. *Mus mettada* auct.) Other species, *listoni*, Wrought, and *comberi*, Wrought.

The most essential character of this genus is the suppression, total or partial, of the posterior sole pads, the structure of the posterior palatal regions remaining still as in *Epimys*.

GRYPOMYS, g. n.

Sole pads four only, the fifth and sixth suppressed. Fifth hind toe short, not reaching to base of fourth. Tail rather short. Mammæ 1—2=6.

* Named in honour of Mr. W. S. Millard, to whose enthusiastic help, in connection with the Bombay Natural History Society, so much of the recent progress of Indian Zoology is due.

Skull very much as in *Pyromys* above described. Upper profile bowed. Supra-orbital ridges well developed. Posterior nares narrowed, the opening some way behind molars. Bullæ large.

Teeth as in *Pyromys*.

Type.—*Grypomys gleadowi* (*Mus gleadowi*, Murray).

This genus combines the foot structure of *Millardia* with the narrow and produced choanæ of *Pyromys*. A new born specimen even of *G. gleadowi* shows no trace of the fifth and sixth foot pads.

It may be noted that these three allied genera may be distinguished from each other by the number of their mammæ alone, these being in *Pyromys* 4—2=12 (*i.e.*, four pectoral and two inguinal pairs), *Millardia* 2—2=8, and *Grypomys* 1—2=6. True *Mus*, in the modern sense, containing the *Mus musculus* group, and *Leggada*, have 3—2=10. In *Epimys* the number varies from 1—2=6 to 3—3=12 but the anterior are never more numerous than the posterior. In the one Indian species of *Apodemus* (*A. arianus*) the number is 1—2=6. *Vandeleuria*, *Golunda* and *Hadromys* all have 2—2=8.

HADROMYS, g. n.

General appearance as in *Golunda*. Form stout. Tail rather short. Sole pads six. Fifth fore toe very short; fifth hind toe reaching just to base of fourth. Mammæ 2—2=8.

Skull shaped almost exactly as in *Golunda*, with the same short muzzle and well marked supra-orbital and parietal ridges. The anterior edge of the zygomatic plate is however concave, and the posterior palate ends behind the last molar.

Incisors very broad and heavy. Molars wholly unlike those of *Golunda*, more like those of *Epimys*, rather hypsodont, with lamminæ well defined. No unworn specimens are however available for examination.

Type.—*Hadromys humei* (*Mus humei*, Thos.*)

The wide difference of "*Mus humei*" from every other murine has long been evident, and its distinction as a special genus is now obviously called for. Its resemblance, both external and cranial, to *Golunda* is very striking.

* Described in detail, P. Z. S., 1886, p. 63.

ON A SMALL COLLECTION OF RODENTS * FROM LOWER SIND.

BY

R. C. WROUGHTON.

The Society has sent me for indentification a small collection of Rodents made by Mr. E. Priestley, D.S.P., Thar and Parkar. Though small, the collection is an interesting one, containing specimens not only of a new genus and of a new subspecies of *Leggada platythrix* of the Dekhan, but also of *Gerbillus gleadowi* described by Murray in 1886 and not since rediscovered until now. The following is a list of the specimens; the number in brackets before the name of the species refers to Blanford's Mammalia.

(253 part) *Funambulus pennanti argentescens*, Wrought.

Funambulus pennanti argentescens, Wroughton, B. N. H. S. Journal, 1905, XVI, 3, p. 413.

♂ 133 (no skin), ♀ 136.

The type locality is Murree, but this specimen seems to differ in no essential particular.

(268). *Gerbillus gleadowi*, Mur.

1886. *Gerbillus gleadowi*, Murray, A.M.N.H. (5) XVII, p. 246.

♀ 5, 10, 17. (No. 17 presented to the National Collection.)

The type was taken by Mr. F. Gleadow, I. F. S., at Rohri in the extreme north of Sind; Mr. Priestley now, after 25 years, obtains it in the extreme south.

(265). *Meriones hurrianæ*, Jerd.

1867. *Gerbillus hurrianæ*, Jerdon, Mamm. of Ind. p. 186.

♂ 2, 4, 12, 14, 15, 23, 37—39. ♀ 1, 3, 11, 13, 16, 22, 31. (Nos. 4, 13, 23, 37 presented to the National Collection.)

(272). *Epimys rattus*, L.

1758. *Mus rattus* Linnæus. Syst. Nat. (10) 1, p. 61.

♂ 30, 33, 35, 36, ♀ 24—29. (Nos. 36 and 29 presented to the National Collection.)

[* Besides rodents some skins of the desert Cat *(F. ornata*, desert fox *V. leucopus)* several Mongooses (*Herpestes*) and two Hedgehogs *(Erinaceus)* were obtained but these could not be sent home in time to be incorporated in the present paper.—Eds.]

These specimens are of course not true *rattus* and I can find nothing in the Museum Collection with which they exactly agree. Probably in the loose terminology of students of *rattus* from the plague point of view, *alexandrinus* would include these specimens. The whole series is extraordinarily constant in coloration.

(289 part). *Leggada platythrix sadhu*, sub-sp. n.

♂ 21. (Presented to the National Collection.)

Bennett originally described *platythrix* from specimens collected by Col. Sykes "in Dukhan" and stated its colour to be "fusco-canescens" and again "testaceous brown" with a greater or less admixture of black. The present is a true 'desert' form, 'drab-grey' darkening in the centre of the back to 'smoke grey.'

The skull closely resembles that of a specimen from Ahmednagar, which may be taken as typical; but the bullæ are smaller, the palatal foramina shorter, and the brain case shorter and deeper; the upper incisors are pale and white-tipped.

Dimensions of the type (measured in the flesh): head and body 79; tail 57; hind foot 17; ear 12·5.

Skull:—Greatest length 25; basilar length 21; zygomatic breadth 12; nasals 10; diastema 7·5; anterior palatal foramina 6; upper molar series 4·5.

Hab.—Lower Sind. (Type from Virawah, Thar and Parkar.)

Type.—Adult male. B. M. No. 11, 3, 13, 8. Original number 21. Collected by Mr. E. Priestley, D. S. P., Thar and Parkar, and presented to the National Collection by the Bombay Natural History Society.

(Gen. et sp. nov.)

♀ 20. (Presented to the National Collection.)

This interesting animal, owing to its characteristic desert colouring superficially, resembles the last so much that at a first glance it might be mistaken for it. Closer examination, however, proves it to be not only specifically but generically distinct. Mr. Thomas is dealing with it in a separate paper. I would suggest that the Society should try and induce Mr. Priestley to obtain more specimens including one or two adult females (with well developed mammæ) in alcohol.

SOME MAYMYO BIRDS.

BY

MAJOR H. H. HARINGTON.

Maymyo, the principal Hill Station of Burma, is situated about 40 miles east of Mandalay on the edge of the Shan Hills, and is about 3,500 feet above sea-level. The country in the immediate vicinity of the station consists of a series of swampy hollows divided by low ridges covered for the most part by stunted oak and chestnut forest interspersed with patches of bracken. Many of these swamps have been drained, and numerous rides cut through the jungle and the station generally improved. From an ornithological point of view Maymyo is not very attractive, as many of the more interesting birds so plentiful in other parts of the Shan States seem to be wanting.

However, the country to the west of Maymyo and on the Ghâts looks very promising, being more varied from the endless sameness of the jungles immediately round Maymyo itself, and I have hopes on some future occasion of being able to manage a bit of birds' nesting between Mandalay and Maymyo.

Early in April 1910 I was ordered up to Maymyo with four Companies of my Regiment for musketry, and so had hopes of getting a few good eggs. With the exception of finding the breeding haunts of the Burmese Jay (*G. leucotis*), and a nest of *B. liventer*, I was not very successful.

We left Mandalay on the 11th April, and took four days for our march up. Owing to the heat and early marching I did not have much inclination or chance of indulging in bird's nesting until we reached the plateau.

On our arrival we were ordered out to Enlya, seven miles south-east of Maymyo, and it was here I did most of my collecting. The country was very disappointing and bird life not at all varied, also five or six hours a day musketry did not give much opportunity of getting further afield and trying new ground.

I have not included the migratory birds, only mentioning those actually noted during the breeding season, and no doubt there are

still a great many more nesting species within a radius of a few miles of Maymyo.

No. 4. *Corvus macrorhynchus*, (Wagl.)—(The Jungle Crow.)

Very common, and should be kept down if the residents of Maymyo ever wish to get a decent head of game near the station, as the Jungle Crow is the worst poacher of the family, which is very well represented round Maymyo, and they must take a big toll of eggs and young birds.

No. 8. *Corvus insolens*, (Hume).—(The House Crow.)

Not so numerous as the above, keeping entirely to the station.

No. 12. *Urocissa occipitalis*, (Blyth.)—(The Red-billed Blue Magpie.)

Fairly common; I did not find any nests.

No. 18. *Dendrocitta himalayensis*, (Blyth.)—(The Himalayan Tree-Pie.)

Plentiful, I think I have also seen *D. rufa*.

No. 25. *Garrulus leucotis*, (Hume.)—(The Burmese Jay.)

The only other record, I believe, of the nesting of the Burmese Jay is a short note by Mr. K. C. Macdonald, sent by me to *The Journal*.

During former visits to Maymyo in the non-breeding season I found the Burmese Jay to be very plentiful in certain parts of the jungle and so always had hopes when opportunity occurred of procuring their eggs, and during my last visit my hopes were realised beyond expectation.

On the 13th April at Thandoung, the last stage in to Maymyo, I made my first attempt at birds' nesting, finding nests of *M. burmanicus*, Burmese red-vented Bulbul, *G. pectoralis*, Black-gorgeted Laughing Thrush, *C. affinis*, Burmese Roller and *B. liventer*, Rufous-winged Buzzard-Eagle. In the same bit of jungle as the last I was fortunate in finding my first nest of the Burmese Jay, *G. leucotis*, with the parent bird sitting very tight, in fact not moving, until my man began to ascend the sapling. The nest was placed about 10 feet from the ground and very conspicuous, and contained four incubated eggs, two of which were addled.

On the 30th April, Mr. P. F. Wickham arrived at my camp after we had finished musketry for the day, so we at once started out to try our luck in the neighbouring jungles, especially devoting ourselves to the Crest Bunting (*M. melanicterus*), which was common, but with no success. As Wickham had to return to Maymyo that evening we made an early start in that direction, trying some likely oak jungle with hopes of finding a Jay's nest. We were soon rewarded by first seeing a Jay and then two or three old nests. Then at last my orderly spotted a nest on which the old bird was sitting, which on investigation contained a nice clutch of four eggs. On resuming our hunt we were rewarded in finding another nest close by which contained three eggs. We found two more nests in the same patch of forest, each having two eggs apiece. These we left in the hopes of getting complete clutches. Of these four nests three were in saplings from 10 to

12 feet from the ground and the fourth placed on a stump not four feet high.

On the evening of the 2nd of May I rode out to visit the last two nests and found one deserted and the other with its two eggs quite warm which when I attempted to blow I found to be on the point of hatching. On the afternoon of the next day I again visited the same jungle and found two nests, each containing five eggs, and another with three young birds which I left until the 9th, when one had disappeared. The two remaining young birds I brought down to Mandalay, one only surviving and is very tame. It was most extraordinary finding seven nests all within an area of about 100 square yards, one or two being within 20 yards of each other; shewing that *G. leucotis* when unmolested breeds in communities; also in every case except one the parent bird had to be driven off the nest.

On going into Maymyo later on I found two more nests, one with eggs and the other containing two young birds.

Nests.—The nests consisted of a rough outline of coarse twigs, containing a compact cup shaped lining made entirely of grass roots, which measured about six inches in diameter by five inches in depth. Four nests were placed in sapplings from 10 to 12 feet from the ground, one on a stump, and others on the branches of trees from 5 to 10 feet from the ground.

Eggs.—Nests containing incubated eggs were got of two, three, four and five clutches, shewing the bird to be irregular; one nest contained five addled eggs, and in many of the others one or two addled eggs were found. The eggs are of the regular family type and vary a great deal in size and colour, some being a uniform pale green with a dark zone round the larger end; others being distinctly speckled all over with darker greenish-brown spots, many having black hair-like streaks, which if one is not careful are very liable to wash off. The average of fourteen eggs was 1·3 × ·95, the largest being 1·43 × ·97, and the smallest 1·23 × ·92.

Since writing the above I am sorry to say the young Jay died in the Red Sea on its way home.

No. 32 (*a*). *Parus commixtus*, (Swinhoe.)—(The Chinese Grey Tit.)

Very plentiful, and its loud notes may be heard in most parts of the jungle.

On the 21st April I took a nest placed in a small hole in the trunk of an oak tree within a few yards of my tent. I watched the pair for three or four days and when the hen had apparently begun sitting I cut into the nest and was rewarded with a nice clutch of seven eggs. I secured both parent birds, as they do not seem to be so highly coloured as those procured at Sinlun Kaba, Bhamo District, also the eggs seem to be decidedly larger.

No. 67. *Dryonastes sannio*, (Swinhoe.)—(The White-browed Laughing Thrush.)

This is the common Laughing Thrush of the Shan Hills. I found several

nests containing both eggs and young. Four seems to be the usual complement, sometimes three, and I found only one nest containing five eggs. The white type of egg is much the commonest at Maymyo. The variation in the colouring or want of colour in this bird's eggs is very interesting, as at Sinlun Kaba (Bhamo) I only found the white eggs late in the season, while at Taunggyi, to the south, I only got the blue variety.

No. 72. *Garrulax pectoralis*, (Gould.)—(The Black-gorgeted Laughing Thrush.)

Fairly common. I found three nests.

No. 73. *Garrulax moniliger*, (Hodge.)—(The Neck-laced Laughing Thrush.)

No nests; probably a later breeder.

No. 118*a*. *Pomatorhinus ripponi*. sp. n. (The Shan States Scimiter Babbler.) Described in the Bull. B. O. C., Vol. XXVII., p. 9.

On comparing my specimen with *P. olivaceus* in the Natural History Museum, I was struck with the difference in the colour of its wings from those of birds from Tenasserim which have a decided rufous edging to their primaries while my specimen has the outer edges of its wing feathers decidedly olive. I then compared them with specimens from the Shan States which I found to agree with mine. And on separating all the skins by their localities I find that those from the Shan States have the outer edges of their primaries olive-brown like their backs, and those from Tenasserim have the outer edges decidedly rufous. I left notes to that effect for Mr. Ogilvie-grant who kindly described the species for one as below.

P. ripponi is great skulker; its loud "Hoop-Hoop" and almost blackbird-like note may often be heard but the bird seldom seen. I failed to find a nest, but on the march up I saw one of a pair carrying a leaf, so they were evidently then nesting.

Pomatorhinus ripponi. sp. n.

Described in the Bull B. O. C., Vol. XXVII, p. 9.

Adult male and female most closely allied to *P. olivaceus*, Blyth from Lower Burma, but with general colour of the upper parts olive brown instead of rufous-brown; the tail similar in colour to the upper parts (in *P. olivaceus* it is much darker, blackish towards the tips and rufous towards the base), the chestnut patch on the sides of the neck somewhat paler, and the bill usually more slender. Total length ca. 8·3 inches, wing 3·4, tail 3·7, tarsus 0·85. Hab., Shan States.

No. 134. *Temelia jerdoni*, (Sharpe.)—(The Red-capped Babbler.)

Seen on several occasions.

No. 139. *Pyctorhis sinensis*, (Gen.)—(The Yellow-eyed Babbler.)

Common; we found several nests. It seems to be a much earlier breeder at Maymyo than at Taunggyi where it is equally common, as many eggs found early in April were on the point of hatching.

No. 145. *Pyctorhis subochraceum*, (Swinhoe.)—(The Burmese-spotted Babbler.)

Seen and heard on several occasions.

No. 228. *Zosterops simplex*, (Swinhoe).—(Swinhoe White-eye.)

Plentiful. Two nests. The birds up here seem to run very near *Z. aureiventris* as noted by Colonel Rippon in his list of Birds of the Southern Shan States, in having traces of a yellow band down the centre of their underparts.

No. 243. *Ægithina tiphia*, (L.)—(The Common Iora.)

Very common. Nesting in the beginning of May.

No. 279. *Molpastes burmanicus* (Sharpe.)—(The Burmese Red-vented Bulbul.)

Very common. Breeding during April and May. Some of the birds round Enlya seem to run very near *M. nigripileus*.

No. 288. *Otocompsa emeria*, (Linn.)—(The Red-whiskered Bulbul.)

Common near water.

No. 317. *Sitta neglecta*, (Wald.)—(The Burmese Nut-hatch.)

I saw a single Nut-hatch on several occasions near my camp, but failed to find its nest.

No. 327. *Dicrurus ater*, (Herm.)—(The Black Drongo.)

Common. Were still in noisy flocks at the end of April when they paired off and started nesting operations.

No. 333. *Dicrurus cineraceus*, (Horsf.)—(The Grey Drongo.)

Plentiful. I found three nests building but was unfortunate over the eggs.

No. 335. *Chibia hottentotta*, (L.)—(The Hair-crested Drongo.)

Plentiful. An early breeder up here. I found hardset eggs early in April.

No. 374. *Orthotomus sutorius*, (Horsf.)—(The Indian Tailor-bird.)

Common.

No. 389. *Megalurus palustris*, (Horsf.)—(The Striated Marsh-warbler.)

One or more pairs in every swamp. Was only successful in finding one nest with hardset eggs.

No. 382. *Franklinia gracilis*, (Frankl.)—(Franklin's Wren-warbler.)

Plentiful and noisy, but had not started nesting before I left Maymyo.

No. 451. *Horornis pallidipes*, (Blan.)—(Blanford's Bush-warbler.)

A very noisy little bird, and a great skulker, inhabiting thick grass and bracken, and were evidently nesting in May. I made two attempts to find their nests by taking out a party of sepoys and systematically working through every square foot of grass, but failed to find any nest. My two specimens, both cocks, had their testes much enlarged and were evidently breeding. I have compared my specimens at the Museum and think this is the first record from the Shan States. I saw several *Cisticola*, *Suyas*, and *Prinia*, but as they had not begun nesting I did not collect specimens.

No. 474. *Lanius collurioides*, (Less.).—(The Burmese Shrike.)

Very plentiful. We found several nests with eggs and young. I made a very fine series of eggs ranging from almost a bright red to dull grey.

No. 475. *Lanius nigriceps*, (Frankl.)—(The Black-headed Shrike.)

Saw none during the breeding season, but it is plentiful in Maymyo later on.

No. 481. *Lanius cristatus*, (L.)—(The Brown Shrike.)

Seen on two or three occasions, but as far as I could see not breeding.

No. 488. *Tephrodornis pondicerianus*, (Genel.)—(The Common Wood Shrike.)

No. 491. *Pericrocotus fraterculus*, (Swinhoe.)—(The Burmese Scarlet Minivet.)

Both fairly common, but I failed to find nests.

No. 500. *Pericrocotus peregrinus*, (L.)—(The Small Minivet.)

Common, breeding in May. I have taken nests at Taunggyi in March.

No. 510. *Graucalus macii*, (Less.).—(The Large Cuckoo Shrike.)

Seen on several occasions, as well as a species of *Campophaga*?

No. 512. *Artamus fuscus*, (*Vieill.*).—The Ashy Swallow-Shrike.

A few to be seen in old Taungyas and probably breeds near Maymyo.

No. 515. *Oriolus tenuirostris*, (Blyth.).—(The Burmese Black-naped Oriole.)

One nest containing three eggs with parent bird procured on the 7th May. Two eggs were unfortunately broken when taking the nest which was situated at the end of a bough. *Nest* suspended between a fork, and composed of grass and grass down and lined with fine grass. Measured outside, 6 × 4×3 deep, and inside 4 × 3 × 2½ deep. Eggs of the family type.

No. 539. *Sturnia nemoricola*, (Jerd.)—(The White-winged Myna.)

No. 546. *Graculipica nigricollis*, (Payk.)—(The Black-naped Myna.)

An early breeder. Hardset eggs in the second week of April.

No. 547. *Graculipica burmanica*, (Jerd.)—(Jerdon's Myna.)

No. 549. *Acridotheres tristis*, (L.)—(The Common Myna.)

No. 553. *Æthiopsar grandis*, (Moore.)—(The Siamese Myna.)

No. 554. *Æthiopsar albicinctus*, (Godw. Aust.).—(The Collared Myna.)

All plentiful and common up at Maymyo, which seems particularly suitable to Mynas. When I got up to Maymyo on the 14th of April all the above were prospecting for nesting sites and having great squabbles amongst themselves over suitable holes.

No. 556. *Sturnopastor superciliaris*, (Blyth.)—(The Burmese Pied Myna.)

Common. Beginning nesting operations in May.

No. 605. *Rhipidura albicollis*, (Vieill.).—(The White-throated Fantail Fly-Catcher.)

Seen on several occasions.

No. 608. *Pratincola caprata*, (L.)—(The Common Pied Bush-chat.)

Very common. Breeding in April and May, and probably earlier. I found three nests containing Cuckoos' eggs; one nest found by P. F. Wickham when we were out together was placed at the bottom of a hole in the ground at least 12 inches from the entrance, which was so narrow that no Cuckoo could possibly have got in, so that the egg must have been rolled into the nest, which contained five eggs of *P. caprata* and one Cuckoo's egg, showing that the Cuckoo had probably been unable to take out the customary one.

No. 663. *Copsychus saularis*, (L.)—(The Magpie Robin.)

Common.

No. 739. *Sporæginthus flavidiventris*, (Wallace.)—(The Burmese Red Munia.)

Plentiful in open grass lands. I also saw the Chestnut-bellied Munia *M. atricapilla* and either the Spotted Munia, *U. punctulata* or the Chinese Munia, *U. topela*. I did not collect specimens as they were not nesting while I was up at Maymyo.

No. 776. *Passer domesticus*. (L.)—(The House Sparrow.)

A few pairs about in the Station.

No. 779. *Passer montanus*, (L.)—(The Tree Sparrow.)

Very common indeed.

No. 781. *Passer flaveolus*, (Blyth.)—(The Pegu House Sparrow.)

Very plentiful, nesting freely in holes of tree stumps in old Taungyas.

No. 803. *Melophus melanicterus*, (Gen.)—(The Crested Bunting.)

Plentiful in the open country round Enlya. At first I was quite unsuccessful in finding their nests, but afterwards found three which were all placed on the tops of small mounds covered by small plants.

No. 847. *Anthus rufulus*, (Vieill.)—(The Indian Pipit.)

Plentiful. I found three nests, two containing young Cuckoos and one containing an egg. Wickham also found two containing Cuckoo's eggs.

No. 895. *Arachnothera asiatica* (Lath.)—(The Purple Sunbird.)

One nest found containing young in May.

No. 912. *Dicæum cruentatum*, (L.)—(The Scarlet Back Flower-picker.)

Common.

No. 948. *Gecinus striolatus*, (Vig.)—(The Little Scaly-breasted Green Woodpecker.)

In May I found a nest containing four fresh eggs, and secured the parent bird. The nest was placed in a hole about four feet from the ground.

No. 975. *Iyngipicus canicapillus*, (Blyth.)—(The Burmese Pigmy Woodpecker.)

Saw two or three parties of young birds about in May.

No. 998. *Thriponax feddeni*, (Blanf.)—(The Burmese Great Black Woodpecker.)

A pair seen on the march up from Mandalay.

No. 1009. *Thereiceryx lineatus*, (Vieill.)—(The Lineated Barbet.)

Common.

No. 1119. *Xantholæma hæmatocephela*, (P. L. S. Mull.)—(The "Copper-Smith.")

Heard on several occasions.

No. 1023. *Coracias affinis*, (Mclell.)—(The Burmese Roller.)

Common. Nest found containing five incubated eggs on the 13th April.

No. 1044. *Halcyon smyrnensis*, (Linn.)—(The White-breasted Kingfisher.)

One nest found placed in a hole in the side of an old rifle pit containing two eggs.

No. 1067. *Upupa indica*, (Reich.)—(The Indian Hoopoe.)

One nest containing young birds found in May.

No. 1086. *Macropteryx coronata*, (Tick.).—(The Indian-crested Swift.)

On the march up saw a bird evidently sitting on its nest, which was placed fairly high up on a dead branch.

No. 1093. *Caprimulgus macrurus*, (Horsf.)—(Horsfield's Nightjar.)

Did not find any nests, but birds were calling at nights all round our camp.

No. 1104. *Cuculus canorus*, (Linn.)—(The Cuckoo.)

Very plentiful. We found eggs and young both in the nests of *P. caprata* and *A. rufulus*.

No. 1107. *Cuculus micropterus*, (Gould.)—(The Indian Cuckoo.)

Heard its complaining cry first on the 2nd May.

No. 1113. *Cacomantis merulinus*, (Scop.)—(The Rufous-bellied Cuckoo.)

Plentiful and very noisy in May; the cock-bird's call in an ascending scale of: "Did you do it?" "Did you do it?" "Did you do it?" and also "Tee, tee, tee, tee, ti-rou;" the hen-birds: "Ch'chee, we, wa, wo.," being continually heard.

I saw hen-birds being hunted by *Frankalina* on several occasions, but could find no signs of their nests. However, I shot a female *C. merulinus* containing a well-formed soft egg, showing they must have been laying somewhere.

No. 1117. *Surniculus lugubris*, (Horsf.)—(The Drongo Cuckoo.)

Seen and heard on several occasions. Its call is a regular series of whistling notes in a descending scale.

One morning I was attracted by a pair of Sunbirds (*A. asiatica*) making a great noise, and on going up I flushed a Drongo cuckoo from the ground but could find no signs of a nest. Eventually I saw the sunbirds had a young bird with them, but could find no reason why they were mobbing the Cuckoo.

No. 1119. *Coccystes coromandus*, (Linn.)—(The Red-winged Cuckoo.)

Fairly common and very noisy, and at night has a bisyllibic whistling

note very like Collared Pigmy Owl (*G. brodei*) but with a more metallic sound.

No. 1120. *Eudynamis honorata*, (Linn.)—(The Indian Koel.)

Common, and often heard in jungles where there are no crows breeding. Query: were they laying in other corvine nests, such as Jays, Blue Magpies and Tree Pies, which are all plentiful up at Maymyo.

No. 1123. *Rhopodytes tristis*, (Less.)—(The Large Green-billed Malkoha.)

Seen on several occasions.

No. 1142. *Palæornis finschi*, (Hume.)—(The Burmese Slaty-headed Paroquet.)

Several parties of young birds about in May.

No. 1207. *Hieræetus fasciatus*, (Vieill.)—(Bonelli's Eagle.)

A pair flew over our range on two consecutive afternoons.

No. 1221. *Butastur liventer*, (Temm.)—(The Rufous-winged Buzzard Eagle.)

On the 13th April, just before finding our first Jay's nest, we saw a Hawk's nest in a fairly high tree with the parent bird looking over the edge and gazing all round with her large yellow eyes, only leaving when myman reached the nest which contained three eggs on the point of hatching,—in fact, two of them were chipped and the young birds calling inside, however, with a little time and trouble they were made into fair specimens. The hen-bird, unfortunately, had to be shot for identification purposes. The eggs are a pure bluish-white, and measure 1·86×1·5, 1·83×1·53 and 1·9×1·53.

No. 1229. *Milvus govinda*, (Sykes.)—(The Common Kite.)

Plentiful round the barracks.

No. 1244. *Astur badius*, (Genel.)—(The Shikra.)

Seen on several occasions.

No. 1282. *Sphenocercus apicaudus*, (Hodgs.)—(The Pin-tailed Green Pigeon.)

One shot by a member of the Musketry School.

No. 1304. *Turtur orientalis*, (Lath.)—(The Rufous Turtle Dove.)

No. 1308. *Turtur tigrinus*, (Temm.)—(The Malayan Spotted Dove.)

Both common and breeding in April and May.

No. 1311. *Œnopopelia tranquebarica*, (Herm.)—(The Red Turtle Dove.)

Very plentiful, and nesting in May.

No. 1324. *Pavo muticus*, (Linn.)—(The Burmese Peafowl.)

No. 1328. *Gallus ferrugineus*, (Linn.)—(The Jungle Fowl.)

Both heard in the Forest Reserves.

No. 1331. *Phasianus burmanicus*, (Oates.)—(The Barred-backed Pheasant.)

Capt. Stewart, 10th Gurkhas, informs me he has shot this species near Maymyo as well as some species of Silver Pheasant.

I think it a great pity no attempt is made at Maymyo at game preserv-

ing. With a little trouble a good stock could be easily established, and most probably the English Pheasant would do very well amongst the oaks and bracken.

No. 1374. *Francolinus chinensis*, (Osbeck.)—(The Chinese Francolin.)
Common.

No. 1382. *Turnix pugnax*, (Temm.)—(The Bustard Quail.)
Put up on several occasions.

No. 1398. *Amaurornis fuscus*, (Blyth.)—(The Ruddy Crake.)
Two nests found in May, one containing three eggs, the other seven.

No. 1401. *Amaurornis phœnicurus*, (Penn.)—(The White-breasted Moorhen.)
One nest found in May with three eggs.

No. 1485. *Gallinago stenura*, (Kuhl.)—(The Pin-tail Snipe.)
The last snipe seen by me were a pair on the 17th May.

No. 1572. *Ardetta cinnamomea*, (Genel.)—(The Chestnut Bittern.)
Plentiful.

ORIENTAL FLYING SQUIRRELS OF THE "*PTEROMYS*" GROUP.

BY

R. C. WROUGHTON.

Excluding the peculiar trans-Himalayan genus *Eupetaurus* Blanford arranges the Indian Flying Squirrels in two genera, *viz*:—*Pteromys* and *Sciuropterus*. With the latter Mr. Thomas has dealt comparatively recently (A.M.N.H., 1908, p. 1), dividing up the group into 6 genera and 3 sub-genera, and it is with the former only that I propose to concern myself.

The name *Petaurista* has now been generally accepted in place of *Pteromys* as being some years older. Quite recently Dr. Stebbing has pointed out that '*petaurista*' meaning a 'rope-dancer' is masculine.

Thanks to the generosity of the Duke of Bedford, and exploration of the Mammal Fauna of China is now going on, and no doubt new material in this group will shortly be available, and I have therefore, under the circumstances, excluded from my review all the species of China, Formosa, &c. Finally, as the "*Petaurista*" group, south of Tenasserim has recently (A.M.N.H. 1908, p. 250) been dealt with by Mr. Thomas, I have entered the species in my Key, but have not again given detailed descriptions. I must note, however, that Pallas (Misc. Zool. p. 56, 1766) applied the specific name "*petaurista*" to the Javan animal very many years before Desmarest established *nitidus* for the same form, and consequently that name must be substituted for *nitidus* in Mr. Thomas' paper.

The superficial resemblance of *philippensis*, *lanka* and *cinderella* on the one hand, and *lylei* and *cineraceus* on the other is, I believe, a mere coincidence. The last two are almost certainly variations of *yunnanensis*, as is also *candidulus* of N. Burma, which extends west at any rate as far as Assam. The three former are most probably variations of *albiventer*, though it is just possible that they are also variations of *yunnanensis* through *candidulus*, parallel to the forms of Tenasserim and Siam.

P. albiventer seems to be the form of the eastern Sub-Himalayas (Nepal, Sikkim) (with *nobilis* at the higher altitudes) while the

Western Himalayas produce *caniceps* and its allied forms, *inornatus*, and *birrelli*. The Simla form *fulvinus* seems most nearly related to *albiventer*.

I have treated all the forms as 'species'; the material available is not sufficiently representative of the whole area dealt with to enable any confident decision as to the inter-relations of the various forms. All that can be done is to recognise 4 groups as follows :—

(1) '*philippensis*' Group.....India, South of the Ganges.
(2) '*albiventer*' Group.....Himalayas.
(3) '*yunnanensis*' Group...Assam, Cachar, N. Burma, Tenasserim and Siam.
(4) '*petaurista*' Group.....Malaya, Sumatra, Java and Borneo.

KEY.

I. Dorsal area grizzled, spotted, or striped with white, yellow or buff.

A. Ground colour, at most, brownish or reddish black, never rufous or ochraceous.

a Size larger. Hindfoot 84mm.

a^1 General colour "claret-brown," grizzled with white.

a^2 Paler, tuft behind ears rufous, belly white (Madras).

(1) *philippensis*, Elliot.

b^2 Darker, tuft behind ears black, belly 'salmon buff' (Siam).

(2) *lylei*, Bonhote.

b^1 General colour without any brown tinge.

a^2 Ground colour drab, grizzled with buffy white, tail grey throughout (Tenasserim).

(3) *cineraceus*, Blyth.

b^2 Ground colour black, washed with white, tail blackish (Ceylon).

(4) *lanka*, sp. n.

b Size smaller. Hindfoot 77. Ground colour mouse grey washed with white. Tail grey, darkening distally (Bombay Presidency).

(5) *cinderella*, sp. n.

B. Ground colour rufous or ochraceous.

a Size smaller. Hindfoot 65-68. Molars 15-16·5.

a^1 Face coloured like back, cheeks rufous.

a^2 Paler, greyer, belly salmon buff (Kasmir).

(6) *inornatus*, Is. Geoffroy.

b^2 Darker, more rufous, belly orange rufous (Hazara).

(7) *birrelli*, sp. n.

b^1 Face grey (Sikkim).

(8) *caniceps*, Gray.

b Size larger. Hindfoot 70-84. Molars 17.

a^1 Size smaller, hindfoot 70-73. Back not grizzled but marked with a pale median line. Shoulders and parachute markedly paler than back. (Sikkim).

(9) *nobilis*, Gray.

b^1 Size larger. Hindfoot 75-84.

a^2 Shoulders paler than back, not grizzled.

a^3 Darker, dorsal area bay (Sikkim).

(10) *albiventer*, Gray.

b^3 Paler, dorsal area bright hazel, grizzled white (Simla).

(11) *fulvinus*, sp. n.

b^2 Shoulders grizzled entirely like back (Upper Burma, Cachar).

(12) *candidulus*, sp. n.

c^2 Back spotted, not grizzled (Molacca).

(13) *punctatus*, Gray.

II. Self-coloured, hands, feet, and tail tip black.

A. Size larger. Hindfoot 70 m.m.

a No black tuft behind ears.

a^1 Dark reddish brown (Java).

(14) *petaurista*, Pallas.

b^1 Orange hazel (Malay).

(15) *melanotus*, Gray.

b Black tuft behind ears.

a^1 Darker (Sumatra).

(16) *marchio*, Thos.

b^1 Paler, (Borneo).

(17) *rajah*, Thos.

B. Size smaller. Hindfoot 60mm.

a Orange hazel (Natuna Islands.)

(18) *nitidulus*, Thos.

b Almost black. (Batu Islands.)

(19) *batuanus*, Miller.

(1) *Petaurista philippensis*. Elliot.

1839. *Pteromys philippensis*. Elliot, Madr. Journ., L. & Sc., p. 217.

1842. *Pteromys oral*. Tickell. Calc. Journ., N. H., ii, p. 401.

1843. *Pteromys griseiventer*. Gray. List. Mamm. Brit. Mus., p. 133.

Synonymy.—The name *philippensis* was given unintentionally by Elliot who ascribed it to Gray, but as the latter never published the name, and the former appended to it a valuable description, by the Rules of Nomenclature, the name must stand. It is greatly to be regretted and that is all there is to be said.

Pteromys oral was described by Tickell from Singhbhoom and has been generally used for the Madras form. I therefore leave it as a synonym of that species. It seems most probable, however, that it is an easily separable race, allied more nearly to the form found in the Bombay Presidency than to true *philippensis*.

Pteromys griseiventer was described by Gray without any type locality, but the type leaves no doubt that it is true *philippensis*.

Description.—Fur of back 40-45 mm. long. General colour above, 'claret brown'; washed with white; below, white. Individual hairs of the back basally 'smoke grey' (30 mm.), then seal brown (5 mm.) and lastly white (5 mm.) tipped black. Face like the back, cheeks grey, distal half of back of ears orange rufous, tufts behind ears rufous. Neck behind the ears, outside of limbs and parachute like back without the white grizzling and tinged ferruginous. Lower lip black. Tail seal brown.

Size.—Head and body, 500; tail, 525; hindfoot, 84; ear, 40. Skulls, greatest length, 77; basilar length, 62; greatest breadth 50; molars, 17·5.

Remarks.—All the Madras specimens I have seen (except one) are referable to this form, but those from Travancore are most

highly coloured without, however, approaching the bright colouring of the Himalayan forms. The one exception mentioned above is from the Shevaroy Hills, and both in size and colouring it more resembles the Bombay form. When material is available from the type locality of *oral* and from other places linking up with *cinderella* and *philippensis* some light will no doubt be thrown on the inter-relation of all these forms.

Note.—Since the above was written, I have examined 3 specimens kindly sent to me for that purpose by the Society. One from Supa in N. Kanara is practically a topo type of Elliot's *philippensis*. It is a young animal and less brightly coloured than a more mature beast would be. The other two, one from Hoshangabad, and a second from Rajputana, are apparently *cinderella*, though the latter, when more specimens are available, may prove to be yet another and still smaller form.

(2) *Petaurista lylei*, Bonhote.

1900. *Petaurista lylei*, Bonh. P. Z. S. 1901, p. 192.

Description.—Fur (40 mm.) long on back. General colour above as in *philippensis*; below salmon buff. Individual hairs of back basally drab grey (15 mm.), then hazel darkening to chestnut (15 mm.), and finally white (5-6 mm.) tipped black. Face like back but pattern finer, cheeks still finer, distal half of back of ears bright orange rufous, tuft behind ears black. Chin brown-black throat hazel, grizzled white (sometimes extending, as a medium line, down belly.) Parachute below bright rufous at extreme edge. Tail black, tinged reddish for ¼ length.

Size.—Head and body, 475; tail, 575; hindfoot, 85; ear, 50; Skull, greatest length, 80; basilar length, 63; greatest breadth, 52; molars, 17.

Remarks.—Though so like *philippensis* in very many ways I believe this form is most closely related to the Chinese *yunnanensis*, Anderson.

(3) *Petaurista cineraceus*, Blyth.

1847. *Pteromys petaurista cineraceus*, Blyth, J. A. S. B., XVI, p. 865.

1859. *Pteromys cineraceus*. Blyth, J. A. S. B., XXVIII, p. 276.

Description.—Fur of back 35-40 mm. long. General colour above drab, grizzled with buffy white, much more finely so than in any other in this group, below white. Individual hairs of back basally 'fawn colour' (25 mm.), then vandyke brown with a subterminal white ring (3-5 mm.). Face like back but finer in pattern, cheeks and chin fawn colour. Forearm with a hazel tinge extending on to hands, feet black-brown. Tail grey throughout.

Size.—Head and body, 463; tail, 565; hindfoot, 84; ear, 40. Skull, greatest length, 80; basilar length, 63; greatest breadth, 53; molars, 17·5.

Remarks.—This species was recorded by Blyth from Arakan and Tenasserim. I have only seen 2 specimens from the latter locality. Probably when more material is available, it will be found that *cineraceus* is allied to *yunnanensis* and *lylei* much as *lanka* is to *philippensis*. It is difficult to imagine how it can be directly connected with those forms bounded as it is on the north and south by members of quite other groups.

(4) *Petaurista lanka*, sp. n.

A *Petaurista* in size and pattern quite like true *philippensis*, but entirely lacking the rufous tinge so characteristic of the latter species.

Fur of back 40-45 mm. long. General colour rusty black much washed with white, below greyish white (the individual hairs have short pale grey bases). Individual hairs of back basally 'mouse grey' (35 mm.) remainder white with black tips. Face and cheeks like back, but the pattern much finer. Hands and feet black. Tail dark.

Dimensions of the type.—Head and body, (c) 460; tail, (c) 560; Hindfoot, 85; ear, 43. Skull, greatest length, 77; basilar length, 60; greatest breadth, 48; molars, 17.

Habitat.—Ceylon.

Type.—Adult male. B.M. No. 96, 3, 27, 1. Collected and presented to the National Collection by C. B. Horsbrugh, Esq.

Remarks.—Three specimens examined. The characters are very constant and the individuals are at once recognisable by their

dark, black and white colouring, almost without any trace of the red brown tinge so characteristic of *philippensis*.

(5) *Petaurista cinderella*, sp. n.

A *Petaurista* rather smaller than *philippensis*, approaching most nearly to the colouring of *lanka*, but much paler.

Fur of back 35-40 mm. long. General colour above 'mouse grey' washed with white, below white. Individual hairs of back smoke grey, darkening distally, with a sub-terminal white ring (5-6 mm.). Face and cheeks like back, but pattern finer. Front portion of parachute immediately behind forearm tinged buffy. Parachute below greyish white (hairs with grey bases). Hands and feet brownish black. Tail mouse grey darkening towards tips.

Dimensions of the type.—Head and body, 463; tail, 563; Hindfoot, 77; ear, 38.

Habitat.—Two specimens collected by myself in the Dangs, Surat District, Bombay Presidency.

Type.—Adult male. B. M. No. 96, 11, 7, 5. Original number 15.

Remarks.—This is the most sombre coloured form in this group; except the faint yellowish tinge behind the forearm there is nothing to relieve the general grey colouring. Judging from Tickell's description true *oral* is even smaller and at the same time more brightly coloured.

(6) *Petaurista inornatus*. Is. Geoff.

1844. *Pteromys inornatus*, Is. Geoff. Jacquemont Voy., IV.

Description.—Fur on back 45-50 mm. long. General colour above bay, washed or coarsely grizzled with buff, below salmon buff, rather darker towards sides of parachute. Individual hairs of back basally slate grey (25 mm.), then woodbrown darkening to burnt umber (15 mm.), remainder buff with black tips. Cheeks grey strongly tinged with rufous. Shoulders rufous, parachutes rather darker. Tail dull ochraceous buff with a black tip.

Size.—Head and body, 356; tail, 356; hindfoot, 66; ear, 40. Skull, greatest length, 65; basilar length, 55; greatest breadth, 46; molars, 15·5.

Remarks.—There is a fine series of 6 specimens, presented by Col. Ward, in the Collection. There is a certain amount of variation in the brightness of the colouring.

(7) *Petaurista birrelli*, sp. n.

Fur as in *inornatus*, but general colour much darker than in that form. Much less markedly grizzled, the pale rings on the individual hairs 'ochraceous' or even darker. The cheeks are rufous with no sign of grey. Belly ochraceous buff rapidly deepening to rufous on the parachute. Tail bright bay, with a sharply marked black tip.

Dimensions of the type.—Head and body, 420; tail, 445; hindfoot, 65; ear, 46. Skull, greatest length, 73; basilar length, 58; greatest breadth, 47; molars, 16·5.

Habitat.—Muree, Hazara, Punjaub. Alt. 8,000 ft.

Type.—Adult female. B. M. No. 5, 11, 19, 3, original number 22, collected 30th July 1905, and presented to the Natural History Museum by Major Birrel, R.A.M.C.

Remarks.—Major Birrel got two specimens, the type and a young one on Mian Jaini Hill.

(8) *Petaurista caniceps*, Gray.

1842. *Pteromys caniceps*. Gray. A. M. N. H., X, p. 262.

1844. *Pteromys senex*, Hodg., J. A. S. B., XIII, p. 68.

Synonymy.—*Pteromys senex* was described by Hodgson from Nepal before 1842 but owing to a delay in preparing the plates was not published until 1844. In 1842 Gray described a Sikkim specimen as *caniceps*.

Description.—Size as in *inornatus* and *birrelli*. In general colouring it closely resembles *birrelli*, both above and below, but the whole head is drab grey and the hands and feet are ochraceous rufous and not black or partially black as in *inornatus* and *birrelli*.

Size.—The following dimensions were recorded by Hodgson:—Head and body, 350; tail, 400; hindfoot, 68. Skull, greatest length, 66; basilar length, 52; greatest breadth, 43; molars, 15.

Remarks.—This seems to be the form of the middle Himalayas.

(9) *Petaurista nobilis*, Gray.

1842. *Pteromys nobilis*, Gray, A. M. N. H., X., p. 263.

1844. *Pteromys chrysothrix.*, Hodgson. J. A. S. B., XIII, p. 67.

Synonymy.—Hodgson's *chrysothrix* from Nepal was published at the same time as *senex* and Gray's *nobilis* from Sikkim at the same time as *caniceps*; Gray's name therefore stands for the species.

Description.—Size rather larger than *inornatus* and *caniceps*. Fur of back 35-40 mm. long. Back above from between the ears to root of tail bay (sometimes stopping somewhat sooner when the rump is coloured like the parachute) with a bright buff median line. The parachute bright buff darkening outwards to orange rufous; below entirely pinkish buff. Face like back but the forehead much tinged with buff. Hands and feet and tail ochraceous rufous, the last with a black tip.

Size.—Hodgson records the following dimensions for his *chrysothrix*:—Head and body, 375; tail, 380; hindfoot, 73. Skull, greatest length, 72; basilar length, 57; greatest breadth, 49; molars, 17.

Remarks.—There can be no doubt that this species is quite distinct from *albiventer*. It appears to be the high level representative of *albiventer* and not a seasonal phase of that species. A variation in the distinctness of the dorsal stripe is probably seasonal but even where the stripe is practically absent their size separates the two forms.

(10) *Petaurista albiventer*, Gray.

1834. *Pteromys albiventer*, Gray. Ill., Ind., Zool. II, pl. 18.

1836. *Sciuropterus magnificus*, Hodg., J. A. S. B., V., p. 231.

Synonymy.—*Pt. albiventer* was published as a plate figure without letterpress, describing it in 1837 (A. M. N. H., 1, p. 584). Gray gave the type locality as Nepal from whence also Hodgson's *magnificus* was described.

Description.—Size larger than *nobilis*. Fur of back 40 mm. long. General colour above bay grizzled with white on the back, buff on the shoulders, and orange rufous in the parachute; below

ochraceous buff. Face like the back, cheeks grey. Hands and feet orange rufous, tail the same with a black tip.

Size.—The dimensions recorded by Hodgson for *magnificus* are —Head and body, 400 ; tail, 550. The hindfoot averages 78. Skull, greatest length, 70 ; basilar length, 56 ; greatest breadth, 47 ; molars, 17.

Remarks.—This is the low level form of the Eastern Himalayas.

(11) *Petaurista fulvinus*, sp. n.

A *Petaurista* of the *albiventer* type but back and parachute less contrasted in colour and with fulvous tinge throughout.

Fur 35-40 mm. long on the back. General colour above hazel, grizzled with white on the back, darkening on the outside edges of the parachute, and brightening to ochraceous rufous on the shoulders and behind the forearm ; below pale rufous. Individual hairs of the back olive grey basally (15 mm.), remainder bright fulvous hazel with a black tip and sub-terminal white ring (5 mm.) Face like back. Cheeks white, tinged rufous. Hands and feet cinnamon rufous. Tail 'vinaceous cinnamon' much tinged with fulvous.

Dimensions of the type.—Not recorded. The hindfoot is 77 mm. and the other dimensions are no doubt quite as in *albiventer*. Skull, greatest length, 70 ; basilar length, 50 ; greatest breadth, 48 ; molars, 16.

Habitat.—Simla.

Type.—Adult male. B. M. No. 85, 8, 1, 121. Collected by W. Davison and presented to the national collection by A. O. Hume, Esq.

Remarks.—Represents *albiventer* in the West Himalaya.

(12) *Petaurista candidulus*, sp. n.

1888. *Pteromys yunnanensis*, Blanf. (nec. Anderson) Faun., Brit. Ind., p. 364.

A large *Petaurista* of the *yunnanensis* type, of paler colouring and so much washed with white on the back as almost completely to obscure the ground colour.

Fur of back 30-35 mm. long. Colour above so washed with

white as to appear drab, parachute rufous; below pure white, tinged with rufous on outer edges of parachute. Individual hairs of the back basally 'mouse grey' (20 mm.), then reddish (5 mm.), and remainder reddish white with a very short black tip (2-3 mm.). Head coloured like back, face becoming white with slight rufous tinge, cheeks white, a grey patch in front of ears, bay tuft behind them.

Distal half of back of ear white. Hands and feet rufous like parachute. Tail drab grey, with well marked black tip.

Dimensions of the type.—Recorded by the Collector.—Head and body, 405; tail, 610; hindfoot, 84; ear, 44. Skull, greatest length, 77; basilar length, 60; greatest breadth, 51; molars, 17·5.

Habitat.—Upper Burma westward to Cachar whence the Museum possesses a specimen. Type from Kindat, Upper Burma.

Type.—Adult male. B. M. No. 10, 10, 19, 3. Collected 20th August 1907, and presented to the Natural History Museum by C. H. Hobart, Esq.

Remarks.—There are specimens in the Museum Collection from Cachar and the Naga Hills. Blanford called these *yunnanensis*, but that species is quite a dark animal, with comparatively little grizzling and with a black tail. I think there can be no doubt that notwithstanding their utterly different facies, this species, *yunnanensis*, *lylei*, and *cineraceus* are very closely related.

When specimens are available from the Shan States it is quite probable that the form of that country will prove to be true *yunnanensis*.

(13) *Petaurista punctatus*, Gray.

1846. *Pteromys punctatus*, Gray, A. M. N. H., XVIII, p. 211.

This species was based on a specimen from Malacca and is quite distinct from any other known form, by its peculiar pattern of white spots on a hazel-brown ground. It is noteworthy that other specimens from Malacca agree with *melanotus* the normal Malay form. The general type of coloration seems rather to ally it with *yunnanensis*. Personally I believe the specimen to be abnormal but it is useless to speculate until more specimens are available.

(14) *Petaurista petaurista*, Pallas.

1766. *Sciurus petaurista*, Pall. Misc. Zool., p. 54.

(15) *Petaurista melanotus*. Gray.

1836. *Pteromys melanotus*, Gray, P. Z. S., p. 88 (noneneed).

1837. *Pteromys melanotus*, Gray, A. M. N. H., I., p. 584.

(16) *Petaurista marchio*, Thomas.

1908. *Petaurista nitida marchio*, Thos., A. M. N. H., p. 250.

(17) *Petaurista rajah*, Thomas.

1908. *Petaurista nitida rajah*, Thomas, A. M. N. H., p. 250.

(18) *Petaurista nitidalus*, Thomas.

1900 *Pteromys nitidalus*, Thos., Nov., Zool., VII., p. 592.

(19) *Petaurista batuanus*, Miller.

1903. *Pteromys batuanus*, Miller, Smiths and Coll. XLV., p. 27.

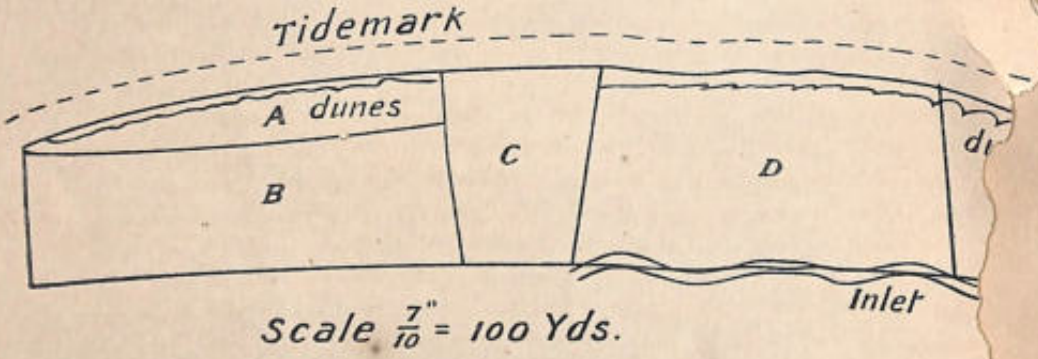
A STUDY OF SEASHORE VEGETATION

BY

W. BURNS, B.SC. (EDIN.).

(From the Botanical Laboratory of the Poona Agricultural College.)

In September 1910, I made a short study of the flora of a typical area on the seashore, near Bassein, in the Thana District. Bassein is situated at the mouth of the Kalyan creek. Between the village and the estuary lies a barren tract of land partially intersected by muddy inlets and useful only for grazing. At the extreme seaward edge of this runs a very bare strip of land after which there is a slight drop and the beach proper begins. The present paper refers to the vegetation of the bare strip of land for a distance of about 1,100 yards from the suspension bridge on the coast there. Observations were started about 250 yards from the bridge, since from that place the strip was fairly uniform in its general appearance. The following rough sketch gives an idea of the nature of the ground.



The whole area is divided up into five secondary areas: A, B, C, D and E. In A there was no vegetation. The dunes here were low and the land immediately behind them was very exposed, hence the lack of plants on this spot. In B, however, plants began to appear. These were (1) seedlings of *Avicennia alba*, the mangrove plant, that is so common on the coast. These were not very big and had obviously been recently deposited. The biggest had only two young foliage leaves showing above the cotyledons. In an area of 25′ × 25′ ten such seedlings were found. This place was fifty yards from the high tidemark of the season. At the tidemark, just opposite the above mentioned area, the seedlings of *Avicennia* were very numerous. In an area 8′ × 3′ the number of *Avicennia* fruits found was 169; most of these had begun to germinate but none were fully rooted.

The other plants on this area of 25′ × 25′ were (2) a small monocotyledonous plant like an *Iphigenia*, (3) the grass *Cyperus conglomeratus*, (4) the grass, *Cynodon dactylon*. These were sparsely scattered over the area.

In the whole of B, besides specimens (2), (3) and (4) above mentioned, there were also found (5) *Launea pinnatifida*, a creeping stoloniferous composite, and (6) a Labiate, *Lippia nodiflora*, which held together small sand hills of about six inches high, on top of which its flowers and fruits appeared. All these plants were still very sparsely scattered with large intervals of bare sand.

At about 600 yards from the bridge began the area marked C. This area was absolutely bare of vegetation throughout its whole depth. The reason was not far to seek. The dunes at this place had disappeared and the wind had an absolutely unrestricted sweep over the barren tract. With the reappearance of dunes vegetation also reappeared and formed area D bounded on one side by the dunes and on the other by a small muddy inlet. In this inlet were seen the first adult Avicennias met with in that morning's excursion, and along with them the following plants:—(4) *Cynodon dactylon*, (7) *Sueda fruticosa*, (8) *Acanthus ilicifolius*, and (9) *Sesuvium portulacastrum*. A little way from the inlet towards the centre of the area, appeared Avicennia seedlings, but it was apparent that these were not from the plants in the inlet since the latter were not fruiting. Still nearer the sea in this same area appeared small isolated clumps of (10) *Ipomea biloba*. These were the outposts of the main body of this plant which completely covered area E. Seedlings of this Ipomea had been met in previous areas but only in D did the plant first appear in clumps and seemed to be forming small dunes. The grass (11) *Panicum colonum* was also found here represented by a few scattered specimens.

In area E there was, as above mentioned, a thick mat of *Ipomea biloba* and the dunes here were higher than at any other point in the areas surveyed, on account of the sand-binding properties of this plant. The Ipomea was in flower and a few fruits were also visible. There was little along with the Ipomea except one intrusive piece of turf and a few scattered grasses and sedges. These were as follows:—

(12) *Pycreus polystachyos*, (13) *Fimbristylis diphylla*, (14) *Cyperus malaccensis*, and (15) *Sporobolus glaucifolius*. There was also one sickly plant of (16) *Calotropis gigantea* and a stunted specimen of (17) *Erythrina indica*.

The Ipomea patch was only 100 yards broad and no more was visible for at least two miles.

Leaving out the doubtful Iphigenia the following list shows the plants found and their natural orders:—

Natural Order.	Plant.
Leguminosæ	(17) *Erythrina indica.*
Compositæ	(5) *Launea pinnatifida.*
Acanthaceæ	(8) *Acanthus ilicifolius.*
Chenopodiaaceæ	(7) *Sueda fruticosa.*
Asclepiadaceæ	(16) *Calotropis gigantea.*

Verbenaceæ	(1) *Avicennia alba.* (6) *Lippia nodiflora.*
Cyperaceæ	(3) *Cyperus conglomeratus.* (14) *Cyperus malaccensis.* (13) *Fimbristylis diphylla.* (12) *Pycreus polystachyos.*
Gramineæ	(4) *Cynodon dactylon.* (15) *Sporobolus glaucifolius.* (11) *Panicum colonum.*

The nature of almost all the plants in the above group shows how severe and limiting was the environment. The Erythrina and Calotropis were very unhappy, and obviously accidents in the vegetation. Almost every one of the other plants is specially adapted to growth on seashores. Some of these plants are worthy of a little further attention.

* Schimper, quoting St. Hilaire, informs us that *Lippia rotundifolia* is found as a part of the typical flora of the campo of Minas Geraes in South America, in land which is true savannah in the depressions and pure steppe on the heights. Its near relation *Lippia nodiflora* occurs, as we have seen, in not very dissimilar conditions on the Bassein coast.

The three grasses found and the sedges *Cyperus conglomeratus* and *Fimbristylis diphylla* are not typically littoral but are of wide distribution and of that adaptability displayed by so many members of these two orders.

† *Pycreus polystachyos* is a plant of wide distribution but with a distinct preference for maritime regions.

‡ *Cyperus malaccensis* is found on brackish mud banks from Bengal to Singapore and distributed in Asia, Australia and Polynesia.

The following three distinct ecological groups are noticeable:—

Sand-binders	*Ipomea biloba.* *Lippia nodiflora.* *Launea pinnatifida.*
Succulents	*Sesuvium portulacastrum.* *Sueda fruticosa.*
Mangrove plants	*Avicennia alba.* *Acanthus ilicifolius.*

Here then, we have three of the groups most typical of tropical seashores. The habit of the sand-binders is remarkable. § Schimper makes the following remarks concerning it:—

"The advantages due to this mode of growth in such habitats are

* Schimper: Plant Geography, 1903, p. 373.

† Hooker: Flora of British India, VI, p. 592.

‡ Hooker: Flora of British India, VI, p. 609.

§ Schimper: Plant Geography, 1903, p. 182.

obvious. The creeping shoots firmly anchored by numerous deeply penetrating roots offer a much better resistance to the wind and incur much less danger of being torn out of the loose shifting substratum than do erect plants. It is, therefore, no wonder that many other littoral plants adopt a mode of life similar to that of *Spinifex*, such as *Remirea maritima* which is almost ubiquitous in the tropics and the still commoner and more widely distributed *Ipomea pes-capræ* (*I. biloba*) the extremely long and distantly rooting creeping shoots of which cover and fix the sand in a narrow-meshed net."

The mangrove plants are specially adapted to growth in heavy muddy soil. The peculiar negatively geotropic roots of *Avicennia* are its means of securing oxygen for its feeding roots buried in the swampy land.

The succulents are typical of saline soil, their fleshiness being due to the development of water tissues specially adapted to guard against injurious concentration of salt in the assimilating cells."

Considering the number of *Avicennia* fruits deposited on the shore and the number that had been taken up to the higher part of the beach I was astonished to note how few adult *Avicennia* plants there were outside the muddy inlet. This may be due to the sand drying after the rains, but it is certainly also due to the fact that cattle wandering along the shore greedily devour the *avicennia* fruits washed up by the tide. A herdsman told me that cattle and buffaloes do not eat the *Ipomea biloba* at all. Hence if any change takes place in the vegetation of the areas described we may expect that it will not be an advance and increase of the mangrove plants but mainly of the sand-binders and possibly of the succulents.

" Schimper: Plant Geography, 1903, p. 89.

NOTES ON GAME ANIMALS FROM NEAR GYANTSE AND IN THE CHUMBI VALLEY.

BY

CAPTAIN F. M. BAILEY.

(With a Plate).

After a residence of 3½ years at Gyantse and in the Chumbi Valley, I venture to think that a few random observations in the game animals found in those places may be of interest to readers of this journal.

The two localities are entirely different in character and fauna. Gyantse lies a hundred miles to the north of the main Himalayan watershed, at a height of 13,000 feet, and has an average rainfall of some seven inches, the surrounding country being treeless and bare, except for thorny scrub in some of the stream beds; while the road reaches a height of 15,200 feet where no vegetation except scanty grass and moss can exist. Chumbi on the other hand is on the southern slopes of the Himalayas, the annual rainfall at the British Trade Agency (at 9,800 feet) being about seventy inches. The ground here is much steeper and is covered with pine and rhododendron forest to a height of 14,000 feet. The fauna of Chumbi resembles that of the Upper Himalayan Valleys, while that of Gyantse is Tibetan, and the Tibetan fauna extends into the Chumbi Valley for a few miles south of the Tangla. Game is generally plentiful at places a short distance on either side of the road. In May 1909, on one day's march, I saw 17 *Ovis ammon*, 25 Burhel and 64 Tibetan Gazelle. A list of the game animals shot during the four years 1906-1909 is appended. Only shootable heads were entered in the game book:—

Ovis ammon.	Burhel.	Tibetan Gazelle.	Musk Deer.	Wolves.	Foxes (*V. Wadelli*).	Hares (*L. Oiostolus.*)
7	11	42	1	2	5	621

FELIS UNICA. Snow Leopard. Tib.—"*Sa.*"

The snow leopard occurs near Gyantse but is rare. I have not heard of it in the Chumbi Valley. On 21st June 1908 I obtained a litter of three young ones which must have been born about a week previously.

CANIS LUPUS. The Wolf. Tib.—"*Changu.*"

These are not uncommon in this part of Tibet, but are not seen much on the main roads. A female measured 54½" in length from nose to tip of tail and 26" in height at the shoulder. I kept young ones, but they were always wild and timid. On one occasion a six months' old cub escaped, and after chasing it for four miles on horseback, I gave up all hope of recapturing it. I was much surprised to find that it had returned of its own accord during the night, and was waiting to be fed at the usual hour in the morning. I once shot a black wolf in Western Tibet, where they are commoner than in other parts of the country. I have seen three black ones together and one black one in the company of three ordinary wolves. I once tried to course a wolf with three greyhounds. The wolf showed no fear and the hounds would not tackle him when they had caught him up.

VULPES WADDELLI. Tib.—"*Wamo.*"

This fox is not uncommon in the scrub round Gyantse, and I have also found it on bare plains at a height of 15,000 feet. A vixen measured 42" from nose to tip of tail and 15½" in height at the shoulder. I have killed these with greyhounds.

VULPES FERRILATUS. The small Tibetan Fox. Tib.—"*Dedze.*"

I have never seen this fox below 14,000 feet, at which elevation I have occasionally seen it at Phari. I once shot one that had just killed a mouse hare (*Lagomys*).

LEPUS OIOSTOLUS. The Wooly Hare. Tib.—"*Regong.*"

This hare is very common in this part of Tibet, where it is found on the hills around Gyantse and also in the thorny scrub in the river bed. It is also common on the slopes of Chumolhari on the Tangla, but does not occur in the Chumbi Valley. I used to course these hares, but it was difficult to find them on level ground and in hills the greyhound had no chance.

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(With a Plate).

After a residence of 3½ years at Gyantse and in the Chumbi Valley, I venture to think that a few random observations in the game animals found in those places may be of interest to readers of this journal.

The two localities are entirely different in character and fauna. Gyantse lies a hundred miles to the north of the main Himalayan watershed, at a height of 13,000 feet, and has an average rainfall of some seven inches, the surrounding country being treeless and bare, except for thorny scrub in some of the stream beds; while the road reaches a height of 15,200 feet where no vegetation except scanty grass and moss can exist. Chumbi on the other hand is on the southern slopes of the Himalayas, the annual rainfall at the British Trade Agency (at 9,800 feet) being about seventy inches. The ground here is much steeper and is covered with pine and rhododendron forest to a height of 14,000 feet. The fauna of Chumbi resembles that of the Upper Himalayan Valleys, while that of Gyantse is Tibetan, and the Tibetan fauna extends into the Chumbi Valley for a few miles south of the Tangla. Game is generally plentiful at places a short distance on either side of the road. In May 1909, on one day's march, I saw 17 *Ovis ammon*, 25 Burhel and 64 Tibetan Gazelle. A list of the game animals shot during the four years 1906-1909 is appended. Only shootable heads were entered in the game book:—

Ovis ammon.	Burhel.	Tibetan Gazelle.	Musk Deer.	Wolves.	Foxes (*V. Wadelli*).	Hares (*L. Oiostolus.*)
7	11	42	1	2	5	621

FELIS UNICA. Snow Leopard. Tib.—"*Sa.*"

The snow leopard occurs near Gyantse but is rare. I have not heard of it in the Chumbi Valley. On 21st June 1908 I obtained a litter of three young ones which must have been born about a week previously.

CANIS LUPUS. The Wolf. Tib.—"*Changu.*"

These are not uncommon in this part of Tibet, but are not seen much on the main roads. A female measured 54½" in length from nose to tip of tail and 26" in height at the shoulder. I kept young ones, but they were always wild and timid. On one occasion a six months' old cub escaped, and after chasing it for four miles on horseback, I gave up all hope of recapturing it. I was much surprised to find that it had returned of its own accord during the night, and was waiting to be fed at the usual hour in

The plate accompanying this paper will appear in the Index number?

vixen measured 42" from nose to tip of tail and 15½" in height at the shoulder. I have killed these with greyhounds.

VULPES FERRILATUS. The small Tibetan Fox. Tib.—"*Dedze.*"

I have never seen this fox below 14,000 feet, at which elevation I have occasionally seen it at Phari. I once shot one that had just killed a mouse hare (*Lagomys*).

LEPUS OIOSTOLUS. The Wooly Hare. Tib.—"*Regong.*"

This hare is very common in this part of Tibet, where it is found on the hills around Gyantse and also in the thorny scrub in the river bed. It is also common on the slopes of Chumolhari on the Tangla, but does not occur in the Chumbi Valley. I used to course these hares, but it was difficult to find them on level ground and in hills the greyhound had no chance.

EQUUS HEMIONUS. Tib.—"*Kyang.*"

This animal may be seen anywhere between the Tangla and Mendza on the road to Gyantse; after the latter place the valley is too confined, as they prefer very wide open plains. They are easy to approach and show very little fear of man. On one occasion when camped at the village of Nyiru, to the east of Kangmar, I was asked by the people to shoot one, as they did considerable damage to the crops. The young are born in August. A photograph of a young one appeared on p. 731 of Vol. XIX of our Journal.

OVIS AMMON HODGSONI. Tib.—"*Nyen.*"

Ovis ammon are occasionally to be found in the hills at the northern end of the Chumbi Valley and at several places on the road to Gyantse. The young are born in June; I have frequently seen newly-born lambs in this month and at the beginning of July. I once saw a ewe apart from a herd with a single lamb at the end of June, at a height of 14,000 feet, where some small rhododendron bushes were growing which concealed the young one when it lay down. A photograph of the best head obtained appeared in Vol. XIX, page 980. Rowland Ward's measurements for this head were:—

Length on Front Curve	49½"
Circumference	19"
Spread from tip to tip	21¼"

OVIS NAHURA. Burhel. Tib.—"*Na.*"

Burhel are very common both in the Chumbi Valley above tree level, and in the neighbourhood of Gyantse as well as at various places on the road. The eleven entered in the game book measure between 20 in. and 23 in.; smaller ones were occasionally shot for food. I kept several tame ones which, though never tied up, seldom strayed far. On two occasions single young were born to these, on the 15th June and 8th August; but from what I have seen of young ones with the wild herds I think that August is exceptionally late. Once a tame ram, 2½ years old, was lost for two days and eventually found with a herd of wild ones, which he left and ran to the man who was searching for him. The horns of this one measured 13 ins. when three years old. These

tame burhel were very fond of playing with my dogs and even with men.

GAZELLE PICTICAUDATA: Tibetan Gazelle. Tib.—"*Goa.*"

Gazelle are still fairly plentiful on the road to Gyantse, being found from the hills south of Phari up to the neighbourhood of Gyantse; on the road itself they are much scarcer and wilder than they used to be. The horns of those entered in the game list measured between 10½ ins. and 14 ins.; only one head of the last measurement was shot (by Captain Kennedy) though 13½ ins. heads were not uncommon.

The following are the measurements of two gazelles:—

Nose to tip of tail	38″	37¾″
Height at shoulder	24½″	22″
Length of horn	12″	11½″

In Western Tibet they are much wilder and more difficult to approach than in the country to the north of Sikkim. On one occasion, when camped near Kamba Jong I counted 117 in sight from my tent. I found the young difficult to rear in captivity. A photograph of one appeared at p. 121 of Vol. XIX of our Journal. A greyhound of mine once caught a full grown buck.

CERVIS AFFINIS. The Shou. Tib.—"*Sha.*"

These stags are found in the Chumbi Valley, their lowest elevation being about 9,000 feet. They are very scarce, a few only crossing the ridge which forms the boundary between Chumbi and Bhutan. I have seen them grazing on Lingmotang Plain in May, when the stags had no horns, and in the winter they are to be found in the dense pine forests, on the eastern side of the Chumbi Valley; but about December the forest is disturbed by the villagers, who at this time are collecting their winter's supply of fuel, and the stags appear, for the most part, to return eastwards to Bhutan. They rarely cross to the western bank of the Ammo Chu and this river may be said to be the limit of their habitat on the west.

I saw in captivity at Shigatse a stag which belonged to the Tashilama, and which I was informed had been obtained from the Bramaputra Valley, east of Lhasa; but I am unable to say to what species it belonged. I found that the roofs of many houses in

Tibet north of Nepaul were adorned with stag horns which, I was told, had been brought from the north, but as the country is bare desert for hundreds of miles in that direction, I think it possible that these horns came from Nepaul. I was unable to bring any horns away as they had become too brittle from exposure to the weather, and in spite of the greatest care, broke in pieces after a few marches.

MOSCHUS MOSCHIFERUS. Musk Deer. Tib.—"*La.*"

A few Musk Deer are to be seen in the Valleys round Gyantse. In the absence of forest in this part of their habitat, they live among rocks. They are plentiful on the ridge dividing Sikkim from the Chumbi Valley and probably at other places in the neighbourhood.

A few other animals may be mentioned here.

The Serow Tib. "*Gyara*" is common in the Chumbi Valley, but difficult to shoot. It is not found above tree level. A photograph of one appeared at p. 822 of Vol. XIX of the Journal.

I have seen a Gooral, which had been killed by a native in the Chumbi Valley, but have never seen one alive myself.

Wild Yak (*Bos grunniens*) and Tibetan Antelope (*Pantholops hodgsoni*) are not found in this part of Tibet at all. In travelling up the Bramaputra, antelope were not seen till about the 85° of longitude, and then in the hills to the north of the river. They were common some distance farther west. The Tibetan name for the wild Yak is "*Drong*" and for the Antelope "*Tso*". I have never heard the word "*Chiru*" used for this animal in Tibet.

A bear was occasionally seen by wood-cutters in the Chumbi Valley. A new species of monkey (*Presbytis lania*) is found in the Chumbi Valley at an altitude of 10,000 feet. The Lynx, Tib. "I" (as the letter E), is found near Gyantse but is rare. A *badger, Meles meles canescens* was obtained in the Chumbi Valley and the skin forwarded to the Society.

REMARKS ON THE SNAKE COLLECTION IN THE QUETTA MUSEUM.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

At the request of Sir Henry McMahon the collection of snakes in the Quetta Museum has been recently submitted to me for identification.

120 specimens were forwarded which include 23 species. One species, I think there can be no doubt, is new to science. This belongs to the genus *Contia*, and I propose to call it *mcmahoni* after the President of the Quetta Natural History Society. In a few other instances the previously known habitat appears to have been extended, *viz.*, *Eryx johni*, *Zamenis ravergieri*, *Contia walteri*, *Bungarus coeruleus*, and *Bungarus sindanus*.

All the snakes have been collected in Baluchistan.

Family.—GLAUCONIIDÆ.

Glauconia blanfordi (Boulenger).

A single typical specimen of this little snake is from Sibi.

Family.—BOIDÆ.

Eryx johni (Russell).

Three specimens, all about two-thirds grown, are from Duki, and Hanna. I can find no previous records of this snake from Baluchistan. The Hanna specimen is the darkest I ever saw. It is brown dorsally, and there are very distinct black bars on the body and tail. The belly is heavily mottled with black. The two Duki specimens are similar, but the black bars are not so distinct. The details of scales and shields are as follows:—

Costals.			Ventrals.	Sub-caudals.	Locality.
Two heads-lengths behind head.	Mid-body.	Two heads-lengths before vent.			
47	53	41	190	33	Hanna.
42	47	34	199	33	Duki.
44	51	38	200	29	Duki.

Family.—COLUBRIDÆ.

Tropidonotus piscator (Schneider).

Four specimens from Harnai, Sibi, Kirta and Sharigh. All are olive-greenish with moderately large black chequers anteriorly, and quite typical in lepidosis.

Lycodon striatus (Shaw).

Three specimens from Quetta. One in particular shows a bright yellow adornment similar in pattern to the white observed in the usual Indian specimens. Probably the others were similar, but the bright yellow is sure to fade in spirit as it does in other *Lycodons* (*jara*, *flavomaculatus*, and *fasciatus*). The ventrals and subcaudals are 179 ? + 60, 180 + 63, and 176 ? + 63. There are 9 supralabials in one specimen on the left side, and the 3rd, 4th, 5th and 6th touch the eye on that side.

Zamenis mucosus (Linné).

Six specimens from Quetta and Hanna. One large adult is unusually dark being a uniform blackish dorsally. In two specimens the loreals are two (1 + 1).

Zamenis rhodorhachis (Jan.).

Several specimens, all of variety *ladacensis* (Anderson) from Quetta, Fort Sandeman, Hanna, Duki, Mach, Takatu, Spinkarez (Hanna), and Sibi. The supralabials are 9, the 4th is invariably divided and its upper part touches the eye. I think there can be no doubt that this is the correct interpretation of the condition, and that the upper part of this shield should not be designated a subocular (*vide* Boulenger's Catalogue, Vol. 1, p. 398). On one side in one specimen the 3rd supralabial is also divided as it normally is in the species *ravergieri*. The ventrals vary from 218 to 230, and the subcaudals are 131 in the only specimen where the tail is complete, and these shields can be counted. The costals in all are 19 two heads-lengths behind the head, 19 in mid-body, and 13 usually (11 once) two headslengths before the anus. The two first steps occur very close together, and are often intermixed but from 19 to 17 ,the row next to the vertebral usually blends with the one below, and from 17 to 15 above the ventrals blends with the 4th (rarely the 2nd). From 15 to 13 the row next to the vertebral again blends with the one below.

In all a regular series of spots of a darker brown than the ground colour pass down the dorsum. These spots are usually rather large, and roundish or oval, but in some specimens these are replaced by narrow bars.

The teeth in this species are quite different from those of *ventrimaculatus*, the species to which it shows such a very close external resemblance. There is a gap at the back of the maxillary array followed by two enlarged teeth in *ladacensis*.

Zamenis karelini (Brandt).

Several specimens from Quetta, Pishin, Mastung, Walikhan, Gulistan,

and Bostan. The ventrals range between 192 and 206, and the subcaudals from 92 to 99. The costals number 19 two heads-lengths behind the head, 19 in mid-body, and 13 two heads-lengths before the anus. The absorption of rows from 19 to 17, and from 17 to 15 occurs very close together and the steps may be intermixed. Usually the row next to the vertebral first blends with the one below (or rarely with the vertebral), and then the 3rd blends with the 4th (rarely the 2nd). From 15 to 13 the reduction is similar to that in the first step, the row next to the vertebral disappearing.

The supralabials are usually 9, the 3rd, 4th and 6th being divided, and the 4th, 5th and 6th touch the eye. This seems to me the true interpretation of the condition, and I do not agree with Mr. Boulenger in considering the upper parts of the 4th and 6th shields suboculars. None of these specimens were adorned with any suspicion of an orange vertebral stripe. The dentition is as follows in one :—maxillary 12 left, 11 right, followed by a gap, and then two enlarged teeth. Palatine 8. Pterygoid 15 left, 16 right. Mandibular 16 left, 15 ? right.

Zamenis ravergieri (Ménétr).

Several specimens from Hanna, Quetta, Kalat, Ziarat, and Harboi. This species does not appear to have been recorded from Baluchistan before, and is evidently common there. The supralabials are 9, the 3rd and 4th divided (the 3rd entire in two specimens) and the 4th, 5th and 6th touch the eye. The ventrals range between 195 and 220, and the subcaudals between 87 and 93. In one example the 4th to the 8th are entire and in another the 4th to the 6th. The costals are in 21 rows, two heads-lengths behind the head, 21 in mid-body, and 15 two heads-lengths before the anus. The first two steps from 21 to 19, and 19 to 17 occur close together, and are sometimes intermixed. Usually the row next to the vertebral is absorbed first into the row below, or into the vertebral, then the 3rd row above the ventrals is absorbed into the 4th and finally the rows reduce from 17 to 15 by the row next to the vertebral being absorbed into the one below. In adults the spots are usually rather a darker brown than the ground colour, but in one adult from Ziarat the dorsal spots are unusually black, and well defined. The maxillary teeth agree with those of *rhodorhachis* and *karelini* in having a gap posteriorly succeeded by two enlarged teeth.

Zamenis diadema (Schlegel).

Specimens of this snake are very numerous, there being no less than 30 examples, from Dhadur Bolan, Hirok, Ziarat, Mushkaf, Khushdilkhan, Harboi Hills (Kalat), Fort Sandeman, Kalat, Hudda, Hanna, Quetta, Urak, Kach, Sibi, Mach, Loralai, Sheikh Wasil, Shaltanzai, Pishin and Hazara Road. There are three distinct colour varieties. *A*—Dorsally buff or pale brownish with a few or many scales deep claret coloured.

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There is no arrangement in the disposition of these dark scales, except in one or two specimens where a congeries of such spots roughly suggests the pattern seen in variety *B*. The head is sometimes completely dark claret coloured, or there may be blotches of this hue irregularly disposed above. On the occiput and neck the claret hue merges into a brilliant crimson.

B.—In this the ground colour is light brown. A dorsal series of large spots of a darker brown pass regularly down the middle of the back, and these spots alternate with those of a lateral series of similar but smaller spots. The head is light brown, with a somewhat irregular disposition of darker spots or mottlings, which often form a complete circle on the crown hence the name *diadema*. There is no crimson cephalic or nuchal adornment.

C. This variety may be considered a melanoistic form of the last. The specimens are blackish, with the same arrangement of regular spots as the last variety, the spots being of a still blacker hue. In one specimen no such spots could be distinguished, the colour being uniformly black.

There were many quite juvenile specimens, but it is remarkable that all of these conformed to the type of adults of variety *B*. I have noted this before in the Punjab where adults of variety *A* are very common, and it would appear that the colouration and markings may become very markedly modified with age.

Unlike the preceding three species of this genus the maxillary array of teeth is not interrupted posteriorly, and there are no enlarged posterior teeth, a fact which leads me to think that the genus *Zamenis* as constituted by Mr. Boulenger needs revision and further subdivision.

Lytorhynchus ridgewayi (Boulenger).

Four specimens from Quetta and Bostan. The ventrals are 182, 170, 171 and 172, the anal entire in 3, and dubiously divided in the 4th. The subcaudals are 41, 45, 50 and 51. The costals are normally 19 two heads-lengths behind the head, 19 in mid-body, and 15 two heads-lengths before the anus. In one the 8th and 9th rows above the ventrals repeatedly fused and divided anteriorly so that the rows were 17 in some places. In another the vertebral, and next scale on the left side blended, and divided repeatedly posteriorly so that the rows were 16 in places. The absorption of rows from 19 to 17, and from 17 to 15 occurs close together and the steps may be intermixed, but usually the vertebral row blends with the next first, and then the 3rd and 4th rows above the ventrals coalesce. The supralabials are 7 or 8, and usually the 3rd and 4th are divided, and touch the eye. On one side in one specimen the 4th and 5th are divided and these only touch the eye. In another the 4th only is divided on one side, and the 4th and 5th touch the eye. In all the specimens there was but one loreal not two as mentioned by Mr. Boulenger (Catalogue Vol.

1, p. 416). The anchor-shaped mark on the head mentioned by Mr. Boulenger was rather disconnected in one specimen.

The dentition is peculiar. There are 8 subequal teeth in the maxillæ, then a gap followed by two ungrooved enlarged teeth. The palatine teeth are 5 in number. There are no pterygoid teeth. The mandible supports 12 on one side, and 11 on the other.

Contia walteri (Boettger).

Two specimens from Quetta and Sharigh are without doubt this species. In both the heads are quite black above, and the body has zebra-like black stripes anteriorly which soon break up into spots, and then disappear posteriorly. The ventrals are 214, and the subcaudals 79 in one example. In the other damage made counting impossible. The anal is divided in both. The scales are 15 two heads-lengths behind the head, 15 in mid-body, and 15 or 13 two heads-lengths before the anus. In the specimen where the rows reduced to 13 the numbers fell owing to a fusion of the 3rd and 4th rows above the ventrals. This was a ♂ example. The loreal was absent in both. The suture between the internasals was subequal to that between the præfrontals in one example, greater in the other. The breadth of the frontal was twice that of the supraocular in one example, and about two-fifths greater in the other. In other respects the specimens agree well with Mr. Boulenger's description (Catalogue Vol. II, p. 264).

Contia mcmahoni. spec. ? nov.

There are four specimens of a little snake of the above genus which I cannot doubt is entitled to rank as a species distinct from any described in Mr. Boulenger's Catalogue, and which I cannot find described elsewhere. These are from Quetta, Loralai, Mach and Spintangi. Three of these are, I presume, adults, and are nearly a foot long, the fourth is a young specimen 6 or 7 inches in length.

Description. Rostral.—touches 6 shields. *Internasals.*—Two, the suture between them equal to or greater than that between the præfrontals. *Præfrontals.*—Two, in contact with internasal, nasal, 2nd supralabial, præocular, supraocular, and frontal. *Frontal.*—Touches 6 shields, the supraocular sutures rather the longest, the breadth fully twice that of the supraoculars. *Nasal.*—Entire. *Loreal.*—Absent. *Præocular.*—One. *Postocular.*—One. *Temporals.*—1 + 1. *Supralabials.*—7, the 3rd and 4th touching the eye. *Infralabials.*—5, the 5th largest, and in contact with 2 scales behind, the 5th only touching the posterior sublinguals. *Costals.*—13 two heads-lengths behind the head, 15 in mid-body, and 13 two heads-lengths before the anus. In all the specimens these scales are 15 in the neck, but soon become 13 by the absorption of the 4th row above the ventrals. After one or two heads-lengths the rows become 15 again by the 3rd row dividing, and remain 15 till the hinder part of the body, where

they again reduce to 13, the 4th row again blending with the 5th (more rarely the 3rd). The ventrals are 204, 206, 209 and 212, the anal divided and the subcaudals 96, 91, 94, and 96. The body dorsally is nearly uniform light brownish, the scales basally rather darker and the head is of a duskier shade in the adult. In the young the head is black, but not quite so black as in typical *persica* and *walteri*. Under-parts uniform whitish. It seems to be most close to *persica* but differs in the greater number of subcaudals, in having 13 scale rows anteriorly, and in the colour of the adult.

Dipsadomorphus trigonotus (Schneider).

Three specimens from Kirani, Sharigh, and Jhalawan. None of these conform to the variety *melanocephalus* (Annandale, Jour. Asiatic. Soc., Bengal, 1904, p. 209) first mentioned by Dr. Annandale and which appears peculiar to the Perso-Baluchistan area. The ventrals and subcaudals of two are 236 + 80 and 232 + 84.

Psammophis leithi (Günther).

A single specimen from Duki. The scales are 17 two heads-lengths behind the head, 17 in mid-body, and 11 two heads-lengths before the anus. In the step from 17 to 15 the 4th row above the ventrals disappears being absorbed into 3rd on one side, and into the 5th on the other. In the step from 15 to 13 the row next to the vertebral is absorbed, and from 13 to 11 the 3rd row above the ventrals disappears. The ventrals are 172, anal entire, and subcaudals 98. There is a single temporal, and 8 supralabials, the 4th and 5th touching the eye. The belly is uniform saffron-yellow.

Psammophis schokari. (Forskal).

Several specimens from Quetta, Toba, Marachak, Jhalawan, Kishingi, Chaman and Khost.

The specimen from Khost is exactly like specimens of *condanarus* in colouration, there being a median and two lateral narrow stripes of buff, the median involving the vertebral row only, and the lateral the contiguous halves of the 3rd and 4th rows above the ventrals. The specimen from Marachak is very similar, but the buff stripes are broader, the median involving the vertebral, and half the adjacent rows, and the lateral involves the 4th and half the 3rd and 5th rows. The striping is not so well defined and conspicuous as in the previous specimen. The rest have a dark vertebral stripe involving the vertebral, and the adjacent half rows, and there is a series of blackish narrow apical stripes on the scales of the 6th row. There are no light stripes at all anteriorly, but the buff stripes typical of *condanarus* are obscurely indicated posteriorly.

It seems to me very dubious whether all these specimens should be considered *schokari*, I incline to the opinion that there may be two species judging from the peculiarities of the subcaudals, the supralabials, and

the number of scales in the posterior part of the body as will be seen from the annexed tabulated details.*

Costals.			Ventrals.	Subcaudals.	Labials touching eye.	Habitat.	
2 heads-lengths behind head.	Mid-body.	2 heads-lengths before anus.					
17	17	11	181	121	5th & 6th	Khost.	Baluchistan.
17	17	11	178	117	5th & 6th	Jhalawan.	
17	17	11	179	115	5th & 6th	Toba.	
17	17	13	177	88	?	Chaman.	
17	17	13	182	84	3rd, 4th & 5th	Quetta.	
17	17	13	177	84	4th, 5th & 6th	Quetta.	
17	17	13	186	75	4th, 5th & 6th	Marachak.	

* I append details of other specimens I have examined from other localities for comparison :—

Costals.			Ventrals.	Subcaudals.	Labials touching eye.	Habitat.
2 headslengths behind head.	Mid-body.	2 headslengths before anus.				
17	15	11	180	119	5th & 6th	Muhammerah (Persia).
17	17	11	175	119	5th & 6th	Do.
17	17	11	?	?	4th & 5th	Persian Gulf.
17	17	11	181	149?	5th & 6th	Dthali (Aden Hinter land).
17	17	11	175	124	5th & 6th	Do.
17	17	13?	175	143	?	Do.
17	17	13	172	?	?	Do.

Distira cyanocincta (Daudin).

Six specimens from Soumiani (Las Bela) and Manora. The ventrals of the four critically examined are 348, 363, 366 and 375. The costals are 29, 30, 31 and 32 anteriorly (two headslengths behind the head) 37, 39, 39, and 40 in mid-body, and 37, 38, 39 and 41 posteriorly (two headslengths

before the anus). There is one postocular on both sides in one example, one on one side in another. The temporal is single on both sides in one specimen, and on one side in two specimens. The body has complete black bands expanding into rhombs dorsally, and not connected ventrally.

Enhydrina valakadyn (Boie).

Two specimens from Soumiana (Las Bela) are quite typical.

Bungarus cæruleus (Schneider).

One typical example from Sharigh, which, as far as I am aware, extends the habitat of this species. The ventrals are 212 but the tail being imperfect the subcaudals cannot be counted.

Bungarus sindanus (Boulenger).

Two specimens from Fort Sandeman. The ventrals are 201 and 214, and the subcaudals 48 in both. I can find no previous mention of this species outside Sind.

The ventrals in these Baluchistan specimens are much lower than the range previously noted by me in my "Poisonous terrestrial snakes of our British Indian Dominions." Within the same week that I examined those specimens I received another from Fort Sandeman through the Secretary of the Bombay Natural History Society, and also details of four others killed this year in the same locality by Major C. H. Ward, of the 4th Rajputs. On revising my previous notes with these additional specimens I find the details noted by me in the above work require some modification. I find for instance that in all the specimens in which I have measured the relative breadth and length of the vertebrals they are as broad or broader than long, not longer than broad, as shown in the plate that accompanies Boulenger's description of one of the type specimens (Bombay Natural History Jour., Vol. XI. p. 73). Again I have stated that some of the terminal subcaudals are divided, and I find that this is very unusual; in fact, is only the case in one of the many specimens I have now seen.

The examination of these recently acquired specimens has broken down many of the distinguishing characters, which at first appeared to differentiate *walli* from *sindanus*, but in spite of this I still think that the two species are distinct. In *walli* the body is very distinctly compressed, but I have never seen any tendency towards compression in *sindanus*. Further the markings in *walli* are distinct, and it appears to be a larger snake than *sindanus*. The record of 14 specimens of *walli* I have examined is 5 feet 4½ inches, whilst that for the 17 specimens of *sindanus* referred to below is 4 feet 3 inches. Mr. Boulenger's quotation from Mr. Mountford that *sindanus* commonly reaches 6 feet is not borne out by these specimens, the details of which I append. The specimens recorded by Mr. Cholmondeley in this Journal (Vol. XVIII, p. 921), and which I considered *walli* (*vide* Vol. XIX, p. 268) must in the light of our increased knowledge I think be acknowledged to be *sindanus*. I await specimens of

both forms to convert into skull preparations which may throw further light on the subject.

| Costals. | | |

Naia tripudians (Merrem).

A single juvenile specimen from Duki. It is pale olive-brown with no suspicion of hood marks, and does not conform to the type of variety *oxiana* (Eichwald). The costals are in 19 rows anteriorly, 21 in midbody, and 13 posteriorly. The ventrals are 189, and the subcaudals 64.

Family.—VIPERIDÆ.

Vipera lebetina (Linné).

Two specimens from Ziarat and Kalat. The ventrals are 170 and 171 and the subcaudals 42 and 46. The costals two heads-lengths behind the head are respectively 22 and 23, in mid-body 23 and 25, and two heads-lengths before the anus 19 in both. They are quite typical.

Echis carinata (Schneider).

Several specimens from Sharigh, Duki, Robat, Hanna, and Quetta. They are all quite typical.

Eristocophis mcmahoni (Alcock and Finn).

One specimen from Kharan lands is quite typical. The costals two heads-lengths behind the head are 23, in mid-body 24, and two heads-lengths before the anus 17. The ventrals are 132, and the subcaudals 32, of which the 2nd to the 6th are entire.

A SECOND LIST OF MOSSES FROM WESTERN INDIA

BY

L. J. SEDGWICK, I. C. S.

The following list is a continuation of the "First List" published in this Journal for February 1910. As mentioned in that article some of the specimens collected by me at Mahableshwar and Panchgani in January and February 1909 had remained to be determined. Of these several proved to be new, and one small plant from a cave at Panchgani has resulted in the foundation of a new genus MERCEYOPSIS, closely allied to MERCEYA, but differing in the arrangement of the cells in the nerve of the leaf. To this new genus have been assigned the Panchgani moss, and six other species, some new, and some previously included under *Merceya* and other genera. A full account of the genus will be found in an article by Mr. H. N. Dixon, F.L.S., in the Journal of Botany for December 1910. In addition to this *Merceyopsis* Mr. Dixon has described in the same article four new species from Western India, all of which are included in the following list, and marked with an asterisk. This does not conclude the publication of the results of my Mahableshwar collection, a good deal of which, together with some specimens gathered recently at Purandhar Fort, remains to be treated of in a subsequent number of the Journal of Botany.

Since the "First List" was printed I have visited Purandhar Fort twice, and have also received from the Rev. Father Blatter, S.J., the names of a few mosses collected by him in this part of India. I have also, through the courtesy of Mr. W. Burns, B.Sc., Economic Botanist, had the pleasure of seeing a few specimens at Poona collected by Professor C. A. Gammie, mainly at a place named Sakar Pathar, near Lonavla. Dr. Gammie's specimens are mainly duplicates of the commoner species recorded in the "First List." Two, however, one a *Bryum* and the other apparently a *Pylaisia*, are new to me, and have been sent to England for identification.

As one recorded habitat after another comes to light it will gradually become possible to determine the approximate range and distribution of each species. But at present I do not regard the data as sufficient to attempt anything definite. It must be remem-

bered that the bryology of this part of India had been until quite recently untouched,—how completely so will be apparent when it is said that *Brachymenium turgidum* described for the first time in 1907, is so common that hardly a tree or Euphorbia bush in the ghats from Trimbak to Castle Rock is free of it, while *Hyophila subflaccida*, a new species mentioned below, seems likely to turn out to be the commonest of species, a denizen of every chunamed wall. Progress must necessarily be slow so long as collecting is confined to occasional holidays in the hills on the part of persons whose ordinary work confines them to the plains. What is wanted is a bryologist resident at some suitable place, say, Panchgani. A year's work in such a locality would be productive of literally hundreds of interesting species, many of which would be new.

A few of the species mentioned in the list were also recorded in the "First List," but are mentioned again in order to record a new habitat. I have not thought it worthwhile to do this in the case of the commoner and better known species.

Campylopus Goughii (Mitt), Jaeg.

c. fr., on rotten wood of trees, common, Mahableshwar, 1909, Sedgwick.

* *C. Sedgwickii*, Card. and Dix., spec. nov.

(described in J. of B. for Dec. 1910, p. 303) ster., on the ground in open places, common, Mahableshwar, 1909, Sedgwick.

Pilopogon Blumii (Dz. & Mb.), Broth.

ster., on earth banks, Purandhar, 1910, Sedgwick.

Octoblepharum albidum, Hedw.

on trees, Khandala, 1905, Blatter.

Fissidens zippelianus, Dz. & Mb.

c. fr., on a wall, Poona, 1910, Sedgwick.

* *F. Sedgwickii*, Broth. & Dix., spec. nov.

(described in J. of B., loc. cit., p. 305) ster., on the stones of the stream above Dhobi's waterfall, Mahableshwar, 1909, Sedgwick.

* *Calymperes tortelloides*, Broth. & Dix., spec. nov.

(described loc. cit., p. 306) c. fr., on trees, Mahableshwar, 1909, Sedgwick.

Hymenostomum edentulum (Mitt.), Besch.

c. fr., on banks, Purandhar, 1910, Sedgwick. (Very variable in robustness.)

Hymenostylium xanthocarpum (Hook), Brid.

c. fr., damp ground, Mahableshwar, 1907, Kirtikar; c. fr., on earth banks, Purandhar, 1910, Sedgwick.

Anœctangium stracheyanum, Mitt.
c. fr., on earth banks, Purandhar, 1910, Sedgwick.

* *Hyophila subflaccida*, Broth. & Dix., spec. nov.
(described in J. of Bot., loc. cit., p. 308) c. fr., on chunamed walls, Andheri, 1908, Kirtikar.

H. stenocarpa, Ren. & Card.
on a basalt rock, Khandala, Blatter.

Gymnostomillum vernicosum (Hcok), Fl.
(mentioned in the "First List" under the name of *Pottia vernicosa*, Hampe) on damp rocks, Vehar, 1905, Blatter.

* *Merceyopsis pellucida*, Broth. & Dix., gen. & spec. nov.
(described in J. of Bot., loc. cit., p. 301) on the roof of a cave, and under stone ledges, sterile, Panchgani, 1909, Sedgwick.

Didymodon rufescens (Hook), Broth.
ster., on stones, Purandhar, 1910, Sedgwick.

Barbula comosa, Dz. & Mb.
on rocks, Khandala, 1904, Blatter.

Brachymenium turgidum, Broth.
on trees, Khandala, 1904, Blatter, and on trees and Euphorbia bushes, abundant, Purandhar, 1910, Sedgwick. (I mention this moss again because it was first named *B. pectinidens* by M. Cardot from Father Blatter's specimen, and packets may possibly have been distributed under that name, which has however been withdrawn in favour of *B. turgidum*.)

Orthomnium subcrispum (C. M.), ined.
on a tree, ster., Mahableshwar, 1909, Sedgwick.

* *Stereophyllum Blatteri*, Card, spec. nov.
(not known whether yet described) on trees, Khandala, 1904, Blatter on trees, Matheran, Kirtikar.

S. ligulatum (C. M.), Jaeg.
on trees, c. fr., Mahableshwar and Panchgani, 1909, Purandhar, 1910, Sedgwick.

Pterobryopsis Walkeri, Broth.
Khandala, Blatter; Sakar Pathar, Lonavla, Gammie.

Macromitrium ellipticum, Hampe.
on trees, Khandala, 1905, Blatter.

Urocladium alopecuroides, Hook.
on trees, Khandala, Blatter.

Leucoloma sarchotrichum, C. M.
on trees, Khandala, 1905, Blatter.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES IV, PART II.

By

Sir George F. Hampson, Bart., F.Z.S., F.E.S.

(Continued from page 674 of this Volume.)

Genus Trachea. *Type.*

Trachea, Ochs. Schmett. Eur., iv, p. 75 (1816) non-descr.; Treit. Schmett. Eur. (5) 2, p. 65 (1825) .. .. *atriplicis.*

Phosphila, Hübn. Verz., p. 208. (1827) .. .. .. *turbulenta.*

Hama, Steph. Ill. Brit. Ent. Haust, iii, p. 4 (1829) .. *anceps.*

Berrhæa, Walk., xv, 1721 (1858) .. .. .. *aurigera.*

Chandata, Moore, Lep. Alk., p. 113 (1882) .. .. *partita.*

Epa, Beth-Baker. Nov. Zool., xiii, p. 192 (1906) .. .. *pratti.*

Achatia, Hübn. Tent. ined .. .. *atriplicis.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons, the 3rd short and blunt; frons smooth; eyes large, round; head and thorax clothed chiefly with scales, the vertex of head with ridge of scales, the pro- and meta-thorax with divided crests; tibiæ fringed with long hair; abdomen with dorsal series of crests. Forewing broad, the apex rounded, the termen crenulate; veins 3 and 5 from close to angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I (Chandata).—Antennæ of male bipectinate with long branches, the apex simple.

1760. Trachea partita.

Sect. II.—Antennæ of male bipectinate with short branches, the apex serrate.

1758. Trachea cyanelinea.

Sect. III.—Antennæ of male serrate and fasciculate.

A. Forewing with the subterminal line green; expanding into a patch on inner area .. .. *hastata.*

B. Forewing with the subterminal line not green.

a. Forewing reddish-brown, the orbicular and reniform confluent below .. .. .. *confluens.*

b. Forewing grey irrorated with fuscous and with patches of olive-green, the orbicular and reniform separate .. .. *stoliczæ.*

1681. TRACHEA HASTATA.

1753. TRACHEA CONFLUENS.

1731. TRACHEA STOLICZCÆ.

Sect. IV.—Antennæ of male with fasciculate male cilia.

1744. TRACHEA DISTORTA.

Sect. V.—Antennæ of male ciliated.

A. Hindwing of male with the upper part of cell short, the discocellulars oblique, veins 6-7 strongly stalked, their stalk curved upwards and thickened.

1739. TRACHEA STELLIFERA.

B. Hindwing of male with the neuration normal.

a. Forewing of male with the disk clothed with silky downturned hair on underside.

1712*a*. TRACHEA DISTANS, Moore, Lep. Alk., p. 130 (1882).

Head and thorax rufous mixed with some black; palpi black above; tegulæ with slight dark medial line; tarsi blackish ringed with rufous; abdomen pale rufous irrorated with fuscous. Forewing bright rufous irrorated with black, the basal half slightly suffused with fuscous except inner area; subbasal line double, black, waved, from costa to vein 1; antemedial line indistinct, double, waved, bent inwards as a black streak above inner margin; claviform quadrate, defined by black and extending to median nervure, orbicular round, defined by black and with slight whitish annulus; reniform more or less completely filled in with white, with strong black bar on inner side, otherwise slightly defined and with irregular outer edge; a medial black striga from costa; postmedial line double, bent outwards below costa, then waved, oblique to vein 3 near subterminal line then incurved, some pale points beyond it on costa; subterminal line represented by a series of small dentate whitish marks, defined on inner side at middle by small dentate black marks, angled outwards at vein 7 and excurved at middle; a terminal series of small black lunules. Hindwing pale rufous tinged with fuscous brown; a terminal series of black lunules; the underside pale rufous, slightly irrorated with fuscous, a small discoidal spot, slight waved postmedial line and diffused subterminal band.

Habitat.—ASSAM, Khâsis; SINGAPORE; BORNEO. *Exp.* ♂ 34, ♀ 40 mill.

b. Abdomen of male clothed with ferruginous scales except at extremity above; underside of both wings clothed with ferruginous scales to submedian fold and postmedial line.

1712. TRACHEA INDISTANS.

c. Wings of male normal.

*a*¹. Forewing with more or less olive or bright green mixed.

*a*². Forewing with the subterminal line dentate at veins 4-3-2.

a^2. Forewing with white striga or small spot beyond extremity of claviform.

a^1. Forewing with white apical patch.

a^2. Forewing olive-green mixed with some yellow .. .. *albidisca*.

b^2. Forewing rufous slightly tinged with olive and mixed with yellow .. .. *aurantiaca*.

b^1. Forewing without white apical patch.

a^2. Forewing with the orbicular defined at sides by white.

a^3. Forewing with the postmedial line strongly incurved and dentate below vein 4 .. .. *auroviridis*.

b^3. Forewing with the postmedial line much less incurved and dentate below vein 4 .. .. .. *chrysochlora*.

b^2. Forewing with the orbicular large, olive-green, conjoined to the reniform.

a^3. Forewing without terminal series of black lunules .. .. .. *albinota*.

b^3. Forewing with terminal series of black lunules .. .. *olivacea*.

b^2. Forewing with triangular olive-green patch beyond the claviform.

a^1. Forewing without terminal series of black points .. .. *venosa*.

b^1. Forewing with terminal series of black points. *literata*.

c^2. Forewing without white or pale patch beyond the claviform.

a^1. Forewing with the reniform white .. .. *monilis*.

b^1. Forewing with the reniform green .. .. *atrovirens*.

b^2. Forewing with the subterminal line dentate at veins 4-3 .. .. *aurigera*.

c^2. Forewing with the subterminal line excurved at middle but not dentate.

a^3. Forewing with white or pale mark beyond the claviform.

a^4. Forewing with oblique white striga beyond the claviform .. .. *microspila*.

b^4. Forewing with wedge-shaped white spot beyond the claviform .. .. *melanospila*.

c^4. Forewing with oblique pale bidentate patch beyond orbicular and claviform .. .. *auriplena*.

b^3. Forewing without pale mark beyond the claviform .. .. *chlorogrammata*.

b^1. Forewing without olive or bright green mixed.

a^2. Forewing with the reniform not wholly filled in with white.

a^3. Forewing with the postmedial line oblique from below costa to vein 3 near subterminal line.

a^4. Forewing almost entirely suffused with black .. .. *opposita*.

b^4. Forewing red-brown with slight fuscous suffusion .. .. *consummata*.

c^4. Forewing red-brown suffused with purplish grey .. .. *siderifera*.

d^4. Forewing grey-brown without rufous tinge .. .. *connivens*.

b^3. Forewing with the postmedial line excurved or straight from below costa to vein 4, and not approximated to the subterminal line.

a^4. Forewing with the postmedial line minutely dentate below vein 4.

a^5. Forewing with the ante- and postmedial areas concolorous .. .. .. *niviplaga*.

b^5. Forewing with the ante- and postmedial areas grey-white except towards costa *fasciata*.

b^4. Forewing with the postmedial line evenly curved below vein 4 .. .. .. *secalis*.

b^2. Forewing with the reniform wholly filled in with white .. .. *ascoldis*.

1735*a*. TRACHEA ALBIDISCA.

Hadena albidisca, Moore, P. Z. S., 1867, p. 59, pl. 6, f. 17.

Dianthœcia nivescens, Butl., Ill. Het. B. M., vii, p. 58, pl. 128 f. 2 (1889).

Head and thorax olive-green with a few white scales; palpi whitish, black at sides; sides of frons black; pectus and legs ochreous and whitish; the tarsi banded with black; abdomen brownish, the dorsal crests and anal tuft rufous. Forewing golden olive-green with a bluish tinge before the antemedial line and on veins of medial area; subbasal line white, defined on each side by black, angled inwards in cell and ending at vein 1; a black mark above inner margin before the antemedial line, which is black defined by white on inner side, oblique, angled inwards in cell, on vein 1, and to inner margin, the area beyond it suffused with

dark brown in and beyond the cell and below the cell and vein 2 to postmedial line; a small triangular white mark from vein 2 marking the extremity of claviform; orbicular blackish defined by some black scales and with slight white spot or bar on its outer edge, open below; a small elliptical white spot in cell before the reniform, which is represented by a diffused white patch extending to vein 2; postmedial line black defined on outer side by white, strongly bent outwards below costa, then dentate and produced to black and white points on the veins, oblique below vein 4 and incurved at vein 2, the costa beyond it black with white points on it; subterminal line white defined on inner side by black marks below costa, then on outer side, dentate and diffused at veins 7, 6; dentate at veins 4, 3, 2, and bent outwards to tornus; a terminal series of small black lunules slightly defined by white on inner side; cilia with a series of black points at tips. Hindwing pale uniformly suffused with fuscous brown, the cilia green mixed with brown towards apex; the underside white irrorated with brown, a black discoidal lunule, curved maculate postmedial line, and diffused subterminal band.

Habitat.—W. China; Punjab, Simla, Dharmsâla; Sikhim; Assam, Khâsis, Chittagong; Madras, Nilgiris; Travancore, Pirmâd. *Exp.* 32-36 mill.

1738. Trachea aurantiaca.

1735. Trachea auroviridis.

1735*b*. Trachea chrysochlora, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 143, pl. III, f. 10 (1908).

Head and thorax olive-green slightly mixed with whitish and black, palpi whitish, blackish at sides except 3rd joint; sides of frons blackish; patagia rufous at tips; pectus and legs rufous mixed with some fuscous, the tibiæ and tarsi banded with black; abdomen fuscous brown, the dorsal crests and anal tuft rufous. Forewing olive-green tinged with rufous; the subbasal line represented by white striæ from costa and cell defined on each side by black; a black patch above inner margin before the antemedial line, which is double, black filled in with white, oblique angled inwards in cell and on vein 1, and bent inwards to inner margin, the area beyond it in and beyond cell and below the cell and vein 2 to postmedial line suffused with black; a small whitish tooth from near base of vein 2 representing the extremity of claviform; the orbicular conical, rufous defined by a few black scales and with white bar on its outer edge, open below; a slight white lunule concave towards base in cell before the reniform which is small, green, its lower part suffused with purple-grey and white scales; postmedial line black defined by white on outer side, strongly bent outwards below costa, then dentate and produced to black and white streaks on the veins, oblique from vein 5 to 2, then angled outwards again, the costa beyond it black with white

points on it; subterminal line whitish, defined on inner side by black towards costa, then on outer side, angled outwards at veins 7, 6, 4, 3, 2, and bent outwards to tornus; a terminal series of small black lunules defined on innerside by whitish; cilia with a series of black points at tips. Hindwing pale, wholly suffused with fuscous brown; cilia olive-green mixed with brown towards tips; the underside whitish irrorated with brown: a black discoidal lunule, curved postmedial line and indistinct diffused subterminal band.

Habitat.—Punjab, Dharmsála. *Exp.* 34 mill.

1734. Trachea albinota.

1733*a*. Trachea olivacea.

Berrhæa olivacea, Moore., P. Z. S., 1881, p. 357. Hmpsn., Cat. Lep. Phal. B. M., vii, p. 144, pl. III, f. 12.

Head and thorax olive-green mixed with red-brown, some of the hairs tipped with white; palpi brown; frons with lateral brown bars; pectus legs and abdomen dark brown; fore tibiæ fringed with green hair, the tarsi with pale rings. Forewing olive-green suffused with reddish brown except on basal and terminal areas, the medial area rather darker, the veins with slight dark streaks irrorated with bluish white; subbasal line represented by double black striæ from costa and cell filled in with green; antemedial line indistinctly double, waved, oblique, angled inwards on vein 1; claviform absent; an oblique greenish-white spot below base of vein 2; orbicular and reniform pale green irrorated with brown and defined by black except below where they are conjoined by a green fascia in and below cell; and indistinct waved medial line; postmedial line slightly defined by greyish on outer side, strongly bent outwards below costa, then minutely dentate, oblique below vein 4, some white points beyond it on costa; subterminal line green, slightly angled outwards at vein 7 and dentate at veins 4, 3, 2, 1, a blackish patch beyond it at discal fold; a terminal series of small black lunules. Hindwing dark reddish brown, the basal inner area rather paler; cilia grey at base and tips; the underside whitish, the costal and terminal areas irrorated and suffused with brown, a discoidal spot, curved postmedial line and diffused subterminal band.

Habitat.—Sikhim. *Exp.* 36-48 mill.

1752. Trachea venosa.

1736. Trachea literata.

1835. Trachea monilis.

Hattia monilis, Moore, P. Z. S., 1881, p. 348, pl. 38, f. 11.

Eurois chalcochlora, Hmpsn., Moths Ind., iv., p. 510 (1896); id. Cat. Lep. Phal. B. M., vii., p. 146, pl. III, f. 15.

1750. Trachea atroviréns.

1733. TRACHEA AURIGERA.

Berrhæa aurigera, Wlk., XV, 1721 (1858); Hmpsn., Cat. Lep. Phal. B. M., vii, p. 148, pl. III, f. 18.

Hadena megastigma, Wlk., XXXIII, 738 (1865).

1735c. TRACHEA MICROSPILA, Hmpsn., Cat Lep. Phal. B. M., vii, p. 149, pl. III, f. 19 (1908).

Head and thorax fuscous brown mixed with some white and black scales and with patches of olive-green on vertex of head, tegulæ, patagia and metathorax; pectus and legs brown irrorated with white, the tarsi with pale rings; abdomen brown irrorated with grey. Forewing grey-brown irrorated with black and some white, the medial area suffused with olive-green: the basal area with patches of green below costa and cell and above inner margin; subbasal line waved, from costa to a slight black spot above vein 1; antemedial line oblique, waved; traces of a claviform defined by black with small oblique white spot beyond its extremity; orbicular and reniform green slightly defined by black and with more or less brown in centres, the former rather elliptical, the latter large, irregular, constricted at middle; a slight waved medial line, oblique from costa to vein 2, then inwardly oblique; postmedial line double at costa, strongly bent outwards below costa, then dentate, very oblique below vein 4, some white points beyond it on costa; subterminal line green, defined on each side by slight black marks and with more or less green suffusion before and beyond it, angled outwards at vein 7, excurved at middle and sharply angled inwards at submedian fold; a terminal series of small black lunules; cilia grey mixed with brown and black. Hindwing with the basal half yellowish-white, the terminal half fuscous, the inner area tinged with brown; cilia whitish with a dark line through them; the underside white, the costal and terminal areas irrorated with brown, a black discoidal spot and curved minutely waved postmedial line with dark band beyond it.

Habitat.—W. CHINA; PUNJAB, Kulu, Sultanpur, Dalhousie, Dharmsála. *Exp.* 50-58 mill.

1732. TRACHEA MELANOSPILA.

Trachea melanospila, Koll., Hügel's Kashmir, IV, p. 480 (1844); Hmpsn., Cat. Lep. Phal. B. M., vii, p. 149, pl. III, f. 20.

Hadena kosakka, Obuth, Et. Ent., V., p. 80, pl. 7, f. 4 (1880).

1732*a*. TRACHEA AURIPLENA.

Trachea atriplicis, Koll., Hügel's Kashmir, IV, p. 479 (nec. Linn.).

Eurois auriplena, Wlk., XI, 557 (1857); Moore, Lep. Ceyl. III, p. 37, pl. 148, f. 2.

Hadena lucia,, Butt., A. M. N. H. (5) 1, p. 195 (1878); *id.* Ill. Het. B. M. III, p. 17, pl. 45, f. 2; Stand., Cat. Lep. Phal., p. 184.

Head and tegulæ olive-green mixed with dark-brown, the latter with some white scales; palpi and lower part of frons dark and pale-brown

thorax fuscous mixed with red-brown and white, the patagia with green fascia; fore tibiæ brown mixed with green, the tarsi with pale rings; abdomen grey-brown, the dorsal crests and anal tuft tinged with rufous. Forewing olive-green irrorated with black, the veins and postmedial area purplish-grey, the costa black; subbasal line waved, from costa to a black and white spot above vein 1; antemedial line defined on innerside by purplish-grey, oblique, minutely waved; claviform absent; orbicular and reniform with black, irrorated brown centres and green annlee, the former elliptical, the latter large, constricted at middle, an oblique purplish-white patch between them from subcostal nervure to submedian fold; postmedial line double at costa, strongly bent outwards below costa, then dentate, oblique below vein 4, some white points beyond it on costa; subterminal line green, expanding into a band on innerside below vein 3 and with green streaks from it to termen between veins 7 and 2, angled outwards at vein 7, excurved at middle and strongly incurved in submedian inter space; a terminal series of small black lunules; cilia green mixed with black. Hindwing with the basal half yellowish-white, the terminal half fuscous, the inner area suffused with brown; cilia yellowish-white with a brown line through them; the underside with the costal area irrorated with black, a discoidal spot and sometimes a streak in cell, the termen grey.

*ab.*1. *lucia*, Hindwing with the basal area more or less tinged with brown.

Habitat.—Japan; Corea; W. China; Kashmir, Scinde Valley; Punjab, Kulu, Sultanpur, Dharmsála, Hurripur; Sikhim; Madras, Nilgiris; Travancore, Pirmád; Ceylon. *Exp.* 48-54 mill.

1734*b*. Trachea chlorogrammata.

1716. Trachea opposita.

1713*a*. Trachea consummata.

Hadena consummata, Wlk., XI., 591 (1857).

,, *confundens*, Wlk., XI., 757 (1857); Moore, Lep. Ceyl., III, p. 38, pl. 148, f. 3.

Mamestra thoracica, Wlk., XV, 1684 (1858).

Hadena inextricata, Wlk., XV, 1729 (1858).

Apamea neurostigma, Snell. Tijd. O. Ent. XXIII, p. 46, pl. 4, f. 4, (1880).

Hadena tulipifera, Saalm. Lep. Madag., p. 321, pl. xi, f. 195, (1891).

Head and thorax bright rufous with some black and whitish scales; palpi black above; frons with lateral black bars; tarsi black ringed with rufous; abdomen rufous. Forewing bright rufous slightly suffused with brown and irrorated with black; subbasal line double, waved, from costa to submedian fold; antemedial line double, waved, oblique towards inner margin;

claviform quadrate, defined by black below and at extremity; orbicular and reniform slightly defined by black, the former oblique elliptical, the latter irregular and with some whitish points on outer edge; a medial blackish striga from costa; postmedial line double, bent outwards below costa, then waved, oblique to vein 3 near subterminal line, then incurved, some pale points beyond it on costa; subterminal line represented by a series of small ochreous spots with minute dentate dark marks before them at middle, slightly angled outwards at vein 7; a terminal series of small black lunules; cilia rufous with a punctiform yellowish line at base. Hindwing whitish suffused with red-brown except basal half of costal area; a fine waved black terminal line; cilia whitish tinged with rufous. Underside of forewing whitish tinged with brown except on inner area, the costal area rufous, a dark postmedial line angled outwards below costa and at middle, and diffused subterminal band; hindwing whitish, the costal area suffused with rufous, a black discoidal lunule, irregularly crenulate postmedial line, diffused subterminal band, and terminal series of black lunules.

*ab.*1. Hindwing entirely suffused with fuscous brown; underside of forewing suffused with fuscous leaving the costal area rufous to postmedial line.

*ab.*2. Hindwing of male with the basal half much whiter and with dark postmedial line.

*ab.*3. Forewing without white points on outer edge of reniform.

*ab.*4. Forewing with prominent white spot on outer edge of reniform.

*ab.*5. Forewing with reddish spot on outer edge of reniform.

Habitat.—Br. E. Africa; Transvaal; Natal; Madagascar; Mauritius; Aden; C. China; Punjab, Dharmsàla; Bengal, Barrackpur; Bombay; Madras, Gooty, Nilgiris; Ceylon, Pundaloya, Trincomali; Java; Celebes; Queensland. *Exp.* 38-42 mill.

Larva.—Brownish grey, the 4th and 11th somites humped; subdorsal vesicular black marks on 4th and 5th somites; an irregular dorsal and lateral black band on 4th somite and dorsal patch on 12th somite; stigmata black.

1713*b*. Trachea siderifera.

Hadena siderifera, Moore, P. Z. S., 1881, p. 357; Hmpsn., Cat. Lep. Phal. B. M., vii., p. 202, pl. 113, f. 15.

Head and thorax dark purplish brown with a few white and black scales; palpi blackish above; frons with lateral black bars; tegulæ with traces of dark medial line; tarsi black ringed with rufous; abdomen dark purplish brown. Forewing dark purplish brown; subbasal line double, black, waved, from costa to submedian fold; antemedial line double, black, waved, oblique; claviform large, quadrate, defined by black on outer side and below; orbicular defined by black, oblique elliptical; reniform defined by black on inner side and below, with white spot on outer edge with white points above

and below it; a waved black medial line, oblique from costa to below cell: postmedial line double, bent outwards below costa, then waved, oblique to vein 3 near subterminal line, then incurved, with slight white points on it at the veins and with pale points beyond it on costa; subterminal line indistinct, ochreous, defined on inner side at middle by small dentate black marks and with small black spots on outer edge, somewhat angled outwards at veins 7·6·4·3; a terminal series of black points; cilia with minute black points at base followed by a dark line. Hindwing deep fuscous brown, the cilia rufous; the underside greyish tinged with rufous and irrorated with brown, a black discoidal spot, sinuous postmedial line and diffused subterminal band.

Habitat.—W. China; Punjab, Kulu, Sultanpur, Simla, Dharmsàla; Sikhim. *Exp*. 44-50 mill.

1713 *a*. Trachea connivens.

Apemea connivens, Feld, Reis. Nov. pl. 109, f. 27 (1874).

Agrotis quadrisigna, Moore, P. Z. S., 1881., p. 350.

„ *placida*, Moore, Lep. Atk., p. 117., pl. 4, f. 19 (1882).

Head and thorax pale brownish grey slightly irrorated with fuscous; palpi blackish above, tegulæ with basal black points at middle and sides; tarsi black with pale rings; abdomen pale brownish grey. Forewing pale brownish grey slightly irrorated with fuscous; subbasal line double, black, waved, from costa to submedian fold; antemedial line double, waved, oblique; claviform short and broad, defined by black except above; orbicular incompletely defined by black, somewhat elliptical; reniform with black bar on inner side and pale rufous or grey spot on outer with slight white points above and below it, otherwise undefined; a waved medial dark line, oblique from costa to submedian fold; postmedial line indistinctly double, slightly bent outward below costa, then waved, oblique to vein 3 near subterminal line, then incurved; subterminal line represented by a series of small pale rufous dentate marks, defined on inner side at middle by small dentate black marks and on outer side by black points, somewhat angled outwards at vein 7; a terminal series of black points; cilia with pale rufous line at base. Hindwing whitish tinged with fuscous especially on terminal area; cilia yellowish white; the underside white, the costal area slightly irrorated with brown, a slight discoidal lunule and traces of postmedial and subterminal lines on costal half.

Habitat.—Natal; Cape Colony; Kashmir; Punjab, Kulu, Sultanpur, Simla, Dharmsàla, Dehra Dhun; Bengal, Calcutta. *Exp*. 36-48 mill.

1713. Trachea niveiplaga.

Hadena niveiplaga, Wlk. xi., 593 (1857).

Mamestra terranea, Butl. Ill. Het. B. M. vii., p. 53, pl. 127, f. 10 (1889).

Bombycia hodita, Swinh. A. M. N. H. (6) xv., p. 6 (1895).

1717 *d.* TRACHEA FASCIATA.

1720. TRACHEA SECALIS.

Noctua secalis, Linn. Syst. Nat. Ed. x., p. 519 (1758): Schiff. Wein. Verz., p. 78 (1776), Bjerkander, Vet. Atk. Handl. xxxix., p. 290 (1778); Staud. Cat. Lep. pal. p. 175.

„ *oculea*, Linn. Faun. Succ., p. 321 (1761); Steph. Ill. Brit. Ent. Haust. iii., p. 9; Bell. Ann. Soc. Ent. Fr. 1858, p. 704, pl. 14, f. 3.

„ *nictitans*, Esp. Schmett. iv., pl. 126, f. 7 (1788); nec Linn; Hübn. Eur. Schmett. Noct. ff. 97. 619-620.

„ *didyma*, Esp. Schmett. iv., pl. 126, f. 7 (1788). Dup. Lep. Fr. vi., p. 443, pl. 100, ff. 5·6; Frr. Neue Beitr. v., pl. 443, f. 2: Steph. Ill. Brit. Ent. Haust. iii., p. 8.

„ *lamda*, View. Tab. Verz. ii., p. 81 (1789).

„ *leucostigma*, Esp. Schmett. iv., pl. 159, f. 7 (1791).

Noctua lancea, Esp. Schmett. iv., pl. 174, f. 5 (1791).

„ *secalina*, Hübn., Eur. Schmett. Noct. f. 420 (1808).

„ *rava*, Haw., Lep. Brit., pp. 137-209 (1809).

„ *furca*, Haw. Lep. Brit. p. 209 (1809): Steph. Ill. Brit. Ent. Haust. iii., p. 10.

„ *l-niger*, Haw., Lep. Brit. p. 211 (1809); Steph. Ill. Brit. Ent. Haust. iii., p. 10.

„ *lugens*, Haw. Lep. Brit p. 212 (1809).

Parastichtis vilis, Hübn. Verz., p. 213 (1827). *c*;

Apamea moderata, Ev. Bull. Mosc. 1843, iii., p. 547 and 1856, iii., p. 56.

Hadena struvei, Ragusa, Nat. Sicil. iv., p. 274, pl. IV., f. 7 (1885).

1717 *e.* TRACHEA ASCOLDIS.

Genus PARATRACHEA.

Type.

Paratrachea, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 216 (1908) .. .. *lacles.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head, the 3rd moderate or long and porrect; frons smooth; eyes large, round; antennæ ciliated; head and thorax clothed with hair and hair-like scales, the pro- and metathorax with divided crests; tibiæ fringed with hair; abdomen with series of dorsal crests and some rough hair at base. Forewing rather narrow, the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of

discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1730. PARATRACHEA-CHALYBEATA.

Nœnia chalybeata, Moore, P. Z. S. 1867, p. 64, Hmpsn. Cat. Lep. Phal. B. M. vii., p. 217, pl. 113, f. 25.

Hadena spectabilis, Pouj. Bull. Soc. Ent. Fr. 1887, p. cx.

Genus EUPLEXIA.	*Type.*
Euplexia, Steph., Ill. Brit. Ent. Haust., III, p. 6 (1829) ..	*lucipara.*
Karana, Moore, Lep., Atk., p. 106 (1882)	*decorata.*
Yula, Beth., Baker., Nov. Zool. XIII, p. 393 (1906) ..	*novæguineæ.*

Sect. I. Antennæ of male bipectinate with moderate branches, the apex simple.

A. Forewing with the antemedial band strongly angled outwards below median nervure .. .. *sinuata.*

B. Forewing with the antemedial band not angled outwards below median nervure .. .. .. *pectinata.*

1743*a*. EUPLEXIA SINUATA.

Euplexia sinuata, Moore, Lep. Atk., p. 125, pl. 4, f. 25 (1882).

♂.. Head and thorax purplish-black; antennæ with tufts of white hair from basal joint; tarsi ringed with white; abdomen fuscous, whitish at base. Forewing purplish fuscous, the basal area with some rufous below the cell; subbasal line represented by a whitish striga from costa and hoop-shaped mark on a black patch below the cell confluent with another black mark on inner margin; a white antemedial band tinged with brown towards costa, strongly angled outwards below the cell and above inner margin and inwards wi[illegible] vein 1; orbicular quadrate, defined slightly by white at sides only and th black before it in cell and between it and reniform, which is fuscous [illegible]ined by whitish and with some whitish in centre, angled inwards on [illegible]ian nervure to the orbicular; the medial area below the cell black, [illegible]fous at inner margin; the postmedial area whitish tinged with rufous and ale brown; the postmedial line obsolescent and defined by white on outer ide, obliquely bent outwards from below costa to vein 6, below vein 5 incurved to lower angle of cell, then oblique, slightly angled outwards at vein 2 and to inner margin, the costa beyond it black with white points; subterminal line indistinct, pale, slightly waved, defined on inner side by black from below costa to submedian fold, the area beyond it purplish fuscous to vein 4, then greyish; cilia black with brownish line at base. Hindwing whitish tinged with fuscous, the costal and terminal areas broadly suffused with fuscous; indistinct postmedial and subterminal lines defined on outer side by whitish below vein 3 and with some blackish before them at vein 2; cilia blackish with a fine white line at base, pale towards tornus; the underside white, the costal and terminal areas irrorated with fuscous, a small discoidal lunule and diffused postmedial and subterminal lines.

Habitat.—Sikhim. *Exp.* 34 mill.

1759. Euplexia pectinata.

Sect. II. Antennæ of male ciliated.

A. Forewing ochreous white with the terminal area leaden grey. .. .. *plumbeomarginata.*

B. Forewing not ochreous white with the terminal area leaden grey.

a. Forewing with white band before the antemedial line.

a^1. Forewing with the antemedial white band angled inwards in submedian fold.

a^2. Forewing without purplish band from costa before the reniform .. .. *albovittata.*

b^2. Forewing with purplish band from costa before the reniform .. .. *fasciata.*

b^1. Forewing with the antemedial band not angled inwards in submedian fold.

a^2. Forewing suffused with silvery metallic green and golden bronze.

a^3. Hindwing wholly suffused with fuscous brown. *decorata.*

b^3. Hindwing white, the terminal area suffused with brown .. .. *gemmifera.*

b^2. Forewing not suffused with silvery metallic green and golden bronze

a^3. Forewing with the claviform with white annulus defined by black .. .. *calamistrata*

b^3. Forewing with the claviform represented by a black point .. .. *chlorerythra*

b. Forewing without white band before the antemedial line.

a^1. Forewing with pale patch on reniform.

a^2. Forewing with the inner margin pale green on medial area.

a^3. Forewing with oblique brown line between veins 7 and 4 beyond the postmedial line which is excurved well beyond the reniform .. .. *discisignata.*

b^3. Forewing without oblique brown line between veins 7 and 4 beyond the postmedial line which is closely approximated to the reniform .. *striatovirens.*

b^2. Forewing with the inner margin not green on medial area.

a^3. Forewing with the postmedial area paler than the terminal area.

a^4. Forewing with the postmedial line formed by three ochreous lines .. .. .. *plumbeola.*

b^4. Forewing with the postmedial line not formed by three ochreous lines.

a^5. Forewing with the postmedial area greyish or purplish without rufous tinge.

a^6. Forewing with the postmedial line not angled outwards at vein 2 .. .. *albonota*.

b^6. Forewing with the postmedial line angled outwards at vein 2 .. .. .. *poliochroa*.

b^5. Forewing with the postmedial area strongly suffused with rufous .. .. *semifascia*.

b^5. Forewing with the postmedial and terminal areas concolorous .. .. *melanistis*.

Forewing without pale patch on reniform.

a^2. Forewing with small white lunule on outer edge of reniform.

a^3. Forewing red-brown largely mixed with grey...*magnielavis*.

b^3. Forewing dark brown with a purplish grey gloss.

a^4. Forewing with the orbicular and reniform not connected by a fascia on median nervure .. .. *metallica*.

b^4. Forewing with the orbicular and reniform connected by a fascia on median nervure...*harfordi*.

b^2. Forewing without white lunule on outer edge of reniform .. .. *erythriris*.

1743*a*. EUPLEXIA PLUMBEOMARGINATA.

1743. EUPLEXIA ALBOVITTATA.

1743*b*. EUPLEXIA FASCIATA.

Euplexia fasciata, Hmpsn., Ill. Het., B. M. viii, p. 77 pl., 145, f. 20 (1891).

♀. Head and thorax black mixed with some white; antennæ ringed with white and with tufts of white hair from basal-joint; tibiæ and tarsi ringed with white; abdomen fuscous, the ventral surface black irrorated with white. Forewing purplish fuscous; some pinkish at base and below costa near base; a black spot above vein 1 before the antemedial band, defined on inner side by a white striga representing the subbasal line, and above by a white fascia connected with the white antemedial band from subcostal nervure to inner margin, angled inwards on median nervure and above inner margin; orbicular quadrate, fuscous defined by white at sides only and with black before and beyond it in cell; reniform white with slight fuscous spot in upper part, confluent below with the white postmedial area and emitting a slight white streak on median nervure to the orbicular; the medial area black below the cell and pale reddish at inner

margin; a purplish fuscous band beyond the reniform, the area beyond it white to the subterminal line, below vein 4 bent inwards to lower edge of reniform; postmedial line very indistinct, formed of black scales bent outwards below costa, then double, minutely waved, below vein 4 bent inwards to lower angle of cell, then oblique, the costa beyond it black with some white points; subterminal line slight, white defined on inner side by black between veins 7 and 2, waved, more strongly below vein 4, the area beyond it purplish fuscous on apical half, pale brownish on inner half; a terminal series of slight black lunules; cilia white at base, black at tips. Hindwing fuscous black, some whitish at base, a small postmedial white spot on vein 2 with some black on each side of it and a wedge-shaped white patch on termen from above vein 2 to vein 1; cilia white at base, black at tips, the underside black-brown irrorated with white, some white below the cell, a white discoidal spot and traces of diffused black postmedial and subterminal lines.

Habitat.—Madras, Nilgiris. *Exp.* 42, mill.

1743c. Euplexia decorata.

Karana decorata, Moore, Lep. Atk, p. 107 (1882); Hmpsn. Cat. Lep. Phal. B. M. vii, p. 228, pl. 113, f. 30.

Head white mixed with black; palpi black with some white in front and at tips; antennæ black; thorax black-brown mixed with red-brown and white, the patagia with curved golden-green marks; pectus and legs black-brown irrorated with white, the tibiæ with some rufous hair above, the tarsi ringed with white; abdomen black-brown irrorated with white, the crests red-brown. Forewing black irrorated with white and with patches and streaks of golden-green, the veins purplish grey, the medial area with reddish streaks below subcostal nervure and vein 7, on median nervure and between veins 4 and 2, and above vein 1; a silvery white subbasal band, from costa to vein 1, expanding into slight streaks in and below cell; a white antemedial band, nearly straight from costa to above inner margin, then bent inwards, emitting an oblique streak on inner side above vein 1 claviform represented by a white lunule on a black patch: orbicular a small round white spot defined by black; reniform white with two small round black spots in its upper part, its brown edge excised, a white spot above it on costa; an indistinct medial line, oblique from costa to lower angle of cell, then inwardly oblique; postmedial line indistinct, strongly bent outwards below costa, then dentate, incurved below vein 7 and oblique below vein 4, some white points beyond it on costa; subterminal line very indistinct, formed of yellowish white striæ and small spots below veins 7 and 5 with obscure blackish spots on their inner side; a terminal series of small black spots; cilia black and white with fine white line at base. Hindwing black-brown with indistinct sinuous postmedial line, some white on termen below vein 2; cilia brown and white with white patch at

sub-median interspace; the underside black-brown thickly irrorated with white, the inner area slightly whitish, a black discoidal spot defined by white, diffused crenulate postmedial line, and traces of subterminal line.

Habitat.—Sikhim. *Exp.* 40-46 mill.

1742. Euplexia gemmifera.

Plusia gemmifera, Wlk. xii. 934 (1857).

Karana similis, Moore, P. Z. S., 1888, p. 407; Butl. Ill. Het. B. M. vii., p. 60, pl. 128, f. 8.

1737. Euplexia calamistrata.

1741*a*. Euplexia chlorerythra.

1728. Euplexia discisignata.

1728*a*. Euplexia striatovirens.

Euplexia striatovirens, Moore, P. Z. S., 1867, p. 58; Hmpsn., Cat. Lep. Phal. B. M. vii., p. 233, pl. 114, f. 1.

Head and thorax purplish fuscous slightly mixed with grey, the metathoracic crest whitish; tarsi with slight pale rings; abdomen whitish suffused with brown. Forewing purple-brown; subbasal line black defined on each side by green, waved, from costa to vein 1; antemedial line defined by green on inner side, angled outwards below costa, then curved; medial area with the cell and area below it to submedian fold dark brown, the inner area green irrorated with brown; claviform and orbicular purplish fuscous slightly defined by grey and black, both confluent with a similar spot below the cell; reniform white, defined by black on inner side only, its centre defined by dark brown spots, rather oblique elliptical, the area beyond it greenish to the postmedial line which is double filled in with greenish, slightly bent outwards below costa to just beyond the cell, incurved at anal fold, incurved and sinuous below vein 4; subterminal line slight, greenish, slightly defined on each side by blackish, somewhat excurved below vein 7 and at middle; cilia with a fine pale line at base. Hindwing whitish suffused with fuscous brown except the inner area, in female wholly suffused; traces of a sinuous postmedial line with a blackish and white striga at vein 2; a white subterminal line from above vein 2 to tornus; cilia with a fine pale line at base; the underside white, the costal area suffused with brown, a small discoidal spot and indistinct postmedial and subterminal lines.

Habitat.—Sikhim. *Exp.* 32-34 mill.

1741. Euplexia plumbeola.

1729. Euplexia albonota.

1729*a*. Euplexia poliochroa.

Euplexia poliochroa, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 237, pl. 114, f. 5 (1908).

♀. Head and thorax grey mixed with reddish brown; tegulæ with ochreous patches; tarsi blackish with whitish rings; abdomen grey mixed

with brown. Forewing violaceous grey tinged with brown, the medial area, suffused with brown except towards costa : subbasal line double, black angled outwards on median nervure, from costa to vein 1, and with slight streak beyond it in submedian fold ; antemedial line indistinctly treble, curved and somewhat waved ; claviform minute, defined by black ; orbicular grey defined by black at sides only, oblique elliptical ; reniform grey with some whitish at centre and whitish annulus defined by black on inner side only ; postmedial line double at costa, bent outwards below costa, then treble, oblique below vein 4 and angled outwards at vein 2 ; subterminal line indistinct, greyish, slightly defined on each side by fuscous brown and very minutely dentate ; a terminal series of slight dark lunules ; cilia with a fine white line at base. Hindwing grey suffused with brown ; traces of a minutely waved dark postmedial line defined by whitish on outer side ; a fine white line at base of cilia ; the underside whitish tinged and irrorated with brown, a black discoidal spot, sinuous postmedial line and traces of subterminal line.

Habitat.—Madras, Nilgiris. *Exp.* 34 mill.

1726. Euplexia semifascia.

1726*a*. Euplexia melanistis.

Euplexia melanistis, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 243, pl. 114, f. 9 (1908).

Head and thorax black, the scales tipped with grey ; tarsi ringed with white ; abdomen black-brown mixed with grey. Forewing black-brown tinged with purple and irrorated with white ; subbasal line represented by double black strie from costa and cell and one in cell ; antemedial line indistinct, double, oblique, slightly waved ; claviform slightly defined by black ; orbicular rounded, defined by black except above, and connected with a spot below the cell ; reniform rather narrow and slightly produced at upper extremity slightly defined by white and with pale yellow marks at middle on inner and outer sides ; postmedial line indistinct, double at costa, bent outwards below costa, at vein 4 bent inwards and obliquely waved to inner margin, some white points beyond it on costa ; subterminal line represented by a series of black marks in the interspaces ; cilia with a pale punctiform line at base. Hindwing black-brown, with a white postmedial point on vein 2 and subterminal points on veins 3 and 2 ; cilia with a slight pale line at base and whitish tips ; the underside irrorated with white, a blackish discoidal lunule, curved postmedial line ; and diffused subterminal line.

Habitat.—Madras, Palni Hills, 7,000. *Exp.* 30 mill.

1804*a*. Euplexia magniclavis.

1727. Euplexia metallica.

1766. Euplexia harfordi.

1727*a*. Euplexia erythriris.

Euplexia erythriris, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 246, pl. 114, f. 15 (1908).

♂. Head and thorax black-brown, the scales slightly tipped with grey; legs irrorated with white; abdomen fuscous brown. Forewing black-brown irrorated with purple and grey, the medial area darker except towards costa, the inner margin with red streak; traces of a double waved subbasal line from costa to submedian fold; antemedial line indistinct, double, oblique, waved; claviform indistinctly defined by blackish; orbicular and reniform with red annuli defined by black, the former oblique elliptical, the latter rather narrow and angled inwards on median nervure below orbicular to the antemedial line; a very indistinct waved medial line oblique from costa to below cell; postmedial line double, bent outwards below costa, then minutely dentate, excurved to vein 4, then oblique, some white points beyond it on costa; subterminal line reddish, defined on inner side by black-brown patches in the interspaces, slightly angled outwards at vein 7 and incurved below vein 3, with slight black streaks beyond it in the interspaces to the terminal lunules; cilia black-brown with slight pale line at base. Hindwing dark brown with traces of a pale subterminal band except towards costa and inner margin; cilia with whitish line at base and whitish tips; the underside greyish brown with traces of discoidal lunule, curved postmedial line and diffused subterminal band.

Habitat.—Assam, Khàsis. *Exp.* 50 mill.

Genus, Ancara.

Type.

Ancara, Wlk., xv, 1714 (1858) .. .. *replicans.*

Sect. 1.—Antennæ of male bipectinate with long branches to three-fourths length, of female with short branches.

A. Forewing deep purplish red-brown suffused with violaceous grey .. .. *obliterans.*

B. Forewing ochreous more or less completely suffused with olive-fuscous .. .. *anæmica.*

1763. Ancara obliterans.

1763*a*. Ancara anæmica.

Ancara anæmica, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 253, pl. 114, f. 23 (1908).

♂. Head and thorax ochreous tinged with rufous and mixed with some fuscous; tegulæ with slight dark medial line; pectus, legs and abdomen ochreous, the legs slightly tinged with pink. Forewing ochreous, irrorated and in parts suffused with olive fuscous, the base of inner area and a patch beyond the reniform tinged with rufous; antemedial line double and minutely dentate at costa, then single, angled inwards on vein 1 and outwards above inner margin; claviform represented by a blackish patch with an ochreous patch beyond it; orbicular and reniform faintly defined by blackish, the former ochreous and conjoined to the patch below cell, the latter narrow

with some olive in centre and slight pale annulus; a dark medial line, oblique from costa to vein 2, then inwardly oblique and somewhat dentate; postmedial line blackish, double towards costa, bent outwards below costa, then dentate, excurved to vein 4, then oblique; subterminal line dark, dentate, angled outwards at veins 4·3 and inwards at discal and submedian folds, with a dark streak beyond it above vein 3; a terminal series of small black lunules; cilia reddish brown. Hindwing ochreous tinged with pinkish and irrorated with fuscous, the terminal area suffused with fuscous, the termen and cilia ochreous; the underside ochreous, the terminal area slightly irrorated with black, a black discoidal spot and curved pinkish postmedial line.

♀. Head and thorax suffused with olive fuscous; abdomen tinged with brown; forewing with the ground colour olive fuscous, the markings indistinct; hindwing wholly suffused with fuscous brown.

Habitat.—CEYLON, Haldamulla, Hambantota. *Exp.* ♂ 42, ♀ 44 mill.

Sect. II.—Antennæ of male ciliated.

A. Forewing with the ground-colour violaceous grey. *glaucochlora.*

B. Forewing with the ground-colour red-brown .. *viridipicta.*

1770. ANCARA GLAUCOCHLORA.

1770*a*. ANCARA VIRIDIPICTA.

Genus, ARBORICORNIS.

1853. ARBORICORNIS RUBRA.

Genus, CORYTHURUS.

1824. COPYTHURUS NOCTURNA.

Genus, OLIGIA.

	Type.
Oligia, Hübn. Verz., p. 213 (1827)	.. *strigilis.*
Miana, Steph., Ill. Brit. Ent. Haust., iii, p. 11 (1829)	.. *literosa.*
Phistedes, Led. Noct. Eur., pp. 44 and 189 (1857) ..	.. *captiuncula.*

Proboscis fully developed; palpi upturned, the second joint reaching about to middle of frons and fringed with hair in front, the third short, blunt, naked; frons smooth; eyes large, round; antennæ of male ciliated; head and thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing triangular, the apex rounded, the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomising with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Forewing of male with fan of large scales in cell on underside.

A. Forewing with the orbicular and reniform confluent on median nervure .. .. *ptyophora.*

B. Forewing with the orbicular and reniform not confluent on median nervure .. .. .. *nadgani.*

1979*a*. OLIGIA PTYOPHORA.

Oligia ptyophora, Hmpsn. Ill. Het. B. M., vii, p. 363 (1908).

Head and thorax greyish mixed with brown and black; tarsi black ringed with grey; abdomen grey mixed with fuscous, the crests black. Forewing red-brown tinged with grey and suffused with fuscous on basal inner and terminal areas; subbasal line represented by black striæ from costa and cell; antemedial line formed of black striæ, somewhat oblique, waved and with short black streaks before it in cell, submedian fold and above inner margin; orbicular and reniform pale brownish incompletely defined by black and open above, the former with slight dark centre, oblique elliptical, the latter with fuscous centre, extending to well below the cell, angled inwards in median nervure and slightly confluent with the former; a black bar from middle of costa and traces of a waved line on inner area; postmedial line black, slightly bent outwards below costa, then minutely waved, strongly excurved to vein 4, then oblique to submedian fold, some slight points beyond it on costa; subterminal line represented by a sinuous grey band from costa to vein 6, spot at middle and oblique striga at tornus; a terminal series of black striæ; cilia blackish. Hindwing whitish suffused with brown except on costal area; cilia white mixed with grey, with white line at base followed by a dark line; the underside ochreous white irrorated with fuscous, a fuscous discoidal spot, curved minutely waved postmedial line, and a terminal series of slight black lunules.

ab. 1. Forewing with patch of white suffusion in and below cell.

Habitat.—PUNJAB, Simla, Dalhousie; SIKHIM, 1,800. *Exp.* 24-28 mill.

1979. OLIGIA NADGANI.

Sect. II.—Forewing of male normal.

A. Forewing with the subterminal line distinctly dentate.

a. Forewing violaceous grey suffused with dark-brown *vermiculata.*

b. Forewing ochreous suffused with red-brown.

*a*¹. Forewing with the postmedial line slightly incurved below vein 4 and widely separated from the lower extremity of reniform .. *pallidisca.*

*b*¹. Forewing with the postmedial line strongly incurved below vein 4 and approximated to the lower extremity of reniform .. .. *gaucostigma.*

B. Forewing with the subterminal line excurved at middle and not dentate.

a. Forewing with the postmedial line slightly incurved below vein 4 and widely separated from the lower extremity of reniform .. *chasiana.*

b. Forewing with the postmedial line strongly incurved below vein 4 and approximated to the lower extremity of reniform .. .. *albirivula*.

1984. OLIGIA VERMICULATA.

Erastria vermiculata, Snell. Tijd., v, Ent., xxiii, p. 85, pl. v, f. 3 (1880).

Daxata glaucescens, Butl. Ill. Het. B. M., vii, p. 81, pl. 133, f. 4 (1889).

Anophia undara, Swinh. Trans. Ent. Soc., 1890, p. 234.

1083. OLIGIA PALLIDISCA.

1985. OLIGIA GLAUCOSTIGMA.

1987. OLIGIA CHASIANA.

Bryophila khasiana, Hmpsn. Moths Ind., ii, p. 299 (1894); id., Cat. Lep. Phal. B. M., vii, p. 373, pl. 117, f. 20.

" *obliquifascia*, Hmpsn., Trans. Ent. Soc. 1895, p. 299; id., Moths Ind. iv, p. 513.

Euplexia repetita, Swinh. A. M. N. H. (7), xv, p. 499 (nec. Butl.).

1981*a*. OLIGIA ALBIRIVULA.

Oligia albirivula, Hmpsn. Cat. Lep. Phal. B. M., vii, p. 375, pl. 117, f. 21 (1908).

♀. Head and thorax whitish mixed with bright rufous; palpi bright rufous; frons with dark lateral bars; tarsi fuscous ringed with whitish; abdomen grey tinged with rufous. Forewing with the inner and postmedial areas, except at costa, white, the basal costal area, the medial area to submedian fold, and terminal area bright rufous; subbasal line double, waved, from costa to submedial fold, with a slight blackish streak beyond it above vein 1; antemedial line double, angled outwards below costa incurved in cell, then strongly excurved and slightly angled inwards on vein 1; claviform defined by brown, extending to median nervure; orbicular with slight ochreous annulus defined by brown, elongate elliptical; reniform defined by brown, with whitish centre defined by brown and yellowish annulus on inner side, whitish on outer, somewhat angled inwards on median nervure; postmedial line double, bent outwards below costa, incurved at discal fold and strongly below vein 4, some whitish points beyond it on costa; subterminal line defined by a rufous shade on inner side, angled outwards at vein 7 to termen and excurved at middle; the terminal area with dark patches at middle and above tornus; a terminal series of black lunules; cilia rufous mixed with black towards tornus and with series of black spots at tips. Hindwing whitish tinged with brown; a terminal series of dark striæ; the underside whitish irrorated with brown, a slight dark discoidal spot, curved postmedial line and terminal series of striæ.

Habitat.—ASSAM, Khásis. *Exp*. 30 mill.

Genus, AGROPERINA.

Type.

Agroperina, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 398 (1908).. *lateritia.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and fringed with hair in front, the 3rd short, porrect; frons smooth; eyes large, round; antennæ of male ciliated; head and thorax clothed with hair and hair-like scales, the latter with indistinctly double ridge-like dorsal crest; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments, some rough hair at base, and lateral fringes of hair. Forewing rather narrow, the apex rectangular, the termen obliquely curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle, 8 anastomosing with the cell near base only.

1710*a*. AGROPERINA LATERITIA.

Phalæna lateritia, Hüfn. Berl. Mag., iii, p. 306 (1767); Esp. Schmett., iv, pl. 131, ff. 3·4; Dup. Lép. Fr. vii, p. 208, pl. 113, f. 5; Frr. Neue Beitr. i, pl. 65; Smith, Cat. Noct. N. Am., p. 134; Staud, Cat. Lep. pal. p. 173.

Noctua molochina, Hübn. Eur. Schmett. Noct., f. 74 (1802).

Mamestra obliviosa, Wlk., xv, 1683 (1858).

Hadena expallescens, Staud. Stett. Ent. Zeit. 1882, p. 41.

Hadena satina, Streck, Lep. Rhop. and Het. Suppl., i, p. 8 (1898); Dyar, Cat. Lep. N. Am., p. 115.

Hadena borealis. Strand, Arch. Naturv. Christian, xxv, 9, p. 13 (1903).

Head and thorax dark purplish red; palpi and frons at sides dark brown; pectus with the hair pale; tarsi dark brown ringed with whitish; abdomen ochreous or reddish brown, greyish at base. Forewing purplish red brown with slight dark irroration, the costal area rather browner, the veins irrorated with some white scales; subbasal line indistinct, waved, from costa to submedian fold; antemedial line double at costa, oblique to submedian fold, angled inwards to a dark point on vein 1, and bent inwards to inner margin; claviform absent; orbicular and reniform narrow with dark brown centres and incomplete white annuli, the former oblique elliptical; a dark medial shade, oblique from costa to vein 2, then incurved; postmedial line double and filled in with whitish at costa, bent outwards below costa, then dentate and produced to black and white points on the veins, excurved to vein 4, then oblique, some white points beyond it on costa; subterminal line indistinct, pale, slightly defined on inner side by brown, angled outwards at vein 7 and dentate at veins 4·3; a terminal series of small black lunules. Hindwing pale suffused with ochreous brown, the

veins and terminal area darker; cilia ochreous; the underside ochreous white, the costal and terminal areas tinged with purplish and irrorated with brown, a dark discoidal point and curved postmedial line with minute dark streaks on the veins.

ab. 1. *borealis.*—Darker and browner. Lapland.

ab. 2.—Pale purplish red.

ab. 3. *expallescens.*—Forewing ochreous suffused with pale red except on inner and postmedial areas, the terminal area tinged with brown. W. and E. Turkistan; Tibet.

Habitat.—CANADA, U. S. A.; EUROPE; ARMENIA; W. TURKISTAN; E. TURKISTAN; TIBET; MONGOLIA; E. SIBERIA; JAPAN; KASHMIR, Goorais Valley, Nubra. *Exp.* 46-54 mill.

Larva, Kirby, Butt. and Moths Eur., p. 240; Hffm. Raup., p. 97, pl. 27, f. 14.

Dark-grey with the thoracic and anal plates black; head brown. Food plants, Grasses, 4.

Genus RHYNCHOPLEXIA.

Type.

Rhynchoplexia, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 433 (1908) . . *rubra.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint fringed with long hair in front, the 3rd long, naked, porrect; frons smooth, with tuft of hair; eyes large, round; antennæ of male ciliated; head and thorax clothed with hair and hair-like scales, the pro- and metathorax with spreading crests; tibiæ fringed with hair; abdomen with dorsal crest at base only. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing purplish red, the reniform defined by white marks on outer side . . . . . *rubra.*

B. Forewing fuscous brown, the reniform not defined by white marks on outer side . . . . . *griseimarginata.*

1767. RHYNCHOPLEXIA RUBRA.

1779. RHYNCHOPLEXIA GRISEIMARGINATA.

Genus LASIPLEXIA.

Type.

Lasiplexia, Hmpsn., Cat. Lep. Phal., B. M. vii, p. 483 (1908) . . *cuprina.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about middle of frons and fringed with long hair in front, the 3rd moderate porrect; frons smooth, with large tuft of hair; eyes large, round; vertex of head with crest; thorax clothed with hair only, the pro- and metathorax

with spreading crests; tibiæ moderately fringed with hair; abdomen with some rough hair at base and basal crest only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with rather short branches, the apex serrate.

1693. LASIPLEXIA CUPRINA.

Apamea cuprina, Moore, P. Z. S., 1881, p. 345, pl. 38, f. 2.

Eurois chalybeata, Hmpsn., Moths. Ind., ii, p. 230 (nec. Wlk.).

Sect. II.—Antennæ of male ciliated.

A. Forewing with white or pale spots on outer edge of reniform .. .. .. *chalybeata*.

B. Forewing without white or pale spots on outer edge of reniform.

a. Forewing red brown suffused with purplish-grey .. .. *nubila*.

b. Forewing black brown irrorated with silvery blue .. .. *cyanea*.

1783*a*. LASIPLEXIA CHALYBEATA.

1729*a*. LASIPLEXIA NUBILA.

1783*b*. LASIPLEXIA CYANEA.

Lasiplexia cyanea, Hmpsn., Cat. Lep. Phal. B. M, vii., p. 486, pl. 119, f. 32 (1908).

♀. Head and thorax very dark brown, the head rather more rufous; tarsi ringed with whitish; abdomen grey brown. Forewing very dark brown with a reddish tinge, irrorated with some silvery blue scales especially on medial area and termen; subbasal line represented by a semi-circular silvery blue mark below costa; antemedial line indistinct, dark, defined on inner side by silvery blue, angled outwards below costa, incurved in cell, then excurved; claviform slightly defined by silvery blue at extremity; orbicular irrorated with silvery blue and defined by black, oblique elliptical reniform indistinct, slightly irrorated with blue, defined by black and its centre also defined by black, a greyish lunule on its outer edge; traces of a curved dark medial line; postmedial line indistinct, dark, defined on outer side by silvery blue towards costa and inner margin, bent outwards below costa, then minutely waved, excurved to vein 4, then incurved, some white points beyond it on costa; subterminal line silvery blue, excurved at vein 7, slightly angled outwards at veins 4·3 and inwards at submedian fold; a terminal series of small black lunules; cilia dark brown at base, yellowish brown at tips. Hindwing deep fuscous brown; cilia yellowish with a dark

line through them; the underside yellowish tinged with brown and broadly suffused with brown on costal and terminal areas, a curved postmedial line.

Habitat.—Assam, Khásis. *Exp.* 46 mill.

Genus Trigonophora.	*Type.*
Trigonophora, Hübn. Verz., p. 217 (1827)	*meticulosa.*
Solenoptera, Herr. Schäff Eur. Schmett. ii., p. 299 (1845) ..	*meticulosa.*
Brotolomia, Led. Noct. Eur., pp. 35 and 115 (1857) ..	*meticulosa.*
Mesolomia, Smith, Cat. Noct. N. Am., p 171 (1897) non descr.	*iris.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching to about middle of frons and broadly fringed with hair in front, the 3rd short; frons smooth, with large tuft of hair; eyes large, round; antennæ of male with fasciculate cilia; thorax clothed with hair only, the tegulæ produced to a dorsal ridge, the prothorax with triangular crest, the metathorax with large paired spreading crests; tibiæ moderately fringed with hair; abdomen clothed with rough hair at base, with dorsal crests on basal segments and lateral fringes of hair. Forewing with the apex obliquely truncate, the termen and cilia slightly crenulate, the termen slightly excised below vein 4; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

1758*b*. Trigonophora fuscomarginata.

Genus Chutapha.	*Type.*
Chutapha, Moore, Lep. Atk, p. 131 (1882)	*costalis.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons smooth, eyes large, round; antennæ of male typically serrate and fasciculated; head and thorax clothed with hair only, the prothorax with triangular ridgelike crest, the meta thorax with paired crests; tibiæ moderately fringed with hair; abdomen with dorsal series of crests and lateral tufts of hair on terminal segments, the male with extensible basal tufts of long hair from lateral stigmata. Forewing with the apex obliquely truncate, the termen and cilia dentate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with short branches, the apical third ciliated.

1758*a*. Chutapha conservuloides.

Sect. II.—Antennæ of male serrate and fasciculate.

1756. Chutapha costalis.

Genus CONSERVULA.

Conservula, Grote, Bull. Buff. Soc. Nat. Sci., ii, p. 17 (1874). *Type.* *anodonta.*

Appana, Moore, P. Z. S., 1881, p. 355 .. .. .. *indica.*

A. Forewing with the antemedial line not bent outwards to inner margin .. .. .. *indica.*

B. Forewing with the antemedial line bent outwards to inner margin .. .. *v-brunnea.*

1827. CONSERVULA INDICA.

1828. CONSERVULA V-BRUNNEA.

Genus OROPLEXIA.

Oroplexia, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 510 (1908). *Type.* *decorata.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and fringed with long hair in front, the 3rd moderate; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed with long hair mixed with a few hair-like scales and without distinct crests; pectus clothed with long hair; tibiæ moderately fringed with hair; abdomen with some rough hair at base and lateral fringes of hair, but without crests. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the reniform angled inwards on median nervure to or to below the orbicular, the postmedial line not filled in with whitish .. *decorata.*

B. Forewing with the reniform not angled inwards on median nervure to or to below the orbicular, the postmedial line filled in with whitish.

a. Forewing with the postmedial line bent inwards along inner margin to the antemedial line .. *retraheus.*

b. Forewing with the postmedial line not bent inwards along inner margin to the antemedial line.

a^1. Forewing with the antemedial line bent inwards to inner margin .. .. *luteifrons.*

b^1. Forewing with the antemedial line not bent inwards to inner margin.

a^2. Forewing with the postmedial line oblique below vein 4.

a^3. Forewing with the orbicular V-shaped .. *separata.*

b^3. Forewing with the orbicular oblique quadrate .. .. *simulata.*

*b*². Forewing with the postmedial line incurved below vein 4 .. .. *albiflexura*.

1774. OROPLEXIA DECORATA.
1772. OROPLEXIA RETRAHENS.
1773. OROPLEXIA LUTEIFRONS.
1775. OROPLEXIA SEPARATA.
1776. OROPLEXIA SIMULATA.
1719. OROPLEXIA ALBIFLEXURA.

Genus DATA.

Type.

Data, Wlk., Journ. Linn. Soc. Zool., vi, p. 191 (1862) .. *thalpophiloides*.
Lasiosceles, Beth. Baker, Nov. Zool., xiii, p. 204 (1906) .. *pratti*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately scaled, the 3rd long: frons rounded: eyes large, round: antennæ of male ciliated; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; pectus clothed with long hair; mid and hind femora and tibiæ with large tufts of hair, the hind tibiæ with the 1st joint fringed with hair: abdomen with dorsal series of crests. Forewing with the apex produced and acute, the termen crenulate, a slight scale-tooth at tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 absolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the veins streaked with whitish, the subterminal line white .. .. .. *callopistroides*.
B. Forewing with the veins not streaked with whitish, the subterminal line bluish white towards costa .. *thalpophiloides*.

1769. DATA CALLOPISTROIDES.
1768. DATA THALPOPHILOIDES.

Genus NEOPISTRIA.

Type.

Neopistria, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 530 (1908). *viridinotata*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately fringed with hair in front, the 3rd moderate; frons rounded; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rounded, the termen excurved at middle and excised below apex and towards tornus, where there is a slight scale-tooth; veins 3 and 5 from near angle of cell; 6 from upper angle; 7, 8, 9, 10 stalked; 11 from cell. Hindwing with veins 3·4 from

angle of cell; 5 obsolescent from just below middle of discocellulars; 6-7 shortly stalked; 8 anastomosing with the cell near base only.

1971. NEOPISTRIA VIRIDINOTATA.

Genus, ERIOPUS.

	Type.
Eriopus, Treit. Schmett. Eur., v. (1), p. 365 (1825) ..	*juventina*.
Callopistria, Hübn. Verz., p. 216 (1827)	*juventina*.
Agabra, Wlk., Journ. Linn. Soc. Zool., vi., p. 136 (1862) ..	*trilineata*.
Obana, Wlk., Journ. Linn. Soc. Zool., vi., p. 190 (1862) nec. Wlk., xxiv., 1103 (1862)	*pulchrilinea*.
Eulepa, Wlk., Journ. Linn. Soc. Zool., vii., p. 54 (1869) ..	*niveigutta*.
Cotanda, Moore, P. Z. S., 1881, p. 374	*placodoides*.
Methorasa, Moore, P. Z. S., 1881, p. 374	*latreillei*.
Herrichia, Grote, New Check List, p. 38 (1882) non. descr., nec. Staud. Lep. 1870	*mollissima*.
Euherrichia, Grote, Papilio ii., p. 122 (1882) non. descr.; id. Ent. Am. vi., p. 163 (1890)	*mollissima*.
Gnamptocera, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*minuta*.
Haploolophus, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*mollissima*.
Dissolophus, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*chloriza*.
Hyperdasys, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*exotica*.
Hemipachycera, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*rivularis*.
Rhoptrotrichia, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*maitlardi*.
Platydasys, Butl. P. Z. S. 1892, p. 126	*pryeri*.

Sect. I.—Antennæ of male with the basal part of shaft thickened, then with angular projection from upperside the tibiæ and 1st joint of midtarsi fringed with long hair.

A. Antennæ of male with scale teeth on shaft beyond the angular projection.

a. Antennæ of male with the angular projection tufted with hair and with long curved bristles beyond it from shaft on upper- and under-sides.

1848. ERIOPUS INDICA.

b. Antennæ of male with the angular projection not tufted with hair and without long bristles beyond it.

*a*¹. Forewing with the ground-colour dark red-brown. .. .. *æthiops*.

*b*¹. Forewing with the ground-colour bright rufous *albistriga*.

1847. ERIOPUS ÆTHIOPS.

1847*a*. ERIOPUS ALBISTRIGA.

Callopistria trilineata, Hmpsn., J. Bomb. Soc. xvii., p. 471 (nec. Wlk).

Eriopus albistriga, Hmpsn. Cat. Lep. Phal. B. M. vii., p. 538, pl. 120, f. 29 (1908).

B. Antennæ of male without scale-teeth on shaft beyond the angular projection.

a. Antennæ of male with the angular projection strong; the tibiæ and 1st joint of tarsi tufted with hair, the mid tibiæ with the spurs tufted with long hair.

1846. ERIOPUS PLACODOIDES.

Eriopus placodoides, Guen. Noct. ii., p. 296 (1852).

" *doleschalli*, Feld. Reis. Nov., pl. 110, f. 14 (1874).

b. Antennæ of male with the angular projection slight.

a[1] (*Eriopus*) Antennæ of male with long bristles beyond the angular projection fore and hind tibiæ of male and 1st joint of tarsi fringed with long hair, the mid tibiæ, inner spur and tarsus to near extremity with very large tufts of hair.

1846*a*. ERIOPUS JUVENTINA.

Noctua juventina, Cram. Pap. Exot. iv., pl. 400, f. N. (1782).

" *purpureo fasciata*, Piller, Prov. Posega, p. 70, pl. vi., f. 2 (1783); Staud. Cat. Lep. pal., p. 183.

" *lagopus*, Esp. Schmett. iv., pl. 125, f. 7 (1788).

" *pteridis*, Fabr. Ent. Syst., p. 90 (1794); Hübn. Eur. Schmett. Noct., f. 65; Dup. Lép. Fr. vi., p. 324, pl. 93, ff. 1-2; Frr. Neue. Beitr., pls. 76 and 305.

Pyralis formosissimalis, Hübn. Eur. Schmett. Pyr., f. iii. (1798).

Callopistria obscura, Butl. A. M. N. H. (5) i., p. 200 (1878); id. Ill. Het. B. M. iii., p. 21, pl. 46, f. 3.

Head and thorax bright rufous mixed with yellowish white and some black scales; palpi blackish below; frons with paired black points above; antennæ of male with the basal part of shaft black at sides; tegulæ yellowish at base, with black lines at and near base and yellowish tips; pectus and legs yellowish white mixed with some rufous, the legs irrorated with brown; abdomen yellowish white suffused with fuscous leaving pale segmental lines, the crests rufous tipped with black, the anal tuft tinged with rufous, the ventral surface yellowish white irrorated with black. Forewing bright rufuous irrorated with black, the veins streaked with yellowish white; subbasal line represented by a white striga from costa and oblique yellowish white line from subcostal nervure to vein 1; antemedial line indistinct double, blackish filled in with pink, defined

on outer side by white at costa, then by pink, angled outwards below costa, then excurved, an oblique pinkish striga before it from submedian fold to vein 1; claviform represented by an oblique pinkish streak, acute and defined by black at extremity; orbicular with rufous centre and yellowish annulus defined by black, very narrow and oblique; reniform white slightly defined by black, its centre ochreous defined by red-brown, produced at upper extremity, and at lower extremity to a hook; a faint oblique black shade from lower angle of cell to inner margin; postmedial line double, black, the inner line strong, the outer slight, filled in with pink, angled inwards below costa, then bent outwards slightly incurved at discal fold, incurved below vein 3, some white points beyond it on costa; subterminal line yellowish white, oblique to vein 7, where it is met by an oblique yellowish white shade from apex, with oblique bar above vein 6, angled inwards to postmedial line above vein 5, then outwards to termen at vein 4, then slight, oblique to submedian fold and bent outwards to tornus; a yellowish white line before termen angled outwards at vein 4, then waved; cilia chequered white and black with a slight blackish line at base. Hindwing yellowish white, suffused with fuscous brown except on costal area; a slight dark discoidal bar, pale postmedial line, and terminal series of dark lunules defined by whitish on inner side; cilia chequered brown and white; the underside white, the costal area tinged with ochreous and slightly irrorated with brown, the apical area tinged with pink, a black striga on upper discocellular, brown postmedial line bent outwards below costa, then slightly waved, incurved below vein 3, subterminal shade from costa to vein 5, and terminal series of small brown lunules.

4 *ab.* 1. *obscura.*—Head, thorax and forewing browner and less rufous, with hardly any pink tinge.

Habitat.—Europe; Armenia; Asia Minor; Persia; E. Siberia; Japan; Corea; Central China; W. China; Assam, Khásis. *Exp.* 34-40 mill.

Larva. Kirby, Butt. and Moths Eur., p. 248. Hffmn. Raup., p. 100, pl. 28, f. 5.

Green with oblique yellow subdorsal stripes often defined by pink; lateral line yellow often defined by pink below; warts slight, yellow; head reddish. Food plant: *Pteris aquilina.* 8-6.

b^1. Antennæ of male ciliated beyond the angular projection; tibiæ, 1st joint of tarsi, and inner spur of mid tibiæ fringed with long hair.

a^2. Forewing with orange apical patch .. .. *xanthopera.*

b^2. Forewing without orange apical patch .. *rivularis*

1843*a*. Eriopus xanthopera.

Eriopus xanthopera, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 545, pl. 121, f. 1 (1908).

Head black mixed with some rufous and white scales ; palpi rufous ; tibiæ rufous in front ; abdomen grey-brown with slight whitish segmental lines, the crests blackish, the anal tuft ochreous. Forewing black slightly mixed with grey, the veins with fine ochreous streaks, some long rufous hair from base of inner margin ; subbasal line white, slightly angled outwards below costa and ending at vein 1 ; antemedial line double, black filled in with ochreous, defined on outer side by a white striga from costa and slightly by grey below the cell, angled outwards below costa, then excurved, an oblique yellow striga before it from submedian fold to vein 1 ; obicular with yellow annulus defined by black, oblique V-shaped ; reniform with oblique white line on inner edge followed by a black line, then yellowish defined on outer side by an oblique white line and triangular spot at lower extremity ; postmedial line double, black filled in with white, defined on outer side by a yellowish band with slight dark line on it from vein 6 to inner margin, slightly angled inwards below costa, then bent outwards, very slightly angled outwards at vein 6, incurved below vein 4, and slightly excurved at vein 1, some white points beyond it on costa ; subterminal line white with an orange patch beyond it at apex and orange mark at vein 4, angled outwards at vein 7, very slight and angled inward to postmedial line at vein 5, then forming a strong oblique striga to vein 4 near termen, then incurved and almost obsolete, with white striga between veins 3 and 2 and slightly excurved at vein 1 ; a series of white striæ before termen ; cilia blackish with a fine yellow line at base, wholly yellow at tornus, the scale-tooth whitish. Hindwing dark reddish brown ; a slight discoidal lunule ; cilia whitish with a brown line through them ; the underside whitish thickly irrorated with brown, the terminal area suffused with brown, a brown discoidal lunule, postmedial line bent outwards below costa, then waved, incurved below vein 4, a terminal series of small lunules defined by whitish on inner side from apex to vein 2.

Habitat.—Madras, Belgaum, Shevaroys ; Travancore, Pirmád, Ceylon, Maskeliya. *Exp.* 30-32 mill.

1843. Eriopus rivularis.

Sect. II.—Antennæ of male with the basal part of shaft slightly thickened and without angular projection, down-curved at middle.

A (Rhoptrotrichia).—Antennæ of male with scale-teeth in curve at middle with long cilia from them and a tuft of four long curved hairs from upper side ; the tibiæ, spurs, and 1st joint of tarsi fringed with long hairs.

1849. Eriopus maillardi.

Eriopus maillardi, Guen Maillard's Reunion, Lep. p. 39, pl. 22, f. 8 (1862).

Callopistria recurvata, Moore, Lép. Atk., p. 144 (1882) ; id. Lep. Ceyl. iii., p. 60., pl. 151., f. 1 ; Hmpsn. ; Nat. His. Socotra, p. 324, pl. 20, f. 8.

B. Antennæ of male without scale-teeth, serrations, or long cilia at middle.

a. (*Hyperdasys*). Mid and hind tibiæ and 1st joint of tarsi of male with tufts of very long hair.

*a*¹. Forewing with the postmedial line distinct, double filled in with whitish .. .. .. *duplicans.*

*b*¹. Forewing with the postmedial line dark and obsolescent .. .. *cœlisigna.*

1845. ERIOPUS DUPLICANS.

1849 *a.* ERIOPUS CŒLISIGNA.

b. (*Dissolophus*). Mid tibiæ of male and tarsus to near extremity fringed with very long hair, the hind femora with fringe of long blackish hair, the tibiæ fringed with long hair.

1839 *d.* ERIOPUS RETICULATA.

Eriopus reticulata, Pag. J. B. Nass. Ver. xxxvii. p. 226., pl. vi., f. 7 (1884).
Callopistria rivularis, Hmpsn. Ill. Het. B. M. ix. p. 103. pl. 163, f. 2 (nec Wlk.).

♂. Head and thorax reddish brown mixed with whitish; frons with lateral white points with black points above and below them; tarsi ringed with white, the fringe of hair from mid femora of male black; abdomen grey suffused with brown and with whitish segmental lines, the crest on 3rd segment tipped with black. Forewing yellowish white suffused with red-brown and irrorated with black, the veins with whitish streaks; subbasal line whitish, curved, from costa to submedian fold; antemedial line double, black filled in with white, slightly angled outwards below costa, then strongly excurved, an oblique whitish striga before it from submedian fold to vein 1; orbicular with black centre and whitish annulus slightly defined by black, oblique V-shaped; reniform white, slightly defined by black, more strongly on inner side, oblique, its upper extremity produced, narrowing below, a white striga beyond lower angle of cell, a black patch before it extending to costa; an oblique fuscous shade from lower angle of cell to inner margin; postmedial line double, black filled in with whitish and defined by grey on outer side, angled inwards below costa, then bent outwards, strongly incurved below vein 4, some white points beyond it on costa; subterminal line white, angled inwards to postmedial line above vein 5, then outwards to termen at vein 4, then almost obsolete, incurved and with oblique white striga between veins 3 and 2; the termen black-brown defined on inner side by a fine white line angled outwards to termen at vein 4, then reduced to striæ; cilia black-brown with a yellowish line at base. Hindwing whitish suffused with brown; cilia white tinged with rufous; the underside white irrorated with brown, a slight discoidal bar and indistinct waved postmedial line.

a b. 1. Forewing with the ante- and postmedial lines defined by points on outerside—New Hebrides.

♀ Much darker.

Habitat.—Sikhim; Travancore, Pirmád; Ceylon, Maskeliya, Uva Burma, Hsipaw, Myingian; Singapore; Borneo; Pulo Laut; Nias I.; Java; Amboina; New Hebrides; Solomons; Fiji. *Exp.* 26-28 mill.

c. Fore femora of male with tuft of hair at extremity, the mid tibiæ above and frons fringed with long hair, the hind femora with fringe of long blackish hair, the tibiæ with the inner spurs and the tibiæ between them fringed with long hair.

1844. Eriopus yerburi.

Sect. III. Antennæ of male sinuous at middle but not thickened and without ridge of scales.

A. Fore tibiæ of male and 1st joint of tarsi with large tufts of hair, mid tibiæ with very large tufts of hair, the inner spurs fringed with long hair, the first joint of tarsi with very large tufts of hair above and below, the terminal joints with tufts above; hind femora with fringe of long blackish hair, the tibiæ and first joint of tarsi fringed with long hair.

1842. Eriopus repleta.

B. *(Gnamptocera)* Tibiæ of male normally fringed with hair; forewing with the termen slightly angled at vein 4.

a. Forewing with the medial area yellow, the veins streaked with yellow .. .. *minuta.*

b. Forewing with the medial area rufous, the veins streaked with rufous .. .. *minor.*

1840. Eriopus minuta.

1841. Eriopus minor.

Sect. IV. Antennæ of male simple and ciliated.

A. Forewing with the termen distinctly angled at vein 4, the mid and hind tibiæ and first joint of tarsi moderately fringed with hair above.

a. Forewing without oblique white subapical streaks .. .. *guttulalis.*

b. Forewing with oblique white subapical streaks.

*a*¹. Forewing with the white bar on inner edge of reniform erect, the veins of medial area not streaked with pink .. .. .. *strigilineata.*

*b*¹. Forewing with the white bar on inner edge of reniform oblique, the veins of medial area streaked with pink .. .. .. *venata.*

1839 *b*. ERIOPUS GUTTULALIS.

1839. ERIOPUS STRIGILINEATA.

1839 *c*. ERIOPUS VENATA.

Callopistria venata, Leech, Trans. Ent. Soc., 1900, p. 111; Hmpsn., Cat. Lep. Phal. B. M., vii, p. 573, pl. 121, f. 11.

Head and thorax black-brown mixed with white and some rufous, a white bar between antennæ, tegulæ with white medial line and whitish tips; tibiæ and tarsi mixed with white: abdomen grey-brown with whitish segmental lines, the crests ochreous and black. Forewing greyish tinged with purplish-pink and thickly irrorated and suffused with black, the veins of medial area with pinkish streaks; subbasal line represented by white striæ from costa and cell with an oblique white striga beyond it across the cell; antemedial line double, black filled in with white and defined by pinkish on outer side, oblique from costa to vein 1, bent inwards to inner margin, an oblique whitish striga before it from submedian fold to vein 1; claviform defined by an oblique pinkish streak above; orbicular with black centre and whitish annulus, oblique elliptical; reniform with oblique white bar on inner side, curved pink lunule in centre defined by black on inner side, its outer edge defined by an oblique white striga and bar beyond lower angle of cell; an oblique series of blackish marks in the interspaces from lower angle of cell to inner margin; postmedial line double, black filled in with white, the inner line lunulate, bent outwards below costa, excurved to vein 4, then incurved, some white points beyond it on costa; subterminal line formed by oblique white streaks above veins 7 and 6, then slight and angled inwards at discal fold, with oblique white streak to termen at vein 4, then obsolescent and defined by blackish on inner side, incurved and with white striga between veins 3 and 2; a terminal series of white lunules; cilia black at tips. Hindwing reddish brown with terminal series of slight brown lunules; cilia with slight white line at base, wholly white at submedian interspace; the underside white irrorated with brown especially on costal area, a slight discoidal spot, waved postmedial line, indistinct diffused subterminal shade, and terminal series of small lunules defined by white on inner side.

Habitat.—CENTRAL CHINA; W. CHINA; ASSAM, Khásis. *Exp.* 30-36 mill.

B. Forewing with the termen very slightly angled at vein 4.

a. (*Methorasa*) Mid tibiæ of male fringed on both sides with very long hair, the first three joints of tarsi fringed with long hair above, in female the first joint only fringed with hair above; hind tibiæ moderately fringed with hair above.

1838. ERIOPUS LATREILLEI.

b. Mid and hind tibiæ and 1st joint of tarsi and the inner spurs of mid tibiæ with very large tufts of hair and scales.

1839*a*. ERIOPUS VARIEGATA.

c. Fore, mid, and hind tibiæ of male with large tufts of hair and scales above.

1839*f*. ERIOPUS LEUCOBASIS.

Eriopus leucobasis, Hmpsn. Cat. Lep. Phal. B. M. vii, p. 581, (1900).

Head and thorax purplish brown mixed with some white and black scales; palpi blackish, the extremities of 2nd and 3rd joint white; frons white with lateral black bars; tegulæ with blackish lines at base, middle, and tips; spurs tipped with white, the tarsi ringed with white; abdomen whitish suffused with red-brown leaving whitish segmental bands, the crest on 3rd segment black. Forewing ochreous whitish almost entirely suffused and irrorated with dark purplish-brown; subbasal line represented by double blackish striæ from costa and cell; antemedial line very indistinct, blackish, interrupted, with black line before it from submedian fold to inner margin; orbicular a small indistinct whitish spot; reniform indistinctly defined by whitish, narrow and with white points beyond its lower extremity; a diffused oblique waved blackish line from beyond lower angle of cell to inner margin; postmedial line blackish with white striga at costa, bent outwards below costa, then dentate, oblique, to vein 4, then inwardly oblique, some white spots beyond it on costa; subterminal line strong, white and dentate from costa to vein 6, oblique and yellowish to vein 4, then blackish, waved, with small whitish spot beyond it below vein 3; a terminal series of small black lunules defined on inner side by some white scales; a fine yellowish line at base of cilia. Hindwing with the basal half yellowish white, the terminal half purple-brown; cilia chequered yellowish white and brown; the underside white irrorated with purplish brown except on basal half of inner area, a black discoidal spot, diffused purple-brown medial band, black postmedial line bent outwards below costa, then crenulate, incurved and obsolescent below vein 3, a terminal series of black spots from apex to vein 5.

Habitat.—ASSAM, Khásis; CEYLON, Kandy; PERAK; JAVA. *Exp.* 28-30 mill.

Genus PACHYLEPIS.

Type.

Pachylepis, Feld. Reis. Nov. p. 7 (1874) non. descr.; Hmpsn. Moths. Ind. ii., p. 337 .. .. *dilectissima*.

2109. PACHYLEPIS DILECTISSIMA.

Genus XANTHOLEPIS.

Type.

Xantholepis, Hmpsn. Cat. Lep. Phal. B. M. ix, p. 513 (1910) .. *dicycla*.

Proboscis fully developed; palpi upturned, the 2nd joint broadly scaled, hollowed out on inner side and reaching to middle of frons, the 3rd moderate

and thickly scaled; frons oblique below and produced to a transverse corneous ridge at middle; eyes large, round; antennæ of female almost simple; thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with depressed crest; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7 from angle; 8·9·10 stalked; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

2110. XANTHOLEPIS DICYCLA.

Genus BORBOTANA.

Type.

Borbotana, Wlk., xv. 1651 (1858) .. .. .. *nivifascia.*

Choluata, Wlk., Journ. Linn. Soc. Zool., vii., p. 57 (1864).. *nivifascia.*

Proboscis fully developed; palpi upturned, the 2nd joint moderately scaled and reaching about to vertex of head, the 3rd moderate; frons smooth; eyes large, round; antennæ with large tuft of scales from basal joint, in male typically serrate and with long fasciculate cilia; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ thickly scaled; abdomen with dorsal crests on basal segments. Forewing with the apex rectangular, the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7 from angle; 8·9·10 stalked, or 10 from cell in male; 11 from cell; forewing of male typically with vein 7 down-curved at base and with groove of ribbed membrane above it. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1756 *b*. BORBOTANA NIVIFASCIA.

Genus PŒCILOGRAMMA.

Type.

Pœcilogramma, Butl., P. Z. S. 1892, p. 126 .. .. *picata.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and rather broadly fringed with scales, the 3rd moderate frons smooth; eyes large, round; antennæ of male with long cilia; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests formed of long spatulate scales; mid tibiæ fringed with very long hair on outerside, the hind tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing rather narrow and elongate, the apex rather produced and acute, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle

of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only. Underside of forewing with rough yellowish scales at base on costa and below the cell; hindwing with rough yellowish scales on base of costa and on inner area.

The typical section has the antennæ and forelegs of male normal.

Sect. I.—Antennæ of male with the shaft excised just before middle, with tuft of hair from upperside just before the excision and slight thickening beyond it; fore coxæ with tufts of long hair, the femora with thick tufts of hair above, the tibiæ with the tuft of long hair on outer side at extremity.

2139*b*. Pœcilogramma albiscripta.

Genus Chytonix.

Type.

Chytonix, Grote, Bull. Buff. Soc. Nat. Sci., ii, p. 66 (1874). . . . *palliatricula*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately fringed with hair in front, the 3rd short frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with rough scales, the prothorax with spreading crest, the metathorax with very large crest; build slender; tibiæ fringed with long hair; abdomen with dorsal series of crests, the crests on 3rd and 4th segments very large. Forewing with the apex rounded, the termen slightly excised towards tornus and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from or from just below upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the medial area dark brown below the submedian fold . . . . . *albipuncta.*

B. Forewing with dark fascia on inner margin on medial area . . . . . *excurvata.*

1982. Chytonix albipuncta.

1979*a*. Chytonix excurvata.

Genus Pseuderastria.

Type.

Pseuderastria, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 614 (1908). *laventica.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching to vertex of head and moderately scaled, the 3rd rather long, porrect; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the prothorax without crests, the metathorax with spreading crest; build slender; tibiæ slightly fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rectangular, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form

the areole; 11 from cell; male with a fovea in cell before middle covered by a valve of scales from median nervure on upperside. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1836. PSEUDERASTRIA LARENTICA.

Genus EDEREMIA.

Type.

Ederemia, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 405 (1908).. *lithoplasta*.

Proboscis fully developed; palpi obliquely upturned and slightly fringed with hair in front, the 2nd joint hardly reaching middle of frons, the 3rd short; frons with rounded prominence with curved corneous plate below it; eyes large, round; antennæ of male ciliated; thorax clothed with scales and hair mixed, the pro and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments, the crest on 3rd segment large. Forewing with the tips rounded, the termen slightly crenulate and somewhat excised towards tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1971*e*. EDEREMIA MEDIALIS.

Ederemia medialis, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 407., pl. 124, f. 8 (1908).

♂. Head and thorax white; palpi brown; tegulæ, patagia at extremities and metathorax suffused with red-brown; fore and mid tibiæ at extremities and the tarsi black ringed with white; abdomen white tinged with rufous except at base. Forewing white; subbasal and antemedial brown patches on costa; a few antemedial black scales below cell and on inner margin; a broad medial brown band with patches of leaden grey scales on it, defined by waved interrupted black lines and with traces of a minute white orbicular with brown centre and black points on its inner and outer edges and a minute black discoidal lunule; the postmedial area with some brown spots on costa and traces of a dentate white postmedial line from costa to vein 3 with some brown suffusion on its inner side and the area beyond it dark defining the subterminal line which is excurved below costa and at middle; terminal area irrorated with brown. Hindwing white with a large fuscous apical patch extending to vein 2; some brown suffusion on inner margin and on termen towards tornus.

Habitat.—BELOOCHISTAN, Quetta. *Exp*. 26 mill.

PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

By

Lieut-Colonel C. J. Bamber, F.L.S.,

Indian Medical Service.

Part VI.

(Continued from page 836 of Volume XX.)

Herbs, erect, with Opposite Exstipulate Simple Leaves.

Leaf Margins Toothed.

Petals United.

Corolla Two-lipped.

Stamens Four.

Inner Pair of Stamens Longest.

Nepeta eriostachya, Labiatæ.
F. B. I. iv. 657.
Himalaya, 11,500 ft.
Kashmir (Clarke).

small, sparsely hairy; leaves ½-¾ in., ovate or ovate heart-shaped, blunt, round-toothed, sessile, velvety beneath, flowers ½ in., bright blue, in unbranched terminal cylindric-oblong densely flowered hairy spikes, 1-3 in. long, calyx ¼ in., sessile, 5-toothed, teeth slender, feathery, tubular, corolla-tube slender near the base, dilated towards the mouth, twice the length of the calyx, 2-lipped, upper lip erect, straight concave notched, lower spreading 3-lobed, lateral lobes small, turned back, mid-lobe much larger, narrow at the base, concave, stamens 4 in unequal pairs, ascending under the upper lip, enclosed in the corolla, the upper inner and posterior pair longer than the lower outer and anterior pair, style with two awl-shaped lobes, nutlets smooth.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

Nepeta nervosa, LABIATÆ. F. B. I. iv 658. Kashmir, 6-10,000 ft. (Falconer).

medium-size, smooth, rootstock long woody; leaves 2-4 by $\frac{1}{3}$-$\frac{3}{4}$ in., linear-lanceolate, long-pointed, sharply toothed, bracts ovate with an abrupt point, otherwise like the last species.

Nepeta campestris, LABIATÆ, F. B. I. iv. 658. Himalaya, 7-9,000 ft. Simla (Collett).

very like the last species, but the spikes are much longer and more slender, calyx teeth less hairy and more divergent, corolla more slender.

Nepeta elliptica, LABIATÆ. F. B. I. iv. 658. Himalaya, 5-8,000 ft. Simla, Mashobra (Collett).

very like *Nepeta nervosa*, but the leaves $\frac{1}{2}$-1 in. felted and stem woolly.

Nepeta supina, LABIATÆ. F. B. I. iv. 658. Himalaya, 7-12,000 ft. Murree (Fleming).

small to medium-size, finely velvety; leaves $\frac{1}{2}$-1 in. ovate, blunt, round-toothed, felted beneath, flowers $\frac{1}{2}$-$\frac{3}{4}$ in. long, in dense flowered circular clusters, lower axillary, upper in an avoid spike, bracts lanceolate, calyx $\frac{1}{4}$ in, curved, narrow, softly hairy, mouth very oblique, teeth of bristles, shorter than the tube, nutlets $\frac{1}{12}$ in., 3-angled, linear; corolla, stamens, and style as in other species of *Nepeta*.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

Nepeta spicata,
LABIATÆ.
F. B. I. iv. 659.
Himalaya, 6-10,000 ft.
Simla (Collett).
Murree, Changlagali (Douie).

medium size, smooth or velvety, much branched; leaves 1½-4 by ½-3 in., ovate or triangular heart-shaped, short-pointed, coarsely round or sharp-toothed, leaf stalk 1-3 in., spikes terminal, oblong or cylindric to 4 in. long, bracts ovate or lanceolate with a bristle-like point, calyx sessile ¼ in., bristly, teeth hairly or bristly slender, flowers are otherwise as in *Nepeta campestris*.

Nepeta raphanorhiza,
LABIATÆ.
F. B. I. iv. 659.
Himalaya, 5-12,000 ft.
Kashmir to Chamba (Jacquemont).

small to medium-size, rootstock round, black, 1 in. diam., edible, stems many, branched or not, slender, smooth or softly hairy; leaves ½-1 in., broadly ovate or ovate heart-shaped, blunt, round or sharp-toothed, stalk half the length of the blade; flowers ⅛ in. purplish-blue in ovoid or cylindric spikes, bracts ovate to lanceolate, calyx ⅛ in., sessile, teeth lanceolate, shorter than the tube, corolla-tube slender, twice as long as the calyx; other characters like those of other species of *Nepeta*.

Nepeta discolor,
LABIATÆ.
F. B. I. iv. 659.
Himalaya, 10-15,000 ft.

very like the last species in habit and foliage but has a long, not a tuberous root, the leaves are often white-felted beneath, and the flowers white or pale blue.

Nepeta glutinosa,
LABIATÆ.
F. B. I. iv. 660.
Himalaya, 11-13,000 ft.
Kashmir.

medium size, velvety from glands, sticky, strongly scented, stem stout, stiff, leafy; leaves ¾-1 in., ovate heart-shaped, short pointed, sharply toothed like a comb, sometimes partly stem-clasping; flowers ⅝ in. long, white or blue, in axillary few-

HERBS ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED,

STAMENS FOUR,

INNER PAIR OF STAMENS LONGEST.

flowered circular clusters, bracts linear oblong bristle pointed, calyx ⅓ in., stalked, teeth ovate with an abrupt point much shorter than the calyx-tube, corolla-tube curved, slender, lips small, otherwise like the other species of *Nepeta*.

Nepeta mollis,
LABIATÆ.
F. B. I. iv. 660.
Himalaya, 8-9,000 ft.
Murree (Fleming).
Kashmir (Jacquemont).

small to medium size, softly felted, stem slender, slightly branched; leaves 1-2 by ½-1 in., ovate-heart-shaped, blunt, round-toothed, shortly-stalked; flowers ⅓ in., pink in few-flowered circular white softly hairy clusters at intervals on spikes 3-8 in. long, bracts ovate or lanceolate, bristle-tipped, calyx ¼ in., mouth oblique, teeth lanceolate, softly hairy, shorter than the calyx-tube, corolla-tube slightly protruding beyond the calyx, lips small, otherwise like the other species of *Nepeta*.

Nepeta distans,
LABIATÆ.
F. B. I. iv. 660.
Himalaya, 6-9,000 ft.
Simla (Collett).
Dewal (Douie).

very like the last, but the bracts are linear and the calyx longer and more curved.

Nepeta ciliaris,
LABIATÆ.
F. B. I. iv. 661.
Himalaya, 6-8,000 ft.
Simla, Mahasu (Collett).

medium size to large, stiff, softly felted; leaves ¾-1⅔ in., ovate heart-shaped, blunt round-toothed; flowers ⅓ in., lilac, stalked, in one-sided dense-flowered circular clusters at intervals along softly hairy spikes, 4-8 in. long, bracts lanceolate, often tinged with purple, calyx ⅛ in. curved, softly

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

hairy, teeth 5, slender, shorter than the tube, nutlets broadly oval with rounded ends, otherwise like the other species of *Nepeta*.

Nepeta ruderalis,
LABIATÆ.
F. B. I. iv. 661.
The Plains to 4,000 ft.
Valleys below Simla (Collett).
Choa Saidan Shah (Douie).

medium-size, annual, velvety, stout or slender, slightly 4-angled, common on road sides; leaves ½-2½ in., green or grey, broadly ovate or circular heart-shaped, shortly stalked, blunt, round-toothed; flowers ¼ in., blue or purple, minutely dotted, stalked in very densely flowered circular one-sided stalked and branched clusters at intervals along softly hairy spikes, calyx ⅛ in., softly hairy, mouth of calyx-tube nearly equal, 3 upper teeth triangular, bristle-tipped, 2 lower thread-like, corolla very small, tube shortly projecting beyond the calyx, nutlets broad, granulate, other characters like those of other species of *Nepeta*.

Nepeta Cataria,
LABIATÆ.
F. B. I. iv. 662.
Kashmir, 1-5,000 ft. (Falconer).
Baluchistan (Lace).

medium size, perennial, stem acutely 4-angled, branched, grey velvety; leaves 1-3 in., ovate or ovate heart-shaped, short-pointed, coarsely round or sharp-toothed; flowers ½ in., dotted with purple in circular clusters on long narrow terminal shortly-stalked densely-flowered spikes 4-10 in. long, bracts awl-shaped equalling or not the calyx, lower bracts leafy, calyx ¼ in. curved, velvety, mouth oblique, teeth nearly equal, awl-shaped, shorter than the calyx-tube, nutlets broadly oblong, smooth, other characters like those of the other species of *Nepeta*.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

Nepeta leucophylla,
LABIATÆ.
F. B. I. iv. 662.
Himalaya, 4-8,000 ft.
Simla (Collett).

medium size, slender, branched, grey-felted, stem slightly angled, leafy; leaves 1-1½ in., ovate heart-shaped, blunt or short-pointed, round-toothed wrinkled above, shortly stalked, otherwise like the last species.

Nepeta graciliflora,
LABIATÆ.
F. B. I. iv. 663.
The Plains to 4,000 ft.
Valleys below Simla (Collett).

very like *Nepeta ruderalis*, but more slender with thin coarsely round-toothed leaves, longer leaf stalks, flowers pale-pink and nutlets more granulate.

Nepeta Govaniana,
LABIATÆ.
F. B. I. iv. 663.
Himalaya, 8-10,000 ft.
Narkanda (Collett).

large, stem 4-angled, branched, finely velvety; leaves 3-6 by 1½-3 in., very variable, ovate or oblong short-pointed, round-toothed, leaf-stalk ½-2 in., flowers 1 in., yellow, stalked, at intervals in few-flowered long-stalked axillary and terminal racemes, calyx ½ in., straight, cylindric, teeth triangular, much shorter than the calyx-tube, corolla-tube long, very small, curved, greatly dilated above the middle, nutlets broadly oblong smooth, otherwise like the other species of *Nepeta*.

Nepeta erecta,
LABIATÆ.
F. B. I. iv. 663.
Himalaya, 6-10,000 ft.
Mashobra.
Narkanda (Collett).
Changlagalli (Doule).

very like the last species, but the flowers are blue, and only the lowest clusters are stalked.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

Nepeta Clarkei,
LABIATÆ,
F. B. I. iv. 663.
Himalaya, 7,500-11,000 ft.
Kashmir.
Tilail.
Kunylwan (Clarke).

finely velvety, branched, stem straight, slightly angled; leaves 1-2 in., ovate oblong or lanceolate, somewhat short-pointed, shortly stalked, sharp or round-toothed, flowers ½ in., blue in dense-flowered clusters at intervals along terminal straight spikes 3-6 in. long and shortly stalked in the lower axils, bracts lanceolate, lower leafy, calyx ⅛ in., velvety, teeth nearly equal, triangular, short-pointed, much shorter than the tube, nearly straight, mouth oblique, corolla tube, 3-times the length of the calyx, mouth dilated, lips small, not ¼ in. across; otherwise like the last species.

Nepeta salviæfolia,
LABIATÆ.
F. B. I. iv. 664.
Himalaya, 6-10,000 ft.
Kashmir
(Jacquemont).

medium-size, slender, branched, covered with densely white felt, stem cylindric; leaves 1-1½ in., oblong or ovate, blunt round-toothed, shortly stalked; flowers ¾ in., pale blue or white, in shortly stalked circular clusters at intervals along a long straight narrow raceme or spike, sometimes 12 in. long, bracts minute, awl-shaped, calyx ¼ in. stalked, roughish, teeth triangular nearly equal, much shorter than the tube, corolla-tube very slender, throat shortly dilated, lobes ¼ in. across, nutlets oblong, otherwise like the last species.

OUTER PAIR OF STAMENS LONGEST.

Origanum vulgare, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Calamintha Clinopodium, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Calamintha umbrosa, LABIATÆ.
F. B. I. iv. 650.
Himalaya, 4-12,000 ft.
Simla, Mahasu (Collett).

small, annual, hairy, stems ascending, rooting at the base; leaves ¾-1½ in., ovate, sharply toothed, shortly stalked; flowers pink-purple, ¼ in. long, in small loose whorls, bracts few, short, calyx 2-lipped, tubular, 13-nerved, upper lip 3-toothed, lower 2-toothed, lower longer narrower, mouth open after flowering, corolla 2-lipped, upper lip erect, nearly flat, notched, lower 3-lobed, spreading, stamens 4, in unequal pairs, style-tip divided, nutlets 4, minute, nearly round, smooth.

Dracocephalum speciosum,

see Herbs, Unbranched, Simple, Toothed.

Dracocephalum nutans,

see Herbs, Unbranched, Simple, Toothed.

Dracocephalum moldavicum, LABIATÆ.
F. B. I. iv. 665.
Himalaya, 7-8,000 ft.
Kashmir (Falconer).

medium-size, annual, quite smooth, branched from the base; leaves 1-2 in., lanceolate, deeply bluntly toothed, sessile or narrowed into a short stalk, flowers ¾-1 in., blue, shortly stalked, in circular clusters at short or long intervals along leafy spikes, 4-8 in. long, bracts lanceolate with bristle points, calyx ½ in., 2-lipped, leathery, smooth, upper lip broad, 3-toothed, teeth broadly ovate with abrupt points, corolla 2-lipped, upper lip erect notched, lower spreading, 3-fid, mid-lobe largest, tube greatly dilated to the throat, stamens 4, in unequal pairs, ascending under the upper lip, nearly projecting beyond it, style-lobes awl-shaped; nutlets 4, smooth, narrowly oblong abruptly cut off at both ends.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Dracocephalum stamineum, see Herbs, Prostrate, Opposite, Exstipulate, Simple Toothed.

Lallemantia Royleana,
LABIATÆ.
F. B. I. iv. 667.
The Plains to 3,000 ft.
Sargodha (Douie).
Baluchistan (Boissier).

small, annual, branched or not, stem slightly angled; leaves ½-1 in., ovate or oblong, blunt, coarsely round-toothed; flowers ⅔ in., pale lilac, shortly-stalked, in many circular clusters at intervals along narrow long spikes, bracts small, soon falling off, oblong, or lanceolate, teeth with long bristle points, calyx ¼ in., erect, stiff, 2-lipped, upper lip with 3 obtuse lobes of which the lateral are under the mid-lobe, corolla-tube hardly projects beyond the calyx, lobes small, stamens 4, in unequel pairs, ascending under the upper lip of the corolla, and enclosed within it, otherwise like *Dracocephalum*.

Scutellaria grossa,
LABIATÆ.
F. B. I. iv. 669.
Himalaya, 4-8,000 ft.
Simla, Mashobra (Collett).

medium size, perennial, velvety, stem slender growing along the ground, then ascending, branched, nearly round; leaves 1-3 by ⅔-2 in., ovate, triangular or lanceolate, short-pointed, coarsely round-toothed, smooth, stalk ¼-1 in., slender; flowers ⅔ in., dark-blue, solitary, axillary, forming terminal slender racemes, 3-6 in. long, bracts ¼-½ in., longer than the calyx, calyx 2-lipped, lips closed in fruit upper lip soon falling off, tube bearing on it a small shield or cup, (scutellum), corolla-tube much longer than the calyx, sharply upcurved near the base, dilated upwards, 2-lipped, upper lip erect, hood-like, notched, lower spreading, 3-lobed, stamens 4 in unequal pairs, ascending under the upper lip, anthers hairy; nutlets 4, slightly velvety.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Scutellaria angulosa,
LABIATÆ.
F. B. I. iv. 669.
Himalaya, 4-9,000 ft.
Simla (Collett).
Dharmpur.

medium size, perennial, velvety or thinly hairy, branches long, spreading, sharply 4-angled; leaves 1-3 in., ovate or lanceolate, bluntly or shortly pointed, round or sharp-toothed, shortly stalked lower surface often purple; flowers 1 in., white or yellowish, tip tinged with purple, in leafy racemes, bracts leafy, upper small entire, nutlets granulate: otherwise like the last species.

Scutellaria galericulata,
Skull cap,
LABIATÆ.
F. B. I. iv. 670.
Himalaya, 5-8,000 ft.
Kashmir, Koti.

medium size to large, perennial, slightly velvety, stem procumbent at first then erect; leaves 1½-2½ in., ovate-lanceolate blunt, or nearly shortly pointed round-toothed, shortly-stalked, upper leaves are not toothed; flowers ⅔ in., yellow, shortly stalked in the axils of leaves and bracts, bracts much longer than the calyx: otherwise like the last species.

Brunella vulgaris,

see Herbs, Opposite, Exstipulate, Simple, Entire, Corolla Two-lipped, Stamens Four.

Marrubium vulgare,
White horehound,
LABIATÆ.
F. B. I. iv. 671.
Himalaya, 5-8,000 ft.
Kashmir (Falconer).
Baluchistan (Boissier).

large, leafy, stout, shortly woolly; leaves ½-1½ in. diam., ovate or circular-toothed, wrinkled, stalk ½-½ in.; flowers ½ in., white in circular axillary clusters, many and dense-flowered, woolly, calyx ⅛-¼ in., teeth 10 awl-shaped, spreading and hooked, throat woolly, corolla short 2-lipped, upper lip erect, divided, lower spreading, mid-lobe largest, stamens 4, enclosed in the corolla, style-lobes short, blunt; nutlets 4, blunt, smooth.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Craniotome versicolor,
LABIATÆ.
F. B. I. iv. 671.
Himalaya, 5-7,000 ft.
Simla (Collett).

medium-size, perennial, softly hairy all over stem round, slender; leaves 2-4 by 1-3 in., broadly ovate heart-shaped, long-pointed, sharp or round-toothed, stalk 1-2 in., slender; flowers $\frac{1}{3}$ in., white, pink or yellow, numerous, crowded in small, stalked clusters forming narrow terminal branched leafy racemes, bracts awl-shaped, calyx $\frac{1}{10}$ in., ovoid equally 5-toothed, teeth triangular, corolla tube much longer than the calyx, 2-lipped, upper lip very short, erect, hood like, lower longer spreading, 3-lobed, mid-lobe largest, stamens 4, in unequal pairs, ascending under the upper lip, style nearly equally divided; nutlets 4, very minute, nearly round, shining.

Anisomeles ovata,
LABIATÆ.
F. B. I. iv. 672.
The Plains to 5,000 ft.
Valleys below Simla, Sipi (Collett).

large, annual, hairy, or felted and densely woolly; leaves 1-3 in., ovate, round toothed, long pointed, stalk $\frac{1}{2}$-$1\frac{1}{2}$ in.; flowers $\frac{1}{2}$ in., white, mid-lobe of lower lip purple, crowded in axillary clusters at intervals along terminal spikes, bracts variable, calyx $\frac{1}{4}$-$\frac{1}{3}$ in., hairy, ovoid, teeth 5, lanceolate, long-pointed, corolla-tube short, 2-lipped, upper lip short, erect, concave, entire, lower 3-lobed, spreading, mid-lobe much longer than the lateral, deeply notched, stamens 4 in unequal pairs, protruding, style nearly equally divided; nutlets 4, broadly, oblong, polished.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Stachys floccosa, Woundwort,
LABIATÆ.
F. B. I. iv. 675.
Himalaya, 5-6,000 ft.
Kashmir (Jacquemont).

large, stout, densely covered with white wool stem 4-angled; leaves 3-4 by 1-2 in., ovate or ovate-lanceolate, heart-shaped, shortly pointed, round-toothed, thick, velvety above, stalk ½-1 in., very thick; flowers ½-¾ in., pink, spotted with purple sessile, crowded in axillary woolly clusters and in terminal spikes with interspaces, bracts as long as the calyx, calyx ¼ in., bell-shaped, 10-nerved, teeth 5, triangular points, spinous, coloured pink, corolla two-lipped, woolly, upper lip erect, lower spreading 3-lobed, mid-lobe largest, tube shortly projecting out of the calyx, stamens 4, ascending, style-lobes nearly equal; nutlets 4, ovoid smooth.

Stachys sericea,
LABIATÆ.
F. B. I. iv. 675.
Himalaya, 6-9,000 ft.
Simla, Mashobra (Collett).
Murree (Donie).

very like the last species only less woolly, and sometimes unbranched.

Stachys melissæfolia,
LABIATÆ.
F. B. I. iv. 675.
Himalaya, 8-10,000 ft.

very like the last species, only more slender, less hairy, silky and leafy, the calyx is shorter, as broad as long, teeth triangular with a thickened tip not ending in a spine.

Stachys palustris, Marsh betony,
LABIATÆ.
F. B. I. iv. 676.
Himalaya, 5-6,000 ft.
Kashmir (Thomson).

medium-size, perennial, stem 4-angled, bristly with reversed hairs; leaves 3-4 by ½-1 in., narrowly oblong or ovate-lanceolate, long-pointed, toothed, sessile, floral leaves longer than the calyx; flowers small, pink in 6-flowered circular clusters, ½-1 in. diam., at intervals, never spicate, bracts minute,

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

calyx ⅛ in., hairy, teeth lanceolate, tips spinescent. corolla-tube not projecting beyond the calyx. nutlets broadly ovoid, broader towards the top. nearly smooth ; otherwise like the last species.

Stachys sylvatica,
LABIATÆ.
F. B. I. iv. 676.
Kashmir (Falconer).

medium-size to large, rough with long stiff hairs, rootstock growing along the ground, stem 4-angled ; leaves 2-4 in., long-stalked, broadly ovate, heart-shaped, toothed, softly hairy, floral leaves sessile, longer than the calyx ; flowers ½ in., pink, in glandular-hairy few-flowered circular clusters, bracts minute, calyx ¼ in., teeth triangular, tips needle-like, corolla-tube projecting from the calyx, nutlets nearly round ; otherwise like the last species.

Stachys parviflora,
LABIATÆ.
F. B. I. iv. 677.
The Plains to 5,000 ft.
Salt Range, Sakesar.
Rawalpindi (Douie).
Baluchistan (Lace).

medium size, perennial, densely covered with flocculent white wool, stem and branches very stout, nearly round, branched from the base ; leaves 1-3 in., very variable, smooth and shining or cottony above, oblong or ovate or lanceolate, thick, sessile, upper leaves woolly all over ; flowers pink or red-purple, very small in clusters separated, 2-4 flowered, calyx ⅛-¼ in., immersed in wool, cupular, teeth short, incurved over the nutlets, corolla-lips very small, upper short, rounded, nutlets 2, ⅛ in. long, grey, granulate, flat on one side, convex on the other ; otherwise like the last species.

Leonuru Cardiaca, see Herbs, Erect, Opposite, Exstipulate, Lobed.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Lamium rhomboideum,
LABIATÆ.
F. B. I. iv. 678.
Himalaya, 12-15,000 ft.
In stony debris.

small, stem very stout, zigzag, densely felted; leaves lower small, upper 2-4 in. diam., crowded, square, wrinkled, toothed, base suddenly contracted into a very thick, short woolly stalk; flowers 1½ in. long, purplish in axillary, many-flowered, clusters or in leafy heads, bracts awl-shaped, calyx ¾ in., woolly, teeth 5, lanceolate, 5-nerved, corolla 2-lipped, upper lip arched, lower spreading, 3-lobed, mid-lobe broad contracted at the base, tube straight, naked within, upper lip or hood, broad, woolly, lateral lobes ovate, undivided, stamens 4, ascending under the upper lip, anthers hairy, style lobes awl-shaped; nutlets 4, sharply three-cornered.

Lamium amplexicaule,

see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Lamium album,

see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Leucas urticæfolia,
LABIATÆ.
F. B. I. iv. 680.
The Plains.
Choa Saidan Shah (Douie).
Baluchistan (Boissier).

small, annual, stem covered with white hairs; leaves 2-3 in., ovate, stalked, coarsely toothed, smooth or covered with white hairs; flowers ½ in., white in axillary round clusters, 1 in. diam., many flowered, at distant intervals, bracts hairy, bracteoles as long as the calyx, calyx ⅓-½ in., cylindric, netted, velvety or hairy, 2-lipped, lower lip abruptly cut off, teeth minute, corolla-tube within the calyx, not ringed within, 2-lipped, upper lip concave, erect, crown woolly, lower lip spreading, 3-lobed, mid-lobe very large, stamens 4, in unequal pairs, ascending under the upper lip, style one-lobed; nutlets 4, ovoid, sharply 3-angled, blunt.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Leucas lanata,
LABIATÆ.
F. B. I. iv. 681.
Himalaya, 3-8,000 ft.
Simla (Collett).

medium-size to large, root-stock stout woody, stem sometimes woody, branches stout, nearly 4-angled, everywhere densely woolly, hairs erect; leaves 1-3 in., thick, ovate or oblong, blunt or short-pointed, round-toothed, bracts bristle-like; otherwise like the last species.

Leucas nutans,
LABIATÆ.
F. B. I. iv. 688.
The Plains.

small, annual, branches spreading; leaves 1-2 in., oblong or linear-oblong, blunt, slightly toothed, sometimes stalked; flowers small in terminal and axillary dense-flowered clusters, calyx $\frac{1}{8}$ in., bent down, hairy, deeply marked with lines, thin, teeth long, much longer than the hairs of the mouth; otherwise like the last species.

Leucas Cephalotes,
LABIATÆ.
F. B. I. iv. 689.
The Plains to 6,000 ft.
Valleys below Simla (Collett).

large, annual, stout, hairy, hairs spreading; leaves 2-4 in., ovate or ovate-lanceolate, short-pointed, shortly-stalked, round and sharp-toothed; flowers in very large terminal round clusters, 1-2 in. diam., surrounded by membranous overlapping linear lanceolate bracts, bristle—pointed, unlike those of any other species, calyx $\frac{3}{4}$ in., tubular, slightly curved, velvety, teeth short awl-shaped, not longer than the hairs of the mouth; otherwise like the last species.

Leucas aspera,

see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

Leonotis nepetæfolia,
LABIATÆ.
F. B. I. iv. 691.
The Plains.
Berara, Ambala Dist.

large, annual, stem 1 in. diam., 4-angled, grooved, minutely velvety; leaves 4-8 by 2-5 in., ovate, round-toothed, thin, stalk 1-3 in., winged above, slender, floral leaves lanceolate, sharply bent down; flowers 1 in. long, orange, in densely many flowered

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

globular clusters 2-3 in. diam. round the stem, like the head of a drum stick, at some distance apart, prickly from the spinescent bracts, bracteoles many, slender, calyx ¾ in. long, ribbed, netted velvety or woolly, tubular turned in, mouth oblique, teeth 8-10, spines, upper ¼ in. long, lower with 3 recurved spinescent teeth, corolla-tube slender, projecting beyond the calyx, 2-lipped, upper lip long, concave, crown woolly, lower minute, spreading, concave, mid-lobe largest, stamens 4, in unequal pairs, ascending under the upper lip, style awl-shaped, 2-lobed, upper lobe very short; nutlets 4, sharply 3-angled, linear-oblong, widening upwards, cut off short.

Phlomis spectabilis, LABIATÆ.
F. B. I. iv. 692.
Himalaya, 3-8,000 ft.
Kashmir (Jacquemont)
Abbotabad (Barrett).
Baluchistan (Lace).

large, stem 1 in. diam., round, white with hairs, or downy with star-shaped hairs; leaves 6-10 by 4-8 in., ovate heart-shaped, round-toothed or nearly small-lobed, wrinkled, felted with star-shaped hairs beneath, tip rounded, stalk 6-12 in., floral leaves small; flowers rose-purple in axillary many flowered circular clusters, 1½-2 in. diam., with rigid thread-like bristly needle-pointed bracts, calyx ½-¾ in., velvety, mouth equal, 5-toothed, teeth spiny ⅓ shorter than the calyx-tube, corolla tube ringed within, 2-lipped, upper lip concave, crown woolly, fringed with silvery hairs, lower spreading, 3-fid, stamens 4, in unequal pairs, ascending, style 2-fid; nutlets 4, ¼ in., linear.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Phlomis cashmeriana,
LABIATÆ.
F. B. I. iv. 692.
Himalaya, 5-6,500 ft.
Kashmir (Royle).

medium-size, root-stock stout, stems several, stout, covered with white loose star-shaped woolly hairs; leaves 5-9 by 2-4 in., linear oblong, blunt-pointed, round-toothed, wrinkled, base heart-shaped, leathery, finely velvety above, stalks 4-6 in., flowers pale purple in many-flowered axillary circular clusters, 1-1½ in. diam., bracts ⅔ in., many, thread-like, felted, tip needle-like, calyx ½-¾ in., folded, felted, teeth spiny, ½ the length of the calyx tube, corolla upper lip very large, felted, not fringed, lower lip very broad, nutlets ⅛ in. long, broadly oblong: otherwise like the last species.

Phlomis setigera,
LABIATÆ.
F. B. I. iv. 693.
Kashmir (Clarke).

large, stem 1 in. diam., nearly smooth, 4-angled like the branches; leaves 4-8 in., ovate, long-pointed, round-toothed, base rounded or heart-shaped, stalks ½-1 in.; flowers in many-flowered axillary circular clusters, bracts short, stiff, bristle-like, tips spiny, calyx ½-⅔ in., hairy, teeth erect, awl-shaped, ½ the length of the tube; nutlets ⅛ in., ovoid with broad top as if cut off short; otherwise like the last species.

Phlomis bracteosa,
LABIATÆ.
F. B. I. iv. 693.
Himalaya, 5-11,000 ft.
Simla, Mashobra (Collett).

large, stout, velvety with white hairs, stem and branches 4-angled, hairs on the stem, when present, sharply turned down; leaves 2-4 in., (in Kashmir, 6-8 in. long, ovate-lanceolate, long-pointed) ovate, blunt-pointed, round-toothed, base broadly heart-shaped, stalked; flowers 1 in., dull blue-purple, in many dense-flowered axillary

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

circular clusters, ¾-1 in. diam., bracts erect equalling the calyx, outer thin lanceolate or linear, tip not spinous, inner narrower, calyx ¼-½ in., tubular, hairy or smooth, 5-toothed, teeth slender with scattered hairs, corolla upper lip fringed with white hairs, nutlets ⅛-¼ in., ovoid with the tip broad and rounded; otherwise like the last species.

Ajuga bracteosa,
LABIATÆ.
F. B. I. iv. 702.
The Plains to 7,000 ft.
Simla (Collett).
Abbottabad.
Rawalpindi Kahuta (Donie).

small, stems and branches from the root-stock many, velvety or smooth; leaves 1-4 in., lanceolate with a broad tip or spoon shaped, blunt-pointed, toothed more or less, lower stalked, upper sessile; flowers ½ in., pale blue or lilac, crowded in axillary circular clusters at short intervals forming leafy spikes, much shorter than the ovate leafy bracts, calyx ⅛ in., 5-toothed, softly hairy, teeth ½ the length of the tube, ovate-lanceolate, short-pointed, corolla-tube straight, nearly twice the calyx, 2-lipped, upper lip very short, erect, deeply notched, lower spreading, mid-lobe dilated, side-lobes oblong, stamens 4, in unequal pairs, protruding, style 2-lobed; nutlets 1/10 in., oblong with rounded ends, deeply wrinkled, pitted.

Ajuga parviflora,
LABIATÆ.
F. B. I. iv. 703.
Himalaya, 2-7,000 ft.
Simla (Collett).
Murree (Donie).

like the last species, but the corolla is smaller, the base is not inflated, the stamens are included, the flower clusters are on bracteate spikes and not axillary.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS NONE.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Euphorbia hypericifolia, see Herbs, Erect, Opposite, Stipulate, Simple. Entire, Petals None.

Bryophyllum calycinum, see Herbs, Erect, Opposite, Exstipulate, Simple Toothed, Petals None.

(To be continued.)

PROTECTION OF WILD BIRDS IN INDIA AND TRAFFIC IN PLUMAGE

BY

P. T. L. DODSWORTH, F. Z. S.

In the *Selborne Magazines* for 1910, Mr. James Buckland has described the enormous havoc which is being made among the birds of the world to satisfy fashion's demands for millinery. For commercial purposes the feathers must be procured during the breeding season, for the reason that the plumes are at that period in their prime condition. At other times they lack smoothness, lustre, and elasticity, and are, therefore, worthless to the milliner. Many species of birds resort annually to ancestral homes with the object of reproducing their kind, and the feather hunters avail themselves of these opportunities. Thirty years ago the heronries in the United States contained about 3,000,000 White Herons, and now they have been practically exterminated. In the low Coral Islands in the North Pacific the destruction of birds by Japanese "plume hunters" has been appalling. On Marcus Island, one of the largest Albatross colonies in these waters has been wiped out. Midway Island was found, by the United States Special Inspector of Birds and Animals, to be covered with innumerable Albatross carcasses, which a crew of poachers had left to rot on the ground, after the quill feathers had been pulled out of each bird. On Lisiansky Island, the property of the United States and a bird reservation, some poachers from Yokohama were caught, and it was found that they had in their possession the skins and feathers of 300,000 birds. On the Hawaiian Islands Reservations, twenty-three plumage pirates, who were arrested, had in their possession 259,000 pairs of birds' wings. These raids led to an interchange of views between Washington and Tokio, and despite stringent orders issued by the Japanese Government, no check has resulted on the activity of plunder. In 1898, 1,538,738 Egrets were killed in Venezuela for their plumes, and ten years later only 257,916 birds were found by the hunters. Exclusive of the plumes of Egrets, the port of Cuidad Boliwar shipped in a single year (1908), 10,612 pounds, or nearly five tons weight of other plumage. The American Jabiru, the largest but one of all living storks, found in the shallow lagoons on the great Savanna regions of the Middle Orinoco basin, is on the verge of extirpation—in London alone about 30,000 of their quills are sold annually. So relentlessly has the humming bird been pursued for its feathers, that certain species in the West Indies with a restricted habitat are already exterminated, while in the case of other species a similar fate seems imminent. In Trinidad there were, till a few years ago, eighteen species of humming birds, now there are only five. At three plume sales held in London this year, the

skins of over 25,000 humming birds were catalogued, and sold for a penny or three half pence each. The shore birds of the Atlantic Coast of the United States which formerly were found in incredible numbers have only been saved from complete annihilation by the timely appointment of wardens. The poaching in these regions has assumed so serious an aspect that quite recently three of the wardens have been murdered while discharging their duties. In the lake district of Southern Oregon—the nursery of immense flocks of migrating waterfowl of the Pacific Coast—hundreds of tons of ducks were found, by an Official of the Biological Survey, to have been killed for their green wing feathers, and the bodies thrown away. White Herons, Swans, Pelicans, Ibises, Terns, and other species too numerous to mention, were all butchered in a like way, and for a like paltry purpose.

Realising that wild birds constitute a valuable asset to the countries which possess them, various legislative measures have been taken by our overseas possessions to protect bird life, but all these well meaning efforts have been rendered abortive by illicit export. Feathers are conveyed clandestinely out of the country under fictitious names, or under false declarations. In March 1908, six cases described as containing "cow-hair" were shipped from India, and were found on their arrival in London to consist of the skins of 6,400 green paraquets. A vast number of feathers which are used in the millinery trade in Great Britain are smuggled into her ports under false declarations: and the action of the brokers by suppressing all detailed advertisements of the London plume sales, says Mr. Buckland, "is indicative of a knowledge on their part that there is being carried on in the heart of the City a business of so questionable a nature that it is expedient in their interests to interpose darkened glasses, or the equivalent, between its inner history, and the eyes of the public."

In conclusion, Mr. Buckland adds that the traffic in ornamental feathers is a national disgrace, and must be stamped out.

The great interest and criticism which this article has called forth, has prompted us to examine the various measures which have been taken, from time to time, in India for the protection of bird life, and we publish the results of our enquiries in the hope that, not only will they be of some interest to ornithologists in general, but also that some good may come of them.

The fauna of British India is protected by the following Acts and Rules :—

(1) *Madras Act II of* 1879.—The operation of this Act is confined to the Nilgiris. It provides for close seasons, and prohibits the killing, capturing, and selling of game and fish during such seasons.

(2) *The Elephant Preservation Acts of* 1873 *and* 1879. (Madras I of 1873, and India VI of 1879).—These Acts prohibit the killing, injuring, or capturing of wild elephants, except in self defence or under a license.

(3) *Forest Laws.* (*a*).—The Indian Forest Act, 1878 (VII of 1878)—Sections 25 (*i*) and 31 (*j*); (*b*) Madras Forest Act, 1882—Sections 21 (1) and 26 (*f*); and (*c*) Burma Forest Act, 1902—Sections 26 (*h*) and 33 (*c*).

The amount of protection afforded by the rules made under these laws differs in various Provinces. They provide (except in the case of Coorg) for a close season, and most of them require permits before any hunting, snaring, or trapping can be indulged in in reserved forests.

(4) *The Wild Birds and Game Protection Act of* 1887. (Act XX of 1887).

(5) *The Act relating to Fisheries in British India.* (Act IV of 1897). This Act prohibits the destruction of fish by dynamite or other explosive substance in any water, or by the poisoning of water; and provides for the protection of fish in selected waters.

As the scope of the present enquiry is restricted to birds alone, it will only be necessary to turn our attention to No. (4)—The Wild Birds and Game Protection Act of 1887. This Act extends to the whole of British India, and empowers Local Governments, Municipalities, and Cantonments to frame rules prohibiting (*a*) the possession or sale during its breeding season within the Municipality or Cantonment of any kind of Wild Bird recently killed or taken; and (*b*) the importation into the Municipality or Cantonment of the plumage of any kind of wild bird during such season.

It would be tedious and wearisome to dilate on the early history of what is known as the "protection" movement, which, beginning in 1869, culminated in the Act of 1887. It will suffice to state for our purpose that in 1886 the question of having a general game law for India engaged the attention of the authorities, but such law was then considered unnecessary. It was, however, decided that Local Governments should be empowered to frame rules prohibiting the sale of game within cantonments or towns during a specified season of the year, and with this object, the Act (XX of 1887) was passed. It is chiefly directed against the destruction of birds, but Local Governments have the power to apply its provisions to any other game.

The limited provisions of this Act, which apply to Municipal and Cantonment areas only, will be readily understood when we bear in mind some of the reasons which actuated Government in objecting to afford wider and more stringent measures of protection. They were:—

(*a*) The predominant claims of agriculture, to which all other considerations must be subservient.

(*b*) The undesirability of interfering with the livelihood of forest and other wild tribes, who depend largely upon the capture of game for their subsistence.

(*c*). The general objection to the creation of new penal offences.

(*d*). The unjustifiability of legislation in the interests of the sportsmen.

(*e*) The absence of evidence that the destruction of birds for the sake of their plumage was carried out on an extensive scale, and that there was any serious diminution in their numbers.

In 1900 the Honorary Secretary of the Society for the Protection of Birds raised the question of the advisability of stopping the export of the plumage of ornamental birds; and in the following year in the Budget Debate of the 27th March in the Supreme Legislative Council, the Hon'ble Sir Allan Arthur urged upon Government the expediency of protective measures for game in India. During his visit to Burma in 1901 Lord Curzon was approached upon the subject in a public address. His Lordship returned a sympathetic reply, admitting that the enactments in force did not go far enough, and that more stringent measures were called for. In addition to this, numerous other representations to a similar effect were received by Government, or appeared from time to time in the public press.

In view of these representations, and of the fact that a considerable time had elapsed since the passing of the Wild Birds and Game Protection Act of 1887, Lord Curzon's Government decided to enquire into the matter, and to ascertain how far the existing measures had been attended with success. The Local Governments were accordingly asked to report (i) upon the working of the Act in question; (ii) whether it afforded an adequate measure of protection; (iii) the extent to which the skins of birds of handsome or useful plumage were exported, and whether the trade had increased or decreased of late years; and (iv) whether there was any extensive destruction of wild birds, especially of non-migratory insectivorous birds, during what should be close seasons for them; and, if so, whether it was leading to the extermination of any species.

The replies received to this reference showed clearly that the working of the Act had proved a failure. And this was only to be expected, since the prohibitions applied only within a specified cantonment or town during a specified season. Rural areas (except forest areas) were beyond the scope of the Act. There was nothing to prevent birds being killed during the close season, and the detention of their skins or feathers outside Municipal or Cantonment limits as the case might be, until the prescribed period was over; or by the transfer of the bird-killing operations beyond the specified boundaries.

As to the adequacy or otherwise as a measure of protection, the general concensus of opinion was that existing legislation did not sufficiently meet the necessities of the case. After a careful review of the whole subject,

the authorities have taken up the question of the advisability of a general Game Law for the protection of game in India, and this is at present under consideration. The proposed bill is of a very simple nature, and affords adequate protection to those wild birds and animals which are threatened with extermination. It defines game, and takes power for Local Governments to declare a close time during which it will be unlawful to capture, kill or deal in any specified kind of game or the plumage of any specified bird. The proposed measure, moreover, provides a general exception in favour of the capture or killing of game in self-defence or in protection of crops, and gives power to the Local Governments to apply its provisions to birds other than certain specified ones. Fish have been excluded from the scope of the proposed bill, as their case has been suitably provided for by rules under the Indian Fisheries Act.

The replies to (iii) and (iv), in respect of exportation and destruction, disclosed not only a serious, but a most disastrous, state of affairs. From all parts of the country came the same cries of destruction and diminution, which amounted to virtual extermination. Of Impeyan and Argus pheasants throughout the Himalayas, of Peacocks and Black Partridges from Bombay, of Egrets from Sind and Burma, and of a host of others, including Jungle-cocks, Paddy-birds, Kingfishers, Jays, and Orioles throughout India generally. So lucrative was the trade that single districts, such as Lucknow in the United Provinces, and Amritsar in the Punjab, contributed between them nearly 16,000 lbs. of plumage annually. Taking as an average 30 skins to the pound, the figures indicated the destruction of nearly five hundred thousand birds in a single year from two districts one! From Bombay it was reported that a single Railway Station to the orth of Sind had exported within a few months 30,000 skins of Black Partridges, and that over many square miles in the Rohri Division these birds had, within two seasons, been absolutely exterminated by a single party of professional trappers. Various other reports showed that birds were netted and trapped, not by thousands, but by millions, without any regard to season or sex. The hen on her eggs, or with chicks at her feet, were all fair spoil to these unscrupulous hunters. A Postal Official, who was stationed for many years at Dharmsala, gives an interesting account of these operations. "Monal and Argus pheasants," he remarks, "are snared in large numbers by professional trappers in the Kashmir and Chamba Native States, and also in the hills near Kulu, Dalhousie, Dharmsala, Palampur, etc. Snares are set in localities which are not frequented by sportsmen and others, and female birds and animals are destroyed *wholesale*. I have personally seen scores of young Monals and female pheasants entangled in the snares. The intention of the snares is, of course, to entrap male Monal and Argus Pheasants, but the system is such that every living thing that comes into the traps is destroyed. A

short description of the system of snaring "might prove of some interest. A hedge of branches of trees, brushwood and grass is erected from the bottom of a hill to the top. At every ten or twelve paces, there is a small opening in which a spring snare is fastened. The snare is composed of a bent branch and a slip-knot. While the birds and animals are feeding, they come across the hedge, and naturally look for an opening in order to cross it. On finding one, they endeavour to pass through it, and are caught in the snare." The writer adds that "the extent of the indiscriminate slaughter under such a system can only be realised by those who have witnessed it." And if these reports were startling, the enormous extent of the export trade in plumage was equally so. During the years 1895-1900 the total quantity and value of feathers (Indian merchandise) exported by sea from India to other Foreign countries amounted to the gigantic total of 11,49,354 lbs., representing a value of Rs. 15,51,831. The details were made up as follows :—

Province from which Exported.	Quantity.	Value.
	Lbs.	Rs.
Bengal	1,69,499	6,64,942
Bombay	9,46,067	7,43,807
Sind	881	1,710
Madras	23,499	1,12,388
Burma	9,408	28,984
Total ...	11,49,354	15,51,831

The greater part of these feathers were exported to the United Kingdom and China ; a considerable portion also went to Austria-Hungary, France, Germany and the Straits Settlements, and the balance was distributed in small quantities between Belgium, Japan, Arabia, Persia, etc. Nor were these the only figures which the authorities had before them at the time. It appeared that much of the export trade was also conducted through the medium of the Indian Post Office. For the period from 1st July 1898 to 30th June 1901, the records of a single Post Office, namely, that of Bombay, disclosed the facts that 1,521 parcels, containing birds' feathers of the aggregate weight of 6,813 lbs., and of the total declared value of £26,004, were despatched by the Foreign Parcel Post. Of this total number, 1,404 parcels, weighing 6,256 lbs., and valued at £23,653 were addressed to the United Kingdom, while the rest were addressed to other countries.

With these data before them, it was obviously impossible for the authorities to view with equanimity such an intolerable state of affairs. All reports and returns showed conclusively that the trade was rapidly increasing; that birds were being killed wholesale for the sake of their plumage; and that, if prompt measures were not taken, the extermination of various species, which are to be found in India only, was imminent. Accordingly as a first step to check this indiscriminate slaughter, a Notification, No. 5028 S. R., dated the 19th September 1902, was issued, under the Sea Customs Act, 1878, (VIII of 1878), prohibiting the taking by sea or by land out of British India of skins and feathers of all birds other than domestic birds, except (*a*) feathers of ostriches, and (*b*) skins and feathers exported *bona fide* as specimens illustrative of Natural History.

As this prohibition was issued without notice or warning, a large number of representations were received, notably from a trader in Simla, who had in stock skins of Impeyans and black Argus to the value of Rs. 6,000, and from two firms in Calcutta who had in hand 6,000 skins of Impeyan and Argus pheasants, and six cases of Kingfishers' feathers, and to enable them to dispose of their stocks, and to wind up their businesses, the operation of the orders was suspended until the 1st January 1903.

Shortly after this, the attention of Government was drawn to a letter which appeared in the *Madras Mail* of the 29th June 1903, in which the writer gave prominence to the fact that no provision had been made for detecting the export of feathers and plumage by land to territories of foreign Governments in India, such as Goa and Pondicherry. This point mediately received due attention, and with the cordial co-operation of the rench and Portuguese authorities, these outlets for export were also losed.

In July of the same year (1903) a Postal Notice drawing attention of the public to the prohibition of 18th September 1902, was issued to the following effect:—

"It is hereby notified that the transmission by post out of British India of skins and feathers of all birds other than domestic birds, except (*a*) feathers of ostriches and (*b*) skins and feathers exported *bonâ fide* as specimens illustrative of Natural History is prohibited.

"2. In the case of all parcels containing birds' skins or feathers for which customs declarations are required, the name of the bird must be entered in the customs declaration; and if exemption from the above prohibition is claimed on the ground that the skins or feathers are being exported *bonâ fide* as specimens illustrative of Natural History, a statement to this effect must be made in the customs declaration, otherwise the parcel will not be accepted for transmission by post."

The trade in plumage, however, being very lucrative, the above measures ere not sufficient to check it, and it appeared that export by foreign

parcel post, under false declarations, was resorted to largely. In consequence of this, two Notifications Nos. 1819-60 and 1821-60, dated the 26th February 1907, were issued under the Indian Post Office Act, 1898, (VI of 1898), empowering certain postal officers to search, or cause search to be made, for birds' skins and feathers in course of transmission by post to any place outside British India, and making the customs declaration in respect of parcels handed to the Post Office for transmission by the Foreign post, a declaration required by the Post Office Act.

As the position in respect of the illicit traffic in plumage from India is not generally known, we have given in detail the foregoing review of the various preventative measures, taken from time to time, in this country, and it will be observed that the Indian Government have practically closed every possible channel of export. But in spite of all these prohibitions, smuggling to a large extent has commenced, and still continues. The explanatory memorandum which is prefixed to Lord Avebury's "Importation of Plumage Prohibition Bill" is most pertinent to the subject, and deserves to be quoted in full :—

"The object of this Act is to check the wanton and wholesale destruction of birds which is being carried on everywhere throughout the British Empire, and in all parts of the world, without regard to agricultural, educational and æsthetic value of birds. As a proof of the extent of the destruction that at present goes on, and which is threatening the extinction of the most beautiful species, it may be mentioned that at the plume auctions held in London during the last six months of 1907 there were catalogued 19,742 skins of the birds of paradise; 1,411 packages of the nesting plumes of the white heron (representing the feathers of nearly 115,000 birds), besides immense numbers of the feathers and skins of almost every known species of ornamental plumaged bird. At the June sale, held at the Commercial Sale Rooms, 1,386 crowned pigeons' heads were sold, while among miscellaneous bird-skins one firm of auctioneers alone catalogued over 20,000 Kingfishers. A deplorable feature of recent sales is the offer of large numbers of lyrebirds' tails and of albatross quills. The constant repetition of such figures as the above—and these plume sales take place at least every two months—shows that the Legislature must choose between the extermination or the protection of the birds in question."

The statements in the above memorandum, astounding as they may seem, are nevertheless indisputable, and the inference that may be drawn therefrom, *viz.*, that an enormous illicit trade flourishes at the present time, is fully borne out by an examination of the records of the Indian Customs Authorities. During the years 1903-1910, no less than 49 cases of smuggling were detected at the ports of Calcutta, Bombay, Madras and Burma. There were 25 cases in Calcutta, 8 in Bombay, 10 in Madras, and 6 in Burma.

A brief description of some of the more important of these cases which have been detected (in addition to the one noticed by Mr. Buckland) is not

only interesting, but instructive as showing the methods adopted by smugglers engaged in the plume traffic;—

BENGAL.

(*a*). In April 1903 a Chinese firm were caught exporting a case of Kingfishers' skins. They were fined Rs. 1,000, and the skins were confiscated. The goods were declared as "Fishmaws."

(*b*). In October 1904, another firm were caught exporting three cases of Peacock feathers. The goods were intended for Hamburg, and were declared as "Indian curios." The firm was fined Rs. 500, and the feathers were confiscated.

(*c*). In August 1905 another Chinese firm were detected exporting 18 cases of Kingfishers' skins. They were intended for Hongkong, and were declared as "Tobacco." An examination of their books showed that since the prohibition of 1902 they had made no less than nine shipments of such goods. They were, therefore, fined Rs. 10,000.

(*d*). In the same year it came to light that a German firm in Calcutta had on various occasions smuggled consignments of Osprey, Heron and Grey Paddy Birds' feathers to the value of Rs. 22,850. They were fined Rs. 7,200. The goods were intended for London *via* Hamburg and Bremen.

(*e*). In January 1906 a Mahomedan presented a shipping bill for "three baskets of slippers," which really contained Kingfishers' skins to the value of Rs. 800. The consignment was intercepted.

(*f*). In June 1906 a consignment of five parcels, containing Osprey feathers, which had been posted in Calcutta addressed to Colombo under a misdescription "Pieces of yellow cloth" was detected. This case is a typical one, and is illustrative of the procedure sometimes adopted by smugglers. When they find it difficult to ship goods from a particular port, they send them by post, and if they wish to make sure that they will not be seized in the post, then, instead of despatching them direct to a foreign address, they post them to some small Indian port, whence they can be redespatched with less fear of detection; or else they send them to a similar intermediate destination by rail.

BOMBAY.

(*a*). During 1907-1908 two cases of smuggling of feathers occurred in this Presidency. In one case 41 packets of Egrets' feathers from Rangoon were intercepted at short intervals by the Bombay Post Office. The feathers, which were of very considerable value, were confiscated. In the other case 25 large boxes of Peacock feathers were shipped from Singapore on their way to Europe under a false shipping bill in which the contents were declared as "Country Cotton goods," and the identity of the shippers concealed. The shippers were traced with much difficulty, and severely dealt with, while the feathers were confiscated.

(*b*). In 1908-1909 a case of attempt to export by train 823 Jungle fowl skins, with feathers complete, was detected at Castle Rock. The exporter was fined Rs. 300, and was given the option of redeeming the feathers on payment of Rs. 4,000.

MADRAS.

During the year 1907-1908 there were 10 cases of attempted exportation of Osprey feathers from the above port. The penalties imposed amounted to Rs. 3,005.

BURMA.

The only important case of smuggling of feathers reported from the above is one which occurred in 1909-1910. The goods were exported from Madras to Rangoon, but as this could not be regarded as "exportation out of British India," the matter was dealt with as a misdeclaration only, and a nominal penalty imposed.

There will doubtless be a marked diminution in cases such as those mentioned above, if, and when, the Bill prohibiting the sale of plumage and skins of certain birds, which is at present before the House of Commons, becomes law. But there seems little hope of stamping out altogether this nefarious traffic, so long as the vicious taste for wearing feathers and skins of birds by the fair sex in their head-gear continues. "Woman," says Mr. Buckland, "has come down through the ages as embodied mercy, tenderness and compassion. Sculptors have represented her with the deep, maternal breast against which tearful little children nestle for succour and comfort. Painters have depicted the poor and the oppressed fleeing to her for refuge from cruelty and wrong. Writers have given her the semblance of Venus, the peerless goddess, who, because of her solicitude for the birds, would not permit victims to be offered her or her altars to be stained with blood.

"What a travesty of this, the world's reverent ideal of womanhood, is the befeathered Herodias of modern times! Is there in the wide world a more repugnant anomaly than the spectacle of modern woman—claiming to be more tender than man—transformed, at the beck of fashion, into a creature heedlessly destructive of bird life, and in practice as blood-thirsty as the most sanguinary beast of prey? It cannot be said in apology for her sin that she errs in ignorance. So much has been written and said about the brutal methods by which her feathers are obtained that the old subterfuges have become too battered to stand. Even those soothing emollients she was wont to apply to her conscience, 'artificial' and 'moulted,' have become too impaired by constant refutations to be of further service. She knows, no one better, that art cannot reproduce a feather, and she would toss her head in high disdain if asked to wear a moulted plume."

It would be interesting to know how the practice of wearing plumes and feathers for ornamental purposes originally arose, but it is without doubt of very ancient date. It is one of those relics of remote ages—akin to some superstitions in the religions of modern times—which in spite of its disastrous effects, still lingers, and is an outrage on every feeling of humanity. Through countless generations, man has been persistently shaking off all traces of his barbaric ancestors, and when the progress made by him is closely scrutinised, even after this enormous lapse of time, it is surprising to find that faint traces of his ancient customs still adhere to him with a wonderful tenacity. Times are, however, changing; powerful Ornithologists' Unions are at work; and the feeling is growing stronger daily that our feathered friends must be protected at all costs. Nothing short of an international law will, perhaps, ever accomplish this; but it is obvious that Governments can no longer countenance so pernicious a trade, the sole object of which is to minister for a short space of time to female vanity, or gratify the passing freak of a summer fashion at the cost of an enormous sacrifice of life. At the present time feathers, skins and other such like tawdries satisfy the demands of millinery, but when these fail, who would be bold enough to prophesy that insects with bizarre and fantastic shapes, or exotic butterflies with gorgeous colouring will not next be called into requisition to meet the demands of a new fashion? The attention of Governments of the day will doubtless then be drawn to the preservation of other species by zealous entomologists pressing for legislation in a fresh direction. But to return to the subject. It seems clear from the measures already taken that India is no longer a haunt for dealers in birds' skins and feathers, and it is high time now that they realised their precarious positions. We take this opportunity of suggesting that no heed should be paid to deputations and memorials urging absurd and frivolous objections, such as birds dropping their feathers naturally; or 1¼ millions of people being deprived of their means of livelihood; or the prohibitions not affording the least protection to birds, etc.

The points which strike us as deserving of further consideration by Government are—

(*i*). To prohibit the export of plumage from one Indian port to another (*vide* the Burma case of 1909-1910).

(*ii*). To prohibit the possession in India of birds' skins and feathers, except in reasonable quantities for personal use, or for scientific purposes only. This, it is thought, is the only measure which will ever put an end to the illicit trade so far as India is concerned at all events. For as long as there is a demand for feathers and skins, smuggling is bound to continue.

In conclusion, we venture to express a hope, and we feel confident that

all true sportsmen and naturalists in India will join us that Government will never be induced, even by the doctrine of non-interference with trade, which is the only argument that can reasonably be urged, ever to relax the prohibitions in respect of plumage, etc., now in force. Even the most impartial student of this question could not help but view, with feelings of dismay and apprehension, the consequences of any such relaxations. For the trade which is now practically extinct would spring into renewed activity, and while causing lasting and irreparable injury by bringing about the extermination of a large number of species of birds, would eventully end by killing itself by destroying that on which it subsisted.



THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Heatschel Colourtype

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

Part IX.

(Continued from page 330 of Volume XX.)

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

EXPLANATION OF PLATE D¹.

FIG. 23. *Papilio hector*, L. ♂.
" 23*a*. " " L. ♀.
" 24. " *aristolochiæ*, Fabr.

A. Hindwing without tails or well developed tails.
a. Hindwing broad and evenly rounded with no blue band or spots on disc of upperside of both wings.
*a*¹. Size very large, 5″·5 to 7″. Forewing black, hindwing yellow .. .. .. *minos*.
*b*¹. Size 5″·5 to 6″·1. Forewing black, hindwing Cambridge-blue .. .. .. *polymnestor* (Pl. D4. figs. 27 ♂, 27*a* ♀).
*c*¹. Size 3″ to 4″·75. Underside hindwing with the marginal interspaces between the black veins yellow or orange bordered inwardly each by a black line.

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

Part IX.

(*Continued from page* 330 *of Volume* XX.)

With Plates D³ and D⁴.

FAMILY—PAPILLIONIDÆ.

Only one genus .. .. PAPILIO.

There are two well marked divisions of the genus as composed of the species which interest these papers; the one composed of butterflies protected by smell and the other not. These divisions are well marked also by the form of the larvæ which, in the first, are abnormal in having the body provided with conical, fleshy tubercles not present in any of the others except one. Curiously enough, this particular one, *clytia*, has the imagines dimorphic, *i.e.*, of two forms varying in colour and general appearance, both minicking Danaine species, the one a *Euploea*, the other a *Danais* (probably *D. limniace*); the pupa is likewise of altogether an abnormal form, looking more like a bit of dead stick than anything else. The members of the first division are *Papilio minos* (generally known as *Ornithoptera minos*), *P. hector* and *P. aristolochiæ*, of which the last two are further distinguished from all the rest by the males being without the anal claspers so conspicuous in most others of the genus.

A. Hindwing without tails or well developed tails.

a. Hindwing broad and evenly rounded with no blue band or spots on disc of upperside of both wings.

*a*¹. Size very large, 5″·5 to 7″. Forewing black, hindwing yellow .. .. .. *minos*.

*b*¹. Size 5″·5 to 6″·1. Forewing black, hindwing Cambridge-blue .. .. .. *polymnestor* (Pl. D4. figs. 27 ♂, 27*a* ♀).

*c*¹. Size 3″ to 4″·75. Underside hindwing with the marginal interspaces between the black veins yellow or orange bordered inwardly each by a black line.

a^2. Hindwing underside end of cell dull, rich ochreous-yellow bordered inwardly by a black line. Size 3″ to 4″ .. *demoleus*. (Pl. D5, fig. 27 ♂)

b^2. Hindwing underside with the whole cell dark-brown or greyish-white.

a^3. Hindwing underside the whole cell brown. Size 4″·25 to 4″·75 .. *clytia* (form *panope*).

b^3. Hindwing underside the cell grey throughout (may have at most a fine black longitudinal streak or two). Size 4″·25 to 4″·75 .. .. .. *clytia* (form *dissimilis*).

Demoleus is a very common insect everywhere and is black in colour spotted all over with yellow.

Clytia is, as above stated, dimorphic in form, the *panope* form being the black one, the *dissimilis* form the light. There is another *Papilio* which resembles the dark form of *clytia* which may possibly be found at some hill-station for it is fairly plentiful in the Kanara District in the hills: it is *P. dravidarum* and may at once be distinguished from *clytia* by having a white spot or dot in the cell of the forewing, also by having no orange marginal spots on the underside of the hindwing.

b. Hindwing narrower, not evenly rounded; colour black with blue band and spots.

a^1. Forewing underside, with the cell unmarked. Size 3″·2 to 3″·75 .. .. .. *teredon*. (Pl. D5, fig. 30 ♂, 30*a* ♀.)

b^1. Forewing underside, the cell with four large spots in it. Size 3″·2 to 3″·5 .. *eurypylus*.

These two fast-flying butterflies have the forewing narrow and have a broad blue (sometimes with a yellow tinge) band from the apex of forewing to along the inner margin of hindwing, broken into spots towards apex: the first has, besides, only a single row of spots on the hindwing, just before the outer margin, the other has many extra spots.

B. Hindwing with prominent tails.

a. Tails narrow and parallel-sided.

a^1. Tails very long, black and white, colour more or less white all over. Size 2″·7 to 3″·75 .. .. *nomius*.

Another species, similar to this, is found in the jungles further south than Bombay; it has two green bands across the black apex of forewing It is *Papilio antiphates*. Size 3″·5 to 4″.

b^1. Tails short, broader, black;



THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Horace Knight del. Hentschel-Colourtype.

a^2. Colour upperside green and black. Size 3″·5 to 4″ .. .. *agamemnon*. (Pl. D5, fig. 29 ♂.)

The tails are, perhaps, very slightly spatulate in this species.

b^2. Colour upperside black and crimson. Size 3″·5 to 4″·75 .. .. .. *hector*. (Pl. D1, figs. 23 ♂, 23*a* ♀.)

b. Tails well developed, broad, spatulate.

a^1. Very large; colour black with large white or yellowish patch on hindwing. Size 4″25· to 5″·5 .. .. *daksha*. (Pl. D3, figs. 26 ♂, 26*a* ♀.)

There is another species similar to this in size and aspect except that the white patch is replaced by peacock blue-green; this is called *P. tami-*

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

EXPLANATION OF PLATE D'.

FIG. 28. *Papilio demoleus*, L. ♂.
,, 29. ,, *agamemnon*, L. ♂.
,, 30. ,, *teredon*, Felder, ♂.
,, 30*a*. ,, ,, ,, ♀.

sub-marginal one of that species. Size 4″·5 to 4″·6.

a^1. Colour above: black with a peacock-green band across both wings.

a^2. The green band very broad. Size 4″·2 to 4″·5 .. .. *buddha*.

b^2. The green band narrow. Size 4″ to 4″·6 .. *crino*.

These last two will not probably be found away from the hills; the first is not uncommon in the Konkan, south of Goa.

a^2. Colour upperside green and black. Size 3″·5 to 4″ .. .. *agamemnon*. (Pl. D5, fig. 29 ♂.)

The tails are, perhaps, very slightly spatulate in this species.

b^2. Colour upperside black and crimson. Size 3″·5 to 3″·75 .. .. .. *hector*. (Pl. D1, figs. 23 ♂, 23*a* ♀.)

b. Tails well developed, broad, spatulate.

a^1. Very large; colour black with large white or yellowish patch on hindwing. Size 4″25· to 5″·5 .. .. *daksha*. (Pl. D3, figs. 26 ♂, 26*a* ♀.)

There is another species similar to this in size and aspect except that the white patch is replaced by peacock blue-green; this is called *P. tamilana* and is found in the Kanara Ghats.

b^1. Smaller; forewing black, hindwing black with white discal spots and a row of sub-marginal bright red ones, especially bright on the underside. Size 3″ to 4″·5 .. *aristolochiæ*. (Pl. D1, fig. 24 ♂.)

c^1. Size of *aristolochiæ*; male black with a band of white spots across hindwing from above tail to apex, continued on to outer margin of forewing as an edge; females of three forms: one like the male, one like *P. aristolochiæ* but with brownish rose-colour instead of the red, a third somewhat like *P. hector* but the tails as in the male. Size 3″·5 to 4″ .. .. *polytes*. (Pl. D2, figs. 25 ♂, 25*a* and *b* ♀♀.)

There is another species, *P. demolion*, found in the Western Ghats in Kanara, &c., which is like the male of *P. polytes* except that it has two white bands to the wings; that is an extra one inside and parallel to the sub-marginal one of that species. Size 4″·3 to 4″·5.

d^1. Colour above: black with a peacock-green band across both wings.

a^2. The green band very broad. Size 4″·2 to 4″·5 .. .. *buddha*.

b^2. The green band narrow. Size 4″ to 4″·6 *crino*.

These last two will not probably be found away from the hills; the first is not uncommon in the Konkan, south of Goa.

The above table is arranged merely for reference, using easily ascertained characters only; natural affinity has no part in it. If the genus *Papilio* as constituted by the species here mentioned were to be grouped according to the relationship of its members, these groups would be as under—

Group I:—

Ornithoptera minos
Papilio hector
" *aristolochiæ*
" *pandiyanus*

with the larval characters as already given; the pupæ of the last two abnormal in having abdominal expansions, of *minos* quite normal. The clasper-character further distinguishes the first from the other two in the imago state. The food-plant of all three is *Aristolochia* of several species of the Family *Aristolochiaceæ*.

Group II:—

Papio clytia

already mentioned: with the larva shaped as in the foregoing, the abnormal, stick-like pupa and the food-plants *Litsea Alseodaphne, Cinnamomum*, of the Family *Laurineæ*.

Group III:—

Papilio demoleus
" *daksha*
" *polymnestor*
" *polytes*
" *dravidarum*

with the larvæ and pupæ quite normal: the young caterpillars resembling bird-droppings in colouration and pattern, quite naked; in the mature stage the colour is a rich green crossed by sullied white bands. The food-plants are all of the Family *Rutaceæ*.

Group IV:—

Papilio tamilana
" *buddha*
" *crino*

with larvæ and pupæ resembling the last group but nearly without markings, the latter narrower than those in that group. The food-plants are rutaceous.

Group V:—

Papilio eurypylus
" *sarpedon*
" *nomius*,
" *antiphates*
" *agamemnon*

with larvæ of various colour, slightly spined when full grown, very heavily so in the first stage; pupæ narrow with thoracic process. Food-plants *Anonaceæ* and *Lauraceæ* (*sarpedon*).

The *Papilionidæ* are a very fairly homogeneous group of butterflies. They are found in all parts of the world being most numerous in South America. They are distinguished from other butterflies by "legs well developed: claws large and simple; no empodium; front tibiæ with a pad; metanotum free, exposed between mesanotum and abdomen." In the Indian region Bingham enumerates some 89 species of which 75 are belonging to the genus *Papilio*, the 14 others are divided into five genera: *Armandia*, *Leptocircus*, *Teinopalpus*, *Parnassius* and *Hypermnestra*. These five are confined to mountainous regions at high elevations. The *Papilionidæ* are known at home as Swallowtails because the two only species of the genus *Papilio* (the only one represented in England) ever found in the British Isles are provided with long narrow tails, one to each hindwing; the commoner being *Papilio machaon* or The Swallowtail; in early days of the eighteenth century it was called the Royal William. This home representative of the family is really scarce nowadays, though it is said to have formerly been fairly abundant in places. The other is not really a butterfly of the British Isles but it is believed has once or twice been blown over from across the Channel and caught there; even this is not quite certain. Its name is *Papilio podalirius*. Both are plentiful enough in places in France and Germany.

The family contains some of the largest and most brilliant of the butterflies. *Papilio (Ornithoptera) minos* female has been known to reach nine inches in expanse of wing, the male always averaging somewhat less. It is a butterfly of the Plains but is sure to be found in some of the Hill Stations. One of the commonest is *P. aristolochiæ* which may be seen sailing along near the ground at any time of the year anywhere in India, its tailed hindwings with their large white patch and red spots being very conspicuous. Little scarcer is the more brilliant, nearly allied *P. hector*, larger than the last, with thinner tails, white on the forewing in streaks forming a band and with much brighter red, especially on the underside, on the hindwing. The prevailing colours are black or

very dark brown variegated with white, grey, blue, green, &c., according to the groups to which the insects belong—for even the genus *Papilio* is susceptible of division into many well-marked sections, and has been so split up by entomologists—and there are numbers of them suffused with brilliant metallic peacock-blues and greens either in large spots or all over, metallic colours which vary in shade with different angles at which the light strikes them. There are a few insects which are nearly uniformly dull, that is dark brown (with the exception of a white border to the wings, however, in every case), such as *P. clytia*, form *panope*; others again are streaked brown and grey or brown and white as *P. clytia*, form *dissimilis*; and these dull species are extremely like some of the protected members of the danaine sub-family of the *Nymphalidæ*.

This resemblance of insects without a disagreeable smell and (presumably) taste to members of a different family widely removed from them in affinity is one of the puzzles of Nature. How did it come about and why? If the *Papilios* "imitating" danaines habitually consorted with these latter or, even, if they fed upon the same plants, it might perhaps be possible to suggest some vague clue to the conundrum, psychical or material; but none of them do either one thing or other. The subject, however, is somewhat out of place here and little would be gained by discussing it, however interesting it may be.

The flight of the Swallowtails—the name is hardly applicable to many of the insects here treated of as tails are by no means present in all—is generally strong and quick, even the largest of them being capable of rapid progression. Many of them, under ordinary circumstances, sail along gently with wings outstretched, hovering over flowers now and again as the fancy seizes them, barely touching the petals with their long legs, to extract the nectar with their uncurled proboscis which, under ordinary conditions, is held safely rolled up and stowed away between the palpi. When disturbed or alarmed in any way, however, they will depart at a great pace, dodging from side to side as they go; and, when near the ground or among trees, they know how to take

advantage of any obstacle which is likely to baffle a pursuing enemy. The larger ones, like *minos*, *polymnestor*, *daksha*, &c., keep nearly always to the protection of trees and bushes high up among the tops of the former or much lower down near the ground, skimming the verdure of the latter; others, smaller in size, more rapid in flight, amuse themselves sailing backwards and forwards over the highest trees or round the tops of hills in open country, chasing each other at intervals up into the blue sky to become mere specks in the distance; and return again to their playground. *P. clytia* is very fond of this form of amusement. The style of flight is perhaps more varied amongst the Papilios than in any other group: the same insect may sail, hover, dart and skip, though the skipping is only true of the very fast-flying species. They all without exception are fond of flowers; few of them bask in the sun: when they do so it is with outstretched wings, the upper drawn down to cover a goodly portion of the hinder ones. It is even then perhaps more to rest than to bask that they assume this position. They are very active, keep on the wing for very long periods and always seem to be busy about something. They are all fond of strong bright light and generally rest under leaves of trees in rainy weather with the wings in the same horizontal position. The weakest flier is *P. aristolochiæ*, those of the *agamemnon* group are the strongest.

These insects always lay their eggs singly, with the exception of *P. demolion* which deposits them one on top of the other in a stick of as many as 15. As a very general rule they are laid exposed on the top of a leaf or on a young shoot. They are nearly spherical in shape, slightly broader than high (this may be due to the necessarily flattened bottom where the egg rests on the leaf); quite smooth on the surface or very minutely pitted; white, green or orange in colour and sometimes blotched with reddish. In the case of *demolion* each egg is flattened on both sides where it rests on the one beneath and supports the next. The insect flutters while depositing, resting with its legs and applying the end of the abdomen to the surface.

The larva emerges by eating a hole through the egg-shell, not

necessarily always in the same place, in a rather jagged way; it eats the shell as its first meal and then makes a bed of silk somewhere near the edge of the leaf; changing this, after it becomes bigger, for the midrib, stretched along which it always lies as in the case of the larvæ of the next family, the *Pieridæ*. It is sluggish in its movements at all periods of its existence, eats voraciously, grows fast and wanders generally before pupating. The pupa is formed against a twig or small branch, the larva lying with its head directed upwards, grasping the pad of silk, prepared before it finally comes to the quiescent state, with its claspers and encircling its body with a loop of the same, one end of which is attached to the support about two-thirds of the distance from tail to head; both the attachments are very strong. When the pupa breaks through the larval skin the cremastral hooks are wound into the tail-pad and the loop supports the downward weight—the larva having let go of the stem or twig some time before to fall back against it—in segment 4/5 as a very general rule, though, owing to same slight disturbance, the position may be somewhat displaced. As the skin of the chrysalis becomes dried by the air the part of the loop touching the body gets stuck to the surface and so keeps the whole more or less secure. In some cases the loop is very short, so that the pupa lies close up against the support with its ventral surface; in others it is long and the pupa swings freely on the tail support. The length of the loop is characteristic of the species or group.

The Swallowtail caterpiller is easy to distinguish from any other by the fact that it possesses an organ called an osmeterium (meaning the "scented wonder" or something of the sort) behind the head. It is situated on the back in the membrane between the head and the second segment and consists of a protrusible single cylindrical stem, dividing into two longly conical branches a short way from the origin, the whole thing not as long as the greatest thickness of the larva. The branches are withdrawn back into themselves from the top downwards, both finally being folded into the main stem which is then similarly drawn into itself. This organ is shiny, thin-skinned and glutinous; it is variously coloured

in different species and emits a very strong scent or smell, somewhat pungent but not disagreeable, recalling the concentrated essence of the juices of the food-plant. The device is certainly protective though how it exactly acts on the senses of enemies it is not easy to say.

The smell, through its pungency, is almost certainly obnoxious to insect foes; for concentrated essences or vegetable juices are known to be avoided by them: witness cloves, cinnamon, lemon, lavender. The stickiness of the organs may, by actual contact with a parasitic fly or wasp of small dimensions, ward of injury: the sudden protrusion and motion of the same might possibly have a like effect in the case of larger enemies. The larvæ often strike at the part of the body menaced with the protruded organs: that much is easy to observe and has often been noted: that an attacking fly is frightened thereby has also been seen; whether the attempt is repeated by the same fly with successful issue is not known. That larvæ do get parasitised is well known. Some of the species suffer greatly in that way.

The form of papilionid caterpillars is spindle-shaped with the ends blunt or cut off square. The head is large and withdrawable under segment 2. Segment 4 is mostly thickened somewhat transversely to the length of the body and often bears a ridge in the same sense; this region is generally the broadest part of the larva. The tail end bears two tubercles of characteristic length as do very often segments 2, 3, 4 also. There are several very well characterized types of these larvæ, each representing easily distinguished divisions of the genus *Papilio*:—

Section I.—Larvæ when full grown without conical fleshy tubercles.

A. Full grown larva with the anal segment continued into two short parallel, sharply conical points, close together.

a. Full grown larva having the appearance of being transversely lined, segment 4 differently coloured to rest.

*a*¹. Full grown larva black on dorsum of segment 4 . . *nomius*.

*b*¹. Full grown larva green on dorsum of segment 4 . . *antiphates*.

These two larvæ are generally whitish in the ground colour though *nomius* is sometimes dark brown or reddy brown.

b. Full grown larva more or less concolourous.

a^1. Lateral spine on segment 4 broadened out into a triangular tooth, white, the two connected by a crest or ridge across the dorsum .. .. *sarpedon.*

b^1. Lateral spines of segment 4 perfectly conical and sharp.

a^2. Colour green sullied with blotches of a very slightly darker shade .. .. *agamemnon.*

b^2. Colour pure green or rusty black .. *eurypylus.*

These three larvæ are all black in their first stage and are profusely covered with little branched spines which they gradually lose in the successive stages, the branches or spinules having disappeared altogether in the 4th stage.

B. Full grown larva with the anal segment not continued into such points; those points represented by mere knobs much more widely separated; the segment high, sometimes nearly perpendicular to the longitudinal axis of the rest of the body while that of the A division is nearly continuous in the same plane as that axis.

a. Full grown larva green, a prominent broad green, whitish or yellow band from dorso-ventral margin of segment 8 running up and back to hinder margin of segment 10 on dorsum or in that direction; a triangular whitish parch occupying the whole of the spiracular region of segment 10.

a^1. The full grown larva with a dorsolateral, small, conical, fleshy tubercle on segment 9 .. .. *demolion.*

b^1. The full grown larva without such tubercles.

a^2. The band on segments 8, 9 yellow-brown, spotted lighter; this band sometimes broken, irregular .. .. .. *demoleus.*

b^2. The band on segments 8, 9 green, indistinct because the same colour more or less as the larva .. .. .. *dravidarum.*

c^2. The band on segments 8, 9 with ground-colour white, sullied as a rule with grey, brown.

a^3. Full grown larva with lateral ocellus on segment 4 black, a brown line across centre and yellow-brown margin, one of the largest Papilio larvæ .. .. *daksha.*

b^2. Full grown larva with lateral ocellus on segment 1 black, a white line across centre and bordered brown in front, blue behind, also a large larva *polymnestor*.

c^2. Full grown larva with lateral ocellus black, not quite as above, very much smaller .. .. *polytes*.

b. Full grown larva green, not marked by bands.

a^1. The ocellus on segment 4 orange-brown, small and not well developed, the crest joining them white .. .. *tamilana*.

b^1. The ocellus on segment 4 otherwise, the crest joining them yellow .. .. .. *buddha* (*crino*).

Section II.—Larvæ with many conical, fleshy, pointed tubercles.

A.—Conical tubercles not red-tipped; the larva with broad creamy markings .. .. .. *clytia*.

B.—Conical tubercles red-tipped; the larva with no yellow markings; marking, if present, white or pinkish.

a. No band on segment 7 .. .. *hector*.

b. A band on segment 7.

a^1. The front margin of segment 2 rosy-white .. .. *pandiyanus*.

b^1. The front margin of segment 2 not white.

a^2. Colour more or less evenly black .. *aristolochiæ*.

b^2. Colour dark rose-brown, marbled satin-grey .. .. *minos*.

Many of these larvæ are spined when they first emerge from the egg; some of them very profusely so; the spines are modified in the later stages into small conical tubercles or fleshy knobs on a few segments, disappearing completely on others; those on which they subsist always are segments 2 and 14; next on segment 4, then 9. The young larvæ of section I, sub-section B, resemble bird-droppings in their colouration; those of Section II, sub-section A also, though in a less degree.

The pupæ are also somewhat variable, though all built on the same general plan with the exception of that of *P. clytia*, alluded to before as resembling a piece of cylindrical stick with the end broken off. In the others, that of the *hector-aristolochiæ* type has dorsolateral, small, flattened expansions to some of the abdominal segments; *minos* is like the *demolius-polymnestor-polytes* form,

with a few roughnesses on the dorsum; *tamilana-buddha* is nearly quite smooth; those of *nomius-eurypylus* have the apex of the thorax produced forwards into a blunt process. *Demolion* has the apex of the thorax produced into a curiously twisted, thin process though otherwise like *polytes*; its suspending loop is, however, very much longer than in this latter. All the pupæ wriggle when touched and produce a hissing sound; this is very noticeable in that of *minos*.

The food-plants of the caterpillars also characterise the groups. *Minos, hector, aristolochiæ pandiyanus* feed upon *Aristolochiaceæ*; *clytia*, however, affects *Laurineæ*; so does *sarpedon*; *nomius, antiphates, agamemnon, eurypylus* eat *Anonaceæ*; all the rest eat *Rutaceæ* (once *demoleus* was discovered feeding upon *Chloroxylon swietenia*, one of the *Meliaceæ*, to which family the Neem belongs). The four families consist of plants with strongly aromatic juices; but is this the only reason why the Swallowtails chose them in the past? There are probably more intimate relations between the families than the botanists allow or recognise. *Chloroxylon* is also aromatic; so is the Wild Carrot at home which feeds the larva of *P. machaon*. Carrot belongs to *Umbelliferæ*, a family quite unlike any of the above. There are, however, exceptions to every rule. The Papiliones are probably of tropical origin and when a species had to become acclimatised to more northern climes by being forced to live there, it would naturally choose food with some of the characteristics it had always been accustomed to; laurels, rues, custard-apples, *Aristolochia* are all uncommon in cold countries and so *machaon* was forced to depend upon carrot which was as good as anything else it could find. It would be interesting to know what all the species of the *Papilionidæ* of the world feed upon.

77. Papilio minos, *Cramer*.—Male *upperside*: forewing rich velvety black, pale yellowish streaks on either sides of the nerves beyond the cell; cilia short, black, alternated with pale, buffy white in the middle of the interspaces. Hindwing with the abdominal fold, the whole of interspace 1 (narrow yellowish streak of underside showing slightly in some specimens), the termen broadly, the extreme base of cell, the costal area, not extending below vein 8 except where it meets the terminal border, black; the rest of the wing rich silky yellow; the veins narrowly but prominently

black; the inner margin of the terminal black border produced inwards into cone-shaped markings in the interspaces. Abdominal fold inside filled with a dense mass of buffy-white, scented, cottony fluff. *Underside* similar, on forewing with the pale streaks along nerves much broader; on hindwing, in interspace 1, the black is limited more or less to centre of interspace, bordered anteriorly by a yellow streak along median vein and vein 2 (sometimes very narrow at the ends or obsolescent), posteriorly by the buff-coloured outer face of fold; the lateral margins of cone-shaped projections of terminal border of interspaces 2, 3 and sometimes 4 laterally bordered, in some specimens, with yellowish extending into the black border. Antennæ, head and thorax black; the collar narrowly crimson; abdomen yellow with a lateral and lateroventral row of black spots.—Female *upperside* and *underside* similar to those in the male but with the following differences:—Forewing: the pale nerve streaks broader and more prominent, white. Hindwing: *upperside* with the black in interspace 1 sometimes strongly suffused with whitish, the streak along median vein and vein 2 white as also the border to cone-shaped marking in the latter interspace, this interspace suffused white to near base; a large postdiscal black cone-shaped spot in each interspace 2-6, the black terminal margin filling apical half of interspace 7 but interrupted at extreme apex by yellow, sometimes obsoletely; the cilia rather largely grey in the interspaces. *Underside* like upperside, the black on underside of forewing and in interspace 1 of hindwing much browner. Antennæ, head and thorax as in the male; abdomen also similar but dark brownish black above. Expanse: 150-190mm.

In both male and female the hindwing on the upperside is clothed with soft, long, brownish-black hairs from base along the dorsal area. The male is always smaller than the female.

Larva.—Head black, round from front view, moderately thick through slightly covered by segment 2. Segment 2 is flat on top with a semicircular, shiny space on the dorsum; front margin straight; immediately in front and immediately behind this shiny space is a sub-dorsal red spot; on the front margin is a lateral, long, and a marginal, shorter, fleshy tubercle. The shape of the larva is sub-cylindrical, squarish looking, the belly being more or less flat, the anal segment being about the same breadth as segment 2, and sloping much—nearly perpendicularly. Each of segments 3 to 9 are of the same size. Each of segments 3 to 14 has a sub-dorsal, fleshy longly conical tubercle, those of segments 9 and 10 being longest: these tubercles are perpendicular to the surface of the body and slightly curved forward: from the 9th and 10th segments these tubercles gradually decrease in length to segments 3 and 13; those on segment 14 are much smaller than those on the preceding segments and are mere knobs. Segments 2, 3, 4,

5 and 14 have a similar lateral tubercle, that on segment 14 being a simple knob, that on segment 5 short, those on the other three segments being longer—the one on segment 4 is slightly longer than the other two. Besides these tubercles there is a spiracular row, on segments 2 to 14 of short ones about half as long as the lateral ones on segment 2: the spiracular tubercle on segment 14 is a mere knob and that on segment 2 is very short. On segments 2 to 13 is a small tubercle on the base of the leg or in the spot where the base of the leg ought to be. The legs are shiny black. The spiracles are longly oval and shiny black. The colour of the body is a velvety, rosey black, marbled with satiny grey on the back. On segments 7 and 8 is a diagonal rosey white band reaching from the base of the subdorsal tubercle of segment 8 to the base of the spiracular tubercle of segment 7. The subdorsal tubercle of segment 8 and the spiracular one of segment 7 are both rosey-white with red tips. All the pointed tubercles—for they are all pointed—are the same colour as the body, with bright red tips. L: 90mm; B: at broadest part (centre of the body): 15mm; H at the same place: 14mm; L of the longest tubercle: 14mm.

Pupa.—Head quadrate, top surface flat and sloping, front edge ridged, straight, with a short, triangular, round-topped projection, pointing sideways. Segment 2 has a carination separating it from segment 1, is divided into three trapeze-shaped portions which are flat, by two ridges—subdorsal—converging towards the centre of the hinder margin; slight-dorsal ridge. Thorax is convex, nearly hemispherical, with a strong dorsal carination running from front margin to apex where it divides into two curved, short, diverging ridges at right angles to each other, which latter two turn in and soon become parallel, running thus to the hinder margin. The thorax is short and the space between the two parallel ridges on its hinder slope is flat. The shoulders have a diagonal ridge running to a point towards the thorax apex. Segment 4 is in the same plane as the back slope of the thorax, the suspending string runs across its centre and behind two extraordinary waxy looking small out-growths situated on the wing-case line. The abdomen from this point to the end of segment 8 is somewhat flattened dorsally; the sides of thorax to where the suspending string passes are parallel to each other, the wing cases are expanded strongly in a curve from this point to the front of segment 8, the expansion being broadest just before the hind margin of segment 7. The abdomen from segment 9 (incl.) to the end is strongly curved down—a full quadrant of a circle—the intersegmental membrane of segments 8/9, 9/10, and 10/11 showing dorsally. Segments 8, 9, 10 have a subdorsal, laterally much flattened, contorted, pointed tooth, those on segments 8 and 9 being very large, those on segment 7 being hardly developed. From the base of each tooth of segment 9 a ridge runs to the base of the short cremaster. The ventral line of the pupa runs at first from the head parallel to hinder slope of

thorax in a curve so that the plane at the end of wing-cases is parallel to dorsum of segments 6, 7, 8. The shape is that of *P. hector* or *aristolochiæ*. Spiracles of segment 2 in a deep hole with a thickened front margin; the rest oval, raised, colour of body. Surface somewhat rough. Colour pink-brown or green with the saddle orange or yellow, and the back of the abdomen the same as saddle; the whole surface reticulated with brown; also with smokey suffusion on the sides of ventrum. The colour of the scent-organs or "osmeterium" is orange. Antennæ and wings bordered with a thin line of black and another of red or pink. L: 50mm.; B: 20-25 mm; H: 15 mm.

Habits.—The egg is laid on the upperside of a leaf, generally on a young one, or on a shoot, sometimes on the stem of the plant and only one is deposited at a time. The butterfly hovers while depositing, holding on with the tips of the toes; the situation chosen being always dense jungles, on the side of a slight opening as often as not. The little larva lives on the undersides of the leaves—in this differing from all others with the exception of *hector*, *aristolochiæ* and *pandiyanus*, its nearest relations—in its first stages, later on it is often found on the stems and stalks, rarely on the upperside of the leaves. It is very sluggish, sits at rest much contracted like other *Papilio* larvæ and feeds hungrily mostly in the mornings and evenings. It is much parasitised by a small braconid hymenopteron or wasp which lays many eggs in its body; the little grubs, emerging, feed upon the inside of the caterpillar and come out through holes which they eat in its skin to turn into pupæ in little cocoons covered with a white or yellowish cottony wool, many together, the mass often completely hiding the body of the host. The caterpillar wanders before pupating, finally fixing itself up against a bit of stick, stalk of a leaf, stem of a plant with the usual tail fastening and a loose body-loop, generally not far off the ground. The pupa makes a loud hissing sound when disturbed by touch. The noise is produced by rubbing the abdominal segments 8, 9, 10, 11 together at the margins by a contracting motion repeated at short intervals. The butterfly emerges in the morning just after sunrise, or a little later. It has a slow, sailing flight as a rule when undisturbed but flies quickly when frightened. It is fond of flowers and frequents shady walks and glades in the jungles, keeping fairly high up,

often, indeed, among the tree tops. It is most plentiful in the monsoon months. The females are quite as plentiful as the males at all times. The larva has been bred on *Aristolochia indica*, a weak climber with not very showy flowers and dry, expanded fruits resembling little baskets, often full of seeds, which grows plentifully in the forests and hills, from sea-level up to 2,500' in Bombay and is found nearly throughout India; also on *Bragantia Wallichii*, a shrub of the underwood in the forests of Western India, south of Goa, with leaves somewhat resembling those of Cinnamon and long thin pod-like fruits. Both these are belonging to the botanical family *Aristolochiaceæ*; the leaves of the former are locally supposed to be a certain cure for snake-bite; the roots of the latter are said to be equally efficacious in cases of cholera; the foliage of both is aromatic and smells rather nasty. The family is most largely represented in tropical America and, there, some of the flowers reach a large size and are very curiously coloured *Papilio minos* is confined to Western India from Bombay to Travancore. Three other species, similar to this, are found in British India; one of which, *P. darsius*, exist, only in Ceylon. The group contains some beautiful forms with green hindwings in the Malayan Sub-region.

78. Papilio hector. *L.* (Pl. D1., figs. 23♂, 23*a* ♀.)—Male *upperside* black. Forewing with a broad, white, interrupted band from the sub-costal nervure opposite the origin of veins 10 and 11, extended obliquely to the tornus and a second short preapical similar band; both bands composed of detached, irregularly indented, broad streaks in the interspaces. Hind wings with a discal, posteriorly strongly curved series of seven crimson spots followed by a sub-terminal series of crimson lunules. Cilia black alternated with white. *Underside*: forewing dull brownish black, hindwing black; markings as on upperside, but the crimson spots and crescentic markings on the hindwings larger. Antennæ, thorax and base of abdomen above black; head and rest of abdomen bright crimson; beneath: palpi, sides of thorax and abdomen crimson. Female similar, the discal series of spots and sub-terminal lunules much duller, pale crimson irrorated with black scales; in some specimens the anterior spots and lunules almost white barely tinged with crimson; abdomen above with the black colour extended further towards the apex. Exp. 88-120mm.

Larva.—Shape more or less cylindrical, squarish in transverse section because of the rows of tubercles which produce the effect; anal end high,

flap nearly perpendicular to longitudinal axis of larva. The body stoutest at the segments 4 and 5. Head black, round, somewhat hidden under segment 2, shiny. Segment 2 is straight in front and on the dorsum is a dull black shield, in front of which, on the front margin, are four bright red, short, fleshy tubercles, two on each side of dorsal line and under each other; on the back margin are two more of the same sort, one on each side of the central line. Segments 3 to 13 has each a sub-dorsal, longish, conical, fleshy tubercle the same segments have also a marginal row of similar tubercles. Segments 2 to 5 have each besides a row of lateral similar tubercles, the tubercle on segment 5 being reduced to a spot. The tubercles of the subdorsal row are longest, the lateral tubercle on the 2nd segment however is longer than any and points forward, all the others being at right angles to body-surface. On the front margin of segments 8 to 12 are two subdorsal, flesh coloured spots, and on the 7th segment are two on the posterior margin, but larger, of the same colour. At the anterior base of each subdorsal tubercle on segments 6 to 14 is a spot of the same colour. On segments 8 to 11 is a lateral small spot on anterior margin, and 2 lateral on segment 7 on the posterior margin: these spots are flesh-coloured also. All the tubercles are bright red. Spiracles oval, shiny black. The two long tubercles on segment 2 are black-tipped. Colour of body is rich black-brown; the osmeterium is orange. L. 45 mm.; B: 10 mm.

Pupa.—The general shape is that of the tailed *Papilios*. Head flat in front, produced out into two sharp-edged, semi-circular, rounded, ear-like, lateral projections connected by a ridge. Segment 2 surrounded in front by a sharp, turned-up ridge; with a dip towards the centre of the segment, and then an ascent towards thorax. Thorax carinated on dorsal line, this carination splitting near centre of thorax into two sharp, rounded ridges, diverging at first, but shortly running parallel to the hind margin of segment. The thorax is convex, smooth, eared flatly and largely on the shoulder, the surface of ear facing outwards, and the ear itself directed outwards and slightly up. Segments 4 to 7 are flat on top and trapezoidal, narrower in front than behind, sloping perpendicularly on sides, then sloping out and down to edges of wings; segments 8/11 have each two large ear-like projections, one on each side of dorsal line laterally, thin and rounded, facing out and inclined outwards; the 8th segment has also a spiracular one at edge of wing. Abdomen much curved down, the dorsal line of segments 4/7 being at an angle of about 120° to the hinder slope of thorax, a somewhat greater angle than in *P. mimos*; the wings are produced in the central ventral line, but not much. Surface smooth, hardly shiny. Spiracles of segment 2 situated in a round, circular depression; the rest raised, oval, dark-brown in colour. Cremaster short, strong, square at end. Colour of pupa light brown, marked on dorsum with white; it looks like brown alabaster; a whited orsal

line on segment 2, another, raised, on each side of this; another round the spiracular hole of same segment. L: 30mm.; B: 10mm.

Habits.—The same as *P. minos*. Young larva lives on undersides of leaves, where the egg is laid; afterwards sometimes on stems, &c. Pupation as in that species also, the loop equally lax. The food-plant is *A. indica* also. The imago or butterfly has also very similar habits except that it does not fly so high as a rule, is very much commoner and is as much an insect of the Plains as of the jungles and hills. It is found in Bengal, Orissa, Chittagong; in the southern half of Peninsular India and Ceylon. In southern India it is one of the commonest butterflies of the Plains. The figure in the coloured plate is good. The red on the underside of hind wing is hardly bright enough.

79. Papilio aristolochiæ, *Fabr.* (Pl. D1, fig. 24.)—Male *upperside* velvety black. Forewing with well-marked, pale streaks along veins on the discal area that do not reach the terminal margin; the latter broadly velvety black; the streaks beyond end of cell extended into its apex. Hindwing with elongate, white, discal markings in interspaces 2-5 beyond the cell. In dry-weather specimens these markings are very short and do not nearly reach the bases of the interspaces; beyond these a curved series of sub-terminal, lunular markings in interspaces 1-7 dull crimson irrorated with black scales, the spot in interspace 1 large, irregular, diffuse, margined interiorly with white. *Underside* ground-colour and markings similar, but the red sub-terminal spots on the hindwing much brighter, not irrorated with black scales, better defined, the anterior four sub-quadrate, the next two crescentric, sometimes quadrate also, the spot in interspace 1 triangular and pointed. Antennæ, thorax and abdomen above to close to end black; the head, sides of prothorax above and of the whole of the thorax and abdomen beneath vermillion-red; last segment vermillion-red.—Female similar; differs from the male only in the comparatively broader wings; this is most conspicuous in the forewing. Exp. 76-114mm.

Larva.—Head black, shiny, round from front view, half hidden. Segment 2 identical with that of *P. hector*. The larva is like *P. hector* in everyway, but differs in the following points: lateral tubercle on segment 5 is absent; all tubercles are shorter and there are no flesh-coloured spots. On segment 11 is a white spot at anterior base of sub-dorsal tubercle, and an indication of one in the same position on segment 12. On segment 8 is a small white spot at posterior, and a larger one at anterior base of sub-dorsal tubercle. The posterior half of segment 7 is pure white, the border of white being irregular anteriorly, the band extending to just below spiracular tubercle, and as an included black spot between spiracular

and subdorsal tubercles: these two tubercles are both white, being on the band: the band extends out in front from the base of the subdorsal tubercle to anterior margin of segment in a square patch, and has a small indentation on the dorsal line. The colour of scent-organs is orange. Colour otherwise the same as *P. hector*. L: 30mm; B: 8mm.

Pupa.—Exactly similar in every way to *P. hector* except that the ear-like processes are longer in proportion to the size of the pupa; the top of segment 2 is covered with a shiny red-brown colour as also the front part of the flat dorsal portion of segments 5, 6, 7. The pupa is somewhat smaller in size than that of *P. hector*.

Habits.—Identical with those of *P. hector*. Like the larva of that species, that of this is also badly parasitised by the same small wasp that attacks *P. minos*. The imago is found in N.-W. India; Sikkim; W. and S. India; Ceylon; Assam; Burma; Tannasserim; extending east to China and Siam and south to Malacca, Java and the Philippines. It is found practically all over India in the Plains and is one of the commonest of butterflies. It has a similar flight to the two preceding species though it is weaker on the wing. In the coloured figure there is too much red in the ground colour. The red on the underside of hindwing is not brilliant enough.

80. Papilio demoleus, L. (Pl. D5, fig. 28).—Male and female *upperside* black. Forewing with the base below the cell and basal half or latter so irrorated with yellow scales as to form more or less complete, transverse, dotted lines; two outwardly oblique, yellow spots in cell and a curved spot at its upper apex; a spot at base and another beyond it in interspace 8; a discal, transverse series of cream-yellow spots, irregular in arrangement and size, extends from interspace 1*a* to 8; the series interrupted in interspace 5 and the spot in interspace 7 double; this is followed by a similar, postdiscal series of spots and an admarginal, terminal series of smaller spots. In many specimens, between the discal and postdiscal series the black ground-colour is irrorated with yellowish scales. Hindwing base, and edging that decreases in width along the dorsal margin, irrorated with yellow scales; followed by a broad, medial, yellow, irregular band, a sinuous, postdiscal series of outwardly emarginate, yellow spots and a terminal series of smaller, similarly coloured spots as on the forewing. The inner margin of the medial band is curved inwards, the outer margin is very irregular and uneven; in the cell the band does not reach the apex, but beyond the cell there are one or more cream-yellow spots and the black ground-colour is irrorated with yellowish scales; finally at the tornal angle there is a roval, ochraceous-red spot emarginate on its inner side in the

female and in both sexes surmounted by a blue lunule; while in interspace 7, between the medial band and the postdiscal spot, there is a large ocellus-like spot of the black ground-colour more or less irrorated with blue scales. *Underside*: ground-colour similar, the cream-coloured markings paler and conspicuously larger. The latter differ from those on the upperside as follows:—Forewing: Basal half of cell and base of wing below it with cream-coloured streaks that coalesce at base; irregular ochraceous spots in interspace 5-8 and a discal series of spots complete, not interrupted in interspace 5. Hindwing: The black at base of wing and along the dorsal margin centred largely with pale cream-colour; the ocellus in interspace 7, the apex of the cell and the black ground-colour between the medial band and postdiscal markings in interspaces 2-6 centred with ochraceous margined with blue. Antennæ dark reddish-brown, touched with ochraceous on the inner side towards the club; head, thorax and abdomen dusky black; the head and thorax anteriorly streaked with cream-yellow: beneath: the palpi, thorax and abdomen cream-yellow with lateral longitudinal black lines on the last. Exp. 80-100mm.

Larva.—Head round, flattish in front nearly hidden under segment 2 in repose, light brown in colour. Segment 2 saddle-shaped, four-sided, cut square off in front, with a small short, fleshy protuberance at each front corner; the front margin of segment is as broad as the head and it gradually increases in breadth posteriorly. Segment 3 nearly twice as broad as segment 2, broader behind than in front, convex. Segments 4 and 5 are the thickest part of the body and are swollen, the anterior margin of segment 4 and posterior of segment 5 being thickened slightly and coloured yellow-brown, the yellow-brown colour on segment 4 reaching only half way down the side, bordered thinly with black and with a series of loops composed of thin black lines and a circular black eye-like mark at each extremely crossed transversely by a light blue line. The hinder margin of segment 5 has some dark spots on the yellow-brown part, this yellow-brown part reaching down the sides half way. Segments 4 and 5—the green part—are broad on top and very much narrower on sides. Segment 6 is slightly smaller in transverse section than segment 5 and the rest of the segments decrease in order in transverse section to the anal segment which is in a plane nearly perpendicular to the others. There is a pair of subdorsal points on segment 12 pointing out horizontally backwards. All the upper part of body is yellow-green with a broadish, greasy-looking white, spiracular band to them. The perpendicular part of the anal segment is whitish. The anterior margin of segment 6 and posterior margin of segment 5—that is the connecting membranes of those two segments—is whitey-black. The white spiracular line on body only reaches from segment 5 to end, and the green-dorsal part of segments 2 to

5 is bordered narrowly with a curved black line, and does not reach the base of the legs, the part below, as well as abdomen and legs, being a dirty transparent white. On segments 8 and 9 is a diagonal band reaching from centre of segment 9 near dorsum to the anterior margin of segment 8 at white, spiracular, marginal line: this band is irregular in contour and coloured yellow-brown, spotted with lighter colour. There is a patch similar in colour to this band at posterior lower margin of segment 10, and two small, similarly coloured spots on hind margin of same on each side of dorsal line. Prolegs large and fleshy. The bands are sometimes obsolescent, osmetria flesh coloured. L: 33mm; B: 7mm.

Pupa.—Head like *pamon* or *daksha* with two projections out in front, these projections short, broad, diverging, toothed slightly on the inside, ridged on top, and separated widely and squarely by a sharp ridge forming the front margin of head. Front of head-segment is sloping, hind margin is flat. Segment 2 is broad and flatly concave on top. Thorax is parallel-sided, shoulders being slightly prominent, the front dorsal slope nearly perpendicular to plane of segment 2, this front slope being overhung by the apex which is produced into a short, square-topped projection; from the top of this projection two ridges diverge to the back margin of thorax—slight ridges—between which the surface is flat transversely, although longitudinally slightly convex. The sides of thorax are slightly convex. The abdomen, dorsally on segments 4 to 8, is rather flat, the wing expansions are very slight, so that the pupa at segment 7 is very little broader than at the shoulders. The abdomen is cylindrical in section, except the last two segments which are square. The cremaster ends off square and is rather broad. There are a pair of very small tubercles at the base of each of the head projections on the top of the head, and a subdorsal one on each of the segments 8 to 11. The projection of the ventral line of junction of the wing cases is accentuated, and broadly parabolic. The surface of each wing-case is flat. The inclination of the dorsal line of the first four segments to the rest is about 120°. Spiracles oval, small, inconspicuous, raised, sunk in pits. Surface very finely but moderately deeply pitted all over. The colour is generally green with a more or less great quantity of yellow marking dorsally on abdomen; when the pupa is formed in a cage and not among leaves it is generally different shades of browns and greys. L: 30mm.; B: 10mm.

Habits.—The egg is laid on the top surface of a leaf. The young caterpillar that emerges is one of those that, from the next stage on until the last but one, imitates a bird-dropping; it is somewhat yellower in shade than that of *P. polytes*. The pupa is formed on the underside of a leaf, against a stalk of twig, &c.; and the loop is rather short that supports it. It is a good deal

slighter for its length than that of *P. polytes*. The larva is very much parasitised and does not use the osmeterium much. The butterfly has a very quick and strong flight and is always hurrying along whenever met with like, *P. machaon* at home, though it is a faster flier than this latter. It does not rise very much above the ground and is fond of flowers and the sun; it is commoner in the Plains than in the jungles and hills and may be seen on the wing throughout the year. Its range is Kashmir to Ceylon; eastwards to Burma up to a moderate elevation in the hills; westwards to Persia; it is found also in China and Formosa. The food-plants are belonging to the family Rutaceæ and it has been bred on *Ruta graveolens*, L.; *Glycosmis pentaphylla*, Correa; *Murraya koenigii*, Sprengler; *Citrus decumana*, *L.*; *Aegle Marmelos*, Correa; all rutaceous; on *Chloroxylon swietenia* DC., one of the *Meliaceæ*. The last food-plant is very exceptional and the larvæ did not look very healthy that were found on it. *C. swictenia* looks at first sight rather like a leguminous tree and this most probably led to a statement made in "Notes on the Larvæ and Pupæ of some of the Bombay Butterflies" by E.H.A. that it had been found on "leguminous plant with aromatic leaves." In this paper, published in this Journal in the year 1896, the butterfly is called *P. erithonius*. The figure on the coloured plate is good.

(To be continued.)

A SURVEY OF THE MAMMALIAN FAUNA OF INDIA, BURMA AND CEYLON.

Up to 1891, Naturalists in India had to rely for information on Mammals to Dr. Jerdon's "Mammals of India," a delightful book with many interesting notes on the habits of the different animals, but sadly wanting in details of distribution, and completeness in descriptions. This was through no fault of the author, but owing to lack of good collections and the paucity of information. At this time practically the only collections of Indian Mammals of any importance were in the Indian Museum at Calcutta and the British Museum in London. For observations over and above his own, the author relied on those of Colonel Sykes, Sir Walter Elliot, Brian Hodgson, Colonel Tickell, Major Hutton, Horsfield, Blyth and Kelaart, all of whom had made collections and published notes and papers in various journals and proceedings.

Some years later, namely, in 1884, R. A. Sterndale published his "Natural History of Indian Mammalia," a purely popular work not adding much to Jerdon's however.

A few years before Sterndale's work was published, namely, in 1881, a memorial prepared by Dr. P. L. Sclater, then Secretary to the Zoological Society, and signed by Darwin, Hooker, Huxley and other well known Scientists, was presented to the Secretary of State for India. In the memorial it was recommended that a series of volumes dealing with the Fauna of India should be prepared and that Dr. Blanford be appointed as editor. The outcome of this memorial was that in June 1888 the first part of the first volume of the series was published. This dealt with the Mammals as far as the Insectivora (Shrews and Bats), but it was not till 1891 that the second part completing the Mammals was published. The delay was caused by Dr. Blanford having to edit

other volumes in the series on birds, fishes and reptiles. Since 1891 this volume has been the standard work on Indian Mammals.

A glance through Dr. Blanford's book, the Mammals of the Indian Region, will show that there is still plenty of work to be done amongst Indian Mammals, even amongst the commonest species. Much has still to be learnt of the habits and distribution of nearly all the Mammals and from the want of specimens, in more than one case, several species were united under one name. This want has also hindered the study of the extent to which the different species vary.

As an instance of our ignorance of the distribution of some common animals it may be mentioned that the exact range and where they meet of the three kinds of Langur monkey, *i.e.*, the Langur, the Madras Langur, and the Himalayan Langur is still unknown.

Amongst the smaller carnivora, we find that the Waved Cat was supposed to have been originally obtained from Nepal and since then specimens have been obtained in as far distant localities as Kashmir and Rajputana. To this information Dr. Blanford adds:—"This cat must therefore be widely dispersed through Northern India, though it does not appear to be common." The Brown Palm-Civet is only known with certainty from the Palni and Nilgiri Hills, but Dr. Blanford suggests that it also probably inhabits the higher ranges of Cochin and Travancore. This has not been proved yet.

Though many people do not know it, a Marten closely allied to the Indian Marten, *Mustila flavigula*, is found in Southern India in the Nilgiri and Travancore Hills. In a paper on the Indian Marten published some years ago by Mr. J. L. Bonhote, the distribution of this Southern Indian race was given as the Peninsula of India!

When the Fauna was published it was thought that four Otters were found in India, but since then Mr. O. Thomas has pointed out that there are in reality only three, the Common Otter and the Himalayan Otter being the same. The distribution of these three

Otters is still very badly known, and though an otter is supposed to inhabit Ceylon it is not known to which species it belongs.

In a recent number of the Journal Mr. Wroughton pointed out how little was known also in regard to the species and distribution of the Hedgehogs of India and practically nothing of their habits.

Years ago the Rev. H. Baker reported, in the Journal of the Asiatic Society of Bengal, that he had found in Malabar some black-velvet-coated animals which he supposed were moles. His description sounds as if the animal was mole-like, but no moles are known to inhabit that part of India.

Of the thirteen white-toothed Shrews recorded in India, Burma, etc., one is found in only one locality and two known only from single specimens. The Assam short-tailed Shrew is likewise only known from a single specimen. In "Notes on Jerdon" Colonel McMaster mentions seeing a black Shrew swimming in a stream near Nagpur. No water shrew is known south of the Himalayas so it is impossible to say to what species this Shrew belongs.

Coming to the bats we find that according to Blanford there are 95 species, of which 12 are known from single specimens and 7 others from only one locality. Several new species have been described since 1891, and many additions made to our knowledge of their distribution.

Even the range of such common animals as the Common and Black-naped hares is wanting, and from information recently received it seems as if there was a variety of the last-named was confined to parts of Southern India. Of that interesting animal the Hispid Hare, found along the foot of the Himalayas and in Assam, hardly any thing is known regarding its habits. The exact range of the common Mouse Deer or Indian Chevrotain is imperfectly known, and the study of a large series of skins from all parts of India would, in all probability, lead to some interesting results. The same might also be said of the wild Pig about which we have more to learn than many people imagine.

To try and remedy the above defects, the Committee of our Society have decided to undertake a survey of the Mammals of India, Burma and Ceylon, and recently issued an appeal to members

for funds to enable them to employ two or more trained European Collectors to make a collection of the Mammals of India, Burma and Ceylon, all over the country, and in anticipation of obtaining the necessary money they commenced by engaging the services of Mr. C. A. Crump who collected for several years with Colonel Ward in Kashmir.

The sum, which it has been estimated, will be required for the purposes of this scheme to maintain two Collectors for two years only is Rs. 30,000 (£ 2,000), which can hardly be considered a large sum when we consider the enormous expanse to be covered and the great value the results of the work will be to Zoology in India.

In recent years a few volunteers have sent in specimens particularly Colonel Ward, Major Dunn, Major Magrath and Captain Whitehead, but it is recognised that the European in this country, whether in Military or Civil employ, has neither the time nor opportunity to collect Mammals and that the only way in which such work can be satisfactorily done is by the employment of trained men for the purpose. Mr. Oldfield Thomas, in charge of the Mammal Department at the British Museum (Natural History), South Kensington, fully supports our scheme and has agreed to identify all specimens for our Society and to describe any new species or varieties in our Journal.

At present, until sufficient funds are forthcoming, the Society dare not employ more than the one Collector, but it will be a regrettable thing if this is not speedily altered, and if only the money was obtainable the Society has at the present moment the chance of obtaining the services of Mr. Shortridge, as he has been recently invalided home from the New Guinea Expedition.

A good many members and others in Burma and elsewhere have kindly offered to help our Collectors when they visit their districts, and this assistance is greatly appreciated, but more money must be obtained if the scheme is not to fall through.

The Society has some 1,500 Members on its Register, and if only each member would contribute Rs. 10 a year for two years this would guarantee the whole sum.

The following donations have been received up to 15th April 1911 :—

Name.	Amount.		
	Rs.	A.	P.
H. H. the Maharaja Scindia (1st donation) ..	2,000	0	0
The Hon. N. C. Rothschild	1,500	0	0
H. H. the Rao of Cutch	1,000	0	0
H. H. the Maharaja of Mysore	1,000	0	0
Sir Dorab J. Tata	1,000	0	0
H. H. Sayajirao Gaikwad of Baroda	500	0	0
Mr. H. M. Phipson	500	0	0
,, Arthur Sassoon	250	0	0
,, W. S. Millard	200	0	0
Dr. N. Anandale	150	0	0
H. E. Sir George Clarke, G.C.M.G., G.C.I.E. ..	100	0	0
Mr. G. Laird MacGregor	100	0	0
,, E. Ernest Green	100	0	0
Prof. G. A. Gammie	100	0	0
Mr. G. R. Lowndes	100	0	0
Capt. R. D. MacGregor	100	0	0
H. H. Sir Sidi Ahmed Khan	100	0	0
Hon'ble Mr. W. T. Morrison	100	0	0
Shrimant Chintamanrao Appasaheb Patwardhan, Chief of Sangli.	100	0	0
Lt.-Col. W. B. Bannerman, I.M.S.	50	0	0
Mr. H. P. Macnaghten	50	0	0
,, H. W. Warburten, I.C.S.	50	0	0
,, J. A. Brandon	50	0	0
,, D. G. Hatchell	50	0	0
,, Geo. E. Bright	50	0	0
Lt.-Col. T. E. Dyson, I.M.S.	50	0	0
Col. H. D. Oliver	50	0	0
Mr. L. H. Savile	50	0	0
,, A. T. Wilson	50	0	0
Capt. J. L. Lunham, I.M.S.	30	0	0
Mr. J. E. B. Hotson, I.C.S.	30	0	0
,, M. M. L. Currie, I.C.S.	30	0	0
Capt. R. A. Lyall	30	0	0
Mr. J. E. Needham	30	0	0
,, E. L. Sale, I.C.S.	25	0	0
,, V. H. Boalth	25	0	0
,, J. McNeill, I.C.S.	25	0	0
Lt. Commdr. Honb'le R. O. Bridgeman ..	25	0	0
Mr. B. D. Richards	25	0	0
,, R. A. Wilson	25	0	0
Lt.-Col. N. A. H. Budd	25	0	0
Carried over ..	9,825	0	0

Name.	Amount.		
	Rs.	A.	P.
Brought forward ..	9,825	0	0
Capt. A. H. Mosse, I.A.	25	0	0
„ A. T. Hunt, R.N., C.I.E.	25	0	0
Mr. E. C. Stuart Baker	25	0	0
Rear-Admiral Sir H. E. Slade, K.C.I.E., M.V.O.	25	0	0
Mr. G. S. Hardy, I.C.S.	25	0	0
Hon'ble Mr. R. A. Lamb	25	0	0
Mr. F. G. Preston	25	0	0
„ W. O. Hannyugton, I.C.S.	25	0	0
General Osborn	20	8	0
Mr. A. L. Emanual, I.C.S.	20	0	0
„ L. V. M. Robertson	20	0	0
Capt. H. F. Salt, R.F.A.	20	0	0
Mr. P. S. Patuck, I.C.S.	20	0	0
Major V. G. Drake-Brockman	20	0	0
Capt. W. R. G. Scroggie, I.M.S.	20	0	0
Mr. C. S. Barton	16	0	0
„ E. Alan Hay	15	9	0
„ Stanley Pershouse	15	9	0
„ H. G. Chippindall	15	8	0
„ T. R. Lawrence	15	0	0
Capt. J. M. Skinner	15	0	0
Lt.-Col. R. M. Betham	15	0	0
Mrs. S. D. Sassoon	15	0	0
Capt. J. R. Tyrell	15	0	0
Mr. C. Petley	15	0	0
„ H. F. Saunders	15	0	0
„ John T. Fry	15	0	0
Capt. C. K. C. Stuart	15	0	0
Mr. C. G. Trench, I.C.S.	15	0	0
Capt. F. C. Fraser	15	0	0
Mr. J. M. Coode	15	0	0
Major P. P. Kilkelly, I.M.S.	15	0	0
Capt. K. G. Gharpurey	15	0	0
Mr. Chas. Mackinlay	15	0	0
„ H. R. Blanford, D. C.	15	0	0
Capt. C. R. Routh	15	0	0
Prof. K. Burnett	15	0	0
Major C. H. Ward	15	0	0
Mr. Chas. White	15	0	0
„ H. V. Cobb, I.C.S.	15	0	0
„ F. Hannyugton	15	0	0
Dr. Wm. Forsyth	15	0	0
Mr. L. O. Clark, I.C.S.	15	0	0
Lt.-Col. H. Loyther	15	0	0
„ M. Harington, I.M.S.	15	0	0
Mr. G. B. S. Cubitt	15	0	0
Carried over ..	10,633	2	0

Name.	Amount.		
	Rs.	A.	P.
Brought forward ..	10,633	2	0
Mr. R. G. Campbell	15	0	0
Capt. D. Campbell	14	13	8
Prof. P. F. Fyson	10	4	0
Capt. W. H. Evans	10	8	0
Mr. H. Whistler	10	4	0
Dr. G. R. Tambe	10	0	0
Mr. R. H. Heath	10	0	0
„ Walsh	10	0	0
„ A. E. Jones	10	0	0
„ G. C. Butterworth	10	0	0
Prof. J. N. Fraser	10	0	0
Mr. E. P. Comber	10	0	0
Dr. M. F. Suter	10	0	0
Capt. H. H. Smith	10	0	0
Mr. F. J. Mitchell	10	0	0
Major J. Girvin, R.A.M.C.	10	0	0
„ H. A. F. Magrath	10	0	0
Mr. A. Wimbush	10	0	0
„ H. Vernon Purkis	10	0	0
Lt. F. B. Scott, I.A.	10	0	0
Mr. R. Volkart	10	0	0
„ W. Reinhart	10	0	0
„ R. Whately	10	0	0
„ K. R. Bomanji	10	0	0
Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.) ..	10	0	0
Mr. W. J. N. Ryan	10	0	0
„ S. B. Tyabji	5	0	0
Total Rs. ..	10,908	15	8

The following subscriptions have been promised :—

Mr. G. M. Ryan .. .. Rs. 100
„ T. R. Bell .. .. „ 10 per month.
„ S. C. G. Wood .. .. „ 10 2nd donation.
Major J. Girvin, R.A.M.C. .. „ 10 „ „

Extra donations :—

Mr. G. R. Lowndes .. .. Camp Kit.
„ N. B. Kinnear .. .. Second-hand Rifle.

Received since 15th April .. Rs. 1,565 0 0

Total received up to 30th April .. Rs. 12,473 15 8

REVIEW.

AN INTRODUCTION TO BIOLOGY FOR STUDENTS IN INDIA.

BY

L. E. Lloyd, Capt., I.M.S.

[*Longmans & Co. Price Rs. 4.*]

Teachers of Natural History all over India will cordially welcome this work which, with the exception of a small book by Powell, is the first attempt to adapt the teaching of Animal Biology to the local conditions and needs of the Indian student.

The first eight chapters are devoted to excellent descriptions of Indian examples of most of the Invertebrate sub-kingdoms. These examples are for the most part easily obtainable and have been selected with judgment. No vertebrate or vegetable organism is described, nor do we think there is any great necessity to describe the vertebrates, as so many English text-books give satisfactory descriptions of types easily obtainable in India.

The last four chapters are good but brief essays on the principles of Biology, Evolution, Variation and Heredity, which are however mainly illustrated by facts in vegetable and vertebrate organisms.

There are few points in the book which call for further criticism than warm praise. For instance, we are told that "*Distoma* is not common in India." Ten years ago we never had any difficulty in finding it in Calcutta. In Eastern Bengal this parasite has at times caused us personally pecuniary loss, and seemed to us to be present in the majority of apparently healthy sheep and goats.

We are surprised to learn that *Euglena* cannot be easily obtained in Calcutta. The author's description of the Earthworm *Pheretima* (*Perichaeta*) *posthuma* differs in many particulars from the older account by Powell; thus the dorsal pores are said to occur between each segment: the vasa deferentia on each side are said not to unite, but run separately side by side till they reach the "prostatic" duct. We have examined six specimens since reading Capt. Lloyd's book, and found the ducts unite in all six cases in the 12th segment. Perhaps Capt. Lloyd's description was taken from an aberrant specimen, or possibly the worm of Calcutta differs from that of Bombay. Lloyd describes as the "crop" the thick walled organ usually called the "gizzard."

We do not quite appreciate what he describes as "the œsophageal glands." The drawing shows these glands in the situation of what Powell has described as "mop-shaped or compound nephridia." These structures are undoubtedly nephridia. The name "œsophageal glands" has already been given to well recognised structures of totally different homology.

Few will agree with the author's account of the thorax of the mosquito. He regards the scutellum as representing the whole of the mesonotum and all anterior to it "more than three-quarters of the whole" thoracic terga as the pronotum.

On page 180 we read "In a European species of cockroach the *males* are wingless"—an obvious slip of the pen for *females*. But why European? Is not *S. orientalis* all too common in India?

One or two sentences might perhaps be better worded, for example page IX—"Science is our united experience of material things *as expressed in books*." On page 2, "Bacteria which have emerged from minute round bodies called spores, just as a chicken emerges from its egg."

These are small faults easily rectified in future editions. The book as a whole will be a great assistance to both teacher and student.

A. POWELL.

INDIAN EARTHWORMS AND THEIR DISTRIBUTION.

W. Michaelsen, "The Oligochæta of India, Nepal, Ceylon, Burma and the Andaman Isles," *Mem. Ind. Mus.*, vol. i, pp. 101-253 (1909), and "Die Oligochatenfauna der vorderindisch-ceylonischen Region," *Abhandl. Naturwissen. Verein, in Hamburg*, Band xix, Heft 5, pp. 1-107 (1910).

In the two papers to which a reference is given Dr. W. Michaelsen, of the Hamburg Natural History Museum, the author of the admirable volume on the Oligochæta in "Das Tierreich" discusses the taxonomy and distribution of the earthworms of India and Ceylon and of their allies, the minute aquatic species of the families Acolosomatidæ, Naididæ and Tubificidæ, his investigations being based mainly on the collections preserved in the Indian Museum. In his last paper he recognizes 177 species of Oligochæta as occurring in India (including Nepal, Burma and the Andamans) and Ceylon. Of these, 24 species belong to the aquatic families, 1 species (*Henlea lefroyi*, Beddard) is parasitic in habits, and 152 are true earthworms. The aquatic Oligochæta exhibit many interesting features as regards habits and structure,* but with few exceptions they have an extremely wide distribution, the same species often occurring in all geographical regions. They are therefore of less geographical interest than the true earthworms.

Dr. Michaelsen divides the earthworms, considering them from a geographical point of view, into two categories, "endemic" and "peregrine" species, the latter being species which accompany man in his wanderings and are introduced with garden plants and the like into the country sur-

* As regards the Indian species see Stephenson's papers (*Mem. Ind. Mus.*, Vol. i. pp. 255-281; *Rec. Ind. Mus.*, vol. i, pp. 133 and 233 (1907); vol. ii, p. 39 (1908); vol iii, p 195 (1909); vol. v, pp. 59, 233 and 241 (1910).

rounding human habitations. He regards 31 of the species found in India and Ceylon as peregrine and a considerable number as of doubtful origin, but the great majority he asserts to be endemic in the strict sense of the word. It may be noted, however, that while the earthworms of Bengal, certain parts of the Himalayas and Madras, the plains of Travancore and of the United Provinces are now pretty well known, those of the Bombay Presidency have still been very imperfectly collected and studied.

In the first of his two papers Dr. Michaelsen states that the Indian Empire and Ceylon may be divided, so far as the earthworms are concerned, into three geographical regions, a North Indian Region, a South Indian-Ceylon Region, and an Indo-Malayan Region. The last is of course not confined by the political boundaries of the Indian Empire but extends eastwards and southwards into Malaysia. So far as our fauna is concerned it includes only Burma and the Andaman Islands. The North Indian Region includes all India north of a line drawn from west to east "somewhat north of the latitude of Madras." The South Indian-Ceylon Region is divided into two sub-regions, the South Indian and the Ceylon Subregion. With a few exceptions the earthworms of the Western Himalayas, as well as all those known from the Punjab, are Palæarctic species, but Dr. Michaelsen considers them to be peregrine, and is apparently prepared to deny that there are any indigenous earthworms in North-Western India. As some of the specimens he has examined come from localities in the Western Himalayas far from any human dwelling, and as the many other elements (*e.g.*, the Diptera) in the fauna of the same localities are Palæarctic, it is difficult to accept this verdict as final. A different view is taken by Beddard as regards the earthworms of Gilgit.*

Dr. Michaelsen is an enthusiast on behalf of the earthworms. "The endemic terrestrial Oligochætes," he writes, "give us one of the best documents for the geological history of a country." He evokes a chain of islands between New Zealand and the Eastern Himalayas to afford a passage for the westward march of the Octochætinæ, and when it is no longer needed for the use of these favoured creatures, dismisses it beneath the sea. We may not be able to follow him in such flights, but it is impossible to avoid recognition of the laborious and accurate work that forms their starting point. All Indian naturalists must be grateful to him for his researches on a group that has hitherto been much neglected in this country but possesses a real geographical importance.—N. A.

* "They are entirely European, *i.e.*, Palæarctic species: they belong, in fact, to the usual British forms. This is of interest, as being an approximation to discovering the limits of the Oriental region for worms": Beddard in Alcock's *Report on the Natural History Results of the Pamir Boundary Commission*, p. 45 (Calcutta, 1898).

MISCELLANEOUS NOTES.

No. 1.—VITALITY OF A WOUNDED TIGER.

In March 1888 I was out in the banks of the Kosi where it leaves Nepal. On the 19th March I fired at a tiger as he disappeared into the jungle and hit him over the left kidney, he could not be followed that evening as it was almost dark. On the 21st he was put up and fired at. On the 24th he was seen, also on the 28th. On the 30th he was put up and killed by a bullet through the skull. One of the party got off his elephant and on to the pad elephant to help in putting up the dead tiger. He was not long at work when he was seen to leap off wildly and begin vomiting and remarked that the stench from a wound in the tiger's back was awful and that it was the tiger I had wounded a week ago. A *post mortem* was made—my bullet had struck the spine just above the left kidney, breaking up the kidney, part of the liver, the whole of the left lung and the pericardial sac was filled with blood, the side of the spine was deeply scraped for about 3 inches and the last rib broken.

W. FORSYTH.

Pen Ithon Hall, Newtown, N. Wales,
4th January 1911.



No. II.—OLD WOUNDS IN TIGER AND PANTHER.



The accompanying illustration is from a photograph of the left and right *femur* of a tiger and panther respectively, shot by myself. It will be noticed that they have both been fractured but have re-united, making of course in each case one hind leg shorter than the other. In the case of the tiger, I was unable to ascertain how the bone (the larger one in the photograph) had been fractured, but in the case of the panther the injury had, no doubt, been caused by a bullet, as I found no less than three old bullets in its body. The tiger too had probably been wounded in the same way although there were no signs to show this. Both animals must, at the time of the injuries, have had considerable difficulty in obtaining their *natural* food if indeed they were not quite incapacitated from doing so. It is at such a time that tigers and panthers are supposed to take to man-eating as being the easiest way of satisfying their hunger, but I can confidently say that neither of these animals were man-eaters. The panther was an exceptionally fine one and measured 7 feet 8 inches in length. It had killed two or three of my young buffaloes before I shot it. There is room for much conjecture.

MARSH HALL, SOUTH MOLTON, N. DEVON, L. L. FENTON,
30th October 1910. LT.-COL.

[Our Society has in its museum a somewhat similar specimen to the above—being the tibia and fibula of a tiger shot by Lt.-Col. G. H. S. Gimlette, I.M.S. at Rewah, C.I., some years ago. Major Gimlette when sending the specimen remarked that the tiger when shot was going quite soundly and showed no sign of lameness. The bullet, if we remember rightly, was still in the leg bone.—EDS.]

No. III.—THE NUMBER OF CUBS IN A TIGER'S LITTER.

In March 1887 I was out on the banks of the Kosi after tiger, when a tigress was shot. On examination it was found that the uterus held 5 fœtus.

In 1888, on the 31st March, on the same ground a tigress was shot, the uterus held 5 fœtus within a week of being born, the skins were to be sent to Rowland Ward.

In 1887, 7 tigers were shot in 6 days.

In 1888, 21 tigers were shot in 31 days, over ground some 20 miles in length and 10 miles in breadth. This ground is partly in British India Territory and partly in Nepal. It is a great grazing ground in the hot weather and tigers follow the herds and in addition hog-deer and pig are very common, so tigers are well fed and their procreative powers are well developed. We came several times on a tigress and 3 cubs.

PEN ITHON HALL, NEWTON, N. WALES, W. FORSYTH.
4th January 1911.

No. IV.—SAMBUR AND TIGER.

A short account of the behaviour of a sambur doe whilst I was waiting for tiger the other day may be of interest.

When some men went out to bring in one of my tied-up buffaloes about 7 A. M. they were unable to approach on account of tigers growling; the buffalo had not then been touched but when I arrived at 8 A. M. the buffalo had been killed and partly eaten. I sat over it from 1 P. M. Soon after that hour, I heard roars every fifteen or twenty minutes and the sharp clarion call of a sambur hind sounding from almost exactly the place from which the roars and other noises made by the tigers were coming.

The doe or hind stuck gamely and continuously to her enemies and never once appeared to leave them all the long afternoon, frequently uttering her bugle-like note of alarm. I could trace the gradual advance of the tigers towards the kill, till at last the doe's bell sounded quite close and almost immediately two fine tigers stepped into view. I killed one with a shot through the heart and the other disappeared. The doe however continued calling loudly for some time notwithstanding the shot fired so close to her. Had she a fawn near?

Why did the tigers not molest her?

H. W. SETON-KARR.

November 1910.

No. V.—FOOD OF SAMBUR.

Last September I was out Pykara way—that is west of Ooty—I was much interested in noting that the sambur had eaten, and in large quantities, the common Nilgiri nettle—*Girardinia heterophy*, etc. This nettle has large species on the leaves and ordinary clothes are no protection when working through it. The irritation lasts for some time and is very painful. It seems strange food for an animal and this in the wet weather or here there is any quantity of food of all sorts in the jungles and on the hill-sides. There is no mistake about the sambur having eaten this plant, the ground all round the plants was trodden down, and the foot marks were quite distinct. I drew the attention of two friends who were with me at the time to this, and though both of them have been in this part for many years (*i.e.*, in Pykara) and are most observant, this is the first occasion on which they have seen the nettle eaten by sambur, or any animal.

CHAS. GRAY.

ORCHARD DENE,

COONOOR, *November 8th*, 1910.

No. VI.—ABNORMAL NUMBER OF YOUNG IN A MARKHOR.

Whilst up in the Chilias district I was in the Rakhiot nullah shooting. On the 21st June I was on the hill-side between Rakhiot and Jalipur Nullahs which overlooks the Indus, trying for a good Oorial. I got a nice one of 28½ inches and later whilst searching for others saw a very interesting sight. This was a female Markhor, sitting on a high rock in the middle of the fir jungle, with three small kids lying beside her. I watched them for a long time. Every now and again the old female would get up and look round for danger, when the little-kids had a great struggle so as not to be left without a drink of mother's milk. I was well above them and so was able to approach moderately close without being seen. I was very supprised to see them where they were as the ground was not like markhor holding ground though there was some about a mile and a half further along the hill-side.

The local people I had with me were both well known local shikaries and said that it was the first time they had either seen or heard of markhor producing three kids at one time though tame goats not infrequently do so. They also had never seen markhor so far outside the nullah and away from their usual haunts.

JHANSI,
August 16th, 1910.

J. A. POTTINGER,
30th Punjabis.

No. VII.—NEW INDIAN BATS.

In the *Annals and Magazine of Natural History* for December 1910 Dr. Knud Anderson describes ten new Fruit-bats among which is a racial form of *cynopterus sphinx=C. marginatus* of the Fauna of B. I., the short-nosed Fruit-bat. This race Dr. Anderson calls *C. sphinx gangeticus* destinguishing it from *C. S. sphinx* by its larger size. He remarks that this bat *C. sphinx* "falls into two well-marked races. The smaller *C. s. sphinx* ranges from Ceylon northward along the western side of the Peninsula at least as far as Bombay, and along the whole of the eastern side to Bengal, Assam, and N. Siam via Assam and N. Shan it meets the extreme northern outpost of *C. brachyotis angulatus*. The larger *C. s. gangeticus* is probably generally distributed over the North-Western and Central Provinces of India, but so far identified only from Lucknow and Nasik."

The type was collected by Major A. S. Begbie at Lucknow and was presented to the British Museum by the Society.

In the same magazine for February 1911 Mr. Oldfield Thomas gives the description of new species of long-eared bat collected by C. A. Crump at Leh, Ladak. The bat is named *Plecotus wardi* after the donor Col. A. E. Ward. It is distinguishable from *P. homochrous* and *P. puck* by a broader skull and paler colour.

No. VIII.—GREAT INDIAN FIN WHALE NEAR RATNAGIRI.

On the 9th of January the Society received information from the Collector of Salt for the Bombay Presidency of a large whale having been washed ashore near Viziadrug in the Ratnagiri district, some miles south of Bombay. Mr. C. Crump, the Society's Mammal Collector, was at once despatched to Viziadrug, but unfortunately when he arrived there he found the whale had gone to pieces, only a few bones remaining. He, however, secured several blades of baleen, the largest of which measured 14½" broad at the base and 22 inches in length. In colour the baleen was a uniform black. The whale was said to have measured between 68 and 70 feet and probably therefore was an example of the Great Indian Fin Whale (*Balænoptera indica*).

In volume XVII of this Journal the stranding of a large whale—said to be 63 feet in length—at Bassein on April 11th, 1906, was recorded. In both cases, owing to the delay in information reaching the Society, chances have been lost of correctly determining the colour of this large whale. Through the kindness of the late Mr. Wood, I. C. S., instructions have been issued to the various officers of the Salt Department near Bombay to immediately report by telegram to the Society any large whale which may be washed ashore.

BOMBAY NAT. HIST. SOC.,
March 1911.

N. B. KINNEAR.

No. IX.—THE RUFOUS-BACKED SPARROW (*PASSER PYRRHONOTUS*, BLYTH).

In the *Fauna of British India*, Vol. II, p. 238, the distribution of this bird is given as "Bahâwalpur; the Eastern Nára, Sind." Since then it has been recorded from Lahore [Journal, B. N. H. S., XIX, 259]. It may therefore be of interest to record that on February 19th of this year I met with a flock of small birds, which proved to belong to this species, in some trees on the R. Sutlej side of Ludhiana. The behaviour of the birds reminded me of a flock of Siskins or Redpolls, and I shot one, fully expecting to find it to be one of those birds. But on picking up a male sparrow that was new to me, I shot a second bird and it too was a male of the same kind. The birds were tame and cared little for the gun, merely flying a few yards and then continuing their busy search for food. Their notes were low and sweet.

A few days later, on the 2nd of March, I shot a solitary female in a small grove of trees at Phillaur on the other side of the river.

RAWAL PINDI,
November 29th, 1910.

H. WHISTLER,
Indian Police.

No. X.—THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES*).

With reference to Mr. Dodsworth's enquiry in the last Journal, I may mention that I have observed Himalayan Greenfinches at Kurseong (6,000 feet), Eastern Himalayas, from early in October to late in December.

KURSEONG, *20th December* 1910. E. A. D'ABREU, F. Z. S.

No. XI.—BLYTH'S BAZA (*BAZA JERDONI*).

I was much interested in Mr. D'Abreu's note of the occurrence of *Baza jerdoni* at Kurseong which appeared in the last Journal (No. 2, Vol. XX). I may mention that the bird is not excessively rare in this part of the district (reputed elevation 1,200 ft. to 2,000 ft.) and Mr. C. M. Inglis while staying with me shot a fine adult at the beginning of the year. I have frequently seen others while going round the garden since then and to-day came across four of these birds. One of these settled close by and from its elongated and at the time half-erected crest was unmistakable. On my pointing my stick at it, it joined three others that were soaring round within easy shot. I may mention this is the only occasion on which I have ever seen it in more than pairs, though *B. lophotes* (The Black-crested Baza) is not very rarely met in threes, fours and even up to five in a party, the latter being presumably two adult birds and the young of the season. I took a clutch (three) of the latter birds' eggs in the early rains from a sal tree, the nest being about 25 feet from the ground. These are now in Mr. Inglis's collection. I had great hopes of obtaining eggs of *B. jerdoni* as well, but the birds deserted the tree in which they showed favourable signs of breeding. However I hope to be more successful next year. The Nepalis consider both the Bazas common birds and have one name for both. *Microhierax eutolmus* (The Red-legged Falconet)—of which I have shown them four specimens—they consider an unknown bird!

I may add in conclusion that to a casual observer *B. jerdoni* may be readily mistaken for *Lophospizias trivirgatus* (The Crested Goshawk), the coloration of both birds being very similar.

LONGVIEW TEA ESTATE, ALEX M. PRIMROSE.
[illegible] P. O., D. H. RY.,
20th November 1910.

No. XII.—SECOND OCCURRENCE OF THE EUROPEAN GREAT BUSTARD (*OTIS TARDA*) IN INDIA.

On the 5th instant I sent you by registered letter post a skin of what I make out to be the Great (European) Bustard (*Otis tarda*), an immature female.

It was shot by a Zamindar near Jacobabad on Sunday, 1st January 1911,

out of a party of four. They had been about the village for some days in the gram and mustard fields. I had not heard of them or I should have gone out to try to watch them. I saw them flying round on the Sunday morning when out pigsticking, but could not tell then that they were anything out of the ordinary.

The Zamindar tells me that they used to fly around on the evenings. They have not been seen since this one was shot. All four were about the same size. The man's father tells me that a bird like it was shot here about 25 years ago, but whether that was another *Otis tarda* or not it is impossible to say. All the people about here recognise this as a Bustard but all agree it is a strange.

Would you please let me know if this is a specimen of *Otis tarda*, as I see the only one previously recorded was shot near Marden 40 years ago.

LARKHANA, SIND,
8th January 1911.

M. H. SIMONDS, CAPT.,
7th Hariana Lancers.

The above skin was sent to Mr. Stuart Baker, who writes as follows:—

It is now almost exactly forty years ago that Hume through his collectors obtained the first specimen of the Great Bustard ever obtained in India. This bird was killed on the 23rd December 1870 at Mardan, north of the Kabul River, and was one of a small party feeding in some mustard fields.

A second specimen of this magnificent bird has now been obtained by Captain M. H. Simonds at Jacobabad, Sind. This bird, like Hume's, is a young female adult and Captain Simonds has recorded the following notes as to its measurements, &c.:—Length 31·5″; tail 8″; wing 19·25″; tarsus 4·5″; bill from gape 2·75″; weight, after cleaning, 5 lbs."

The weight of the uncleaned bird, fresh, we may estimate at about 8 lbs. The wing in its dry state is just over 19″ and the bill from tip to feather of forehead is 1·38″. The tarsus if measured at the side from joint to joint is 4·30″; mid toe, including claw, 2·41″.

The rufous pectoral land, which in the male extends across the heart, is well developed in this female on both sides of the heart, though hidden to a great extent by the superlying grey feathers.

DACCA, 13*th March* 1911.

E. C. STUART BAKER.

No. XIII.—THE EUROPEAN BUSTARD *OTIS TARDA* IN NORTHERN INDIA.

I am sending you a wing and foot of a great European Bustard, two of which were shot by a Daffadar of the 15th Lancers on the 8th instant, between this place and Mardan.

Seven of these rare visitors have been seen near here during the last fortnight, and I have been out after them several times but could not get

near them. I am sorry I cannot send a whole skin as the man hallaled them very badly.

In North China I once saw a large number of both the Great Indian and European Bustard on the same ground, and it was very interesting to note the difference between them; the Great Indian Bustard were always scattered when feeding, and rose and flew independently like Houbara, but the European ones did not separate so much when on the ground, and rose and flew together more like geese, although, of course, not in V formation. This habit of the Great Indian Bustard of feeding apart can often be turned to good account when stalking them if riding on a camel you disturb one of the outside birds, so that it does not fly very far. Then you lie down in a direct line between the solitary bird and the rest of the flock and send your camel round to disturb the latter who will nearly always fly to join their companion and often give an easy shot, as they do not fly high.

It was very cold in the north of India about Christmas, the thermometer falling to within ½ a degree of the record which accounts for their presence here, and also for some Mute and Bewicke Swans which were shot on the Kabul river near here last week.

We do a great deal of hawking here specially Houbara, and it is the greatest ambition to kill an European Bustard with a Saker Falcon, but up to now no flight has been obtained after them.

I see from Hume and Marshal that it is just 40 years since an European Bustard was killed in India, and that one was then shot at the same place as these were. It is very doubtful if they will ever be seen here again, as most of the ground will in a few years be under cultivation by means of the Malakand canal. Both the birds killed were females and weighed 9½ lbs. each.

RISALPUR, *9th January* 1911. H. FOOKS, LIEUT.-COL., I.M.S.

No. XIV.—LITTLE BUSTARD *(OTIS TETRAX)* IN KASHMIR.

I am sending you by Post a skin of what I believe to be the *Otis tetrax* = Lesser Bustard. This is the second of these birds, which has been shot in Kashmir during the last 12 months. This one was shot by Major Smith near the Woolar Lake.

SRINAGAR, *16th November* 1910. F. J. MITCHELL.

[In Volume XVII, p. 945, Col. A. E Ward recorded a Little Bustard which was obtained near Hajan, Kashmir, in December 1906.—Eds.]

No. XV.—WEIGHTS OF NILGIRI WOODCOCK.

I notice in an article under the heading "Woodcock Shooting in the Nilgiris" in Vol. XX, No. 3, page 854, that it is stated that the heaviest bird known to have been killed on the Nilgiris turned the scale at 14½

ounces and was shot in March. In reference to this statement, it may perhaps be worth mentioning that in February 1901, I killed a Woodcock outside Ootacamund that weighed exactly 16 ounces. I weighed it several times to make sure, and finally sent to the local taxidermist, Mr. Van-Ingen to have it set up, as it was certainly the finest bird I had ever seen.

H. R. BAKER, MAJOR,
73rd Carnatic Infantry.

CANNANORE, 11*th February* 1911.

No. XVI—OCCURRENCE OF THE GREAT SNIPE (*GALLINAGO MAJOR*) NEAR BANGALORE.

On the 28th October 1910, a specimen of *Gallinago major*, the Great, a Double Snipe was obtained by Capt. A. Boxwell, of the 119th Infantry, near Bangalore, this being the second record of its appearance in India. This specimen is that of a very young bird, probably of a late June hatching, and is remarkable for the amount of colouring in the outer tail, feathers, exceptional even for a bird of this age. It is, however, easily distinguishable from the Fan-tail by its great size and from our other large snipe, *solitaria* and *nemoricola*, by the shape of its tail feathers. From *solitaria* it also differs in its much shorter wing and from nemoricola in the comparative length of primaries and secondaries. From *megala* and *stenura* it can be separated at once merely by a glance at its tail feathers, none of which are attenuated.

Capt. Boxwell writes concerning this specimen in a forwarding letter and a subsequent note as follows :—

"The bird weighed 7 ounces. It got up from a piece of loose mud on the edge of a stream which divided some sugar-cane from a rice field."

"It made no noise as it got up except the flutter of its wings which I thought was more noticeable than that made as a rule by a snipe, but I did not realize that it was not an ordinary snipe till its size on the snipe stick drew my attention."

E. C. STUART BAKER, F.L.S.,
F.Z.S., M.B.O.U.

DACCA,
30*th December* 1910.

No. XVII.—MUTE SWAN (*CYGNUS OLOR*) ON THE MEKRAN COAST.

At 6-30 A.M. on the 11th of February my cook Abdul Aziz informed me that two geese had settled on the Kalingi-Ab, about half a mile from the Telegraph Concession. I was too ill to go myself, so roused Mr. Griffiths, of the Indo-European Telegraph Department, who occupies the same rooms. He dressed and took his double barrelled gun with him. The ground adjoining the abovementioned patch of water affords no cover, so Mr. Griffiths, therefore, took a few cartridges containing ball. He fired at the birds from a distance of about 100 yards, hitting the male bird through

the neck and slightly winging the female with the same ball. She, however, rose and flew slowly over Mr. Griffiths who shot her.

The birds turned out to be Swans, and were identified with the assistance of Captain White, 117th Mahrattas, as being Mute Swans *Cygnus olor* and tallied in every respect with the description in *Indian Ducks and their allies*. The male was pure white, but the female was a very light lead grey on the back, and must, therefore, have been an immature bird. Abdul Aziz is a well recognised shikari in these parts, his experience extending well over thirty years, but he has not seen such birds in the neighbourhood of Jashk before.

JASHK,
23rd February 1911.

F. G. STEINHOFF,
Medical Officer, Indo-European Telegraphs.

[As far as we are aware this is the first record of this Swan in Persia, but it is known to occur in Egypt, Arabia, Asia Minor, Afghanistan and N.-W. India.—Eds.]

NO. XVIII.—THE DWARF GOOSE, *ANSER ERYTHROPUS*, NEAR FYZABAD.

To-day whilst on the river Gogra, which flows past here, I came across a flock of geese, amongst which I noticed four very much smaller birds than the usual Indian geese. Later on in the day I very luckily came across this flock for a second time and managed to bring to bag one (I think a female) of these smaller birds.

Looking up its description in *Indian Ducks and their allies*, I came to the conclusion it must be a "Dwarf Goose." I am sending the skin down to you for identification—unfortunately in skinning, the man entrusted with the work cut off the legs, wings and beak, which will spoil it for the specimen I intended it to be.

FYZABAD,
23rd February 1911.

G. H. PLINSTON,
XI Rajputs.

[The remains of the bird are those of a Dwarf Goose, an uncommon species in India, though according to Blanford it is common in Persia where it breeds.—Eds.]

No. XIX.—NOTES ON DUCKS AT KOHAT.

I am sending you by parcel post to-day a skin of a female stiff-tailed duck, *Erismatura leucocephala* as I see from "*Indian Ducks and their allies*" that this is considered a rare bird, and thought you might care to have the skin. I shot it a few days ago on a large tank in the salt range near Lilla, and I saw about 20 more at least; another man in my Regiment, who was shooting further west also shot two, and I saw a lot more, so it appears this duck is not so rare as is frequently supposed.

I also noticed a large number of the common Sheldrake, *Tadorna cornuta* and shot one. Neither of these two ducks have I ever seen before in this

country. The Smew, *Mergus albellus* was present on this tank, too, in big flocks, and I shot two of them and found them not bad eating after being kept several days.

I see it says in Stuart Baker's book that it is exceptional to find the Smew in large flocks. I noticed one big flight of over a 100 birds one evening.

KOHAT, *January* 1911. W. M. LOGAN HOME, 112th Infantry.

No. XX.—BIRDS NESTING IN THE NILA VALLEY (GARHWAL).

The following notes may be of interest as some of the nests and eggs, I believe, have not been described before. The Nila stream joins the Bhaghirathi at Searsic at about 8,000 feet elevation and the valley runs up to the Nila Pass, on crossing which one descends into the Sutlej drainage: the valley being at the back of the first snowy range is protected from the full force of the monsoon, and although there was plenty of rain and mist, the atmosphere was fairly dry, even at the end of July.

Graculus eremita.—Red-billed Chough.—I found a nest in a crevice of a cliff at an elevation of 8,800 feet on April 25th, made of deodar twigs and thickly lined with wool; it contained four fresh eggs of a whitish ground colour, thickly spotted with yellowish brown and purplish grey. It being at rather a low elevation for the Chough to build. I secured the female and within 48 hours the male had brought another mate, who actually sat in the nest for some hours; they ultimately, however, abandoned it. There were two other pairs breeding not far off, but in an inaccessible place.

Lophophanes rufinuchalis.—Simla Black Tit.—These birds I found very common from 8,000 up to 11,000 feet; they appear to build invariably in a hole in the ground, usually under a stone or root, and except when building it is practically impossible to find the nests, as they are usually in most unlikely looking holes. It is also not easy to hit off the right time to get a full clutch of fresh eggs, as they have an exasperating habit of carrying in wool long after the eggs have been laid, and I lost two clutches by their being hard-set when dug out, however five nests with fresh eggs were secured, and many were seen with young in May. The nest is a mere pad of wool with a little moss and is placed sometimes two feet from the entrance; the eggs seen were much less spotted than most tits and four seems the full clutch, at least I never saw more, either of eggs or young.

Tribura thoracia.—Spotted Bush Warbler.—This bird breeds fairly commonly in the Valley at about 12,000 feet, and a good many nests were seen in June and July: they are domed and placed on the ground in a tuft of grass or among thick herbage, and are made entirely of dry grass with usually a single feather as a lining, I only twice saw two feathers used and never more. The full clutch seems to be four, but commonly three only are

laid: the eggs are longer in shape and much less speckled than those of *Tribura luteiventris* or *Tribura mandelliji*.

Merula maxima.—Central Asian Black-bird.—Several pairs were seen at 13,000 feet and over, and several nests with young, the eggs must have been laid early in May, when the whole place was under deep snow. However, I was lucky enough to find one pair building in June and on the 21st got a fine clutch of four from the nest, securing the birds. Their dimensions are somewhat larger than given in the Birds of India, the male being 12 inches long, wing 6·25, tarsus 1·55, bill from gape 1·25 and the eggs are larger than those I have seem from Cashmere. All the nests seen were massive structures of dry herbage and grass with a little earth on the foundation and very thickly lined with fine grass. They were all placed on ledges of rock, sometimes quite unconcealed, but the birds were very wary in approaching them. It is curious that the existence of this bird should have been overlooked in these parts, as it is fairly common and much in evidence, both from its frequenting the open and from its rattling alarm call.

Adelura cæruleicephala.—Blue-headed Robin.—I got three nests of this bird, each with four fresh eggs, or from 10 to 11,000 feet in the last fortnight of May. They were all placed in banks and concealed by drooping grasses. The eggs are as described by Wardlaw Ramsay of a dull cream colour with a darker zone. The birds are very wary, while building the male appearing to be always on guard, anyhow I never saw him assisting in building: the female sits very close, once the eggs are laid, and we could never find a nest by searching, the only chance was to find a pair building, which was not at all easy, and I consider these nests as among the most difficult to find. Great numbers of these birds were passing up the Bhaghirathi Valley in April, and it would seem they do not all remain to breed in these valleys.

Ruticilla frontalis.—Blue-fronted Redstart.—This was a common nest from 11 to 13,000 feet; it has, of course, been recorded before, but I found one nest building in a cavity in a birch tree, quite 20 feet up, and on June 5th, I took the eggs (3) and secured the bird, it being such an unusual position for the nest of this bird, all the numerous nests I have seen having been on the ground, usually sheltered by an overhanging bank, stone, or grass tuft.

Grandala coelicolor.—Hodgson's Grandala.—On July 15th we found a nest with two young at 16,700 feet, it was placed under a ledge of rock at the top of a snow bank and was very neatly built of fine moss with a lining of feathers, a rather large nest, 9 inches across, internally 3½ inches. The eggs must have been laid by June 15th, when the place would have been inaccessible from snow. The nest was discovered by seeing the female catching little white moths in the grass and flying off with them, but it

took several days as she went up fully 1,500 feet to her nest and the mist (which was incessant over 14,000 feet) made it very difficult to follow her. I kept the young alive for six days on white moths and ants' eggs when they died very suddenly. One other nest with two young was seen. Up to June 25th these birds were about in small flocks of from 5 to 10, feeding at 14,000 and some of them must have been building at that time fully 2,000 feet above their feeding grounds, so it would seem they do not separate into pairs when building, and this makes the nest more difficult to find.

Accentor nepalensis.—Eastern Alpine Accentor.—Two nests were found with two and three eggs on June 27th and July 4th both in precisely similar situations, being placed well under flat stones, at nearly 15,000 feet. The nests were beautifully made of moss throughout, no other material being used. The eggs were, of course, blue and unspotted. Later on several nests with young were seen. The dimensions of several specimens I secured are much less than those given in the Birds of India, all I measured being 6 inches in length with a wing of 3·3 as against 7 inches and 4 inches, and it would almost seem that this is a smaller race.

Propasser thura.—White-browed Rose Finch.—Two nests of this bird were taken at 13,000 feet at the end of July, the nests were placed low down in juniper bushes and built solidly of dry grass with an inner lining of hair. The eggs are clear greenish blue, sparingly spotted with black, not with brownish grey as mentioned by Mandelli. The clutch appears to be four.

Propasser ambiguus.—Hume's Rose Finch.—Two nests were found at 12,000 feet, and I watched the birds building from a few yards off. The nest and eggs do not differ from those of *Propasser pulcherrimus* and the females are practically inseparable, though *ambiguus* is slightly the smaller, the specimens I got being 5·6 in length with a wing of 2·8, and I never got a female *pulcherrimus* under 5·8 in length with a wing under 3·0.

Propasser pulcherrimus.—Beautiful Rose Finch.—This bird was exceedingly common, and I saw over 30 nests, all placed low down in prickly bushes and made of dry grass and lined with hair. The clutch was usually four, but sometimes five and many full clutches were laid by July 20th. The hen sits very close and can be examined on the nest once the full clutch is laid, until then she is wary enough.

Propasser rhodochrous.—Pink-browed Rose Finch.—This species was not so common as *pulcherrimus*, but a good many nests were seen. I should consider the eggs of *ambiguus*, *pulcherrimus* and *rhodochrous* as quite inseparable, a clear greenish blue with black spots, but *rhodochrous* is easily recognised on the nest by the broad supercilium, which shows up well while the bird is sitting.

Fringillauda sordida.—Stoliczka's Mountain Finch.—This was a common

breeder at 13,000 feet and over. The nests are of dry grass lined with hair and always placed in a hole in the ground. The full clutch appears to be four; the bird can frequently be caught on the nest as she sits very close. I do not think this bird has been recorded as breeding in these parts before, though, of course, it has been from Cashmere and elsewhere.

Besides the Grandala, I was unfortunate in finding nests with young only of *Pyrrhospiza punicea*, the Red-breasted Rose-Finch; *Tichodroma muraria*, the Wall-creeper; and *Buteo ferox*, the Long-legged Buzzard; of other nests of interest, which however have been recorded before from other parts, we got *Lerwa nivicola*, the Snow-Partridge; *Cephalopyrus flammiceps*, the Fire-cap; *Larvivora brunnea*, the Siberian Blue Chat; *Turdus viscivorus*, the Missel-Thrush; *Sitta leucopsis*, the White-cheeked Nuthatch; *Oreocincla dixoni*, the Long-tailed Mountain Thrush; *Accipiter nisus*, Sparrow Hawk; *Chelidorhynx hypoxanthum*, the Yellow-bellied Flycatcher; *Pycnorhamphus carneipes*, the White-winged Grosbeak; *Horornis pallidus*, the Pale Bush-Warbler, and *Anorthura nepalensis*, the Nepal Wren.

BAREILLY, *December* 1910. S. L. WHYMPER.

No. XXI.—THE BROAD SNOUTED MUGGER IN THE INDUS.

A fallacy that numbered me among its victims until quite recently was that of the non-existence in the Punjab rivers of the broad-snouted mugger, *i.e.*, either *Crocodilus porosus* or *palustris*, the variety *Gavialus gangeticus*, or fish-eating crocodile, is of course common. Formerly I had supposed that this latter species was the only one to be found in the Indus or its tributaries, and from questioning other sportsmen it appeared that I was by no means the only one to hold these views. Quoting from the *Indian Field Shikar Book*, it being the only reliable work in which I have found any reference to the crocodile, we learn that *Crocodilus prosus* inhabits the rivers of Bengal, the East Coast of India and Burma, whilst the habitat of *palustris* is practically the same as that of *porosus*. So there would seem to be fair excuse for my former supposition.

During a three years' sojourn in Dehra Ismail Khan, I never heard of such a thing as a broad-snouted crocodile in the Indus. Though, I shot not a few fish-eaters and spent many days after them. In October last I proceeded on a boating trip downstream, and in due course of time arrived opposite the formerly important town of Leiah, some sixty miles as the crow flies from my starting point. The boatmen had already excited my curiosity by accounts of some broad-snouted crocodiles, which lived in a "dhand" or sluggish tributary of the Indus close to Leiah. They said there was a regular colony of these brutes living in this place, the larger ones measuring 10-12 feet in length and the smaller ones anything down to 3 or 4 feet; that they had taken several people during the last four years or so, besides occasional goats, sheep, &c., and that they were

only to be found in this "dhand" and never in the main river. As sport had hitherto been rather poor, I resolved to go and look up these muggers, though I was sceptical of their existence.

We arrived at last at about 4-30 p. m. at the place where the guide said that the muggers were most often seen. The "dhand" here was some 30 yards broad with banks from 10 to 15 feet high covered here and there with clumps of long grass and small bushes. The water subsequently proved to be very deep, the banks seeming almost vertical except at certain well-marked fords. I was gazing at what looked like a piece of driftwood in the water, when it slowly sank and re-appeared a few yards further on, proving the existence of one mugger, anyway. Shortly afterwards the shikari spotted one on the bank opposite us. He was lying in the middle of some rushes, and was so well hidden that I could scarcely make out anything without my glasses, although the distance was only about 40 yards. The mugger did not move in the slightest, while we were watching him and appeared to be quite used to men, and I finally shot him through the neck. A local fisherman, who was with us, volunteered to swim across and tow the mugger back, a feat which he performed without any difficulty, although there were certainly more muggers in the water close by. The mugger proved to be a well-conditioned little beast of 5 feet 6 inches with a girth of 24½ inches, and on skinning him we found him to be covered with fat. Natives keep this fat for use as an embrocation, and we took twice as much of this off him as off any fisheater I have ever shot. The reason for this is that the stream swarms with various sorts of fish, moving up to 15 lbs. or more, and these evidently provide the muggers with an easy and inexhaustible supply of food.

Although I stayed at this place until the following afternoon, I did not succeed in bagging another, though I killed a fish-eater of about 11 feet, and also blew up the head of a mugger of quite 10 feet, which rose to the surface of the water close to me. Neither of these corpses were retrieved. It was apparently very lucky to find the small one out on the bank, as the people told me that the broad-fronted muggers seldom came out to bask, though they often float on the top of the water. I very much regret that I did not count the teeth of this crocodile, so the question of the genus being *palustris* or *porosus* still remains to be decided. The local name for the broad-snouted mugger, by the way, is ("baghori") Urdu باگھڑیل the fish-eater being known as "māggār," māggār mach or "sansār" usually the latter. "Gharial," the native name attributed to *Gavialus gangeticus* in the *Indian Field Shikar Book*, is unknown on the Indus, and I have yet to meet a native who understands it.

Can anyone solve the problem of how these crocodiles got into that "dhand?" They are unknown in the main stream, although the "dhand"

leads directly into the Indus. They have been there now some 4 or 5 years according to local accounts.

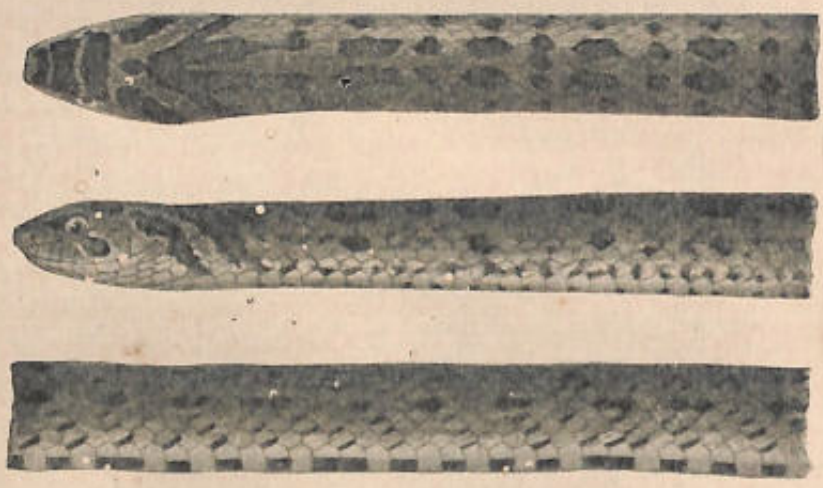
The accompanying photos are disappointing, as the sole of films turned out to be a bad one. They show, however, the mugger, and also the dhand" where he lived.

R. FRANCIS, LIEUT.,
47th Sikhs.

JULLUNDER, *25th January* 1911.

[The name "gharial" is probably a Ganges or Brahmaputra name. The broad-snouted crocodile was probably *C. palustris*, which is the common one on the West Coast of India, *vide* Boulenger's *Reptilia Fauna of British India* Series.—EDS.]

No. XXII.—A NEW SNAKE *SIMOTES JUGLANDIFER* HITHERTO UNRECOGNISED AS A DISTINCT SPECIES.







In a previous issue of this Journal (Vol. XIX, pp. 3 and 8) under the name *Simotes albocinctus*, Variety *juglandifer* I commented upon a snake which has up to the present time been considered merely a colour variety of the species *albocinctus*.

I remarked that this form appears so different in its markings from the typical variety of *albocinctus*, that to those unacquainted with ophiology the two would certainly be taken to be different species. The fact that after a repeated and critical examination of the two, side by side, I could discover no difference in the lepidosis, compelled me as it had done others before me, to accept the view that *juglandifer* was merely a colour variety of *albocinctus*.

I have now, however, evidence to put forward to claim for the former the rank of a species distinct from *albocinctus*. I find that in *juglandifer* there are short edentulous spaces anteriorly and posteriorly in the palatine bone: the former would accommodate one tooth, and the latter two or three. In *albocinctus* there is no space anteriorly, and a short space that might accommodate one tooth posteriorly. In both species there is a slight interval in the pterygoid bone anteriorly that might take a single tooth, and in both the maxilla and mandibles are toothed to their extreme anterior limits. As will be seen from the synopsis of dentition from three skulls of each in my collection, there are rather fewer palatine teeth in *juglandifer*.

The fact that the lepidosis in the two appears to be identical makes a detailed description of this unnecessary, but in colours and markings the two are very distinct. *Albocinctus* is usually reddish or dark-brown dorsally with light, black-edged crossbars. *Juglandifer* is dark-brown dorsally, and has a series of peculiarly shaped marks reminding one of the kernel of a walnut running down the back, just like those seen in *L. splendidus* and *oligodon venustus*. These marks are sometimes completely bisected by the masial anterior and posterior indentations. Sometimes too there are broken crossbars in the intervals as shown in figure 1 of our Plate. Both appear to grow to a similar length.

Both species occur in the Eastern Himalayas and the Assam (Khasi) Hills. I have found *albocinctus* in the Assam Plains at Dibrugarh.

Though not very uncommon *juglandifer* is not nearly so numerous as *albocinctus*. The dentition of the two in my specimens is as follows :—

Specimen.	Habitat.	Side of head.	Maxillary.	Palatine.	Pterygoid.	Mandibular.	Species.
a	Dibrugarh	Left.	10	8	19	16	*albocinctus*,
		Right.	11	9	19	15	Var. *typica*.
b	Dibrugarh	Left.	10	9?	18	13	Do.
		Right.	10	9?	19?	14	
c	Pashok (East Himalayas).	Left.	11	7	17	15	Do.
		Right.	10	8	?	15	
d	Tindharia (East Himalayas).	Left.	12	7?	17?	13	*juglandifer*.
		Right.	11	7	18	13?	
e	Ditto	Left.	10	6	17(18?)	15	Do.
		Right.	10	7	17(18?)	15	
f	Pashok or Tindharia.	Left.	10?	6(7?)	16(17?)	17	Do.
		Right.	10	6(7?)	17	17	

F. WALL, C.M.Z.S.,
MAJOR, I.M.S.

CHITRAL, 15*th March* 1910.

No. XXIII.—NOTES ON THE COLOUR OF THE COMMON KEELBACK.

Major Wall in his article on the *Macropisthodon plumbicolor* refers to Cantor's descriptive word "plumbicolor" as misleading, and states that the Common Keelback is always some shade of green. This, of course, is perfectly true of the dorsal and costal scales, but the ventrals in all the young I have examined not a great number, unfortunately have been the exact colour of plumbago, and for them plumbicolor is a most apt descriptive word.

I should like very much to know whether young keelbacks are always found with plumbaginous belly scales.

If it is owing to the characteristic, I have mentioned that Cantor used

the word "plumbicolor" his choice is unfortunate for the descriptive word should apply to some evident, permanent characteristic, while as far as I have observed the keelbacks, the plumbaginous belly scales disappear with age.

T. M. EVANS.

PANCHGANI, *7th January*, 1911.

No. XXIV.—MOSQUITOS AND FISH.

The fact that fish devour the larva of mosquitos has attracted the attention of several observers in Bengal in recent years. At first sight this habit of fish does not appear to be of much significance. Mosquitos and fish as well as malarial parasites have all been living in Bengal for some time past. But the fish have become important in this connection, because of certain circumstances which are believed to appertain to the island of Barbadoes.

It is said that there is no malaria in Barbadoes, because there are no mosquitos there. Mosquitos cannot live because all the fresh waters are swarming with a small fish called "the millions," which would devour the larvæ if they were present. It is evident that the millions do not devour mosquito larvæ in Barbadoes, they have not the opportunity.

The absence of malaria and mosquitos and the presence of "the millions" may, for the sake of discussion, be called the narrative concerning malaria in Barbadoes. There is no reason so far as I know for believing that this narrative is untrue, but it is evident that before any steps are taken in India to fight malaria by means of fish, we ought to be quite sure that it is true.

If the narrative is true, there is something very remarkable about the fish called "millions." In nature there is a balance between the numbers of any species and the amount of food that is available for their nutrition. Population is diminished by famine and increased by plenty, this is no less true of fish. A given volume of natural water cannot support more than a certain weight of fish.

If then the fresh waters of Barbadoes are constantly swarming with a particular kind of fish, that kind of fish must have some special source of nutriment. Most fresh waters in the world contain fish but not in swarms. If the millions are able to live in swarms in any kind of typical pond it is evident that they ought to be introduced into malarial regions.

But it is most unlikely that a species of fish can exist in vast numbers in any kind of fresh water, if it has this power it must have a special method of extracting nitrogenous food out of pond water, a secret which it does not share with other animals. The suggestion has been made that in Bengal the fish *Hapochilus panchax* should be encouraged to play the part of the

Barbadoes "millions," on the assumption, of course, that the narrative concerning the latter is strictly true. But it is unnecessary to stock tanks in Bengal with *Hapochilus*, for they are already stocked to a large extent. It was recently stated in one of the daily papers that the waters of some of the colliery districts in Bengal were to be stocked with *Haplochilus* in order to lessen malaria. Before money is spent on such a venture, it would be well to enquire whether those waters are not already supporting as many small fish as possible. It cannot be dogmatically asserted that every tank in Bengal contains *Haplochilus*, but fish of this kind are certainly as common and as widely distributed in Bengal as sticklebacks in England. In either case if we were to find that a long existent pond was devoid of small fish, we should strongly suspect that such were unable to live in that particular pond.

The statement has been made that since the introduction of *Haplochilus* into the waters of the Zoological Gardens at Alipore, the larvæ of mosquitos can no longer be found there. This is a misleading and even a harmful statement, for it might well induce people to spend money in stocking ponds which are already stocked with *Haplochilus*. Mosquito larvæ are still to be found in the tanks at Alipore, and the *Haplochilus* was there before the time of its alleged introduction. I myself saw it there in 1907. It is sometimes spoken of by observant children as the fish with the white topee.

R. E. LLOYD, Capt., I.M.S.

Calcutta, 13*th February*, 1911.

No. XXV.—NOTE ON THE BUG, *ASPONGOPUS JANUS*.

During a recent tour in the Southern districts of the Bombay Presidency I happened to spend a day (October 29th) in the town of Bagalkot in the Bijapur district,—and very quickly noticed that the streets seemed to be alive with the immature forms of a pentatomid bug—*Aspongopus janus*. These were crawling about the road in almost every street and lane through which we passed, on the roads leading from the town, and along the railway line near Bagalkot station. Not a single adult form was noticed on the ground in this position, but on examining one of the very common large malvaceous weeds round the town, *Abutilon muticum*, the adult bugs of the same species, were found in very large numbers. Several individuals were found on almost every plant, feeding on both the young shoots and the older leaves. The results of their feeding on the plant did not appear serious, and only a slight shrivelling and curling up of the younger leaves was noticed.

The difference between the appearance of the adult and immature insects in this case is sufficiently striking to be figured, and the appearance

of the two is shown below. The unshaded portion is in both cases an orange red, though the tint varies much in different specimens, and the shaded part black. The figures are illustrated twice the natural size (×2).



Adult.



Immature.

From the same plant (*Abutilon muticum*) at the same time and place, I obtained several other bugs, and the fact that this is a food-plant for each of them is worth noting.

1. *Nezara graminea*, originally described as feeding on gramineous plants, but recorded from Bombay as found on *Gynandropsis pentaphylla* (Dixon).

2. *Dysdercus cingulatus*.—The so-called red cotton bug.

3. *Oxycarenus lactus*.

The immature bugs of this species were present in immense numbers, almost every plant giving a considerable number. A few adults were caught, but as the insect is a fairly active flier, it would naturally not be obtained to the same extent. This insect has already been noticed attacking the seed capsules of other *malvaceous* plants. Green records it on *Abutilon asiaticum* in Ceylon and Dixon on *Gossypium stocksii* in Bombay.

HAROLD H. MANN.

POONA, 10*th November*, 1910.

No. XXVI.—FEROCITY OF FEMALE MANTIS.

In the note on the "Food of a Mantis" (Journal, Vol. XX, No. 3, p. 878), your correspondent records the case of a female mantis eating the male during the act of mating and enquires if the phenomenon has been hitherto recorded with regard to this group.

As a matter of fact it has been recorded more than once, Riley having

noted it in America as long ago as 1886 (Science Vol. VIII, p. 326). In a note on the same subject in Insect Life (Vol. V, p. 145, 1893), the same author states :—"It is a well known fact that the male insect of the family Mantidæ approaches the female at the risk of his life." My attention was called to this note in 1905, when I was in Washington, D. C., studying in the laboratories of the Bureau of Entomology. At that time I had a pair of the only American species, *Stagmomantis carolina*, under observation. One day I discovered the pair in coitu and to my astonishment the head, the anterior pair of legs and a goodly portion of the prothorax had already been devoured. The male which seemed in no way inconvenienced remained quietly engaged in the copulatory act, while the female continued her meal. I interrupted the copulation by pulling aside the abdomen of the male with a pair of forceps, but immediately on releasing it it returned to the original position and copulation proceeded as before. I finally killed the pair and preserved them in my collection. Unfortunately in travelling on three continents since that date, these interesting specimens became so damaged as to become useless and had to be thrown away.

LESLIE C. COLEMAN.

BANGALORE, 17*th February*, 1911.

No. XXVII.—A COMMON BLISTER BEETLE (*CANTHARIS ROUXI*, Cast.) AS A NUISANCE TO MAN.

That the blood of the Blister Beetle (Fam. *Cantharidæ*) contains a blistering principle (cantharidin) and that these insects are able to force the blood out through pores situated at the femoro-tibial joints of the legs are well known facts. The blistering power of Indian species seems not to have been at all investigated, and I have been unable to find a record in print of any of these forms causing inconvenience to man.

On the 11th October 1910, I received from Dr. P. Palpu, Deputy Sanitary Commissioner, Mysore, specimens of one of the commonest Indian Blister Beetles (*Cantharis rouxi*, Cast) with the statement that they were swarming into the houses at nights at Harihar, flying to the lights and producing blisters by getting between the clothing and the skin. In response to an inquiry for definite information, the same gentleman stated that, in the early part of October, they had come to lights in the Harihar station in great abundance, and that he had not only examined a number of people on whom blisters had been produced by this beetle, but had also succeeded in producing blisters on his own arm by applying the exuded fluid and leaving it for 8 to 10 hours.

That the above is by no means an isolated case is indicated by the fact that another gentleman has since informed me of a similar experience, although he could not inform me as to the species concerned. It would be

interesting to ascertain just how common it is, and it suggests a possible economic source for cantharidin and fly blisters in India.

LESLIE C. COLEMAN.

BANGALORE, 17*th February* 1911.

No. XXVIII.—GALLS OF *PARACOPIUM CINGALENSE*, WALK., ON *CLERODENDRON PHLOMIDIS*, LINN. f.

At Agali in the Bhavani Valley, on 21st January 1911, I found a number of deformed flowers on a *Clerodendron phlomidis* bush. On opening these individuals of a *Lygeid* Hemipteron were discovered, which turned out to be *Paracopium cingalense*, Walk. (*vide* Rhynchota, Fauna of British India, Vol. II, p. 128, fig. 92).

The normal flower of *C. phlomidis* has a tubular carolla, with expanded limb, from $\frac{3}{4}$ to 1 inch long, extruding from a wide campanulate calyx (fig. 1). In the deformed specimens the carolla fails to develop on the ordinary lines, but swells into a globular gall distending the unaltered calyx. The throat remains open, but is blocked by the undeveloped lobes outside (fig. 2), and the rudimentary stamens within. The gall is moderately thick-walled and hollow, no trace of ovary and style being present.

From 1 to 7 live individuals were found in a single gall, all in the same gall being in the same stage of development, but in the several galls all stages of development were to be seen. That the insect reaches maturity before emerging can hardly remain in doubt, seeing that in two cases pairs were detected in copulla within a gall.

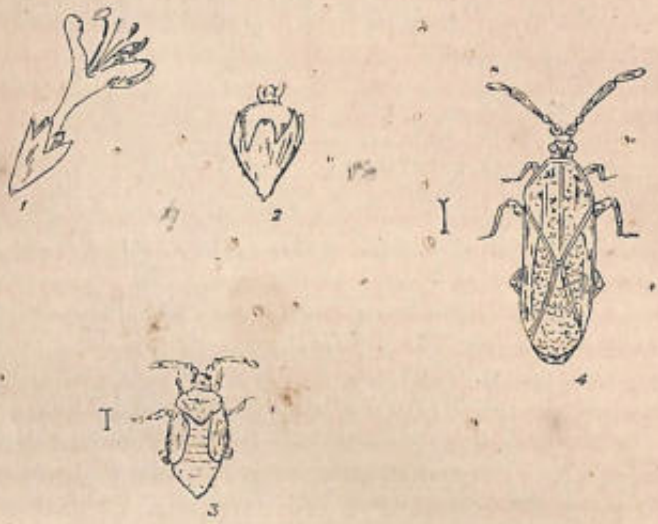
The growth of the gall keeps pace with the development of the insects within and remains green till after the latter have matured, when the walls break down or crack through desiccation. In the smallest galls very young wingless nymphs were found and the mature only in the large galls and proportionately with the intermediate sizes and stages.

The rudimentary stamens effectually prevent the egress of the guests until the walls of the gall break down, but apparently permit the entrance of visitors, for occasionally small diptera and lepidopterid larvæ were found within.

When a practical exit was cut in a mature gall, the perfect insects eagerly escaped into the light; in the opposite case, the immature ones sought to conceal themselves in the darker recesses and under the *debris* of cast off integuments.

I could detect no eggs and am unable to suggest where and how these are laid.

No "ambrosia" fungi or other source of food occurs in the lumen of the galls, and it must be presumed, therefore, that the insects feed entirely on juices extracted from the walls of their prison.



1. Normal flower of *Clerodendron phlomidis* (Nat. size.)
2. Deformed flower of *Clerodendron phlomidis*, Lin f. containing (Nat. size).
3. Nymph of *Paracopium cingalense*, Walk. (much enlarged).
4. Adult *Paracopium cingalense*, Walk. (much enlarged).

The nymphs (fig. 3) before the wings are fully developed are translucent green; just before maturity the insect is very light grey, almost white, and darkens when mature (fig. 4). I omit any further description as that will be found in full on the page quoted above.

COIMBATORE, 19*th February* 1911. C. E. C. FISCHER.

No. XXIX.—NOTE ON THE RATE OF GROWTH OF BARNACLES IN INDIAN SEAS.

Mr. W. S. Millard has submitted to me for examination three large specimens of the Acorn Barnacle (*Balanus tintinnabulum*, Linn.) and has asked me to write a note upon them for the Society's Journal. As the approximate age of these specimens has been ascertained, I avail myself of the opportunity of compiling what is known as regards the rate of growth of barnacles in Indian seas.

It is well known that both Acorn Barnacles (*Operculata*) and the stalked species (*Pedunculata*) are hatched from eggs as minute free-swimming larvæ of the "nauplius" type. After a short period of active life, their form changes and they settle down on some solid object, to which they finally fix themselves, in this position they attain the adult form.

Precise records of the rate of growth of barnacles in Indian seas are few, and even as regards European waters further information of a detailed kind

is needed. Gruvel, in his "Monographie des Cirrhipèdes," page 426, states that the rate of growth from the fixation of the larva until the attainment of the normal size of the adult, is approximately 1 mm. a day; but it is clear from the observation of others both that the rate of growth is not uniform in different species and under different conditions and that the rate cited by Gruvel is often exceeded. Darwin ("Monograph on the Cirripedia—Balanidæ," page 156, and "Monograph on the Cirripedia—Lepadidæ," page 63) quotes some interesting observations of his own and of other observers made in different latitudes and on different species, and a few notes on the subject may be found in the works of other writers; but as regards Indian seas I have been obliged to rely in compiling this note on observations that have come under my own notice.

As regards Pedunculates from Indian seas, I only know of one precise statement (see "Rec. Ind. Mus." page 295), which was based on an observation made by Dr. J. Travis Jenkins. A clean buoy was moored off the Madras Coast on February 23rd, 1910, and was lifted on March 3rd of the same year. On it were found numerous specimens of *Lepas anserifera* and several of *Conchoderma virgatum* var. *hunteri*. The largest of the former measured 8 mm. in capitular length, and of the latter 15 mm. *L. anserifera* is the commonest non-parasitic Pedunculate in the Bay of Bengal and its larvæ must swarm off the East Coast of India in February, for every piece of driftwood or other floating substance is rapidly covered at that time of year with young barnacles of the species. Hoek ("Siboga-Expeditie," Mon. xxxia (Cirr. Ped.), p. 2) states that in the Malay Archipelago, in which *L. anserifera* (a cosmopolitan species) is also common, specimens with a capitular length of 21mm. were found on the keel of the "Siboga" forty days after the bottom had been cleaned, and that, on another occasion, specimens with a capitular length of 25mm. were found one hundred and seven days after cleaning. The larvæ of the genus *Lepas* do not measure more than 1·5mm. in length at the time of fixation, and I think it is legitimate to assume that the individuals found on the buoy must have settled on it almost as soon as it was put into the water.

The specimens of *Conchoderma* found on the buoy by Dr. Jenkins are the largest examples of the variety to which they belong I have seen. This variety is apparently confined to the Indian Ocean and probably does not attain the same dimensions as the typical form of the species, which is practically cosmopolitan. Darwin states that off the Galapagos Islands certain individuals of the typical form reached a total length of half an inch (*ca.* 11mm.) and became sexually mature in a period of not more than thirty-three days. He gives the length of the larva at the time of fixation as 0·05 inch.

The rate of growth of the Acorn Barnacles does not seem to be quite

as rapid as that of the stalked forms. Professor Herdman found specimens of *Balanus amphitrite* (perhaps the commonest Indian species) on May 9th on baskets which had been placed in the sea off Galle (Ceylon) on April 17th. These specimens measured from 3 to 8mm. in basal diameter, and some of them were sexually mature (see Herdman's "Report on the Ceylon Pearl Oyster Fisheries," part v, p. 147). *Balanus amphitrite* is a widely distributed species, the size of which varies greatly in different circumstances; on the East Coast of India the basal diameter of fully grown specimens is usually about 14mm. *B. tintinnabulum*, also a common species in all warm seas, usually reaches a larger size than *B. amphitrite*. The base of the largest of the three specimens sent me by Mr. Millard measures 56 × 59mm. These specimens were taken from the bottom of a light-ship in Bombay Harbour and must have been less than nine months old. I have examined another specimen of this species, the base of which measured 60 × 65mm. It was known to be not more than a year old, and was from the Gulf of Manaar ("Mem. As. Soc. Bengal," i, p. 79, footnote). Darwin puts on record a statement that specimens of *B. tintinnabulum*, measuring from 5 to 6 inches in diameter, have been found on ships that had been to sea for not more than a year, while he himself found, on the Coast of Chile, a specimen of a somewhat similar species (*B. psittacus*) that had attained a basal diameter of 1·3 of an inch on a chain that had been six months under water.

These observations, scattered and incomplete as they are, give some idea of the rapid growth of barnacles on ships' bottoms and in similar situations, but valuable observations of a more precise nature might be made without much difficulty in a sea-port provided like Bombay with an extensive harbour.

N. ANNANDALE,
Indian Museum, Calcutta.

December 16th, 1910.

PROCEEDINGS

OF THE MEETING HELD ON 19TH JANUARY 1911.

A meeting of the members of the Bombay Natural History Society took place on Thursday, 19th January 1911, at the Society's Rooms, Mr. H. M. Phipson presiding.

Mr. R. Gilbert, in proposing that Mr. H. M. Phipson be asked to take the chair, said that it was not often that the Society now had the chance of welcoming one who was one of the founders of the Society, and as Mr. Phipson was only making a short stay in India, they should get all the benefit they could do from his visit. Mr. H. M. Phipson then took the chair amid acclamation.

NEW MEMBERS.

The election of the following 96 new members since the last meeting was duly announced :—

Mr. A. Kirke-Smith (Bombay); Lt.-Col. R. E. Dyer (Multan); Lt. R. B. Seymour Sewell, I.M.S (Calcutta); Mr. W. H. Hunter (Calcutta); Mr. H. W. Oddin Taylor, B.Sc. (Lon.), A.M.I.C.E. (Satara); Major H. Gough, I.A. (Quetta); Mr. A. E. Percy Rae (Rangoon); Mr. M. N. Varvill (Bombay); Mr. D. Clouston (Nagpur); Mr. F. Ludlow (Karachi); Capt. K. G. Gharpurey, I.M.S. (Andheri); Major H. Robinson (Poona); Capt. W. H. Leonard, I.M.S. (Malakand); Mr. B. Gale, I.M.S. (Peshawar); Mr. J. B. Jenkins (Jalgaon); Lt. F. C. L. Grieve (Mhow); Mr. George Girard (Calcutta); Lt. C. M. Maltby (Upper Topa); Capt. W. B. Spalding (Cawnpore); Mr. A. A. Lane Roberts, I.C.S. (Kulu Punjab); Mr. S. R. Perfect (Karachi); Mr. H. R. Blunt (Kashmir); Lt. A. J. Lee, I.M.S. (Delhi); Capt. G. W. Hay (Europe); Capt. E. Burd, I.A. (Rangoon); Mr. Hugh Whistler (Rawalpindi); Mr. J. C. Higgins, I.C.S. (Assam); Capt. H. D. Henderson (Manipur); Capt. B. Fagan (Manipur); Mr. F. M. Dowley (Bezwada); Capt. W. G. B. Hawley (Multan); Mr. R. C. Rilley (Kandri *via* Kamptee); Mr. R. N. H. Reid (Coorg); Lt. B. C. T. Paget (Wellington, Nilgiris); Mr. J. S. Wilkes (Russellkonda, Ganjam); Mr. W. R. Shelton (Agar, Burma); The Secretary, Flyfishers' Club (36, Piccadilly, London W.); Mr. F. von Bock (Jacobabad, Sind); Mr. H. A. Inglis (Anarh, Leberia Sarai P.O.); Mr. R. V. Gregory (Purna, Deccan); Mr. A. C. Duff, I.C.S. (Russellkonda, Ganjam); Mr. C. C. Wilson (Coimbatore); Mr. E. M. F. Nicholson (Bombay); Major A. M. Fleming, I.M.S. (Raipur); Mr. W. T. N. Ryde (England); Major W. Selby, D.S.O., F.R.C.S., I.M.S. (Lucknow); Mr. N. Calder (Lucknow); Mr. C. H. K. Chamen (Hyderabad, Deccan); Mr. J. F. Keddie (Raheng, Siam); Major Lowther (Bolarum, Deccan); Mr. Colin R. White (Trichinopoly); The Mess Secretary, 18th Infantry (Ferozepore);

Mr. K. Hacker (Mandalay, Burma); Lt. A. H. P. Cruickshank (Lahore Cantonment); Mr. J. A. Brandon (Bombay); Lt.-Col. J. Farmer (Punjab); Mr. M. Wall (Punjab); Capt. G. F. S. Routh (Meerut); Mr. W. Mayes (Lahore); Mr. H. G. Young (Ferozepore); Mr. P. E. Gourju (Berhampore); Mr. N. F. Peck, I.C.S. (Chittagong); Rev. E. Gombert, S.J. (Trichinopoly); Mr. N. Gupta, Bar.-at-law (Dacca); Mr. C. C. Lumley (Decca); Mr. J. L. Remington (Bandikui); Mr. E. Boothe (Bombay); Rev. E. E. Hill, M.A. (Satara); Mr. W. E. C. Johnson (Assam); Capt. L. C. Taullier (Bombay); Mr. J. F. Blackwood (Jalpaiguri); Mr. K. L. Gordon (Ceylon); Mr. R. C. Dodson (Sialkot); Mr. A. K. Digby (Rawalpindi); Prof. R. S. C. Brown, B. Sc. (Poona); Rev. Father Joseph Asmuta, S.J. (Bombay); Mr. F. B. Wilkins (Dacca); Mr. C. F. Coates (Lakon, U. Siam); Mr. D. Aitchison (Madras); Mr. E. S. Pinfold, B.A. (Rangoon); Capt. A. M. Addison (Rawalpindi); Lt. H. G. Martin (Rawalpindi); Lt.-Comdr. The Hon'ble R. O. B. Bridgeman, H. M. S "Redbreast" (Bombay); Mr. E. T.C. Farr (Ceylon); Capt. W. F. Reichwald (Mhow); Lt. The Hon'ble H. G. O. Bridgemen, R. H. A. (Rawalpindi); Mr. A. A. L. Parson, C.S. (Patiala, Punjab); Mr. R. C. Bolster, I.C.S. (Déra Ghazi Khan); Mr. J. H. Luke (Narayanganj); Mr. A. H. Ley, I.C.S. (Calcutta); Mr. I. M. Cameron (Bagaha P.O., Champaram, Bengal); Mr. H. F. Treeby (Ambala); Mr. F. C. Fowle (Bombay); Capt. G. N. Reynolds (Saugor); The Mess President, 52nd Sikhs (F.F.) (Peshawar); and Capt. Boxwell (Bangalore).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contribution.	Locality.	Donor.
Young Leopard Cat (*Felis bengalensis*). Himalayan Palm Civet (*Paradoxurus niger*). Small Shrew and a Mrs. Hume's Pheasant (*Phasianus humiæ.*)	Haka, Chin Hills.	Capt. F. E. W. Venning.
Several Jackals, Foxes, Desert and Jungle Cats, Mice, Squirrels and Hedgehogs.	Thar-and Parkar, District, Sind.	Mr. E. Priestley, D.S.P.
1 Stoat (*Mustela whiteheadi*) ? ...	Chitral ..	Major F. Wall, I.M.S.
2 Wild Dog (*Cyon dukhunensis*) Skins.	Kadra, Kanara ..	Mr. W. A. H. Miller, I.F.S.
4 Bats, 3 Rats and a Squirrel ...	Kurseong, Darjeeling.	Mr. E. A. D'Abreu.
1 Marmot, 2 Mouse Hares and 1 Vole.	Baltistan ..	Mr. A. S. Brooke.
1 Bamboo Rat (*Rhizomys badius*) ...	Jalpaiguri ..	Mr. A. Field.
Markhor (*Capra falconeri*) head ...	Chitral ..	Mehtah of Chitral.
Arabian Thar (*Hemitragus jayakari*) Skin with horns.	Muscat ..	Capt. Hunt, R.N., C.I.E.

Contribution.	Locality.	Donor.
Pair of Sambar horns (*Cervus unicolor*).	Kurnool ..	Mr. B. H. Barlow Poole.
Shou (*Cervus affinis*) head	Tibet ..	Through Col. Manners Smith.
5 Bird Skins	Baltistan ..	Capt. F. L. Hughes.
35 Bird Skins	Garhwal ..	Mr. S. L. Whymper.
Great Snipe (*Gallinago major*) ...	Bangalore ..	Capt. Boxwell.
3 Solitary Snipe (*Gallinago solitaria*).	Chitral ..	Capt. Lyall.
Wood Snipe (*Gallinago memoricola*)...	Almora ..	Major F. Wall, I.M.S.
Pintail Snipe (*Gallinago stenura*) (variety).	Bhandup .	Mr. J. L. Symons.
Curlew (*Numenius arquata*)	Panvel ..	Mr. P. M. D Sanderson.
Scimitar Babbler (*Pomatorkinus erythrogenys*	Simla ..	Mr. P. T. L. Dodsworth.
Marbled Teal (*Marmaronetta angustirostris.*)	Ferozepore ..	Mr. A. S. Brooke
1 Bittern (*Botaurus stellaris*) ...	Agra District ..	Mr. C. A. Cooke.
2 Swan (*Cygnus musicus*) heads ...	Bannu ..	Major H. A. F. Magrath.
1 Whooper's Swan (*Cygnus musicus*) .	Campbellpore ..	Lt. Hornsby.
1 Bewick's Swan (*Cygnus bewicki*) ...	Marden, N.-W F. P.	Major H. W. Codrington.
2 Golden-eyed Duck (*Clangula glaucion*).	Jhelum ..	Lt. G H. Dempster.
Stiff-tailed Duck (*Erismatura leucocephala*).	Kohat ..	Lt. W. H. Logan Home
Smew (*Mergus albellus*)	Bhadarwa ..	Mr H. Vernon Purkis.
Little Bustard (*Otis tetrax*)	Kashmir ..	Mr F. J Mitchell.
European Great Bustard (*Otis tarda.*)	Jacobabad ..	Capt. M. H. Simonds.
5 Great Indian Bustards (*Eupodotis edwardsi*).	Thar and Parker District, Sind.	Mr E. Priestley.
3 Houbaras (*Houbara macqueeni*) ...	Do. ..	Do.
8 Bengal Floricans (*Sypheotis bengalensis*).	Do. ..	Mr E C Stuart Baker.
A number of Duck, &c.	Pithoro, Sind ..	Messrs. J. E C. Jukes, G. M. Lane, C O. Lowsley and C. W. Arbuthnot.
274 Birds Eggs of 50 species	Assam ..	Mr. E. C. Stuart Baker
3 Eggs of Indian Plantive Cuckoo (*Cacomantis passerinus.*)	Hyderabad ..	Prof. K. Burnett.
A large number of Snakes and Lizards.	Various localities	Major F. Wall, I.M.S.
25 Frogs and Toads, 20 Lizards, 3 Salamanders, several Centipeds, etc.	Kurseong ..	Mr. E. A. D'Abreu.
10 Frogs	Neliput Hills, S. India.	Mr. A. M. Kinloch.
Zamenis gemonensis	Muhammerah, Persian Gulf.	Lt A. T. Wilson
Krait (*Bungarus cæruleus*) and Brown Tree Snakes (*Dipsadomorphus trigonatus*).	Bhuj, Cutch ..	Mr. J. H. Smith.
King Cobra (*Naia bungarus*)... ...	S. Lushai Hills .	Mr J. Masters.
Burmese Krait (*Bungarus magnimaculatus*).	Shewbo, Burma. .	Lt.-Col. F. J. Dewes, I M S.
Several Snakes	Rajputana .	Mr. H. N. Coleman.
42 Snakes and 184 Lizards	Thar and Parker District.	Mr E Priestley.

Contribution.	Locality.	Donor.
1 Snake and several Insects	Ootacamund ..	Mrs. Millard.
Some Fresh Water Fishes, Frogs and Crabs.	Goa ..	Mr. P. F. Gomes.
A small collection of Butterflies ...	Kulu ..	Mr. H. Whistler.
12 Butterflies	Pachmahri ..	Capt. G. H. Evans.
1 Meteorite	Kofteir, Punjab. .	General W. Osborn.

Minor contributions from :—Major W. H. Kendrick, Major C. H. Ward Messrs. J. H. Skelton, G. D. Gmmanney, E. C. Stuart Baker, G. M. Ryan, A. H. Marshall, W. Palmer, L. Newcome, A. Marshall, B. N. Mundy and Jaber Ali.

A WHALE AT VIZIADRUG.

The Honorary Secretary said that the Society received information from Mr. A. Wood, I.C.S., Collector of Salt Revenue, on the 11th instant, that a large whale had been washed ashore on the rocks about 2½ miles from Viziadrug Customs House (Ratnagiri District). The Society at once sent off a man to try and measure and obtain some information about the external characters, which are still unknown, of the Indian Fin-Whales, but unfortunately it was too late and the specimen had been broken to pieces by the sea.

From the information gained on the spot the whale measured about 70 feet in length, and was, therefore, probably a specimen of the Great Indian Fin whale (*Balænoptera indica*). It was apparently stranded on the 6th instant, and if only telegraphic information had been sent immediately to the Society, it might have been possible to have obtained some valuable information and notes on the subject. This was the second large whale which had been washed up on the Bombay coast during the last 5 years, and unfortunately they were still without any information as to the external characters of the Indian Fin-Whales.

SPECIAL APPEAL FOR THE COLLECTION OF MAMMALS.

The Honorary Secretay then drew the attention of members to the urgent need of good specimens of Indian mammals, in which not only the Society itself, but even the South Kensington Natural History Museum, London is more deficient than is generally realised.

He considered the question of such importance and he felt sure that in this he had the support of all those interested in Natural History, that he had drawn up a special appeal for funds to meet the expenses of two trained collectors, whom it was proposed to bring out from home, to collect Indian mammals for the Society.

This would be the first real attempt to collect mammals in India, which as far as he knew had never before been systematically worked.

This appeal, he was glad to say, had met with a response, which, seeing that the list was open only a week ago, might be considered encouraging.

All subscriptions would be acknowledged in the Society's Journal, and subscribers would be informed from time to time of the progress made in carrying out this important work.

He appealed not only to members of the Bombay Natural History Society, but also to any one interested in Natural History, who would recognise that a work of this kind was not only of value to Science, but of interest to themselves; in that it supplied a want which was keenly felt even in the premier Museums of the world.

This was, he said, the first appeal for funds which the Society had made since its foundation in 1883, for any of its various enterprises in Natural History, and, therefore, it was hoped that it would meet with the response it deserved.

A MARINE AQUARIUM.

The Honorary Secretary said that during a recent visit to Madras, he had the opportunity of inspecting the Marine Aquarium and it so impressed him with its excellence that it occurred to him that members of the Bombay Natural History Society might care to hear some details about it, and possibly by bringing it before the notice of the public, the description of it might influence some local benefactor to give to Bombay a similar institution which would prove to be both popular and of educational importance.

The Marine Aquarium, at Madras, was the first institution of its kind in India, if not the first in the tropics. It owes its inception to Lord Ampthill, who, while Governor of Madras, drew up in conjunction with Mr. Edgar Thurston, Superintendent of the Madras Museum, the first rough plan of a public Aquarium. It was constructed in 1908, by the Government of Madras, at a cost of about Rs. 15,000, the object being for Educational and Scientific purposes and an annexe to the Presidency College and also for the general public.

The building is a low, unpretentious brick edifice and is situated on the seaward side of the famed Madras Marine, less than a hundred yards from the sea. The site is very similar to that of Chowpatty. The main entrance leads into a large paved area with a central fresh-water pond and fountain, and on either side are five tanks with plate-glass fronts, lit from above, each measuring $7 \times 3 \times 3\frac{1}{2}$ feet. The entire seaward side of the central area is occupied by a large open tank at present stocked with turtles (*Chelone mydas*). On either side of the entrance passage are two rooms designed for Committee meetings, storage of materials, etc., and one of them is at present occupied by the aeration plant.

With the exception of two tanks for fresh water fish (at present containing species of *Megalops*, *Ophiocephalus*, *Notopterus*, etc.,) which are

oxygenated by living *Vallisneria*, the remaining eight tanks contain salt water, which circulates from tank to tank and in addition are supplied with air from two compression cylinders, forced into each tank through a Berkfield filter candle. At present the cylinders are filled by hand pumps, but the use of an oil engine is contemplated. Seawater is conveyed to a covered well in the rear of the Aquarium along a pipe filled by hand at the seaward end. From the well it is pumped into filter beds, and from these passes to large elevated cisterns, whence it is distributed to the tanks. The shore water on the Madras Coast is so disturbed by the surf that this filteration is unavoidable at present, though the removal thereby of small organisms is undoubtedly a drawback. The water which has circulated through the Aquarium tanks can, if desired, be brought back to the filter beds and used a second time.

The Director of the Aquarium is the Superintendent of the Madras Museum, and he is assisted by a small local Committee.

The number of visitors at first was something like 1,100 a day and even now some 400 to 600 persons a day visit the Aquarium. A small admission fee is charged ($\frac{1}{2}$ an anna) and one day in the week is reserved for the upper classes who pay 4 annas each, and one day is reserved for purdah ladies. The number of visitors from 21st October 1909 to 31st March 1910, was 100,463 and the amount realised in admission fees was Rs. 3,330-4-6. The largest number of visitors on a single day was 3,436.

The staff consists of 3 keepers, 2 door-keepers and coolies costing about Rs. 100 per mensem, so that at present it may be considered as self-supporting.

The magnificent colours and wonderful shapes of many of the fish form a most attractive display. The exhibits include Sea-snakes (*Enhydrina* and species of *Distira*) and among the fish species of the following:—

Ginglymostoma, Stegostoma (Tiger sharks), Chiloscyllium, Murœna (Eels), Arius, Therapon Serranus, Lutjanus, Myripristis, Trachynotus, Pterois, Caranx, Antennarius, Heniochus, Julis, Teuthis, Balistes, and Tetrodon. The invertebrates comprise cuttle fish, holothurians, hermit crabs (Clibanarius), swimming crabs (Scylla and Neptunus), lobsters (Panulirus), prawns (Penseus), etc.

All the specimens had been taken on the Madras Coast within a few miles of the Aquarium.

Fish are brought in by paid fishermen who, however, will not bring in live edible fish. Rs. 5 has been offered for a live pomfret without success and none of the common edible fish appear to be procurable.

Feeding.—Owing to the fact of the water being filtered artificial food has to be supplied and lumps of raw fish are given every afternoon.

Many of the details given here were kindly sent him by Professor P. F. Fyson of the Presidency College, Madras, who also forwarded some rough

colour sketches of the fish which had been enlarged by Miss G. Millard. Other technical details were obtained from an account of the Aquarium written by Dr. J. P. Henderson, which was published in *Nature* in February last.

The photographs would also enable members to gain some idea of the general appearance of the Aquarium and also of the interior.

In conclusion the Secretary asked "Is it too much to hope that some public spirited citizen will come forward and enable Bombay to follow the execellent example which Madras has set us?"

There could, he thought, be no doubt that such an Aquarium in Bombay would be both popular and of great educational value.

Professor Powell said it would be difficult to exaggerate the importance of such an Aquarium as an educational factor. No progress in the study of practical Biology can be expected till such an Aquarium is available for teachers, students and those engaged in original research on Biological problems. He would venture to say that ninety per cent. of our University graduates in Biology had never seen or handled a Sea Urchin, Star Fish, Jelly Fish, or Lancelet, though they possibly write glib polysyllabic accounts of their structure, development and life-histories. Such "learning" obtained from text-books is not science. At present the Bombay student of Natural Science learns it in exactly the same way as he learns history from text-book. He knows not science but the "history of science." He can tell you what Huxley, or Darwin, or De Vries has observed as he can tell you how Napoleon or Hannibal has fought. He has made no personal observations or experiments, but with an Aquarium at hand to supply our colleges with Biological material this state of affairs can be remedied, not otherwise.

SMALL GAME SHOOTING IN SIND.

An interesting paper on this subject was read by Mr. N. B. Kinnear, who gave his experiences of a three weeks' shoot in December with Mr. E. Priestley, D.S.P., a member of the Society, in Lower Sind.

OF THE MEETING HELD ON 2ND FEBRUARY 1911.

A meeting of the members of the Bombay Natural History Society took place on Thursday, 2nd February 1911, at 6-15 p.m., at the Society's Rooms, H. E. Admiral Sir Edward Slade, M.V.O., presiding.

NEW MEMBERS.

The election of the following 5 new members since the last meeting was duly announced :—

Mr. E. B. M. Bulkely (Sabathu); Capt. H. C. H. O'Brien (Nowshera); Lt.-Col. A. L. Duke, M.B. (Quetta); the Hon'ble Mr. W. Fraser (Cawnpore) and the Mess Secretary, 45th Sikhs (Nasirabad).

ACCOUNTS FOR 1910.

The Honorary Treasurer, Mr. L. H. Savile, presented the Statement of Accounts for 1910, which, he remarked, continue to show fairly satisfactory results. The subscriptions received during the year amounted to Rs. 22,872-15-10, which included Rs. 827-10-0 for subscriptions in arrears and Rs. 3,089-9-4 for subscriptions for 1911 and 1912 paid in advance.

The entrance fees amounted to Rs. 2,690, which is slightly less than last year. 285 new members were elected as compared with 294 in 1909.

It was resolved that the accounts be passed subject to the usual audit and a vote of thanks was passed to Mr. Savile, the Honorary Treasurer.

ELECTION OF THE COMMITTEE.

The following gentlemen were elected as office-bearers for the present year:—

President, H. E. the Right Hon'ble Sir George Sydenham Clarke, G.C.M.G., G.C.I.E., F.R.S.; Vice-Presidents, Mr. J. D. Inverarity, B.A., LL.B., Rev. F. Dreckmann, S.J., and the Hon'ble Mr. Justice N. C. Macleod; Honorary Secretary, Mr. W. S. Millard; Honorary Treasurer, Mr. L. H. Savile; Honorary Librarian, Mr. T. M. S. Culbertson; Managing Committee, Mr. E. C. Stuart Baker, F.Z.S., Lt.-Col. W. B. Bannerman, M.S., Mr. T. R. Bell, I.F.S., Mr. C. L. Burns, Mr. E. Comber, F.Z.S., Vet.-Col. G. H. Evans, Prof. G. A. Gammie, Mr. E. Ernest Green, F.E.S., Mr. N. B. Kinnear, Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.), Mr. J. McNeill, I.C.S., Lt.-Col. A. Newnham, F.Z.S., Dr. A. Powell, Mr. G.M. Ryan, I.F.S., Major F. Wall, I.M.S., C.M.Z.S., Mr. John Wallace, C.E., and Captain W. H. Evans, R.E.

APPEAL FOR FUND FOR MAMMAL COLLECTION.

The Secretary said that although some members had kindly subscribed to the Society's appeal for funds to enable them to make a collection of mammals, he hoped that many more would send in subscriptions. If each member gave Rs. 10 only per annum for two years the whole amount would be subscribed as the Society had more than 1,500 members. One member had promised to subscribe Rs. 10 per mensem until further notice and such help was greatly appreciated. One of the original objects of the Society was the promotion of the study of Zoology, and therefore he hoped that by the next meeting he would be in a position to announce many more subscriptions.

PAPER READ.

Mr. H. Maxwell Lefroy, Imperial Entomologist to the Government of India, then read a paper on "The Progress of Entomology in India." The paper will be published in the Society's Journal. The meeting then terminated with a vote of thanks to Mr. Lefroy for his interesting paper.

OF THE MEETING HELD ON 9TH MARCH 1911.

A meeting of the members of the Bombay Natural History Society took place on Thursday, the 9th March, 1911, at the Society's Rooms, the Hon. Mr. R. A. Lamb, I.C.S., C.I.E., C.S.I., presiding.

The election of the following 23 new members since the last meeting was duly announced :—

Mr. F. Ware (Madras); Mr. M. P. Thomas (Unpur); Mr. T. Cooper (Abu Road); Mr. K. W. Barlee, I.C.S. (Bombay); Maharaj Kunwar Major Dowlatsing (Idar, Mahi Kantha); Mr. G. F. W. Elwes (Europe); Mr. R. G. Abbott (Bombay); Mr. C. D. Donald (Rangoon); Mr. G. B. Scott (Ahwaz P. O., *via* Persian Gulf); Capt. R. B. Worgan (Madras); Capt. C. A. Godson, I.M.S. (Assam); Mr. H. N. Colan (Jodhpur, Rajputana); Mr. J. V. Collier, I.F.S. (Ramnagar); Mr. J. H. Lyall, I.F.S. (Haldwani); Mr. J. N. Oliphant (Kheri, Oudh); Mr. H. E. Wells, M.B. (Minbu); Mr. F. R. R. Rudman, I.C.S. (Jubbulpore, C.P.); Dr. A. J. M. Paget, M.D. (Berbera, Somaliland); Mr. L. Volkart (Bombay); Mr. W. Reinhart (Bombay); Mr. A. C. Hiley (Belgaum); Mr. R. W. Inder (Belgaum) and Mrs. Mary H. Nichol (Selangor).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donor
Jackal (*Canis aureus*) Skin	Thana Dist. ...	Mr. E. G. L. Laird Macgregor, I.C.S.
Four-horned Antelope (*Tetracerus quadricornis*).	Do. ...	Do.
Head Skins of Indian Gazelle (*Gazella bennetti*) and Black Buck (*Antilope cervicapra.*)	Okhamandal ...	Capt. A. H. E. Mosse, I.A.
Shed Antler of Shou (*Cervus affinis*).	Chambi Valley ...	Major Barclay.
7 Mammal Skins	China ...	Trustees of British Museum.
Pallas's Squirrel (*Sciurus erythraeus*).	Shillong ...	Major Wilson.
Stone Curlew (*Œdicnemus scolopax*).	Karjat ...	Mr. J. Black.
Grey Partridge (*Francolinus pondicerianus*) (variety).	Fort Munro ...	Mr. F. J. Mitchell.
Stiff-tailed Duck (*Erismatura leucocephala*).	Jhelum Dist. ...	Capt. F. K. Hughes.
Golden Eye (*Clangula glaucion*) ...	Roorkee ...	Major A. H. Cunningham, R.E.
Whooper Swan (*Cygnus musicus*) ...	Sohan, R. Punjab.	Lt. P. L. Orde.
Whooper (*Cygnus musicus*) head and feet.	Lahore ...	Mr. L. C. Glasscoke.
White-winged Wood Duck (*Asarcornis scutulatus*).	Burma ...	Mr. W. O. Hannyington.
1 Spur (*Galloperdix spadacea*) and 1 Grey Jungle Fowl (*Gallus sonnerati*).	Khandesh ...	Lt.-Commdr. Hon'ble R. O. B. Bridgeman.

Contribution.	Locality.	Donor.
12 Fishes	Madras ...	Prof. P. F. Fyson.
1 Snake (*Eryx johnii*)...	Bombay ...	Mr. C. N. Robinson.
Several Butterflies	Hyderabad, Sind.	Capt. F. C. Fraser.
A number of Beetles	Various ...	Lt. H. G. Chippindall.
Sponges and Crustaceans	Do.	Indian Museum.

Minor Contributions to the Museum from :—L. A. Wilson, Messrs. R. Gilbert, H. E. Standage, L. H. Savile, C. Lowsley, C. B. Antram and A. Dunbar Brander.

INDIAN MAMMAL SURVEY.

The Secretary said that the members who had subscribed would doubtless like to know how this was progressing. So far the Society had received some Rs. 3,000, but in addition to this His Highness the Maharaja Scindia had kindly promised Rs. 2,000 as a first donation and H. H. the Gaekwar of Baroda Rs. 500, so that the total received and promised up to date was over Rs. 5,000.

The first collector, Mr. C. A. Crump, had already started work in East Khandesh, where Mr. A. H. A. Simcox, I.C.S., the Collector of this District, had kindly offered to help him, and it was proposed that he should work eastwards from Khandesh—south of the Nerbudda towards Jubbulpore.

As to whether the Society would be able to employ a second man depended entirely on the members themselves. It would of course take many years for one man to cover the whole of India, Burma and Ceylon, but the Society would not feel justified in employing another collector until the sum of Rs. 15,000 at least was received and a similar amount would be required the following year.

One member (Mr. Lowndes) had kindly presented them with all his camp kit in addition to a handsome subscription, and the Secretary once again emphasized the fact that if only each member would give Rs. 10 the amount would be subscribed.

He should mention that H. E. Sir George Clarke, F.R.S., who was President of the Society, in forwarding a cheque for Rs. 100 towards the object of the appeal wrote, "I have seen your appeal for funds to make a systematic collection of mammals of India. I did not realize that existing specimens were so inadequate and I cordially agree with you that an effort should be made to improve it."

The Chairman said he hoped that all members would respond to the appeal. Some people, he believed, considered that it was the duty of Government to do such work, but he was unable to concur in that view. The

benefits to be derived from the Survey, however great they may be to Science, are not sufficiently connected with Government administration in any of its branches to justify the expenditure on it of public funds.

PAPER READ.

The following paper was then read "On the improvement in the yield and quality of Indian wheat with an exhibit of the new wheats obtained at Pusa by selection and hybridisation by Mr. Albert Howard, Economic Botanist to the Government of India, and Mrs. Gabrielle L. C. Howard, Personal Assistant to the Imperial Economic Botanist.

Most of the merchants interested in the wheat trade attended and there was an exhibit of the new Pusa wheats which have been obtained by selection and hybridisation. By adopting these modern methods of improvement new Indian wheats have been produced of the same grain quality as American and Canadian Spring wheats which now command the highest prices on the English market. These new wheats are far superior in milling and baking qualities to the average Indian wheat exported from the country and it is expected that they will soon be grown on a sufficient scale to influence the trade.

In addition to quality, great improvements have also been made in the production of wheat. New methods of cultivation and soil management have been devised by which crops of over 2,500 lbs. of wheat to the acre have been grown continuously on the same land without manure and without irrigation water or rain after sowing time. Such yields were not considered possible in India under dry farming conditions, but they have been obtained at Pusa using only the means at the command of ordinary cultivator.

The paper in question will be printed in full in a forthcoming issue of the Journal of the Bombay Natural History Society.

OF THE MEETING HELD ON 11TH APRIL 1911.

A meeting of the members of the Bombay Natural History Society took place on Tuesday, the 11th April 1911, at the Society's Rooms, Lieut.-Colonel W. B. Bannerman presiding.

The election of the following 15 new Members since the last meeting was duly announced :—

Mr. Gulabrai Bhawandas (Shewan, Sind); Mr. P. Vlasto (Bombay); Lt. J. Wolfe Murray, R.N. (Bombay); Mr. A. R. Villar (Tharrawaddy, L. Burma); Mr. R. E. Macpherson (Sholapur); Lt.-Col. H. Fooks, I.M.S. (Risalpur, N.-W. F.P.); Mr. Freeman Roper (England); Mr. C. P. G. Jones (Sinbo, Burma); Mr. E. H. Burt (Bombay); Lt. C. B. Evans, R.N. (Bombay); Mr. A. Barnes (Rutlam); Shrimant Chintamanrao Appasaheb Patwardhan, Chief of Sangli (Sangli, S.M.C.); Mr. W. E. Beazley (Malakand); and Mr. N. H. Deane (Rangoon, Burma).

CONTRIBUTIONS TO THE MUSEUM.

Mr. N. B. Kinnear, in the absence of the Honorary Secretary, acknowledged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donor.
2 Markhor Masks (*Capra falconeri*)	Chitral ...	Capt. R. A. Lyall.
2 Muntjac heads (*Cervulus muntjac.*)	Kangra Dist. ...	Genl. W. Osborn.
2 Pine Martens (*Martes flavigula*) ...	Chitral ...	Cap. R. A. Lyall.
1 Flying Squirrel (*Sciuropterus fimbriatus*).	Do. ...	Do.
1 Large Brown Flying Squirrel (*Pteromys oral*).	Almora ...	Major F. Wall, I.M.S
2 Indian Desert Gerbilles (*Tatera hurriana*).	Sibi, Baluchistan.	Major C. Ward.
2 Afghan Gerbilles (*Tatera erythrura*).	Do. ...	Do.
1 Shrew	Dehra Dun ...	Major H. Fulton.
1 Wing of European Bustard (*Otis tarda*).	Risalpur ...	Col. H. Fooks, I.M.S.
1 Head of Mute Swan (*Cygnus olor*).	Nowshera ..	Capt. H. O'Brien.
2 White-winged Wood Ducks (*Asarcornis scutulatus*).	Shwebo ...	Mr. W. O. Hannyngton.
1 Himalayan Pied Kingfisher (*Ceryle lugubris*).	Almora ...	Major F. Wall, I.M.S.
1 Solitary Snipe (*Galinago solitaria*).	Do. ...	Do.
1 Golden Eye (*Clangula glaucion*)...	Jhelum ...	Mr. F. L. Hughes.
3 Grey Partridges (*Francolinus pondicerianus*).	Mekran Coast ...	Capt. A. Hunt, R. N.
1 Reed Bunting (*Emberiza schaeniclus*).	Rawalpindi ...	Mr. H. Whistler.
4 Spotted Wings (*Psaroglossa spiloptera*).	Dehra Dun ...	Major H. T. Fulton.
2 Eggs of Sandgrouse (*Pterocles exustus*).	Orcha ...	H. H. Maharaja of Orchha.
1 Python (*Python molurus*) (alive).	Wardha ...	Mr. P. S. Patuck, I.C.S.
1 Burmese Krait (*Bungarus magnimaculatus*).	Minbu, Burma ...	Major F. Wall, I.M.S.
5 *Typhlops brahminus* (juv) ...	Assam ...	Do.
1 Cobra (*Naia tripudians*)	Palli Hill, Bandra	Col. J. Forbes.
1 Green Whip Snakes (*Dryophis mycterizans*).	Do. ...	Mr. J. Brikett.
1 *Simotes arnensis*	Thana ...	Mr. H. Bulkley.
1 Phoorsa (*Echis carinata*) ...	Cutch ...	Mr. J. H. Smith.
9 Fishes, 7 Crabs, 1 Lizard	Karwar ...	Mr. P. Gerhardt.

INDIAN MAMMAL SURVEY.

The Secretary announced that since the last meeting of the Society he had received some Rs. 6,500 making the total subscription up-to-date about Rs. 10,000. Among the principal contributors were H. H. the Maharaja Scindia, Rs. 2,000 (which was mentioned at last Meeting), the Hon. N. C. Rothschild, Rs. 1,500, H. H. the Rao of Cutch, Rs. 1,000 and H. H. the Maharaja of Mysore, Rs. 1,000. The Society's collector, Mr. Crump, was still in Khandesh working eastwards towards the Berars from where it

was proposed that he should work north into the C. P. The first instalment of skins had been received and was exhibited. There was nothing of special interest in the collection as it was made in rather a poor district—from the mammal point of view. The mammal life in East Khandesh does not seem to have recovered yet from the famine and the ravages of the Bhils.

A second instalment of skins was expected shortly and as Mr. Crump had mentioned in his last letter that he was in a better district, a more varied and interesting collection was expected.

The Secretary added that Sir Dorab Tata had just promised a donation of Rs. 1,000 towards the mammal appeal.

The Hony. Secretary proposed that a vote of thanks should be passed to Mr. A. H. A. Simcox, I.C.S., with whom Mr. Crump had been staying part of his time in Khandesh, Mr. Simcox had given every assistance in his power and had, therefore, made Mr. Crump's work much easier.

Mr. Nigel Kerr, in seconding the vote of thanks to Mr. Simcox, said it appeared that had it not been for the public spirit of the Indian Princes mentioned and Mr. Rothschild, the funds received in response to the appeal would not have been encouraging and would not hold out much chance of the services of a second collector being obtained. He hoped that the members of the Society would all respond to the appeal. It was not too much to ask every member to contribute at least Rs. 10.

PAPER READ.

The following paper was then read by Capt. J. Taylor, I.M.S.—Experiments on the breeding of "Mus rattus" in which he said:—

The experiments on the breeding of rats were done at Parel in order to estimate the fecundity of *Mus rattus*. The details given and the calculations from them are based on actual observations in specially constructed godowns in which the natural conditions were reproduced as closely as possible.

From the results of the breeding experiments a table of total fecundity was produced and in this was shown the enormous possible rate of increase of these rodents. The factors affecting the rat population were considered and the importance of destruction of young rats by their parents shown. The bearing of the observations on general questions of rat destruction was considered and a comparison made between *Mus rattus* and *Mus decumanus*.

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THE MOTHS OF INDIA

Explanation of Plate F.

1. Mustilia phæopera.
2. Andraca albilunata.
3. Leucoma thyridoptera.
4. Parasa metathermes.
5. Miresa phocea.
6. Miresa metathermistis.
7. Arbela campbelli.
8. Phalera ochropis.
9. Natada fulvidorsia.
10. Tetraphleps ferrogrisea.
11. Marumba microta.
12. Epipyrops poliographa.
13. Ampelophaga obliquifascia.
14. Sphecosesia pedunculata.
15. Lepidopoda andrepiclera ♂.
16. Oxyplax fulvata.
17. Hypolamprus lepraota.
18. Pentateucha curiosa.
19. Rhodoneura discopis.
20. Ægeria cyanopasta.
21. Natada fulvimixta.
22. Miresa pyronota.
23. Marumba poliotis.
24. Arbela minima.
25. Rhagastis leucocraspis.
26. Ægeria pyrodisca.
27. Lepidopoda andrepiclera ♀.
28. Phalacra rufa.
29. Lælia fulvata.
30. Sangatissa arctiades.
31. Euproctis xanthoceps.
32. Miltochrista ocellata.
33. Phalacra tenera.
34. Preparctia hannyngtoni.
35. Chadisra semiferrea.



THE BHARAL (*Ovis nahura*).
TOP: Young male, 16 months old. MIDDLE: Male, 3 years old.
BOTTOM: Female, 2 years old, with kid.

