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J. WOOD-MASON, ESQ.,

VICE-PRESIDENT.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will communicate their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.

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LIST OF CONTRIBUTORS.

Page

ALCOCK, ALFRED;—*Natural History Notes from H. M.'s Indian Marine Survey Steamer* 'Investigator,' *Commander* ALFRED CARPENTER, R. N., D. S. O., *commanding.* No. 10. *List of the* Pleuronectidæ *obtained in the Bay of Bengal, in* 1888 *and* 1889, *with descriptions of new and rare species* (Plates XVI—XVIII), ... 279

————————;—*Natural History Notes from H. M.'s Indian Marine Survey Steamer* 'Investigator,' *Commander* ALFRED CARPENTER, R. N., D. S. O., *commanding* No. 12. *Descriptions of some new and rare species of Fishes from the Bay of Bengal obtained during the season of* 1888-89. (Plate XXII.), ... 296

ANDERSON, HENRY H.;—*Notes on Indian Rotifers.* (Plates XIX—XXI.) 345

ATKINSON, E. T.;—*A new Species and Genus of* Coccidæ. (Plate I), 1

————————;—*Notes on Indian* Rhynchota; Heteroptera, No. 5, ... 20

————————;—*Index to the first five Papers on Indian* Rhynchota, *completing the Family* Pentatomidæ:—I Journ. lvi. pt. ii, p. 22, 1887; II, *ib.*, p. 144: III, *ib.* lvii, p. 1, 1888: IV, *ib*, p. 118: V, *ib.*, lviii, p. 20, 1889, ... 441

BARCLAY, A.;—*A Descriptive List of the* Uredineæ, *occurring in the neighbourhood of Simla (Western Himalayas). Part II.* Puccinia. (Plates XII.—XIV.) 232

BOURNE, ALFRED GIBBS;—*On certain Earthworms from the Western Himalayas and Dehra Dun.* (Plate III.) 110

DOHERTY WILLIAM;—*Notes on Assam Butterflies.* (Plate X.) 118

————————;—*On certain* Lycænidæ *from Lower Tenasserim.* (Plate XXIII), ... 417

HILL, S. A.;—*The Tornadoes and Hailstorms of April and May* 1888 *in the Doab and Rohilkhand.* (Plates IV.—IX), ... 135

KING, GEORGE;—*Materials for a Flora of the Malayan Peninsula.* 359

LETHIERRY, M. L.;—*Definitions of three new* Homoptera, ... 252

LYDEKKER, R.;—*On the Tortoises described as* Chaibassia. (With two Wood-cuts), ... 327

Page

MUKHOPADHYAY, ASUTOSH;—*The Geometric Interpretation of Monge's Differential Equation to all Conics*, ... 181

————————;—*Some applications of Elliptic Functions to Problems of Mean Values. (First Paper).* (With a Wood-cut) 199

————————;—*Some applications of Elliptic Functions to Problems of Mean Values. (Second Paper)*..... 213

OATES, EUGENE W.;—*On the Species of* Thelyphonus *inhabiting Continental India, Burma, and the Malay Peninsula.* (Plate II.) 4

PEDLER, ALEX.;—*On the Volatility of some of the compounds of Mercury and of the metal itself.* 189

PRAIN, D.;—Noviciæ Indicæ I. *Some additional species of* Pedicularis, ... 255

SCLATER, W. L.;—*Description of a Stag's Head alied to* Cervus dybowskii, Tac., *procured from the Darjeeling Bazaar.* (Plate XI.) 185

SIMON, E.;—*E'tude sur les Arachnides de l' Himalaya recueillis par* M M. OLDHAM *et* WOOD-MASON *et faisant partie des collections de l' Indian Museum, Ire Partie*,..... 334

WOOD-MASON, J.;—*Notice of a Neolithic Celt from Jashpur in the Chota Nagpur District.* (Plate XV.) 254

————————;—*The Ethiopian and Oriental Representatives of the Mantodean Subfamily* Vatidæ, ... 306

Supplement No. 1.

ATKINSON, E. T.;—*Catalogue of the* Insecta *of the Oriental Region* No. 1. *Order* Coleoptera, *Family* Cicindelidæ, ... 1

————————;—*Catalogue of the* Insecta. *Order* Rhynchota. *Sub-order* Hemiptera-Heteroptera. *Family* Capsidæ, ... 25

Supplement No. 2.

WATERHOUSE, J., COLE, W. H. and POPE, T. A.;—*Metric Weights and Measures prepared for the use of the Photographic and Lithographic offices, Survey of India*, ... 1

Dates of issue of the different numbers of the Journal, Pt. II, 1889.

No. 1.—Containing pp. 1—134, with Plates I, II, & III, was issued on May 21st, 1889.

No. 2.—Containing pp. 135—254, with Plates IV, V, VI, VII, VIII, IX, X, XI, XII, XIII & XIV, was issued on September 3rd, 1889.

No. 3.—Containing pp. 255—326, with Plate XV, was issued on November 7th, 1889.

No. 4.—Containing pp. 327—440, with Plates XVI, XVII, XVIII, XIX, XX & XXI, was issued on December 30th, 1889.

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No. 1.—Containing pp. 1—199, was issued on January 17th, 1890.

No. 2.—Containing pp. 1—15, was issued on October 24th, 1889.

LIST OF PLATES.

I.—Pseudopulvinaria sikkimensis, n. sp.

II.—*Indian species of* Thelyphonus.

III.—Typhœus Masoni, sp. nov. *and* Perichæta houlletii.

IV—IX.—*Maps illustrating barometric pressure in the Doab and Rohilkhand.*

X.—*Assam Butterflies.*

XI.—*Head of* Cervus dybowskii.

XII.–XIV. *Species of* Puccinia *found in the neighbourhood of Simla.*

XV.—*Neolithic Celt from Jashpur.*

XVI.–XVIII. Pleuronectidæ *from the Bay of Bengal.*

XIX.–XXI. *Indian Rotifers.*

XXII.—*New and Rare Fishes from the Bay of Bengal.*

XXIII.—Lycænidæ *from Tenasserim.*

ZOOLOGICAL GARDEN. CALCUTTA.

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ASIATIC SOCIETY OF BENGAL.

Part II.—NATURAL SCIENCE.

No. I.—1889.

I.—*A new Species and Genus of* Coccidæ.—*By* E. T. Atkinson, B. A.

[Received September 30th;—Read November 7th, 1888.]

(With Plate I.)

The Coccid described below was received from Mr. F. Gammie, who procured it at Munghphu (3800 feet) in Sikkim on *Quercus incana*, *Castanea indica*, and *C. tribuloides*. I forwarded specimens to Mr. W. H. Maskell of Wellington, New Zealand, who devotes much attention to this family, and he has kindly sent me the drawings of the insect in its different stages shown on the accompanying plate. This coccid clearly belongs to Maskell's group *Hemicoccina*, which is characterised by having, in the larval stage, the anal tubercles of the *Coccina*, and, in the adult female, the abdominal cleft and lobes of the *Lecanina*. I had provisionally placed this insect in the genus *Pulvinaria* of the group *Lecanina*, as the adult female does not appear to differ from the adult females of that genus. Mr. Maskell was at first of the same opinion, but, having examined the larval form in its earliest stages, he found that it presented undoubted and distinct 'anal tubercles' (Fig. 11), which at once remove it from the *Lecanina*.

It cannot be placed in the genus *Kermes* of the group *Hemicoccina* owing to structural differences, so that we have to form a new genus, to which the name *Pseudopulvinaria*, as suggested by Mr. Maskell, has

been given to show its connection with the lecanid genus *Pulvinaria*. The insect is really a hemicoccid possessing more lecanid appearances than any other of the group hitherto known. The position of the insect on the tree during its several stages is rather curious. The larvæ and the females of the second stage cluster along the midrib of the lower surface of the leaf, whilst the adult female alone is found along the twig to which the leaves are attached (Fig. 1). The secretion is closer than in *Pulvinaria*, and quite as cottony during the larval stage, but, in the second stage, becomes more waxy, so as to approach in appearance the genus *Orthezia*, and the masses of wax on the leaves are more like detached or attached plates (Fig. 2) than threads. Unfortunately the male has not yet been secured.

It is satisfactory to know that the adult female is subject to the attacks of several species of hymenopterous and dipterous parasites, which we may hope to characterise hereafter, for, otherwise, from the size and number of these coccids on the leaves and twigs affected, much damage must ensue, should they increase to any extent. It disappears during the rains (July—September), but comes on abundantly at the close of the rains, and matures about April.

Genus Pseudopulvinaria nov.

Adult females naked, without a waxy fringe, somewhat circular or oval and flattish. In *Kermes*, the adult female is entirely globular, except a small incision where it rests on the twig to which it is attached, and appears to have neither legs, antennæ, nor rostrum.

Pseudopulvinaria sikkimensis, n. sp.

Adult ♀, above reddish-brown, naked, somewhat convex, irregularly circular or oval in shape, varying in size, skin smooth, punctulate. The insect frequently falls off, leaving the white cottony ovisac attached to the twig. Furnished beneath with eyes, antennæ, legs and rostrum; the abdominal cleft and lobes distinct (Fig. 5): antennæ borne on a tubercle, 6-jointed, second joint longest, unarmed; others with setæ varying in length (Fig. 6): claw with four digitules, the upper pair longest (Fig. 7). The ovisac on which the female rests is formed of a compact white cerous substance, following and extending beyond the outline of the insect itself. The spinnerets (*filières*: Fig. 8) are scattered irregularly over the nether caudal surface and are not arranged in groups or circles. Found only on the twigs: long, 5—9 mill.

The ♀ of the second stage (Fig. 9) with its waxy plates is found on the lower surface of the midrib of the leaf. These plates seem to be

attached transversely to a longitudinal median ridge and give this form a peculiar ribbed appearance.

The larval form is furnished with antennæ, legs, rostrum, and anal tubercles bearing long setæ (Fig. 10). These tubercles are very distinct in the earliest stage of the larva (*l'etat embryonnaire*: Fig. 11), and are characteristic of the group.

The ♂ is unknown.

Hab. Mungphu (3800 feet), Sikkim.

EXPLANATION OF PLATE I.

Fig. 1. Insect on twig and leaves: slightly reduced.
2. Waxy masses on leaves, magnified.
3. Adult ♀, dorsal aspect, cotton removed: magnified about 4.
4. Same, ventral aspect, cotton removed: magnified.
5. Same, abdominal cleft, lobes, anogenital ring and spinnerets: do.
6. Same, antennæ: × 90.
7. Same, claw and digitules: × 90.
8. Same, spinnerets: magnified.
9. ♀ of second stage, dorsal aspect, with waxy plates.
10. Larva, ventral aspect: × 90.
11. Anal tubercles just before emerging from the egg: magnified.
12. Edge of the body of larva with hairs &c.: × 350.

II.—*On the Species of* Thelyphonus *inhabiting Continental India, Burma, and the Malay Peninsula.*—*By* Eugene W. Oates, F. Z. S. *Communicated by* The Superintendent of the Indian Museum.

[Received January 24th;—Read April 3rd, 1889.]

(With Plate II.)

The obscure animals which belong to this genus are very little known. I have steadily collected them for some years now with the best results, and not long since I took the opportunity of studying the specimens contained in the Indian Museum, all of which were very kindly placed at my disposal by Mr. J. Wood-Mason, the Superintendent of the museum.

There are now thirteen species known within the above limits, of which three have been already described, eight are new to science, and two are unknown to me, and in my opinion insufficiently described to be ever determinable. These two were described by Mr. A. G. Butler many years ago and in terms which, when applied to these animals, are altogether insufficient. For this reason I have excluded them from this paper, and I hope to notice them on a future occasion, when I have had time to examine the types, which I understand are in the British Museum. These two species are *T. sepiaris*, described from Tonghoo and Ceylon, and *T. nigrescens*, from Tenasserim (Cist. Ent. vi, p. 129).

The *Thelyphoni* live under timber and stones, lying concealed during the day time and creeping about at night only. When discovered, they seem overcome with surprise, but they speedily recover and hurry away with considerable speed into holes and crevices. They are frequently found at the roots of trees under accumulations of dead leaves and rubbish. They require moisture, but must have well drained soil.

I have never found two species together, and my experience is that each species inhabits a tract of country to the exclusion of others. For instance, in Rangoon *T. rangunensis* is found; proceeding 80 miles north, this species ceases and *T. sylvaticus* occurs. Similarly, further north *T. saxatilis* is alone found to occur. Reef and Double Islands each has its peculiar species. The species which so far as I know has the largest area of distribution is *T. indicus*, but the localities "Western Bengal and Southern India" attached to the few specimens I have been able to examine are so vague that no certainty can be attached to this point.

The *Thelyphoni*, when once you get into the way of finding them, are sufficiently abundant. I have frequently found twenty in one morning,

and, on one occasion, while visiting the lighthouse on Double Island, I secured 360 in three hours' work, myself and one man.

All the species I have met with emit a peculiar odour, more like aromatic vinegar than anything else I know, but more pungent. This odour emanates from a liquid which is ejected from an orifice near the root of the tail, and so powerful is it that it has frequently betrayed to me the position of the animal. On one occasion, when examining a live animal, I had a drop of the liquid injected into my eye, but it proved to be harmless.

These animals, it is hardly necessary to state, are quite incapable of inflicting injury to anything large than an insect. They have no sting and their cheliceres are very weak. A writer in the "Scientific American" sometime ago graphically described how a species common in Florida was in the habit of killing horses, so powerful was its sting. This is of course all nonsense.

I have not been able to discover anything regarding the breeding of these whip-scorpions. I have taken the very young only a-quarter of an inch in length and also what appeared to be pregnant females, but I could find neither eggs nor embryos in them. Mr. Fea, the energetic Italian naturalist now working in Burma, informs me, however, that he once discovered a female carrying a bunch of egg under her cephalothorax by the aid of her first pair of legs. This is all I know about the matter.

The two sexes of the *Thelyphoni* grow up absolutely alike till full grown. At this stage, the male, by some process upon which I am able, I am sorry to say, to throw no light, undergoes a transformation and emerges from it totally different from the female. That this is fact can admit of no doubt. Adult males are nearly as abundant as adult females, but half or three-quarter grown males with the external characters of the adult male, or with any characters at all not possessed by the female, are unknown. Once adult the sexes are as different as possible in appearance.

The immature animals resemble the adult female in all characters except colour, and in this latter respect the differences are not great, reds being replaced by olive-yellows or greens and black tints by pink ones.

In growing up, they seem to undergo numerous moults just like the scorpions and spiders.

The adult sexes are markedly different in all the species I know. The more marked difference is in the size and armature of the cheliceres, but there are minor differences, such as the grooving or entirety of the first lower abdominal segment, the size of the abdomen, and the colour of the cheliceres.

Adults of both sexes may be recognized by a certain redness and tumidity of the first lower abdominal segments not apparent in the immature animal.

I append a key to the eleven species known to me, and, in the plate, I have figured some parts of certain animals which will be of great assistance in the discrimination of the species.

In my descriptions I have only dwelt upon those characters which are of importance, chiefly the details of the cheliceres, the colours, and the important points of the cephalothorax and abdomen. I have not found the legs to vary in any appreciable degree in the different species, and therefore I have omitted them.

It will be noticed in the key that the females of some species cannot be discriminated from each other. I do not mean by this that the females are absolutely alike, but merely to express my inability to diagnose them in intelligible brief terms. Compared with each other they are sufficiently distinct, varying in shade of colour, shape of cheliceres, and in other points.

There are many immature specimens in the Indian Museum which I have hesitated to describe till mature animals are available. It is to be feared that many of the descriptions of these animals are based on young specimens, and, if so, they are useless, as the young of many species (which, when adult, are perfectly distinct) are absolutely alike.

On examining the specimens which the late Dr. Stoliczka referred to *T. angustus*, Lucas (J. A. S. B. 1873, pt. ii, p. 134), I found that the specimens were referable to the young of *T. assamensis*, *T. formosus*, and a species from Penang, the adult of which is unknown.

Key to the Species.

a. With a sharp ridge between the central and lateral eyes.

a'. First joint of cheliceres with a lateral spine as well as a terminal one.

a''. Apophysis of the fourth joint of the cheliceres cylindrical, smooth on both edges, the outer edge rounded off at the tip (Fig. 13), ... *assamensis*, ♂.

b''. Apophysis of the fourth joint of the cheliceres sharply triangular, serrated on both edges, ... *assamensis*, ♀.

b'. First joint of cheliceres with only a terminal spine; second joint generally with 6 teeth.

c''. First lower abdominal segment divided longitudinally by a groove (Fig. 3 and 4).
a'''. Groove very deep and distinct (Fig. 3).
a⁴. Moveable finger of cheliceres festooned interiorly (Fig. 5); the terminal joint of the cheliceres of large size, broader than the fourth joint, ... *indicus*, ♂.
b⁴. Moveable finger of cheliceres simply rounded interiorly (Fig. 11); the terminal joint of the cheliceres weak, much narrower than the fourth, ... *johorensis*, ♂.
b'''. Groove very shallow and indistinct (Fig. 4), *indicus*, ♀.
d''. First lower abdominal segment entire, with no trace of a groove, ... *johorensis*, ♀.
b. With no sharp ridge between the central and lateral eyes, this region being rounded.
c'. Apophysis of fourth joint of cheliceres long and cylindrical, smooth on both edges, suddenly and quadrately widened out on the terminal quarter of its length (Fig. 12), ... *andersoni*, ♂.
d'. Apophysis of fourth joint of cheliceres cylindrical, smooth on both edges, suddenly narrowed on the terminal half of its length (Fig. 10), *wood-masoni*, ♂.
e'. Apophysis of fourth joint of cheliceres absolutely cylindrical, the two edges being parallel throughout their length and smooth (Fig. 7).
e''. Length of abdomen and cephalothorax 1·3 inch, ... *insularis*, ♂.
f''. Length of abdomen and cephalothorax 1 inch, *formosus*, ♂.
f'. Apophysis of fourth joint of cheliceres approximately cylindrical but the edges more or less swollen towards their extremities (Fig. 9).
g''. Inner edge of the fourth joint of the cheliceres coarsely granulated; the inner edge of the third joint double the length of the front edge of the second,..... ..... *binghami*, ♂.
h''. Inner edge of the fourth joint of the cheliceres smooth; inner edge of third joint equal to the front edge of the second.
c'''. The three hinder pairs of legs uniformly red,..... *saxatilis*, ♂.

d'''. Coxæ and femora of the three hinder pairs of legs reddish-brown, the other joints red.

a⁴. Apophysis of fourth joint gently swollen near the tip only, ... *rangunensis*, ♂.

b⁴. Apophysis of fourth joint greatly swollen over the terminal third of its length, *sylvaticus*, ♂.

g'. Apophysis of the fourth joint of the cheliceres triangular, sharply pointed, serrated on both edges (Fig. 2 and 8).

i''. First lower abdominal segment broadly rounded posteriorly (Fig. 3) all the legs red, *binghami*, ♀.

j''. First lower abdominal segment sharply protruding posteriorly (Fig. 4).

e'''. All the legs uniformly red, ... { *wood-masoni*, ♀. *insularis*, ♀. *formosus*, ♀.

f'''. Coxæ and femora of all the legs reddish-brown, the other portions red, ... *rangunensis*, ♀.

g'''. The three hinder pairs of legs uniformly red; the first pair reddish-brown,..... *saxatilis*, ♀.

1. Thelyphonus assamensis. Pl. II, Fig. 13.

Thelyphonus assamensis, Stoliczka, J. A. S. B. 1869, pt. ii, p. 205, pl. xix, fig. 1; 1873, pt. ii, p. 133, pl. xii, fig. 2.

Thelyphonus scabriusculus, Stoliczka, J. A. S. B. 1873, pt. ii, p. 130, pl. xii, fig. 1.

Thelyphonus psittacinus, Butler, Cist. Ent. vi, p. 129, pl. v, fig. 2 (1873).

♂. Cheliceres and cephalothorax black; abdomen black tinged with red; legs and tail very deep red; below, first joint of cheliceres black with a rufous tinge; cephalothorax, abdomen, and legs deep blood-red.

♀. Similar in coloration to the male, but with the cheliceres slightly tinged with red.

Immature animal. Entirely dull reddish, the legs tinged with olivaceous brown.

Length 1·7 inches; cheliceres ·75 inch.

Many animals of this species are of an uniform madder-brown colour and this is probably the normal colour immediately after the change of skin. Analogous cases occur among the scorpions.

Structure. ♂. Cheliceres densely and coarsely granulated in every part; second joint with five teeth on the front and lateral edges, always distinct, two large spines below; third joint with a very long sharp spine below; fourth joint very large, with a small spine below and a

large apophysis on the interior-front corner, long and cylindrical, terminated with a large spine and furnished below with numerous teeth like a coarse file (Fig. 13); fifth joint much narrower than the fourth, fixed finger short and triangular almost smooth on both edges, movable finger long and curved, serrated below, in shape much as in Fig. 11; one sharp spine on the lower projecting angle of the joint; first joint of cheliceres below densely punctured and slightly wrinkled in places; the anterior process with a lateral spine as well as a terminal one; cephalothorax densely granulated all over with a very pronounced sharp ridge between the lateral and middle eyes.

First lower abdominal segment wrinkled in the middle, not divided by a groove; posterior edge well rounded.

Structure ♀. Cheliceres as densely granulated as in the male; second joint with five very distinct teeth in front and two spines below; third joint with a blunt spine on the interior edge and a long, sharp one below; fourth joint with a minute spine below and a triangular, pointed apophysis on the interior-front corner serrated on both edges (Fig. 8); fifth joint very narrow and feeble, fixed finger short and sharply triangular, serrated on both edges, movable finger longa nd sharply pointed, curved (Fig. 6), serrated on the inner edge; first joint of cheliceres below as in the male.

Cephalothorax as in the male. First abdominal segment below differing in no respect from that of the male.

Found throughout Assam and Sikkim, and the hill-ranges of Eastern Bengal and Cachar.

The late Dr. Stoliczka appears to have been ignorant of the great difference of structure between the sexes of these animals, and he describes the two sexes under different names. His name has priority over Mr. Butler's by four years. This species is widely distributed and appears to be common, and was consequently, we may suspect, known to the earlier writers on these animals, but to identify it with any of their names is now impossible. It will be well, therefore, to adopt Dr. Stoliczka's name instead of making fruitless attempts to find an earlier one.

2. Thelyphonus indicus. Pl. II, Figs. 1—6.

Thelyphonus indicus, Stoliczka, J. A. S. B. 1873, pt. ii, p. 138, pl. xii, fig. 5.
„ *beddomei*, „ J. A. S. B. 1873, pt. ii, p. 142, pl. xii, fig. 6.

♂. Cephalothorax and abdomen dull chestnut-brown; cheliceres bright chestnut; legs and tail deep red below, cheliceres deep chestnut; abdomen, sternum, and legs bright chestnut. Length 1·3 inches.

♀. Similar to the male in colour.

Structure, ♂. Cheliceres strong; basal joint slightly punctured and wrinkled towards the front; second joint densely and coarsely granulated, the anterior portion rounded, with five or more sharp distinct teeth on the edge and two stronger ones on the lower surface; third joint thickly punctured all over and wrinkled towards the interior edge, which is angular and furnished with one spine, another spine below; fourth joint sparingly punctured all over and slightly granulated towards the origin of the apophysis which is triangular (Fig. 1) and slightly curved backwards, closely serrated on the outer edge and furnished with a few blunt spines on the inner; fifth joint large, broader than the fourth, sparingly punctured all over, fixed finger triangular, short and broad, finely serrated on the outer edge, the inner edge rough and furnished with a few small spines; movable finger slightly curved, the upper edge sinuated, finely serrated and with a blunt tooth near the tip (Fig. 5,), the lower edge simply curved and roughly serrated.

Cephalothorax densely granulated with a sharp sinuated ridge between the lateral and central eyes.

First lower abdominal segment of huge size, tumid, divided longitudinally by a groove and broadly rounded posteriorly (Fig. 3).

Structure, ♀. The abdomen much larger and the cheliceres shorter and slighter; the apophysis of the fourth joint of the cheliceres is also much broader at the base, but of about the same length, and consequently much blunter; the first abdominal lower segment is pointed posteriorly and barely grooved (Fig. 4). The movable finger is also of a very different shape and size (Fig. 6).

An examination of the late Dr. Stoliczka's types and of some other specimens more recently acquired by the Indian Museum demonstrates that his *T. indicus* is the male and *T. beddomei* the female of the same species.

The number of teeth on the front edge of the second joint of the cheliceres varies much in this species as may be seen from the following enumeration of examples examined.

♂. 7 teeth on right; 5 on left with traces of 3 more.

♂. 6 on right one being bifid; 5 on left with trace of another.

♂. 6 on right; 5 on left.

♂. 6 on right; 5 on left.

♀. 7 teeth on each side (*T. beddomei*).

All the specimens I have examined came from Southern India and Western Bengal, but no precise locality is attached to them.

Mr. Butler identifies his *T. sepiaris* with this species (Ann. & Mag. Nat. Hist. ser. 4, vol. xii, p. 116), but as he gives *T. sepiaris* from Tonghoo and Ceylon, and allows *T. beddomei* to be a good distinct species,

I fear the matter is too involved for me to arrive at any conclusion on the subject without the examination of his type, and for this I have had no opportunities.

3. THELYPHONUS JOHORENSIS, n. sp., Pl. II, Fig. 11, ♂.

♂. Cheliceres very deep red; cephalothorax nearly black; abdomen deep red; legs deep madder, brighter towards the extremities; below, first joint of cheliceres deep red; abdomen, sternum and exinguinal joints of legs blood red. Length 1·2 inches; cheliceres ·5 inch.

♀. Similar in colour to the male; slightly smaller.

Immature animal. Cephalothorax and abdomen red, legs brighter, cheliceres bright coral-red.

Structure, ♂. First joint of cheliceres densely punctured all over; second densely punctured, with six teeth on the anterior and lateral edges and two strong spines below; third densely punctured all over, with a very strong spine below; fourth joint densely punctured, with a long recurved triangular apophysis, serrated on the outer edge, and with a few teeth on the outer; fifth joint (Fig. 11) weak, narrower than the fourth, sparingly punctured, fixed finger serrated on the outer edge, with a few spines on the outer and down the side of the joint; movable finger weak, serrated on the inner edge, with a few spines on the lower edge.

Cephalothorax densely granulated all over, the space between the central and lateral eyes ridged.

First lower abdominal segment deeply grooved longitudinally (Fig. 3), extremely swollen large and rounded.

Structure, ♀. Similar to the male, but the apophysis of the fourth joint of the cheliceres shorter and broader at base; first lower abdominal segment without a longitudinal groove, and pointed posteriorly.

I have much pleasure in naming this species after the territory of the Sultan of Johore, where Mr. Wood-Mason discovered it.

4. THELYPHONUS ANDERSONI, n. sp., Pl. II, Fig. 12.

♂. Cephalothorax and cheliceres dark red, the legs paler red, the abdomen of intermediate colour; below, cheliceres dark red; abdomen, sternum and exinguinal joints of legs pale red; tail rather paler than the legs. Length 1 inch.

♀. Similar in colour to the male and of same size.

Immature animal. Unknown.

Structure, ♂. Cheliceres smooth with a very few minute punctures; first joint normal; second with a few obsolete teeth on the anterior and lateral edge and two strong spines below; third with a

sharp tooth on the lower surface; fourth with an indistinct spine on the lower edge and with a long apophysis on the interior angle. This apophysis is about the same length as the joint to which it is attached, perfectly cylindrical for three-quarters of the length, and suddenly widened out on the terminal quarter of its length to a width half as wide again as the cylindrical portion and terminating in a single recurved spine (Fig. 12); fifth joint feeble, narrower than the fourth, the interior edge toothed and furnished with hairs, the exterior edge of the fixed finger serrated; movable finger curved, sharply pointed, furnished with hairs and serrated below. Cephalothorax densely granulated, except on a portion between the lateral and central eyes, which is smooth and tumid but not ridged. First lower abdominal segment large, broadly sinuated behind, but not grooved.

Structure, ♀. Differs from the male in the structure of the cheliceres and first lower abdominal segment. Second joint of cheliceres with five distinct teeth, one on the middle of the anterior edge and four on the lateral, the foremost, situated at the angle of the two edges, being twice as large as the others, which are all of equal size, two small spines on the lower surface; third joint with a small tooth on the interior edge and one below; fourth joint with a short and sharply triangular apophysis, both edges serrated; fifth joint as in the male.

The first lower abdominal segment is longer and pointed posteriorly.

I have much pleasure in naming this species after Dr. John Anderson, the late Superintendent of the Indian Museum, who discovered it in Upper Burma. The male was taken in the second defile of the Irawadi river and the female on Pudeepyoo mountain. Both are preserved in the Indian Museum.

The only female of this species is much mutilated, but I have described it to the best of my power. I regret, however, to have to leave it out of my key; when writing which I had not access to the specimen.

5. Thelyphonus wood-masoni, n. sp., Pl. II, Fig. 10.

♂. Cheliceres and cephalothorax pitchy-black; abdomen black tinged with red; legs blood-red; tail like the legs; below, first joint of cheliceres dark reddish-brown; legs and sternum with first abdominal segment blood-red, remainder of abdomen darker red.

♀. Similar to the male in colour.

Immature animal. Cheliceres coffee-brown, cephalothorax and abdomen dull rufous, the legs dull reddish vandyke-brown.

Length, male 1 inch; female, ·95.

Structure, ♂. Cheliceres very sparingly punctured and nearly smooth all over, the exterior angle of the second joint transversely

wrinkled; second joint with 3-6 obsolete teeth on the anterior and interior edges and two blunt spines below; third joint with one spine below, the interior edge equal in length to the anterior edge of the second joint; fourth joint very broad, no spine below, with a long apophysis springing from the antero-lateral corner, the first half cylindrical and broad, the terminal half about half the thickness of the first and constricted in the middle, quadrately terminated and furnished with a small spine at the end (Fig. 10), the inside of the apophysis at the end with a large rounded process; fifth joint large, rounded, broader than the fourth joint, the inner edge scooped out to receive the rounded process on the apophysis of the fourth joint, causing the fixed finger to stand out as a cylindrical tooth serrated on both edges; movable finger moderately curved, serrated on the inner edge.

Cephalothorax densely granulated, the space between the anterior and the lateral eyes tumid.

Structure, ♀. Cheliceres with the first joint normal; second with five teeth on the anterior and lateral edges and two spines below: third joint with a lateral spine and one below; fourth with a spine below and a sharply-pointed triangular apophysis serrated on the inner edge and and with 3 spines on the outer; fifth joint weak, narrower than the fourth, the fixed finger sharply triangular and serrated on both edges, the movable finger gently curved and serrated on the inner edge.

The cheliceres, as in the male, are nearly smooth, being very slightly punctured in a few places only.

Described from specimens taken on Muleyit mountain in Tenasserim and now in the Indian Museum. I have named it after Mr. J. Wood-Mason, the energetic Superintendent of the Indian Museum.

6. Thelyphonus insularis, n. sp., Pl. II, Figs. 7, 8.

♂. Cheliceres, cephalothorax, and abdomen deep black; legs and tail bright red; below, the first joint of cheliceres deep red, the other joints black, abdomen and legs bright red. Length 1·3 ins.; cheliceres ·75 ins.

♀. Of the same colour as the male. Length 1·3, chel. ·5 in.

Immature animal. Fourth and fifth joints of the cheliceres pink, second and third pinkish-brown; cephalothorax and abdomen greenish; coxal and femoral joints of legs pale greenish-brown, the remaining joints and the tail pale orange-yellow; below, first joint of cheliceres pale red, the other joints, and the legs, of the same colour as the upper surface, abdomen pale greenish-brown. With age the colours become firmer and the changes to the adult stage are very gradual. In half-grown specimens the legs are nearly uniform red and the cheliceres becoming blackish.

Structure, ♂. Second joint of cheliceres punctured all over, granulated and wrinkled at the anterior lateral corner, teeth on the interior and anterior margins indistinct, very variable in number and in all cases small and obsolete, no distinct spine below. Third joint punctured all over and coarsely granulated on the inner edge, with a spine below. Fourth joint with very few punctures, nearly smooth, apophysis long and cylindrical, terminated with two blunt teeth and with a large rounded process interiorly near the end (Fig. 7). Fifth joint very large and round, very nearly smooth, fixed finger short, triangular with a broad base, serrated on both edges, movable finger rather shorter than the fifth joint, serrated and sinuated within (Fig. 5). First joint beneath very sparingly punctured.

Cephalothorax granulated all over and transversely wrinkled behind the central eyes.

First lower abdominal segment smooth in the middle, not divided longitudinally by a groove.

Structure, ♀. The upper surface of cheliceres sparingly punctured throughout, 2nd joint with five very distinct teeth on the front and lateral edges, of which the two on the front edge are the largest, two teeth on the lower surface; third joint with a tooth on the interior edge and one below; fourth joint with a tooth below, the apophysis triangular, finely serrated on the outer edge, with two or three teeth on the inner (Fig. 8). Fifth joint narrower than the fourth, fixed finger sharply triangular, serrated on the outer edge, also on the inner edge nearly down to the bottom of the joint; movable finger shorter than fifth joint, gently curved throughout and serrated interiorly.

Cephalothorax and other parts, as in the male, except the first lower abdominal segment, which is pointed posteriorly.

This species is remarkable for the huge cheliceres of the adult male. It is common on Double Island at the entrance of the Moulmain River, to which island it appears to be confined, for on the opposite coast of the mainland *P. formosus* only is found. This island, which is crowned by a lighthouse, is very rocky, and only a few acres in extent. Some soft soil is found here and there under the rocks and under the bricks used for the staircase up to the summit of the island, and under these this animal occurs in incredible numbers.

7. Thelyphonus formosus.

Thelyphonus formosus, Butler, Ann. and Mag. Nat. Hist. ser iv, vol. x, p. 201, pt. xiii, f. H.

" " Stoliczka, J. A. S. B. 1873, p. 137, pt. xii, f. 4.

♂. Cheliceres shiny-black; cephalothorax black slightly tinged

with red; abdomen reddish-brown tending to black; legs entirely dark red; lower surface dark chestnut, the first joint of the cheliceres much deeper; tail paler than the legs. Length 1 inch.

♀. Similar to the male in colour, and somewhat larger.

Immature animal. Cheliceres brownish-red turning to almost pure red at the end; cephalothorax black; abdomen olivaceous-brown: first three joints of all the legs olive-green; remainder of the legs and the whole lower surface pale reddish-yellow, darker on the first joint of the cheliceres.

Structure, ♂. Cheliceris very sparingly punctured all over, the second joint with a few wrinkles across the exterior portion, and with five more or less obsolete teeth on the anterior and interior edges; two spines on the lower surface; third joint with one spine below; fourth joint with a minute spine below and a long cylindrical apophysis on the interior-front angle, terminated below by a bifid tooth, and with a large rounded tubercle within; fifth joint large, broader than the fourth with a spine beneath, the fixed finger very short and triangular, serrated on both edges; movable finger sharp and curved (Fig. 11), finely serrated interiorly.

Cephalothorax finely granulated all over; space between lateral and frontal eyes swollen but not ridged.

First abdominal segment below smooth, not divided, broadly rounded posteriorly.

Structure, ♀. Second joint of cheliceres with five very distinct teeth on the front edge and two spines below; third joint with a spine below; third joint with a minute spine below and a short, bluntly-triangular apophysis on the interior-frontal angle, serrated interiorly and with a few teeth on the outside; fifth joint weak and narrow, the fixed finger triangular, sharply pointed and serrated on both edges, the movable finger weak, sharply curved and serrated within.

Cephalothorax as in the male.

First abdominal segment below smooth, the middle posterior portion abruptly lengthened.

Found in the neighbourhood of Moulmein in Tenasserim, where it appears to be common.

8. Thelyphonus binghami, n. sp.

♂. Cheliceres and cephalothorax deep black; abdomen black tinged with red; legs bright red; below, first joint of cheliceres and the abdomen deep red, legs bright red.

♀. Of the same colour as the male, but the cheliceres strongly tinged with red.

Immature animal. First and second joint of chelicerœs reddish-brown, the others coral-red; cephalothorax and abdomen dark brown; first three joints of all the legs olive-green, the others pale yellowish-red; below, the cephalothorax and abdomen reddish-brown.

Length 1·1 inches; chelicerœ, ♀ ·55; ♀ ·45 inch.

Structure, ♂. Chelicerœ sparingly granulated and punctured all over. Second joint with five ill-defined teeth on the front and lateral edges and two small spines below; third joint very long and cylindrical with one spine below; fourth joint long, the inner side granulated; with a blunt spine below and a long cylindrical aphophysis on the anterior-lateral corner, slightly constricted in the middle and enlarged at the tip (Fig. 9) terminated with a rather sharp spine and a tumid process interiorly; fifth joint as broad as the fourth, serrated and festooned on the inner edge; fingers remarkably small, the fixed one triangular, nearly smooth on the inner edge, serrated on the outer, the movable one gently curved and serrated interiorly.

Cephalothorax minutely and densely granulated, the space between the lateral and frontal eyes barely tumid.

First lower abdominal segment entire, elevated and projecting posteriorly.

Structure, ♀. Chelicerœ as in the male, but the second joint with five sharp and well-defined teeth, one on the anterior edge and four on the inner lateral edge; apophysis of fourth joint triangular with a few large spines on the inner edge and closely serrated on the outer; the fifth joint is much narrower than the fourth but the two fingers are the same as in the male. The third joint is much shorter and broader than the same one in the male and the whole chelicerœ are shorter and stouter.

Cephalothorax exactly as in the male.

First abdominal segment entire, and rounded posteriorly as in the male.

The males and females of this species approach each other very closely in structure with regard to the cephalothorax and abdomen and the only point of distinction lies in the chelicerœ.

This species is very abundant on Reef Island at the entrance of the Tavoy river in Tenasserim. It is a densely wooded island crowned by a small lighthouse. It is probably this species which Mons. Simon records from Tavoy and not *T. formosus*.

I have much pleasure in naming this species after Major C. T. Bingham, of the Forest Department of India, who has greatly assisted me in collecting these obscure animals.

9. THELYPHONUS SAXATILIS, n. sp.

♂. Cephalothorax, cheliceres, and abdomen black; first pair of legs reddish-black, except the tarsal joint, which, with the three other pairs of legs, is bright red; tail reddish-brown; below, the first joint of cheliceres black tinged with red; sternum and base of legs red; legs the same colour as the superior surface; abdomen reddish brown.

♀. Resembles the male in colour.

Immature animal. Cheliceres reddish-brown turning to pink on the last two joints; cephalothorax and abdomen dark olive-brown; first pair of legs olive, except the tarsal joint, which, with the three other pairs of legs, is pale red; below, uniform pale red, except the base of the cheliceres, which is reddish-brown.

Length 1·1 inch; cheliceres of male, ·5.

Structure, ♂. Second joint of cheliceres punctured all over, the exterior-front corner wrinkled, the anterior and lateral edges with a a few obsolete teeth, varying in number, one spine below; third joint punctured on the upper surface, granulated on the inner, and one blunt spine below; fourth joint nearly smooth, merely with a very few punctures, no spine below, apophysis long and cylindrical, constricted in the middle, rather swollen at the end with a tumid process on the inner side near the tip (Fig. 9); fifth joint large, nearly entirely smooth, fixed finger short and triangular, serrated on the outer edge, nearly smooth on the inner; movable finger rather long, curved throughout, the inner edge festooned and serrated.

Cephalothorax densely granulated, the space between the lateral and frontal eyes rather swollen.

First lower abdominal segment entire, rounded posteriorly.

Structure, ♀. Cheliceres much shorter than in the male but similarly punctured, etc.; second joint with five sharp distinct teeth on the front and internal edges and two spines below; third joint with one long spine below; fourth joint with a spine below and a triangular apophysis with a few spines or teeth on the inner edge and densely serrated on the outer; fifth joint narrow and feeble, fixed finger triangular, serrated on both edges, movable finger curved, sharply pointed and servated on the inner surface.

First lower abdominal segment entire, sharply protruding posteriorly in a blunt point.

This species is very common at Thayetmyo in Burma being found under stones and bricks and in mud walls. Mr. D. K. Macdonald of the Public Works Department collected large numbers of this animal for me at that place.

10. Thelyphonus rangunensis, n. sp.

♂. Cephalothorax, cheliceres, and abdomen deep black; coxæ and femora of all the legs reddish brown, remainder of legs deep red; beneath, the cheliceres dark reddish-black; sternum and legs deep red; abdomen deep reddish-brown.

♀. Of precisely the same colour as the male.

Immature animal. Cheliceres deep reddish-brown turning to red at the tips; cephalothorax and abdomen nearly black; coxæ and femora of all the legs and the tibial joint of the first pair of legs deep olive-green, remainder of legs pale red.

Length 1 inch; cheliceres, ·45 in the male, ·35 in the female.

Structure, ♂. Second joint of cheliceres sparingly punctured, with a few obsolete teeth on the front and interior margins and two spines below, of which one is very large and one very small; the exterior upper corner wrinkled; third joint rather closely punctured on the upper and outer sides, granulated within, with one tooth below; fourth joint nearly smooth, very broad, no spine below, apophysis very long, cylindrical, and of nearly equal width throughout, slightly wider near the extreme tip; fifth joint large, nearly smooth, fixed finger triangular, serrated on both edges, movable finger curved, sharp-pointed, and serrated within.

Cephalothorax densely granulated all over, the space between the lateral and frontal eyes slightly prominent and obsolately ridged.

First lower abdominal segment entire, with the margin posteriorly rounded.

Structure, ♀. Cheliceres short; second joint with two spines below and five sharp, distinct ones on the front and inner edges, sparingly punctured all over but not wrinkled; third joint sparingly punctured all over with a spine on the inner surface; fourth joint with a few punctures, a spine below, and a triangular apophysis with a few large teeth on the inner edge and serrated on the outer edge; fifth joint sparingly punctured and serrated on the inner edge, fixed finger triangular and serrated on both edges, movable finger short and curved and serrated within.

Cephalothorax as in the male.

First abdominal segment below sharply produced posteriorly, entire.

This species is very common in Rangoon and the whole district round, being found under old timber, stones, and bricks.

11. Thelyphonus sylvaticus, n. sp.

♂. Cheliceres pitchy black; cephalothorax and abdomen dull

black; first pair of legs and the coxæ and femora of the other legs very dark red, remainder of the legs bright red.

♀. The adult female is unknown, but will, without doubt, be found to have the same coloration as the male in respect to the legs.

Immature animal. Cheliceres pinkish brown; cephalothorax and abdomen dull blackish; coxæ and femora of all the legs deep olive, the other parts of the legs pale rufous.

Length ·9 inch; cheliceres ·4 inch.

Structure, ♂. Cheliceres very slightly punctured, nearly smooth; second joint wrinkled on the exterior front corner with a few obsolete teeth on the front and interior edges, varying in number, one spine below; third joint without any spine; fourth joint broad with no distinct spine below, apophysis long, the first half very narrow and cylindrical, suddenly widening out to double the width on the terminal third; a tumid process on the interior surface near the tip; fifth joint fairly large, greatly situated on the interior edge, fixed finger triangular, smooth on the inner edge, serrated on the outer; movable finger sharply curved, and pointed, serrated on the inner edge.

The cephalothorax is densely granulated and the first abdominal segment entire and rounded posteriorly.

This species which is remarkable for the colour of its legs is no doubt common in the Tharrawaddy District of Burma, but I only procured an adult male and an immature animal of it, the former at Zigon, and the latter at Minhla. They were found in forest.

EXPLANATION OF PLATE II.

Fig. 1. Apophysis of the fourth joint of the cheliceres of *T. indicus* ♂.
„ 2. „ „ „ „ „ „ *T. indicus* ♀.
„ 3. First lower abdominal segment of *T. indicus* ♂.
„ 4. „ „ „ „ „ *T. indicus* ♀.
„ 5. Terminal joint of cheliceres of *T. indicus* ♂.
„ 6. „ „ „ „ *T. indicus* ♀.
„ 7. Apophysis of the fourth joint of the cheliceres of *T. insularis* ♂.
„ 8. „ „ „ „ „ „ „ *T. insularis* ♀.
„ 9. „ „ „ „ „ „ „ *T. saxatilis* ♂.
„ 10. „ „ „ „ „ „ „ *T. wood-masoni* ♂.
„ 11. Terminal joint of cheliceres of *T. johorensis* ♂.
„ 12. Apophysis of the fourth joint of the cheliceres of *T. andersoni* ♂.
„ 13. „ „ „ „ „ „ „ *T. assamensis* ♂.

III.—*Notes on Indian* Rhynchota; Heteroptera, No. 5.

By E. T. Atkinson, B. A.

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Subfamily, Acanthosomina, Stål.

Oefvers. K. V.-A. Förh. (3), p. 32, 39 (1872): En. Hem. v, p. 108 (1876):—*Acanthosomida*, Stål, Hem. Afric., i, p. 33, 219 (1864).

a, *b*, *c*, as in Subfam. *Pentatomina* (J. A. S. B., pt. ii, p. 192, 1887).

(*d*.) Tarsi 2-jointed: scutellum not reaching the middle of the dorsum of the abdomen, generally very narrow at the apex; and furnished with frena extended almost to the apex: tibiæ obtusely rounded, rarely furrowed. It contains those genera of the family *Pentatomidæ* of Dallas which have the scutellum triangular, subequilateral, or not much longer than broad, not reaching or barely extending beyond the middle of the dorsum of the abdomen, the apical part placed behind the frena, generally small, short, and narrow, the frena generally extended for a distance towards the apex of the scutellum, rarely reaching only the middle of the scutellum, apical margin of corium straight, rarely rounded towards the exterior apical angle, tibiæ obtusely rounded, and the sixth ventral segment, in ♀, rather strongly sinuated at the apex in the middle before the genital valvules.

Genus Macrocheraia Dallas.

List Hem. i, p. 299 (1851); Walker, Cat. Het. ii, p. 390 (1868): Stål, Oefvers. K. V.-A. Förh., p. 640 (1870): En. Hem., v, p. 110, 112 (1876):—*Acanthosoma*, pt., Herr. Schäff, Wanz. Ins., viii, p. 5 (1848).

Body elongate-ovate: head large, broad, gradually sinuately narrowed behind the middle, sides anteriorly parallel or barely diverging, apex broadly and obtusely rounded, tylus and juga subequal in length: antennæ 5-jointed, basal joint short and stout, not extending beyond the apex of the head, second joint minute, third joint largest, nearly as long as the two following taken together, fourth longer than the fifth: rostrum rather long, reaching the base of the ventral spine; 2 and 3 joints about equal, the fourth shorter, basal joint half concealed within the head: pronotum anteriorly and sides distinctly margined, margins narrowly elevated and smooth, unarmed: scutellum rather small, longer than broad; frena not extending beyond the middle of the scutellum: membrane with longitudinal veins: mesostethial lamina reaching the head: sixth ventral segment, in ♀, furnished, towards the

sides at the anterior margin, with a small cavity or hollow; pectus with a strong ridge, which is more elevated anteriorly, and cut off obliquely at its posterior extremity to make room for the ventral spine which is short, scarcely passing the posterior coxæ

295. Microdeuterus megacephalus, Herr. Schäff.

Acanthosoma megacephalum, Herr. Schäff., Wanz. Ins., viii, p. 5, t. 251, f. 783 et B (1848), ♀.

Microdeuterus megacephalus, Stål, Oefvers. K. V.-A. Förh., p 640 (1870); En. Hem., v, p. 112 (1876).

♀. Entirely dark ochreous-yellow; finely, impressly punctured: base and apex of scutellum red-brown, the base with four yellow spots (sometimes obsolete): the pronotum somewhat red-brown towards the margin and in the middle: spots on the posterior part of segments of the connexivum and its posterior prolongation, brown with a violet tint: beneath unicolorous: rostrum reaching the end of the second ventral segment; the ventral spine extending as far as the base of the first pair of feet (*Herr. Schäff.*). Stål notes that the rostrum, at least in the ♂, reaches somewhat the apex of the third ventral segment: the venter with a median ridge is continued up to the apex of the sixth segment, which, in the middle, is a little shorter than the three preceding taken together, and somewhat obtuse-angularly emarginate at the apex: lower margin of the genital segment clothed with long, dense hairs, lateral lobes gradually acuminate. Long, 12 mill.

Reported from Bengal, Calcutta, Sikkim (mihi).

296. Microdeuterus dallasi, n. sp.

Microdeuterus megacephalus, Dallas (nec Herr. Schäff ?), List Hem., ii, p. 300, t. 10, f. 4 (1851): Walker, Cat. Het. ii, p. 390 (1867): Stål, Oefvers, K. V.-A. Förh., p. 640 (1870); En. Hem., v., p. 113 (1876).

Differs apparently chiefly in the spinose posterior prolongations of the connexivum: these are present, but are much less produced.

Reported from N. India.

Genus Acanthosoma, Curtis.

Brit. Ent. i, p. 28 (1824): Dallas, pt, List Hem. i, p. 198, 303 (1851); Walker, Cat. Het, ii, p. 392 (1867): Stål, Oefvers, K. V.-A. Förh., p. 368 (1870); (3) p. 39 (1872); En. Hem., ii, p. 61 (1870); v, p. 110, 113 (1876): Distant, Biol. Centr. Am. Rhyn., p. 100 (1879).

Head punctured, small or moderate, flat, triangular, gradually narrowed, narrow at the apex, with the tylus longitudinally impressed;

pronotum levigate, sides immarginate, process of the lateral angles not turning forwards, short, triangular, somewhat depressed: scutellum narrow at the apex, frena extended for a distance towards the apex, apical margin of corium straight: first joint of the antennæ extending beyond the apex of the head: mesostethial ridge high, laminated posteriorly, abruptly lower before the intermediate coxæ, not produced hindwards between them; not or only very slightly extending beyond the anterior margin of the mesostethium, more or less distinctly rounded at the apex: apical angles of the sixth abdominal segment in ♂ rounded at the apex.

297. ACANTHOSOMA PROXIMA, Dallas.

Acanthosoma prozimum, Dallas, List Hem., i, p. 303 (1851): Walker, Cat. Het. ii, p. 388 (1867).

Acanthosoma prozima, Stål, En. Hem., v, p. 113 (1876); Distant, Scient. Res. 2nd Yarkand Miss., p. 7 (1879).

Above brownish or yellowish green: very like *A. hæmorrhoidalis*, Linn., the lateral angles of the pronotum are less prominent, rufous, punctured black: apex of scutellum, black (*Dallas*). Long, 15½—16 mill.

Reported from Murree (Panjáb): Rawal Pindi (mihi).

298. ACANTHOSOMA DISTINCTA, Dallas.

Acanthosoma distinctum, Dallas, List Hem., i, p. 304 (1851): Walker, Cat. Het. ii, p. 393 (1867).

Acanthosoma distincta, Scott, A. M. N. H. (4 s.) xiv, p. 290 (1874): Stål, En. Hem., v, p. 113 (1876): Reuter, Berlin Ent. Zeitschr., xxv, p. 75 (1881): Distant, Trans. Ent. Soc., p. 415 (1883).

♂. Above pale olive-green, rather thickly punctured with black, head pointed in front, finely punctured: pronotum with a transverse impunctate space towards the anterior margin; lateral angles prominent, subspinose, obtuse, ferruginous: scutellum brownish, becoming green towards the apex, with the apex itself whitish, membrane brownish, semitransparent, with a dark line at the base, surrounding the apical margin of the corium: abdomen above red, with the margins bright orange, with a black band at the junction of each segment: body beneath pale testaceous: abdomen with the emargination of the apical segment very deep reaching the middle of the abdomen; the margins spotted with black: legs pale greenish, with the tarsi fulvous. Antennæ rather long, pale greenish, with the two apical joints dusky ferruginous (*Dallas*). Long, 13—13½ mill.

Reported from N. E. India, Murree (Panjáb), Darjiling, Japan.

299. ACANTHOSOMA DIFFICILIS Dallas.

Acanthosoma difficile, Dallas, List Hem., i, p. 304 (1851): Walker, Cat. Het. ii, p. 399 (1867): Stål, En. Hem., v, p. 113 (1876).

♂. Pale olive-green, tinted red and orange, punctured: head reddish; juga wrinkled and with a few black punctures: pronotum rather thickly punctured, black; anterior and lateral margins reddish, lateral angles prominent, deep red: scutellum deep orange, with numerous scattered black punctures, disc of corium thickly and rather finely punctured, outer margin orange, rather strongly punctured black: membrane transparent, nearly colourless: margins of abdomen not spotted: body beneath dark orange: abdomen with the apical segment not very deeply emarginate: legs ferruginous-orange: antennæ with the three basal joints somewhat ferruginous (*Dallas*). Long, 13—14 mill.

Locality unknown.

300. ACANTHOSOMA DUBIA, Dallas.

Acanthosoma dubium, Dallas, List Hem., i, p. 304 (1851): Walker, Cat. Het., ii, p. 399 (1867): Stål, En. Hem., v, p. 113 (1876).

♂. Closely allied to and hardly distinct from the preceding: differs in having the head anteriorly somewhat rounded: angles of pronotum less prominulous, rounded: third joint of the antennæ black at the apex (*Dallas*). Long, 13—14 mill.

Locality unknown.

301. ACANTHOSOMA LAEVICORNIS, Dallas.

Acanthosoma laevicorne, Dallas, List Hem., i, p. 311 (1851): Walker, Cat. Het. ii, p. 399 (1867).

♂, ♀. Above pale yellowish-olive: head triangular, pointed in front, with the tylus passing the juga, the surface slightly wrinkled, pronotum thickly and rather coarsely punctured; lateral angles produced into long, impunctate horns which are sometimes yellow, horns directed forwards and of the same thickness from the base to near the apex which is acute and slightly recurved: scutellum rather strongly but not very thickly punctured; hemelytra very thickly punctured membrane transparent, brownish: body beneath, orange or pale olive: abdomen impunctate, but very finely wrinkled towards the sides; apex sometimes bright red: legs and rostrum testaceous or pale olive: antennæ testaceous, with the third joint black, except at the base (*Dallas*). ♂, long, 15—16; ♀, 21 mill.

Locality unknown.

302. Acanthosoma forfex, Dallas.

Acanthosoma forfex, Dallas, List Hem., i, p. 308 (1851); Walker, Cat. Het., ii, p. 394 (1867); Stål, En. Hem., v, p. 115 (1876); Distant, Scien. Res. 2nd Yarkand Miss., p. 7 (1879).

♂. Elongate, above pale olive-green, rather densely and strongly punctured black: head pale, with a few fine black punctures; the apex somewhat pointed, with the tylus longer than the juga; eyes black: pronotum with the lateral angles prominent, forming a short, obtuse spine on each side; two yellowish impunctate patches close to the anterior margin, the lateral margins and angles reddish brown: scutellum with the disc reddish brown, with a yellowish, impunctate, median, longitudinal line; the lateral margins and the apex olive-green: membrane transparent, brownish. Body beneath, pale greyish green, tinted with red; abdomen impunctate, obtusely ridged in the middle; sexual organs greatly developed, the lateral pieces produced into two curved processes of a bright orange colour, bearing a small brush of hair at their apices, and nearly as long as the abdomen: the internal pieces black at the tip: prostethium densely and finely punctured: legs pale yellowish-green, with the tips of the claws black: rostrum testaceous, extreme tip pitchy black: antennæ pale yellowish-green, becoming brown towards the apex (*Dallas*). Long, 12½ mill.

Reported from N. India: Murree.

303. Acanthosoma elongata, Dallas.

Acanthosoma elongatum, Dallas, List Hem., i, p. 309 (1851); Walker, Cat. Het., i, p. 394 (1867); Stål, En. Hem., v, p. 115 (1876).

♀. Elongate, above yellowish-green, punctured with black: head slightly rugose, impunctate, somewhat pointed in front, with the tylus longer than the juga: eyes black: pronotum yellowish-green in front, reddish behind, coarsely and rather thickly punctured with black, with the exception of a transverse band near the anterior margin; lateral angles produced into strong, deep crimson spines, with the apex obtuse: scutellum coarsely but sparingly punctured with black, and with a reddish-brown, triangular mark in the middle of the base: coriaceous portion of the hemelytra reddish internally, the outer margin and the greater portion of the apex, yellowish-green; the whole surface densely and strongly punctured with black and somewhat rugose: membrane brownish transparent: body beneath, bright yellow, shining: abdomen impunctate, with a strong median ridge; sexual organs much developed, but much less so than in *A. forfex*; lateral processes bright red; pieces flat, yellow, widened, emarginate at the tip which is black: prostethium

with a few black punctures; posterior margin of the metastethium thickly and finely punctured: legs greenish-testaceous with tarsi dusky, and the tips of the claws black: tip of the rostrum, blackish; antennæ with the basal joint greenish-testaceous: the remainder brown, becoming darker towards the apex (*Dallas*). Long, 14½ mill.

Reported from N. India.

304. Acanthosoma (?) binotata, Walker.

Acanthosoma binotata, Walker, Cat. Het., ii, p. 395 (1867).

Testaceous, elongate-oval, roughly punctured; punctures brown: head elongate, smooth in front; tylus hardly extending beyond the juga: rostrum extending to the last coxæ; tips black: antennæ slender, less than half the length of the body; joints successively increasing in length; first extending a little in front of the head: pronotum in front with a smooth band, of which the fore border is a curved pale testaceous line; sides and a slender stripe, pale testaceous; hind angles forming two long, acute, slightly recurved, spines: scutellum with a slender pale testaceous stripe, on each side of which there is a brown patch; tip also brown: pectoral ridge well developed: abdomen beneath slightly ridged, with two incomplete macular brown stripes; spine extending to the intermediate coxæ: hemelytra clouded with brown, around a smooth, transverse, pale-testaceous spot on the disc; membrane cinereous (*Walker*). Long, 6½—7 mill.

Reported from India; differs from *C. punctata*, Dallas, by the thoracic spines.

305. Acanthosoma aspera, Walker.

Acanthosoma aspera, Walker, Cat. Het., ii, p. 395 (1867): Distant, Scien. Res. 2nd Yarkand Miss., p. 7 (1879).

Testaceous, elongate-oval, thinly and roughly punctured; punctures mostly black: head elongate; tylus extending very little beyond the juga: rostrum extending a little beyond the hind coxæ; tip black: antennæ slender, a little more than half the length of the body; first joint extending a little beyond the front of the head; second as long as the third; fourth a little shorter than the third; fifth black, testaceous towards the base, shorter than the fourth: hind angles of the pronotum forming two red, long, stout, acute, very slightly recurved and ascending, spines: pectoral ridge much developed: abdomen beneath slightly ridged; spine extending to the intermediate coxæ: legs rather slender: membrane cinereous (*Walker*). Long, 9—9½ mill.

Reported from India, Murree.

306. Acanthosoma (?) truncatula, Walker.

Acanthosoma truncatula, Walker, Cat. Het., ii, p. 396 (1867).

Testaceous, broad, nearly oval, roughly punctured: head mostly smooth; tylus extending very little beyond the juga: rostrum extending to the last coxæ; tip black: antennæ slender, about half the length of the body; first joint extending beyond the front of the head; second as long as the third: pronotum with a smooth band in front, and with a slender paler stripe; hind angles forming two long, stout, hardly acute, directly diverging horns: pectoral ridge well developed: abdomen beneath smooth, slightly ridged; spine extending to the intermediate coxæ: legs rather slender: membrane cinereous (*Walker*). Long, 6½ mill.

Reported from India.

307. Acanthosoma (?) immunda, Walker.

Acanthosoma immunda, Walker, Cat. Het., iii, p. 573 (1868).

Reddish testaceous, elongate-oval, roughly and rather thinly punctured: head elongate, triangular, blackish above, excepting the sides, which are reddish and slightly elevated: eyes red: antennæ testaceous, more than half the length of the body; first joint extending beyond the front of the head; second longer than the first and than the third; fourth a little longer than the third; fifth piceous, luteous at the base, longer than the fourth: pronotum with two stout acute spines which are black towards their tips and are nearly as long as half the breadth of the pronotum: scutellum with a black stripe, which is abbreviated towards the base: sternal ridge deep: ventral spine extending to the intermediate coxæ: legs testaceous, slender: membrane pale cinereous, with a broad blackish stripe (*Walker*). Long, 7½ mill.

Reported from India.

308. Acanthosoma (?) alaticornis, Walker.

Acanthosoma alaticornis, Walker, Cat. Het., iii, p. 573 (1868).

Tawny, elongate-oval, shining, roughly punctured: head elongate, slightly acute; sides reflexed: eyes piceous, not prominent: rostrum extending to the last coxæ; tip black: antennæ piceous, slender; first and second joints testaceous; first extending much beyond the head; second as long as the third; fourth longer than the third; fifth shorter than the fourth: pronotum pale testaceous along each side in front, with a broad testaceous band between the horns which are as long as the intermediate breadth and are broad and linear from the base to near the

tips, where they are black, dilated and recurved; scutellum less than half the length of the abdomen: pectoral ridge pale testaceous, extending to the head: abdomen ferruginous, pale testaceous along each side, black at the tip; beneath with a pale testaceous stripe; ventral spine pale testaceous, lanceolate: legs slender, pale testaceous: hemelytra pale testaceous towards the base and along the hind border, and with a large pale testaceous apical spot which extends to the costa; membrane brown: wings cinereous (*Walker*). Long, 11½ mill.

Reported from India.

309. Acanthosoma (?) nigricornis, Walker.

Acanthosoma nigricornis, Walker, Cat. Het., iii, p. 574 (1868).

Tawny, elongate-oval, roughly and thinly punctured, testaceous beneath: head slightly acute, transversely and finely striated; sides reflexed: eyes piceous, not prominent: rostrum extending to the intermediate coxæ, tip black: antennæ black, slender; first and second joints tawny; first extending much beyond the front of the head; second a little longer than the third; fourth longer than the second and than the fifth: pronotum with a transverse callus on each side in front; horns black, stout, shorter than the intermediate breadth, very slightly curved backward, tapering from the base to the tips, which are slightly rounded: scutellum very slightly ridged, less than half the length of the abdomen, much attenuated at the tip, which is rounded: pectoral ridge deep, extending to the head: abdomen black towards the tip above; ventral spine extending to the middle coxæ: legs testaceous, slender: hemelytra with a brown costal stripe, which widens towards the tip; membrane brown: wings brownish cinereous (*Walker*). Long 14¾ mill.

Reported from India.

Genus Sastragala, Am. & Serv.

Hist. Nat. Ins. Hém., p. 155 (1843). Includes *Acanthosoma*, pt., Dallas, List Hem., i, p. 303 (1851): Stål, Oefvers. K. V.-A. Förh., p. 638 (1870); En. Hem., v, p. 110, 113 (1876).

Pronotum anteriorly levigate; within the levigate and more or less distinctly elevated apical margin with fewer punctures, which are placed in a row sometimes confused or here and there double; process of the lateral angles obtusely rounded, horizontal, not turning forwards: scutellum narrow at the apex: apical angles of sixth abdominal segment, in ♂, straight or somewhat acute, not rounded: mesostethial ridge not produced hindwards, not, or but very slightly, extending be-

yond the anterior margin of the prosternum, more or less distinctly rounded at the apex.

310. Sastragala uniguttata, Donovan.

Cimex uniguttatus, Donovan, Ins. Ind. Hem., t. 8, f. 5 (1800).

Acanthosoma uniguttatum, Dallas, List Hem., i, p. 311 (1851); Walker, Cat. Het., ii, p. 394 (1867).

Sastragala uniguttata, Stål, En. Hem., v, p. 113 (1876); excl. syn. Distant, A. M. N. H. (5 s.) iii, p. 45 (1879).

♂. Pronotum with acute spines, ferruginous; scutellum marked with a large white dot (*Donov.*).

Donovan's figure agrees best with the description of *S. heterospila*, Walker, except that the latter has a black band or line between the lateral angles.

Reported from Madras, Assam.

311. Sastragala lineata, Dallas.

Acanthosoma (*Sastragala*) *lineata*, Dallas, Trans. Ent. Soc., v, p. 194 (1849): Walker, Cat. Het., ii, p. 396 (1867): Stål, En. Hem., v, p. 115 (1876).

Above dusky testaceous, strongly punctured with brown: head yellow, with a brown line on each side of the tylus, and a row of brown punctures on each of the juga; eyes brown: pronotum with the lateral spines acute, slightly recurved, pitchy brown; a transverse band near the anterior margin, and a narrow longitudinal line along the middle of the pronotum impunctate, yellow: scutellum, yellowish brown, paler towards the apex, and with a yellow spot in the middle of the base: hemelytra dusky testaceous, thickly and strongly punctured, the apex yellowish; a short, transverse, impunctate, orange band, near the outer margin, considerably beyond the middle, directed towards, but not reaching, the internal angle; membrane transparent, faintly clouded with brown: abdomen above deep red, the margins yellowish; head pronotum and abdomen beneath, with the legs, rostrum and antennæ testaceous; the antennæ rather darker; ventral spine short, scarcely reaching the intermediate legs (*Dallas*). Body long, 7 mill.

Reported from Sikkim.

312. Sastragala binotata, Distant.

Sastragala binotata, Dist., Trans. Ent. Soc., p. 353, t. 12, f. 12 (1887).

Apex above brownish ochraceous; corium with the lateral margins —widened into a spot in the middle—dull ochraceous, inwardly shaded blackish, membrane bronzy: head transversely wrinkled: antennæ

ochraceous, third joint much longer then the second: pronotum and scutellum sparingly and coarsely punctured, the corium more thickly punctate: lateral angles of pronotum produced into long, somewhat conical spines, their apices subacute, and very slightly reflexed hindwards: body beneath and legs ochraceous; apex of rostrum pitchy (*Dist.*). Long, 13; exp. angl. pron. 10 mill.

Reported from Sikkim (mihi).

313. SASTRAGALA RUFISPINA, Distant.

Sastragala rufispina, Dist., Trans. Ent. Soc., p. 325 (1887).

Body above dark ochraceous, pronotal angles purplish red: head finely and transversely wrinkled, apical part of tylus foveated and excavated: pronotum, scutellum and corium somewhat sparingly and coarsely punctate: lateral angles of the pronotum produced in obtusely pointed spines: membrane pale hyaline, blackish at the base: body beneath very pale ochraceous, legs a little darker in hue: apex of the rostrum pitchy, reaching second abdominal segment; last abdominal segment with two small black spots at the apex: pronotal spines red, beneath as above (*Dist.*). Long, 17; exp. angl. pron., 11 mill.

Reported from N. India.

314. SASTRAGALA MUSTELINA, Distant.

Sastragala mustelina, Dist., Trans. Ent. Soc., p. 352 (1887).

Body above ochraceous; membrane pale brownish; connexivum with the segmental spines black: antennæ ochraceous, apical half of third joint infuscate, third joint much longer than the second; head somewhat obscurely transversely wrinkled, eyes pitchy: pronotum, scutellum and corium coarsely punctate: lateral angles of the pronotum produced into long, straight, somewhat conical, subacutely pointed spines; [illegible] beneath, rostrum and legs coloured as above: extreme apex of [illegible]strum pitchy (*Dist.*). Long, 13; exp. angl. pron., 11 mill.

Reported from Naga Hills (Assam).

315. SASTRAGALA HETEROSPILA, Walker.

Acanthosoma heterospila, Walk., Cat., ii, p. 894 (1867).

Testaceous, elongate-oval, roughly punctured: head and fore-part of the pronotum with a reddish tinge; elongate, tylus extending very little beyond the juga; rostrum extending a little beyond the hind coxæ; tip black: antennæ slender, about half the length of the body; first joint extending beyond the front of the head; second much shorter the third;

fourth longer than the third: pronotum with a black band, which occupies the hind border and includes the hind angles; these form two long acute directly diverging spines: scutellum black, with a large luteous spot in the disc; tips whitish: pectoral ridge well developed: abdomen slightly ridged beneath; spine extending to the intermediate coxæ: legs rather stout: hemelytra black along the hind border and irregularly black along the outer border; membrane brown, cinereous along the outer border, including a white costal spot at its base (*Walker*). Long 9½ mill.

Reported from the Panjab: Bunkoti in Jaunsar, 9000 feet (mihi).

316. Sastragala parmata, Distant.

Sastragala parmata, Distant, Trans. Ent. Soc., p. 353 (1887).

Body above brownish-ochraceous; spines on pronotum reddish-brown; scutellum with a large cordate ochraceous spot, surrounded with blackish; antennæ ochraceous, 3-4 joints subequal in length, a little shorter than the fourth: eyes purplish-brown: pronotum sparingly and coarsely punctate, the lateral angles produced into long, thick, rounded spines, very slightly reflexed at the apices: scutellum with the median spot levigate, remainder coarsely punctate, apex ochraceous; corium coarsely punctate, with the lateral margin luteous and levigate: body beneath and legs ochraceous; apex of rostrum pitchy (*Dist.*). Long, 12; exp. angl. pron., 9 mill.

Reported from N. India.

Genus Anaxandra, Stål.

En. Hem. v, p. 110, 113 (1876).

Mesosternal ridge long, rather prominent to a distance before the anterior margin of the prosternum, with the apical part before the same margin prominulous, gradually narrowed or acuminated: process of lateral angles of the pronotum turning outwards, slightly upward and distinctly forwards, pronotum at the anterior margin with punctures arranged confusedly in somewhat like two rows; apical angles of the sixth segment of the abdomen, in ♂, somewhat obtuse.

317. Anaxandra rufescens, Dallas.

Acanthosoma rufescens, Dallas, List Hem., i, p. 311 (1851); Walker, Cat. Het., ii, p. 399 (1867).

Anaxandra rufescens, Stål, En. Hem., v., p. 114 (1867): Reuter, Berlin. Ent. Zeitschr., xxv, p. 77 (1881).

♀. Head dull olive, impunctate, pointed in front, with the vertex

orange: pronotum with the anterior portion olive, rather coarsely but sparingly punctured with black, and with a broad, impunctate, orange band near the anterior margin; posterior portion ferruginous, rather thickly punctured with black; lateral angles produced into long, acute, red spines, which are directed a little forwards, but have the apex slightly turned back; the basal portion of these spines is coarsely punctured with black, the apex smooth. Scutellum ferruginous olive, sparingly and irregularly punctured with black; the apex testaceous: hemelytra thickly and rather strongly punctured with black, with the outer margin, as far as the submarginal vein, olive; membrane transparent, brownish: body beneath orange; pectus yellowish; abdomen with the posterior angles of the last segment, and the posterior margins of the intermediate and apical vulvar plates, bright red; legs pale yellowish olive, with the base of the femora and the tarsi orange-testaceous: rostrum short, testaceous: antennæ pale olive (*Dallas*). Long, 16—17 mill.

Reported from India, Darjiling (mihi).

318. Anaxandra cornuta, Dallas.

Acanthosoma cornutum, Dallas, Trans. Ent. Soc., v, p. 193, t. 19, f. 6 (1849); List Hem., i, p. 312 (1851); Walker, Cat. Het., ii, p. 394 (1867).

Anaxandra cornuta, Stål, En. Hem., v, p. 114 (1876).

♂, ♀. Above olive, slightly clouded with yellowish, rather thickly and strongly punctured: pronotum with the lateral angles strongly cornuted; the processes being more darkly coloured than the rest of the surface: the antero-lateral margins of the pronotum beneath are greenish: scutellum acute, slightly sinuated on each side, immediately before the apex; hemelytra thickly and strongly punctured; membrane brownish at the base, particularly at the internal angles: joints of the antennæ concolorous with the body, the apex, and sometimes the whole of the joints pitchy: legs pale brownish yellow, with the tibiæ and tarsi somewhat darker: ventral spine long, reaching as far as the base of the anterior legs.

♂. With the pronotal processes dark olive green, rounded at the apex, beneath flat, but not grooved: the membrane is pale and semitransparent; the abdomen above red, with broad whitish margins: the body beneath is pale ochraceous, with a reddish tinge towards the apex of the abdomen: ventral spine pale.

♀. With the pronotal processes pitchy, very acute, the apex recurved and tipped with bright orange, strongly channelled beneath; the membrane is brownish; the abdomen beneath pitchy brown, darkest at the apex, and palest on the outer margins and along the median ridge; ven-

tral spine pale, tipped with brown: pectus brownish, with the sternal ridge semitransparent: head beneath brownish (*Dallas*). Long, 13; breadth of pronotum 10 mill.

Reported from Sikkim (mihi).

319. Anaxandra nigro-lineata, Stål.

Anaxandra nigro-lineata, Stål, En. Hem. v, p. 114 (1876).

♀. Olivaceous-flavescent, sparingly punctured above; three apical joints of the antennæ, lateral margins and longitudinal line (anteriorly abbreviated, posteriorly fissured) on the head, longitudinal line on the pronotum before the middle, apical interior spot on the last segment of the connexivum, basal band (posteriorly bisinuate) on the last dorsal segment, and a transverse line on the mesopleuræ, black: flavescent spot on the scutellum, exteriorly and posteriorly margined with black; exterior margin of scutellum punctured in rows at that spot: lateral angles of the pronotum produced in a very long process, sparingly punctured, smooth towards the apex, acuminate and slightly recurved at the apex: dorsum of abdomen sub-sanguineous: membrane slightly infuscate, exterior margin (base excepted) deeper fuscous: wings infuscate (*Stål*). Body long, 17; breadth of pronotal processes, 18½ mill.

Reported from India, Darjiling (mihi).

In form and punctuation very like *A. cornuta*, Dallas: pronotal processes longer and turning less upwards.

320. Anaxandra sigillata, Stål.

Anaxandra sigillata, Stål, En. Hem. v, p. 114 (1876).

♀. Closely allied to *A. nigro-lineata*, Stål, but smaller, pronotal processes shorter, above black, anteriorly at the apex more strongly rounded, membrane more obscure, exterior limbus pale at the base, margins of the head concolorous, and pronotum without a black longitudinal line; spot on the scutellum at the very narrowly blackish anterior margin sparingly punctured (*Stål*). Long, 13; breadth of pronotal processes, 10 mill.

Reported from India.

321. Anaxandra nigrocornuta, Reuter.

Anaxandra nigrocornuta, Reuter, Berlin. Ent. Zeitschr., xxv, p. 77 (1881).

♀. Olivaceous, greenish, head a little, pronotum and scutellum sparingly irregularly, and hemelytra more densely punctured black; head, sutures towards the base of the clypeus, and two approximated

dots on the margin of the vertex, black; apical half of third joint of the antennæ and two last joints, black; anterior band on the pronotum and its sides posteriorly towards the angles, base of scutellum, clavus towards the apex and corium at the claval suture, ferruginous; lateral angles of pronotum produced outwards in a very long horn, entirely black up to the sparingly punctured apex, acuminate at the apex and distinctly recurved, convex on the anterior margin; this horn is as long as the base of the scutellum, slightly rising: membrane smoky with a small whitish dot at the base of the exterior margin: dorsum of abdomen red, apex black, the dorsal genital lobes, in ♀, however, have a red spot; posterior angles of segments of connexivum, black; body beneath pallid. Horns of pronotum beneath olivaceous-virescent-ferruginous, punctured black; pectus palely flavescent, colour verging somewhat into ruddy; prostethium punctured, anterior lateral margin virescent, meso- and meta-stethium somewhat smooth: inferior margin of mesostethal plate rounded: venter slightly rufescent, apical angles of the segments of the connexivum, narrowly black: dorsal genital lobes, in ♀, obliquely rounded outward, there before the base abruptly strongly oblique, slightly concave (*Reuter*). Long, 13½ mill.

Reported from Darjiling.

322. Anaxandra fulvicornis, Distant.

Anaxandra fulvicornis, Dist., Trans. Ent. Soc., p. 354 (1887).

Body ochraceous, with an olivaceous tinge: anterior lateral margins of the head, a median narrow longitudinal stripe commencing before the apex of the head and ending on the disc of the pronotum, and the lateral margins of the scutellum (united before the apex), black: basal joint of antennæ ochraceous: pronotum with the disc posteriorly coarsely punctate, lateral angles produced into long, slightly ascending, and directed forwards, dull-luteous spines, of which the apices are very slightly reflexed and subacute: basal two-thirds of scutellum luteous, posteriorly rounded, and margined black: corium coarsely punctate and rugulose: membrane brown: body beneath and legs ochraceous: mesonotum with an oblique black line on each side. Closely allied to *A nigro-lineata*, Stål, but differs in the smaller expanse of the pronotal angles (*Dist.*). Long, 15; exp. angl. pron. 14 mill.

Reported from Sikkim.

323. Anaxandra tauriformis, Distant.

Anaxandra tauriformis, Dist., Trans. Ent. Soc., p. 354 (1887).

Body above bright castaneous: lateral margins of the head, ante-

rior and lateral margins and posterior disc of the prothotum, lateral margins of the scutellum, lateral margins of the corium and the membrane, ochraceous: 1-2 joints of the antennæ, ochraceous: head transversely wrinkled and with a few dark punctures: eyes greyish-brown, margined inwardly ochraceous: pronotum on the disc sparingly and coarsely, on the anterior margin thickly, punctate; humeral angles produced upwards and forwards into long spines of which the apices are distinctly truncately reflexed hindwards, these spines are sparingly punctate for about half their length: scutellum sparingly and coarsely punctate: corium thickly punctate: abdominal spines above and beneath castaneous, but beneath inwardly margined blackish: body beneath and legs ochraceous (*Dist.*). Long, 15; exp. angl. pron. 14½ mill.

Reported from Khasiya Hills (Assam).

324. Anaxandra hamata, Reuter.

Anaxandra hamata, Reuter, Berlin. Ent. Zeitschr., xxv, p. 78 (1881).

♂. Very like *A. rufescens*, Dallas, differs however in the lateral horn of the pronotum, also (in ♂) in anterior margin before the apex itself, being a little more distinctly convex, entirely sanguineous, and especially in the structure of the genitalia in the ♂. First genital segment about one-third shorter than preceding, apical margin slightly sinuate, second segment uncovered on the margin, straight in the middle, with two small bands subvertically placed in the middle itself, shortly but densely fulvous-pilose, apical angle produced in a long, somewhat incurved horn, this horn furnished at the apex with a densely fulvous pilose fascicula, its exterior margin as long as the lateral margin of the preceding segment, inferior margin as long as the margin of the apical segment: *styli* briefly biramose at the apex, upper ramus narrow and acutely acuminate, apex somewhat curved, inferior broader and more obtuse, abruptly dentately contracted at the apex (*Reuter*). Long with membrane 15 mill.

Reported from Darjiling.

325. Anaxandra compacta, Distant.

Anaxandra compacta, Dist., Trans. Ent. Soc., p. 355 (1887).

Body above ochraceous, with an olivaceous tinge; head with the basal margin, a spot behind each eye, and the margins of the tylus (not reaching the apex), two circular enclosing lines near anterior margin of pronotum, and a large median rounded spot near the base of the scutellum, black: angles of the pronotum, castaneous: both pronotum

and scutellum very obsoletely and obscurely punctate; the corium finely but distinctly punctate: angles of pronotum produced in short, robust spines of which the apices are rounded above and subtruncate: body beneath ochraceous, much tessellated with black: the pronotal spines above castaneous (*Dist.*). Long, 10; exp. angl. pron., 10 mill.

Reported from Sadiya (Assam).

Genus Clinocoris, Hahn, Stål.

Pt. Wanz. Ins. ii, p. 70 (1834); Stål, Oefvers. K. V.-A. Förh., xxix (3), p. 39 (1872); En. Hem., v, p. 110, 114 (1876). Includes *Sastragala*, Fieber, Eur. Hem. p. 78, 327 (1861);—*Elasmostethus*, pt, Fieber, l. c., p. 78, 328 (1861):—*Elasmucha*, Stål, A. S. E. F. (4 s.) iv, p. 54 (1864); Oefvers. K. V.-A. Förh. p. 638 (1870):—*Meadorus*, Muls. and Rey, Pun. France, Pent., p. 315 (1866).

Antennæ 5-jointed, two-thirds of the length of the body, inserted under the margin of the head forwards in a small elevation, the first joint stout and almost as long as the third; the second as long as the fourth but thinner; the third somewhat shorter than the fourth which however is stouter and almost as stout as the rounded fifth joint: rostrum 4-jointed; ocelli small, placed near the posterior margin of the head: corium besides the strong vein on the inner margin, with a longitudinal vein arising at the base and bifurcated before the middle: membrane with a transverse cellule-like vein emitting six longitudinal veins towards the external margin: feet comparatively long and slender. The mesosternal ridge posteriorly is produced hindwards between the intermediate coxæ: the posterior lateral margins of the pronotum are narrowly depressed and slightly amplified; the furrow from the orifices short, or somewhat so: two apical ventral segments in ♀, without a subimpressed, opaque, lateral spot.

326. Clinocoris recurvus, Dallas.

Acanthosoma recurvum, Dallas, List Hem., i, p. 310 (1851); Walker, Cat. Het. ii, p. 394 (1867).

Clinocoris recurvus, Stål, En. Hem., v, p. 114 (1876).

♀. Ovate, above pale olive, punctured with black: head thickly and finely punctured with black, the tylus longer than the juga: pronotum thickly and strongly punctured with black; the lateral angles produced into strong, acute, slightly recurved, deep red spines; the disc with a broad, transverse, yellowish white band across the middle: membrane transparent, brownish: margins of the abdomen dull orange, with a black spot at the posterior angle of each segment: body beneath fulvous, punctured with black; the abdomen sparingly and finely, the

pectus more thickly and coarsely punctured: ventral ridges impunctate, well marked, but not very prominent: legs yellowish testaceous, with the claws black: rostrum testaceous, with the apex black: antennæ testaceous, with the apical half of the fifth joint black (*Dallas*). Long, 10½ mill.

Reported from N. India.

327. Clinocoris punctatus, Dallas.

Acanthosoma punctatum, Dallas, List Hem., i, p. 306 (1851); Walker, Cat. Het. ii, p. 393 (1867).

Clinocoris punctatus, Stål, En. Hem., v, p. 114 (1876).

♀. Greenish testaceous, coarsely punctured: head punctured with brown; tylus passing the juga: pronotum strongly and closely rugosely punctate, the punctures brown: scutellum triangular, with the apex much attenuated and produced, strongly but not thickly punctured with brown: corium very coarsely punctured, but with a small impunctate patch on the disc a little behind the middle: membrane transparent, colourless: margins of the abdomen with a small spine at the posterior angles of each segment, and with a small black spot on each segment at the posterior margin: abdomen beneath coarsely and sparingly punctured on the sides, the disc impunctate and with a very distinct median longitudinal ridge: pectus thickly and strongly punctured, especially on the sides: legs orange-testaceous: antennæ testaceous, with the two apical joints brown (*Dallas*). Long, 9—9½ mill.

Reported from N. India.

328. Clinocoris cruciger, Reuter.

Clinocoris cruciger, Reuter, Berlin. Ent. Zeitschr., xxv, p. 80 (1881).

♀. Saturated ochraceous, head with some fine punctures, pronotum, scutellum and hemelytra strongly impressly-punctured: third joint of the antennæ subequal in length to the second, two last equally long, last black, base pallid: anterior lateral margins of the pronotum, with an arch just behind the apical margin, a longitudinal line and another transverse line just behind the middle forming a cross with the former, and lateral angles, impunctate, levigate; these lateral angles straightly, spinosely produced outward, with a distinct spine slightly recurved, not quite acute; membrane hyaline, with a band irregularly streaked fuscescent: abdomen above unicolorously ochraceous, beneath with two discoidal bands and a lateral row of spots on both sides, pale yellowish. Rostrum not extending beyond the last coxæ: the part of

the posterior margin of the pronotum between the margin of the corium and angle, equal in length to the remaining part, towards the base much, and towards the angle slightly sinuated, the latter part within the margin of the corium straight, very slightly oblique, whence the basal margin slightly and very broadly sinuate, basal angles very obtuse: scutellum with almost two rows of dots towards the apex which is not quite acute: exterior margin of corium, behind the middle, strongly roundly amplified towards the apex: pectus sparingly, prosternum strongly, punctured fuscous; mesosternal plate much higher towards the apex than before the intermediate coxæ, apex almost extending beyond the prosternum, and apical margin obliquely truncate, inferior margin slightly rounded towards the apex and towards the intermediate coxæ gradually broadly but strongly sinuate: ventral spine reaching the apex of the mesosternal plate: sixth ventral segment, in ♀, emarginate at the apex: apical margin truncate in the middle, folded at the angles of the emargination; superior genital lobes short, very slightly rounded at the apex, contiguous to entire interior margin (*Reuter*). Long, 6½; with membrane, 8 mill.

Reported from Darjiling.

329. Clinocoris scutellata, Distant.

Clinocoris scutellata, Dist., Trans, Ent. Soc., p. 355 (1887).

Body above ochraceous, thickly and coarsely punctate: spines of pronotum rosy red: scutellum with a blackish median longitudinal band extending from about the base to the middle: antennæ ochraceous: lateral angles of the pronotum straightly produced into subacute spines of which the apices are slightly reflexed hindwards, and the posterior margins are somewhat sinuated: membrane pale hyaline, with reflections of the red upper surface of the abdomen: body beneath and legs ochraceous: sternum coarsely punctuate (*Dist.*). Long, 8; exp. angl. pron., 6 mill.

Reported from Naga Hills (Assam).

330. Clinocoris maculata, Distant.

Clinocoris maculata, Dist., Trans. Ent. Soc., 355 (1887).

Body above black ochraceous: pronotum and scutellum coarsely but sparingly punctate, corium thickly punctate: spines of pronotum black: corium with a levigate, ochraceous spot on the disc of the apical area: punctuation entirely dark-brownish and the corium is therefore much darker than the pronotum or scutellum: lateral angles of pronotum produced into stout spines of which the apices are subacute

and prominently reflexed, and their posterior margins situated: membrane very pale ochraceous, pitchy towards the apex: body beneath apparently ochraceous (*Dist.*). Long, 8; exp. angl. pron. 6 mill.

Reported from N. E. India.

Subfamily Urostylina, Dallas.

Urostylidæ, Dallas, Trans. Ent. Soc., n.s. ii, p. 15, (1852); List Hem., i, p. 313 (1851);—*Urolabidina*, Stål, En. Hem., v, p. 115 (1876).

Antennæ 5-jointed, basal joint extending to a distance beyond the head: rostrum short, scarcely passing the anterior coxæ, basal joint enclosed in a groove: head small, tylus as long as the juga, lateral margins not trenchant; antenniferous tubercles exserted: genitalia generally more or less produced: odoriferous orifices spinose: pectus not sulcated (*Dallas*).

I. Ocelli present.

a. Basal joint of the antennæ nearly as long as the head and the pronotum taken together; antennæ very slender:—2. *Urostylis*.

b. Basal joint of the antennæ not twice the length of the head, much shorter than the head and pronotum; antennæ stouter:—1. *Urochela*.

II. Ocelli wanting:—3. *Urolabida*.

Genus Urochela, Dallas.

Trans. Ent. Soc., n. s., i, p. 2 (1850); List Hem., i, p. 313 (1851); Walker, Cat. Het. ii, p. 410 (1867); Stål, En. Hem. v, p. 115 (1876).

Head small, short, broader than long, abruptly narrowed, just before the eyes; juga and tylus produced, distinct, rounded; tylus longer than the juga; eyes large, prominent, globose; ocelli moderate, situate close to each other at the back of the head; antennæ longer than the body, 5-jointed, inserted in a tubercle which appears beyond the margin of the head, just before the eyes; first joint stoutest, as long as the pronotum, cylindrical, thinner at the base; second about half as long again as the first, and a little stouter than the second; fourth about as long as the first, slender; all clothed with fine short hairs which are longer on the first joint: rostrum inserted close to the anterior margin of the head, short, reaching only to the middle of the mesostethium, 4-jointed, 1 and 3 joints nearly equal, fourth shorter, second longest; the first at its base enclosed in a small groove of the underside of the head; labrum reaching the middle of the second joint of the rostrum, transversely striated. Body broad, very flat above, convex beneath: pronotum trapezoidal, slightly margined laterally, much narrowed in front, the anterior

margin being considerably narrower than the head and eyes: scutellum rather short, triangular, with the sides nearly straight and the apex acute. Hemelytra ample, the coriaceous part larger than the membranous, with the basal half of its outer margin much elevated; a vein which arises from a strongly elevated line at the base, runs about two-thirds the length of the corium, where it emits a branch on its inner side which reaches the base of the membrane, and passing into it, gives rise, after running singly for a short distance, to five veins on the disc of the membrane, of which the two inner and the two outer ones are united at the base before joining the common trunk: the membrane reaches beyond the apex of the abdomen, and has six veins, of which the outer one is very short, placed at the basal angle. Abdomen convex beneath, the margins thin, projecting a little beyond the hemelytra on each side: the anal apparatus, in ♂, consists of two claw-like processes which project nearly as far as the posterior angles of the terminal segment of the abdomen, with their points turned outwards; a small triangular plate is situate at the base of these which it partially covers, and within the cavity appears the apex of a second triangular piece, which is probably the margin of the dorsal portion of the segment; all these parts are clothed with long woolly hairs, which nearly fill the intermediate spaces: in the ♀, the vulvar plates are not remarkable: the pectus is flat; mesostethium broad, placing a considerable interval between the insertions of the anterior and the intermediate feet; on each side of the metastethium close to its anterior margin and near the intermediate coxæ is a small spine directed outwards and forwards, these appear to be perforated on their posterior surface, at about half their length and are evidently formed by the produced margins of the odoriferous apertures: legs moderate, slender, the posterior pair longest; tarsi 3-jointed, 1 and 3 about equal, the second minute (*Dallas*). Distinguished from *Urostylis*, Westw., by its stout antennæ of which the first joint is not much longer than the head.

331. Urochela quadripunctata, Dallas.

Urochela 4-punctata, Dallas, Trans. Ent. Soc. (n. s.) i, p. 3, t. 2, f. 1 (1850): Walker, Cat. Het., ii, p. 410 (1867); Stål, Ea. Hem. v, p. 115 (1876).

Body elongate-ovate, above ferruginous grey, finely and thickly punctured: pronotum narrowly margined with yellow and with a narrow, impunctate, longitudinal line on the disc, of the same colour; a small black spot on the lateral margin, near the lateral angle: scutellum with a narrow longitudinal yellow line, continuous with that of the pronotum, the lateral margins yellowish: the basal third of the outer margin of the hemelytra and a small line in the yellow basal portion, a spot on the

disc, and another at the middle of the apical margin, black; membrane pale brown, with the veins paler. Connexivum banded with yellow and black; abdomen beneath smooth, impunctate, yellow; a spot on each side of each segment within the stigmata, and another on the lateral margin, black; head beneath, pectus and rostrum, testaceous; the apex of the latter, pitchy: legs dusky testaceous, femora punctured with pale brown: antennæ with the basal joint dusky testaceous, second black, pale at the base, 3-4 joints black, basal portion of the latter, yellowish white (*Dallas*). Long, 9 mill. Type.

Reported from Bhutan, Sikkim; very common on Observatory Hill, Darjiling, at the end of the rains (mihi), and at Mungphu.

332. Urochela guttulata, Stål.

Urochela guttulata, Stål, En. Hem., v, p. 115 (1876).

♀. Palely grey-flavescent, above more densely and more distinctly, beneath more remotely and more finely, punctured fuscous; antennæ blackish; first joint altogether or only towards the base, 4-5 joints towards the base, greyish-flavescent: a line on the pronotum and scutellum, more or less distinct, levigate, anterior scars inwardly blackish: hemelytra with a small fuscous spot on the disc and at the middle of the apical margin, sometimes absent: membrane fuscous with small rounded pallid spots, here and there confluent; lateral streak on the pectus and lateral spots arranged in longitudinal rows, black (*Stål*). Long, 12; broad, 5½ mill.

Like *U. quadripunctata*, Dallas, but larger, antennæ shorter and more slender, lateral margins of pronotum dilated, before the middle obtusely roundly-amplified and obsoletely sub-serrate, slightly sinuated in the middle, the levigate line on the pronotum and scutellum much less distinct, sometimes partly evanescent; membrane sprinkled with pallid dots; pectus very distinctly streaked with black.

Reported from Darjiling, Mungphu (mihi).

333. Urochela pilosa, Stål.

Urochela pilosa, Stål, En. Hem., v, p. 116 (1876).

♂. Palely greyish-flavescent, pilose: pronotum, scutellum, hemelytra and prosternum somewhat strongly punctured black, the former further adorned with fine subferruginous dots: 2-5 joints of antennæ black; 4-5 joints flavescent at the base: lateral limbus of pronotum and hemelytra also dorsum of abdomen, weakly ferruginous: membrane fuscous-vinaceous: two spots on the hemelytra, a band on the segments of the connexivum, and the circuit of the spiracula, black:

sides of venter punctulate. The ♂ has the genital segment retuse; sides emitting a process turning upwards, acuminate at the tip, somewhat longer than broad at the base. Long, 10½; broad, 4½ mill.

Distinguished from the preceding by being somewhat broader, dorsal punctuation stronger, without the ventral spots arranged in rows or the levigate line on the pronotum and scutellum: lateral margins of pronotum anteriorly obtusely rounded, prominent, not sinuated in the middle, (Stål).

Reported from Darjiling.

334. Urochela bimaculata, Dallas.

Urochela bimaculata, Dallas, List Hem., i, p. 313 (1851); Walker, Cat., Het., ii, p. 410 (1867); Stål En. Hem., v, p. 116 (1876).

♀. Head, pronotum and scutellum brownish grey, thickly and finely punctured with black: head with two black streaks on the vertex: pronotum with the lateral margins considerably waved: corium whitish, finely punctured with brown and with numerous scattered coarse black punctures; the middle of the disc with a large brown spot, membrane semitransparent, brownish: margins of the abdomen dark brown, with a yellow line on each of the sutures: body beneath fulvous: abdomen with the disc shining, faintly wrinkled transversely and rather sparingly punctured with black; the sides somewhat opaque, thickly and finely punctured with black; the stigmata and two rows of spots on each side of the abdomen black: pectus rather thickly and finely punctured on the sides, with the sternum nearly impunctate: femora testaceous, very thickly covered with fine black or brown points; tibiæ brownish at the apex; tarsi with the apical joint brown: rostrum testaceous, with the tip pitchy: antennæ with the basal joint greyish-testaceous, thickly covered with very minute black points; 2—3 joints black; 4—5 black, with the base yellow (*Dallas*). Long, 13—14 mill.

Reported from N. India.

335. Urochela obscura, Dallas.

Urochela obscura, Dallas, List Hem., i, p. 314 (1851); Walker, Cat. Het., ii, p. 410 (1867); Stål, En. Hem., v, p. 116 (1876).

♂. ♀. Above brown, somewhat obscure, densely and finely punctured; head impunctate, black, with a spot on each side within the eyes, a spot on the middle of the vertex, and the apices of the juga, brown: lateral margins of the pronotum waved, narrowly edged with yellow: scutellum rather coarsely punctured with black, with the basal angles yellowish;

the apex with an indistinct reddish longitudinal ridge: hemelytra clouded with blackish; membrane brown, opaque: margins of the abdomen black, with a yellow line on each of the sutures: body beneath reddish: abdomen impunctate, minutely transversely rugose, with the stigmata black: pectus finely punctured with black on the sides; pectus impunctate, black: legs brownish; femora with brown dots: rostrum brownish testaceous, with the tips pitchy; antennæ with the basal joint pitchy brown, paler at the base; 2–4 joints, black; fifth joint orange, tip black: anal plate, in ♂, is entire, convex, and encloses a second plate, within and above which the sexual organs are visible (*Dallas*). Long, 10½—12 mill.

Reported from India.

336. Urochela discrepans, Walker.

Urochela discrepans, Walker, Cat. Het., ii, p. 411 (1867).

Tawny, elongate-elliptical, thinly punctured, a little paler beneath; punctures brown or black: head with a black spot on the hind border; tylus conical, extending much beyond the juga; rostrum extending nearly to the hind border of the third ventral segment; tip black: antennæ black, more than half the length of the body; first joint extending much beyond the front of the head; second as long as the first; third about half the length of the second; fourth a little shorter than the second; fifth reddish, piceous towards the tip, a little shorter than the fourth: pronotum with four incomplete and irregular black stripes and with black, slightly reflexed sides: scutellum with two broad black stripes, and with a black dot on each fore angle: pectus and under side of abdomen with four rows of black points: hemelytra with two black dots, one on the disc and one on the middle of the outer border: membrane lurid cinereous. Distinguished from *U. bimaculata* by the tylus being more prominent, and the first joint of the antennæ being more slender (*Walker*). Long, 12½—13 mill.

Reported from India.

337. Urochela pulchra, Distant.

Urochela pulchra, Dist., Trans. Ent. Soc., p. 356, t. 12, f. 8 (1887).

Body above ochraceous, shaded, and punctured brownish: head and pronotum brownish, margins of pronotum, olivaceous; antennæ brownish, second joint longer than the first: scutellum olivaceous, with scattered, coarse, brown punctures, with some mottled markings and a spot in each basal angle of the same colour: corium olivaceous, with large, irregular, coarse, brown punctures on inner area; clavus brown-

ish; membrane brownish, apex paler: body beneath brownish, laterally spotted ochraceous; connexivum ochraceous, spotted black: legs ochraceous, femora speckled brownish: apex of rostrum pitchy (*Dist.*). Long, 15 mill.

Reported from Sikkim (Rangbi, mihi).

338. Urochela ferruginea, Distant.

Urochela ferruginea, Dist., Trans. Ent. Soc., p. 356 (1887).

Body above brownish ochraceous, very thickly and darkly punctate: eyes and two median lines on head, fuscous: antennæ fuscous, 1-2 joints subequal in length, third very short: pronotum with a median longitudinal line and the margins, narrowly luteous: scutellum with a median longitudinal line, a linear spot at the basal angles, the apex and the margin, narrowly luteous: corium with the margins narrowly, and some longitudinal discal lines luteous: membrane fuscous: connexivum fuscous, with lineate ochraceous spots: body beneath brownish ochraceous, tinged with fuscous, and with fuscous lateral spots, connexivum as above: legs brownish ochraceous, apices of the tibiæ and the tarsi fuscous (*Dist.*). Long, 12 mill.

Reported from Assam.

Genus Urostylis, Westwood.

Pt. Hope, Cat. Hem., i, p. 45 (1837): Dallas, List Hem., i, p. 313 (1851); Stål, En. Hem., v, p. 117 (1876).

Antennæ very long and slender, basal joint nearly as long as the head and pronotum taken together: rostrum and pronotum as in *Urolabida*, Westw.: body less elongated: ocelli present: membrane with seven longitudinal veins: abdomen, in ♂, simple, not armed with a forceps; in ♀, terminated by a true, corneous, curved, recurved stylus, bifid at the apex.

339. Urostylis punctigera, Westwood.

Urostylis punctigera, Westwood, Hope, Cat. Hem. i, p. 45 (1837); Dallas, List Hem. i, p. 315 (1851); Walker Cat., Het., ii, p. 411 (1867); Stål, En. Hem., v, p. 116 (1876); Distant, A. M. N. H., (5 s.) iii, p. 45 (1879).

Rufescent-luteous, punctured, above more or less tinted virescent; pronotum with two somewhat large black spots in the middle towards the anterior margin (sometimes absent); hemelytra with a somewhat large black spot in the middle of the corium: antennæ fuscous, base of the fourth joint, luteous: body beneath and feet concolorous (*Westw.*). Body long, 10½ mill.

Reported from Bengal, Nepál, common in Sikkim (mihi), Calcutta.

340. Urostylis gracilis, Dallas.

Urostylis gracilis, Dallas, List Hem., i, p. 315 (1851); Walker, Cat. Hem., ii, p. 411 (1867); Stål, En. Hem., v, p. 116 (1876); Distant, A. M. N. H., (5 s.) iii, p. 45 (1879).

♂. Head impunctate, orange: eyes black: pronotum, scutellum and hemelytra green, rather thickly and finely punctured: membrane semitransparent, brownish: body beneath yellow, legs fulvous; tibiæ pale; tarsi brownish: rostrum testaceous, with the tip black: antennæ, very long and slender; basal joint orange; second greenish; 3—5 joints brownish, the two latter with the base greenish-white (*Dallas*). Long, 10½ mill.

Reported from N. India, Sikkim (mihi).

341. Urostylis pallida, Dallas.

Urostylis pallida, Dallas, List Hem., i, p. 315 (1851); Walker, Cat. Het., ii. p. 411 (1867); Stål, En. Hem., v, p. 117 (1876).

♀. Above pale greenish yellow: head brownish: pronotum finely punctured with brown, with the lateral margins waved: scutellum more strongly punctured with brown than the thorax: coriaceous portion of the hemelytra thickly and finely punctured, with the inner [illegible] outer portions of the apical margin black, the median portion yellow; membrane transparent whitish, with a black spot in the inner basal angle: body beneath orange: abdomen with the disc smooth and shining, the sides reddish and faintly wrinkled: legs testaceous; femora covered with brown points, which, towards the apex, form a short line on each side: rostrum yellow with the tip black: antennæ with the basal joint testaceous; the remainder pale brown (*Dallas*). Long, 13½—14 mill.

Reported from N. India, Sikkim (mihi).

342. Urostylis notulata, Dallas.

Urostylis notulata, Dallas, Trans., Ent. Soc., (n. s.), ii, p. 16 (1852); Stål, En. Hem., v, p. 117 (1876).

♀. Ovate, pale testaceous: head rather small, triangular, broader than long; impunctate, faintly wrinkled, with a small oblique pit on each side within the eyes; the apex of the lobes and the whole underside of the head, pale yellow; eyes dark brown, ocelli reddish; antenniferous tubercles, brown: antennæ clothed with very small whitish hairs; the basal joint testaceous, becoming dusky towards the apex and covered with very minute brown punctures; 2—4 joints brown, the last rather paler; rostrum pale yellow with the extreme tip black: pronotum

broader than long, trapezoidal, with the anterior angles rounded off; pale testaceous, rather thickly punctured with brown, with an abbreviated longitudinal red line on the middle of the anterior portion; the disc with a faint transverse furrow or impression before the middle; the portion between this furrow and the anterior margin elevated; beneath testaceous, finely punctured with brown, and with a pale reddish patch within each antero-lateral angle: scutellum testaceous, rather thickly punctured with brown: meso- and meta-notum beneath, pale fulvous, smooth, impunctate, with a large dull, pale-brown patch on each side. Legs clothed with fine whitish hairs: femora yellow-testaceous, covered with fine brown points; tibiæ and tarsi dusky; claws brown: corium testaceous, thickly and rather finely punctured; the punctures pale brown, the apical margin brown, with the median portion yellow: membrane transparent, colourless, with a dark brown spot on the inner basal angle: wings semitransparent, brownish: abdomen above bright red, shining, very finely wrinkled transversely, with a blackish line on each side within the margins: the margins brownish testaceous, edged with brown: abdomen beneath with the disc pale fulvous, flat, shining, finely wrinkled transversely, covered with very minute brown points; the sides red; the margins testaceous (*Dallas*). Long, 12½—13½ mill.

Reported from N. India.

343. Urostylis fumigata, Walker.

Urostylis fumigata, Walker, Cat. Het. ii, p. 413 (1867): var., Distant, Scien. Res., 2nd Yarkand Miss., p. 7 (1879).

Testaceous, fusiform, very finely punctured: head very small: rostrum extending to half the space between the first coxæ and the intermediate pair, apex black: antennæ nearly as long as the body, first joint almost as long as the pronotum, second much longer than the first, third piceous, a little more than half the length of the second, 4-5 piceous, pale testaceous towards the base, fourth a little shorter than the second, fifth much shorter than the fourth: pronotum with a very slight transverse impression; sides very slightly reflexed, abdomen with large apical appendages; the upper segment lanceolate, armed beneath with two spines: membrane brownish cinereous (*Walker*). Long, 9½ mill.

Reported from Silhat, Murree (Marri).

344. Urostylis philoides, Walker.

Urostylis philoides, Walker, Cat. Het., ii, p. 413 (1867).

Testaceous-green, fusiform, very finely punctured, testaceous beneath:

head small: rostrum extending almost to the intermediate coxæ, apex black: antennæ a little longer than the body; first joint a little longer than the pronotum, second as long as the first; third black, about half the length of the second, fourth blackish, pale testaceous at the base, a little longer than the second: pronotum with a very slight transverse impression, sides hardly reflexed: scutellum ochraceous towards the tip and with an ochraceous callus on each side at the base; abdomen, in the ♂, with very large apical appendages; two long, stout, slightly ascending spines, above which there are two small spines: hemelytra pale green; membrane lurid-cinereous. Distinguished from the preceding by the longer and more slender basal joint of the antennæ and by the protuberances on the scutellum (*Walker*). Long, $7\frac{1}{3}$ mill.

Reported from Burma.

345. Urostylis lopoides, Walker.

Urostylis lopoides, Walker, Cat. Het., ii, p. 414 (1867).

Testaceous, elongate-elliptical, minutely punctured; punctures brown: head small: rostrum extending to half the space between the first coxæ and the intermediate pair: antennæ pubescent, as long as the body; first joint rather stout, as long as the pronotum, second black, testaceous at the base, as long as the first; third black, about half the length of the second; fourth black, whitish for nearly half the length from the base; shorter than the second; fifth whitish, black towards the tip, shorter than the fourth: pronotum with a pale testaceous longitudinal line and with a slight transverse impression, pale testaceous and slightly reflexed on each side and along the fore border; an elongated black point in front of each hind angle: scutellum with a pale testaceous line: legs moderately long and slender: hemelytra with four small brown spots, first and second costal; first near the base, second at a little before the middle, third on the disc; fourth on the middle of the outer border; membrane lurid-cinereous (*Walker*). Long, $8\frac{1}{2}$—$9\frac{1}{2}$ mill.

Reported from India.

346. Urostylis nigromarginalis, Reuter.

Urostylis nigromarginalis, Reuter, Berlin. Ent. Zeitschr., xxv, p. 85 (1881).

♀. Testaceous, above erectly pallid pilose: pronotum, scutellum, and corium externally sparingly punctured with large impressed ferruginous dots; scutellum with a subtriangular, fuscescent spot towards the base, a little more densely punctured; corium internally and towards the apex very finely and obsoletely concolorously punctured, impressed at the claval suture with a row of minute dots, clavus also at the

scutellary margin with a row of strongly impressed dots, lateral margin of corium itself thinly black: membrane hyaline-white, interior and basal margins also excurrent streak on apex of membrane, fuscous. Long. 12½ mill.

Rostrum reaching somewhat the middle of the mesosternum: antennæ longer than the body, rufous-testaceous, two first joints with long pallid exserted hairs placed close together, third briefly pilose, last sub-glabrous, first joint subequal in length to pronotum and half the head taken together, second joint almost one-third longer than first and a little over 2½ time longer than third, the third twice shorter than fourth, basal halves of fourth and fifth, pallid; the fifth shorter than the fourth: anterior lateral margins of pronotum ochraceous, finely serrulate, with long pale hairs, slightly reflexed in the middle: prosternum without a median ridge (♀): mesosternum longitudinally obsoletely subsulcate at the base, equally convex on the disc: feet pallid-pilose, apices of the tibiæ and tarsi, ferruginous: sixth ventral segment, in ♀, about two-thirds longer than preceding, apical margin very slightly rounded; dorsal genital lobes seen from above triangular, very slightly rounded on the exterior margin, interior broadly distant with margin subsinuated, impressed on the disc, inward in the form of an arch, red; seen from beneath, elongate, with the apex acutely rounded, interior margin carinate, ventral lobes turning upwards (*Reuter*).

Reported from Darjiling.

Genus Urolabida, Westwood.

Pt., Hope, Cat. Hem., i, p. 45 (1837); Dallas, List Hem., i. p. 313 (1851); Trans. Ent. Soc. (n. s.) ii, p. 16 (1852): Stål, En. Hem., v, p. 117 (1876). Includes *Urostylis*, pt., Westwood, l., c., p. 45 (1837): *Calliprepes*, White, M. N. H., (n. s.) iii, p. 543 (1839); Trans. Ent. Soc. iii, p. 93 (1842):—*Typhlocoris*, Herr. Schaff., Wanz. Ins. v, p. 79 (1839); ix, p. 175 (1850).

Body elongate-ovate, slender, sides parallel, pronotum as broad as the abdomen, posterior angles not prominent: head small, clypeus short: ocelli wanting: rostrum hardly reaching, or extending beyond, the intermediate coxæ: antennæ, in the ♂, very long, slender, longer than the body, 1-2-4-5 joints of equal length, the third joint shorter: antennæ in the ♀ shorter: hemelytra elongate; membrane with twelve very indistinct longitudinal veins: feet elongate, slender: abdomen, in ♂, terminated by two styli bearing a forceps and with a shorter intermediate spine; in the ♀, terminated by a curved, corneous, recurved appendage produced almost to half the length of the abdomen or not produced. Type, *U. tenera*, Westw.

347. Urolabida Grayii, White.

Callicrepes Grayii, White, Mag. N. H., iii, p. 543 (1839); Trans. Ent. Soc., iii, p. 93 (1841—43).

Urolabida Grayii, Dallas, List Hem., i, p. 316 (1851); Trans. Ent. Soc. (n. s.) ii, p. 16 (1851); Walker, Cat. Het., ii, p. 415 (1867); Stål, En. Hem., v, p. 117 (1876).

Virescent-luteous: pronotum with two posterior triangular dorsal spots, and scutellum with two basal spots, red: membrane with an obscure basal line, coriaceous part with a green transverse line at the apex, oblong-elliptical: head small, with a distinct neck, in front slightly trilobed: antennæ placed on the upper side of the head on a slightly projecting lobe, in front of the eyes which are very prominent; first joint not so long as the head and pronotum, ciliated, cylindrical, rather thickest at the tip: a depression between the eyes which narrows and is continued to the back part of the head, the narrowest part being impressed on the sides, no ocelli: rostrum short, not reaching far beyond the first pair of legs, apparently 3-jointed, second joint longer than first and third: pronotum semicircular, not so broad as the hemelytra, somewhat truncated behind, in front emarginate and margined as are also the slightly sinuated distinctly ciliated sides: scutellum as long as head and pronotum together, pointed: hemelytra large, reaching beyond the abdomen; the membrane with seven veins, the two interior veins almost united at the base, the two exterior united at the apex: legs slender, hairy; tarsi 3-jointed, first joint as long as the second and third together, claws furnished with pulvilli: abdomen flat above, slightly convex below, margined (*White*). Distinguished by the genitalia in the ♀ being of the ordinary form and not produced into large forceps-like process. Long, 14¾; breadth of pronotum, 5¾ mill.

Reported from Nepal.

348. Urolabida histrionica, Westwood.

Urostylis histrionica, Westwood, Hope, Cat. Hem., i, p. 46 (1837); Walker Cat. Het. ii. p. 411 (1867).

Typhlocoris semicircularis, Herr. Schäff., Wanz. Ins., v, p. 79, f. 525 (1839).

Urolabida semicircularis, Walker, *l. c.* p. 414.

Urolabida histrionica, Stål, En. Hem., v, p. 117 (1876).

Rufescent luteous, punctured; pronotum and hemelytra tinted virescent; pronotum posteriorly with a testaceous semicircle running through the scutellum to its apex, sides of pronotum testaceous; a black spot at the apex of the corium in the middle; antennæ fuscous, varied with fulvous; body beneath concolorous, feet paler (*Westwood*). Body, long, 10½ mill.

Walker (*l. c. supra*) describes this species as *U. semicircularis*, thus :—Ochraceous, fusiform, very finely punctured: head small; rostrum extending nearly to the intermediate coxæ; antennæ blackish, slender, nearly the length of the body, first joint reddish, as long as the pronotum, second a little longer than the first, remainder successively decreasing in length, fifth joint reddish at the base: pronotum with three bright green patches, one in the middle and one on each side of the hind border; sides slightly reflexed: abdomen and posterior legs, ferruginous: fore legs greenish testaceous; tibiæ black and slightly dilated at the tips; tarsi black at the base: hemelytra with two pale green streaks, and with a deeper green costal streak; an irregular black mark along the outer side; membrane slightly ochraceous; wings pellucid. A variety has the antennæ pale green, joints with blackish tips, first entirely blackish; legs pale greenish testaceous. Distinguished from *U. binotata*, chiefly in the length of the antennæ. Long, 10½ mill.

Reported from India, Sikkim (mihi), Calcutta.

349. Urolabida tenera, Westwood.

Urolabida tenera, Westwood, Hope, Cat. Hem., i, p. 45 (1837); Dallas, List Hem., i, p. 316 (1851); Walker, Cat. Het., ii, p. 414 (1867); Stål, En. Hem., v, p. 117 (1876).

Palely luteous, punctured; pronotum and hemelytra, virescent-luteous; pronotum posteriorly fulvescent: body beneath, antennæ and feet pallid (*Westwood*). Long, 14½—15 mill.

Reported from India.

350. Urolabida uniloba, Stål.

Urolabida uniloba, Stål, En. Hem, v, p. 117 (1876).

♂. Closely allied to *U. tenera*, Westwood, but smaller, antennæ shorter, less slender, first joint as long as the pronotum, extremity of the base of the second joint, all the third joint and apical part of the two apical joints, black: genital segment without a lateral process, median process much shorter, gradually narrowed, abruptly recurved from the base, depressed, above with a transverse tubercle almost in the middle, apex bilobed (*Stål*). Long, 10; broad, 4½ mill.

Reported from Darjiling.

351. Urolabida binotata, Walker.

Urolabida binotata, Walker, Cat. Het. ii, p. 415 (1867).

Greenish testaceous, fusiform, very finely punctured: head small:

rostrum extending a little beyond the first coxæ, apex black: antennæ slender, a little longer than the body, first joint as long as the pronotum, second as long as the first, 3-5 joints black towards the tips, 3 shorter than 4, the fourth shorter than 3, fifth shorter than 4: pronotum transversely impressed in front; sides slightly reflexed: abdomen with two apical laminæ: hemelytra with a black longitudinal streak extending from the disc to the outer border of the corium: membrane pellucid (*Walker*). Long, 10½ mill.

Reported from Silhat.

352. Urolabida chennelli, Distant.

Urolabida chennelli, Dist., Trans. Ent. Soc. p. 356 (1887).

Body above reddish ochraceous, marked with black and luteous: head with the median and anterior portions luteous, the eyes fuscous; first joint of antennæ reddish ochraceous: pronotum with a blackish, discal, semicircular line, between which and the base the colour is paler and thickly punctured with fuscous; on the anterior disc are two levigate, luteous spots: scutellum luteous with three black basal spots, one median and one at each angle, a large round, reddish-ochraceous spot divided by a median longitudinal luteous line, and the apical area, distinctly punctured fuscous: corium with the inner claval and the apical margins, black, these black lines outwardly and broadly margined luteous, the costal margin of the same colour: membrane pale hyaline: body beneath and legs luteous, apices of the femora beneath, and apices of the tarsi and rostrum, blackish (*Dist.*). Long, 15 mill.

Reported from Naga Hills (Assam).

353. Urolabida khasiana, Distant.

Urolabida khasiana, Dist., Trans. Ent. Soc. p. 357 (1887).

Above luteous with reddish-ochraceous markings, a small black spot at each lateral pronotal angle, and two black spots on the apical margin of the corium: head with some reddish ochraceous markings behind the eyes which are blackish; 1-2 joints of the antennæ, ochraceous: anterior and lateral margins of the pronotum and transverse bands on disc, also lateral margins of the scutellum and the corium, reddish ochraceous: lateral, claval and apical margins of corium luteous, last with two distinct black spots: membrane pale hyaline: body beneath and legs, luteous: apex of rostrum, a spot on apices of femora beneath, and apices of tarsi, black (*Dist.*). Long, 14 mill.

Reported from N. Khasiya Hills (Assam).

Genus Eurhynchiocoris, Reuter.

Berlin Ent. Zeitschr. xxv, p. 84 (1881).

Body oblong, parallel, somewhat flattish; head horizontal, equal in length to breadth with eyes; juga acuminate, almost twice shorter than clypeus, the latter dilated towards the apex, porrect, genæ subacuminate at the apex, the superior margin more strongly rounded and a very little longer than the juga, buccule twice shorter than the head, laminately dilated towards the apex, very low at the base: rostrum long, slender, reaching almost the apex of the fourth ventral segment, first joint extending beyond the buccule, second a little less than twice longer than the first, third about one-half shorter than second and as long as the fourth joint: first joint of the antennæ as long as the head, second almost one-third longer than the first, third twice shorter than second, the prosternum obtusely carinate in the middle, and the mesosternum at the base (*Reuter*).

354. Eurhynchiocoris sparsipunctatus, Reuter.

Eurhynchiocoris sparsipunctatus, Reuter, Berlin Ent. Zeitschr., xxv, p. 85 (1881).

♂. Ferruginous-fuscous, opaque; pronotum somewhat margined [illegible]e base by a transversely impressed line, disc obsoletely rugose, irregularly sparingly sprinkled with rather large, impressed, black dots, here and there, however, irregularly formed into black spots: anterior lateral margin very slightly sinuate in the middle, black, testaceous at the basal angles: scutellum with the basal angles, two patches on the disc, and a spot before the apex, black; towards the base, finely and sparingly, towards the apex, strongly and densely, punctured black: clavus with a row of dots here and there abrupt at the scutellary margin; corium with a row of impressed dots at the claval suture and some large black dots close to this suture and many others situate in the exterior area, disc almost impunctate in the middle, several irregular spots on the exterior margin, median spot on the corium and another at the middle of the apical margin, fuscous: membrane fuscous with 6—7 paler veins: pectus with four black-fuscous marginal dots on each side, first in the middle of the side of the prosternum, second in basal angle of mesosternum, and two last on the metasternum: dorsum of abdomen red, connexivum testaceous, segments broadly banded black in the middle, spiracula on the venter placed amid black dots, sides of segments here with a median point and more internally a small streak on the basal margin, black (*Reuter*). Long, 11 mill.

Reported from Silhat.

Sub-fam. TESSARATOMINA, Stål.

Hem. Afric., i, p. 33, 233 (1864); En. Hem., i, p. 60 (1870):—*Edessidae*, pt., Dallas, List Hem. i, p. 316 (1851).

(*a*) as in sub-fam. PENTATOMINA (Jour. As. Soc. Ben. pt. II, p. 129, 1887).

(*b*.) Spiracula of the basal ventral segment not hidden by the posterior part of the metastethium, sides of the basal segment scarcely shorter than those of the second segment.

Stål makes the following sub-divisions of the Asiatic species:—

Tarsi 3-jointed: antennæ 4-jointed, second joint shorter than the two apical taken together: apical margin of corium straight or somewhat rounded: membrane at the base with several areolas emitting longitudinal veins; hamus usually distinct; primary and subtended veins entirely distant: segments of abdomen single.

I. Metasternum much elevated and freely produced forwards: scutellum distinctly produced behind the frena, produced part triangular or spoon-shaped: thorax more or less produced hindwards at base in the middle before the scutellum:—Div. *Tessaratomaria*.

II. Metasternum simple or elevated, never freely produced forwards: scutellum equilateral, narrowly and slightly produced at apex behind the frena, rounded or truncated at the apex: thorax produced posteriorly:—Div. *Eusthenaria*.

The other divisions are *Oncomeraria* chiefly from Australia; *Prionogastraria* and *Cyclogastraria* from Africa.

Div. TESSARATOMARIA.

Genus EMBOLOSTERNA, Stål.

En. Hem. i, p. 66 (1870).

Allied to *Tessaratoma* Serv., differs in having the head more acute, perpendicular; eyes larger, ocelli nearer the eyes: lateral angles of pronotum cornuted, anterior lateral margins not flattened out, and apical part of scutellum broader. Body large, obovate; head perpendicular, small, triangular, narrow at apex, subacute; lateral margins somewhat straight, juga much longer than the short tylus and contiguous before it; bucculæ much elevated; eyes large, transverse; ocelli very close to the eyes: antennæ short, somewhat slender, first joint on a level with the apex of the head, second joint a little longer than the third, and somewhat shorter than the fourth: pronotum much declined before the middle, posteriorly amplified and produced hindwards, lateral angles produced outward in a depressed horn, anterior lateral margins somewhat straight,

obtuse towards the anterior margin, not flattened out, posterior lateral margins sinuate: scutellum somewhat equilateral, apical part behind the frena broad, somewhat equilateral, slightly concave: apical margin of corium straight, rounded towards the exterior apical angle: hamus present: prostethium furrowed, the margins of the furrow somewhat amplified: mesostethium with a rather high ridge, prominulous between the first pair of coxæ: metastethium elevated, produced anteriorly in a process which is gradually compressly narrowed, gradually increasing in height forwards, roundly truncated at the apex, and abbreviated between the first pair of coxæ, very obtusely sinuated at the base: apical angles of the abdominal segments, acute, prominulous: feet short, rather stout: femora bispinose beneath at the apex: tibiæ furrowed above (*Stål*).

355. Embolosterna taurus, Westwood.

Tessaratoma taurus, Westw., Hope, Cat. Hem., i, p. 27 (1837).
Tessaratoma cornuta, Dallas, List Hem. i, p. 342 (1851); Walker, Cat. Het., iii, p. 462 (1868).

Black, very thinly punctured: corium more castaneous: apex of scutellum luteous: sides of pronotum produced on both sides in a very large, obtuse horn: body beneath fuscous-luteous; feet short; femora bispinose at the apex (*Westw.*). Long, 26-27 mill.

Above chestnut-brown: pronotum anteriorly thickly rugosely punctured, disc moderately punctured and faintly wrinkled transversely: lateral angles produced into broad, blunt horns, convex above and concave beneath; posterior margin much produced over the base of the scutellum of which the apex is broad, golden-yellow: membrane brassy black: body beneath tawny, abdomen opaque with the median ridge and the lateral margins shining, faintly wrinkled: pectus thickly clothed with a fine golden pubescence, with the sutures deep dark brown, legs castaneous; rostrum deep castaneous with the apex black: antennæ pitchy (*T. cornuta*, Dallas). Long, 29½; exp. hum. 22 mill.

Reported from Malacca, Ligor, Borneo, China.

Genus Tessaratoma, St. Farg. & Serv.

Enc. Méth., x, p. 590 (1825): Am. and Serv., Hist. Nat. Ins. Hém., p. 164 (1843): Dallas, List Hem., i, p. 340 (1851): Walker, Cat. Het., iii, p. 459 (1868): Stål, Hem. Afric., i, p. 229 (1864); En. Hem., i, p. 68 (1870).

Head somewhat small, triangular, rounded at the apex, flat; the juga longer than the tylus, and anteriorly contiguous; antenniferous tubercles very slightly prominulous, unarmed; bucculæ rather elevated: ocelli near the eyes: antennæ 4-jointed, short, somewhat stout: rostrum

short, reaching somewhat the middle of the mesosternum, first joint posteriorly extending somewhat beyond the bucculæ: pronotum rather produced posteriorly over the base of the scutellum which is somewhat produced at the apex, hardly covering the interior basal angle of the membrane; frena extended to a distance beyond the middle of the scutellum: the apical margin of the corium rounded towards the exterior apical angle: membrane with several areolas at the base, emitting longitudinal veins: prostethium anteriorly slightly dilated, sinuated behind the eyes, canaliculate in the middle: mesostethium with a robust ridge, furrowed behind the middle: metastethium much elevated, somewhat sinuated posteriorly, produced to a distance anteriorly, the produced part compressly narrowed forwards, extended to the first pair of coxæ, touching the mesosternal ridge: second ventral segment elevated in the middle in an obtuse tubercle, and touching the base of the metastethium: feet robust, femora usually spinose beneath at the apex; tibiæ furrowed above; tarsi 3-jointed (*Stål*).

356. Tessaratoma nigripes, Dallas.

Tessaratoma nigripes, Dallas, List Hem., i, p. 341 (1851); Walker, Cat. Het., iii, p. 461 (1868); Stål, Ofvers. K. V.-A. Förh., p. 642 (1870); Ent. Hem., i, p. 67 (1870).

Tessaratoma javanica, var. *nigripes*, Voll., Faun. Ent. Ind. Néerl. p. 26 (1868).

♀. Colour and form of *T. papillosa*, Drury: head with the margins narrowly edged black: lateral margins of pronotum rounded, broadly reflexed: apex of scutellum broad and rounded, hollowed above and black: abdomen above black, somewhat shining, finely wrinkled transversely, margins dark brown; beneath dull red, somewhat opaque, very thickly covered with minute confluent punctures, with the median ridge, the lateral margins and an irregular interrupted band on each side of each segment deep pitchy brown: pectus spotted black: sternal ridge deep chocolate brown: legs, rostrum and antennæ, black (or deep brown), the last long and slender (*Dallas*). Long, 32-33 mill.

Reported from Java, Philippines, Sikkim (mihi).

357. Tessaratoma malaya, Stål.

Tessaratoma malaya, Stål, Ent. Hem., i, p. 67 (1870): Distant, A. M. N. H. (5 s.), iii, p. 15 (1879).

♀. Ochraceous: antennæ, extreme margin of head, rostrum, at least half of the apical part of the scutellum behind the frena, spots on the pectus at the coxæ, and a large transverse lateral spot, also the feet, black or fuscous-piceous: dorsum of abdomen subsanguineous:

wings fulvescent. Differs from *T. javanica*, Thunb., in its larger size, and especially in having the metasternal process gradually higher forwards, freely prominulous anteriorly, not quiescent on the sternum, flattened lateral part of pronotum much and gradually rounded, entirely somewhat reflexed: anal valvules, in ♀, as in *T. Javanica* (*Stål*). Long, 35; broad, 19 mill.

Reported from Malacca, Ligor, Assam, Sikkim (mihi).

358. Tessaratoma javanica, Thunberg.

Cimex javanicus, Thunberg, Nov. Ins. Spec., ii, p. 145 (1783): Gmelin, ed. Syst. Nat., i (4), p. 2158 (1788): Stoll, Punaises, p. 9, t. 1, f. 2, and larva, t. 38, f 271 (1788).

Tessaratoma javana, Burm., Handb. Ent., ii (i), p. 350 (1835).

Tessaratoma proxima, Westw., Hope, Cat. Hem., i, p. 27 (1837): Walker, Cat. Het., iii, p. 462 (1868).

Tessaratoma papillosa, Blanchard, Hist. Ins. Hém., p 142, t. 6, f. 2 (1840).

Tessaratoma angularis, Dohrn, Stettin Ent. Zeit., xxiv, p. 349 (1863): Walker, l. c., iii, p. 462 (1868).

Var. *a*.—*Tessaratoma conspersa*, Stål, Trans. Ent. Soc., (3. s.) i, p 595 (1863): En. Hem., i, p. 67 (1870): Walker, l. c., p. 462 (1868): includes *stictica*, De Haan.

Var. *b*.—*Tessaratoma timorensis*, Vollen., l. c, p. 26, t. 3, f. 4 (1868): Walker, l. c., p. 464 (1868).

Tessaratoma javanica, Am. and Serv., Hist. Nat. Ins. Hém, p. 16 (1843): Dallas, l. c., p. 340 (1851): Voll., Faune Ent. l'Arch. Ind. Néerl., iii, p. 25, t. 3, f. 4b (1868): Walker, l. c., 1, p. 461-2 (1868): Stål, En. Hem., i, p. 67 (1870).

Varies in coloration from almost ferruginous to light olive brown. In *T. javanica*, the anal segment, in ♂, is truncate at the apex, and the apical angles are rounded: in *T. papillosa*, the anal segment, in ♂, is sinuate at the apex and the apical angles acute. In the latter, the lateral anal valvules, in the ♀, are more distinctly sinuate at the apex and less obliquely than in the former; the interior apical angle, too, is acute and tooth-shaped. Thunberg describes this species as:—'glabrous, luteous, anus obtuse, antennæ and feet ferruginous.' Stoll describes it:—antennæ 4-jointed, black; eyes prominent, distinct: margins of pronotum produced forwards, body red-brown with a pectoral spine: feet black. When alive entire body beneath covered with a white powdery substance, above of the colour of Russian leather or hazel, anterior margin of the head weakly emarginate between the lobes: eyes and ocelli yellowish or glaucous: antennæ blackish-violet, pilose: lateral margins of pronotum sometimes dilated so far as to form a quadrant: apex of scutellum often brown: beneath, entire body, or some patches on the pectus, sternal and abdominal ridges and the margin of the abdomen of a deep blackish brown, or the entire lower surface of that colour: feet black-brownish or violet (*Voll.*). The ♀ is smaller, sides of thorax rounded, a little

dilated towards the posterior angles: antennæ and feet fuscous, body beneath and abdomen above more carneous: anus formed of a single quadrate lobe (*T. proxima*, Westw.). Long, 26 mill. The length apparently varies from 25 to 35 mill.

Var. *a*:—*T. conspersa*, Stål, ♂. Testaceous-flavescent, rather densely punctured, above remotely and minutely sprinkled fuscous: pronotum rugosely punctured at the anterior lateral margins which are obtusely roundly subangulated in the middle: metasternal ridge somewhat reaching the first coxæ: femora bispinose beneath at the apex (*Stål*). Long, 25; broad, 14 mill. Celebes, Java, Arakan (mihi). In the Arakanese specimen, the entire scutellum is black. Vollenhoven makes the apex of the scutellum and the antennæ black; body beneath hardly more obscure: pectus with some transverse brown patches: feet obscure brown-red.

Var. *b*:—*T. timorensis*, Voll.: small; pronotum not dilated, colour hazel, anterior and lateral margins finely rugose: antennæ and feet obscure, almost black. Timor, Sibságar (Assam).

Reported from E. Archipelago, Malacca, Sikkim, Assam (mihi.).

359. Tessaratoma papillosa, Drury.

Cimex papillosus, Drury, Ill. Nat. Hist., i, p. 96, t. 43, f. 2 (1770): Wolff, Ic. Cim., i, p. 12, t. 2, f. 12 (1800): China.

Cimex chinensis, Thunb., Nov. Ins. Spec., ii, p. 45, t. 2, f. 59 (1783): Walker, Cat. Het., iii, p. 461 (1868): China.

Cimex sinensis, Gmelin, ed. Syst. Nat., i (4), p. 2158 (1788): Japan, China.

Tessaratoma chinensis, Guérin, Règne An., Texte, Ins. iii, p. 345 (1829-44): Dallas, List. Hem., i, p. 340 (1851); Walker, l. c., p. 461 (1868): China.

Tessaratoma sonneratii, St. Farg. and Serv., Enc. Méth., x, p. 590 (1825): Guérin, l. c., Icon., t. 55, f. 4 (1833): India.

Larva, *Tessaratoma ossa-cruenta*, Gray, Griffith, An. King., xv, p. 239, t. 46, f. 1 (1832).

Tessaratoma papillosa, Hahn, Wanz. Ins. ii, p. 123, t. 67, f. 204 (1834): Am. and Serv., Hist. Nat. Ins. Hém., p. 16 (1843): Walker, l. c., p. 461 (1868): Stål, En. Hem., i, p. 68 (1870).

Head small, yellowish-olive, eyes of the same colour: antennæ black: pronotum yellow-olive, elevated above the level of the head, sides rather projecting at the ligature of the wings: scutellum triangular, terminating in a point near the middle of the abdomen, upper part of it lying beneath the pronotum: hemelytra opaque, yellow-olive; membrane almost transparent; wings yellow-brown: abdomen above dark red, beneath clay-colour, serrulate on the sides, or with a tooth on each segment: anus terminates in two angular points, with a small spine or corniele on each side: pectus pale clay colour, having a black

spot directly under the fore-legs and another on each side of the intermediate pair: all the legs brown-yellow: rostrum brown (*Drury*). Long, about 25-26 mill.

Flavescent, anus 4-toothed, sternum porrect (*Gmelin*, l. c.).

♀. Above entirely testaceous: beneath with head and pronotum a little lighter and abdomen a little ferruginous: lateral margins of pronotum almost round, posterior margin truncate, almost straight: sternal process widened, not extending beyond the base of anterior coxæ: abdomen dentate on the sides, last segment with four small angles, the two interior formed by an emargination: all femora beneath with two short spines, placed side by side, a little before the tip (*T. sonneratii*, Serv.). Long, 25-26 mill. Serville observes that he had a specimen of the ♂ in which there was no olivaceous colour, posterior margin of the pronotum yellow, tip of scutellum alone brown: antennæ and feet brown ferruginous. Probably this ♂ belongs to the preceding species. Stål observes that the lateral valvules, in the ♀, are distinctly sinuated at the apex and less obliquely so than in *T. javanica*, the interior apical angle is acute and dentiform.

Reported from China, Java, India. The Indian Museum has specimens from Amoy, Assam, Calcutta.

360. Tessaratoma (?) furcifera, Walker.

Tessaratoma furcifera, Walker, Cat. Het. iii, p. 463 (1868).

Testaceous: head, pronotum and scutellum thickly and very minutely punctured: head obliquely and finely striated on each side, rostrum piceous; antennæ black, second joint a little longer than the third: thorax with the sides piceous, forming two very much rounded angles, posterior angles rounded: scutellum slightly grooved towards the tip which has a black forked spot: pectus partly black, ridge ferruginous, reaching the fore coxæ: abdomen ferruginous, posterior angles of the apical segment, elongated, acute: legs ferruginous: hemelytra thickly and minutely punctured; membrane pale testaceous-cinereous. Thorax diverging directly from the head less than in *T. papillosa*, sides of thorax almost angular (*Walker*). Long, $27\frac{1}{4}$ mill.

Reported from Siam.

Genus Siphnus, Stål.

Trans. Ent. Soc. (3 s.), i, p. 597 (1863); En. Hem., i, p. 68 (1870): Walk., Cat. Het. iii, p. 467 (1868).

Body obovate: head rather large, obtusely triangular: antennæ 4-jointed: pronotum somewhat produced posteriorly, posterior lateral margins slightly sinuate: scutellum triangular, narrow at the apex:

metastethium elevated, produced like a horn forwards: feet short, robust, unarmed. Allied to *Tessaratoma*, head larger, pronotum not so produced posteriorly (*Stål*).

361. Siphnus alcides, Stål.

Siphnus alcides, Stål, Trans. Ent. Soc., (3 s.) i, p. 597 (1863); En. Hem., i., p. 68 (1870): Walker, Cat. Het. iii, p. 467 (1868).

♂. Yellow-castaneous, shining, hemelytra more obscure: antennæ obscurely subæneous, apical joint weaker towards the apex: lateral margins of pronotum and abdomen, also costal margin of hemelytra anteriorly greenish-brassy: membrane fuscous: pronotum one-fifth shorter than breadth, sparingly, distinctly punctured, anterior margin somewhat sinuate in the middle, lateral margins slightly rounded behind the middle, not reflexed, posterior margin slightly rounded: scutellum sparingly, distinctly punctured: hemelytra finely, remotely punctured (*Stål*). Long, 31; broad, 16½ mill.

Reported from Cambodia.

362. Siphnus hector, Stål.

Siphnus hector, Stål, Trans. Ent. Soc., (3 s.), i, p. 597 (1863); En. Hem., i, p. 68 (1870): Walker, Cat. Het., iii, p. 467 (1868).

♂. Narrowly obovate, weakly castaneous, remotely obscurely punctured: scutellum, antennæ and feet, fuscous-castaneous: apex of two apical joints of the antennæ, apex of scutellum and basal part of femora, yellow-castaneous: hemelytra castaneous, veins sparingly sprinkled flavescent: membrane fuscous: anterior lateral margins of pronotum, margin of abdomen and irregular, transverse spots on venter, arranged in four rows, subæneous-fuscous. Narrower than the preceding, more densely and more distinctly punctured: pronotum one-third shorter than breadth, anterior lateral margins slightly incrassate, straight, anteriorly very slightly rounded, anterior margin slightly somewhat sinuate in the middle, basal margin somewhat straight (*Stål*). Long, 29; broad, 15 mill.

Reported from Malacca.

363. Siphnus dilatatus, Walker.

Siphnus dilatatus, Walker, Cat. Het., iii, p. 467 (1868).

Tawny, elongate-oval: head finely and transversely striated: rostrum extending nearly to the intermediate coxæ; tip black: pronotum and scutellum thinly and roughly punctured: pronotum with a very

slight transverse ridge near the fore-border and with a black marginal line extending on each side from the fore-border to the hind angle which is rounded and prominent: scutellum darker than the pronotum, triangular, acute, abruptly attenuated and slightly furrowed near its tip: pectus testaceous; sternal ridge lanceolate, extending to the first coxæ, its posterior extremity concave, contiguous to the broad, round, ventral spine, abdomen blackish: beneath piceous, very thickly and finely punctured, its middle part longitudinally and very minutely striated; hind angles of the apical segment elongated, acute, not extending so far as the appendages, which are acute: legs piceous; femora tawny at the base: hemelytra piceous, thickly and minutely punctured: wings black (*Walker*). Long, 38½ mill.

Reported from Siam.

Genus Hypencha, Am. and Serv.

Hist. Nat. Ins. Hém., p. 166 (1843): Stål, En. Hem., i, p. 68 (1870).

Head rather pointed: antennæ a little longer than in the genus *Tessaratoma*, with the joints proportionately more slender and not short, stout and incrassate: rostrum not reaching the insertion of the intermediate feet: pronotum transverse, the posterior angles prominent, though rather rounded; the posterior margin slightly rounded and sinuated, not extending over the base of the scutellum: sternal ridge extended in a point which becomes lower at the insertion of the intermediate feet and advances in the form of a recurved hook, compressed and obtuse, beyond the first pair of feet: scutellum not reaching the middle of the abdomen, its tip canaliculate or spoon-shaped: abdomen oval, not or only very slightly enlarged on each side: feet as in *Tessaratoma* but the internal or posterior spine at the end of the intermediate and last femora is notably more robust than the external or anterior spine: there are apparently no spines at the tip of the first femora: the other characters as in *Tessaratoma* (*Am. and Serv*).

364. Hypencha luctuosa, Stål.

Hypencha luctuosa, Stål, Trans. Ent. Soc., (3 s.) i, p. 596 (1863); Stål, En. Hem. i, p. 69 (1870).

Tessaratoma luctuosa, Walker, Cat. Het., iii, p. 463 (1868).

♂. Obovate, subæneous black; above sparingly, distinctly, on hemelytra more finely, punctulate; beneath, densely and finely rugulosely punctured: apical joint of antennæ (except the base), head beneath and meso- and meta-stethium yellow-testaceous: lateral angles of pronotum hardly prominent. Allied to *H. apicalis*, St. Farg., but

narrower, lateral angles of pronotum rounded, hardly prominent outwards and in no sense forwards: margins of abdomen immaculate: last femora beneath near the apex armed with two spines (*Stål*). Long, 28; broad, 15 mill.

Reported from Burma.

365. HYPENCHA APICALIS, St. Fargeau & Serville.

Tessaratoma apicalis, St. Farg. and Serv., Enc. Méth. x, p., 591: Burm., Handb. Ent., ii (i), p. 351 (1835): Voll., Faune Ent. l'Arch. Ind. Neérl., iii, p. 26 (1868); Walker, Cat. Het., iii, p. 462 (1868).

Var.—*Hypencha reriki*, Ellenr., Nat. Tijdschr. Ned. Ind., xxxiv, p. 160, f. 30 (1862); Walker, l. c., p. 462 (1868).

Tessaratoma picea, Dallas, List Hem., i, p. 341 (1851).

Hypencha apicalis, Am. & Serv., Hist. Nat. Ins. Hém., p. 166 (1843); Stål, En. Hem., i, p. 68 (1870).

♀. Deep pitchy brown, shining: last joint of antennæ ferruginous, black at the base: membrane bronzed: sides of pronotum dilated, rounded, its posterior margin very little advanced over the scutellum, of which the apex is spathulate: sternal ridge elongate, rising at its anterior part and extending beyond the base of the first pair of coxæ: abdomen a little denticulate on the margin, by reason of the posterior angles of the upper segments extending beyond those which follow: last segment with four, almost spinose, angles, the two interior formed by one emargination: all the femora with two spines beneath placed side by side a little before the apex, those of the first pair very short those of the last pair long, like the posterior spine of the middle pair (*Serv.*). Long, 33-34 mill.

Var. ♀. Shining-black or piceous, with very numerous, small, brassy-green impressed punctures on the pronotum and scutellum: hemelytra violaceous black, varied with purple and cærulean: anterior angle of the pronotum unidentate: abdomen attenuated hindwards, with the margin serrated, posterior teeth longer, curved and arcuate: the posterior angle of the scutellum fuscous-brunneous, with a foveola, containing an intumescence: antennæ black, apex of the last joint ochraceous-brunneous: feet piceous: beneath fuscous-black; sternum, neck and face ochraceous (*H. reriki*, Ellenr.). Long, 28—29 mill.

Reported from Java, Sumatra, Borneo.

366. HYPENCHA OPHTHALMICA, Stål.

Hypencha ophthalmica, Stål, Trans. Ent. Soc., (3 s.) i, p. 596 (1863); En. Hem. i, p. 69 (1870).

Tessaratoma ophthalmica, Walker, Cat. Het., iii, p. 463 (1868).

♀. Distinctly punctured, obscurely ferruginous, tinted subcupreous;

beneath with feet, apex of scutellum and marginal spots on abdomen, sordid testaceous-flavescent: tibiæ above margined black: eyes large: lateral angles of pronotum somewhat prominent, anterior lateral margins somewhat straight: last femora beneath with two spines at the apex (*Stål*). Long, 24; broad, 12 mill.

Reported from Ligor, Malacca.

Genus Pygoplatys, Dallas.

List Hem., i, p. 338 (1851): Walker, Cat. Het., i, p. 459 (1868); Stål, En. Hem., i, p. 69 (1870).

Head not broader than long, somewhat pointed in front, scarcely emarginate with the lateral margins plane: antennæ 4-jointed, rather stout, basal joint not reaching the apex of the head, second joint longer than the third, fourth about equal to the second: rostrum 4-jointed, reaching the middle of the space between the anterior and intermediate coxæ, second joint longest; basal joint very thick, about as long as the fourth, fourth longer than the third: pronotum with the lateral angles produced into broad flat processes, or strong, pointed spines; the posterior margin produced in a semicircle over the base of the scutellum: pectus with a very strong ridge, attached to the metastethium, where it is somewhat pentagonal, deeply emarginate posteriorly for the reception of the ventral spine, produced anteriorly in a long free spine, reaching far forwards and considerably depressed at its apex; mesostethium with a distinct canal in which the apex of the rostrum reposes: scutellum somewhat obtuse at the apex, distinctly channelled: abdomen oblong, nearly as broad at the apex as at the base, projecting far beyond the hemelytra on each side, with the posterior angles of the apical segment produced; vulvar plates very broad; basal plates received in a semicircular emargination in the middle of the apical sigment of the abdomen; lateral plates transverse, with their apices acute and with a strong tooth in the middle of their posterior margins; median plates united, forming a single, somewhat quadrate piece, widened behind, with two strong spines on its posterior margin and its lateral angles rather acute; there are thus eight teeth in the space between the posterior angles of the abdomen: legs moderate; femora unarmed; tarsi 3-jointed (*Dallas*).

367. Pygoplatys acutus, Dallas.

Pygoplatys acutus, Dallas, List Hem., i, p. 340 (1851); Walker, Cat. Het., iii, p. 460 (1868); Stål, En. Hem., i, p. 69 (1870).

Pygoplatys roseus, Voll., Faun. Ent. l'Arch. Ind. Néer., iii, p. 24, note, (1868).

♀. Above pale brown, thickly and rather strongly punctured: pro-

notum with a long, stout, acute spine on each side: margins of abdomen with a brassy-green spot on each segment: body beneath and legs somewhat fulvous; sternal ridge bright fulvous; antennæ pitchy brown (*Dallas*). Long, 17¾; breadth of shoulders, 16¾ mill.

Above rosy, except the base of the head and the anterior inclined part of the pronotum which like the body beneath are luteous: posterior part of pronotum punctured black; lateral horns rather long, turning a little forwards, rounded at the apex, (*P. roseus*, Voll.). Long, 18 mill.

Reported from Malacca, Burma.

368. Pygoplatys minax, Vollenhoven.

Pygoplatys minax, Voll., Faune Ent. l'Arch. Ind. Néerl., iii, p. 23, t. 3, f. 3 (1868).

♀. Above obscurely fulvous, beneath, luteous-ochraceous: head reddish ochraceous; eyes glaucous, ocelli yellow placed on small, black, cuneiform spots: antennæ of a deeper red, pronotum very broad; lateral angles in the form of horns, rather broad at the base, recurved, diminishing in size towards the tip which is obliquely truncated, their colour is of a deeper red than the disc, marked with small black impressed punctures, the rest of the pronotum is indistinctly punctured, except the transverse part near the anterior margin, posterior margin yellowish: scutellum lightly sprinkled with impressed dots, apex channelled: corium very finely punctured, disc paler; membrane hyaline, colourless: the portion of the abdomen extending beyond the hemelytra is broad, slightly purplish red; the angles of the segments are denticulate and touch almost a submarginal black band: feet and tibiæ with a reddish tinge (*Voll.*). Long, 19 mill.

Reported from Borneo: Indian Museum has a specimen from Johore. Possibly *P. ralandii*, Voll. (l. c.), is only a variety.

Genus Amissus, Stål.

Trans. Ent. Soc., (3 s.) i, p. 595 (1863): En. Hem. i, p. 70 (1870).

Body, large, oval: head subelongate; juga very long, contiguous before the tylus; bucculæ much elevated: ocelli remote from the eyes: antennæ 4-jointed: posterior margin of pronotum roundly produced in the middle above the base of the scutellum, which is itself produced at the apex: apical margin of corium straight, apical angle rounded; membrane furnished at the base with many areolas, emitting longitudinal veins: mesostethium elevated, anteriorly somewhat produced and cleft: metastethium slightly elevated, posteriorly very broadly sinuate: second ventral segment slightly elevated and produced at the base in the

middle: feet somewhat short, femora armed with two spines beneath at the apex: last pair of tibiæ about equal in length to the femora: 1-2 joints of tarsi equally long: allied to *Hypencha*, Am. & Serv. but structure of head and of sterna different (*Stål*).

369. Amissus atlas, Stål.

Amissus atlas, Stål, Trans. Ent. Soc. (3 s.) i, p. 596 (1863); Walker, Cat. Het., iii, p. 466 (1868); Stål, En. Hem., i, p. 70 (1870).

♀. Fuscous-castaneous: narrow limbus and posterior part of pronotum, apex of scutellum, hemelytra, coxæ, trochanters and margin of abdomen, weakly castaneous: antennæ, veins of hemelytra and the tarsi sub-castaneous-yellow: apical angles of abdominal segments, black: pronotum robustly cornuted: head with the sides subparallel, and slightly sinuate in the middle, subtruncate at the apex, more than twice longer than the breadth: second joint of antennæ somewhat longer than the third, but shorter than the apical: pronotum remotely distinctly punctured, posteriorly somewhat smoother, lateral angles obliquely produced forwards in long, depressed, slightly arcuate horns; anterior lateral margins crenulated: scutellum remotely, distinctly, punctured, smooth at the apex: hemelytra densely punctured, veins smooth: beneath densely alutaceous (*Stål*). Long, 41; broad, 19 mill.

Reported from Singapore, Tenasserim.

Div. Eusthenaria (p. 52).

Genus Eusthenes, Laporte.

Ess. Hém. p. 64 (1832); Am. & Serv., Hist. Nat. Ins. Hém., p. 167 (1843); Dallas, List Hem., i, p. 342 (1850); Walker, Cat. Het., iii, p. 467 (1868): Stål, Hem. Afric., i, p. 225 (1864); En. Hem., i, p. 71, 230 (1870).

Head almost squarely truncate at the tip: antennæ rather long: pronotum transverse, lateral margins defined, posterior angles prominent but rounded, posterior margin not extending itself over the scutellum: sternal ridge not prolonged beyond the intermediate pair of feet and consisting only of a kind of plate placed between those and the last pair, straightly truncate posteriorly, and rounded anteriorly, narrower in the ♂: scutellum not reaching the middle of the abdomen, its tip ending in a small, almost square and spoon-shaped, prolongation: four vulvar pieces in ♀, square at their tip; anal plate, in ♂, not near so broad as in *Tessaratoma*: feet very robust, first pair rather small, intermediate longer; posterior femora much longer and stouter than the intermediate, especially in the ♂, with a strong hook-like spine at the base; all the femora with two weak spines towards their tips, those of the first pair hard-

ly visible: posterior tibiæ, in ♂, strong, curved inside at their base; tarsi strong and large, second joint almost as large as the third (*Am.& Serv.*).

a. First pair of femora beneath near the apex unarmed or furnished on both sides with a small spinule: intermediate femora beneath, near the apex, with a moderate or small distinct spine: mesostethial ridge or wrinkle depressed, often broadly and distinctly furrowed, posteriorly broader, convex and more elevated; metastethium anteriorly narrowed, not however compressed, touching the elevated base of the mesostethial ridge, posteriorly not or but very slightly inflexed: second ventral segment more or less elevated in the middle, usually touching the base of the metastethium.

b. Feet obscurely piceous or piceous-black: wings usually obscurely fuscous and slightly tinged violaceous.

c. Tarsi and feet concolorous; spiracula cinctured flavescent. *E. robustus*, St. Farg., and *E. scutellaris*, Herr. Schäff.

cc. Tarsi pale castaneous or yellow-castaneous; wings somewhat violaceous-fuscous.

E. hercules, Stål; *E. cupreus*, Westwood, *E. eurytus*, Dist.

bb. Feet, a great part of the first joint of the antennæ and the apex of the scutellum, weakly castaneous: last pair of femora sometimes fuscous-castaneous.

E. polyphemus, Stål.

aa. Fourth joint of the antennæ, yellow-testaceous at the base: wings and dorsum of the abdomen black-violaceous: first pair of femora beneath near the apex, with a somewhat robust spine on the anterior side, with a very minute spinule or unarmed, on the posterior side: middle femora near the apex with a rather large spine on both sides: metastethium anteriorly and posteriorly gradually compressly narrowed: second ventral segment not elevated in the middle, not higher than the first segment: apical angles of the abdominal segments not so prominulous as in the preceding.

E. sævus, Stål.

370. Eusthenes robustus, St. Fargeau & Serville.

Tessaratoma robusta, St. Farg. & Serv., Enc. Méth. x, p. 591 (1825).

Oncomeris robustus, Blanchard, Hist. Ins. p. 142 (1840).

Eusthenes elephas, Dohrn, Stettin Ent. Zeit., xxiv, p. 351 (1863); Walker, Cat. Het., iii, p. 468 (1868).

Eusthenes robustus, Am. & Serv., Hist. Nat. Ins. Hém., p. 167 (1843): Dallas, List Hem., i, p. 342 (1851): Walker, Cat. Het., l. c. p. 468 (1868): Vollenhoven, Faune Ent. l'Arch. Indo-Néer., iii, p. 27 (1868): Stål, En. Hem., i, p. 71, 230 (1870): Distant, A. M. N. H., (5 s.) iii, p. 45 (1879).

♂. Body broad, blackish-brown: antennæ black: pronotum and

scutellum covered with transverse wrinkles which give it a leathery appearance: apex of scutellum and hemelytra brown-ferruginous: sides of pronotum a little dilated, lateral margins dilated, rounded: abdomen dentate on the margins: anus emarginate: all the femora beneath with two spines, side by side, before the apex; posterior femora long, very stout, having a large, strong and very pointed spine towards their base; tibiæ very arcuate, especially at the base (*Serv.*). The anal plate in the ♂ is short and almost straightly truncate at the tip: in the ♀, the anal plate is bilobed, and also the pronotum is more deeply wrinkled, and the ventral grooves are neither so long nor so deep.

Pronotum distinctly broader than the base of the hemelytra, anterior lateral margins somewhat dilated, distinctly rounded behind the middle, lateral angles distinctly prominent, obtuse: apical part of scutellum produced behind the frena, somewhat broadish, subquadrate, obtusely rounded at the apex, flavescent-castaneous: mesostethial wrinkle or ridge posteriorly convexly elevated: the metastethium not pallescent, at least in ♀, narrowed somewhat forwards before the middle, behind the middle, first narrowed somewhat hindwards, then furnished with parallel sides, truncated at the base, broader at the base than at the [illegible] second ventral segment elevated in the middle and touching the [illegible]ethium: venter marked obliquely behind the spiracula with a [illegible] yellow-castaneous spot: last tibiæ in ♂, curved; in ♀, straight, [illegible]owly furrowed beneath from the base, hardly beyond the middle: last tarsi with the first joint at the apex and second at the base yellow-castaneous: wings obscurely subviolaceous-fuscous: dorsum of abdomen opaque (*Stål*). Long, 36-46 mill.

Reported from Java, India, Sibsagar (Assam).

371. Eusthenes scutellaris, Herrich Schäffer.

Tessaratoma scutellaris, Herr. Schäff., Wanz. Ins. iv, p. 81, t. 133, f. 410 (1839): Walker, Cat. Het., iii, p. 463 (1868).

Eusthenes minor, Voll., Faun. Ent. l'Arch Indo-Néer., iii, p. 29 (1868).

Eusthenes scutellaris, Stål, En. Hem., i, p. 71, 231 (1870); Distant, A. M. N. H. (5 s.) iii, p. 45 (1879).

Dark castaneous-brown: head, scutellum, abdomen, antennæ and feet darker, apex of the fourth joint of the antennæ ferruginous: above sparingly punctured: pronotum and scutellum transversely rugose; apex of scutellum narrow, produced: last femora incrassate, having near the base inwards, a very long, somewhat curved tooth and before the apex two teeth: last tibiæ stout, arcuate (*Herr. Schäff.*), ♂, beneath usually of a very obscure brown with a violet tinge, and the ♀ of a brown-red. Stål remarks that this species differs from *E. robustus*, Serv., in its smaller

size, pronotum not so broad, anterior lateral margins somewhat straight, or very slightly rounded, apex of scutellum narrower, longer, behind the middle, gradually narrowed, angulated at the apex, mesostethial ridge posteriorly broader and more tumid, metastethium pallescent, apparently shorter and broader, abdomen especially behind the middle narrower, posterior angles of sixth segment more acute and produced to a greater distance, anal lobes longer and narrower, last pair of feet a little shorter, last pair of femora not reaching sixth ventral segment, first joint of last tarsi shorter, its apex, also base of second joint concolorous, which, however, varies much: wings paler, palely sub-fuscous ochraceous; dorsum of abdomen subviolaceous-shining. Long, 25-27 mill.

Reported from Java, Sumatra, India, Khasiya Hills (Assam, mihi).

372. Eusthenes hercules, Stål.

Eusthenes Hercules, Stål, En. Hem. i, p. 231 (1870).

Above rufescent piceous; beneath piceous-flavescent; a narrow median band on the venter, fuscous, spiracula with a pale cincture; scutellum and feet fuscous-piceous, last pair of feet more obscure flavescent-castaneous: dorsum of abdomen obscurely somewhat ginous, obsoletely punctulate: connexivum subviolaceous-black, spot on segments yellow-castaneous: apex of scutellum castaneous.

♂. Anal segment amplified hindwards, broadly somewhat truncated at the apex, somewhat sinuated in the middle, posterior angles rounded at the extremity of the apex: apical angles of the sixth segment of the abdomen not so produced, obtuse at the apex itself: metastethium equally narrowed forwards and hindwards from the middle, equally broad at the base and apex, posteriorly slightly inflexed: second ventral segment not elevated in the middle, not touching the metastethium, punctuation as in the other species of the genus; stature and form of pronotum like *E. robustus*, Serv.; differs in having the pronotum not broader than the hemelytra, the mesostethial ridge posteriorly very slightly elevated and furrowed almost to the base, the colour of metastethium, of the lower side of the body and tarsi; also the first joint of the last pair of tarsi longer: last tibiæ in ♂, stout, hardly curved towards the base, beneath narrowly convex, almost third basal part broadly depressed, gradually narrowed (*Stål*). Long, 39; breadth at base of hem. 20 mill.

Reported from Silhat, Naga Hills (Assam).

373. EUSTHENES EURYTUS, Distant.

Eusthenes eurytus, Dist., Trans. Ent. Soc., p. 358 (1887).

Allied to *E. hercules*, Stål, but smaller, the pronotum much less rounded at the antero-lateral margins, and the lateral angles even less produced than in that species: antennæ entirely black, except the apical joint which is very narrowly ochraceous at the apex: tarsi bright ochraceous (*Dist*). Long, 36; exp. angl. pron. 16 mill.

Reported from India.

374. EUSTHENES CUPREUS, Westwood.

Tessaratoma cuprea, Westwood, Hope, Cat. Hem., i. p. 27 (1837).

Eusthenes cupreus, Dallas, List Hem., i. p. 342 (1851); Walker, Cat. Het., 1, p. 467 (1868); Stal, En. Hem., 1, p. 71,231 (1870); Distant, A. M. N. H., (5 s.) iii, p. 45 (1879).

Castaneous, coppery or brassy, more or less shining; scutellum black: antennæ as long as half the body, first joint very minute, 2-3 joints equal, fourth longer, extreme tip rufescent; posterior femora (♂) long and much thickened, furnished with a long spine before the middle and with teeth towards the apex: pronotum and scutellum more or less deeply transversely furrowed: anal apparatus in ♂, formed of two lobes; in ♀, quadrilobate (*Westw.*) Long, 27 mill.

Reported from Nepál, Assam, Sikkim (mihi). N. India, Penang, Siam.

Stål notes (En. Hem. i, p. 231) that in collections two species are confused, one (long, 24; breadth of hem. 12 millims) known by its smaller size, a little more shining, anterior part of pronotum and the hemelytra at base olivaceous, somewhat ænescent, antennæ shorter, anterior lateral margins of the pronotum not reflexed, dorsum of abdomen with a large shining brassy-green disc. The other species is larger (long, 29—35; breadth of hem. 14½—17½ millims), less shining, pronotum anteriorly more obscure, but scarcely olivaceous or ænescent, antennæ longer, extreme part of the anterior lateral margins of the pronotum very narrowly reflexed, dorsum of abdomen without a brassy-green disc. The longer of these species is *E. cupreus*, Westw., and the other is *E. theseus*, Stål.

375. EUSTHENES THESEUS, Stål.

Eusthenes theseus, Stål, En. Hem., i, p. 231 (1870).

Characters as noted above under *E. cupreus*, Westw.

376. Eusthenes polyphemus, Stål.

Eusthenes polyphemus, Stål, Trans. Ent. Soc., (3 s.) i, p. 598 (1863); En. Hem., i p. 72, 232 (1870); Walker, Cat. Het., iii, p. 468 (1868).

♂, ♀. Above more or less obscurely ænescent-castaneous; beneath with feet, apex of scutellum, a great part of the first joint of the antennæ and small dorsal marginal spots on the abdomen, yellow-castaneous: last pair of femora somewhat fuscous-castaneous. In the ♀, the metastethium is posteriorly much broader than in the ♂, in which the form of the metastethium is very like that of *E. hercules*, Stål, and also the form of the second ventral and anal segments, but differs in having the mesostethial ridge more elevated and there without a furrow, the last pair of tibiæ not so stout, and the lower flattened part longer, reaching the middle of the tibiæ. The last tibiæ, in the ♂, are very slightly curved. Differs from *E. robustus*, Serv., in having the anterior lateral margins of the pronotum, not, unless posteriorly, slightly rounded, lateral angles somewhat more prominulous, the very large spine on last pair of femora and the last pair of tibiæ more curved: the last tibiæ, in ♂, are very slightly curved Long, 33; broad, 17 mill.

Reported from the Dekhan, N. India.

377. Eusthenes sævus, Stål.

Eusthenes sævus, Stål, Trans. Ent. Soc., (3 s.) i, p. 597 (1863); Walker, Cat. Het., iii, p. 468 (1868); Stål, En. Hem., i, p. 72, 232 (1870).

♂, ♀. Olivaceous-black, slightly turning into ferruginous: beneath with the base of the apical joint of the antennæ and the apex of the scutellum, yellow testaceous, here and there purpurascent and ænescent. Smaller than *E. robustus*, Serv., and longer than *E. cupreus*, Westw., differs in having the antennæ a little stouter, also in the colour of the apical joint of the antennæ and of the apex of the scutellum, especially, in having the elevated part of the metastethium narrower posteriorly, and the large spine of the last pair of femora in the ♂ placed nearer to the base; the other spines on the last femora are fewer and smaller than in *E. robustus*: apical angles of sixth abdominal segment, in ♂, somewhat straight, hardly acute: anal segment in ♂ posteriorly: broadly and obtusely sinuated, posterior angles obtusely rounded (*Stål.*) Long, 27-30; broad, 13 mill.

Reported from N. China: Dekhan, Sikkim (mihi).

378. Eusthenes antennatus, Distant.

Eusthenes antennatus, Distant, Trans. Ent. Soc., p. 357 (1887).

Head, pronotum and corium purplish brown: legs ochraceous;

scutellum very dark olivaceous with the apex castaneous: membrane shining brassy brown: basal and apical joints of the antennæ ochraceous, the last with the apex blackish, 2–3 joints blackish, base of second joint very narrowly ochraceous: apical joint somewhat longest, 2 very slightly longer than 3: body beneath brownish-ochraceous, or, in some, castaneous: legs castaneous, tarsi very slightly pale: pronotum finely, transversely striate; scutellum more coarsely striate; corium thickly and finely punctate: posterior femora with a long spine and a double row of short spines on apical half of the under surface, of which the two last are the longest. The elongate form of the body and the colour of the antennæ distinguish this species which is variable: connexivum generally purplish brown, with a more or less distinct ochraceous spot at the base of the segments (*Dist.*). Long, 35-36; exp. angl. pron., 12 mill.

Reported from Khasiya Hills (Assam); Nepal.

Genus Eurostus, Dallas.

List Hem., i, p. 342 (1851); Walker, Cat. Het., iii, p. 468 (1868): Stål, Hem. Afric., i, p. 225 (1864); En. Hem., i, p. 72 (1876).

Head longer than broad, narrowed in front, with the apex slightly emarginate: antennæ 4-jointed, second joint longer than the third, fourth about equal to the second: rostrum 4-jointed, scarcely reaching the middle of the mesostethium, second joint longest, 3-4 nearly equal, shorter than the first; pronotum with the lateral angles unarmed, posterior margin not produced: scutellum, short, not reaching the middle of the abdomen; the apex small and rounded, somewhat spoon-shaped: abdomen unarmed at the base: sternum without a ridge: legs stout; the four anterior femora with two spines beneath close to the apex, last pair much incrassated (♂), with a very long acute spine near the base, two shorter ones near the apex, and a double row of minute spines, or acute tubercles, running along the under surface (*Dallas*).

379. Eurostus validus, Dallas.

Eurostus validus, Dallas, List Hem. i, p. 343, t. 11, f. 2 (1851); Walker, Cat Het. iii, p. 468 (1868): Stål, En. Hem. i, p. 72 (1870).

♂. Elongate-ovate, deep chestnut, punctured: head finely rugose: pronotum minutely punctured, faintly transversely rugose, with the anterior and lateral margins, black: scutellum coarsely rugose, with the disc finely, the margins coarsely, punctured; with the lateral margins and the tip blackish: corium rather paler than the rest of the surface, very thickly and minutely punctured: membrane brownish, semitrans-

parent: margins of abdomen black: the abdomen beneath, smooth and shining, impunctate, tinted with violet; stigmata yellowish: pectus violet-black, strongly wrinkled; prostethium castaneous with a violet-black, wrinkled patch; sternum pale: legs pitchy castaneous, slightly shining, with numerous minute tubercles; tarsi paler: rostrum castaneous, with the tip black: antennæ black; apical joint bright orange, with the base black (*Dallas*). Long, 30-34 mill.

Reported from China, India (?).

380. Eurostus grossipes, Dallas.

Eurostus grossipes, Dallas, List Hem., i, p. 343 (1851): Walker, Cat. Het., iii, p. 468 (1868): Stål, En. Hem., i, p. 72 (1870): Distant, A. M. N. H. (5 s.) iii, p. 45 (1879).

Head, pronotum and scutellum opaque, pitchy, with a greenish tinge: pronotum faintly wrinkled transversely, with a leathery appearance; lateral margins narrowly edged with brown: scutellum coarsely wrinkled, with the whole surface also finely wrinkled and sparingly punctured; the apex much hollowed, impunctate, dull orange: corraceous portion of the hemelytra deep pitchy brown, opaque; membrane, pale brown, opaque: margins of the abdomen of the same colour as the pronotum with a dull orange band at the base of each segment: abdomen beneath dull violet, opaque, with the lateral margins and the obtuse median ridge, pale fulvous brown: pectus dull violet, wrinkled, with the margins and the sternum brown: legs pale fulvous brown; posterior femora very stout: rostrum brown: antennæ with the basal joint brown, second black, extreme tip of fourth joint slightly ferruginous (*Dallas*). Long, 35-36 mill.

Reported from Assam, Sikkim (mihi).

Genus Mattiphus, Am. & Serv.

Hist. Nat. Ins. Hém., p. 168 (1843): Dallas, List Hem., i, p. 344 (1851); Walker, Cat. Het., iii, p. 468 (1868): Stål, Hem. Afric. i, p. 225 (1864); En. Hem., i, p. 72 (1870).

Pronotum dilated laterally, transversely quadrate, anterior angles long, rather pointed, anterior margins slightly roundly emarginate: sternum with a rather narrow ridge, very distinct, situate between the intermediate and last pair of feet: abdomen not or scarcely extending beyond the hemelytra on each side: the other characters as in *Pycanum* (*Am. & Serv.*).

Mattiphus laticollis, Westwood.

Eusthenes laticollis, Westw., Hope, Cat. Hem., p. 27 (1837). Java.
Mattiphus carvenoi, Am. & Serv., Hist. Nat. Ins. Hém., p. 168 (1843). India.
Mattiphus laticollis, Dallas, List Hem., i, p. 344 (1851); Walker, Cat. Het., iii, p. 468 (1868); Stål, En. Hem., i, p. 72 (1870). Malacca.

Castaneous, shining: pronotum transverse, quadrate: scutellum castaneous-black, extreme tip whitish: antennæ blackish, apices of joints, white: sides of abdomen, black, immaculate: body beneath, with feet, luteous: abdomen shining brassy, sides with a row of transverse black lines (*Westw.*). Long, 27 millims.

Reported from Java, India, Malacca.

381. Mattiphus oblongus, Dallas.

Mattiphus oblongus, Dallas, List Hem., i, p. 344 (1851): Walker, Cat. Het., iii, p. 468 (1868): Stål, En. Hem., i, p. 75 (1870).

♂, ♀. Above brilliant brassy green, generally becoming dull pitchy brown after death: pronotum transverse, quadrate, with the anterior angles rather less than right angles, the anterior margin nearly straight, with a small median emargination for the reception of the head; the lateral margins also nearly straight, the posterior margin gently rounded; the surface of the pronotum is faintly wrinkled transversely and minutely punctured: scutellum transversely wrinkled, and rather thickly and finely punctured: margins of the abdomen projecting beyond the hemelytra on each side, especially at the apex; the posterior angles of the apical segment very prominent, acute, making the apex of the abdomen apparently truncated, and giving an oblong form to the whole body: body beneath golden yellow: legs pale fulvous brown: antennæ darker, with the tip of the third and base of the fourth joints yellow or orange; the remainder of the fourth joint black (*Dallas*). Long, ♂ 25; ♀, 27 mill.

Reported from N. India. The Indian Museum has specimens from Assam.

382. Mattiphus æruginosus, Stål.

Mattiphus æruginosus, Stål, Trans. Ent. Soc., (3 s.) i, p. 600 (1863); En. Hem., i, p. 73 (1870): Walker, Cat. Het., iii, p. 469 (1868).

♂. Oval, above brassy-green, punctulate; pronotum transversely slightly rugose, behind the middle and the hemelytra inwards, turning into ferruginous: beneath with feet, the extremity of the apex of the scutellum, apex of third and base of fourth joint of the antennæ, also small marginal spots on the abdomen, testaceous-flavescent: pectus and

venter shining golden purplish: femora unarmed. Stature of *Pycanum rubens*, Fabr., nearest to *M. reflexus*, Dallas, from the Philippines, distinct in having the lateral margins of the pronotum straight from the apex beyond the middle, thence obtusely roundly angulate, antennæ stouter, and marking otherwise (*Stål*). Long, 21; broad, 11 mill.

Reported from Ceylon.

Genus Asiarcha, Stål.

En. Hem., i, p. 73 (1870).

Body oval: head somewhat short, equally long and broad between the eyes; juga contiguous, rounded at the apex, lateral margins straight: ocelli scarcely twice as far from the eyes as from each other: rostrum reaching the intermediate coxæ: second joint of the antennæ longer than the third: sides of pronotum dilated: abdomen gradually slightly narrowed hindwards, apical angles of segments acute, a little prominulous, angles of sixth segment altogether prominulous hindwards, in ♂, acute: prosternum furrowed: mesosternum with a longitudinal furrowed ridge or wrinkle: metasternum elevated, anteriorly and posteriorly, narrowed, higher than the base of the mesosternum: first ventral segment elevated in the middle in a tubercle, touching the base of the metasternum: feet moderate, femora beneath with two rows of very minute teeth, last pair armed inwards near the apex with a largish spine: last tibiæ somewhat straight, as long as the femora. Near *Mattiphus*, Am. & Serv., differs in having the head shorter, more obtuse, the structure of the sterna, the angles of the last abdominal segment in ♂ acute, produced, and the first ventral segment elevated in the middle (*Stål*).

383. Asiarcha nigridorsis, Stål.

Mattiphus nigridorsis, Stål, Trans. Ent. Soc., (3 s.) i, p. 600 (1863): Walker, Cat Het., iii, p. 469 (1868).

Asiarcha nigridorsis, Stål, En. Hem., i, p. 73 (1870).

♂, ♀. Above black, obsoletely verging into ferruginous, beneath with antennæ and feet testaceous-flavescent; extreme margin of venter black, the fourth joint of antennæ, black, flavescent at the base, the third joint (except apex) infuscate: membrane greenish æneous. Allied to *M. oblongus*, Dallas, but differs in being larger, above black: pronotum more amplified forwards, lateral angles more produced, smaller, part of anterior margin reflexed, posterior angles of sixth abdominal segment produced more acutely and a little farther. Head obtuse, about as long as the intraocular breadth; pronotum gradually distinctly amplified for-

wards, lateral angles distinctly produced forwards; posterior angles of sixth abdominal segment acute (*Stål*). Long, 29; broad, 15 mill.

Reported from India, Panjab.

Genus CARPONA, Dohrn.

Stettin, Ent. Zeit., xxiv, p. 351 (1863): Stål, En. Hem., i, p. 74 (1870). Includes *Virbius*, Stål, Hem. Afric., i, p. 225 (1864).

Form of the pronotum as in *Dalcantha dilatata* Am. & Serv., the lateral margins are produced in the form of an equilateral triangle with the apex on a level with the eyes: form of the abdomen is very like that of *Pygoplatys*, Dallas, and entirely different from *Dalcantha*, Am. & Serv., moreover the metastethium is unarmed, which distinguishes it from *Pygoplatys*; likewise the abdomen is not prolonged in a thorn or spine; the last femora are a little thicker than the others and the apex of each femur has two teeth: first joint of the antennæ not reaching beyond the level of the head (*Dohrn*).

384. CARPONA ANGULATA, Stål.

Pycanum angulatum, Stål, Trans. Ent. Soc., (3 s.) i, p. 601 (1863): Walker, Cat. Het., iii, p. 471 (1868).

Virbius angulatus, Stål, Berlin Ent. Zeit., p. 158 (1868).

Pycanum smaragdiferum, Walker, l. c., p. 472 (1868).

Carpona angulata, Stål, En. Hem., i, p. 74 (1870).

♀. Subæneous-black, beneath fuscous-ferruginous, tinted brassy-green: small marginal spots on abdomen yellow-testaceous: sides of pronotum angulated, amplified, angles turned forwards, anterior margin of the lateral dilated part sinuate, lateral margins subparallel: femora beneath with two spines near the apex: last tibiæ distinctly curved (*Stål*). Long, 32; broad, 16 ½ mill.

Reported from Siam.

385. CARPONA FUNESTA, Dohrn.

Carpona funesta, Dohrn, Stettin Ent. Zeit., xxiv, p. 351 (1863); Walker, Cat. [illegible], p. 474 (1868): Stål, En. Hem., i, p. 74 (1870).

Obscurely black-piceous, opaque, very finely and densely punctured: strongly rugose, juga somewhat exarcuate, tylus shorter; eyes and [illegible] brownish, the latter of a lighter colour: first joint of the antennæ [illegible]ling somewhat beyond the head, second joint about four times as [illegible]s the first: lateral margins of head, margins of gular plates, and [illegible]f second joint of rostrum light brown-yellow: anterior margin of [illegible]um is semilunately emarginate, and ends on each side in a yellow

protuberance; here also the somewhat exarcuate fore border separates from the lateral borders in a rather equilateral produced triangle which approaches the other side of the lateral margins in a rounded pointed angle of about 75°: humeral angles rounded and with the posterior half of the pronotum and the strongly rugose scutellum shining, the anterior half of the pronotum and the corium are dull: membrane dark brown with a metallic lustre: beneath dull piceous-brown, the margins of each part of the pectus, two spots in the middle of the mesostethium, the margin of the corium and a spot on the base of the margin of each abdominal segment light yellow brown: feet dark piceous-brown with prominent beaded edges. Very like *C. angulata*, Stål, and hardly specifically different: it is however, distinguished by the pronotum being more opaque, dilated part more finely and more densely rugulose, venter finely and densely punctulate, apical angles of pronotum ochraceous at the apex, prominulous in a tooth to the eyes, anterior margin of lateral dilated part of pronotum straight, at anterior angles only not entirely gradually sinuate, juga less narrowed towards the apex, more rounded outwards. Long, 34 mill.

Reported from Cambodia.

386. Carpona amplicollis, Stål.

Pycanum amplicolle, Stål, Trans. Ent. Soc., (3 s.) i, p. 600 (1863); Walker, Cat. Het., iii, p. 470 (1868).

Carpona amplicollis, Stål, En. Hem., i, p. 74 (1870).

♀. Black, minutely rugulose, punctulate, beneath turning into ferruginous; pronotum transverse, lateral angles produced forwards, stature almost that of *M. oblongus*, Dallas, pronotum proportionately broader, more dilated forwards and the lateral angles more produced: 2 and 4 joints of antennæ of equal length, third somewhat longer: pronotum gradually somewhat amplified from the base forwards, then abruptly forming on both sides an angle somewhat produced forwards: scutellum more distinctly punctured than the pronotum: beneath very densely, finely rugulosely punctulate: femora beneath near the apex armed with two spines, the interior spine on the last femora robust: last tibiæ slightly curved behind the middle (*Stål*). Long, 32; broad, 18 mill.

Reported from N. India.

387. Carpona amyoti, Vollenhoven.

Pycanum amyoti, Voll., Tijdsch. voor Ent., (2 s.) i, p. 219, t. ii, f. 7 (1866); Ent. l'Arch. Indo. Néer, iii, p. 34, t. 3, f. 8 (1868): Walker, Cat. Het., iii, p. 471(

Carpona amyoti, Stål, En. Hem. i, p. 74 (1870).

Of a deep cherry-brown, a little lighter beneath: antennæ bla

yellow: eyes light brown, ocelli yellow: pronotum dilated, disc finely transversely rugose and irregularly punctured: scutellum distinctly rugose, its apex lighter: hemelytra very finely punctulate, the margin obscure near the base: membrane transparent brown: rostrum, marks on the pectus, the coxæ, and the reflexed margin of the hemelytra, yellowish: some small triangular white patches on the lateral margins of the abdominal segments; the sixth segment is acuminate in both sexes, the 4-6 segments a little dilated in the ♀: feet stout, with long spines on the femora (*Voll.*). Scarcely differs from the preceding, compared with Vollenhoven's figure it differs in having the angles of the dilated part of the pronotum produced much more forwards than in *C. angulata*, Stål. Long, 32; broad, 19 mill.

Reported from India (?), Sumatra (?).

Genus Pycanum, Am. & Serv.

Hist. Nat. Ins. Hém., p. 171 (1843): Dallas, List Hem., i, p. 345 (1851): Walker, Cat. Het., iii, p. 470 (1868): Stål, Hem. Afric., i, p. 225 (1864): Eu. Hem., i, p. 75 (1864).

Head rather pointed, anterior margin slightly emarginate: antennæ long, joints rather robust, the first scarcely extending beyond the anterior margin of the head, the rest almost canaliculate, the second a little larger than the third which is as long as the fourth: rostrum reaching the middle of the space lying between the insertion of the first and that of the second pair of feet: pronotum semilunate, rather regularly rounded in front, posterior border almost straight and not produced over the scutellum, lateral margins flat and a little reflexed: no sternal ridge: scutellum rather broad at the base, but short, not reaching the middle of the abdomen; its apex very small, extended a little in form of a long square and its tip spoon-shaped: abdomen oval, margins flattened and almost foliaceous, extending on each side a little beyond the hemelytra: venter tumid: base not elevated: feet moderate; femora beneath with two more or less prominent spines at the apex (*Am. & Serv.*).

388. Pycanum rubens, Fabricius.

Cimex rubens, Fabr., Ent. Syst., iv, p. 107 (1794): Stoll, *Punaises*, p. 21, t. 4, f. 25, 29 (1788).

Cimex amethystinus, Weber, Obs. Ent., p. 115 (1801).

Edessa amethystena, Fabr., Syst. Rhyng., p. 150 (1803).

Edessa rubens, Fabr., Syst. Rhyng., p. 151 (1803).

Tessaratoma alternata, St Farg. & Serv., Enc. Méth., x, p. 591 (1825).

Aspongopus amethystinus, Burm., Handb. Ent., ii (i), p. 351 (1835): Herr. Schäff., Wanz. Ins., iv, p. 85, t. 135, f. 417 (1839); Blanchard, Hist. Ins., p. 143 (1840).

Pycanum amethystinum, Am. & Serv., Hist. Nat. Ins. Hém., p. 172 (1843); Dallas, List Hem. i, p. 345 (1851); Walker, Cat. Het., iii, p. 470 (1868).

Dinidor amethystinus, Herr. Schaff., Wanz. Ins., vii. p. 76 (1844).

Pycanum rubens, Vollenhoven, Faune Ent. l'Arch.-Indo-Néer., iii, p. 32 (1868); Stål, Hem. Fabr. i. p. 40 (1868); En. Hem. i. p. 75 (1870); Distant, A. M. N. H., (5 s.) iii, p. 45, 52 (1879).

Antennæ pilose, black, last joint a little rufescent at the apex: head greenish, shining, blackish at the apex: pronotum ruddy, anterior and lateral margins virescent: scutellum greenish, shining, with a flavescent spot on the apex: hemelytra ruddy, spotless: wings obscure: abdomen reddish, last segment greenish and the margin spotted yellow: feet black (*C. rubens*, Fabr.). Head with the margin a little reflexed; juga wrinkled at their base, brown-violaceous above: antennæ black, briefly pilose; apex of the last joint slightly brownish: eyes brown, ocelli lighter: pronotum of a semicircular form, not dilated, red-brown, transversely rugose, especially posteriorly, its lateral margins reflexed: scutellum of the same colour, transversely rugose, apex yellowish: hemelytra concolorous, very finely punctulate, interior and exterior margins transversely rugose: membrane nacreous brown: the portion of the abdomen extending beyond the hemelytra has alternate yellow and black bands: body beneath ochraceous, mottled with light brown and a little violet: feet brownish, more obscure above. Long, 12-16 mill.

Var. *a*. Light yellowish brown above: borders of head and the antennæ violet grey: venter a little more violet than the type. Sumatra.

b. Rather obscure brown violet: head and anterior margin of pronotum with a dull green reflection: beneath mottled with light brown, violet and bronzy green: margin of abdomen with square alternate yellow and violet spots. Sumatra.

c. Obscure brown violet: head, anterior margin of pronotum and the scutellum of a dull green: below of a beautiful violet, with ochraceous patches: feet black. Banca, Biliton: a variety of P. *amethystinus* Fabr. and found in Assam (mihi).

d. Blackish violet: posterior margin of pronotum and posterior half of hemelytra, bronzed green: pectus brown violet; venter very deep violet, spotless; feet brown. Sumatra.

e. Head, pronotum and scutellum of a brilliant green: hemelytra cherry-red: entire body below golden green with brownish-yellow patches: margin of abdomen yellow with patches of an obscure brown: femora red: tibiæ deep brown. Malacca (*Voll.*).

In Assam and Sikkim the representatives of this species are usually of an uniform ochraceous colour above.

Reported from the East. Arch., Assam, Sikkim (mihi).

389. Pycanum pretiosum, Stål.

Pycanum pretiosum, Stål, Œfvers. K. V.-A. Förh., p. 234 (1854); l. c., p. 64, t. 1 a, f. 2 (1856); l. c., p. 645 (1870); En. Hem. i, p. 75 (1870): Walker, Cat. Het. iii, p. 471 (1868).

Pronotum, scutellum and hemelytra obscurely sanguineous, violaceous: beneath violaceous, sanguineous: anterior part of head violaceous green, rugulosely punctured; antennæ black, fulvescent at the extreme apex, last joint much longer than the preceding: pronotum broadly truncate anteriorly, sinuate behind the head, sides oblique, somewhat straight, rugosely punctured, anteriorly and with two basal spots, metallic green: scutellum rugosely punctured, green at the base on both sides, luteous at the apex: hemelytra at the apex virescent, rather finely punctulate: membrane cupreous: pectus and abdomen on both sides varied green, its margin above and below luteous, spotted black: feet obscurely fuscous, castaneous; femora spinose at the apex. Long, 26; broad, 14 mill. Reported from Penang. Hardly differs from P. *rubens*, and should belong to variety (*d*); only a slight dissimilarity in the form of the pronotum and the length of the third joint of the antennæ.

390. Pycanum ponderosum, Stål.

Pycanum ponderosum, Stål, Œfvers. K. V.-A. Förh., xi, p. 234 (1854); *l. c.* xiii, p. 63, t. 1 a, f. 1 (1856); Walker, Cat. Het. iii, p. 471 (1868): Stål, En. Hem., i, p. 75 (1870).

Dalcantha Sancti Fargavii, Voll., Tijdschr. Ent., (2 s.) i, p. 218, t. 11, f. 6 (1866).

♀ Sordid luteous above and beneath, scutellum and hemelytra luteous; rugosely punctured: head triangular, submarginate at the apex, margined black: antennæ black, fulvescent at the extreme tip: pronotum transverse, equally broad, anteriorly and posteriorly, sinuate behind the head, dilated anteriorly on both sides, rugulosely punctured, except the basal margin, very narrowly margined black: scutellum rugosely punctured, more weakly luteous at the apex: hemelytra densely punctured; membrane sordid hyaline; beneath with three large patches on both sides of the pectus, one on both sides on the abdomen, oblong, broad, much sinuated inwards, metallic green: abdomen above with black marginal spots: feet obscurely castaneous, femora spinose at the apex (*Stål*). Long, 33; broad, 18 mill. Differs from P. *rubens*, Fabr., in being larger and stouter and in the longer last joint of the antennæ; the pronotum, moreover, is rectangular, dilated anteriorly on both sides. The *D. Sancti Fargavii*, Voll., is luteous, head and sides of pronotum margined black: abdominal limbus spotted fuscous, antennæ, black. Long, 28-35; broad, 20-21 mill.

Reported from Silhat, Assam, Damdim (mihi).

391. Pycanum jaspideum, Herrich Schäffer.

Pycanum jaspideum, Herr. Schäff., Wanz. Ins., ix, p. 308, t. 323, f. 1009 (1852): Walker, Cat. Het., iii, p. 470 (1868): Stål, En. Hem,. i, p. 75 (1870).

Æneous-cupreous, beneath and feet obscurely testaceous: like *P. rubens*, Fabr., antennæ longer and thinner, second joint much longer than the third; first joint brown yellow, apex of third and base of fourth joint, white yellow: lateral margins of the pronotum strongly reflexed, ventricosely advanced, its surface and that of the scutellum strongly transversely rugose: feet and beneath brown-yellow without a metallic lustre: the incisures of the margin of the abdomen alone yellowish (*H. S.*). The color of the feet and marking of the antennæ in this species would place it in *Mattiphus*, but the spined femora bring it into *Pycanum*. Long, 25 mill. ?

Reported from Assam.

392. Pycanum (?) rubidum, Walker.

Pycanum rubidum, Walker, Cat. Het., iii, p. 471 (1868).

Deep red: sides of head and pronotum, antennæ, legs and costa of the hemelytra, at the base, black: head thickly and very minutely punctured, obliquely striated on each side in front; eyes testaceous; rostrum tawny; second joint of antennæ a little longer than the third, fourth much longer than the second: pronotum transversely and finely striated, minutely and rather thinly punctured, sides slightly rounded, obliquely striated: scutellum less finely striated than the pronotum: pectus and underside of the abdomen metallic-green: luteous spots on each side of the abdomen, femora blackish red: hemelytra very thickly and minutely punctured, membrane lurid. Pronotum more dilated than in P. *rubens*, possibly only a variety (*Walker*). Long, 27¼ mill.

Reported from Mount Ophir.

393. Pycanum (?) stabile, Walker.

Pycanum stabile, Walker, Cat. Het., iii, p. 472 (1868).

Dark dull red: sides of the head and of the pronotum, legs and costa of the hemelytra, at the base, black: head extremely minutely punctured, with an æneous tinge: rostrum piceous: pronotum transversely and finely striated, minutely and rather thinly punctured; fore part nearly smooth; sides in front longitudinally striated, dilated and forming two rounded right angles: scutellum less finely striated than the pronotum: pectus metallic green; lobes mostly bordered with tawny: abdomen with black lateral spots, underside with two very broad me-

tallic green stripes; disc longitudinally and very finely striated: hemelytra extremely minutely and thickly punctured, partly and slightly tinged with æneous-green; membrane cinereous *(Walker)*. Body long, 32-33 mill.

Reported from India: appears to be intermediate between P. *ponderosum*, Stål, and *Carpona angulata*, Stål, (Siam).

394. Pycanum (?) pallipes, Walker.

Pycanum pallipes, Walker, Cat. Het., iii, p. 473 (1868).

Blackish-green, pale luteous beneath: head, pronotum and scutellum very thickly and minutely punctured: head pale luteous behind, and with an interrupted stripe of that hue: eyes pale luteous, with ferruginous disc: antennæ luteous; second joint more or less brown above; third brown, yellow towards the tip, much shorter than the second; fourth black, yellow towards the base, a little shorter than the second: pronotum with a very narrow luteous border, transversely and finely striated; fore part on each side much dilated, longitudinally striated, forming a well defined right angle: scutellum transversely rugulose: abdomen above purple; connexivum deep green, bordered with brown, and, at the tip, with pale luteous: hemelytra blackish, irregularly red about the borders; membrane emerald green: wings blackish cinereous (*Walker*). Body long, 25 mill.

Reported from N. India. Walker notes that it appears to be a link between *Pycanum* and *Dalcantha*, and is close to *D. stâlii*, Voll.

Genus Oxylobus, Stål.

En. Hem., i, p. 75 (1870).

Body ovate: head small, gradually somewhat sinuately narrowed before the eyes; juga contiguous, rounded at the apex; ocelli twice as far from each other as from the eyes: rostrum reaching middle of mesostethium: antennæ 4-jointed, fourth joint longer than the second: sides of pronotum dilated: prostethium longitudinally sulcate: mesostethium with a depressed, continued ridge or wrinkle, furrowed through its entire length: metastethium not elevated: abdomen gradually amplified hindwards, angles of segments acute, very slightly prominulous, sixth segment very broad, apical angles acute, produced to a distance: basal segments of venter not elevated in the middle: feet moderate; tibiæ straight; last pair somewhat equal to femora in length: differs from *Pycanum* in the shape of the abdomen *(Stål)*.

395. Oxylobus nigro-marginatus, Stål.

Pycanum nigro-marginatum, Stål, Trans. Ent. Soc., (3 s.) i, p. 601 (1863): Walker, Cat. Het., iii, p. 470 (1868).

Dalcantha servillei, Voll., Tijds. voor Ent., (2 s.) i, p. 220, t. 11, f. 9 (1866).

Oxylobus nigro-marginatus, Stål, En. Hem., i, p. 75 (1870).

♂. Pale subolivaceous flavescent, or virescent; above remotely distinctly, on the hemelytra a little more densely and more finely punctured, beneath densely and minutely rugulosely punctulate: narrow lateral margins of the pronotum, costal margin of hemelytra towards the base, apex of apical angles of last segment of the abdomen, also its lateral margins, black: membrane vitreous: antennæ cerulean-black towards the apex. Head somewhat longer than the intraocular breadth, obtuse at the apex: second joint of the antennæ longer than the third, shorter than the apical: pronotum as in *M. laticollis*, Westw., broadly rounded at the base, gradually somewhat narrowed from the base forwards, thence anteriorly on both sides forming abruptly a right angle, rounded at the apex: abdomen gradually somewhat amplified towards the apex, apical angles of last segment acutely, obliquely produced hindwards to a distance, diverging: first femora unarmed, posterior femora with a distinct spine on the posterior side beneath towards the apex (*Stål*). Long, 20; broad 10 mill.

Reported from Tringani, Malacca.

Genus Dalcantha, Am. & Serv.

Hist. Nat. Ins. Hém., p. 170 (1843): Dallas, List Hem., i, p. 345 (1851): Walker, Cat. Het., iii, p. 473 (1868): Stål, Hem. Afric., i, p. 225, 230 (1864); En. Hem., i, p. 76 (1870).

Head short, somewhat broad; juga longer than the tylus, anteriorly contiguous, obtuse at the apex, lateral margins posteriorly rather deeply sinuated: antenniferous tubercles not prominulous, unarmed; bucculæ rather elevated, reaching the base of the head: ocelli remote from the eyes: rostrum short, first joint extending somewhat beyond the bucculæ posteriorly: pronotum posteriorly broadly rounded: scutellum small, triangular, subequilateral, slightly produced at the extreme apex; frena extended almost to the apex of the scutellum: membrane at the base with many areolas, emitting longitudinal veins: prosternum anteriorly scarcely dilated, furrowed in the middle: mesosternum furnished with an obtuse, somewhat furrowed, ridge, or with two parallel ridges: metasternum not elevated: venter unarmed at the base, not elevated: feet moderate, somewhat robust, femora sometimes spinose at the apex beneath; tibiæ prismatic, above furrowed: tarsi 3-jointed (*Stål*). Differs little from *Mattiphus* and *Pycanum* except in the shorter and broader head.

396. Dalcantha dilatata, Am. & Serville.

Dalcantha dilatata, Am. & Serv., Hist. Nat. Ins. Hém. p. 171 (1843); Dallas, List Hem., i, p. 345 (1853); Walker, Cat. Het., iii, p. 473 (1868); Stål, En. Hem. i, p. 76 (1870).

♀. Head, pronotum, scutellum and hemelytra of a deep green above, thickly and finely punctured or tuberculated: pronotum edged brown on the sides, on the disc with two red elongate rings pointing towards the external margin: lateral margins and apex of the scutellum, of a reddish yellow; membrane and wings, transparent nacreous, yellow-greenish: abdomen above of a yellow-red, the lateral dilatations brown-reddish, marked with some yellowish lines: body beneath yellow, mottled with brownish: feet yellowish: antennæ black, first joint yellowish, tip of the fourth joint sulphur yellow (*Am. & Serv.*). Long, 27 mill.

Reported from India.

397. Dalcantha Stâlii, Vollenhoven.

Dalcantha Stâlii, Vollenhoven, Tijdschr. v. Ent. Ned. Ind., (2 Ser.) i, p. 220, t. 11, f. 8 (1866); Stål, En. Hem., i, p. 76 (1870).

Dalcantha regia, Walker, Cat. Het., iii, p. 474 (1868).

Purplish or fuscous black above, testaceous or luteous beneath with margins infuscate: head, pronotum and hemelytra, extremely minutely and thickly punctured: head finely and obliquely striated on each side in front: eyes testaceous; disc piceous: antennæ black, first joint tawny, testaceous beneath; third hardly longer than second; fourth testaceous towards the tip, shorter than the second: pronotum, fore part excepted, transversely and very finely striated, the fore part dilated, very slightly angular on each side: scutellum transversely and minutely rugulose, pale yellow at the tip: abdomen widening from the base to the fourth segment where it extends much beyond the hemelytra; 5-6 segments much narrower: membrane brown; pronotum less dilated than in *D. inermipes*, from which it differs also in the femora having two spines near the tips (*Walker*). Long, 25; breadth of abd. at base, 12; in fourth segment, 18 mill.

Reported from Silhat, Sibságar (Assam).

398. Dalcantha inermipes, Stål.

Dalcantha inermipes, Stål, Trans. Ent. Soc., (3 s.) i, p. 599 (1863); Walker, Cat. Het., iii, p. 473 (1868); Stål, En. Hem., i, p. 76 (1870).

♂. Above obscurely ferruginous-æneous, beneath with feet and costal limbus of hemelytra from base almost to middle, testaceous-flavescent, sparingly varied ferruginous; median longitudinal line on

venter and antennæ (the yellow-testaceous basal joint excepted), black. Allied to *D. dilatata*, Am. & Serv., differs in having the pronotum a little shorter, lateral part more dilated and rounded, antennæ more slender and femora unarmed (*Stål*). Long, 20; broad, 10 mill.

Reported from the Punjab.

The following genera and species require further examination before admitting them to the Asiatic list.

Div. Onçomeraria, Stål.

Tarsi 3-jointed: apical margin of corium more or less distinctly sinuate, very rarely rounded: membrane without basal areolas, transverse basal vein emitting longitudinal veins: scutellum longer than broad, part placed far behind the frena: primary and subtended veins of wings approximate or contiguous, diverging towards the apex: hamus wanting.

Genus Piezosternum, Amyot & Serville.

Hist. Nat. Ins. Hém., p. 161 (1843): Dallas, List Hem., i, p. 338 (1851); Walker, Cat. Het., iii, p. 437 (1868): Stål, Hem. Afric, i, p. 224, 227 (1864); En. Hem., i, p. 63 (1870). Includes *Salica*, Walker, l. c. p. 469 (1868).

Body large, obovate: head small triangular; juga longer than the tylus, and anteriorly contiguous; antenniferous tubercles entirely visible from above, very close to the eyes, a little prominulous, unarmed; bucculæ continuous, much elevated, higher in front than behind; eyes rather prominulous; ocelli near the eyes: antennæ 5-jointed, shortish, rounded, first joint extending beyond the apex of the head, second longer than the third; rostrum extending beyond the first pair of coxæ, first joint extending a little beyond the bucculæ posteriorly: lateral margins of pronotum very narrowly reflexed, basal part produced hindwards and covering base of scutellum which is triangular, longer than broad, acute at apex; frena extended beyond the middle of the scutellum: apical margin of corium sinuate, exterior apical angle acute: membrane with simple longitudinal veins, emitted from the transverse basal vein, prosternum simple: metasternum much elevated, posteriorly truncate, anteriorly produced, the produced part gradually compressly narrowed forwards, extended to the first coxæ, quiescent on the mesosternum: apical angles of the abdominal segments prominulous in a tooth; second ventral segment somewhat elevated in the middle at the base and touching the truncate posterior part of the metasternum: feet moderate last pair distant; femora unarmed; tibiæ slightly furrowed above; tarsi 3-jointed (*Stål*). From America and Africa.

399. *Piezosternum* (?) *firmatum*, Walker, Cat. Het. iii, p. 458 (1868).
Piezosternum cribratum, Walker, l. c., ♀, ♂.

Testaceous, elongate-oval, paler beneath: head minutely punctured; rostrum extending rather beyond the first coxæ; antennæ piceous, second joint longer than the third: pronotum and scutellum thinly and roughly punctured: pronotum with an irregular smooth band near the fore border, sides transversely striated, lateral angles produced into horns which are as long as half the intermediate space, slightly inclined forwards and ascending, with black punctures towards the tips which are slightly acute; hind border rounded, extending over the base of the scutellum which is attenuated, acute, pale-greenish and slightly grooved near the tip: pectoral ridge lanceolate extending to the first coxæ: abdomen narrowly bordered black, hind angles of the apical segment forming two spines which extend a little beyond the eight intermediate spines: hemelytra rather thinly and roughly punctured with a blackish patch on the disc: membrane pale cinereous (*Walker*). Body long, 14-15 mill. P. *cribratum* is a little smaller, horns more inclined forwards and scutellum smaller.

Reported from Malacca.

400. *Piezosternum* (?) *ingenuum*, Walker, Cat. Het. iii, p. 459 (1868).

Testaceous: head minutely punctured; rostrum extending a little beyond the first coxæ, tip black; antennæ luteous, less than half the length of the body, 2-3 joints about equal in length, fourth longer than the third: pronotum and scutellum thinly and roughly punctured, minutely and transversely striated along each side; horns directly diverging, with blackish punctures, rounded at the tips, longer than their breadth at the base; hind border rounded, extending over the base of the scutellum which is acute, grooved and much attenuated towards the tip: the pectoral ridge lanceolate, extending to the first pair of coxæ, notched at the base: hind angles of the apical segment of the abdomen elongated, acute, not extending beyond the anal appendages: hemelytra very thickly and minutely punctured, with variable rosy patches: membrane pale cinereous (*Walker*). Body long, 19 mill.

Locality not given (Malacca ?).

Genus Muscanda, Walker.

Cat. Het. iii, p. 576 (1868).

[illegible] nearly elliptical, thickly and rather roughly punctured: head [illegible]cal in front, a little longer than broad; juga contiguous much [illegible]e tylus; eyes prominent; rostrum stout, extending to the first

coxæ; antennæ slender, a little more than half the length of the body first joint extending to the front of the head, second a little shorter than the third, fourth much longer than the third, fifth shorter than the fourth: pronotum with a slight transverse ridge between the horns which are broad, slightly tapering, truncated at the tips, slightly ascending, extending obliquely forward, about half the length of the intermediate breadth of the pronotum; a transverse callus on each side in front: scutellum a little less than half the length of the abdomen, attenuated towards the apex which is rounded: pectus without a ridge; abdomen without a ventral spine: legs rather long and slender: membrane with longitudinal veins some of which are fuscate. Distinguished from *Piezosternum*, A. & S., by the long horns of the thorax and the much less acute scutellum (*Walker*).

401. Muscanda testacea, Walker.

Muscanda testacea, Walker, Cat. Het. iii, p. 577 (1868).

Testaceous including eyes: abdomen thinly punctured on the disc beneath, where there are black points along each side on the hind angles of the segments: membrane cinereous (*Walker*). Body long, 21 mill.

Reported from Darjiling.

Genus Bessida, Walker.

Cat. Het. iii, p. 577 (1868).

Body elongate-oval, thickly and somewhat roughly punctured: head longer than broad, narrow and rounded in front; juga contiguous much beyond the tylus; eyes small, not prominent: rostrum extending to the first coxæ; antennæ slender, about one-third of the length of the body; first joint not extending to the front of the head, second very much longer than the third, fourth longer than the third, fifth a little longer than the fourth: pronotum with a small slight transverse ridge between the horns which are stout, acute, very slightly inclined forwards and not longer than their breadth at the base; transverse callus on each side near the fore border; sides straight, slightly serrate: scutellum attenuated, rounded at the tip, more than half the length of the abdomen which is truncated at the tip: legs moderately long and stout (*Walker*).

402. Bessida scutellaris, Walker.

Bessida scutellaris, Walker, Cat. Het., iii, p. 578 (1868).

Ferruginous, ochraceous beneath: antennæ, scutellum,

and legs ochraceous: membrane lurid (*Walker*). Body long, 12½-13 mill.

Reported from Burma.

Subfam. Dinidorina, Stål.

En. Hem. i, p. 79 (1870); Ofvers. K. V.-A. Förh. (3), p. 32 (1872):—*Edessida*, pt., Dallas, List Hem. i, p. 316 (1851): *Dinidorida*, Stål, Ofvers. l. c. p. 522 (1867).

a, *b*, as in Subfam. Pentatomina (Jl. Pt. II, p. 192, 1887).

(*c*)—Scutellum never extending beyond the middle of the dorsum of the abdomen, apical part broad: hemelytra and wings usually complete, rarely abbreviated: membrane very large: primary and subtended veins of wings distant, converging at the apex, the space between not amplified there.

Genus Cyclopelta, Amyot & Serville.

Hist. Nat. Ins. Hém., p. 172 (1843); Dallas, List Hem., i, p. 346 (1851); Walker, Cat. Het., iii, p. 477 (1868); Stål, En. Hem., i, p. 80 (1870):—Includes *Dinidor*, Stål, (*nec* Latr.), Hem. Afric., i, p. 81, 211 (1864).

Head rather broad, but small, almost straightly truncated and slightly emarginate in front; juga longer than the tylus; eyes small, prominulous; ocelli very distinct: antennæ rather long, 4-jointed, rather flattened; first joint short, though extending a little beyond the anterior margin of the head, second longer than the third which is a little shorter than the fourth: rostrum reaching the insertion of the middle pair of feet: pronotum almost semicircular anteriorly, the posterior margin slightly rounded: scutellum scarcely reaching the middle of the abdomen, its apex broad and lunately rounded: membrane with irregular areolas formed of transverse and longitudinal veins, not extending beyond the apex of the abdomen: the abdomen broad, rounded posteriorly, margins flat and extending on each side beyond the hemelytra; feet moderate, rather robust: femora with some spines beneath towards the apex (*Am. & Serv.*).

403. Cyclopelta obscura, St. Farg. & Serville.

Tessaratoma obscura, St. Farg. & Serv., Enc. Méth, x, p. 592 (1826). Java.

Aspongopus alternans, Westwood, Hope, Cat. Hem., i, p. 26 (1837).

Aspongopus depressicornis, Herr. Schäff., Wanz. Ins., iv, p. 85, t. 135, f. 418 (1839)

Dinidor depressicornis, Herr. Schäff., l. c., vii, p. 76 (1844).

Cyclopelta obscura, Am. & Serv. Hist. Nat. Ins. Hém., p. 173 (1843); Dallas, List Hem., i, p. 347 (1851); Walker, Cat. Het. iii, p. 479 (1868); Vollenhoven, Faune. Ent. l'Arch. Indo-Néer., iii, p. 37 (1868); Stål, En. Hem. i, p. 30 (1870); Ofvers. K. V.-A. Förh., p. 645 (1870); Distant, J. A. S. B., xlviii (2), p. 37 (1879): Lethierry, An. Mus. Gen., xviii, p. 649 (1883).

♀. Body entirely dull brown mingled with shades of reddish;

antennæ black: abdomen scarcely denticulate on the lateral margins, upper border black with red patches, lower, red with black patches: femora with two small spines placed side by side near the apex and others along them (*Serv.*). *A. depressicornis*, Herr. Schäff., is described as:—Fuscous, ovate; above very flat, coriaceous, coarse, dark red-brown, dull; fore-border of pronotum and both the humeral protuberances smoother, redder: antennæ 4-jointed, 2-3 joints depressly dilated: spots at base and apex of scutellum and on the connexivum, orange: venter convex, smoother, sordid orange varied brown: feet castaneous.

This species varies much in colour: sometimes blackish, sometimes obscurely ferruginous, beneath paler, sometimes ferruginous-flavescent; connexivum and ventral limbus marked with ferruginous or yellow-ferruginous spots: basal spot on the scutellum distinct [sometimes absent]. Long, 14-15 mill.

Reported from Assam, Sikkim (mihi), Calcutta, Madras: China, Philippines, Malacca, Java, Borneo.

404. Cyclopelta trimaculata, Vollenhoven.

Cyclopelta trimaculata, Voll., Faune Ent. l'Arch. Ind. Néerl, iii, p. 37, t. 4, f. 4 (1868); Stål, En. Hem., i, p. 80 (1870).

Black-purplish: a small line or oblong spot on the side of the pronotum, triangular spot at base of scutellum united by a median line with a spot on the apex and two submarginal streaks on venter, yellow: rostrum, feet and border of connexivum, red (*Voll.*). Probably only a local variety. Long, 13-16 mill.

Reported from Malacca, Borneo.

405. Cyclopelta tartarea, Stål.

Cyclopelta tartarea, Stål, Ofvers. K. V.-A. Förh., p. 234 (1854); l. c. p. 64 (1856); Walker, Cat. Het., iii, p. 480 (1868): Stål, En. Hem. i, p. 80 (1870): Distant, A. M. N. H. (5 s.) iii, p. 45 (1879).

♂. Entirely blackish or subcupreous blackish above, coriaceous, punctured, transversely rugose: sometimes a minute sanguineous spot at the base of the scutellum: membrane fuscous ochraceous: beneath black, somewhat shining æruginose. Differs from *C. obscura*, only in having the connexivum concolorous, neither broadly red, nor spotted black, and in the feet being more obscure. Long, 15; broad, 9 mill. Reported from Himálaya, Bombay, Ceylon, very common in Sikkim (mihi). Long, 10-11 mill. I have an entirely black small species from Vizagapatam and Dehra Dun. On the whole, the links between these three species are rather fairly established, and the two latter may be

considered local varieties. The uniform blackish variety being more common in India and those with yellow spots on pronotum, scutellum and connexivum being more common in Burma and southwards.

Genus Aspongopus, Laporte.

Ess. Hém., p. 58 (1832); pt. Am. & Serv., Hist. Nat. Ins. Hém., p. 173 (1843); Herr. Schäff., Wanz. Ins. vii, p. 77 (1844); Dallas, List Hem. i, p. 348 (1851); Walker, Cat. Het., iii, p. 480 (1868); Stål, Hem. Afric. i, p. 81, 212 (1864); En. Hem. i, p. 81 (1870). Includes, *Spongopodium*, Spinola, Ess. Hém., p. 305 (1837):—*Amacosia*, Spin., Gen. Ins. Artr. p. 118 (1852):—*Peltagopus*, Signoret, A. S. E. F. (3 s.), viii, p. 396 (1861).

Body oval or ovate: head small, subfoliaceous, juga sometimes a little longer than the tylus; bucculæ much elevated, foliaceous, subsemicircular: rostrum extended almost to the intermediate coxæ, first joint extending beyond the bucculæ: antennæ 5-jointed: lateral angles of pronotum not prominent, obtuse: apical part of scutellum, broad: frena extended to or a little beyond the middle of the scutellum: veins of membrane more or less anastomosed: venter unarmed at the base; feet robust, femora often spinulose (*Stål*).

Stål distributes the species of this genus amongst the subgenera *Colpoproctus* and *Aspongopus*. The first is found in Africa, the second in India, and is distinguished by having the head subequilateral or scarcely transverse, the lateral margins straight or slightly sinuated, the eyes not stylated: the anal segment, in ♂, is entire at the apex, rounded, and is rarely furnished with an obsolete sinus in the middle.

406. Aspongopus brunneus, Thunberg.

Cimex brunneus, Thunberg, Nov. Ins. Spec., ii, p. 45 (1783); Gmelin, ed. Syst. Nat., i, (4), p. 2158 (1778).

A. (Aspongopus) brunneus, Stål, En. Hem. i. p. 82 (1870); Distant, A. M. N. H. (5 s.), iii, p. 45, 52 (1879).

Above brunneous, beneath fuscous, antennæ pilose (*Thunb.*): closely allied to and frequently confounded with *A. obscurus*, Fabr., it is thus differentiated by Distant (l. c.).

Abdomen above red.

Third joint of the antennæ, a little longer than the second, *brunneus* Thunb.

Abdomen above black.

Second and third joints of the antennæ equal. *obscurus*, Fabr. Long, 16-17; broad, 10 mill.

Reported from India, Assam.

407. Aspongopus obscurus, Fabricius.

Cimex obscurus, Fabr., Ent. Syst., iv. p. 107 (1794).

Edessa obscura, Fabr., Syst. Rhyrg. p. 151 (1803); Wolff. Ic. Cim., p. 177, f. 171 (1811).

Aspongopus obscurus, Burm., Handb. Ent., ii (i), p. 352 (1835); Herr. Schäff., Wanz. Ins., vii. p. 80 (1844); Dallas, List Hem., i. p. 349 (1851); Walker, Cat. Het., iii, p. 482 (1868): Vollen., Faune Ent. l'Arch. Inds. Néerl., iii, p. 38 (1868): Stål, Hem. Fabr., i, p. 38 (1868).

A. (Aspongopus) obscurus, Stål, En. Hem. i, p. 82 (1870).

Body, wings and feet, fuscous: pronotum, hemelytra and scutellum obscurely olivaceous: head and antennæ (except the yellow last joint) black: anterior margin of pronotum fuscous: scutellum more obscure at the base: margins of abdomen obsoletely spotted yellow (*Fabr.*).

♀. Yellow-castaneous, shining somewhat cupreous, densely punctured: antennæ black, last joint yellow-testaceous: margins of pronotum concolorous: upper and lower marginal spots on the abdomen, castaneous-flavescent: dorsum of abdomen testaceous: wings sordid yellow, violaceous-fuscous at the apex (*Stål*). Long, 17; broad, 9⅔ mill.

Reported from Australia, Celebes, Aru, Bouru, Java, India, Ceylon, N. Bengal, Silhat, Pondicherry: Assam (mihi), Sikkim (mihi), Calcutta.

408. Aspongopus janus, Fabricius.

Cimex Janus, Fabr., Syst. Ent., p. 714 (1775); Spec. Ins., ii, p. 357 (1781); Mant. Ins., ii, p. 295 (1787); Gmelin, ed., Syst. Nat., i (4), p. 2152 (1788); Fabr., Ent. Syst., iv. p. 107 (1794); Wolff, Ic. Cim., i, p. 13, t. 2, f. 13 (1800); Stoll, Punaises, p. 30, t. 6, f. 41 (1788).

Cimex afer, Drury, Ill. Nat. Hist., iii, p. 66, t. 46, f. 7 (1782).

Cimex surinamensis, Gmelin, ed. Syst. Nat., i. (4), p. 2134 (1788).

Edessa Janus, Fabricius, Syst. Rhyng., p. 151 (1803).

Pentatoma Janus, St. Farg. & Serville, Enc. Méth., x, p. 56 (1825).

Aspongopus vicinus, Westwood, Hope, Cat. Hem., i, p. 25 (1837).

Aspongopus Janus, Lap., Ess. Hém. p. 58 (1832); Burm., Handb. Ent. ii (i), p. 352 (1835); Am. & Serv., Hist. Nat. Ins. Hém., p. 173 (1843); Herr. Schäff., Wanz. Ins., vii, p. 78, t. 240, f. 747 (1844); Dallas, List Hem., i, p. 348 (1851); Walker, Cat. Het. iii, p. 482 (1868); Distant, A. M. N. H., (5 s.) iii, p. 45 (1879).

A. (Aspongopus) Janus, Stål, En. Hem., i, p. 83 (1870).

Head deep black, immaculate: pronotum rufous, anterior segment black, elevated margin rufous: scutellum black, rufous at the apex: hemelytra rufous; wings black: abdomen black with the elevated margin, rufous: feet black (*Fabr.*). *A. vicinus*, Westw., differs only in the smaller size and the rufescent colour being more luteous. Long, 16 mill.

Reported from Philippines, Java, Borneo, Siam, India, N. Bengal,

Assam, (mihi), Tranquebar, Bombay, Karachi (mihi), Trivandrum (mihi).

409. Aspongopus ochreus, Westwood.

Aspongopus ochreus, Westw., Hope Cat. Hem., i, p. 25 (1837) : Walker, Cat. Het., iii, p. 483 (1868) : Stål, En. Hem., i, p. 85 (1870) : Distant, A. M. N. H., (5 s.) iii, p. 45, 52 (1879).

Entirely luteous-ochraceous : pronotum and scutellum transversely rugose : antennæ and feet fuscous : last joint of antennæ and tarsi pale : body beneath concolorous (*Westw.*). Long, 17-18 mill.

Reported from Bengal.

410. Aspongopus siccifolius, Westwood.

Aspongopus siccifolius, Westw., Hope, Cat. Hem., i, p. 26 (1837) : Stål, En. Hem., i, p. 85 (1870) : Distant, A. M. N. H. (5 s.) iii, p. 45 (1879).

Cyclopelta siccifolia, Dallas, List Hem., i, p. 347 (1851) : Walker, Cat. Het., iii, p. 479 (1868).

Obscurely coppery-fuscous, very much punctured ; antennæ short, apical joint pale ; membrane luteous-fulvous, irregularly reticulated with concolorous veins ; pronotum transversely subfoveolate ; first femora denticulate beneath (*Westw.*). Body long, 14½-15 mill.

Reported from Ceylon, India, Gogo, N. Bengal, Assam.

411. Aspongopus nigriventris, Westwood.

Aspongopus nigriventris, Westw., Hope, Cat. Hem., i, p. 26 (1837) ; Dallas, List Hem., i, p. 349 (1851) ; Walker, Cat. Het., iii, p. 482 (1868) ; Vollenhoven, Faune Ent. l'Arch. Indo-Néerl., iii, p. 39 (1868) : Stål, En. Hem., i, p. 85 (1870) : Distant, A. M. N. H., (5 s.), iii, p. 45 (1879).

Altogether black-fuscous, above just tinted with cupreous, very finely punctured : pronotum transversely substriated : membrane with about twelve longitudinal veins of which some are forked : last tibiæ, a little dilated in the middle (*Westw.*). Long, 17-18 mill. *A. chinensis*, Dallas (List l. c.), differs almost only in having the second joint of the antennæ much longer than the third and may perhaps be united with this. ♂, long, 17-18 ; ♀, long, 18-19 mill.

Reported from China, Borneo, Sulu, India, Silhat, Assam, Sikkim (mihi).

412. Aspongopus sanguinolentus, Westwood.

Aspongopus sanguinolentus, Westwood, Hope, Cat. Hem., i, p. 26 (1837) ; Dallas, List Hem., i, p. 350 (1851) ; Walker, Cat. Het., iii, p. 483 (1868) ; Stål, En. Hem., i, p. 85 (1870).

Closely allied to *A. nigriventris*, Westw., differs especially in having

the abdominal margin sanguineous, last tibiæ simple, and the veins of the membrane less regular and more forked (*Westw.*). Long, 14-15 mill.

Reported from India, Java.

413. Aspongopus fuscus, Westwood.

Aspongopus fuscus, Westwood, Hope, Cat. Hem., i, p. 26 (1837); Dallas, List Hem., i, p. 349 (1851); Walker, Cat. Het., iii, p. 483 (1868); Stål, En. Hem., i, p. 85 (1870); öfvers. K. V.-A. Förh., p. 645 (1870).

Closely allied to *A. sanguinolentus*, Westw., and perhaps only a variety of that species; colour more piceous, and interrupted on the luteous sides of the abdomen by black dots; membrane with more areolas at the base (*Westw.*). Long, 15½-16 mill.

Reported from Java.

414. Aspongopus nepalensis, Westwood.

Aspongopus nepalensis, Westwood, Hope, Cat. Hem., i, p. 26 (1837); Dallas, List Hem., i, p. 349 (1851); Walker, Cat. Het., iii, p. 483 (1868); Stål, En. Hem., i, p. 85 (1870); Distant, A. M. N. H. (5 s.), iii, p. 45 (1879).

Allied to but much longer than *A. nigriventris*, Westw., altogether fuscous-piceous: membrane concolorous with about 12 veins, some of which are forked and areolated at the base: sides of the pronotum almost straight (oblique); last tibiæ a little dilated before the middle (*Westw.*). Long, 18-19 mill.

Reported from Nepál, Silhat, Assam, common in Sikkim (mihi).

415. Aspongopus unicolor, Dallas.

Aspongopus unicolor, Dallas, List Hem., i, p. 349 (1851); Walker, Cat. Het., iii, p. 480 (1868); Stål, En. Hem., i, p. 85 (1870).

♀. Closely resembles *A. obscurus*, Fabr., entirely fuscous except the black antennæ: body beneath paler than the upper surface: legs brown, posterior tibiæ dilated before the middle and with a long oval pit on the dilated portion: antennæ black with the basal joint brown. Long, 16½-17 mill.

Reported from India?

416. Aspongopus marginalis, Dallas.

Aspongopus marginalis, Dallas, List Hem., i, p. 350 (1851): Walker, Cat. Het., iii, p. 483 (1868): Stål, En. Hem., i, p. 85 (1870).

♂. Black piceous, somewhat obscure: pronotum and scutellum very thickly and minutely punctured and faintly wrinkled transversely;

membrane brownish: margins of the abdomen banded with black and orange, the middle of each segment being orange: the abdomen is thickly and finely punctured beneath; the margins orange with a black spot on each of the sutures: legs black: antennæ black with the apical joint bright orange; second joint much shorter than the third (*Dallas*). Long, 16-16½ mill.

Reported from Tenasserim.

417. Aspongopus circumcinctus, Walker.

Aspongopus circumcinctus, Walker, Cat. Het., iii, p. 483 (1868).

Aeneous-black, thickly and very finely punctured, brassy-piceous beneath: eyes piceous: rostrum tawny: antennæ black, second joint a little longer than the third; fourth longer than the second; fifth a little shorter than the fourth: sides of pronotum and of abdomen, testaceous, deeper on the latter: pronotum and scutellum transversely and very slightly striated, the latter piceous at the tip: corium piceous, membrane lurid (*Walker*). Long, 15-16 mill. Allied to *A. Mülleri*, Voll., (Java), but differs in the dark colour of the head and of the under-side of the body and is probably only a local variety.

Reported from India.

418. Aspongopus nigro-aeneus, Reuter.

Aspongopus nigro-aeneus, Reuter, Ent. Mon. Mag. xvii, p. 234 (1881).

Entirely brassy-black: head, pronotum and scutellum densely and finely punctured, obsoletely transversely rugose: sides of head distinctly sinuate: second joint of the antennæ a little over half longer than the first, 2-3 compressed, third longer than the second: apical margin of the corium slightly rounded: prostethium triangularly impressed in the middle, margins of impression scarcely reflexed. Differs from *A. ochreous*, Westw., in the colour, the impression on the prostethium, being less deep, the denser punctuation, and the faint wrinkles (*Reuter*). Long, 16½ mill.

Reported from Siam.

Genus Megymenum, Laporte.

Ess. Hém., p. 52 (1832): Boisd., Voy. Astrolabe, Ins., ii, p. 632 (1835): Guérin, Voy. La Coquille, Ins., ii, p. 171 (1838): Stål, Öfvers. K. V.-A. Förh., p. 522 (1867): En. Hem., i, p. 86 (1870). Includes:—*Pseudaradus*, Burm., Silb. Rev. Ent., ii, p. 19 (1884): *Amaurus*, Burm., Nov. Act. Acad. Leop. xvi, Suppt. p. 294 (1834): *Platydius*, Westw., Zool. Journ. v., p. 446 (1835).

Head large or somewhat so; juga much longer than the tylus and

contiguous before it; antennæ 4-jointed, 2-3 joints much compressed: mesosternum deeply furrowed: buculæ much elevated, rounded: spiracula of the first ventral segment visible.

Stål distributes the species of this genus amongst the subgenera *Pseudaradus*, *Megymenum*, *Anoplocephala* and *Pissistes*. The two first are found in India, the third in the Eastern Archipelago and the last in China.

Pseudaradus:—Head with the sides tumid at the eyes, unarmed: pronotum anteriorly with a tubercle in the middle: lateral margins of the abdominal segments distinctly produced posteriorly in a lobe or tooth; prominulous before the middle, or almost in the middle, in a tooth, or small very obtuse lobule; 2-3 joints of antennæ amplified on both sides.

Megymenum:—Head furnished before the eyes on both sides with a tooth, or, oftenest, a very distinct spine: pronotum anteriorly in the middle not, or only very slightly, tumescent: lateral margins of abdominal segments posteriorly distinctly produced in a lobe or tooth, prominulous before the middle, or, in the middle, in a tooth, or very obtuse small lobule: 2-3 joints of the antennæ amplified on both sides.

Div. Pseudaradus.

419. Megymenum brevicorne, Fabricius.

Cimex brevicornis, Fabr., Mant. Ins., ii, p. 294 (1787); Gmelin, *ed.* Syst. Nat., (4), p. 2152 (1788).

Edessa brevicornis, Fabr., Syst. Rhyng., p. 154 (1803).

Amaurus brevicornis, Burmeister, Handb. Ent., ii (i), p. 350 (1835).

Megymenum brevicorne, Dallas, List Hem., i, p. 364 (1851); Walker, Cat. Het. iii, p. 500 (1868); Stål, Hem. Fabr., i, p. 38 (1868).

M. (*Pseudaradus*) *brevicorne*, Stål, En. Hem., i, p. 83 (1870).

Ovate, obscurely cupreous or brassy-black: head black, much canaliculate; antennæ short, compressed: pronotum with the sides expanded, spine anteriorly acute: scutellum and hemelytra obscurely cupreous, immaculate: wings sordidly whitish, abdomen above black, beneath cupreous: feet blackish, first pair of femora dentate inwards (*Fabr.*). Closely allied to *M. inerme*, Herr. Schäff., differs in having the 2-3 joints of the antennæ broader, the former shorter, the latter longer, and the 3-4 joints together longer than the second. The pronotum is unarmed, margins bisinuate; margin of abdomen somewhat dentated. Long, 15 mill.

Reported from China, Assam.

420. Megymenum inerme, Herr. Schäffer.

Amaurus inermis, Herr. Schäff., Wanz. Ins., v. p. 62, t. 163, f. G. H. (1839).
Megymenum inerme, Dallas, List Hem., i, p. 364 (1851); Walker, Cat. Het., iii, p. 501 (1868); Distant, A. M. N. H. (5 s.), iii, p. 45 (1879).
M. (*Pseudaradus*) *inerme*, Stal, En. Hem., i, p. 86 (1870).

Hardly differs from *M. subpurpurascens*, Westw., except in having the antennæ smaller or more slender, the spines on the anterior angles of the pronotum entirely obtuse, also the angles a little prominent. Long, 15 mill.

Reported from Bengal, Assam, China.

Div. Megymenum.

421. Megymenum subpurpurascens, Westwood.

Platydius subpurpurascens, Westwood, Zool. Journ., v, p. 446, t. 22, f. 8 (1834).
Megymenum cupreum, Guérin, Voy. La Coquille, Zool. Ins., ii, p. 172 (1838); Am. & Serv., Hist. Nat. Ins. Hém., p. 182, t. 3, f. 10 (1843); Dallas, List Hem., i, p. 363 (1851); Vollenhoven, Faune Ent. l'Arch. Indo-Néer., iii, p. 47, t. 4, f. 8 (1868); Walker, Cat. Het., iii, p. 504 (1868).
Amaurus cupreus, Herr. Schäff., Wanz. Ins., v. p. 61, t. 163, f. 503 (1839).
Megymenum meratii, Le Guillou, Rev. Zool., p. 261 (1841).
M. (Megymenum) subpurpurascens, Stål, En. Hem., i, p. 87 (1870).

Head, pronotum, scutellum and corium, fuscous-purple: membrane fulvescent and obscurely veined: antennæ and feet black: body beneath purple (*Westw.*). In stature approaching *M. brevicorne*, Fabr., but very close to *M. spinosum*, Burm., from which it differs chiefly in having the angulose posterior part of the pronotum prominulous in a small tooth and the scutellum a little amplified behind the lateral sinus. Le Guillou's, *M. meratii* is described as:—Fuscous black, pronotum with anterior angles acute, lateral margins anteriorly deeply sinuate, dilated behind the sinus: margin of abdomen sinuate, somewhat dentate. Long, body, 14½-15 mill.; breadth of the abdomen, 8-8½ mill.

Reported from New Guinea, Celebes, Ceram, Borneo, Java, Philippines, Siam, Cambodia, Penang, India, Silhat (mihi).

Genus Thalma, Walker.

Cat. Het., iii, p. 503 (1868).

Body elliptical, convex, very thickly and minutely punctured: head not longer than broad; juga contiguous beyond the tylus, rounded on the outer side and the tips, a porrect spine on each side before the eyes which are not prominent: rostrum reaching the last coxæ: antennæ 4-jointed dilated; 2-3 joints dilated; the third much shorter than the second;

fourth fusiform, slender, shorter than the third: pronotum unarmed, sides rounded, posterior angles not prominent, posterior border slightly rounded: scutellum less than half the length of the abdomen, much rounded at the apex: abdomen with the upper apical membrane entire; two broad laminæ beneath: legs stout: tarsi 2-jointed, second joint much longer than the first: hemelytra reaching the apex of the abdomen: membrane with five longitudinal veins and with a few transverse veins. Differs from *Megymenum*, in the structure of the pronotum, the less reticulated membrane, the stouter body and the sides of the abdomen not dentate.

422. Thalma biguttata, Walker.

Thalma biguttata, Walker, Cat. Het., iii, p. 503 (1868).

Purplish black, dingy ochraceous beneath: antennæ black, last joint luteous at the apex: pronotum tinged metallic-green on each side: a luteous dot at base and apex of scutellum: beneath punctured black, pectus with three irregular black stripes faintly visible on the venter: abdomen above with luteous spots along each side: legs black: hemelytra blackish; corium beneath dingy testaceous; wings purplish blue (*Walker*). Long, 16¾ mill.

Reported from Amboina, Burma (?).

Genus Atelides, Dallas.

A. M. N. H., (2 s.) x, p. 359, 436 (1852): Walker, Cat. Het., iii, p. 500 (1868): Stål, öfvers. K. V.-A. Förh., p. 522 (1867); En. Hem., i. p. 89 (1870).

Body somewhat ovate, broadest behind the middle: head foliaceous; juga reflexed at the sides, much longer than the tylus, with their inner margins contiguous throughout nearly their whole length, gaping slightly at the apex; tylus very small; lateral margins with a strong spine in front of the eyes: eyes very prominent: ocelli small, placed close to the base of the head and about equally distant from one another and from the eyes: antennæ 4-jointed, stout, basal joint short, not extending beyond the apex of the head; 2-3 joints prismatic; the second longer than 3-4 together, furnished with three longitudinal furrows; third joint black and hirsute like the second; fourth orange, somewhat pilose, with the base black, perhaps a little longer than the third, elliptical, elongate; 3-4 joints much thinner than the second: rostrum rather slender, reaching the intermediate coxæ, inserted about the middle of the under surface of the head, between two somewhat triangular lamellæ; basal joint rather stout, passing the anterior margin of the prosternum; second joint longest, thinner than the first; third joint shorter than the first, about equal to it in thickness; fourth joint shortest and thinnest:

pronotum subquadrate, rather narrower in front than behind, lateral angles slightly spinose: scutellum short and broad, with the apex broad and rounded: hemelytra very short, covering only the two first segments of the abdomen (not always), with their apical margin truncated, somewhat membranous: sternum with a narrow longitudinal canal: abdomen nearly circular, slightly convex above, very convex beneath, with the apex somewhat truncated: the two lateral vulvar plates bearing stigmata: legs stout, femora unarmed; tibiæ prismatic, the posterior pair slightly dilated internally and channelled beneath; anal apparatus, in ♂, seen from beneath, appears to consist of a plate of a semicircular form, broadly notched on its posterior margin and occupying a broad emargination of the last segment of the abdomen; seen from above, it presents a circular corneous ring, the upper portion of which is very narrow, whilst the lower portion is produced and emarginate posteriorly: the opening of the ring is narrowed irregularly by a large tooth on each side, close to which the margin of the ring is clothed with yellowish hairs.

423. Atelides centrolineatus, Dallas.

Atelides centrolineatus, Dallas, A. M. N. H., (2 s.) x, p. 306, 436, t. 5, f. 1-5 (1852): Walker, Cat. Het., iii, p. 500 (1868): Stål, En. Hem., i, p. 89 (1870).

♀. Head above, brassy black, somewhat obscure, rather finely rugose, with the lateral margins tinged with chestnut, and with a longitudinal orange yellow band down the middle; beneath brownish fulvous, with the orbits brassy: eyes brown; ocelli yellow: antennæ with the first two joints black, thickly clothed with short stiff hairs, but with the furrows of the second joint naked; basal joint fulvous at the base; apical joint fulvous: rostrum pale chestnut with the basal joint fulvous: pronotum blackish, somewhat brassy, with the annular spots near the anterior margin and an indistinct patch within each lateral angle chestnut, the surface minutely punctured and wrinkled transversely; the disc with a smooth orange-yellow band continuous with that on the head; the sides broadly margined with dull orange, with the extreme edges black: scutellum black, very thickly and minutely punctured and transversely wrinkled, with a smooth orange-yellow band continuous with that on the thorax: pectus brownish fulvous, sparingly punctured, with a broad, brassy black, rugose longitudinal band on each side within the lateral margins: legs pale chestnut brown: hemelytra blackish, somewhat brassy, finely granulose; outer margin broadly fulvous, edged with black; the submarginal vein, a streak on the disc and the base of the inner margin fulvous; membrane brown: abdomen above blackish, somewhat brassy, finely granulose, with the sides dull chestnut irrorated with black points; the middle with a longitudinal orange band continuous

with that on the scutellum: margins pale chestnut-brown, with the edges and a band on each of the sutures black; abdomen beneath pale chestnut-brown, minutely granulated, with a blackish brassy band down each side within the line of stigmata: stigmata black; apical and lateral vulvar plates edged with black (*Dallas*). ♀, long, 19-20; ♂, 16-17 mill.

Reported from Silhat. The Indian Museum has specimens from Assam.

Add:—*Sagriva vittata*, Spin., Gen. Ins. Art., p. 117 (1852).

Subfam. Phyllocephalina, Stål.

öfvers. K. V.-A. Förh., p. 615 (1870); l. c. (3), p. 32 (1872): En. Hem., v, p. 117 (1876):—*Phyllocephalidæ*, Dallas, List Hem., i, p. 350 (1851):—*Phyllocephalida*, Stål, Hem. Afric., i, p. 32, 234 (1864).

(*a*) As in Subfam. Pentatomina (Jl. Pt. II, p. 192, 1887).

(*b*)—Rostrum short, not extended behind the first coxæ, two basal joints very short, entirely, or for the greatest part, hidden between the bucculæ: head usually foliaceous or elongated and triangular, with the juga produced to a distance before the tylus, and usually contiguous: spiracula of the basal ventral segment hidden by the posterior part of the metastethium: tarsi 3-jointed: antennæ 5-jointed.

Genus Cressona, Dallas.

List Hem., i, p. 358 (1851): Walker, Cat. Het., iii, p. 494 (1868): Stål, Hem. Afric., i, p. 234 (1864); En. Hem., v, p. 117, 118 (1876).

Body oblong, ovate: head small, gradually narrowed anteriorly, rounded at the apex, sides less strongly dilated; juga contiguous at the apex, not much longer than the tylus; entire antenniferous tubercles prominulous beyond the sides of the head: eyes moderate; ocelli distant, placed very close to the eyes: antennæ 5-jointed, about as long as the head and pronotum, rather stout, basal joint short and stout, passing the apex of the head, remainder nearly equal in length: rostrum 4-jointed, passing the anterior coxæ, rather stout, basal joint very short, entirely concealed within the deep groove on the underside of the head, third joint longest, fourth a little longer than the second: furrow of the orifices long: pronotum with the lateral angles produced into long, stout, straight horns which project forwards beyond the apex of the head and are somewhat compressed towards the apex which is notched; lateral margins of the pronotum strongly dentate, the denticulations continued along the under surface of the lateral horns and terminating a little before the apex of these in a large flat tooth: scutellum of the usual form

and size; frena extended beyond the middle of the scutellum: membrane with longitudinal veins: legs stout, tibiæ quadrangular with the angles prominent, especially on the anterior pair; tarsi 3-jointed, basal joint longest (*Dallas*).

424. Cressona valida, Dallas.

Cressona valida, List Hem., i, p. 358, t. 11, f. 3 (1851); Walker, Cat. Het., iii, p. 491 (1868); Stål, En. Hem., v, p. 118 (1876).

♀. Entirely ochreous, densely and finely punctured: pronotum with two close longitudinal lines of brown punctures down the middle: coriaceous part of the hemelytra with some more or less distinct, black points on the middle of the disc; membrane brownish, semitransparent, with numerous brown points: wings transparent, nearly colourless: abdomen above, brown at the base and within the lateral margins; margins ochreous, punctured: abdomen beneath, thickly punctured with brown, and with numerous black points; 3-5 segments each with a large whitish patch on each side of the disc: pectus brownish obscure with a large shining castaneous-brown patch on each side of the mesostethium: legs concolorous, femora covered with brown points: rostrum with the tip black: antennæ testaceous, covered with brown points; last joint brown with the base testaceous (*Dallas*). Long, 25 mill.

Reported from India: Sikkim (mihi).

Genus Dalsira, Am. & Serv.

Hist. Nat. Ins. Hém., p. 175 (1843); *Phyllocephala*, pt., Dallas, List Hem., i, p. 352, (1851); Walker, Cat. Het., iii, p. 492 (1868): Stål, En. Hem., v, p. 118, 119 (1876).

Head short, almost equally long and broad: antennæ longer than the pronotum: rostrum extending beyond the insertion of the anterior feet: lateral margins of the pronotum rounded, posterior margin truncated, almost straight: scutellum extending a little beyond the middle of the abdomen, sinuated on the sides: membrane almost as large as the coriaceous portion, more or less transparent, with rather regular longitudinal veins: wings a little shorter than the abdomen which is rather tumid beneath: feet tolerably robust and short, nearly equal in (*Am. & Serv.*).

25. Dalsira glandulosa, Wolff.

Edessa glandulosa, Wolff, Ic. Cim., v, p. 176, t. 17, f. 170 (1811).

Aelia glandulosa, Burm., Handb. Ent., ii (i), p. 357 (1835).

Phyllocephala glandulosa, Dallas, List Hem., i, p. 353 (1851); Walker, Cat. Het., iii, p. 492 (1868).

Dalsira glandulosa, Stål, En. Hem., v, p. 119 (1876); Distant, A. M. N. H., (5 s.) iii, p. 45 (1879).

Antennæ 5-jointed, filiform, black, first joint short: head, pronotum, scutellum and hemelytra obscurely ferruginous; head rounded at the apex, impressly punctured, lateral margins somewhat elevated, impressed at the apex with two small lines which diverge posteriorly; ocelli behind the greyish eyes, distant; rostrum 4-jointed, very short, black, placed between two rounded plates at the base: pronotum impressly punctured, convex, posterior angles prominent, somewhat acute: scutellum longer than half the abdomen, impressly punctured and very finely transversely rugose, with a large deep black, marginal gland on each side at the base, transversely rugose, oblong, placed obliquely, posteriorly girth with a somewhat tumid border: hemelytra very finely impressly punctured, with six yellow longitudinal lines alternately abbreviated; membrane fuscous, striated whitish: wings cinerescent, veins fuscous: abdomen above fuscous, margin paler, somewhat dentated; beneath brunneous, with a row of elevated points on both sides: pectus concolorous, impressly punctured: anus obtuse: feet unarmed; femora fuscous, with two ferruginous longitudinal lines; tibiæ angulated, ferruginous, exterior side with 4-5 deep black points: tarsi fuscous, 3-jointed (*Wolff*). Long, 23 mill.

Reported from China, Bengal, Assam (mihi).

Genus Basicryptus, Herrich-Schäffer.

Wanz. Ins., VII, p. 81 (1844): Stål, En. Hem., v. p. 119 (1876):—*Phyllocephala*, pt., Dallas, List Hem., i, p. 352 (1851); Walker, Cat. Het., iii, p. 487 (1868).

Dallas included *Phyllocephala*, Lap., *Dalsira*, Am. & Serv., *Schizops*, Spinola, and *Basicryptus*, Herr. Schäff., in his genus *Phyllocephala*. The three last occur in India and near them lies *Gonopsis*: they may be thus differentiated:—

1-6. Pectus without a levigate streak near the coxæ.

2-5. Scutellum without a flavescent, continued streak.

3-4. Costal margin not, unless anteriorly, levigate or spar[se]ly punctate:—*Dalsira*.

4-3. Costal margin of corium entirely pale, levigate and sm[ooth], sometimes marked by transverse spots or impressions, or by bla[ck] arranged in remote transverse rows:—*Basicryptus*.

5-2. Continued lateral streak on scutellum, intramarginal before the middle, marginal behind the middle, also entire costal limbus, flavescent:—*Schizops*.

6-1. Pectus with a levigate lateral streak (posteriorly abbreviated) near the coxæ; the streak generally pale:—*Gonopsis*.

First joint of rostrum is hidden between the oval lateral pieces of the head beneath; second joint free, shortest; 3-4 of equal length; third reaching first coxæ; the fourth reaches the middle of the carinate mesosternum: membrane hardly half the size of the coriaceous portion of the hemelytra.

Genus Basicryptus, Herr. Schäff.

Wanz. Ins., vii, p. 83 (1844): Stål, En. Hem., v, p. 119 (1876).

Juga rounded at the apex, contiguous beyond the tylus; first joint of rostrum entirely hidden, second shortest, 3-4 equally long, third reaches the first pair of feet, fourth the middle of the finely ridged mesostethium: membrane half as large as the coriaceous portion.

426. Basicryptus illuminatus, Distant.

Basicryptus illuminatus, Dist., Trans. Ent. Soc., p. 358 (1887).

Body above dull dark reddish, pronotum with a broad, discal, transverse, luteous band, margined black, attenuated at each end, and slightly notched at the middle: eyes dull ochraceous; 1-3 joints of antennæ reddish: lateral margins of the pronotum somewhat finely crenulated, the lateral angles broadly and subacutely produced: scutellum with a small luteous spot in each basal angle and a few very small luteous spots at the apex, and with some median and lateral black punctures: base of lateral margin of corium narrowly luteous, and with some very small and irregular scattered black spots: membrane pale hyaline, somewhat thickly ornamented with small fuscous spots: body beneath and legs dull reddish, with black punctures: disc of sternum and some sublateral streaks to abdomen obscure luteous: tarsal joint somewhat ochraceous beneath (*Dist.*). Long, 14; exp. angl. pron., 10 mill.

Reported from N. India.

Genus Schizops, Spinola.

Schyzops, Ess., p. 297 (1837): *Schizops*, Am. & Serv., Hist. Nat. Ins. Hém., p. 176 (1843); Stål, pt., Hem. Afric., i, p. 234, 239 (1864); En. Hem., v, p. 118, 120 (1876).

Head triangular, juga produced much beyond the tylus and forming the apex of the triangle, rounded, bifid, the cleft very narrow, contracted

hindwards and reduced near the end of the tylus to a simple impression where abut two other like impressions that mark the separation of the three lobes: labrum and rostral canal start from the end of the tylus, the former is transversely striated and covers the whole of the first and at least half the second joint of the rostrum: head beneath convex; the rostral canal does not reach its base and receives the whole of the first joint of the pronotum and part of the second joint; the rostrum does not reach the mesostethium, the apex of its fourth joint rests on the posterior margin of the prostethium between the first pair of feet; there is no ventral groove: prostethium flat, acuminate, its sides with a simple margin: mesostethium flat, apex tumid, concealing the middle of the first segment: the second segment without spine or protuberance, venter uniformly convex and even somewhat tumid: femora simple; tibiæ triangular, edges not dilated; first joint of tarsi as long as the other two together: abdomen extending beyond the hemelytra: membrane occupying one-third of the hemelytra, veins variable.

Differs from *Dalsira*, Am. & Serv., in having the lateral streak continued through the scutellum, intramarginal before the middle, marginal behind the middle, also costal limbus, entirely flavescent.

427. Schizops insignis, Walker.

Schismatops insignis, Walker, Cat. Het. iii, p. 495 (1868).
Schizops insignis, Stål, En. Hem., v, p. 120 (1876).

Tawny, very thickly and minutely punctured, slightly clouded with blackish beneath: head a little longer than its breadth; juga lanceolate, contiguous, except at their tips: eyes livid, not prominent: rostrum extending to the first coxæ: antennæ black; second joint a little longer than the third: pronotum between the hind angles with a transverse ridge and an anterior slight metallic-green transverse furrow, the latter abbreviated at each end; space between the ridge and the hind border mostly piceous; hind angles acute, prominent: scutellum piceous, rounded at the tip, with two testaceous stripes which are bordered with bright green on the outer side near the base: legs tawny: hemelytra piceous; costa testaceous; membrane cinereous with many black points (*Walker*). Body long, 17-18 mill.

Reported from Burma.

Genus Gonopsis, Amyot & Serville.

Hist. Nat. Ins. Hem., p. 180 (1843): Stål, En. Hem., v, p. 121 (1876).

Allied to *Megarhynchus*, Lap.: head with the juga distant: posterior angles of pronotum very prominent in a pointed spine: extremity of ab-

domen, in ♂, almost straightly truncate; in ♀, slightly roundly emarginate (*Am. & Serv.*).

428. Gonopsis rubescens, Distant.

Gonopsis rubescens, Dist., Trans. Ent. Soc., p. 359 (1887).

Body above sanguineous: head somewhat obscurely punctate; antennæ reddish, third joint shorter than second or fourth, fifth joint longest and pilose: lateral margins of the pronotum finely crenulate, the lateral angles produced into short subacute spines between which is a transverse ridge, before which the surface is obliquely deflected towards the head; pronotum is also transversely rugulose, except two levigate spots on the anterior area: scutellum longitudinally rugose, with a row of black punctures on the basal half of the lateral margins: corium obscurely punctate and finely rugulose, with a few black punctures near the inner apical angle: membrane pale hyaline: body beneath and legs pale reddish; the body is very finely and darkly punctate, and the tibiæ have a fuscous spot on under side of apices (*Dist.*). Long, 14; exp. angl. pron., 7 mill.

Reported from Sikkim.

Genus Diplorhinus, Am. & Serv.

Hist. Nat. Ins. Hém., p. 178 (1843): Dallas, List. Hem., i, p. 359 (1851); Walker Cat. Het., iii, p. 494 (1868): Stål, En. Hem., v, p. 118, 122 (1876).

Juga prolonged, broad, divaricate, pointed: 2-3 joints of the antennæ of equal length: pronotum posteriorly rugose and strongly punctured, lateral angles produced in a process which is obtuse or abruptly somewhat acuminate at the apex, turning outwards, sides crenulate: scutellum less strongly punctured than the pronotum: veins of membrane, straight, black on a pale ground: posterior tibiæ straight.

429. Diplorhinus quadricornis, Stål.

Diplorhinus quadricornis, Stål, En. Hem., v, p. 122 (1876).

♂. Very close to *D. furcatus*, Westw., differs in the longer juga, gradually acuminate, more divaricate, furnished with straight lateral margins; pronotum more strongly rugose, lateral margins more remotely and more obtusely denticulate, process of the lateral angles twice as long, body narrower (*Stål*). Long, 20; broad, 8½; breadth of pronotal processes, 12½ mill.

Reported from N. E. India, Assam (mihi).

430. Diplorhinus furcatus, Westwood.

Atelocerus ? furcatus, Westwood, Hope, Cat. Hem., i, p. 20 (1837).
Phyllocephala distans, Herr. Schäff., Wanz. Ins., vii, p. 71, t. 237, f. 740 (1844).
Orthoschizops ? furcata, Walker, Cat. Het., i, p. 232 (1867).
Diplorhinus furcatus, Am. & Serv., Hist. Nat. Ins. Hém., p. 178, t. 3, f. 6 (1843); Dallas, List Hem., i, p. 359 (1851); Walker, l. c. iii, p. 494 (1868); Voll., Faune Ent. l'Arch. Ind. Néerl., iii, p. 41 (1868); Stål, En. Hem., v, p. 122 (1876).

Fuscous: hemelytra and scutellum a little paler: head large, porrect, bifurcate: antennæ short, very slender, pale: pronotum scabrous, sides serrate and posteriorly produced on both sides in a prominent angle: median line on hemelytra, blackish: membrane hyaline, with eight straight, black, longitudinal veins: feet lutescent (*Westw.*). In *P. distans*, H. S., the lateral margin of the hemelytra and a small longitudinal line at base of the scutellum are ochreous; beneath dark brown, more red-brown posteriorly: feet yellow-brown. Long, 18-19 mill.

Reported from Java. Sumatra.

Genus Macrina, Amyot & Serville.

Hist. Nat. Ins. Hém., p. 179 (1843): pt., Dallas, List Hem., i, p. 360 (1851); Walker, Cat. Het., iii, p. 496 (1868): Stál, Hem. Afric., i, p. 234, 244 (1864); En. Hem., v, p. 118, 122 (1876).

Body oblong-ovate: head triangular; juga flat, very acute, contiguous or somewhat so; in Indian species, the second joint of the antennæ extends at least by half beyond the apex of the head: sides of pronotum produced behind the middle in a gradually acuminated process, turning outwards and more or less forwards: posterior angles of the genitalia, in ♂, hardly prominulous, rounded.

431. Macrina dilatata, Distant.

Macrina dilatata, Distant, A. M. N. H., (5 s.) iii, p. 45, 52 (1879): Waterhouse, Aid, t. 6.

Broad, ovate: head broad, triangular, moderately covered with deep dark punctures; juga slightly sinuated, divided at the apex, meeting beyond the tylus which is much shorter: antennæ with the third joint shortest; fourth rather longer; fifth longest, black, with the base rufous (the first four joints vary in different specimens from rufous to luteous): rostrum reaching anterior coxæ: pronotum with the base slightly rugulose, somewhat crescent-shaped in front where it is bordered with a pale luteous band between the lateral angles, which are produced into two stout spines directed forwards; spinal apices black: anterior portion of the pronotum abruptly deflexed to the head, transversely costate, no-

derately punctured with brown; lateral borders denticulated: scutellum reaching beyond the base of the membrane, with five longitudinal, indistinct, somewhat catenulate elevated ridges, which are sprinkled with luteous, the median ridge generally most indistinct: membrane pale fuscous, extending beyond the apex of the abdomen: beneath and legs concolorous, thickly and finely punctured with brown: tibiæ sulcated (*Distant*). ♂, long 16, breadth at base of corium 8; exp. angles pronot. 11 millims. ♀, long 17, breadth at base of corium, 8½, exp. angles pronot. 12 mill.

This species approaches *M. coccinea*, Walker, but differs in its much greater breadth: some specimens are of a much darker colour than others.

Reported from the Naga hills 2000-6000 feet; N. Khasiya hills 1500-3000 feet.

432. Macrina coccinea, Walker.

Macrina coccinea, Walker, Cat. Het., iii, p. 497 (1876); Distant, A. M. N. H., (5 s.), iii, p. 45 (1879).

Bright red, very elongate-oval; head acute, a little longer than broad; tylus transversely striated; juga contiguous, obliquely striated: eyes not prominent: rostrum partly black, extending to the first coxæ: antennæ slender; second joint much longer than the third, as long as the fourth; fifth longer than the fourth, sometimes mostly black: pronotum and scutellum transversely rugulose; the former with a ridge between the posterior angles, which are acute, elongated and slightly inclined forward; sides in front serrated; a transverse, sometimes testaceous, callus on each side near the anterior margins: scutellum much attenuated, rounded at the tip, with a few or many yellow speckles: abdomen truncated at the tip; legs slender: hemelytra thickly and minutely punctured; membrane pellucid (*Walker*). Body long, 14½-15 mill.

Reported from Penang, India, Assam, Sikkim (mihi).

Genus Tetroda, Am. & Serv.

Hist. Nat. Ins. Hém., p. 177 (1843): Dallas, List Hem., i, p. 355 (1851); Walker, Cat. Het., iii, p. 493 (1868): Stål, Hem. Afric., i, p. 234 (1864); En. Hem., v., p. 118, 122 (1876).

Head with the juga long, gradually acuminate, slightly diverging outwards, somewhat straight, and tip slightly rounded; narrowed from the eyes, not incised at the eyes, lateral margins for the most part straight: second joint of antennæ a little shorter than the third, rest

almost equal in length: sides of pronotum laminated, produced anteriorly in a depressed porrect process, sides scarcely crenulate: scutellum extending scarcely beyond the middle of the abdomen, ending in a rounded point: veins of membrane rather straight.

433. Tetrodes histeroides, Fabricius.

Acanthia histeroides, Fabr., Ent. Syst. Suppt. p. 526 (1798).

Aelia furcata, Fabr., Syst. Rhyng., p. 188 (1803): Stoll, Punaises, p. 109, t. 28, f. 197 (1788).

Aelia histeroides, Fabr., Syst. Rhyng., p. 189 (1803).

Phyllocephala furcata, Herr. Schäff., Wanz. Ins., vii, p. 70, t. 237, f. 738 (1844).

Megarhynchus 4-spinosus, Westw., Hope, Cat. Hem., i, p. 19 (1837); Walker, l. c. p. 493 (1868)?

Tetroda histeroides, var. *sumatrana*, Ellenr. Nat. Tijds. v. Ned. Ind., xxiv, p. 171 (1862).

Tetroda histeroides, Am. & Serv., Hist. Nat. Ins. Hém., p. 178 (1843); Dallas, List Hem., i, p. 356 (1851); Walker, Cat. Het., iii, p. 493 (1868); Stål, Hem. Fabr., i, p. 41 (1868); En. Hem., v, p. 122 (1876); Vollenhoven, Faune Ent. l'Arch. Indo-Néer., iii, p. 41 (1868); Distant, A. M. N. H., (5 s.), iii, p. 45 (1879); Scott, Trans. Ent. Soc., p. 306 (1880).

Head black, bifid, with the rostrum inserted below the lobes; pronotum obscure, flat, the anterior angle much produced on both sides, somewhat spinose: scutellum black with a white marginal line on both sides: hemelytra black: body obscure (*Fabr*). Long, 17 mill.

Reported from Java, Burma, Bengal, Sikkim (mihi), Assam (mihi), Sinkip island.

434. Tetroda divaricata, Dallas.

Tetroda divaricata, Dallas, List Hem., i, p. 356 (1851); Walker, Cat. Het., iii, p. 493 (1868); Stål, En. Hem., v, p. 124 (1876).

♂. Fuscous, punctured: juga divaricate: membrane whitish, veins black: body beneath more obscure: antennæ black, two basal joints fuscous (*Dallas*). Long, 13-14 mill. Hardly different from *T. histeroides*, Fabr.

Reported from Nepál, Sikkim (mihi).

435. *Tetroda atomaria*, Dallas, List Hem., i, p. 356 (1851); Walker, Cat. Het., iii, p. 493 (1868).

♂. Head testaceous, thickly and faintly punctured; juga nearly meeting at the apex, lateral margins straight: pronotum with the anterior portion testaceous, obscure, punctured, becoming dark brown posteriorly, with numerous small elevated testaceous points: scutellum

dark brown, nearly black, punctured, with numerous small warts similar to those on the pronotum, and on each side at the base a yellow impunctate line, which tapers to a point posteriorly: coriaceous portion of the hemelytra dark brown, punctured, with several irregular longitudinal testaceous lines formed of small raised points; membrane whitish, opaque: body beneath testaceous, with an interrupted black band down each side within the lateral margins, on the line of the stigmata; stigmata white: pectus punctured with brown: legs testaceous; femora punctured with brown: rostrum pale testaceous: antennæ yellowish-white (*Dallas*). Long, 12½ mill.

Reported from N. India.

436. Tetroda bilineata, Walker.

Tetroda bilineata, Walker, Cat. Het., iii, p. 494 (1868).

Fawn-colour or blackish, or of an intermediate hue, very thickly and minutely punctured: head very much longer than broad; juga separate, lanceolate, twice the length of the tylus: eyes rather prominent: rostrum extending to the first coxæ: antennæ black, about one third the length of the body; second joint a little longer than the third; fourth longer than the second; fifth a little longer than the fourth: pronotum and scutellum transversely and slightly striated: pronotum with the anterior angles porrect, much elongated, very acute: scutellum attenuated rounded at the tip, with two whitish stripes which taper and converge from the base nearly to the tip and are bordered with black on the outer side: abdomen beneath in the blackish individuals of a dull dark red hue: membrane cinereous; veins black (*Walker*). Body long, 14-17 mill.

Reported from Java, Sumatra, Malacca, Burma, India, Sikkim (mihi).

Genus Gellia, Stål.

Hem. Afric., i, p. 234, 243 (1864); En. Hem., v, p. 118, 122 (1876).

Body oval: head much dilated, foliaceous, lateral margins distinctly incised at the eyes, abruptly dilated at the eyes and forming an angle, thence rounded before the incisure; juga very slightly distant: anterior lateral margins of the pronotum produced forwards in a depressed lobe.

437. Gellia nigripennis, Dallas.

Tetroda nigripennis, Dallas, List Hem., i, p. 357 (1851); Walker, Cat. Het., iii, p. 493 (1868).

Gellia nigripennis, Stål, En. Hem., v, p. 123 (1876).

♂. Reddish testaceous, thickly and finely punctured: head with

the lateral margins abruptly dilated a little before the eyes; juga foliaceous, rounded externally and nearly meeting at the apex: pronotum faintly rugose transversely, and with a distinct transverse ridge not far from the posterior margin: scutellum with its lateral margins brownish and with a black streak at each side at the base: hemelytra with the disc brownish; membrane black: margins of the abdomen ferruginous: body beneath with an irregular blackish band on each side on the line of the stigmata which are white: legs testaceous; tibiæ at the apex and the tarsi ferruginous: rostrum and antennæ testaceous, the latter somewhat ferruginous (*Dallas*). Long, 12½-13 mill.

Reported from N. India, Karachi (mihi).

438. Gellia obtusa, Dallas.

Tetroda obtusa, Dallas, List Hem., i, p. 357 (1851); Walker, Cat. Het., iii, p. 493 (1868).

Gellia (?) obtusa, Stål, En. Hem., v, p. 124 (1876).

♂. Testaceous, very thickly and finely punctured: head with the juga foliaceous, rounded at the apex, with the inner angles obtuse, not meeting; lateral margins with a minute black spine, tipped with yellow, on each side in front of the eyes: pronotum with an indistinct, transverse ridge near the hinder margin: scutellum with several scattered black points, and a black streak on each side at the base: membrane whitish, opaque: abdomen beneath thickly and rather coarsely punctured, with a large transverse impunctate pit on each side of each segment, touching the posterior margin of the preceding segment; the space around each of the stigmata with an irregular patch of black punctures: pectus rather coarsely punctured, with a few scattered black points, and a black shining spot on each side of the metastethium: legs testaceous; femora with brown points: rostrum testaceous, with the apex black: antennæ testaceous (*Dallas*). Long, 13½-14 mill.

Reported from N. India.

Genus Megarhynchus, Lap.

Ess. Hém., p. 65 (1832): Am. & Serv., Hist. Nat. Ins. Hém., p. 179 (1843): Dallas, List Hem., i, p. 361 (1851): Walker, Cat. Het., iii, p. 498 (1868): Stål, Hem. Afric., i, p. 234 (1864); En. Hem., v, p. 118, 123 (1876).

Body very elongate: head very long, ending in a sharp, bifid point, the bifurcation so close as to appear above but a longitudinal groove in the middle of the head: eyes very small, hardly prominulous: antennæ long, 5-jointed, first very short, rest of equal length to each other: rostrum very short, hardly reaching the insertion of the first pair of feet,

joints rather equal: pronotum nearly continuing the triangle formed by the head, without posterior spines turning forwards; posterior angles not prominulous: scutellum elongate, rounded at the tip, extending a little beyond the half of the abdomen: hemelytra hardly allowing the margin of the abdomen to be seen; membrane shorter than the coriaceous portion: wings shorter than the hemelytra: abdomen flat above, slightly tumid beneath, elongate, as broad at its base as the pronotum, gradually narrowing and abruptly truncate at the tip, nearly at the end of the hemelytra: feet robust, long, unarmed; tarsi long (*Am. & Serv.*).

439. Megarhynchus rostratus, Fabricius.

Aelia rostrata, Fabr., Syst. Rhyng., p. 188 (1803): Burm., Handb. Ent. ii (i), p. 357 (1835).

Lygæus hastatus, Fabr., Syst. Rhyng., p. 239 (1803).

Megarhynchus elongatus, Laporte, Ess. Hém., p. 65 (1832).

Megarhynchus hastatus, Dallas, List Hem., i, p. 361 (1851); Walker, Cat. Hem., iii, p. 498 (1868): Voll., Faune Ent. Ind. Néer., iii, p. 42 (1868).

Megarhynchus rostratus, Am. & Serv., Hist. Nat. Ins. Hém., p. 180 (1843): Herr. Schäff., Wanz. Ins., ix, p. 303, t. 322, f. 999 (1853): Ellenr., Nat. Tijddskr. Ned. Ind., xxiv, p. 172, f. 31 (1862); Stål, Hem. Fabr., i, p. 41 (1868); Ofvers. K. V.-A. Förh., p. 645 (1870); En. Hem., v, p. 123 (1876).

Clypeus of the head very long, bifid, with acute lobes; head, pronotum, hemelytra, body and feet, cinereous, immaculate; antennæ alone entirely rufous (*Æ. rostrata*, Fabr.). Very elongate: head porrect, subulate, acute, sulcate in the middle: antennæ inserted beneath the head, pale at the base, rufous at the apex: pronotum smooth, a little produced on both sides posteriorly, pale deep black before the margin: the margin itself white: scutellum elongate, smooth, flavescent; margin white: hemelytra ferruginous, margin white: wings hyaline: body flavescent, with a deep black spot on both sides at the apex (*L. hastatus*, Fabr.). Long, 20 mill.

Reported from Philippines, Java, Sumatra, Cambodia, Cochin-China, Siam, Burma, India, China, Sikkim (mihi).

440. Megarhynchus truncatus, Westwood.

Megarhynchus truncatus, West., Hope, Cat. Hem., i, p. 20 (1837); Dallas, List Hem., i, p. 361 (1853): Walker, Cat. Het., iii, p. 498 (1868): Voll., Faune l'Arch. Ind. Néer., iii, p. 43 (1868): Stål, En. Hem., v, p. 123 (1876).

Megarhynchus testaceus, Am. & Serv., Hist. Nat. Ins. Hém., p. 180 (1843): Walker, l. c., iii, p. 498 (1868).

Large: sub-parallel, testaceous-luteous, punctured fuscous: head acuminate, scarcely bifid, pronotum simple, as broad as the abdomen,

sides oblique, serrated: hemelytra fuscous, marked with pale lines: apex of the abdomen truncated (*Westw.*). Form somewhat similar to the broader examples of *M. rostratus*, Fabr., head and pronotum punctured fuscous; anterior lateral margins of the pronotum narrowly pallescent, not so strongly transversely rugose; distinct median longitudinal line and fine anterior transverse wrinkle levigate; posterior angles produced in an acuminate tooth (*Stål*). Long, 21 mill.

Reported from Java, Penang, India, China, Assam (mihi).

441. Megarhynchus limatus, Herr. Schäff.

Megarhynchus limatus, Herr. Schäff., Wanz. Ins., ix, p. 303, t. 322, f. 998 (1853): Stål, En. Hem., v, p. 124 (1876): Distant, A. M. N. H., (5 s.), iii, p. 45 (1879).

Elongate-obovate, broadest over the pronotum: head bifid, a little longer than broad: pronotum and scutellum grossly punctured, transversely rugose: sides of pronotum serrulate, roundly prominulous and moderately acute, though the angles are hardly prominent: scutellum with five weakly elevated longitudinal lines: the hemelytra finely punctured between the elevated veins: dark ochreous yellow; the feet more ferruginous; hemelytra between the veins, purple-red. Like and closely allied to *M. truncatus*, Westw., from which it differs in having head and pronotum shorter, stature broader, punctuation stronger, concolorous or weakly ferruginous, rarely fuscous on the head: the lateral margins of the pronotum are not pallescent, they are strongly rugose, posterior angles slightly and somewhat obtusely prominulous, no levigate longitudinal line or only a very obsolete one, no anterior transverse wrinkle or ridge. Long, 20-21 mill.

Reported from Assam (mihi).

442. Megarhynchus transversalis, Westwood.

Tetroda transversalis, Westw. in Royle's Ill. Bot. Him., p. liv, t. 10, f. 7 (1839); Dallas, List Hem., i, p. 356 (1851); Walker, Cat. Het., iii, p. 493 (1868).
Megarhynchus(?) transversalis, Stål, En. Hem., v, p. 124 (1876).

Fuscous-black: acutely bicornuted; anterior angles of pronotum produced acutely forwards: pronotum and scutellum transversely striated: corium black, very thinly punctured; membrane whitish: antennæ and feet black (*Westw.*). Long, 15½; broad, 7¼ mill.

Reported from the Himalaya.

443. Megarhynchus diversus, Walker.

Megarhynchus, diversus, Walker, Cat. Het., iii, p. 498 (1868).

Testaceous, subfusiform, narrowest at the tip of the abdomen, thick-

ly and minutely punctured; some of the punctures black: head a little longer than broad; juga lanceolate, connected: eyes not at all prominent: rostrum extending to the fore coxæ: antennæ slender, second joint much longer than the third, as long as the fourth; fifth longer than the fourth: pronotum with the posterior angles prominent and nearly rectangular; sides in front serrated: scutellum attenuated, rounded at the tip, with some black speckles along each side near the base: abdomen with the hind angles of the apical segment extending beyond the anal appendage: hemelytra more minutely punctured than the pronotum: membrane pellucid (*Walker*). Long, 12½ mill.

Reported from India. Differs from *M. truncatus*, Westw., in having the posterior angles of the pronotum more determinate and the thorax more abruptly contracted.

IV.—*On certain Earthworms from the Western Himalayas and Dehra Dun.*—*By* Alfred Gibbs Bourne, D.Sc. (Lond.), C.M.Z.S., F. L. S., *Fellow of University College, London, and Madras University. Communicated by* The Superintendent of the Indian Museum.

[Received December 15th, 1888;—Read January 2nd, 1889.]

(With Plate III.)

Introduction.—These specimens were collected and placed in my hands for examination by Mr. J. Wood-Mason, Superintendent of the Indian Museum, Calcutta. They come from two localities, Dehra Dun and Masouri. Dehra Dun lies at the foot of the Western Himalayas and at no great elevation. Masouri lies at an elevation of 5—6000 feet on the southern slopes of the Western Himalayas.

The worms from Dehra Dun belong to the three genera *Perichæta*, *Perionyx*, and *Typhæus*. There is one species of each of these genera. The *Perichæta* is *P. houlleti*, E. Perrier. The specimens of *Perionyx* are none of them in a sufficiently mature condition to enable me to characterize the species; they differ in the shape of the setæ and in colour from *P. saltans*, Bourne; neither can they be referred to *P. excavatus*, E. Perrier; nor to *P. m'intoshi*, Beddard. The *Typhæus* I have referred to a new species, *T. masoni*. The worms from Masouri include three species of *Lumbricus*, or at any rate of some genus or genera of the *Lumbricidæ*, and two species of *Perionyx*. The specimens of the latter are, like the specimens of *Perionyx* from Dehra Dun, immature, and do not moreover appear to belong to any of the hitherto described species of this genus. I refrain from naming the species of *Lumbricus*, because I could only give an incomplete description and thus hamper any future observer who obtains them in a fresh condition. The literature with regard to the genera and species of the *Lumbricidæ* is already in great confusion. I am now acquainted with seven distinct species belonging to this family which occur in India.

We have not at present many data with respect to the relation between the altitude and the worm fauna.

I have stated* that *Perichæta stuarti* is to be found at an elevation, of 5000 ft. and also at one of 1000 ft., but this has proved to be a mistake which arose from my collector having mixed specimens from the two localities. I cannot find *P. stuarti* at any great distance down the ghaut.

* On Indian Earthworms, Part I. Preliminary Notice of Earthworms from the Nilgiris and Shevaroys. Proc. Zool. Soc. 1886, p. 667.

Fletcher* has recorded specimens of the same species of worm from different altitudes, *e. g.*, *Lumbricus novæ-hollandiæ* from the sea-level at Sydney and from 2,700 ft. at Capertee; *Perichæta exigua* from the sea-level near Sydney and from Springwood on the Blue Mountains.

There is, I presume, nothing like the difference in climate between these Australian localities that exists between that of any hill-station in India and of the plains. So far as my observations go all the species from hill-stations differ from those of the plains. I have found species of *Perichæta*, *Acanthodrilus*, and *Moniligaster* on the hills and other species in the plains, but I have never found *Lumbricus* in the plains. I do not know how far the present collection is an exhaustive one from the district, but so far it appears that *Typhæus* is confined to the plains or moderate elevations, while there is an undoubted *Perionyx* from Dehra Dun, and of the three species of *Perionyx* previously described *P. saltans* comes only from considerable elevations, *P. excavatus* and *P. m'intoshi* come presumably from the plains, so that the genus *Perionyx* is also to be found at varying elevations.

None of the species in the present collection are identical with any which I have hitherto found in Southern India.

Perichæta houlleti.

I do not propose to give any lengthy account of this worm without examining it in a fresh state. It is the less necessary to do so as the existing accounts enable one to recognise it with great certainty. It was originally described by Perrier,† and Beddard subsequently published two notes upon the species.

In one‡ of these he has described the setæ which are placed on the clitellar somites as much smaller than the setæ of the "anterior pre-clitellar" somites, and states that they terminate in a "distinctly bifid extremity; the two points in which the seta ends diverge at a considerable angle from each other, but are connected by a delicate membrane. The opposite extremity of the seta, which is imbedded in the body wall, is abruptly truncated. The whole seta has not the S-shaped curve, which is so constant a character in the group, but is curved only in one direction. As in the other setæ of the same species, and in the setæ of earthworms generally, the middle part is somewhat thicker; but this region does not lie in the middle of the

* Notes on Australian Earthworms. Proc. Linn. Soc. N. S. W. 1886, p. 545; 1887, p. 387.

† E. Perrier, Recherches pour servir a l'Histoire des Lombriciens Terrestres, Nouv. Arch. d. Mus. t. viii, 1872.

‡ Proc. Zool. Soc. 1887, p. 389.

setæ, but is closely approximated to the posterior extremity; the part of the seta which lies behind the dilated region is straight. The general shape of these clitellar setæ, apart, of course, from the bifid extremity, is like that of imperfectly developed ordinary setæ. That this is not really the case with these setæ is, however, clearly shown by the fact that all the setæ of the several rows comprised in the clitellum have precisely the same shape, and also by the fact that in two specimens of the worm, which were the first that came to hand, the structure of these clitellar setæ was precisely identical."

The ordinary setæ present also some variations in size. The seta immediately on either side of the median ventral line is usually if not always larger than the others. The setæ on the clitellar somites in my specimens agree with the minute description quoted above.

Perrier states that the gizzard occupies somite IX, but I have found that the septa separating somites VIII—IX and IX—X are absent, so that the gizzard may be said to occupy somites VIII, IX, X. This is the position ascribed to the gizzard in *P. fœ*, *P. indica*, *P. peregrina*, and is moreover its probable position in *P. sieboldi*, *P. japonica*, *P. musica*, and *P. annulata*. These are all worms possessing other special characters in common, and further investigation will probably add to the list *P. affinis*, *P. birmanica*, *P. sumatrana*, *P. hasselti*, *P. robusta*, *P. aspergillum*, *P. quadragenaria*, *P. elongata*, *P. schmardæ*, *P. capensis*, and, possibly, *P. queenslandica* and *P. darnleiensis*.

The organs described by Perrier as testes are doubtless seminal reservoirs; in position and structure they agree with these organs in so many other worms. I have not, however, been able to find the true testes, but could doubtless do so in fresh specimens. The spermathecæ and prostates have been described and figured by Perrier. I have figured them in Pl. III, Figs. 4 and 5. The number, position, and structure of the spermathecæ have been largely used as specific characters. The structure of the prostate glands is a character of no less specific importance.

Typhæus masoni, sp. n.

External characters.—Length 130 m.m.; width 6 m.m. Prostomium is short and broad and can be retracted so as to be hidden by the first or buccal somite. The latter is but very slightly marked off from the second somite and is as usual devoid of setæ. The other pre-clitellar somites consist of two, three, or even four annuli.

The clitellum when fully developed extends completely round the body in somites XIV, XV, XVI, nearly the whole of XVII, and a small portion of XIII.

The clitellum presents ventrally a very curious appearance owing to the structures about to be described. Between somites XV and XVI, and also between somites XVI and XVII, there is a pair of oval depressions in the middle of each of which stands a little papilla. Between somites XIX and XX there are similar structures, but the depressions are much less marked and the whole thing is smaller. These structures are a very little further from the ventral median line than are the ventral pair of setæ on each side. The male pores are placed in somite XVII a little further still from the median ventral line; they are on papillæ which lie in very deep pits. These structures are shewn in Pl. III, Fig. 1.

The oviducal pores are placed anteriorly to the setæ in somite XIV; they are separated from one another.

The spermathecal pores are very well marked slit-like apertures placed between somites VII and VIII; they lie nearer the middle line than do setæ 3.* The dorsal pores, intersomitally placed, are visible behind the clitellum; they are especially well marked at the posterior end of the body.

Nephridiopores are not visible. There are eight setæ in each somite; they are confined to the ventral surface of the body. Their arrangement in eight longitudinal rows is what chiefly strikes one on examining a spirit specimen. In about the anterior two-thirds of the body setæ 1 and 2, and 3 and 4, lie nearer to one another than do setæ 2 and 3, that is to say, the setæ are placed in couples, but this arrangement gradually changes and in about the posterior third of the body the eight setæ still lying in a row on the ventral surface are almost equidistant from one another. The ventral gap remains however a trifle wider than the interspace between any two setæ.

The full complement of setæ is present in the clitellum, but in somite XVII setæ 1 and 2 are replaced by the groups of penial setæ described below.

Septa.—The most anterior septum is septum IV—V (*i. e.*, the septum which forms the boundary between somite IV and somite V). This and septum V—VI are very thick being exceedingly muscular. The next septa which are developed are, I think, septa VIII—IX, IX—X, and X—XI. These are all fairly muscular and placed close together, that is to say, they do not correspond in position with the external divisions between the somites. It is therefore exceedingly difficult to

* I adopt the convenient system of numbering the setæ suggested by Benham, seta 1 being the seta which lies nearest the median ventral line on either side; seta 2 the seta immediately beyond seta 1 and so on.

state with certainty which segments they really bound. All the remaining septa are very thin.

Alimentary Canal.—The mouth occupies the usual position and when the prostomium is protruded is overhung by it, but, as stated above, the prostomium can be retracted so as to be completely hidden by the buccal somite; the mouth then appears to be terminal.

The buccal cavity and pharynx resemble those of *T. orientalis.*

The gizzard has precisely the structure described for that species. It is "divided into two portions an anterior small thin-walled compartment and a large thick-walled portion, the gizzard proper, this last has a nacreous appearance on the outside and is lined by a very thick chitinous layer." It lies between septum V—VI and septum VIII—IX and thus extends over three somites (VI, VII, VIII). Muscular bands are attached to the walls of the gizzard and pass to the body wall.

The alimentary canal is considerably dilated in somite XI or XII, a pair of œsophageal glands being present. From the gizzard up to this dilation the œsophagus is narrow, and beyond the latter, until it widens out at about somite XVI, it is also narrow.

There are four pairs of glandular bodies placed on the intestine in the hinder region of the body. They are all bi-lobed and lie below the dorsal vessel and not above it. (Beddard states that they lie above the dorsal vessel in *T. orientalis.*)

Nephridia.—There are large tufts of nephridial tubules in the pharyngeal region and a series of smaller tufts in the other pre-clitellar somites. I have especially noted the tufts which are placed near the spermathecal ducts. I am unable, from the specimens I have, to enter into further details with regard to the nephridia, but I have observed nothing which differs from Beddard's account of these organs in *T. orientalis* and *T. gammi.*

Generative organs.—I am anxious to examine other specimens before giving a full account of these organs.

A pair of ovaries are present in the usual position in, I believe, somite XIII, but the specimens being very contracted in this region it is impossible to be quite certain as to the number of any particular somite. The oviducts open to the exterior by a pair of pores placed in the anterior half of somite XIV.

I have been unable to see the testes.

I have found a single pair only of seminal reservoirs and near them a pair of bodies with a nacreous appearance which seem to be ciliated rosettes, as, connected with these, I find the vasa deferentia.

I cannot be quite certain, but apparently both the seminal reservoirs and the ciliated rosettes belong to somite XI; as mentioned above, the

septum which I have calculated to be septum X—XI is a thick one, and they certainly lie posterior to it. The seminal reservoirs are very large and extend backwards over three or four somites.

The prostates (I reserve for the present any expression of opinion as to the desirability of retaining this term or substituting for it the term atria) are large and lie one on either side of the body. Each consists of an irregularly coiled, almost orange-coloured, glandular tube which is connected at one end with a muscular duct opening to the exterior in somite XVII. The vas deferens is connected with this just before it penetrates the body wall. There is a muscular sac containing several very long and slender penial setæ; these project from the little papilla which lies in the depression round the male pore. These setæ are shewn in Pl. III, Fig. 3. There are two varieties, one of which is nearly a quarter of an inch in length and much longer than the other.

There is a single pair of spermathecæ, the apertures of which lie between somites VII and VIII, as shewn in Pl. II, Fig 1. Each spermatheca is large, somewhat reniform in shape, and has arising from the hilus a short, very stout and muscular efferent duct. Opening into the duct near the hilus is a pair of diverticula. One of these is so deeply bi-lobed as to almost form two separate little sacs, while the other is slightly tri-lobed. Both have a very nacreous appearance which is not possessed by the spermatheca itself.

General Remarks.—There can be no doubt but that this worm belongs to the genus *Typhæus*, Beddard. Two species of this genus have been described, *T. orientalis** and *T. gammi*.†

I should have hesitated about placing this worm without further information in a separate species had not Beddard described this second species *T. gammi*; but this worm differs as much from either *T. orientalis* or *T. gammi* as these latter do from one another. Beddard denies the existence of a prostomium. If this is non-existent it is a very remarkable fact. Beddard states that setæ 3 and 4 are absent from the somites which form the clitellum in *T. orientalis*. He does not mention their presence or absence in speaking of *T. gammi*. They are present in my species, although not always visible on a mere external examination. Beddard says nothing with regard to the arrangement of the setæ in the posterior region of the body, so that I am justified in concluding that the arrangement which I haved noted is peculiar to my species; it gives the worm such a striking appearance that one could hardly fail to notice it. Beddard does not mention œsophageal glands as present in either *T. orientalis* or *T. gammi*.

* Beddard, Ann. & Mag. Nat. Hist. ser. 4, vol. xii, 1883.

† Beddard, Quarterly Journ. Microsc. Science, vol. xxix, 1888.

There is still some doubt, I think, with regard to the position of the septa in all species, and, until this is resolved, it is difficult to fix the position of the testes, seminal reservoirs, and ciliated rosettes. Beddard states that in *T. gammi* the two most anterior septa are septa IV—V and V—VI; that one septum, presumably VI—VII, is absent and that "farther back are three thickened septa which lie between segments VIII, IX and X." Now, I believe, that in ascribing a position to the internal organs we should determine the somite by the septa which bound it. It is true that the septum often appears to have a position which is not in accordance with the limits of the somites as marked externally, but this may be seen in longitudinal sections to be due to the fact that the muscular fibres of the septum adhere for some little distance, either backwards or forwards, to the body wall. Beddard's statement that three septa lie between three "segments" is misleading. Three septa bound two somites. I would interpret the "three thickened septa" mentioned above as septa VIII—IX, IX—X, and X—XI. If this be the case the single pair of testes and ciliated rosettes lie in somite XI. According to Beddard's account of *T. gammi* they lie in somite X, while judging from his figure they would appear to be in somite XII.

I propose to define the present species as follows:—

T. masoni.—Penial setæ of two varieties lying together in the same sac; the one variety very long, with a slight S-shaped curve and a subterminal dilation at the distal extremity, while the proximal extremity presents irregular transverse markings; the other variety shorter, somewhat spear-shaped, the distal extremity flattened and furnished with obscurely marked chevron-shaped ridges.

The setæ in about the posterior third of the body are not arranged in couples as in the anterior two-thirds, but are equi-distant from one another, the ventral gap being slightly larger than the interspace between any two setæ.

The spermathecæ are provided with two diverticula, the one bifid the other obscurely trifid.

I do not suggest any modifications of Beddard's definition of the genus, but expect that some will be ultimately necessary. As far as we know, neither the character of the diverticula of the spermathecæ nor the number of these organs themselves is of generic value. The number of intestinal glands probably varies in different species, and, further, I am not quite sure about the position of the testes.

EXPLANATION OF PLATE III.

Fig. 1. *Typhæus masoni*. Ventral view of the anterior somites. *m*. mouth; *sp*. spermathecal pore; ♀. oviducal pores; ♂. male pores; $p^1p^2p^3p^4$. copulatory papillæ; *c*. clitellum. The roman numerals indicate the numbers of the somites.

Fig. 2. Prostate gland, etc., of the left side from the same worm. *ext*. aperture to the exterior (male pore); *v. d*. vas deferens; *m. d*. muscular duct of the prostate gland; *pr*. the prostate gland; *p. s*. sac containing penial setæ.

Fig. 3. Penial setæ from the same worm. One of each of the two varieties *a* and *b*, is drawn.

Fig. 4. *Perichæta houlleti*. Prostate gland of the left side. *ext*. aperture to the exterior; *m. d*. muscular duct; *pr*. prostate gland.

Fig. 5. Spermatheca of the same worm seen turned forwards. *sp*. Spermathecal sac proper; ap^1. large cœcal diverticulum; ap^2. small cœcal diverticulum.

V.—*Notes on Assam Butterflies.*—*By* William Doherty, *Cincinnati, U. S. A. Communicated by* the Superintendent of the Indian Museum.

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(With Plate X.)

A collection of butterflies made on the Upper Assam frontier between August and December, afforded material for the following notes. The specimens were taken partly in the hills beyond Margherita, on the border of the independent Naga country, fifty miles due south of Sadiya and the Brahmaputra, and partly on the Dibang and Dikrang rivers north of Sadiya. The season was a very poor one, the cold weather commencing earlier than usual. The number of species taken was so small, and some groups were so poorly represented, that I have thought it best to postpone publishing a list of the butterflies of the district till after my return there next spring.

The dry-season, non-ocellate brood of *Mycalesis*, *Melanitis*, *Junonia*, etc., appeared about the end of September, and none but rubbed and ragged individuals of the wet-season brood were seen flying after that date. *Æmona amathusia*, a morphid, turned out to be also dimorphic, as indeed might have been expected. My theory of the effect of drought and humidity (somewhat like that of heat and cold on certain European species) on the shape and ocellation of these butterflies has now received confirmation from various sources. In Eastern Java and the neighbouring islands of Sumba, Sambawa, and Timor, the seasons are the reverse of those in India, the winter months—December, January and February—being the rainy ones. I found the broods of the *Satyridæ* similarly reversed there, the wet-season form coming out late in the autumn, and the dry-season one in the spring. This is of course only indirect evidence, but direct evidence has not been wanting. Mr. de Nicéville, who early adopted my views on this subject, some time ago reared *Mycalesis mineus* from the eggs of *M. visala* and has lately bred *both* forms of *Melanitis leda* under natural conditions from the eggs of the ocellate one. This, however, took place at the time of the change of monsoon. At any other time it must be very unusual for both forms to come from the same parent. Two years ago in the early part of the dry season in the island of Sambawa, I succeeded in obtaining both *Melanitis leda* (*determinata*) and *ismene* from the eggs of *leda* by keeping a wet sponge in the box in which the former species was reared. I particularly recommend this experiment to naturalists living in the East, as *Melanitis* lays its eggs with unusual facility in captivity, and the larva feeds on young growing rice, which is always obtainable. My

chief difficulty with this and other species resulted from my constant change of abode. The dimorphism of many other species yet remains to be demonstrated by breeding. But in these cases, the evidence of the prehensores, in itself irresistible, added to the thousand signs and tokens of identity obvious to any unbiassed field-naturalist, settles beforehand what the results will be.

Another group in which much may be done by breeding is that of the *Euplœas* included by Mr. Butler in *Salpinx*. Mr. Moore has described a number of Assam species forming the majority of his genus *Pademma*. These are not local varieties. In a single glade in the forest one may find them all, together with dozens of intermediate forms. I have collected species of *Salpinx* in various regions from Malabar to Timor, and even in the smaller islands, where *Euplœas* of other types are among the most constant of insects, they varied to a remarkable extent. In Upper Assam, where *midamus* is the dominant *Euplœa*, the *Pademmas* more or less resemble that species, and after various fluctuations in the border-country between *midamus* and *core*, they finally assume, in Lower Bengal, a tolerably fixed and constant form (*kollari*) as a mimic of the latter.

In general, however, it seems to me that the results expected from breeding will never be realized, and the formula now much in vogue among lepidopterists—"these forms may be only varieties of ——— but till careful breeding has proved that such is the case, we prefer to keep them distinct"—is about as dangerous as can well be imagined. The burden of proof is thus thrown on the unfortunate breeder, and the describer feels that he can safely neglect the ordinary means of proving a species, examination of a series of both sexes from more than one locality, and an attempt to associate some structural peculiarity of form, sex-mark or prehensores, with the proposed species. The *Pieridæ* have especially suffered in this regard, and in particular *Terias*, *Ixias*, and *Teracolus* have been thus reduced to confusion thrice confounded. Breeding can probably accomplish little with such genera. A group of these butterflies, sitting together on the wet sand, will, in three cases out of four, consist of but one variety, varying little; or, if there is another present, it will usually appear quite distinct. The next stream-bed may contain quite another breed. There is no reason for supposing that these varieties would not, in a majority of cases, breed true. It would be only now and then that the breeder, having overcome the great and greatly underrated (at least in the moister parts of the Eastern tropics) difficulties of rearing a new generation, will find any great variation in his specimens. But even this will prove nothing, because hybridism, which undoubtedly takes place occasionally between butterflies unques-

tionably distinct, must play a great part in such unstable races as those of *Terias*. The results of Mr. de Nicéville's previously mentioned experiment with *Melanitis* (though not, I think, those of mine) may with apparent justice be attributed by some to this cause. It is not by breeding that species like those of *Terias* described by Mr. Moore from Mergui will be invalidated. On examining the forms of different regions, one observes that the genus varies similarly almost everywhere, that the races have no well-marked habitat, and that every fresh locality and season adds links connecting them. The cutting down of forests seems to produce a general amalgamation of varieties which perhaps bred truly before. *Ixias* is a much more variable genus in the scrub jungles of Mount Abu, than in the high forests of Burma. In the open country around Calcutta and Rangoon, there is an inconstancy in the specimens of *Terias* which will rarely be found in the neighbouring tracts still left in their original state. The plants these butterflies feed on, instead of growing here and there in open spaces in the forest, are spread uniformly over extensive districts, and the wandering habits thus originated lead to hybridism and the obliteration of local races. The varieties of *Teracolus*, which are, so far as my experience goes, confined to dry, open country, are by no means so locally true as those of the forest-haunting genera.

It was perhaps the general destruction of forests in the long-settled parts of the East-India, China, Java—whether by the agency of nature or by that of prehistoric man, that gave rise to seasonal dimorphism in the *Satyridæ*. In the wet, dark woodland, their ocelli served them as a protection. Then came the change; the country was partly deforested, and, instead of the former uniformly damp climate, there was a long dry season in which the rank vegetation withered, the sunlight entered everywhere, and the ocellate butterflies were rendered conspicuous. Some species disappeared from the regions thus affected, while others lost their ocelli and assumed the angular shape and dull neutral colouring of dry leaves, and so survived. In the less variable climate of the equatorial regions, this has rarely taken place, and generally only the ocellate broods are found there. And in desert regions, instances may perhaps occur where the ocellate form has altogether disappeared.

Other interesting examples of the effect of environment on insect life may be mentioned. The large dark form of *Hypolimnas bolina* called *jacintha* occurs along with the typical race in many neighbourhoods. But I have generally taken *jacintha* in shady jungle, while the other variety may be common in the dry, open country half a mile away. In Assam I observed a remarkable case of similar change in the female of *Appias hippoides*. The normal form is dark above and

below, and but slightly clouded with whitish and dirty yellow. It was usually taken in the forest, moving slowly about in the deep shade, or lying *perdue* among the leaves. The other was almost as brightly coloured with pure white and rich yellow as the male, differing chiefly in the absence of the subapical yellow spot on the forewing below. Like the male it was always flitting up and down the sunny paths at the edges of the wood, only alighting from time to time for a moment or two. Intermediate specimens occurred, and there was no possibility that the species could be different; but the forms were so unlike that they might almost claim to be called dimorphic. I might have hesitated to adopt the conclusion that the differences corresponded with, or perhaps resulted from, the difference in station and habits, if I had not observed precisely the same thing in *Appias nero* in Borneo and the Malay Peninsula. Here again a female almost as richly-coloured as the male,* flies about with it in the sunlight, and a dusky, dull orange form lies hidden in the woods. But it is possible that these differences in the female may correspond with those very slight ones in the male on which Mr. Butler has based his *Appias figulina*, and that two distinct species are in question.

In *Euthalia* and its allies, great differences exist in allied species in the costal vein of the forewing, which in some species is free, and in some anastomosed with the first subcostal branch. I here give a list of the species taken in Assam, and those in the Indian Museum, arranged with reference to this peculiarity :

With the costal vein free.

Symphædra nais,
Lexias teuta,
Lexias teutoides,
Lexias recta,

* Unless my memory fails me, Mr. Forbes, in his "Wanderings in the Eastern Archipelago," observes that the females of *Belenois, Catopsilia, Appias*, and *Hebomoia* are more conspicuously coloured than the males. Seen against the white floor of a cabinet-drawer, or against a dusty road, they may be, but white backgrounds are not to be found in the jungle as nature made it. There the male of *Appias nero* goes by like a flash of living fire, and the pure white of the male of *Appias leis* or the green-white of the male of *Catopsilia* are of a brightness almost luminous. The dark variegations of the female obviously mitigate their brilliancy. Besides, even the brightest-hued females are more retiring and fonder of the shade than the males are, and hence less obvious. In all probability the female is only more conspicuous than the male in such extraordinary species as that justly called *Hypolimnas anomala* by Wallace, and perhaps in a few such *Lycænidæ* as *Biduanda thesmia* and *Catapœcilma delicatum*.

Dophla evelina,
Dophla derma,
Dophla ? dunya,
Euthalia lubentina,
Euthalia phemius, (a mimic),
Euthalia aconthea,
Euthalia jama,
Euthalia telchinia, (a mimic),
Euthalia kesava,
Euthalia vasanta,
Euthalia garuda,
Euthalia ? franciæ,
Euthalia ? sahadeva,
Euthalia ? anyte,
Euthalia ? patala,
Euthalia ? nara.

But of these, one out of five specimens of *nara* and *patala* had the costal vein anastomosed. And while all the seventeen males of *kesava* examined had no anastomosis, it was invariably present in the eighteen females placed under this species in the Calcutta Museum.

With the costal and first subcostal veins united.

Euthalia ? durga,
Lexias ? dirtea,
Lexias ? cyanipardus,
Felderia lepidea, (apparently a protected species),
Felderia macnairi, (apparently protected),*
Felderia iapis,
Felderia andersonii, (apparently protected),
Felderia satropaces, (apparently protected),
Felderia cocytina,
Tanaëcia pulasara,
Tanaëcia cibaritis,
Tanaëcia nicevillei, (a mimic),
Tanaëciaj ahnu,
Tanaëcia adima,
Tanaëcia apiades,
Tanaëcia puseda,
Tanaëcia ? anosia.

* It is mimicked by a new and remarkable species of *Herona* (?) of which both sexes were taken by me in Borneo, and are now in Mr. Neumoegen's possession.

In *durga* one out of six males had no anastomosis, and similar cases occurred in *dirtea* and *cyanipardus*, and apparently in *satropaces*. It is obvious that this feature is not absolutely constant. I have a specimen of *Symphædra dirtea*, female, in which no less than three very conspicuous anastomoses occur, the costal vein being united with the first subcostal branch, the latter with the second, and that with the third. The variation in *Prothoë* is mentioned below. Two years ago I made a list of the Malayan species similar to the above, and it exhibited similar irregularities.

The specimens described below are in Mr. Neumoegen's collection, unless the contrary is stated.

Family Satyridæ.

Mycalesis (Sadarga) charaka, Moore, (*oculata*). Margherita, only the ocellate form taken.

Lethe naga, n. sp. Pl. X, Fig. 4, ♀. Female, *above* dark fuscous. *Forewing* with a broad white oblique band from the costa (near which it is broader and whiter) to the submedian, above which it is suddenly bent downwards, passing close by the end of the cell but not touching it, its inner border distinct, its outer diffused. *Hindwing* with two pale submarginal lines, the ocelli showing through the wing, especially the white pupil of the fifth. *Below* uniform light fuscous-brown with a slight bronzy lustre. *Forewing*, base unmarked except by a very obscure darker line across the cell, the white band as above, two straight pale submarginal lines and five perfect subequal ocelli (ringed with pale violet), set in nearly a straight line between the lower median and the lower subcostal branch. *Hindwing*, with two irregular transverse darker lines placed unusually close together, and enclosing a narrow space obscurely glossed with violet. They originate below the costal vein, the inner crossing into the cell at the origin of the upper discocellular, and continuing parallel with it to the hind margin of the cell halfway between the forkings of the median vein, continued obscurely through the submedian space. The outer line runs in a parabola from the costal vein to the upper median, skirting but not touching the end of the cell, and, crossing the base of the upper median space, disappears above the last ocellus. Ocelli six, all large, perfect, with white pupils surrounded by black and ochreous and set in a large violet-whitish ring. The first is within the line of the others, and is extremely large, the next three subequal, the next larger, the sixth geminate, with two separate white pupilled black spots in a yellow field. Two wavy submarginal pale lines.

A single female, near Margherita. It is very large—about three and a half inches in expanse. The hindwing has almost no outer angle, the forewing has the outer margin straight (rounded in *verma*, etc.) and the lower angle not cut away (as in *hyrania*). The last bifurcation of the median vein of the hindwing takes place a little before the end of the cell. The species has no near allies. *Lethe margaritæ*, Elwes (*Neorina** *margaritæ*, Marshall and de Nicéville), which it apparently connects with the other *Lethes*, obviously differs in the white band of the hindwing below, and the white scales diffused over the under surface. As in *margaritæ*, the white band of the forewing is probably absent in the male.

Family Elymniadæ.

Dyctis pealii, Wood-Mason, Pl. X, Fig. 3, ♀. Sadiya and Margherita. The female differs greatly from the male in this handsome species. The tails are much longer than in the male—longer even than in *Elymnias caudata*. *Above*, the wings are tinted with blue instead of violet. *Forewing* with the subcostal band very obscure, the cell dark, the disc pale. *Hindwing* with a conspicuous rufous-orange anal spot occupying the entire breadth of the submedian space, the violet submarginal band of the male replaced by a short bluish fascia thence to the large discal and apical pale area. *Below*, the entire forewing, except the cell and the outer margin, is clouded with large violet-white striæ, and so is the apical and part of the discal area of the hindwing.

Family Morphidæ.

Æmona amathusia, Hew. (*pealii*, W.-M.). *Æ. pealii* appears to be the wet-season form of *amathusia*, differing only in the less acute and falcate forewing, the more distinct ocelli, and brighter colouring below, the usual differences between seasonal forms in India. I took two specimens of *pealii* near Sadiya in September. The outer margin of the forewing was convex throughout, but the apex was slightly more acute than in the type. On the first of December, I caught a single ragged specimen of *amathusia* near Margherita, apparently quite typical.

* That species is of course a *Lethe*. The true *Neorinas* are singular insects, and can only be retained in the *Satyridæ* on account of the difficulty of putting them anywhere else. I have often observed *N. loweii* in Borneo, the Malay Peninsula, and Eastern Java (where, however, the local representative may be distinct). It is continually changing its perch, flitting round and round the passers-by, and alighting with the wings partly or wholly open. When flying, it has the strongest possible resemblance to *Papilio helenus*, and it may possibly be advantageous for a scarce, rather weak-flying insect of morphid or satyrid affinities to resemble a common *Papilio* of powerful and irregular flight.

Family Apaturidæ.

Potamis (*or* Apatura) ulupi, n. sp. Pl. X, Fig. 2, ♂.

Male, *above*, *forewing*, black, quite unglossed, markings light ochreous-fulvous, the base, costa, hind-margin, and a few submarginal touches diffused rufous-brown; two small light ochreous spots above the radials, the upper largest; an obliquely transverse fulvous macular band from the subcostal vein to the lower angle, the first three spots being elongate-quadrate, separated only by veins, the last with a pale space beyond it, the fourth well separated from the first three, outwardly incised, the fifth subquadrate, diffused, close to the outer margin, with a large black spot partly enclosed by its inner border, the sixth slender, lying along the margin of the interno-median space; another transverse band from the upper edge of the cell to the submedian vein sloping obliquely outwards, and divided into three parts by the median vein and its lower branch, occupying the middle half of the cell (with a diffused streak at the lower angle, almost separated from it by an oblique black crescent), the basal half of the lower median and half of the interno-median space. *Hindwing* ochreous-fulvous, the abdominal margin as far as the lower, and in the middle of the disc the upper median branch, covered with diffused black scales, the apical part also sordid, the veins dark, the marginal line and a broader submarginal line thickened at the crossing of the veins, black, within which is a line of five partly united dark spots diminishing anally to mere streaks. A large and distinct black spot discally in the lower median space.

Below, *forewing*, paler tawny, the black spaces above replaced by dusky fulvous ones, except a large black spot in the lower median space, and a diffused blackish one below it, near the lower angle of the wing. The two subapical spots, and a touch on the costa beyond the cell, lilac-white. *Hindwing* light fulvous, the base slightly glossed, pale; a large ocellus pupilled with purple in the lower median space; a lustrous lilac-white band across the wing discally, bordered inwardly by a darker ferruginous band broadest near the costa; a submarginal ferruginous line, within which are a few obscure lilac-white touches, between which and the lilac band lie four good-sized lilac-white spots and some ferruginous touches.

One male taken by Lieut. Hartert on the Dikrang near Sadiya, another by me at Kobong between Sadiya and Margherita. One or two others were seen.

This butterfly has no near allies. In general appearance it is something like *Dilipa morgiana* or *Sephisa dichroa*. In its small body and rather weak flight it resembles *Apatura* (*Eulaceura*) *osteria*, and if

the female turns out to have two parallel raised processes on the underside of the abdomen, as in that species, it might be classed with it. But it seems nearer the European *iris*, though so differently coloured. The border is less serrate, the forewing more falcate, and its costa longer than in any other *Apatura*. The abdominal margin of the hindwing is long and the outer margin not much rounded. The radial veins of the forewing are unusually approximate basally, and the last bifurcation of the subcostal is unusually near the margin. It is remarkable that the varieties of *Apatura namouna* and *Dilipa morgiana* found in the Naga Hills, judging from the specimens in the Indian Museum, differ from Sikkim specimens and somewhat resemble this species in their smooth-bordered elongate wings, weak bodies, and dull colouring.*

Prothoe regalis, Butler, var. One ragged male taken near

* In a paper which appeared in this Journal in May, 1886, the corrections to which arrived too late for publication, *Potamis* (*Apatura*) *namouna* was by a clerical error placed among the *Nymphalidæ*, instead of among the *Euripinæ* at the top of the preceding page. This group, like the *Doleschallinæ* and *Charaxidæ* (which by a similar error were placed between the *Apaturidæ* and *Nymphalidæ*) seem intermediate between the *Apaturidæ* and *Satyridæ*. As *Charaxes* is partially connected with the *Euripinæ* by *Prothoë* and *Mynes* it had better be placed as a sub-family at the end of the *Apaturidæ*. The name *Bybliadæ* must be substituted for *Eurytelidæ*. *Kallima*, it seems, is a true apaturid, near *Rhinopalpa* and *Hypolimnas*. There is no important difference between the *Junonia* and *Apatura* groups, though the *Vanessa* group seems distinct enough. So much confusion arises from the use of the names *Nymphalis* and *Apatura*, that it is a pity that they cannot be dropped altogther. The *Apaturidæ* might then stand as the *Vanessidæ*, the *Nymphalidæ* as the *Neptidæ*. The latter including *Limenitis*, *Adelpha*, *Neptis*, *Euthalia*, *Parthenos* and their allies is a well separated group; the former can only be separated from the *Satyridæ* and *Morphidæ* by an artificial line. The long series of genera from the most primitive morphid to the highest apaturid (*Cynthia* or *Cethosia* for instance) forms almost an unbroken chain. The anomalous genus *Pseudergolis*, in which the forelegs of the female, though small, are quite perfect, might be formed into a separate family, or subfamily. The undescribed female of *P. avesta*, which exhibits this peculiarity, has but little resemblance to the male, but is a close mimic of *Precis iphita*.

Libythea seems more allied to *Hamadryas* and the *Neotropidæ* than to the *Pieridæ*. Of the *Erycinidæ*, the American *Lemoninæ* (with their reticulate eggs) seem very much nearer the *Lycænidæ* than their Eastern allies are, though no doubt all three are related. The arrangement adopted with the *Hesperiadæ* cannot stand, and I have altogether remodelled it. The statement that the enclosed spaces (laterally) on the eggs of *Lycænidæ* were tetragonal was inadvertent. They are trigonal, tetragonal, hexagonal, or wholly irregular, according to the genus and sub-family. My work on eggs and young larvæ still progresses, and on account of the great number of genera covered, it may, I hope, prove a useful supplement to the labours of Scudder and Edwards.

Margherita, and one seen near Sadiya. The former agrees with *regalis* in the dusky underside, and the very broad blue band and five blue spots of the forewing above, but the hindwing and the base of the forewing have an obvious violet gloss, though they are not, as in *angelica*, powdered with bluish-white scales. The costal and first subcostal veins of the forewing are well separated. Mr. de Nicéville thought that this occurred only in *P. caledonia (Mynes calydonia*, Staudinger). But *P. angelica* has the veins sometimes free and sometimes united.

Family Nymphalidæ.

Tanaëcia adima, Moore. Margherita. This species has the hindwing sometimes wholly brown, sometimes with a narrow macular band of blue over three or four spaces marginally. These and intermediate forms are all found in the same locality. I am inclined to think the species distinct from *apiades*, though very near it.

Family Lycænidæ.

Sub-family Lycæninæ.

Pithecops fulgens, n. sp., Pl. X, Fig. 6, ♂. Male, *above* black, *forewing* with the cell, the interno-median space and the disc to the lower radial, resplendent cyaneous blue in some lights, dull violet in others, the black border wide, extending one-third towards the base. *Hindwing* similarly blue from the lower subcostal to the submedian, the black border somewhat narrower, especially towards the anal angle. Cilia of hindwing whitish except at the ends of the veins. Female, *above* blackish, the costa and outer margin of the forewing darker. Cilia of the forewing pale, of the hindwing white.

Below, both sexes pure white, a very slender dark marginal line, a narrow submarginal white band containing a line of six minute dark transverse streaks in the forewing and five in the hindwing, within which is a narrow transverse ochreous-brown fascia very clearly defined (in the hindwing by an obscure dark line on its inner border), extending across the whole breadth of the forewing and on the hindwing from the upper subcostal to the submedian vein. Traces of slender discal streaks in the forewing near the lower angle within the ochreous band. Apex of forewing obscured with black scales, hindwing with a large and conspicuous subapical black spot extending from the costa to the lower subcostal vein.

Margherita, where it perhaps takes the place of *P. hylax*. According to Mr. de Nicéville, that species is in Sikkim much commoner than *Neopithecops*, which I did not see in Assam at all. But in the Chittagong

Hill Tracts, at Saudoway and Bassein in Burma; in Tenasserim, and in the Malay Peninsula, *Pithecops* is the rarer form. In Java it is *Neopithecops* that is rare, another instance of its close faunal resemblance to the Himalayas. In the Celebes, I did not observe any *Neopithecops*, but a large protected *Pithecops* (*P. phœnix*, Röber) is very common and conspicuous. On the other hand, *Neopithecops* seems to occur alone in Malabar (where I found it as far north as the Gersapa Falls in North Kanara), and Ceylon, and also, so far as my experience goes, in the islands of Lombok, Sambawa, and Sumba east of Java.

The genera differ in many important points. As regards prehensores, the clasp (*harpago*) of *Neopithecops*, seen from the side, is simply clavate at the tip, while that of *Pithecops* is long and slender and ends in two opposing points like a pair of pincers. As to the egg, in that of *Neopithecops* the raised lines form triangles laterally, in that of *Pithecops* quadrangles. Both genera are apparently more or less protected, and are mimicked by certain rare species of *Logania* (*Gerydinæ*) and *Cyaniris* (*Lycæninæ*).

Sub-family Poritiinæ.

Massaga hartertii, n. sp., Pl. X, Fig. 1, ♂. Male, *above* black, markings in some lights lustrous sea-green, in others more or less bluish, the tips of the scales being blue and slightly bent downwards. *Forewing* with six submarginal spots, the upper five small and subequal, arranged in a linear series, the lower slightly nearer the base, oblong and much larger than the others; a slender oblique fascia beyond the cell, divided by the radials into three parts, the lowest longest; a stripe along the lower side of the median vein, extending to the base, a small part of it lying beyond the lower median branch, which divides it; beyond this a wider transverse discal spot, divided by the middle median into two portions outwardly dehiscent; another stripe along the hind margin almost from the base, the outer end inclined upwards, with a minute spot above its termination, separated from it by the internal vein. *Hindwing* with a large pale costal area, a tuft of long hairs, appressed in the direction of the apex, on a gland which forms a raised elliptical line on the underside above the origin of the first subcostal vein; submarginal spots four, a diffused one extending from the median halfway to the submedian vein, a large obliquely-semicircular one dark in the middle, in the lower median space, a narrow crescent close to the marginal black line in the upper median space, and a small diffused spot in the next space, partly united with the upper discal spot. Discal spots three, one occupying the submedian space from its base, constricted in the middle, the clavate end occupying

the whole breadth of the space; beyond this two spots of moderate size in the median spaces discally. *Below* rufous-brown with a slight bluish gloss. *Forewing* with a broad white band beyond the cell, from the costa (where it is narrowest) almost to the hind margin; beyond it a broad space of darker, richer brown, then a row of seven delicate whitish transverse submarginal streaks, of which the upper three are most distinct, crescent-shaped, the others obscure and irregular. Beyond these a paler space, with three whitish streaks, parallel with and close to the upper three of the inner series. Margin chestnut brown, cilia chiefly light. *Hindwing*, basal part unmarked, a broad white band crossing the wing from the costa, occupying the outer third of the cell, its inner margin well defined, and but slightly irregular. The disc is covered with large rufous-brown markings in two very irregular series, the first four (those above the radial) on a white ground, the others on a ground obscurely clouded with violet and whitish scales. Two of these spots in the inner series and the median spaces, are much larger than the others, the outer one quadrate. A dark wavy outer discal line extends on a white ground to the upper median, where it is interrupted, and from there to the anal angle on a whitish ground. Marginal line orange-brown, bordered inwardly by a silvery line, between which and the wavy discal line are, in the upper median space a blackish area, in the lower median space a gray area, and thence to the anal angle a blackish line inwardly bordered with reddish. Cilia basally grey, outwardly dark.

From *Poritia phalena*, Hewitson, (Singapore), of which it seems to be the northern representative, it differs in the narrow streak below the cell in the forewing, with the bifid spot beyond it, and in the long mark in the hind margin. The hindwing below is quite different, much less white, the discal spots larger and of the general ground-colour, the submarginal spots absent and the apical rufous-brown space greatly reduced.

In the right forewing the first subcostal branch is wholly absent. This interesting aberration may be of frequent occurrence in this group, and may have been the cause that Moore, Felder, and Distant passed over this vein in their descriptions of the genus.

The egg probably agrees with that of the other species of the subfamily. It is a truncate pyramid, the base somewhat convex, nearly twice as long as wide; a horizontal apex, two vertical and two sloping sides, the former trapezoidal, reticulate near their upper edges, the latter and the apex nearly square, delicately reticulate. In the ovarian tubes of the female, these eggs are found in pairs, attached by their bases. Along with those of *Liphyra brassolis*, they are the most remarkable eggs in the family.

The chrysalis somewhat resembles those of the *Erycinidæ* and strikingly illustrates the singularity of the group. It is suspended, not girt, but rigidly inclined towards the surface of the leaf. It is less compact in form than that of other *Lycænidæ*, and is studded with bristles. Of these a number on the side of the head are white, with two black ones on each side of the top of the head, and one black one on each side of the thorax above the thoracic angle. The second, third, and fourth abdominal segments have each a lower white and an upper black bristle approximate laterally, while the last segments have a number of white lateral and of black subdorsal ones. The ground colour is ochreous much marked with dark, especially on the upper surface of the abdomen, each segment having a black line near its hind margin, except the first which has two distinct black spots dorsally. The wing-covers are veined and bordered with brown.

I name this species after my fellow traveller in Assam, Lieutenant Ernst Hartert, the ornithologist and African traveller, who obtained the sole specimen.

Sub-family Theclinæ.

Zephyrus pavo, de Nicéville. A single specimen taken near Margherita at only four hundred feet elevation. Though a male, it precisely agreed with Mr. de Nicéville's description of the (unique) type which was very likely also a male, though described as a female.

Ticherra acte, Moore. The very distinct dry-season form, non-ocellate and dusky fuscous below, was first seen in November, as well as that of *Cheritra freja*, while that of *Loxura atymnus* appeared early in October.

Dacalana vidura, Horsf. This species, which is rare in Assam though common in the Malayan region, has the habit of alighting on the underside of leaves (with closed wings), disappearing in the act as if by magic. It is a ground butterfly, living among bushes. *Neomyrina hiemalis*, which alights in precisely the same manner, is on the other hand a tree butterfly, and rarely descends within reach of the net. When flying it strongly resembles the white species of *Cyrestis* and the moths of the genus *Urapteryx*, the latter being apparently a protected group.

Family Papilionidæ.

Papilio (Pangeranopsis) elephenor, Doubleday. Two males of this rare species, Dikrang near Sadiya.

Papilio (Euplœopsis) telearchus, Hew. The undescribed female of this species appears to be dimorphic, one form resembling the male,

and the other the female, of *Euplœa midamus* (*linnœi*). Both were taken on the Dikrang near Sadiya.

Family Hesperiadæ.

Gehlota-group.

Gehlota, n. g. I separate *Plesioneura sumitra, leucocera* and their allies under this name. The typical *Plesioneura, alysos, Moore* (? = *curvifascia, Felder*), is closely allied to *Astictopterus* and *Kerana*. Like them it lies quiet in shady places, flying only now and then, and slowly; alighting with closed wings. The egg, like that of *Kerana*, is of the lowest type among butterflies. It is limpet-like, greatly flattened, red, leathery, nearly smooth (the ribs are visible only near the base), with a broad transparent basal carina. *Sumitra* is on the other hand one of the swiftest and most active of insects, incessantly whirling around flowers, or patrolling up and down a path, almost invisible from the rapidity of its flight. Like its allies of the *Tagiades* group, it alights with open wings. The egg is more than three-fourths as high as wide, generally white, with very numerous (three times as many as in *Tagiades*), sharply cut ribs, and a greatly contracted base without carina. I postpone a comparison of the structure of the imagines.

Gehlota pinwilli, Distant. One male, Margherita, agreeing well with Mr. Distant's description and figure. The species resembles *hypsina* and other *Cethosias* in colouring. If this is a case of mimicry it has its parallel in that of an *Agarista* only two inches in expanse, which obviously mimics the great Bornean *Hestias*. The enemies of butterflies seem not quite able to grasp the fact that they do not *grow*.

Suastus-group.

Plastingia margherita, n. sp., Pl. X, Fig. 5, ♂. Male, *above* black, with light golden-ochreous translucent markings, and richer orange-ochreous opaque ones. Of the former there are on the *forewing*, two unusually large, elongate-quadrate, subapical ones, separated by a vein, the lower longest: one large oblique cellular one of hour-glass shape; and three discal ones in echelon, of which one is very large, occupying the entire breadth of the lower median space, irregularly pentagonal, twice as long as broad, separated from the cell-spot only by the black median vein; the other two smaller, elongate, broadest outwardly. Also with the following opaque markings:—one above the cell and one in the interno-median space, extending obliquely from the internal vein, not far from the base, to the lower median vein, which separates it from the basal part of the larger discal spot. *Hindwing* with a large irregular

ochreous patch in the disc just beyond the cell, consisting of two translucent areas joined by the opaque orange-ochreous base of the upper median space, the outer one larger, obliquely quadrate, between the lower subcostal and upper median branches, the other occupying the basal part of the lower median space.

Below blackish, the veins, except near the abdominal margin of both wings, widely bordered with reddish-ochreous. *Forewing* with the rufous costal area extending over the upper part of the cell; that in the interno-median space much larger and paler than above. *Hindwing* with a number of lustrous lilac markings in the black spaces between the reddish nerve-rays, namely, two in the cell, the basal one elongate, one at the base of the costa, elongate, two in the upper subcostal space, the outer one elongate, one in the lower subcostal space, quadrate, and three in the median and submedian spaces, in a line receding from the border. Cilia ochreous.

One male, Margherita, and a similar one, Sadiya. The species is a local form (differing in the large subapical spots, the absence of the outer—fourth—discal spot, the undivided cell-spot separated from the interno-median one, and in the ochreous patch of the hindwing consisting of two hyaline and one opaque space and confined to the disc) of another found in the three Indo-Malayan islands, the Malayan Peninsula, and Mergui, but everywhere rare. The Javanese form (*callineura*) seems, judging from my specimens, to differ but slightly. The single, very worn Mergui specimen, taken by Dr. Anderson, has been identified by Mr. Moore as *Plastingia latoia*, Hewitson. But that species (and *P. callineura*, Felder, which is regarded as conspecific with it) has been described and figured by Hewitson, Felder, and Distant with ochreous submarginal spots on the hindwing below, no blue ones being mentioned. In any case the above-mentioned characters separate my species as a distinct local form.

The egg of several species of *Plastingia* examined by me generally resembles that of *Suastus*. But like those of *Hesperia sativa*, de Nicéville, and the species of *Cupitha*, though in a lesser degree, it possesses a large crown-like mass of white cells apically, surrounding the micropyles, as delicate in structure as the finest lace. They are the most beautiful butterfly-eggs known to me.

Ismene-group.

Capila jayadeva, Moore. One female, Margherita. I mention this species because according to Mr. Elwes it has never been recorded from anywhere except Sikkim.

Tagiades-group.

SATARUPA NARADA, Moore. Margherita, where *S. bhagava* also occurs.

CALLIANA PIERIDOIDES, Moore. This extraordinary genus and species were described from a single bad specimen without locality, from Grote's Indian and Burmese collections. I obtained several males near Margherita, but no females. They fly in the darkest parts of the forest towards the end of the afternoon,* alighting, like the other butterflies of the *Tagiades* group, with outspread wings. In the morning they lie concealed, adhering closely to the underside of leaves.

No one who sees it floating lazily with level wings up and down the bed of a stream, its pure-white upper surface singularly conspicuous in the gloom of the jungle, can doubt that the species is protected. I see no reason to suppose that it mimics any Pierid. In a very vague way it resembles the geometrid genus *Euchera*, which is likewise protected, and has somewhat similar habits.

The entire body and wings of this butterfly are saturated with a powerful and delicious odour of mingled vanilla and heliotrope. This is often perceptible as it flies past. After pinching the insect, the scent is sometimes obvious for hours afterwards on one's fingers. After lying two weeks in its paper, a dried specimen still gave out perfume. None of the sweet-smelling lepidoptera known to me, not even the *Lethes*, *Euploeas*, or *Callidulas* have a more powerful odour. Yet it seems to have no specialized scent-organs (such as those genera have), unless the tufts on the hind-tibiæ, present in many other hesperians, be so considered.

I unluckily caught no female, though I once saw a male circling round a dark-coloured hesperian, which escaped. It is perhaps rash to speculate where certainty may before long be attained, but the female is most likely dark. For the male seems protected only by the intensity of its sweet odour (just as the aromatic herbs of Hymettus and Cyllene, as the shepherds there told me, are protected from cattle by the same pleasant fragrance that attracts the bees), and no female known to me has any sweet odour at all. Odours common to both

* Prof. Wood-Mason tells me that this is a common habit among the *Hesperiadæ*. In Cachar a great many species used to come late every afternoon to visit a certain plant with blue flowers. This seems to me a most interesting fact, illustrating the close relationship between the Hesperiadæ and the Sphinges. I have never observed anything similar myself, though some of the *Ismenes*, especially the house-haunting sorts like *Parata chromus*, etc., often fly about at sunrise and sunset, alighting on rocks and walls.

sexes are, as in *Agarista*, *Radena*, and *Acræa*, invariably bad. And I know of no case where a female has any peculiar odour of its own.

I add figures of *Remelana yajna* (Himalayas) and *Castalius manluena*, Felder, (Nicobars), described in this Journal in 1886.

EXPLANATION OF PLATE X.

Fig. 1. *Massaga hartertii*, n. sp., ♂, p. 128.
„ 2. *Potamis* (*or Apatura*) *ulupi*, n. sp., ♂, p. 125.
„ 3. *Dyctis pealii*, Wood-Mason, ♀, p. 124.
„ 4. *Lethe naga*, n. sp., ♀, p. 123.
„ 5. *Plastingia margherita*, n. sp., ♂, p. 131.
„ 6. *Pithecops fulgens*, n. sp., ♂, p. 127.
„ 7. *Remelana yajna*, Doherty, ♂, p. 134.
„ 8. *Castalius manluena*, Felder, ♂, p. 134.

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VI.—*The Tornadoes and Hailstorms of April and May* 1888 *in the Doab and Rohilkhand.*—*By* S. A. Hill, B. Sc., *Meteorological Reporter to the Government of the N.-W. Provinces and Oudh.*

[Received October 6th;—Read November 7th, 1888.]

(With Plates IV—IX.).

The early part of last hot weather was remarkable for the number and severity of the atmospheric disturbances which occurred all over Northern India. In the beginning of April the most violent disturbances took place in Bengal, and chief amongst these was the tornado at Dacca, an account of which has been published in this Journal (Vol. LVII, Pt. II, p. 185) by Mr. Pedler and Dr. Crombie. At the end of April and in the beginning of May there were several very destructive storms of a similar character in Rohilkhand and the Upper Doab, together with a number of less violent disturbances accompanied by hail on the outer Himalayas. The peculiar and distinctive feature of the three most important storms of this period was the extraordinarily destructive character of the accompanying hail, which, owing either to the immense size of the hailstones and the velocity with which they fell, or to the great quantity of the hail and the low temperature it caused, was most unusually fatal to human and animal life, as well as

destructive to crops and trees. All the storms referred to occurred on the 30th April or the 1st May; though in some places there was a slight tendency to their recurrence on the 2nd May.

General Weather of the Period.

The general features of the weather of Northern India during the week ending with the 2nd May may be gathered from the following tables compiled from the telegraphic reports published by the Simla Meteorological office.

26th April, 1888.

Station.	Pressure at 8 A. M.	Change since previous day.	Temperature.			Wind.		Humidity 8 A. M.	Cloud 8 A. M.	Rainfall.	Weather Remarks.
			8 A. M.	Maximum.	Minimum.	Direction.	Mean Velocity per hour.				
Simla ...	23·160	+.009	58·0	70·7	53·1	N. E.	...	89	2	...	
Chakrata ...	23·169	+.022	63·7	71·3	54·3	E.	6	32	..	...	
Mussooree...	23·328	+.030	66·0	73·5	56·0	N. N. E.	12	41	...	...	
Ranikhet ...	23·996	+.020	65·6	74·5	59·0	S. E.	8	38	4	...	Fine.
Lahore ...	29·681	−.022	83·2	100·6	62·0	C.	2	30	2	...	Clear.
Ludhiana ...	29·666	−.011	82·2	102·8	68·0	C.	2	30	4	...	Fine.
Roorkee ..	29·675	−.005	79·3	98·6	65·2	C.	6	32	...	...	Hot wind.
Meerut ...	29·693	+.004	82·9	99·3	68·5	N. W.	5	30	...	...	
Bareilly ...	29·700	+.025	80·9	99·7	68·5	E.	5	26	...	...	
Gorakhpur...	29·756	+.047	74·3	95·8	70·8	E.	5	74	5	...	Threatening.
Ajmere ..	29·749	−.068	86·3	101·3	81·5	W.	8	46	...	...	
Jeypore ...	29·758	−.037	84·6	100·1	74·0	W.	5	31	...	...	Dust haze.
Agra ..	29·723	−.021	85·7	103·0	76·5	W.	6	28	...	...	
Lucknow ...	29·740	+.041	78·7	105·8	65·4	E.	6	73	...	...	
Allahabad ...	29·716	+.027	86·3	101·5	70·6	S. E.	7	21	...	...	Hot wind.
Benares ...	29·726	+.056	79·6	102·8	69 6	C.	7	55	..	...	
Patna ...	29·766	+.041	78·5	97·5	70·2	E.	7	72	2	...	Fine.
Gya ...	29·744	+.025	86 7	102 5	68·8	C.	6	69	5	...	"
Sutna ...	29 756	+.027	83 2	99·1	68·6	N. W.	9	42	...	...	...
Nowgong ...	29·743	+.006	83·7	100·1	75·6	S. W.	4	18	5	...	Fine.
Jhansi ...	29·725	−.001	84·5	102·5	76·9	N. W.	6	29	3	...	"

On the 26th the atmospheric pressure was nearly normal all over Upper India, but the westerly winds of the previous days had fallen off in strength and many calms were reported, whilst easterly winds were advancing over Behar and eastern districts of the N.-W. Provinces.

27th April.

Station.	Pressure at 8 A. M.	Change since previous day.	Temperature.			Wind.		Humidity 8 A. M.	Cloud 8 A. M.	Rainfall.	Weather Remarks.
			8 A. M.	Maximum.	Minimum.	Direction.	Mean Velocity.				
Simla ...	23·225	+.065	62·5	72·5	53·1	N. E.	...	56	2	...	
Chakrata ...	23·240	+.071	67·2	76·8	60·3	S. W.	7	24	...	...	
Mussooree...	23·390	+.062	66·5	76·0	60·5	N.	14	37	...	...	
Ranikhet ...	24·028	+.032	70·0	77·0	63·5	W.	8	31	...	...	
Lahore ...	29·705	+.024	86·7	103·1	69·9	C.	2	38	2	...	Clear.
Ludhiana ...	29·679	+.013	83·7	104·8	73·0	C.	1	37	8	...	
Roorkee ...	29·727	+.052	83·8	103·1	72·1	S.	5	41	...	...	Hot wind.
Meerut ...	29·742	+.049	81·9	103·8	71·9	N. W.	3	37	4	...	
Bareilly ...	29·744	+.044	80·4	101·3	70·5	S. E.	4	64	...	...	
Gorakhpur...	29·783	+.027	74·3	94·8	70·3	S. S. E.	6	74	4	...	
Ajmere ...	29·798	+.049	84·3	103·8	82·5	W.	15	50	...	...	Strong wind.
Jeypur ...	29·774	+.016	88·6	105·1	78·9	N. W.	7	33	...	...	Dust haze.
Agra ...	29·725	+.002	91·2	107·0	80·9	W.	3	28	...	...	Hot wind.
Lucknow ...	29·768	+.028	77·7	106·3	73·8	E.	5	71	...	...	
Allahabad ...	29·741	+.025	80·7	105·6	74·1	E.	6	60	1	...	Dust haze.
Benares ...	29·746	+.020	77·6	104·8	74·0	E. N. E.	7	70	...	...	
Patna ...	29·779	+.013	75·0	91·4	68·7	E. N. E.	9	81	10	...	
Gya ...	29·746	+.002	83·7	102·5	73·3	N. E.	6	59	...	...	
Sutna ...	29·720	−.036	90·7	104·6	74·1	N.	9	18	...	...	Hot wind.
Nowgong ...	29·741	−.002	86·8	106·6	75·6	W.	3	25	...	...	
Jhansi ...	29·721	−.004	90·7	108·5	85·4	N. N. W.	5	34	...	...	

Pressure had increased slightly on the 27th but the distribution was almost unaltered. The weather was still fine and rainless, but the easterly winds continued and humidity was increasing over the eastern districts.

28th April.

Station.	Pressure at 8 A. M.	Change since previous day.	Temperature.			Wind.		Humidity 8 A.M.	Cloud 8 A. M.	Rainfall.	Weather Remarks.
			8 A. M.	Maximum.	Minimum.	Direction.	Mean Vel.				
Simla ...	23·196	−.029	63·2	76·0	57·4	W.	...	35	3	...	
Chakrata ..	23·193	−.047	69·1	74·8	61·3	N.	8	19	4	...	
Mussooree...	23·350	−.040	70·0	76·5	61·0	C.	14	36	7	...	
Ranikhet ...	24·020	−.008	71·5	77·0	61·0	W.	8	33	...	...	
Lahore ...	29·660	−.045	81·2	104·1	70·4	C.	1	45	8	...	Gloomy.

Station.	Pressure at 8 A. M.	Change since previous day.	Temperature.			Wind.		Humidity 8 A. M.	Cloud 8 A. M.	Rainfall.	Weather Remarks.
			8 A. M.	Maximum.	Minimum.	Direction.	Mean Velocity.				
Ludhiana ...	29·619	−.060	85·2	107·8	71·0	C.	...	32	8	...	
Roorkee ...	29·657	−.070	80 8	103·6	70·1	N. E.	5	27	6	...	Hot wind.
Meerut ...	29·658	−.084	85·8	105·2	72·9	N. W.	3	40	...	...	
Bareilly ...	29·676	−.068	81·9	102·8	70·0	S. E.	4	54	3	...	
Gorakhpur...	29·767	−.016	77·7	92·8	73·8	S. S. E.	1	75	1	...	
Ajmere ...	29·750	−.048	84·8	103·3	81·5	W.	16	50	5	...	Strong wind.
Jeypore ...	29·742	−.032	87·6	105·1	75·9	N. W.	8	44	6	...	
Agra ...	29·695	−.030	90·7	109·5	81·4	W.	7	24	...	...	Hot wind.
Lucknow ...	29·730	−.038	82·2	105·3	75·8	E.	5	62	...	...	
Allahabad ...	29·713	−.028	87·3	105·6	77·6	E.	4	49	...	...	Dust haze.
Benares ...	29·707	−.039	82·4	101·8	79·0	E.	6	61	...	...	
Patna ...	29·761	−.018	80·6	90·9	72·7	E.	6	74	...	...	
Gya ...	29·735	−.011	85·7	108·1	73 3	N. E.	4	56	...	...	
Sutna ...	29·711	−.009	92·7	107·2	77·6	W.	12	15	...	...	Strong wind.
Nowgong ...	29·723	−.018	91·8	107·1	74·6	W.	4	18	...	...	
Jhansi ...	29·708	−.013	90·6	108·5	84·4	N. W.	7	31	2	...	

The barometer had now commenced to fall briskly on the N.-W. Himalaya and at adjacent stations, and this fall was accompanied by a further advance of the easterly winds along the outer hills. The humidity was slightly less at most of the observing stations, but cloud had increased over the hills. There was still no rain.

29th April.

Station.	Pressure at 8 A. M.	Change since Previous day.	Temperature.			Wind.		Humidity 8 A. M.	Cloud 8 A. M.	Rainfall.	Weather Remarks.
			8 A. M.	Maximum.	Minimum.	Direction.	Mean Velocity.				
Simla ...	23·144	−.052	64·5	77·5	59·3	N. E.	...	44	3	...	
Chakrata ...	23·179	−.014	68·2	79·3	59·3	C.	6	40	12	...	Fine.
Mussooree...	23·334	−.016	69·0	77·0	60·0	N.	13	48	12	...	
Ranikhet ...	24·014	−.006	68·5	79·5	62·5	W.	8	45	...	...	
Lahore ...	29·605	−.055	81·7	104·1	69·9	C.	2	47	4	...	
Ludhiana ...	29·586	−.033	86·7	107·3	74·6	C.	...	39	4	...	
Roorkee ...	29·622	−.035	85·3	104·1	73·1	S.	3	35	2	...	
Meerut ...	29·645	−.013	81·9	106·2	73 9	N.	2	65	10	...	
Bareilly ...	29·644	−.032	85 9	102·8	78·0	S. E.	3	55	4	...	
Gorakhpur...	29·692	−.075	81·2	95·3	77·3	S. S. E.	5	67	2	...	
Ajmere ...	29·666	−.084	85 3	104·3	82·0	W.	13	52	6	...	Hot wind.
Jeypore ...	29·661	−.081	87·6	105·6	79·4	E. S. E.	7	36	8	...	
Agra ...	29·624	−.071	89·2	110·5	84·4	W.	6	32	8	...	
Lucknow ...	29·673	−.057	86·6	102·3	78·8	C.	2	50	5	...	Fine.
Allahabad ...	29·637	−.076	88·8	106·6	79·3	E. N. E.	4	48	4	...	
Benares ...	29·655	−.052	84·9	104·8	81·4	E.	5	59	3	...	
Patna ...	29·747	−.014	80·1	94·9	75·7	E.	6	82	...	...	
Gya ...	29·691	−.044	89·7	101·5	75·3	C.	4	56	7	...	
Sutna ...	29·616	−.095	93·7	107·2	77·1	W.	10	23	...	...	Strong wind.
Nowgong ...	29·641	−.082	92·8	108·1	77·6	W.	5	25	5	...	Hot wind.
Jhansi ...	29·690	−.018	90·6	109·5	84·9	N. W.	6	28	4	...	Fine.

On the 29th there was a further considerable fall of the barometer, especially over the western desert. Pressure was now unusually low everywhere. Strong west winds were blowing over Rajputana and Bundelkhand and the temperature in the day time was very high, maxima of 110° and upwards being reported for the previous afternoon at Agra and other places. The humidity had increased considerably on and near the hills, and there was more or less cloud everywhere, but still there was no rain except a few drops at Delhi.

30th April.

Station.	Pressure at 8 A. M.	Change since previous day.	Temperature.			Wind.		Humidity 8 A. M.	Cloud 8 A. M.	Rainfall.	Weather Remarks.
			8 A. M.	Maximum.	Minimum.	Direction.	Mean Velocity.				
Simla ...	23·077	−.067	60·8	72·5	50·0	N. E.	...	52	6	0·48	
Chakrata ...	23·110	−.069	60·6	74·3	48·2	E.	10	54	10	0·14	Strong wind.
Mussooree...	23·264	−.070	63·0	74·0	52·5	N. E.	20	48	8	...	Distant lightning.
Ranikhet ...	23·934	−.080	66·6	76·5	58·0	C.	8	55	5	...	Fine.
Lahore ...	29·457	−.148	86·2	101·6	68·5	S. S. E.	1	36	8	...	
Ludhiana ...	29·476	−.110	86·7	105·3	76·6	C.	...	34	8	...	
Roorkee ...	29·566	−.056	80·8	103·6	71·1	S.	3	59	4	0·18	Thunder storms. with hail.
Meerut ...	29·574	−.071	82·4	106·2	73·9	N. E.	3	58	2	...	
Bareilly ...	29·570	−.074	82·9	104·3	73·0	S. E.	5	53	3	...	
Gorakhpur...	29·626	−.066	71·3	99·8	66·8	S.	5	88	5	0·86	Dust storm.
Ajmere ...	29·600	−.066	83·8	103·3	80·5	W.	14	51	5	...	Hot wind.
Jeypore ...	29·600	−.061	85·6	106·6	75·4	N. W.	7	30	7	...	Dust haze.
Agra ...	29·568	−.056	88·2	109·5	81·9	S. E.	7	45	3	...	
Lucknow ...	29·590	−.083	82·7	105·3	74·8	E.	5	50	3	...	
Allahabad ...	29·623	−.014	84·3	105·1	81·6	E.	5	55	6	...	Dust haze.
Benares ...	29·637	−.018	80·6	106·8	79·0	N.	6	64	7	...	,,
Patna ...	29·680	−.067	69·5	97·0	69·7	N. N. E.	9	95	10	...	Distant lightning.
Gya ...	29·619	−.072	88·2	104·5	75·3	C.	5	57	8	0·01	
Sutna ...	29·578	−.038	95·2	107·7	85·5	W. S. W.	12	18	4	...	Dust haze.
Nowgong ...	29·576	−.035	93·8	108·1	85·7	W.	6	20	3	...	Dust storm.
Jhansi ...	29·552	−.138	93·7	109·5	90·9	W.	6	26		...	Dust haze.

On the morning of the 30th there was a still further fall of pressure, especially in the Punjab, but the distribution remained almost unaltered, and resembled that which obtains about the beginning of the rainy season. The winds were easterly over the hills and the whole of the country north of the Ganges. The changes of humidity were various,

but the sky was generally clouded. Slight rain had fallen on the hills the previous evening and there had been a thunderstorm with hail at Roorkee.

1st May.

Station.	Pressure at 8 A. M.	Change since previous day.	Temperature.			Wind.		Humidity 8 A. M.	Cloud 8 A. M.	Rainfall.	Weather Remarks.
			8 A. M.	Maximum.	Minimum.	Direction.	Mean Velocity.				
Simla ...	23·099	+.022	52·0	70·1	49·5	S. E.	...	70	8	0·38	
Chakrata ...	23·175	+.065	47·4	73·8	46·2	E.	11	90	10	0·36	Drizzling.
Mussooree...	23·330	+.065	48·5	73·5	47·0	N. N. E.	20	87	10	0·59	Thunder storm.
Ranikhet ...	24·077	+.143	51·5	75·5	50·0	E.	8	92	10	0·61	Raining.
Lahore ...	29·415	−.042	84·2	101·1	73·4	S. W.	7	34	10	...	Dust storm.
Ludhiana ...	29·514	+.038	80·7	99 3	78·1	S.	3	43	...	...	"
Roorkee ...	29·711	+.145	70·3	98·6	67·7	E.	5	74	9	0·26	Distant lightning.
Meerut ...	29·677	+.103	75·9	101·3	67·0	N. E.	6	71	...	0·30	
Bareilly ...	29·689	+.119	78·9	102·8	70·5	E. S. E.	9	61	2	0·15	Dust storm.
Garakhpur...	29·751	+.125	78·2	87·3	73·8	E.	6	72	1	...	
Ajmere ...	29·651	+.051	79·8	101·3	77·6	W.	17	65	...	...	Strong wind.
Jeypore ...	29·625	+.025	85·6	105·1	81·4	W.	6	43	...	...	Dust haze.
Agra ...	29·645	+.077	85·2	107·5	79·9	S. E.	9	49	2	...	
Lucknow ..	29 714	+.124	80.7	104·8	75·8	E.	5	68	...	...	
Allahabad ...	29·715	+.092	83 3	105·1	78·1	E.	8	62	...	...	Dust haze.
Benares ...	29·732	+.095	79·1	103·3	75·5	E.	7	72	...	...	
Patna ...	29·735	+.055	79·6	87·4	72·2	E.	7	78	...	0·03	Showery.
Gya ...	29·739	+.120	84·2	99·0	72·8	N.	11	63	4	...	
Satna ...	29·686	+.108	92·2	107 2	80·6	W. N. W.	15	23	...	...	Strong wind.
Nowgong ...	29·686	+.110	89·3	107·1	83·2	W.	7	30	...	...	Hot wind.
Jhansi ...	29·643	+.091	88·6	110·5	86·4	S. W.	8	41	...	...	

A rapid rise of pressure had now taken place over the whole region except in the Punjab. The gradients were steeper than usual and the winds strong. Easterly winds continued over the same region as before. Temperature was still very high in Bundelkhand, but had fallen elsewhere. Many dust-storms were reported with slight rain.

2nd May.

Station.	Pressure at 8 A. M.	Change since previous day.	Temperature. 8 A. M.	Maximum.	Minimum.	Wind. Direction.	Mean Velocity.	Humidity 8 A. M.	Cloud 8 A. M.	Rainfall.	Weather Remarks.
Simla ...	23·179	+.080	57·5	63·0	55·1	S. E.	...	52	9	...	Dust haze.
Chakrata ...	23·243	+.068	55·6	57·8	49·2	E.	12	77	10	0·56	Strong wind.
Mussooree...	23·394	+.064	59·0	55·0	46·5	S. S. E.	13	76	4	1·04	Hail Storm.
Ranikhet ...	24·081	+.004	58·6	63·2	49·0	C.	8	73	4	0·73	Threatening.
Lahore ...	29·680	+.265	75·1	88·1	65·5	C.	11	56	10	...	Dust storm.
Ludhiana ...	29·698	+.184	81·2	90·2	78·1	S.	7	45	...	...	,,
Roorkee ...	29·753	+.042	75·8	82·6	69·7	S.	4	62	4	0·35	Distant lightning.
Meerut ...	29·764	+.087	77·9	83·2	69·0	S. E.	5	63	8	0·18	
Bareilly ...	29·755	+.066	82·4	92·1	72·0	E. S. E.	9	52	2	0·10	
Gorakhpur...	29·756	+.005	79·7	92·8	73·3	E. S. E.	5	74	...	...	
Ajmere ..	29·776	+.125	81·3	98·8	72·6	S. W.	11	32		...	Dust haze.
Jeypore ...	29·775	+.150	81·6	102·1	74·9	N. N. W.	10	25	...	...	,,
Agra ...	29·743	+.098	85·2	104·5	77·0	E.	8	51	...	...	Hot wind.
Lucknow ..	29·750	+.036	86·6	102·3	76·3	S. E.	6	50	...	...	Dust storm.
Allahabad ...	29·747	+.032	88·3	105·6	80·6	S. S. E.	6	66	...	...	Dust haze.
Benares ...	29·737	+.005	84·4	103·8	80·4	E.	6	70	...	...	
Patna ...	29·748	+.013	85·6	97·0	76·7	C.	7	72	...	...	
Gya ...	29·762	+.023	86·2	102·0	76·8	N. E.	5	68	...	...	
Sutna ...	29·759	+.073	93·2	106·2	76·6	W.	13	19	...	...	
Nowgong ...	29·754	+.068	89·8	105·1	75·6	W.	2	33	...	...	Hot wind.
Jhansi ...	29·731	+.088	89·6	106·5	85·9	S. S. W.	8	41	...	...	

There was a further very large increase of pressure over the whole region, especially in the Punjab, where it exceeded a quarter of an inch. The barometric depression in the Punjab had nearly filled up and a secondary depression had appeared in the eastern districts of the N.-W. Provinces. The winds were still easterly along the foot of the Himalaya, and very strong easterly winds had been blowing at the hill stations the previous afternoon. A great fall of temperature had taken place since the previous day and many dust-storms with rain had occurred. Hail had fallen at Mussooree and Delhi. On the 3rd a further fall and redistribution of pressure took place with the effect that westerly winds again set in over the *whole region*.

These observations indicate that, from the 26th April to the end of the month, there was a steady influx of moist air from the east over the northern half of the Gangetic plain and the outer Himalaya; that during this time there was a constant high temperature over the regions

to the south of the Ganges and Jumna; whilst from the 28th onwards the barometer fell steadily, so that on the morning of the 30th it stood unusually low, especially in the Punjab. Something then occurred to cause a rapid fall of temperature and rise of pressure, so that on the morning of the 2nd May the distribution of pressure was greatly altered, and its absolute value everywhere much higher than on the 30th, whilst the temperature at the northern stations had fallen many degrees. To account for these changes the morning observations show only a few dust-storms with hail in one or two places. There had been in the interval several violent tornadoes; but as none of them (except one which passed over Delhi) went near any of the meteorological observatories, the daily reports give little or no indication of their occurrence.

The weekly reports of rainfall compiled by the district officers also throw very little light on the origin or progress of these storms. They only record the quantity of rain which fell, or, in the case of hail, the quantity which happened to remain and get melted in the funnel of the gauge. When hail falls with great velocity and rebounds to a considerable height, the part which is caught and melted in the gauge is evidently always much less than the total quantity which falls into it, and bears no constant relation to what falls.

The district returns of rainfall for the Meerut, Rohilkhand, Kumaon, and Sitapur divisions for the four days from the 29th April to the 2nd May, inclusive, are as follows (the rainfall is recorded at 6 P. M., any which falls after that hour being included in the total for the next day):

Division.	District.	Station.	April.		May.		Total.
			29th.	30th.	1st.	2nd.	
Meerut.	Dehra Dun ...	Mussooree ...	...	0·40	1·27	...	1·67
		Kalsi	...	...	...	1·10	1·10
		Dehra	...	0·14	0·54	...	0·68
		Chakrata ...	...	0·14	0·36	0·56	1·06
		Ambari ...	...	0·20	0·70	...	0·90
		Bhogpur ...	...	...	0·70	...	0·70
	Saharanpur ...	Saharanpur ...	...	0·40	0·50	...	0·90
		Roorkee ...	...	...	0·80	...	0·80
		Nakur	...	..	0·10	...	0·10
		Deoband ...	...	...	0·70	...	0·70
		Hardwar ...	...	0·35	0·45	...	0·80
		Muhammadpur ...	...	0·10	0·80	...	0·90
		Naiashahr ...	...	..	...	...	...
		Jarauda ...	...	...	...	...	...
	Muzaffarnagar ...	Shamli	...	...	0·20	0·70	0·90
		Budhana ...	...	0·10	...	...	0·10
		Muzaffarnagar ...	...	1·05	0·30	...	1·35
		Jaoli Jansath ...	...	1·80	0·20	...	2·00
		Bhainswal ...	...	...	...	...	...
		Kandhla ...	...	...	...	...	...

Division.	District.	Station.	April. 29th	April. 30th	May. 1st	May. 2nd	Total.
Meerut (concluded).	Meerut	Sardhana	...	...	0·30	...	0·30
		Meerut ...	...	...	0·30	...	0·30
		Mawana ...	...	...	0·20	...	0·20
		Bagpat ...	...	...	0·60	...	0·60
		Ghaziabad ..	...	...	...	...	...
		Hapur ...	...	...	0·30	...	0·30
		Garhmukhtesar ...	...	...	0·10	...	0·10
	Bulandshahr	Sikandarabad ...	...	...	...	...	...
		Bulandshahr ...	...	...	...	...	..
		Anupshahr ...	...	...	...	...	...
		Khurja ...	...	...	...	...	...
		Narora ...	...	...	...	..	..
		Dayanatpur ...	...	..	...	...	...
	Aligarh	Khair ...	...	...	...	...	...
		Aligarh ...	.	...	...	...	...
		Atrauli ...	...	..	...	...	...
		Iglas ...	...	...	.	...	...
		Hathras ...	...	...	...		...
		Sikandra Rao ...	...	...	...	...	...
		Balanpur ...	...	...	...	...	...
Rohilkhand.	Bijnor	Bijnor ...	...	0·58	0·30	0·10	0·98
		Nagina ...	...	...	0·90	...	0·90
		Dhampur ...	...	0·10	0·20	...	0·30
		Najibabad ...	...	..	0·70	...	0·70
		Chandpur ...	...	0·60	2·50	...	3·10
	Moradabad	Thakurdwara ...	...	...	1·40	...	1·40
		Moradabad ..	...	.	1·45	...	1·45
		Amroha ...	..	...	0·20	...	0·20
		Hasanpur ...	...	...	0·30	0·90	1·20
		Sambhal ...	...	...	..	...	...
		Bilhari ...	...	...	...	...	...
	Pilibhit	Pilibhit (City) ...	.	0·30	0·40	..	0·70
		Pilibhit (Kutchery)	...	0·27	0·36	...	0·63
		Bisalpur ...	...	0·10	0·20	...	0·30
		Puranpur ...	...	0·10	0·14	...	0·24
		Amaria ...	..	0·30	0·30	...	0·60
Rohilkhand (concluded).	Bareilly	Mirganj ...	...	...	...	...	...
		Nawabganj ...	...	0·80	2·10	...	2·90
		Aonla ...	...	...	1·50	...	1·50
		Bareilly ...	...	...	0·10	...	0·10
		Karor ...	...	...	0·18	...	0·18
		Faridpur ...	...	...	0·70	...	0·70
		Baheri ...	...	0·10	0·70	...	0·80
	Budaun	Bisauli ..	...	...	1·10	...	1·10
		Gunnaur ...	...	...	...	...	...
		Sahaswan ...	...	...	...	...	...
		Budaun ...	...	...	...	...	..
		Dataganj ...	...	...	0·85	...	0·85
	Shahjahanpur	Pawayan ...	...	...	...	...	...
		Tilhar ...	...	1·50	...	...	1·50
		Shajahunpur ...	...	1·56	...	...	1·56
		Jalalabad ...	...	...	...	...	...

Division.	District.	Station.	April.		May.		Total.
			29th	30th	1st	2nd	
Kumaun.	Kumaun ...	Champawat ...	0·28	2·40	...	...	2·68
		Pithoragarh ...	0·05	0·69	0·78	0·17	1·69
		Almora ..	0·17	0·40	1·20	0·26	2·03
		Naini Tal ...	0·30	1·10	2·40	...	3·80
		Haldwani ...	0·50	1·60	...	...	2·10
		Ranikhet Obsry. ...	...	0·16	1·23	0·11	1·50
		„ Treasury ...	0·29	...	0·94	0·43	1·66
	Garhwal ...	Pauri	...	...	0·92	0·12	1·04
		Srinagar ...	...	0·70	0·70	0·10	1·50
	Tarai ...	Rudarpur ...	...	0·60	0·70	...	1·30
		Kilpuri	...	...	0·20	..	0·20
		Kashipur ...	...	0·10	0·90	0·10	1·10
		Satarganj ..	...	0·10	0·30	...	0·40
Sitapur.	Sitapur ...	Sitapur	...	...	0·56	...	0·56
		Biswan	...	...	...	0·50	0·50
		Sidhauli ...	...	...	...	...	...
		Misrikh ...	...	...	...	...	...
	Hardoi ...	Hardoi	...	...	...	...	...
		Shahabad ...	...	...	...	...	...
		Sandila	...	...	...	...	...
		Bilgram ...	...	..	...	...	...
	Kheri ...	Kheri	0·07	...	0·04	...	0·11
		Muhamdi ...	...	...	0·20	...	0·20
		Nighasan ...	...	...	...	...	...

The disturbances which produced rain or hail on the 30th April and 1st May were thus pretty general over all the north-western districts of the N.-W. Provinces, but in most places they were of an ordinary character like the thunder-storms which frequently occur in the hot weather months. The storms which were of tornado-like violence and destructive to human life were much more limited in their scope, as may be seen from the district reports and newspapers.

Number, Times of occurrence, Duration and Paths of the Tornadoes of the 30th April and 1st May.

On hearing of the violence of the Moradabad storm and of the occurrence of the same storm, or others nearly coincident with it, in the surrounding districts, I issued a circular to the chief civil officers of Meerut, the Tarai, and all the districts of the Rohilkhund Division. The circular and the replies are printed in the Appendix. Of the Delhi storm I have received no local reports except those which appeared in the newspapers, some cuttings from which are also appended.

The somewhat conflicting evidence of these reports regarding the time at which the storm visited each place may be summarized as follows :—

I. *Storm of 30th April.*

Place.	District.	Time of occurrence.	Character of Storm.
Gunnaur ...	Budaun.	6 P. M.	Slight, without precipitation.
Sahaswan ...	Do.	6 P. M.	Slight, with small hail.
Budaun ...	Do.	6 P. M.	Moderate, with hail.
Hapur ...	Meerut.	4-5 P. M.	Slight, with small hail.
Mawana ...	Do.	8-10 P. M.	Severe, with hail.
Meerut ...	Do.	6 P. M.	Slight dust storm only.
Amroha ...	Moradabad	Evening.	Slight, with hail.
Moradabad ...	Do.	6 P. M.	Most destructive, very severe hail-storm.
Thakurdwara ..	Do.	Evening.	Slight, with hail.
Baheri ...	Bareilly.	6-8 P. M.	Destructive, heavy hailstorm, several men killed.
Nawabganj ...	Do.	7-9 P. M.	Ditto. ditto.
Bisalpur ...	Pilibhit.	10-12 P. M.	Severe, with large hailstones.
Puranpur	Do.	7-10 P. M.	Slight, with hail.
Several places ...	Bijnar.	Evening.	Very slight, with hail in places.

From this summary, taken in connexion with the rather indefinite ideas of time possessed by the native tahsildars on whose statements it is founded, it appears that there were at least three distinct storms of the character of tornadoes over the Rohilkhand plain on the afternoon and evening of the 30th April, not to mention the hailstorms which occurred the same day at Naini Tal, Mussooree, and other places on the hills.

(1.) The Moradabad tornado, appears to have originated or been first felt near the ground, in the vicinity of Hapur, the southern tahsil of the Meerut district, between 4 and 5 P. M. Thence it proceeded eastwards, gradually increasing in intensity, passing to the south of Amroha and striking Moradabad with full force about 15 minutes past 6. It then crossed the Rampur State, reaching Baheri and Nawabganj in Bareilly about 8 P. M. and being still of destructive violence. Afterwards it passed eastwards across the Pilibhit district to the border of Kheri, which it probably reached between 9 and 10 P. M., the violence of the storm at the same time gradually abating. Its course, shown on both the charts for the 30th April, was about 150 miles in length and the time occupied in traversing it about 5 hours. The velocity of translation was thus something like 30 miles per hour. Regarding the time of passage of the central most violent region over any given point no exact data are obtainable. The Collector of Moradabad estimates it at 15 or 20 minutes, but says, "It is of course not easy to determine the exact point of time when the storm stopped." The breadth of the strip of country over which the trees were blown down

does not seem to have been anywhere quite a mile, and if this be accepted as the diameter of the dangerous area, the duration of the destructive wind, with the above-mentioned rate of progression could not much exceed two minutes.

(2.) The Mawana storm was a small one occurring late in the evening. It passed eastwards, crossing the Ganges into the south of the Bijnor district, and the north of Moradabad (Thakurdwara). It may have originated in the afternoon and crossed over into the Doab from the districts west of the Jumna, but I have no information on this point.

(3.) The Budaun storm, also of no great importance, probably travelled nearly from west to east along a path stretching from Gunnaur to the north of the Budaun tahsil, parallel to, and simultaneously with, the Moradabad storm. Regarding the time of occurrence there is, however, a conflict of opinion; it is stated to have occurred later as Gunnaur than at Budaon. If this be so, it must have travelled from east to west in a contrary direction not only to the other storms of the same and following days but contrary also to the usual course of all tornadoes which have been observed, at least in extratropical countries.

The probable courses of (2) and (3) are shown on the charts, but there is no means of determining the whole distance traversed or the velocity of progression.

II. *Storms of the 1st May.*

Place.	District.	Time of occurrence.	Character of Storm.
Delhi ...	Delhi.	3-4 P. M.	Destructive, enormous hailstones.
Ghaziabad ...	Meerut.	Afternoon.	Ditto. ditto.
Sambhal ...	Moradabad.	Evening.	Slight.
Hasanpur ...	Do.	Do.	Slight.
Jaintipur ...	Shajahanpur.	2-3 P. M.	Very destructive with hail.
Tilhar ...	Do.	3 P. M.	Ditto. Hailstones enormous.
Shahjahanpur ...	Do.	4-5 P. M.	Destructive, hail moderate.
Dataganj ...	Budaun.	4 P. M.	Moderate with hail.

The above table shows that there were at least two violent storms over the region on the afternoon of the 1st May, one of which passed over Delhi and Ghaziabad and the other over Tilhar and Shajahanpur.

(1.) The Delhi storm apparently approached that city from the west or north-west, passed over Delhi about half-past 3 in the afternoon, crossed the Jumna to Ghaziabad, where it was still of extreme violence and accompanied by enormous hailstones, and in the course of evening, time not stated, reached the Sambhal and Hasanpur tahsils

of Moradabad district, but died out before reaching Bilari. The distance from Delhi to Sambhal is about 85 miles and the whole course of the storm was probably not less than 100 miles. As the times of its passage are not exactly stated, no estimate can be made of its rate of progression. The breadth of the belt of country damaged by it is estimated by the *Pioneer* correspondent at 2 miles.

(2.) The Tilhar storm commenced near Datoganj in the eastern part of Budaun district probably about 2 P. M., though the local report from Datoganj says 4 P. M. It passed over Jaintipur about 2-30, and Tilhar at 3 or 3-30 P. M., reaching Shajahanpur between 4 and 5 P. M., its intensity at the same time gradually diminishing. Beyond Shahjahanpur it has not been traced as a violent storm, but the disturbance probably passed into Sitapur district and was the occasion of same rainfall there. If the assumed time of commencement be correct, this storm took about 2½ hours to travel from Datoganj to Shahjahanpur, a distance of about 35 miles; or if we may suppose that the times assigned to its passages over Datoganj and over Jaintipur and Tilhar are equally erroneous, the one being as much too early as the other is too late (an assumption which would make the time of its passage over Tilhar agree with the statement of the *Pioneer* correspondent), the time occupied in passing over this distance would be about an hour less. In the one case the velocity of translation would be 14 miles an hour, and in the other 23, both of which estimates are considerably less than the velocity found for the Moradabad storm. No exact details of the breadth of country affected by the storm or of the duration of its passage have been received.

In these estimates of the rate of progression of the several disturbances mentioned, it is assumed that the destructive tornado and the much more widely felt hailstorm are identical. This assumption is open to question, but I know of no criterion by which the two phenomena can be satisfactorily distinguished. It seems to me that a tornado is only a violent whirlwind which reaches to the ground, whilst an ordinary thunderstorm or a hailstorm may be quite as intense in its gyratory motion as a tornado, but at some level considerably above the ground.

Direction and Force of the Wind in these Storms.

The reports all agree in stating that the storms commenced with a strong west wind which unroofed houses, uprooted trees, and did damage in various other ways, and that after a short time the wind shifted to North-West, or North, at the same time slacking considerably. In one or two cases a further veering to North-East or East is reported, though, after the storm was over, the wind again blew from the west.

There can be no doubt, therefore, that as in the case of the 600 tornadoes in the United States investigated by Finlay, the wind blew in whirls according to the usual law of cyclonic circulation for the northern hemisphere; but the whirling movement was combined with a rapid movement of translation from West to East which had the effect of greatly increasing the velocity of the westerly currents blowing on the south side of the centre, and partially or completely annulling that of the easterly currents on the north side. The velocity of the wind in the Moradabad storm has been roughly estimated at 60 miles per hour. If this be accepted as the velocity of rotation, the actual velocity of the west winds must have been about 90 miles, and of the easterly ones only 30 miles per hour.

It is greatly to be regretted that in none of the storms mentioned was any competent European officer able to devote his time to the local investigation of the direction and force of the wind, by the examination of its destructive effects on buildings and trees, a task which has been so ably performed by Dr. Crombie in the case of the Dacca tornado. It is also to be regretted that no local meteorological observations are forthcoming; though, as Mr. Mackintosh, the Collector of Moradabad, very justly remarks, when people's roofs have been carried off, or are tumbling in, the circumstances are not conducive to the taking of correct observations.

Except at Moradabad no estimate has been made of the velocity of the wind. The Collector of Bareilly estimates its pressure at Baheri and Nawabganj during the passage of the Moradabad storm at 28 lbs. to the square foot, which would correspond to a velocity of about 75 miles an hour, and is probably not far from the truth. At Tilhar, the force must have been very considerable. Trees were blown to distances of 10 or 15 yards, and roofs were carried 25 or 30 yards. For the Budaun storm the tahsildars give curious and fanciful estimates of the wind's force, which at one place was considered equal to the strength of 3 elephants and in another to 16 horses combined. One curious effect of the pressure of the wind is given by the Moradabad correspondent of the *Civil and Military Gazette*. A train of empty goods waggons, standing on a siding at Moradabad station, was blown along the line to a distance of nearly two miles, where it came into collision with a strong bullock, and whether owing to this accident or to a shift of the wind's direction it was there derailed, and tore up the line for a considerable distance.

As regards ascending currents near the centre of the tornado, the Moradabad report indicates the probability that there was a strong aspiration in an upward direction. The way in which the verandahs

of the Collector's house were "shorn away," and the massive masonry portico dislodged by the wind, as well as that in which the roofs of houses were lifted bodily off and carried to a distance, are hardly explicable except on the assumption of a powerful upward component in the wind's motion.

Electrical Phenomena.

Except at Delhi, the existence of thunder and lightning in connexion with the storm is not expressly mentioned; for by an oversight, no direct inquiry was made regarding this point in my circular. I have been privately informed, however, by a resident of Moradabad, that the tornado commenced there also as a thunderstorm, and there can be little doubt that as in almost every case investigated by Finley in the United States, all these storms were accompanied by electrical disturbances. No casualties from lightning are mentioned except the death of one man in the Bareilly district.

Hail.

At every place without exception, from which anything like a full account of the local storm has been received, hail is reported. In many instances, the fall was light and the hailstones were small, not larger than a "grown seed," that is, about as big as a pea, and similar to what falls in ordinary hailstorms. In the Moradabad storm, however, the quantity of hail and the velocity with which it fell seems to have been enormous, though the size of the hailstones was not great, not larger than a pigeon's egg. The hail which accompanied the same storm in its passage over the Bareilly district later in the evening was of a similar character, the average weight of the hailstones being about an ounce ($\frac{1}{2}$ chittack). The extraordinary thing about this hail was its fatal effect upon human beings. It is difficult to believe that over 230 people could have been killed in one district and 16 in another by showers of ice pellets no bigger than boys' marbles; but such would seem to have been undoubtedly the case. The Collector of Moradabad reports that men caught in the open and without shelter were simply "pounded to death" by the hail. The hailstones were therefore probably falling from such a height that they approached the ground with a velocity in something approaching to the same order of magnitude as that of a rifle bullet. It should be borne in mind, however, that immediately before the storm, the temperature had been very high, and that many, if not the majority, of the deaths due to it may have been occasioned by the persons exposed to its fury being knocked down and temporarily packed in ice. The shock to the system, especially of a

thinly clad native of India, under such circumstances, would probably in many cases be sufficient to cause death. At Bisalpur in Pilibhit district some of the hailstones are said to have been ¾ seer (1½ lb) in weight, but these must have been aggregates of many individual stones. At Puranpur they were the size of plums, that is to say, about the same size as at Moradabad.

The hail which fell on the 1st May, though less fatal to human life, owing to the longer warning given of its approach, consisted of very much larger stones. The Delhi correspondent of the *Pioneer* vouches for one stone as much as two pounds in weight, though this was doubtless an aggregate of several smaller ones; for the writer says that for two minutes the fall presented the appearance of a shower of lumps of ice. The stone as big as a man's fist and weighing 2¼ *chittacks* (4½ ounce) picked up by the same observer may have been a single one, for the occurrence of such is confirmed by a writer in the *Civil and Military Gazette*, who says that at Ghaziabad many hailstones as large as cricket balls fell. The form of the stones was a "flat oval" probably like the disc or button shape often observed in smaller hailstones. Many persons are said to have been cut and wounded by these large hailstones, and at least one was killed outright, having his head split open. At Tilhar the hailstones which fell the same afternoon appear to have been almost equally large. The Assistant Collector says they were larger than goose eggs at Tilhar, while, in the west of the tahsil, they averaged nearly 3 inches in diameter. The *Pioneer* correspondent, a European gentleman who was in camp near Tilhar, says, however, they were only as large as turkey's eggs. They were probably not spherical, and three inches was perhaps about their longest dimension, instead of the mean diameter.

Finlay has found (*Professional Papers of the Signal Service, No. VII*) that, out of 192 cases of tornadoes accompanied by hail in the United States, the hail preceded the tornado in 135 cases, followed it in 76, and coincided with it in 4 cases. In these Indian storms the hail seems in all cases to have occurred either simultaneously with the most violent phase of the storm or after its first fury had passed. From the Moradabad report it appears that the "hurricane" and hail occurred simultaneously. In the Tilhar storm, at every place where it was observed, the first and most violent wind came from the west and afterwards it suddenly veered to the north, when the hail commenced. At Jaintipur there was a distinct pause between the two gusts of violent wind, probably coincident with the passage of the actual centre of the storm. The hail seems therefore to have fallen chiefly over the western half of the area affected by the storm at any given instant.

Destruction of Life and Property.

By far the most destructive of these storms was that which passed over Moradabad. Over 230, and probably close upon 250, people were killed in Moradabad alone, chiefly by the hail. Sixteen men were killed by hail, one by lightning, and 7 by falling trees and other causes in the Bareilly district, and 5 men are reported as killed in Pilibhit. The casualties thus amounted to about 280 in all, not counting any which may have occurred in the native state of Rampur, over which the storm passed.

In the Tilhar storm only about a dozen men were killed altogether, and the number of fatal cases at Delhi was about the same.

The damage done to crops and trees has been variously estimated, and probably but little reliance can be placed on any of the reports regarding this point. The estimates of the value of animals killed and buildings injured or destroyed are more trustworthy. At Moradabad, where by far the greatest destruction of property as well as of life took place, the total damage done is estimated by the Collector at Rs. 100,000.

Relations of the Tornadoes to other Meteorological Phenomena.

Under the head of general weather it has been stated that, for several days preceding these storms, there had been a steady influx of moist easterly winds into the area affected by them, and that latterly this was combined with a general fall in the barometer, whilst after the storm there was a rapid increase of pressure, and west winds set in again over the whole region. There may, therefore, have been some direct and obvious connexion between the distribution of pressure and the genesis of the storms, though the observations made at 8 A. M., when the air is still undisturbed by the convection currents set up by the daily action of the sun, do not show this connexion clearly. At all the stations mentioned in the preceding tables, and at several others in the same region, meteorological observations were made at 10 A. M. and 4 P. M., as well as at 8 A. M. The principal observations made at these hours on the 29th and 30th April and the 1st and 2nd May are here given, the actual pressures as well as their values at sea-level being shown. For the hill stations the latter are of course very doubtful, and in reality have no meaning whatever; but the region affected by the storm lies so close to the hills that its relation to the general trend of the isobars could not be properly shown without extending these over a part of the mountain region. In reducing the observations of the hill stations to sea-level, the temperature has been assumed to increase downwards, or

to diminish upwards, at the following rates, which have been determined from observations in the day time in the month of May in North-Western India, and are given at p. 358 of a paper on the *Winds of Northern India*, published in the *Phil. Trans.*, *Vol.* 178.

Height.	*Temperature Decrement.*
Sea-level to 1,000 ft.	7·3°
1,000 to 2,000 „	6·1
2,000 to 3,000 „	5·1
3,000 to 4,000 „	4·1
4,000 to 5,000 „	3·2
5,000 to 6,000 „	2·3
6,000 to 7,000 „	1·5
7,000 to 8,000 „	0·8

*Some of the barometric observations appear to be in error to the extent of a tenth or a twentieth of an inch. These are marked with a note of interrogation.

Stations.	Elevation.	10 A. M.					4 P. M.					Rainfall.
		Pressure observed.	Pressure at sea level.	Temperature.	Humidity.	Wind Direction.	Pressure observed.	Pressure at sea level.	Temperature.	Humidity.	Wind direction.	
Simla ...	7048·24	23·160	29·550	68·0	40	S. W.	23·128	29·496	69·4	34	S. W.	...
Chakrata ...	7051·58	23·188	29·557	70·6	33	W.	23·158	29·499	72·1	31	E.	...
Mussooree ...	6881	23·346	29·582	71·0	39	S. S. E.	23·285	29·538	68·3	49	S.	...
Ranikhet ...	6068·75	24·017	29·578	72·8	39	W.	23·966	29·532	71·3	48	S. W.	...
Pithoragarh ...	5368·20	24·650	29·612	76·1	46	C.	24·516	29·443	80·5	38	S. W.	...
Katmandu ...	4387·8	25·619	29·892	62·4	93	S. W.	25·511	29·761	62·9	85	S. W.	0·72
Ludhiana ...	811·86	28·782	29·510	95·8	25	C.	28·679	29·466	99·4	21	C.	...
Dehra ...	2233·00	27·463	29·609	87·2	27	S. S. E.	27·383	29·514	89·7	29	W. S. W.	...
Roorkee ...	886·63	28·747	29·609	95·2	28	S. E.	28·621	29·472	99·2	29	C.	...
Bareilly ...	568·47	29·074	29·631	93·1	46	S. E.	28·925	29·470	102·0	26	C.	...
Gorakhpur ...	255·93	29·425	29·681	90·3	52	S. S. E.	29·301	29·551	99·0	40	C.	...
Durbhanga ...	166·32	29·566	29·737	82·5	73	E. N. E.	29·418	29·586	87·5	63	E. N. E.	...
Lahore ...	702·22	28·904	29·597	94·0	36	N. W.	28·789	29·472	99·2	27	N. E.	...
Sirsa ...	661·61	28·920	29·570	96·2	41	C.	28·788	29·424	105·5	28	W.	...
Sambhar ...	1253·52	28·408	29·633	91·4	35	W. S. W.	28·283	29·479	101·8	17	W.	...
Jeypore ...	1430·60	28·246	29·630	94·7	33	W. S. W.	28·125	29·479	104·4	15	N. W.	...
Meerut ...	737·48	28·899	29·620	92·7	50	N. E.	28·757	29·463	101·3	39	C.	...
Delhi ...	717·81	28·927?	29·705?	93·2	38	N.	28·865?	29·560?	104·2	28	E.	0·02
Agra ...	555·44	29·071	29·610	98·8	28	W.	28·924	29·450	108·1	15	N. W.	...
Lucknow ...	369·39	29·314	29·679	93·0	46	N. W.	29·175	29·530	105·4	28	S. S. E.	...
Allahabad ...	309·28	29·332	29·636	96·1	35	S. E.	29·204	29·501	105·1	20	W. N. W	...
Benares ...	266·97	29·365	29·630	93·8	41	E.	29·237	29·493	105·3	17	N. W.	...
Ghazipur ...	219·74	29·443	29·660	94·8	45	S. E.	29·296	29·509	101·3	34	C.	...
Patna ...	182·84	29·564	29·749	90·6	58	E.	29·391	29·492	95·7	44	N. E.	...
Gya ...	374·9	29·296	29·669	94·7	48	E. N. E.	29·112	29·477	102·7	39	E. N. E.	...
Sutna ...	1040·20	28·598	29·601	101·0	14	W.	28·485	29·479	104·5	14	W. N. W.	...
Nowgong ...	757·04	28·895	29·626	100·4	19	W.	28·772	29·492	104·9	19	W.	...
Jhansi ...	840·13	28·871	29·691	99·9	17	N. W.	28·692	29·497	106·9	15	N. N. W.	...
Neemuch ...	1639·36	28·080	29·672	92·1	41	W.	27·962	29·513	104·1	21	W.	...
Ajmere ...	1611	28·078	29·643	90·3	47	W.	27·969	29·493	102·4	30	W.	...

30th April, 1888.

Stations.	Elevation.	10 A. M.					4 P. M.					Rainfall.
		Pressure observed.	Pressure at sea level.	Temperature.	Humidity.	Wind direction.	Pressure observed.	Pressure at sea-level.	Temperature.	Humidity.	Wind Direction.	
Simla ...	7018·24	23·132	29·581	63·3	54	S. E.	23·098	29·633	56·3	72	N. W.	0·63
Chakrata ...	7051·58	23·131	29·510	68·5	49	E.	23·073	29·516	62·7	62	S. E.	0·14
Mussooree ...	6881	23·288	29·529	69·2	44	C.	23·235	29·514	65·3	58	S.	0·40
Ranikhet ...	6068·75	23·967	29·545	70·3	47	C.	23·906	29·458	71·3	49	S. W.	0·16
Pithoragarh ...	5368·20	24·623	29·609	73·4	49	C.	24·548	29·499	75·2	49	S. W.	0·03
Katmandu ...	4387·8	25·554	29·799	64·4	88	N. W.	25·474	29·606	76·4	54	W.	...
Ludhiana ...	811·86	28·695	29·489	94·8	24	S. E.	28·586	29·375	94·8	24	S. E.	...
Dehra ...	2233·00	27·404	29·562	83·1	29	E. N. E.	27·340	29·467	89·6	32	S. E.	...
Roorkee ...	886·63	28·700	29·570	89·3	30	S. E.	28·584	29·444	93·2	35	S. E.	0·18
Bareilly ...	568·47	29·033	29·591	92·1	113	S. E.	28·918	29·465	99·8	28	S. E.	...
Gorakhpur ...	255·93	29·377	29·638	79·2	72	E.	29·297	29·554	86·9	63	E.	0·86
Durbhanga ...	166·32	29·508	29·682	70·5	92	E. S. E.	29·425	29·596	77·4	91	E. S. E.	1·48
Lahore ...	702·22	28·769	29·460	92·7	30	S. E.	28·625	29·319	88·0	36	N. E.	...
Sirsa ...	661·61	28·850	29·498	96·9	31	S. W.	28·740	29·380	101·9	27	W.	...
Sambalpur ...	1253·52	28·338	29·564	89·4	28	W.	28·249	29·448	100·3	19	W. S W	...
Jeypore ...	1430·60	28·203	29·588	93·7	22	N. W.	28·084	29·438	103·5	19	W. N. W.	...
Meerut ...	737·48	28·835	29·558	90·9	46	N. E.	28·687	29·396	97·7	37	N. E.	...
Delhi ...	717·81	28·871	29·579	93·2	38	E.	28·820	29·517	101·2	30	E.	...
Agra ...	555·44	29·033	29·574	96·1	24	S. W.	28·909	29·438	105·3	17	S. W.	...
Lucknow ...	369·39	29·250	29·615	91·6	38	W. N. W.	29·159	29·515	102·4	28	N. N. E.	...
Allahabad ...	309·28	29·314	29·622	89·8	49	E. S. E.	29·188	29·484	105·3	23	E.	...
Benares ...	266·97	29·357	29·624	89·5	51	E.	29·250	29·508	102·3	27	N. W.	...
Ghazipur ...	219·74	29·431	29·652	86·4	63	E.	29·299	29·514	97·9	43	S. E.	...
Patna ...	182·84	29·490	29·682	72·5	87	E.	29·396	29·582	85·1	62	E. N. E.	0·03
Gya ...	374·9	29·254	29·629	90·2	53	E. N. E.	29·154	29·524	95·9	45	E.	0·01
Sutna ...	1040·20	28·566	29·589	100·5	13	W. N. W.	28·461	29·452	105·6	10	W.	...
Nowgong ...	757·04	28·855	29·585	99·9	17	W.	28·759	29·476	106·9	12	W.	...
Jhansi ...	840·13	28·760	29·576	100·9	16	N. N. W.	28·669	29·475	105·9	13	S. W.	...
Neemuch ...	1639·36	28·047	29·645 ?	89·6	29	W.	27·955	29·512	102·1	13	W.	...
Ajmere ...	1611	28·014	29·574	90·3	37	W.	27·933	29·462	99·9	32	W.	...

1st *May*, 1888.

Stations.	Elevation.	10 A. M.					4 P. M.					Rainfall.
		Pressure observed.	Pressure at sea level.	Temperature.	Humidity.	Wind direction.	Pressure observed.	Pressure at sea level.	Temperature.	Humidity.	Wind direction.	
Simla ...	7048·24	23·136	29·655	58·0	58	S. E.	23·104	29·586	60·2	63	S. E.	0·23
Chakrata ...	7051·58	23·181	29·879	46·9	93	E.	23·120	29·714	52·5	78	E.	0·41
Mussooree ...	6881	23·324	29·865	48·0	86	N. N. E.	23·310	29·763	54·0	75	N. N. E.	1·27
Ranikhet ...	6068·75	24·085	29·891	53·3	90	E.	24·040	29·823	54·4	90	E.	1·23
Pithoragarh ...	5368·20	24·755	29·993	51·6	96	N. E.	24·706	29·901	54·7	92	C.	1·36
Katmandu ...	4387·8	25·634	29·833	71·4	64	N. W.	25·559	29·684	78·9	52	S. W.	0·20
Ludhiana ...	811·86	28·744	29·561	81·7	44	S.	28·675	29·481	86·7	36	S.	...
Dehra ...	2233·00	27·500	29·735	66·4	87	N.	27·447	29·621	80·3	40	E. S. E.	0·44
Roorkee ...	886·63	28·857	29·765	70·3	75	N. E.	28·728	29·610	82·3	42	E.	0·61
Bareilly ...	568·47	29·166	29·743	78·3	68	N. E.	29·086	29·660	79·9	74	C.	0·25
Gorakhpur ...	255·93	29·488	29·747	86·3	63	E.	29·394	29·649	92·3	56	E. S. E.	...
Durbhanga ...	166·32	29·631	29·830	79·9	80	E.	29·494	29·663	86·0	76	E. S. E.	...
Lahore ...	702·22	28·727	29·422	88·7	33	S. E.	28·714	29·411	84·7	44	S. E.	...
Sirsa ...	661·61	28·869	29·526	89·8	60	S. E.	28·807	29·451	98·8	31	S. W.	...
Sambhar ...	1253·52	28·378	29·609	88·3	39	W. S. W.	28·314	29·523	96·8	16	W.	...
Jeypore ...	1430·60	28·225	29·615	91·6	38	W. S. W.	28·159	29·526	99·6	13	W.	...
Meerut ...	737·48	29·005	29·753	76·4	62	N. E.	28·865	29·607	77·9	65	N. E.	0·48
Delhi ...	717·81	28·951	29·672	84·7	54	S. E.	28·874	29·610	72·2	81	E.	0·82
Agra ...	555·44	29·105	29·650	92·5	33	S. E.	29·005	29·538	103·1	15	S. W.	...
Lucknow ...	369·39	29·352	29·721	87·1	55	N. W.	29·242	29·601	100·4	31	N. W.	...
Allahabad ...	309·28	29·419	29·727	90·3	51	E.	29·286	29·583	105·3	20	N.	...
Benares ...	266·97	29·485	29·734	88·1	54	E.	29·342	29·601	102·6	26	N. N. W.	...
Ghazipur ...	219·74	29·531	29·751	90·7	58	E.	29·406	29·621	101·1	38	E.	...
Patna ...	182·84	29·576	29·763	84·6	69	E. N. E.	29·475	29·658	93·5	67	N. E.	...
Gya ...	374·9	29·347	29·724	89·7	56	E. N. E.	29·236	29·604	100·3	39	E.	...
Sutna ...	1040·20	28·655	29·666	98·2	18	W.	28·560	29·556	104·0	11	N. W.	...
Nowgong ...	757·04	28·955	29·696	94·3	23	W.	28·852	29·576	103·9	11	W. S. W.	...
Jhansi ...	840·13	28·831	29·653	97·8	22	S. S. W.	28·737	29·547	104·2	15	S. W.	...
Neemuch ...	1639·36	28·069	29·678	86·1	42	W.	27·941 ?	29·500 ?	101·1	19	W.	...
Ajmere ...	1611	28·050	29·627	85·8	30	W.	27·996	29·538	96·9	30	S. W.	...

2nd May 1888.

Stations.	Elevation.	10 A. M.					4 P. M.					Rainfall.
		Pressure observed.	Pressure at sea level.	Temperature.	Humidity.	Wind Direction.	Pressure observed.	Pressure at sea level.	Temperature.	Humidity.	Wind Direction.	
Simla ...	7048·24	23·206	29·703	61·0	51	S. E.	23·150	29·618	61·2	57	S. E.	...
Chakrata ...	7051·58	23·253	29·773	60·6	74	E.	23·201	29·721	59·7	74	N. E.	0·51
Mussooree ...	6881	23·408	29·767	62·7	75	S. S. E.	23·344	29·679	63·3	72	S. S. E.	...
Ranikhet ...	6068·75	24·096	29·773	64·4	68	N. W.	24·040	29·646	69·3	66	C.	0·11
Pithoragarh ...	5368·20	24·774	29·930	59·5	88	C.	24·711	29·760	68·9	63	C.	0·28
Katmandu ...	4387·8	25·614	29·789	73·9	54	N. W.	25·569	29·668	82·8	49	W.	0·12
Ludhiana ...	811·86	28·879	29·690	87·7	34	S.	28·744	29·535	95·8	18	S.	...
Dehra ...	2233·00	27·562	29·739	81·5	45	N.	27·493	29·646	86·3	36	S. E.	0·21
Roorkee ...	886·63	28·851	29·729	87·3	36	S. E.	28·769	29·636	91·8	38	S.	...
Bareilly ...	568·47	29·194	29·759	88·6	42	S. E.	29·083	29·637	96·5	39	S. E.	...
Gorakhpur ...	255·93	29·512	29·770	88·3	57	E.	29·381	29·633	97·4	44	C.	...
Durbhanga ...	166·32	29·616	29·787	82·5	81	E. S. E.	29·472	29·640	89·4	66	E. N. E.	...
Lahore ...	702·22	28·959	29·605	84·2	39	S. E.	28·827	29·517	94·2	2	S.	...
Sirsa ...	661·61	29·032	29·690	92·2	33	S. W.	28·945	29·596	96·5	40	W. S. W.	...
Sambhar ...	1253·52	28·510	29·740	90·8	9	W.	28·416	29·629	96·4	4	S. W.	...
Jeypore ...	1430·60	28·357	29·752	92·7	11	W.	28·258	29·633	98·3	8	W. S. W.	...
Meerut ...	737·48	29·012	29·746	85·5	49	S. E.	28·916	29·635	94·2	32	C.	...
Delhi ...	717·81	29·016	29·740	84·2	58	S. E.	28·939	29·650	92·2	45	N.	...
Agra ...	555·44	29·190	29·736	95·1	24	S. E.	29·104	29·641	101·9	10	S. E.	...
Lucknow ...	369·39	29·390	29·756	93·5	48	N.	29·291	29·651	100·4	36	N.	...
Allahabad ...	309·28	29·442	29·746	97·2	40	S.	29·311	29·608	106·8	15	W. N. W.	...
Benares ...	266·97	29·472	29·737	94·5	53	C.	29·348	29·605	107·4	13	W.	...
Ghazipur ...	219·74	29·533	29·752	91·8	61	E.	29·443	29·657	103·6	29	N. W.	...
Patna ...	182·84	29·575	29·760	90·0	65	E. N. E.	29·461	29·644	94·1	49	N. N. E.	...
Gya ...	374·9	29·357	29·730	95·0	50	C.	29·210	29·573	107·7	34	W. N. W.	...
Sutna ...	1040·20	28·723	29·736	98·2	18	W.	28·596	29·597	102·8	12	W.	...
Nowgong ...	757·04	29·017	29·754	96·8	25	W.	28·904	29·631	102·9	16	W.	...
Jhansi ...	840·13	28·914	29·738	97·8	21	N. N. W.	28·817	29·633	101·9	13	W.	...
Neemuch ...	1639·36	28·181	29·791	88·1	37	W. S. W.	28·074	29·650	97·6	25	W. S. W.	...
Ajmere ...	1611	28·183	29·756	89·3	21	S. W.	28·074	29·621	96·4	17	S. W.	...

For 4 P.M., the hour nearest to those at which the storms occurred, the sea-level pressures and wind directions have been laid down on a chart for each day, and the isobaric lines have been drawn for differences of ·05 inch. On the charts for the 30th April and 1st May the tornado tracks are also shown.

On the 29th, there was apparently at 4 P. M. an anticyclonic area over the Nepal Himalaya and North Behar, with an extension running north-westwards over Northern Oudh and the outer hills. The lowest pressure was in the vicinity of Sirsa on the border of the western desert, and a long V-shaped depression extended from it towards Agra and Bundelkhand. An independent region of (hypothetical) low pressure occupied the interior of Kumaun and Garhwal.

On the 30th, the pressure had fallen considerably in most places, but risen at Chakrata and Simla, and the gradients between Simla and Ludhiana were very steep. The lowest pressure was at Lahore, but a succession of V-shaped isobars projected south-eastwards to Sutna. The winds were light and somewhat irregular, though on the whole consistent with the distribution of pressure. The three storms whose tracks are marked appear to have originated in or near the line of lowest sea-level pressure and to have proceeded eastwards nearly at right angles to the isobars, that is to say, up the slope of pressure, a statement which appears somewhat paradoxical, seeing that the strongest winds were from the west, or in the same direction as the paths along which the storms progressed.

On the 1st May, there had been a considerable rise of pressure over the whole region, especially over the hills of Kumaun and Garhwal. In Dehra Dun the gradients producing S. E. or S. winds at low levels were excessively steep, but over the rest of the region they were much the same as on the previous day. The line of lowest pressure indicated by the vertices of the V-shaped isobars was however shifted a good deal to the south, and now extended from the vicinity of Sirsa through Alwar to Sutna. Over the Gangetic plain, the winds were light and irregular, but, west and south of the Jumna, they blew steadily in the directions indicated by the distribution of pressure. Both the storm tracks shown lay well to the north of the line of lowest pressure, and, as on the 30th April, the storms progressed in opposition to the baric gradient.

On the 2nd May, there were still steep gradients over the Eastern Punjab and adjacent hills, but over Rajputana, the N.-W. Provinces, Oudh, and Behar the pressure was nearly uniform, and the two isobars shown on these regions of the chart took peculiar and unusual courses. The anticyclone over North Behar and Nepal had disappeared, and the easter-

ly winds over the submontane belt were dying out. Next morning, as above stated, westerly winds reasserted themselves right up to the mountains of Nepal.

It is clear from the study of these four charts that there was nothing in the general distribution of pressure at sea-level, even just before or during the progress of the tornadoes, to account for their formation. The general features of this distribution on the first three charts are identical, yet violent storms occurred in several places on the 30th April and 1st May, whilst there was nothing of the kind on the 29th April, if we except a small hailstorm which came on late in the evening over the Siwalik hills and Roorkee.

In his *Tornado Studies for* 1884 *(Professional Papers of the Signal Service No. XVI)*, Finlay has found that tornado tracks in the United States lie almost invariably to the S. E. of a region of low pressure, that is to say, they lie on the side of the depression covered by warm moist winds from the Gulf of Mexico. The analogous position for the upper Gangetic plain would be the N. E. side of the depression over which moist winds from the Bay of Bengal blow, and this is where the storms under discussion actually occurred. But while the American tornadoes in all cases travel almost parrallel to the isobars and in very nearly the same direction as the S. W. winds proper to the octant in which they are found, four at least of the five storms here described, and very probably the fifth also, travelled against the baric gradient and against the wind previously existing at the level of the plain. It is extremely likely therefore that the conditions of pressure which produced these tornadoes were not those existing at sea-level (for these, in a region including high mountains, are to a great extent hypothetical merely), but rather those obtaining at some definite higher plane in the atmosphere, probably, as pointed out by Mr. Archibald in a review of a French work on the experimental production of such disturbances on a small scale (*Nature*, Vol. XXXVIII, p. 104), at the place where cloud formation begins. If once a tornado is commenced at this level, it may be maintained for an indefinite time by the energy converted from the potential to the kinetic form in the condensation of vapour; and the movement may be rapidly propagated downwards by means of the viscosity of the air, and by indraught from below towards the partial vacuum in the vortex.

Now, though the situation of the Rohilkhand plain and Upper Doab at the foot of the Himalayas does not favour a proper understanding of the distribution of pressure at sea-level, it has he advantage of enabling us, by observations made at adjacent plain and hill stations, to get a very fair idea of the vertical distribution of temperature up to a height

of 7,000 or 8,000 feet; and, knowing the vertical distribution of temperature, we can compute approximately the pressure at any given height. The three stations of Roorkee, Dehra, and Mussooree lie within a horizontal distance of little more than 20 miles, but their elevations above sea-level are respectively 887, 2,233 and 6,881 feet. From observations made at these places we may therefore determine the distribution of temperature almost exactly up to about 7,000 feet, and with some approach to accuracy for one or two thousand feet further. The computed temperatures up to 10,000 feet for 10 A.M. and 4 P.M. each day, derived from the observations of these three stations, are the following:—

Height.	29th April.		30th April.		1st May.		2nd May.	
	10 A.M.	4 P.M.	10 A.M.	4 P.M.	10 A.M.	4 P.M.	10 A.M.	4 P.M.
Sea-level ...	100·2°	106·0°	94·4°	94·9°	72·3°	82·9°	90·5°	95·0°
1,000 Feet ...	94·2	98·4	89·0	92·7	70·0	82·3	86·5	91·4
2,000 „ ...	88·8	91·5	84·2	89·8	67·3	80·5	82·5	87·3
3,000 „ ...	84·0	85·4	80·0	86·2	64·2	77·5	78·5	83·0
4,000 „ ...	79·8	80·1	76·4	81·9	60·6	73·3	74·5	78·3
5,000 „ ...	76·2	75·4	73·4	76·8	56·7	67·9	70·5	73·4
6,000 „ ...	73·2	71·5	71·0	71·0	52·3	61·3	66·5	68·1
7,000 „ ..	70·8	68·3	69·2	64·4	47·5	53·5	62·5	62·5
8,000 „ ...	69·0	65·8	68·0	57·1	42·3	44·5	58·5	56·6
9,000 „ ...	67·8	64·1	67·4	49·1	36·6	34·3	54·5	50·3
10,000 „ ...	67·2	63·0	67·4	40·3	30·6	22·9	50·5	43·8

The temperatures given in the last three lines are of course subject to doubt, but up to 7,000 feet they may be accepted as correct. They have been computed by the formula $t = t_0 + ah + bh^2$, the three constants being determined by the observations of Roorkee, Dehra, and Mussooree.

On the 29th April, both at 10 A.M. and 4 P.M., the vertical distribution of temperature was similar to the normal distribution in May, given on page 152, that is to say, the decrease on ascending was at first very rapid, but became less and less rapid as the height increased. When the decrease is more rapid than 1° in. 183 feet, or 5·46° in 1,000 feet, the equilibrium of the atmosphere is unstable and convective movements are almost certain to occur. Under ordinary circumstances, as on the 29th April, these disturbances commence at the level of the plain and probably bring about an interchange between the lowest layers of the atmosphere and others at a considerable height,* such move-

* To this interchange the hot west winds are probably due, the feeble and irregular currents of the lower atmosphere being replaced during the hottest hours of the day by steady west winds descending from an upper layer.

ments being often accompanied by whirlwinds of any size from the little dancing "devil" or *bhût* to a big dust-storm. As long, however, as they do not extend up to the cloud layer, they produce no precipitation, draw upon no important source of energy, and give rise to no violent tornadoes.

At 10 A. M. on the 30th, the conditions were similar to those just described, though the temperature over the plain was considerably lower than on the previous day; but by 4 P. M. a rapid decrease of temperature at high levels had commenced, and above 5,000 feet the conditions were such as to produce convection currents extending upwards to an unknown height. During the night the greater nocturnal fall from the mean temperature at the lower stations restored the conditions of stable equilibrium, but by 10 A. M. on the 1st May unstable conditions again appeared at heights of 7,500 feet and upwards, and by 4 P. M. these conditions extended down to below 5,000 feet. On the 2nd May, the temperature at 10 A. M. decreased uniformly upwards at the rate of 4·0° for 1,000 feet—a rate consistent with stable equilibrium; but in the afternoon conditions likely to produce convective disturbances reappeared at heights above 6,000 feet. On the 3rd, the normal conditions were completely re-established.

It would therefore seem that the occurrence of the tornadoes of the 30th April and 1st May was intimately connected with a sudden fall in the temperature of the air from 5,000 or 6,000 feet upwards—a fall so rapid that powerful vertical convection currents were certain to supervene. What the cause of this fall of temperature may have been is not known, but presumably it was connected with the influx of easterly or south-easterly winds of a moderate temperature, at a time when the temperature at the level of the plains was excessively high. On the 30th, the disturbances, which were probably due to this relatively low temperature at high levels, commenced rather late in the afternoon—after 4 P. M.; but on the 1st May, when unstable conditions appeared as early as 10 A. M., the tornadoes took place at an earlier hour, probably commencing about 2 P. M.

When no source of energy is drawn upon in an atmospheric disturbance, except the sensible heat of the air and its actual energy of motion, the disturbance is not likely to be very violent or of long duration; but when the indefinitely large supply of energy which is stored in the form of the latent heat of vapour begins to be converted into the kinetic form, the disturbance may be greatly intensified and prolonged to an indefinite extent. Hence the dust-storms of the hot weather never acquire any great violence, unless they extend upwards to such a height that condensation of vapour occurs, and in very dry

weather this does not take place until a height but seldom attained is reached. In the cases now under discussion it is probable that, owing to the moist air brought in by easterly winds and the upward diffusion of the vapour during the three or four very hot days preceding the 30th April, the plane at which condensation commenced when the rapid fall of temperature set in that afternoon was unusually low for the time of year. If we adopt Hann's formula for the vertical distribution of aqueous vapour, and compute its constants from the observations of Bareilly, Roorkee, Dehra, Mussooree, Chakrata, Ranikhet, and Pithoragarh (a large number of observations of this somewhat erratic element being desirable), we get the following results for 4 P. M. each day :—

29th April, $log\ f = 9\ 7352 - \cdot0346\ h$.
30th „ $log\ f = 9\cdot7412 - \cdot0275\ h$.
1st May, $log\ f = 9\cdot7630 - \cdot0370\ h$.

In these formulæ f is supposed to be expressed in decimals of an inch of mercury and h in thousands of feet. In Hann's general formula for all seasons and places the co-efficient of h is ·0462. On the 30th of April therefore the rate of diminution of vapour pressure with increase of height was only $\frac{2\cdot75}{4\cdot62}$ or $\frac{3}{5}$ of the average rate, whilst the decrease of temperature from 5,000 feet upwards was very rapid. On the 1st May, the vapour diminished rather more quickly, but the decrease of temperature was so rapid as to overtake it and cause condensation at the same or a lower level. If we compare the pressure of saturated vapour at the temperature of the air with the actual vapour tension given by the above formulæ, we find that, on the 29th, the relative humidity was below 50 per cent., even at 10,000 feet, whilst on the 30th condensation commenced at about 9,300 feet and on the 1st May at 8,000 feet :—

Tension of vapour at 4 P. M.

Height.	29th April.		30th April.		1st May.	
	Saturated.	Actual.	Saturated.	Actual.	Saturated.	Actual.
Sea level ...	2·307″	·544″	1·645″	·551″	1·127″	·585″
1,000 feet ...	1·809	·502	1·537	·518	1·105	·538
2,000 „ ...	1·481	·463	1·404	·488	1·043	·494
3,000 „ ...	1·221	·428	1·253	·459	·945	·453
4,000 „ ...	1·029	·395	1·091	·432	·821	·416
5,000 „ ...	·881	·365	·923	·406	·684	·382
6,000 „ ...	·773	·337	·760	·382	·544	·351
7,000 „ ...	·693	·311	·606	·360	·411	·322
8,000 „ ...	·636	·287	·468	·338	·295	(·296)
9,000 „ ...	·600	·265	·350	·318	·199	(·272)
10,000 „ ...	·577	·245	·251	(·300)	·122	(·250)

The figures in brackets are computed by the above logarithmic formulæ for the actual distribution of vapour up to the highest observing stations, but as they exceed the pressures of saturation at the probable temperatures of the air they do not represent actual facts. The differences between them and corresponding pressures of saturated vapour represent in fact the vapour which must have been condensed. It thus appears that on the afternoon of the 30th April, and probably throughout the greater part of the following day, the distribution of temperature was such as to cause vertical movements of the atmosphere above the level of 5,000 or 6,000 feet, and that the cloud level, even supposing no such movements to be in progress,* was probably at the comparatively low elevation of 8,000 or 10,000 feet. The conditions were therefore favourable for the development and intensification of any disturbances casually occurring in the currents set up. It now remains to inquire whether any relation can be traced between the places of occurrence and tracks followed by the tornadoes and the distributions of pressure at or near the cloud level where they in all probability commenced.

For this purpose, the 4 P. M. observations of pressure on each of the two days of the storms have been reduced to a level of 9,000 feet above the sea, and the resulting values are laid down on the last two charts. These high-level pressures have been computed on the assumption that the temperature decreased each day on ascending according to the scale above shown—an assumption which is probably not far wrong as regards the Himalaya stations, and the line of nearest stations on the plains, *viz.*, Ludhiana, Roorkee, Bareilly, and Gorakhpur, but perhaps rather wide of the truth as regards more distant places. If the decrease of temperature above the more distant stations was less rapid, as is probable, the effect of the assumption made must be to diminish the pressures towards the south of the area covered by charts, making the gradients for westerly winds less steep, though in other respects producing little change. Thus the pressures as computed for Bareilly and Agra are almost identical on the 30th April, and differ by only 0·217″ on the 1st May; whilst, if we assume for Agra the rate of decrease of temperature found by Glaisher in his balloon ascents in clear weather, the excess of Agra over Bareilly at the 9,000 feet level is 0·247″ on the 30th and 0·333″ on the 1st. The computed pressures at 9,000 feet are given in the following table and have been laid down on charts V and VI:—

* In an ascending current, since there is no diminution of the quantity of vapour until condensation commences, cloud will be found wherever the expansion due to upward motion has reduced the temperature to the dew point.

Pressures at 9,000 *feet* 4 P. M.

Station.	30th April.	1st May.	Station.	30th April.	1st May.
Simla ...	21·494″	21·505″	Jeypore ...	21·613″	21·602″
Chakrata ...	21·492	21·499	Meerut ...	21·473	21·346
Mussooree ...	21·516	21·541	Delhi ...	21·524	21·378
Ranikhet ...	21·505	21·542	Agra ...	21·540	31·614
Pithoragarh ...	21·550	21·551	Lucknow ...	21·601	21·614
Katmandu ...	21·579	21·643	Allahabad ...	21·610	21·662
Ludhiana ...	21·425	21·362	Benares ..	21·585	21·641
Dehra ...	21·509	21·523	Ghazipur ..	21·536	21·634
Roorkee ...	21·463	21·411	Patna ..	21·415	21·563
Bareilly ...	21·541	21·397	Gya ...	21·521	21·614
Gorakhpur ...	21·425	21·491	Sutna ...	21·625	21·655
Durbhanga ...	21·317	21·467	Nowgong ...	21·649	21·664
Lahore ...	21·287	21·288	Jhansi ...	21·633	21·640
Sirsa ...	21·503	21·494	Neemuch ...	21·654	21·651
Sambhar ...	21·570	21·560	Ajmere ...	21·590	21·587

The charts indicate very clearly that on both afternoons there was at the cloud-level a low pressure region overlying the Punjab and another over Behar, and that these two regions were connected by a long narrow trough of low pressure extending over Rohilkhand and the north of Oudh. The conditions were therefore both days such as were likely to generate eddies by the interference of the easterly and westerly currents along the low-pressure axis; but at 4 P. M. the isobars were more regular and the conditions likely to generate tornadoes better marked on the 1st May than on the 30th, April. On the 30th, at this hour in the afternoon, the low-pressure trough over Rohilkhand was almost completely blocked by a region of relatively high pressure near Bareilly, caused apparently by the upheaval of the pressure planes there, on account of the local high temperature (99·8°). Towards sunset this obstruction doubtless disappeared with the fall of temperature below, and then the distribution of pressure became similar to that of the 1st May. At any rate, whatever may have been the reason, the tornadoes of the 30th did not commence until near sunset, whilst on the following day they began in the middle of the afternoon.

The tornado tracks shown on the two high-level charts have a very definite relation to the isobars. *They commenced a little to the south of the low pressure axis, and approached slightly or ran parallel to it for a certain distance, but in no case succeeded in crossing it.* These storms, as regards the horizontal components of their motions, appear therefore to have been eddies formed in the strong westerly currents of the lowest

cloud layer where these began to be retarded on approaching the low-pressure axis, and they were carried forward with the current in which they originated. Regarding the vertical movements and the production of hail, of the origin of which Ferrel's theory appears to me to be the true one, it is impossible for want of information to enter into any detail. The form of the storm-cloud, so indicative of vertical suction as well as of horizontal whirling movements, and to which so much attention has been paid in America, is not even mentioned in any of the local reports.

APPENDIX I.

Circular Letter of Inquiry and Replies from District Officers.

Circular.

Having been charged by the Meteorological Reporter to the Government of India with the preparation of an account of the origin and history of the destructive storm which recently visited Moradabad, I have the honour to request the favour of your assistance in furnishing materials for discussion regarding the storm in so far as it affected your district.

From the reports received from your *tahsils* and *thanas* I have to request in particular that you will be good enough to furnish me with an abstract of the information on the following points :—

1. The date and hour at which the storm commenced in those places where it was felt, and its duration at each place.

2. The direction of the wind at each place at the beginning, middle and end of the storm.

3. An estimate of the force of the wind from observation of the damage done by uprooting trees, unroofing houses, &c.

4. Whether the storm was accompanied by hail or not, and if hail was observed, what was the average size of [illegible]?

5. How many people were killed, if any, and how they were killed, whether by lightning, falling in of houses, or from what cause?

6. What was the estimated value of the total damage done by the storm?

As the path of the storm seems to have avoided the regular meteorological observations, I shall be glad if you happen to be able to furnish any *barometric* or thermometric observations made during its passage.

REPLIES.

(1) *Letter No.* $\frac{1272}{XII-353}$ *dated 30th May, 1888, from the Collector of Moradabad to the Meteorological Reporter to Govt. N.-W. P. and Oudh.*

With reference to your 417 dated 16th May, 1888, I have the honour to enclose a copy of my report $\frac{1147}{XII-353}$ dated 7th May, 1888, which gives nearly all the information which I have been able to collect regarding the late storm.

2. Although, as I shall mention hereafter, there were slight storms at other places, the really severe storm was confined to Moradabad and a small area round it. It took place on 30th April. The dust-storm began about 6 P. M., the hurricane and hail about a quarter past 6. The hurricane and hail lasted between a quarter of an hour and twenty minutes. It is of course not easy to determine the exact point of time when the storm stopped. There was a good deal of wind, and very strong wind for some time afterwards.

3. As far as I myself noticed the wind was north-west throughout. Some of the tahsildars say that the wind was first west and then changed to north. One tahsildar says that the wind was east, but I have no doubt that this is a mistake.

4. The wind was certainly travelling at about 60 miles an hour, at least so I am informed by people who know more of such things than I do.

5. There was a terrific hailstorm; the bigger hailstones were of the size of small pigeon's eggs.

6. For an answer to your question 5, see para. 5 of my report.

7. It is very difficult to estimate the amount of the damage done. Fortunately there was little damage done to crops, but there was a great deal of damage to houses. The total damage done cannot have exceeded, in my opinion, a lakh of rupees. It was the loss of life which made the storm so noteworthy.

8. Regarding the tahsils, there was no storm of any kind at Bilari. There were slight storms with a little hail and rain at Thakurdwara and Amroha on the evening of the 30th and slight storms at Sambhal and Hasanpur on the 1st of May. But all these storms were so slight that they probably would not have been noticed had it not been for their connection with the great storm at Moradabad.

Moradabad does not boast a barometer, and thermometric observations do not appear to have been taken by any one during the storm. Most people's roofs were either blown off or tumbled in, a state of things

which I am sure you will understand does not conduce to the taking of correct meteorological observations. It was bitterly cold during the storm and for a considerable time after it.

(1 *a*.) *Letter No.* $\frac{1147}{XII-353}$ *dated 7th May*, 1888, *from the Collector of Moradabad to the Commissioner, Rohilkhand Division, Bareilly.*

In accordance with the instructions contained in your $\frac{235}{XII-84}$ dated 5th May, 1888, I have the honour to submit a brief report regarding the storm which occurred on the 30th April 1888, of the main features of which His Honor the Lieutenant-Governor and yourself have been already apprised.

2. I myself only arrived in Moradabad on the 30th, so that at the time of the calamity I was under the disadvantags of having no local knowledge of the place. I took charge in the afternoon and about 6 in the evening I drove to the house usually occupied by the Collector, standing on the rising ground on the further side of the race course. I briefly mention what happened to myself because the house where I chanced to be and the adjoining one, standing as they do on the ridge of the rising ground on which the station of Moradabad is situated, were the houses on which the fury of the storm first fell and which seem to have suffered more than any others. Soon after I entered the storm commenced. It became quite dark and the house was filled with dust. The doors were burst open by the wind. A terrific storm of hail followed breaking all the windows and glass doors. The verandahs were shorn away by the wind. A great part of the roof fell in and the massive pucca portico was blown down. The walls shook. It was nearly dark outside and hailstones of an enormous size were dashed down with a force which I have never seen anything to equal.

3. As soon as the storm abated I went out. The race course was mostly covered with water. There were also long ridges of hail on the higher ground one or two feet or more in depth. The roads were strewn with trees; there were very few to be seen standing; many of the largest ones had been torn up by the roots The roof of the first house I saw had been blown altogether away, leaving only the broken walls standing. The double-storeyed barracks had stood though seriously injured, but one of the single-storeyed ones had collapsed. There is not a single house in the civil station which did not sustain the most serious injury. Had the hurricane lasted a few minutes longer scarcely a house could have been left standing. But little harm comparatively

was done in the city. It stands lower than the civil station, and the streets being narrow and the houses closely packed together the wind had less power, and there was more protection from the hail. Damage of course there was. Tiles were blown off, windows broken and balconies and badly built *kutcha* walls shaken or sometimes blown down, but there was nothing like the damage which there was in the civil Station.

4. The really destructive hail seems to have been confined to a very small area, about six or seven miles round Moradabad. There were slight storms at Thakurdwara, Bilari, and Sambhar, but nothing of any consequence. The rest of the district appears to have escaped altogether.

5. There have been up to date 222 inquests on bodies of persons killed in the storm. There are a few more reports in cases in which it was not possible to hold inquests. 230 deaths in all have been reported up to the present time. Ther are no doubt some deaths which have not been reported, but not many. The total mortality may safely be put as under 250. The vast majority of the deaths were caused by the hail. Some were caused by the falling of trees or walls, but these were comparatively few. Men caught in the open and without shelter were simply pounded to death by the hail, 14 bodies were found on the race course, 4 almost immediately in front of the house known as the Collector's. There were no deaths from hail in the city itself and not many in the environments. Most of the deaths were in the bare and level plains round the station where people were caught unawares. More than one marriage party was caught by the storm near the banks of the river and was annihilated. No Europeans were killed.

6. The police report that 1,600 head of cattle, sheep, and goats were killed, but probably a good many strays were, as was very natural, put down at first as killed. Beyond the cattle and the damage done to houses, there was not much loss. There were fortunately no crops on the ground to be destroyed. Most of the grain had been threshed and stored. The grain was blown away from some threshing-floors, but the loss in this way was not considerable. I should not omit to mention that many valuable groves and mango trees have been destroyed.

7. The most serious damage was done in the Cantonment. I at once offered the officer commanding all the assistance in my power. The Municipal staff which could be spared was deputed to assist in clearing the roads &c., and I procured as many workmen as possible. Owing mainly to Captain Mackenzie's energy all that was possible has been done to remove the signs of the disaster, but it will I fear be many years before Moradabad is itself again.

8. To sum up so far as the people are concerned, the loss of property was comparatively small owing to the fortunate circumstance of there being no crops on the ground. Had there been such, they must have been utterly destroyed. The damage to the houses will of course be repaired by the people themselves. The loss in grain from the threshing-floors was trifling. It may be necessary to ask for an increased *takavi* grant for the purchase of cattle; but the people of this district are averse to taking these advances, and I cannot say at present whether any increase of budget provision will be requisite. Almost all the public buildings require special repairs, most of which have been already taken in hand.—Should any special assistance be required from Government it will be applied for hereafter.

(2.) *Report on the occurrence of a violent storm accompanied by hail on the 1st May, 1888, at Shahjahanpur.*

The storm occurred with violence only in two tahsils, Tilhar and Shahjahanpur.

(*a.*) In the west of the Tilhar tahsil (Jaintipur) the storm began at 2 on 1st May 1888 and lasted (along with the hailstorm) till 3-30 or so.

In Tilhar itself it began at 3 P. M. and lasted till 4 P. M.

(*b.*) In Shahjehanpur the storm began at 4 P. M. and lasted till about 5 P. M.

2. (*a*) In the west of Tilhar tahsil the wind first came from the west, then it stopped for about 5 minutes and a north wind accompanied by hail set in.

(*b*). In Tilhar itself the wind blew from the west, then it turned to the north with hailstones.

(*c.*) In Shahjehanpur the wind began from the west, then it turned round quite suddenly without warning to the north and hail fell.

3. Trees were blown in several cases 10 to 15 yards. Thatched roofs were blown 25 or 30 yards where the wind got a proper hold of them.

4. The storm began with a west wind which was very violent. The north wind brought hail and was not so violent by any means.

(*a.*) I have asked a great many inhabitants of the west of Tilhar tahsil about the size of the hailstones. They all agree that the stones average nearly 3 inches in diameter and that many were longer.

(*b.*) In Tilhar the stones are estimated as bigger than goose eggs.

(*c.*) In Shahjehanpur the stones were longer, but nothing so very extraordinary.

5. I cannot tell how many exactly were killed, but not more than 10 or 12. Every one had had full warning before, as a heavy dust-storm had been going on nearly an hour before the hurricane commenced. At least 2 men were killed by hail, 2 by the falling of a house, 1 by the falling of a cart loaded with *bhusa*, and the rest by trees. The hail wounded a very large number.

6. It is impossible to estimate the total damage done in the district by the storm.

Quite 2,000 trees must have been uprooted and very many others sadly knocked about. The melon crops were injured. The damage done to Government buildings in the two tahsils roughly estimated at Rs. 360.

Unfortunately I have not been able to hear of any baormetric &c. observations made during the storm.

When the north wind began to blow there was a considerable fall of temperature.

(3.) *Abstract of Tahsildars' reports and replies to the questions set by the Meteorological Reporter to Government.*

Questions.	Answers by Tahsildars of				
	Budaun.	Datoganj.	Sahaswan.	Bisoli.	Gunnour.
1. Date and hour at which the storm commenced in those places where it was felt and its duration at each place.	The storm was felt in the northern part of the Tahsil between 4 and 5 P. M. on 30th April 1888. Duration about 1 hour. It was felt more in Pergana Budaun and less in Ujhani.	Of the 5 Thanas in this Tahshil, 2 Dotaganj and Sudullaganj were visited by the storm. Also Hazratpur to a less extent. Was felt at 4 P. M. on 1st May 1888 duration 10 minutes everywhere.	There was no storm so to all in this Tahsils, but on the 30th April 1888 after 6 P. M. there was an ordinary wind storm accompanied by drops of rain and very small sized hailstones, causing no loss or damage. It had come from west.	No storm felt here or in this Tahsil.	Very strong and high wind at 6 P. M. on 30th April. Duration 2 to 2½ hours Gunnaur.
2. Direction of wind at the beginning, middle, and end of the storm.	South-westerly in the beginning. North-east in the middle. Easterly in the end of the storm.	North-westerly in the beginning passing on south eastwards. No change in the middle.			Westerly in the beginning and then throughout the duration north-westerly passing to south-east.
3. An estimate of the force of the wind from observation of the damage done by uprooting trees, unroofing houses &c.	Uprooting of trees occurred. Force of the wind estimated to be equal to 3 elephants' force combined.	Estimated force equal to 16 horses combined.			No damage of the kind. Hence no estimate of its force can be accurately framed.
4. Whether storm was attended with hail and of so what was average size of the hailstones.	There was a slight shower of hailstones. Average size 2 to 2½ tolas.	Hailstones attended the storm—average diameter ½ inch.			No rain, no hailstones. Only cloud.
5. How many people were killed, if any, and how they were killed, whether by lightning, falling in of houses, or from what cause.	No death due to storm in this Tahsil.	2 men killed by falling down of trees in Dotaganj.			No casualties.
6. What was the estimated value of the total damage done by the storm.	Faslzaid, mango and Jaman fruit suffered, damage estimated, 6 annas in the rupee. Trees uprooted numbered 5 per cent.	Estimated loss of sheep, goat, buffalo, oxen and fruit and groves amounted to Rs. 1000.			No damage.

(4.) *Letter No.* $\frac{2428}{XII}$ *dated 27th June*, 1888, *from the Collector of Bareilly to the Meteorological Reporter to Govt. N.-W. P. and Oudh.*

I have the honour to reply as to—

Point I. At (*a*) Behari, commenced 6 P. M., continued to 8 P. M.
(*b*) Nawabganj, commenced 7 P. M., continued to 9 P. M.

Point II. (*a*) at commencement N.-W. then W. finally E.
(*b*) at commencement W. then cyclonic, finally W.

Point III. Force about 28lbs. to square foot.

Point IV. Hailstones averaging about ½ chattack.

Point V. (*a*) 16 men by hail, 1 by lightning and 7 by falling boughs and other causes.

Point VI. About 4,000 to 5,000.

Baheri is the purgannah stretching right across the north of the District of Bareilly. Nawabganj lies to the south-east of it.

(5.) *Statement showing particulars of the Storm of 30th April*, 1888.

District.	Tahsil.	The date and hour at which the storm commenced in those places where it was felt and its duration at each place.	The duration of the wind at each place at the beginning, middle and end of the storm.	An estimate of the force of wind from observation of the damage done by uprooting trees, unroofing houses, &c.	Whether the storm was accompanied by hail or not, and if hail was observed, what was the average size of the hailstones.	How many people were killed, if any, and how they were killed—whether by lightning, falling in of houses or from what cause?	What was the estimated value of the total damage done by the storm?	Remarks.
Pilibhit	Pilibhit...	.....	.....	.....	.....	.....	.....	The storm of 30th April was not sufficiently severe to cause any appreciable damage.
	Bisalpur	30th April, 1888, from 10 P. M. to 12 P. M.	Northerly wind.	Very great.	Storm was accompanied by hail, some were three quarters of a seer in weight.	Four men were killed by falling trees.	Rs. 8,000 of trees only.	
	Puranpur	30th April, 1888, from 7 P. M. to 10 P. M.	Westerly wind.	Rather great.	Storm was accompanied by hail, the size of hailstones was equal to a plum of ordinary size.	One man was killed by a falling tree.	Rs. 2,000 of houses and trees both.	

(6.) *Letter No.* $\frac{1261}{\text{XII}-599}$ *dated 22nd May, 1888, from the Collector of Bijnor to the Meteorological Reporter to Govt. N.-W. P. and Oudh.*

In reply to your letter No. 425 dated the 17th instant, I have the honour to state that the storm of 30th April was very slightly felt in this district, and was not accompanied by much wind. In a few places small hailstones fell, but no damage was caused. No persons were killed so far as I have been able to discover. If necessary I shall submit a further report, but as the storm was so slight, I do not think I shall be able to furnish the information required.

(7.) *Letter No.* $\frac{860}{\text{XII}-6}$ *dated 21st May, 1888, from the Superintendent, Tarai District, to the Meteorological Reporter to Govt. N.-W. P. and Oudh.*

In reply to your No. 429 dated the 17th instant, I have the honour to furnish information on the points noted, with reference to the destructive storm which recently visited Moradabad.

1. A slight storm but nothing of any moment passed over the Tarai on the 30th April, and lasted from about 5·30 to 6 P. M.

2. The wind was from the west.

3. No estimate was made of the force of the wind, and no particular damage was done by it.

4. The storm was not accompanied by hail.

5. No people were killed either by lightning, falling of houses, or any other cause.

6. No damage was done by this storm.

7. No barometric or thermometric observations were available. The Tarai was not in the line of the storm.

(8.) *Letter No.* $\frac{2014}{\text{XII}-117}$ *dated 23rd June, 1888, from the Collector of Meerut to the Meteorological Reporter to Govt. N.-W. P. and Oudh.*

In reply to your No. 418 of the 16th May, 1888, I have the honour to say that I have caused enquiries to be made in the different tahsils of the district. This enquiry was undertaken as there had been no definite report of any severe damage caused by a dust-storm and the making of it has caused the delay in replying.

2. The Moradabad storm occurred, I think, on April 30th last. On the evening of that day in Meerut itself there was a slight dust-

storm from the north-west which did no damage at all; it came on about 6 P. M.

3. In Hapur between 4 and 5 P. M. there was a dust-storm which lasted about ten minutes accompanied by some rain and a little hail of small size. There was no damage done. The wind was strong at first and from the north, it then turned east and boxed the compass.

4. In Mowana the storm occurred later and lasted from about 8 to 10 P. M. The wind was strong at the beginning and at the end. Several trees were uprooted and some houses unroofed, but no persons were killed. In the uplands hail was small, about the size of a gram seed, in the Ganges valley it was larger and did some damage to melons. In no other tahsil was there any disturbance that day.

APPENDIX II.

(1.) Extracts from the Telegraphic and Correspondence Columns of the Pioneer (Allahabad).

Delhi, 1st May.

A severe thunderstorm passed over the station this afternoon. Two trees have been struck by lightning and there is no doubt that other damage has been done, as several crashes have been heard. It has been raining and blowing hard since 3 o'clock, and there was a sharp and most destructive shower of hail between 3 and 4 o'clock, some of the stones being of extraordinary size. I picked up one as big as a man's fist which weighed two and a quarter ounces. This, I fancy, decides the fate of our mango crop and our fruit prospects generally.

Since preparing the above for despatch I hear that a lad aged four, who ran out during the hailstorm to pick up some of the stones, was killed on the spot.

2nd May.

As far as is known at present the hailstorm last evening would appear to have been local in its effect, all the damage up to the present being reported from the city and civil station of Delhi, and the western suburbs of Sabzimandi and Paharganj. The storm seems to have travelled in a south-easterly direction, for after passing over Delhi and crossing the Jumna, it went on in the direction of Meerut and Bulandshahr.

Several persons are reported to have been killed during the storm,

but the details need confirmation. A house outside the city was struck by lightning, but it was fortunately untenanted at the time. The lightning descended through the roof in the centre room and struck the floor; it then glanced off and, darting through a side room, passed out into the open.

3rd May.

The hailstorm on Tuesday afternoon was quite phenomenal in character. Later reports show that it was a far more remarkable occurrence than would appear from my telegrams. The stone picked up by me weighed two and a quarter chittacks, not ounces, as erroneously stated at first; and, incredible as it may seem, one picked up in the hospital garden in the fort weighed one and a half pounds. More extraordinary still, another hailstone secured near the telegraph office was of the size of an average melon, and turned the scale at two pounds.

These stones were weighed in the presence of reliable witnesses by two gentlemen of unquestionable veracity, and I have satisfied myself that there is not the least reason to doubt the authenticity of these reports. As it is possible, however, that many will still feel disinclined to credit my statement, and as the Meteorological Department will doubtless require full and reliable information in regard to what is here believed to be the most remarkable fall of hail on record, I am prepared to furnish any further particulars which may be needed, and to give the names and addresses of the gentlemen who weighed the enormous hailstones referred to.* I am also in a position to produce any further evidence which may be required to substantiate my facts.

The fall for about two minutes presented the appearance of a shower of lumps of ice, most of which smashed on coming in contact with the earth, only those which fell into soft earth having been secured intact. The shape of the stones generally was a flat oval, very few being round like ordinary hail. All kinds of rumours are flying about in regard to persons killed and injured during the storm, but, as several of these are doubtless exaggerated, if not absolutely imaginary, it would be unsafe to give particulars at present. It is a fact, however, that out of a flock of some fifty geese and ducks which were in a tank near the Ridge when the hail descended only nine were spared to the owner. It is true also that the lightning struck a thatched building in the same vicinity, and killed a man and woman who had taken shelter in it.

5th May.

Up to the present eleven persons are reported to have been killed

* References to these gentlemen have been given to me.

during the storm on Tuesday last. One man literally had his head split open, and over 200 persons are said to have been injured more or less. The full extent of damage to fruit and vegetable crops has not yet been correctly ascertained, but it is reported to be very serious.

7th May.

I have little to add to the particulars already furnished by telegraph in reference to the recent hailstorm at this place except that two or three additional deaths have been reported, and that the damage to the fruit and vegetable crops has been quite as serious as I had surmised. On both banks of the Jumna for about two miles above the railway bridge, and for a mile below that point, the melons have almost been completely destroyed owing to the necessarily exposed situation of the fields; and in the city and surrounding gardens very few mangoes are now to be seen. It is very fortunate, indeed, that the hailstorm was confined to so limited an area, or the damage would almost have amounted to a district calamity. The country to the north and south of Delhi, within a couple of miles of the city on either side, does not appear to have felt the effects of the storm in the least, and as the distance from the Jumna Bridge to the borders of the Rohtak district is only about 25 miles, the actual area effected in this district could scarcely exceed some 50 square miles.

Moradabad, 2nd May.

A terrific storm of hail and wind occurred here on the evening of the 30th ultimo. Most of the houses in the civil station have been unroofed, but little damage comparatively speaking has been caused in the city. Above 150 deaths are reported up to date, mostly from hail. Some details have reached us of the terrific storm referred to in our telegram from Moradabad. The storm began on the evening of April 30th. The wind blew with tornado-like strength, rain fell in torrents, and at intervals there were heavy showers of hail. Nearly every tree in the station was uprooted and the roads were blocked for miles by the fallen timber. Large numbers of mud huts were beaten down, while in the cantonment much damage was also done. The majority of the houses were unroofed, the north-west wall of the racquet-court was blown bodily down, and the house of the Judge adjoining was also damaged. The portico of Mr. Fisher's house fell, smashing up the Collector's horse and trap which were standing beneath it. But the most serious consequences resulted from the showers of hail, the stones being of phenomenal size. Natives who were exposed in the open were, to quote a correspondent, "half-frozen by the cold wind and then killed outright by the hailstones." Others were struck by falling trees or

injured by the collapse of their huts. One hundred and fifty deaths had been reported up to Tuesday evening, and the full returns had not even then been received. There were signs that day of a renewal of the storm, but the danger passed over. The temperature remained almost as low as in February, the change being most marked after the recent great heat. Masses of frozen hail were to be seen lying about the station long after the storm had ceased.

Our Moradabad correspondent writes under date 2nd May :—"People here say nothing like the storm was ever known before. About 6 A. M. I was looking at the house which I had taken, the one usually occupied by the Collector here, standing on the race-course. The house suddenly became dark and full of dust. A terrific storm sf wind followed. Most of the doors were brust open and the glass broken by the hail that followed almost immediately. Part of the roof fell in. The verandas were blown asunder. The heavy masonry porch fell, crushing the horse and phaeton standing underneath. When I came out the race-course was covered with water. Many of the houses in the civil station had been completely unroofed, including one of the barracks. Most of the trees had been blown down and were strewn on the road. Not much damage seems to to have been done in the city. One hundred and sixty deaths have been reported up to the time I write, and no doubt some more reports will come in. Most of the deaths were from hail, a few from the falling of walls and trees. The hail appears to have stopped within a few miles of Moradabad. Most of the district escaped completely. One of the two companies of the Seaforth Highlanders stationed here is leaving for Bareilly in consequence of the unroofing of the barracks."

A correspondent writes from Camp Tilhar, Shahjehanpur district, 3rd May :—"It may be interesting to trace the course of the storm of the 1st. This place is 12 miles west of Shahjehanpur on the O. and R. line. The whole of that day a strong east wind had been blowing: about 3-30 P. M. a bank of dust came up from the west and the wind then changed. It only appeared at first one of the usual dust-storms, but after a slight fall of hail the storm became very violent, rain poured in streams, and hailstones fell, the size of which astonished all, and I am not exaggerating when I say that many were the size of a turkey's egg, while the smallest were the size of a pigeon's. I regretted afterwards I had not been able to weigh some, but I would not venture out myself and so could hardly ask anyone else. The storm lasted until 4-30. The destruction to trees has of course been great, but I have only heard of the loss of one life.

"The opium cultivators who were congregated in the groves of trees

escaped in a most miraculous way, for branches of trees were falling all round them, but only one man was slightly injured. The shed which has been built for their convenience had half the roof blown down, while houses innumerable have been unroofed. In all the years that I have been in India it was the severest storm that it had ever been my lot to witness."

A Naini Tal correspondent writes under date 2nd May :—"Another sharp thunderstorm, with heavy rain, broke over the station last evening about 6-30 P. M., and one or two minor ones occurred during the night. The great storm of yesterday did much damage, the roads being strewn with the leaves of trees, cut off by the hail, and all flowers, fruit trees, &c., exposed to its violence were cut to pieces. Government House suffered severely, and nearly two hundred panes of glass were broken by the hail. Clouds are still hanging about, and the distant roll of thunder proves that the disturbance of the elements is not yet over. The traditional 'oldest inhabitant' cannot remember such severe weather in the month of May, but it seems to be part of the same storm that has broken over Calcutta, Darjeeling, &c."

(2.) Extracts from the *Civil and Military Gazette* (Lahore).

Moradabad, 1st May.

A perfect cyclone swept over Moradabad last evening. The wind was so high that it blew sixty empty goods vans from the sidings in which they were standing for at least two miles out of the station along the line in the direction of Chundousie. This was not sufficient. Dame Nature, not content with a rather heavy goods train, thought she might as well have a mixed train, and sent after them thirteen empty lower class carriages. All these seventy-three vehicles went careering gaily along the line by themselves for two miles without let or hindrance, when the foremost of them met with an unfortunate bullock lying across the line, and no cow-catcher being at hand, it was, as Stephenson predicted, bad for the "coo"; but it was still worse for the empty goods vans, for the first one, in coming in collision with the bullock, got derailed, and all the others followed suit, tearing up the track for a distance of about two miles. Some of the vans were turned upside down, and looked somewhat like huge tortoises on their backs. The train, which should have reached Bareilly at 3-14 A. M., never turned up at all. But the train from Allyghur, due at 10-2 P. M., did not arrive till 3-14. A very large peepul tree between Chundousie and Moradabad had been torn up by its roots and sent right into the telegraph posts, which not only knocked them down, but destroyed them entirely for a considerable distance on both sides. The wreck of broken and damaged carriages was amazing.

Bareilly, 1st May.

A violent storm of quite a cyclonic character burst on and in the vicinity of the Rohilkhand and Kumaon line last evening. At Bareilly it began to blow in violent gusts about half-past 7 and raged at intervals, subsequently accompanied by rain till about 12 o'clock, in fact, even up to 4 this morning there were heavy showers. The corrugated iron roofs of the Deonarain and Richha Road stations, respectively at $21\frac{1}{2}$ and $27\frac{3}{4}$ miles from Bareilly, were blown off, and the stations considerably wrecked by the violence of the wind. The whole length of line from Atmora, $16\frac{3}{4}$ miles from Bareilly, to Baheri, $31\frac{1}{4}$ miles, a distance of upwards of fifteen miles, was strewn, not only with branches torn off from adjacent trees, but many of the trees themselves. In consequence of the line having to be cleared of these obstructions, the Naini Tal train, which should have arrived at Bareilly junction at 3-20, did not reach that station till half-past 7, being upwards of four hours and ten minutes late. The Moradabad train is also late; it ought to have arrived here at 3-44 P. M. and is not here yet 20 past 8.

Ghaziabad, 4th May.

The hailstones which fell here during the storm of the 1st were of phenomenal size. Some selected ones, to which accredited witnesses testify, were three and four inches in diameter and weighed from four to eight ounces. Those of medium size were as large as cricket balls. They were not quite round, but spheroidal, and the rebound of the large ones was not less than fifty feet. A gentleman, many years a resident here, had never seen anything like it.

Shahjahanpur, 4th May.

An exceedingly violent hurricane burst over the city and station of Shahjahanpur on the evening of the 1st. The wind began to rise about 4 o'clock P. M., and blew violently from an easterly direction, when on a sudden it veered round to a westerly direction. The consequence of this sudden change in the direction of the current of air must have been a considerable downward pressure of the opposing currents; and the trees, both through the city, the civil station, and cantonment, suffered very much. I arrived at the Shahjahanpur Railway station from Bareilly at 11 P. M. There was not a single *ticca gharry** in attendance, owing to trees and branches of trees of all sizes lying across the road from the Railway station to the city and all round. In going round the city on the morning of the 2nd I found enormous trees and branches strewed about in all direction, and many roofs and walls crushed in by them.

* *Thika gári*, hackney carriage.

The thatched roofs of the three porticoes of the Government Native School were blown clean off. I hear several people in the city have been killed from the falling in of roofs and walls, which have been crushed in and knocked down by the falling branches and trees. The kutcherry* compound had an appearance as if the trees had been cut down for the purpose of forming an *abattis* to stand a siege. The oldest inhabitant of Shahjahanpur says he cannot remember ever to have experienced so severe a hurricane. The accounts from Moradabad (native accounts) are most wonderful, even in the way of imagination. One is that that there were several shocks of earthquake at the time the tempest occurred in that station, and that here and there cracks appeared in the earth. Another, that a party of five hundred souls forming a wedding procession between Moradabad and Powajan were caught in the storm, and all perished, the bridegroom amongst them, with the exception of five men. A third, that many poor people who were watching their cucumber, melon, and water-melon beds in the vicinity of the Ramgunga River were overwhelmed in the dense columns of sand-dust borne along by the storm-wave, and being daily dug out and carried into Moradabad for identification. The weather to-day, the 4th of May, is quite cool, needing no punkha even in the middle of the day.

* Magistrate's Court.

VII.—*The Geometric Interpretation of Monge's Differential Equation to all Conics.*—*By* Asutosh Mukhopadhyay, M. A., F. R. A. S., F. R. S. E.

[Received May 22nd;—Read June 6th, 1888.]

Contents.*

§ 1. Historical introduction.
§ 2. Geometric interpretation.

§ 1. *Historical Introduction.*

Before proceeding to give the true geometric interpretation of Monge's differential equation to all conics, which I have recently discovered, and which it is the object of this paper to announce and establish, a brief survey of the past history and present position of the problem may not be wholly unprofitable. In the first place, then, we remark that the differential equation of all conics was, more than three-quarters of a century ago, first discovered by the illustrious French mathematician Gaspard Monge, and published by him in 1810.† It should be remembered that, in his paper, Monge does not furnish us with any clue to the method by which, from the integral equation of the conic, he derived the differential equation which now appropriately bears his name: neither is there any attempt at a geometric interpretation; it is simply stated that the differential equation to all conics of the second order as obtained by the elimination of the constants from the equation

$$Ay^2 + 2Bxy + Cx^2 + 2Dy + 2Ex + 1 = 0$$

is

$$9q^2t - 45qrs + 40r^3 = 0,$$

where, as usual,

$$p = \frac{dy}{dx}, \quad q = \frac{d^2y}{dx^2}, \quad r = \frac{d^3y}{dx^3}, \quad s = \frac{d^4y}{dx^4}, \quad t = \frac{d^5y}{dx^5};$$

and this statement is followed by a verification that the differential equation of all circles

$$(1 + p^2)r = 3pq^2$$

leads, on differentiation, to the differential equation of all conics.

After Monge's paper, we come to the following statement made by the late Dr. Boole:‡

* For [illegible] analysis of this paper, see the *Proceedings* for 1888, pp. 157-158; [illegible]re, vol. xxxviii, p. 173.

† Sur les Equations différentielles des Courbes du Second Degré. (Bulletin de [illegible]c. Philom. Paris, 1810, pp. 87-88; Corresp. sur l'Ecole Polytech. (Hachette) [illegible]aris, 1809-13, t. ii, pp. 51-54).

‡ Differential Equations, Fourth Edition, pp. 19-20.

"Monge has deduced the general differential equation of lines of the second order, expressed by the algebraic equation

$$ax^2 + bxy + cy^2 + ex + fy = 1.$$

It is

$$9\left(\frac{d^2y}{dx^2}\right)^2 \frac{d^5y}{dx^5} - 45\frac{d^2y}{dx^2}\frac{d^3y}{dx^3}\frac{d^4y}{dx^4} + 40\left(\frac{d^3y}{dx^3}\right)^3 = 0$$

But, here our powers of geometrical interpretation fail, and results such as this can scarcely be otherwise useful than as a registry of integrable forms."

The subject seems to have attracted the notice of English mathematicians from the above statement of Boole, and, during the thirty years which have elapsed since these remarks were first made, there appear to have been two attempts to interpret geometrically Monge's differential equation to all conics. The first of these propositions, by Lieut.-Col. Cunningham, is that the eccentricity of the osculating conic of a given conic is constant all round the latter.* The second proposition, by Prof. Sylvester, is that the differential equation of a conic is satisfied at the sextactic points of any given curve.† I have elsewhere considered in detail both these propositions, and I have fully set forth my reasons for holding that neither of them is the true geometric interpretation of Monge's defferential equation to all conics.‡ In fact, as I have already remarked, there are two tests which may be applied if we wish to examine whether a proposed interpretation of a given differential equation is relevant or not, *viz.*,

1st. The interpretation must give a property of the curve whose differential equation we are interpreting; in fact, it must give a geometrical quantity which vanishes at every point of every curve of the system.

2nd. The geometrical quantity must be adequately represented by the differential equation to be interpreted.

Lieut.-Col. Cunningham's interpretation cannot be accepted as it satisfies neither of the tests; it fails to give such a property of all conics as would lead to a geometrical quantity which vanishes at every point of every conic; moreover, it is not adequately represented by the differential equation to be interpreted, inasmuch as it is really the geometric interpretation of the differential equation

$$\frac{(e^2-2)^2}{1-e^2} = \frac{T_0^2}{9q^4U},$$

* Quarterly Journal of Mathematics (1877), vol. xiv, pp. 226-229.

† American Journal of Mathematics (1886), vol. ix, pp. 18-19.

‡ Journal, A. S. B. (1887), vol. lvi, part ii, pp. 134-145; P. A. S. B. (1887), pp. 185-186; P. A. S. B. (1888), pp. 74-86.

where

$$T_0 = (1+p^2)(3qs-4r^2) - 3q^2\,(2pr-3q^2)$$
$$U = 3qs - 5r^2,$$

and, by actual calculation, I have proved this differential equation to be one of the five independent first integrals of the Mongian equation.* Professor Sylvester's interpretation is, similarly, wholly out of mark, as satisfying the second test but not the first, inasmuch as it gives a property not of all conics but of an extraneous curve.

So far my criticism has been purely negative, as I have confined myself to the statement that the true interpretation of the Mongian equation still remains to be found. I now proceed to give what I believe to be the long sought for interpretation of the differential equation to all conics.

§ 2. *Geometric Interpretation.*

Consider the conic of closest contact at a given point of any curve; refer the system to rectangular axes through any origin; then, if x, y be the coordinates of the given point, and α, β those of the centre of aberrancy, I have already established the system of equations†

$$\alpha = x - \frac{3qr}{3qs-5r^2},$$
$$\beta = y - \frac{3q\,(pr-3q^2)}{3qs-5r^2}.$$

If now $d\psi$ be the angle between two consecutive axes of aberrancy, ρ the radius of curvature, and ds the element of arc, of the "aberrancy curve" (which is the locus of the centre of aberrancy), we have

$$ds^2 = d\alpha^2 + d\beta^2$$
$$\rho = \frac{ds}{d\psi}.$$

Now, from the above expressions for α, β we get easily

$$\frac{d\alpha}{dx} = \lambda T,$$
$$\frac{d\beta}{dx} = \mu T,$$

* See *Nature*, vol. xxxviii, pp. 318-319, where Lieut.-Col. Cunningham substantially acknowledges the correctness of my criticism.

† See my paper "On the Differential Equation of all Parabolas", J. A. S. B. (1888), vol. lvii, pt. ii, pp. 316—332; cf. p. 324.

where

$$\lambda = \frac{r}{(3qs - 5r^2)^2}$$

$$\mu = \frac{pr - 3q^2}{(3qs - 5r^2)^2},$$

$$T = 9q^2t - 45qrs + 40r^3.$$

Therefore

$$\left(\frac{ds}{dx}\right)^2 = \left(\frac{d\alpha}{dx}\right)^2 + \left(\frac{d\beta}{dx}\right)^2 = (\lambda^2 + \mu^2)T^2,$$

and

$$\rho = \frac{ds}{d\psi} = \frac{ds}{dx}\,\frac{dx}{d\psi} = (\lambda^2 + \mu^2)^{\frac{1}{2}}\ T.\ \frac{dx}{d\psi}.$$

But

$$\frac{dx}{d\psi} = \frac{dx}{d\omega}.\ \frac{d\omega}{d\psi},$$

and, as proved in my former paper,* we have

$$\frac{d\omega}{dx} = \frac{q}{1+p^2},$$

and

$$\frac{d\psi}{d\omega} = \frac{9\rho^2 + 4\left(\frac{d\rho}{d\omega}\right)^2 - 3\rho\,\frac{d^2\rho}{d\omega^2}}{9\rho^2 + \left(\frac{d\rho}{d\omega}\right)^2},$$

where

$$9\rho^2 + \left(\frac{d\rho}{d\omega}\right)^2 = \frac{(1+p^2)^4}{q^6}\left\{r^2 + (rp - 3q^2)^2\right\},$$

$$9\rho^2 + 4\left(\frac{d\rho}{d\omega}\right)^2 - 3\rho\,\frac{d^2\rho}{d\omega^2} = \frac{(1+p^2)^5}{q^6}(3qs - 5r^2),$$

so that

$$\frac{d\psi}{d\omega} = \frac{(1+p^2)(3qs - 5r^2)}{r^2 + (rp - 3q^2)^2}$$

Hence, finally,

$$\frac{dx}{d\psi} = \frac{r^2 + (rp - 3q^2)^2}{q\,(3qs - 5r^2)},$$

and

$$\rho = \frac{\left\{r^2 + (rp - 3q^2)^2\right\}^{\frac{3}{2}}}{q\,(3qs - 5r^2)^3}.\ T.$$

* J. A. S. B. (1888), vol. lvii, pt. ii, pp. 316—332; cf. p. 322.

This result may also be obtained without calculating the value of $\frac{dx}{d\psi}$. For, α, β being the coordinates of the centre of aberrancy, we have

$$\rho = \frac{\left\{1+\left(\frac{d\alpha}{d\beta}\right)^2\right\}^{\frac{3}{2}}}{-\frac{d^2\alpha}{d\beta^2}},$$

and

$$\frac{d\alpha}{d\beta} = \frac{d\alpha}{dx}\frac{dx}{d\beta} = \frac{\lambda}{\mu},$$

$$\frac{d^2\alpha}{d\beta^2} = \frac{dx}{d\beta}\frac{d}{dx}\left(\frac{d\alpha}{d\beta}\right) = \frac{1}{\mu T}\frac{d}{dx}\left(\frac{\lambda}{\mu}\right)$$

$$= \frac{1}{\mu T}\frac{d}{dx}\left(\frac{r}{pr-3q^2}\right) = -\frac{q}{\mu T}\frac{3qs-5r^2}{(pr-3q^2)^2}$$

$$= -\frac{q}{T}\left(\frac{3qs-5r^2}{pr-3q^2}\right)^3.$$

Substituting, we get, as above,

$$\rho = \frac{\left\{r^2+(rp-3q^2)^2\right\}^{\frac{3}{2}}}{q\,(3qs-5r^2)^3}\,T.$$

This, therefore, is the most general expression for the radius of curvature of the "aberrancy curve" of any given curve. Now, when

$$T = 0$$

we have $\rho = 0.$

But $$T = 0$$

is known to be the differential equation to all conics; hence, obviously, the geometric interpretation of Monge's differential equation to all conics is as follows:—

The radius of curvature of the aberrancy curve vanishes at every point of every conic.

This geometrical interpretation will be found to satisfy all the tests which every true geometrical interpretation ought to satisfy, and I believe that we have at length got here the interpretation which has been sought for by mathematicians during the last thirty years, ever since Cayley wrote his now famous lines.*

19th May, 1888.

* For some remarks (which, however, seem to me to be very weak) on this interpretation by R. B. H. (Hayward?), see *Nature*, vol. xxxviii, pp. 197, 564, 619.

VIII.—*Description of a Stag's head allied to* Cervus dybowskii Tac., *procured from the Darjeeling Bazaar.*—*By* W. L. Sclater, *Deputy Superintendent of the Indian Museum.*

[Received 27th Feb.,—Read 6th March, 1889.]

(With Plate XI.)

Some months ago a stag's head was sent to the Museum by Mr. Dunne, who wished the head to be mounted to hang up in his hall.

Mr. Fraser, the 2nd assistant to the Superintendent, on examining the head, at once saw that it was something out of the common, that it was the head of neither Sambur, Tibet deer, or Kashmir deer, and he drew my attention to the fact.

On my writing to Mr. Dunne he most kindly consented to exchange the head for one of a Sambur, and further informed me that he had bought the head in the bazaar at Darjeeling, but that, beyond that, he knew nothing about it.

I sent the head to Simla to Mr. Hume in order that he might compare it with the heads in his own magnificent collection; Mr. Hume wrote to me telling me that he had nothing like it in his collection, but drew my attention to the description of *Cervus dybowskii* of M. Taczanowski published in the Proceedings of the Zoological Society for 1876, and further said that he thought it probable that the specimen in question was either identical with, or nearly allied to, that interesting species.

I propose first of all to describe the head and afterwards to make some remarks on its affinities.

The head which I exhibit this evening, and of which the accompanying plate gives a good idea, is at once distinguished by the entire absence of the second brow antler which is so characteristic of the Elaphine group of the genus *Cervus*.

With regard to the skull, the most noticeable feature is the curious expansion of the nasal bones, which spread out over the suborbital vacuity, causing the vacuity to be much smaller than in either the Sambur or the Tibetan or Kashmir stag; the suborbital pit too is larger than that of the Kashmir or Tibetan stag (*Cervus cashmeerianus* and *C. affinis*), but is smaller than that of the Sambur (*C. aristotelis*); the other noticeable points in the skull are the form of the auditory bulla and the molar teeth.

The auditory bulla is distinctly Elaphine; as in the Tibetan and Cashmir stags, it is small, compressed, and rugged, and not swollen, while the bulla of the Rusine stags is much swollen and quite smooth.

The molar teeth have three well marked columns on the external sur-

face of each tooth; the intermediate ones, however, are not so well marked; this also shows an Elaphine rather than a Rusine affinity.

The antlers are placed on moderate pedestals, the brow antler springs at almost a right angle to the beam, and subsequently is slightly turned up at the point; half way up the beam there is another anteriorly directed tine, that on the right antler being considerably shorter than on the left; above this, the median tine, there are two more anteriorly directed tines, the lower one of considerable length, the upper one short, but surpassing the distal unbranched end of the beam in length.

The horns are thin and slender, marked with longitudinal ridges, and rather worn, so that they were probably soon about to be shed; the animal was therefore probably killed in early spring or late winter, if there is any analogy to be drawn from the time of horn-shedding of the Kashmir stag.

The head when it arrived had been preserved with the skin on; this was carefully removed and cured.

The rhinarium agrees with that of the Rusine rather than with that of the Elaphine group; it is fairly extensive, but does not quite surround the nostrils; the prenarial portion, forming the isthmus between the narial and labial portion, is rather narrow; but the infra-narial portion, the absence of which is so marked in the Elaphine group, is here well developed.

The hair on the head is rather coarse, it is dark brown in colour, each hair being provided with a subterminal band of yellow, so that the general appearance of the fur is of a speckly yellow; the hair round the rhinarium and upper lip is white.

The above description leaves little or no doubt that the animal belongs to the group Pseudaxis as defined by Sir V. Brooke in his well-known paper on the Cervidæ (P. Z. S. 1878, p. 907).

There are only two species of the group Pseudaxis which approach our specimen in size; these are *C. mantchuricus* and *C. dybowskii*; of these *C. mantchuricus*, though figured, is nowhere very fully described. *Cervus dybowskii* is well described by Taczanowski (P. Z. S. 1876, p. 25), and seems to agree with our specimen in nearly all respects; there are, however, only 8 points to the antlers described by Taczanowski, while our specimen possesses 10 points; in every other respect except size our specimen agrees with the description given by M. Taczanowski; the colour speckly brown, the white muzzle, and also the curiously shaped nasals, which are clearly shown in the wood-cut accompanying the description, though not mentioned in the text.

In size the *Cervus dybowskii* seems slightly inferior to our specimen, as will be seen by the measurements in inches of the two specimens given

below; in the case of *C. dybowskii* the centimetres have been reduced to inches.

	Darjeeling specimen.		*C. dybowskii.*
	Right antler	left antler	
Length of antlers along the curve, ...	36·0	35·5	22·0
Between the antlers at their base, ...	3·5		3·5
Spread, ...	32·0		16·0
Length of basal tine, ...	7·5	8·0	5·8
Length of 2nd tine, ...	8·0	12·5	5·0
Length of 3rd ditto, ...	11·5	9·5	5·0
Length of 4th ditto, ...	3·5	4·5	—
Tip of beam, ...	2·0	2·5	—

The following are the usual skull measurements given in inches:—

Length of skull from tip of premaxillaries to the occipital condyle, ...	13·75
The palate from the tip of the premaxillaries to the posterior nares, ...	8·0
Extreme breadth behind the orbits, ...	7·5
Length of the three molars, ...	2·5
Width of palate between the posterior molars, ...	2·75
Length of the suborbital pit, ...	2·0

The types of *Cervus dybowskii* were procured by M. Dybowski in Southern Ussuri, which lies to the south of the Amur river and to the north of Vladivostok, the great Russian Port in Japanese seas.

The specimen which I here exhibit was, as I have mentioned above, bought by Mr. Dunne in the Darjeeling bazaar, so that there is absolutely no evidence as to whence the stag came, but it seems probable that it was brought from Tibet, and, as the skin and horns were in good condition, it does not seem likely that it came from a very distant part of Tibet.

If therefore the stag in question really does turn out to be specifically identical with the stag from Ussuri-land, the range of the *Cervus dybowskii* must be very great, reaching from Tibet all through Western China and Manchuria to Ussuri, in which case it is very remarkable that it should not have been oftener procured by scientific collectors.

IX.—*On the Volatility of some of the compounds of Mercury and of the Metal itself.*—*By* ALEX. PEDLER.

I propose only in the present paper to add a few facts to those already known on the subject of the volatility of mercury and of some of its compounds. Popularly, the liquid metal mercury, or quicksilver, may be considered to be a typical case of a liquid which is non-volatile. This, however, is not the case, and the volatility of mercury has been the subject of many researches. Faraday* was one of the first to notice that mercury is sensibly volatile even at the ordinary temperature of the air, and he states that this is the case between 15·5° and 27°, but not at 6·7°, both in spaces filled with air and *in vacuo*. This volatility of mercury was proved by suspending gold leaf for 2 months in a vessel over mercury, when the leaf became amalgamated. This volatility is also proved by the old process of daguerreotyping, and by the fact that, if a current of electricity is passed through a Torricellian vacuum or through Geissler's tubes which are being exhausted with a mercurial pump, the spectrum of mercury can be seen. Numerous writers such as Regnault,† Berthellot,‡ Ramsay and Young,§ Karsten,‖ Merget¶ and McLeod** have all proved the volatility of mercury. Merget in particular has shown that even at a temperature of—44°, it possesses a sensible vapour tension, while McLeod has been able to estimate the actual weight of mercury which existed in the form of vapour in a vessel at the ordinary temperature of the air. In one experiment it was found that in a flask 1·9 litres capacity the weight of mercury vapour was only the very small amount of 0·00009 gram.

In India, where we deal usually with atmospheric temperatures considerably above those where all the published experiments on this subject have been made, it may naturally be expected that the volatility of mercury will be a very appreciable quantity. This fact has lately been proved to me in a very striking way. At Buxar (Behar) there is a Government Meteorological Observatory where there is a mercurial barometer suspended on the inner wall of a house, but immediately opposite a doorway, and in such a position that though exposed to the

* Faraday, Schw. 32 482, and Pogg. 9, also Watts's Dictionary of Chemistry, article on Mercury.

† Compt. rend. lxxiii.

‡ Ditto ditto 100, 13, 26-1328.

§ Journ. Chem. Soc. Trans. 1886, 37-50.

‖ Pogg. 7, 245.

¶ Compt. rend. lxxiii, 1356.

** Chem. News, 48, 251.

reflected glare from the ground, it is protected from the actual direct rays of the sun. It was not receiving any direct rays of the sun at the time the following facts were observed, and its position is such that, except for perhaps a very brief period during the winter season, it is never reached by the sun's rays. This observatory was inspected on October 23rd, 1888, and in the Torricellian vacuum of the barometer, at some little distance above the surface of the mercury in the tube and immediately behind the usual position of the vernier, I found a deposit of from 100 to 120 small globules of mercury ranged all round the inside of the tube, the size of which averaged about half that of an ordinary pin's head. I could not actually determine the weight of mercury which had thus distilled upwards, but I estimated it roughly to have been more than half a gramme. The Superintendent of the observatory has informed me that the deposit of mercury was first noticed on September 20th, 1888, and that after having been removed and the instrument put right by me on October 23rd, the deposit had again commenced to form on the 15th of November. In this case then it is proved that mercury can at the temperature of Buxar for the period named give off sufficient vapour *in vacuo* to effect an actual slow distillation. The meteorological elements for Buxar in October 1888, were :—

mean maximum temperature 90·1° F = 32·3° C
mean minimum temperature 70·0° F = 21·1° C

and the mean temperature of the solar radiation thermometer in Behar in October was about 139·1° F = 59·5° C.

The cause of the mercury collecting in the portion of the vacuous part of the barometer tube shaded by the vernier is easily understood, for it is this part which is protected from the glare from the ground heated by the sun, and will therefore be at a slightly lower temperature than the rest of the tube. The only other cause which could be acting in this case would be the difference between the highly illuminated and shaded parts of the tube. If this were the cause it would show that the distillation was caused by the action of light, but this alternative can probably be neglected.

The fact of this slow distillation of mercury in a barometer tube should be carefully noted by meteorologists, particularly in tropical countries. In the case in question the barometer was one of Fortin's principle, and the presence of the globules of distilled mercury did not introduce any error into the barometric readings, but if the instrument had been constructed on the Kew principle, as is the case very largely now with barometers, the presence of this sublimed mercury would have entirely vitiated the accuracy of the readings of the barometer.

The volatility of certain compounds of mercury has also been brought to my notice in the course of a number of experiments which I have been carrying out on the action of light on various chemical compounds. The usual method of experimenting has been as follows:—A small quantity of a compound is placed in a glass tube sealed at one end, and if a solid, a small plug of cotton wool is placed above it. The tube is then considerably narrowed before the blowpipe at about 3 to 4 inches from the closed end, and above the constricted part a stick of caustic soda or a piece of metallic sodium or other reagent is placed, to decompose or combine with any vapour which may be evolved by the compound which is being tested. The tube is then rendered vacuous by a Sprengel pump and hermetically sealed, the whole tube being 8 to 10 inches long. It is afterwards exposed to the sunlight or kept in the dark as the case may require.

The following mercuric compounds have been tested:—mercuric oxide, mercuric cyanide, mercuric iodide, mercuric oxalate, mercuric chloride (corrosive sublimate), and mercuric bromide. Of the mercurous salts only mercurous chloride was tested, for it is well-known that such compounds as mercurous oxide, mercurous iodide, etc. are very readily decomposed.

Red mercuric oxide was placed in a sealed tube *in vacuo* with a few freshly cut pieces of metallic sodium in the upper part of the tube. The experiment was commenced in March 1887, and the tube was exposed daily to sunlight for about a year. On examination the pieces of sodium were all found completely covered with a decided layer of oxide, and on removing the oxide, part of the sodium surfaces appeared like a piece of sodium amalgam. After acting on the sodium with water a considerable number of distinct and moderate sized globules of mercury were obtained.

The oxide of mercury, which was of a bright red colour at the commencement of the experiment, was examined. It was of a dark chocolate brown colour, and on examination it was found to consist of unchanged red mercuric oxide with a distinct quantity of mercurous oxide. Metallic mercury was tested for but none could be detected. The experiment therefore proves conclusively that mercuric oxide is feebly volatile at temperatures such as those obtained in sunlight, for the only way in which the mercury could have passed to the sodium is by volatilization of the oxide. No metallic mercury was found in the oxide after the action of sunlight, and therefore no upward distillation of mercury as such could have happened.

Observations have already been made showing that mercuric oxide when exposed to sunshine turns black superficially and partially de-

composes. Guibert* states that the decomposition yields mercury and oxygen, while Donovan* states that mercurous oxide and oxygen are formed. Donovan's explanation therefore of the reaction appears to be the correct one, and not that advanced by Guibert.

Jacob Myers (Deut. Chem. Ges. Ber. VI. 11) has also shown that mercuric oxide apparently commences to decompose *in vacuo* in a very feeble manner at about 150°C, but that even at 240° the tension of the evolved oxygen is only 2 m.m., but it is clear that the phenomenon described in the previous experiments is quite different from that alluded to by Myers.

Mercuric cyanide *in vacuo* appeared quite non-volatile, and, even after exposure to the direct rays of the sun for a month in the hot season of the year, the compound itself seemed to be quite unaltered.

Mercuric iodide appeared also quite non-volatile at ordinary air temperatures *in vacuo*, even when exposed to the rays of the Indian sun, and it also appeared practically unchanged in composition by the direct action of sunlight, and, though there was a slight darkening in colour under the influence of light, the change was to a great extent temporary, and disappeared when the iodide was exposed to the air.

Mercuric oxalate was exposed to the direct rays of the sun *in vacuo* for seven and a half months during the hot season of the year. There was no evidence whatever of the substance being volatile, but the colour of the salt darkened rapidly under the influence of the sun and changed to a deep grey. The grey mass after treatment with solution of potassic cyanide, and afterwards with ammonic chloride, left a black residue from which globules of mercury were obtained by the usual process, and which black residue gave all the tests for metallic mercury. This salt, though not volatile at ordinary temperatures *in vacuo*, appears therefore to decompose by sunlight according to the equation :—

$$Hg\,C_2O_4 = Hg + 2CO_2.$$

Mercuric chloride was the next salt tested, and this yielded rather important results. One of the experiments may be described as follows :—On March 6th, 1886, a glass tube $\frac{1}{4}$ of an inch internal diameter was filled at its closed end with 10·876 grams of pure mercuric chloride. It was drawn out, &c., in the usual manner, and a stick of caustic soda placed in the upper part of the tube, which was then rendered vacuous and hermetically sealed. After sealing, it was daily exposed to the sun's rays with the end of the tube containing the caustic soda upwards. After a few days a grey deposit of metallic

* Gmelin's Chemistry, Vol. VI, p. 10.

mercury commenced to form on the surface of the caustic soda, and this gradually increased until the whole surface of the caustic soda and part of the interior surface of the glass was covered with a grey film. The experiment was allowed to go on till June 10th, 1887, when the tube was opened and examined. The mercury salt in the lower end of the tube was weighed, and found to be 10·1628 grams and had therefore lost 0·0132 gram. The mercury salt was examined, and was found to have been partly reduced to mercurous chloride (calomel), and 0·018 gram of this salt had been produced. This calomel when examined under the microscope was of a distinct crystalline nature, and crystals belonging to the usual form for calomel* were found; these crystals also answered to all the tests for calomel. No free mercury was found in the corrosive sublimate.

The amount of mercury which had been deposited in the upper part of the tube, and which was due to the decomposition of the vapour of the mercuric chloride was also estimated, and was found to weigh 0·0112 gram, or very nearly the amount which would be calculated from the loss of weight, etc. of the mercuric chloride. It is clear therefore that mercuric chloride is very decidedly volatile at ordinary air temperatures *in vacuo* and when exposed to sunlight, and from a nearly circular surface of the powdered salt about $\frac{1}{4}$ inch in diameter a very appreciable weight of mercuric chloride had evaporated and had passed up a tube nearly six inches in length, while a further appreciable weight of the mercuric chloride had changed into mercurous chloride.

To test whether this decided volatility was in any way facilitated by the strong light used in the experiment, another tube $\frac{3}{8}$ inch diameter had been similarly prepared, but had been kept in the dark. This experiment was started on April 19th, 1887. The action in this case did not commence so rapidly as in the previous case. After a month only about $\frac{1}{3}$ of an inch of the lower end of the stick of caustic soda was covered with the deposit, and the deposit gradually but slowly increased. The tube was opened on January 2nd, 1889, and the incrustation was found of a yellow to a yellow brown colour. The deposit was examined under the microscope, and no metallic mercury could be detected. The deposit was weighed, and found to be only 0·0016 gram., and it was found to consist practically entirely of mercuric oxide (HgO).

Thus it is clear that the mercuric chloride is volatile at ordinary air temperatures, but the volatility appears to be increased by the direct action of light. The reactions in the two cases are also slightly different,

* Watts's Dict. Chem. Vol. II, P. 135 fig. 237.

for, while in full sunshine mercury only is deposited by the action of the caustic soda on the mercuric chloride vapour, in the dark mercuric oxide is deposited, and the reaction appears to be $HgCl_2 + 2NaHO = HgO + H_2O + 2NaCl$.

So far as I have been able to ascertain the partial decomposition and volatility of solid mercuric chloride at ordinary atmospheric temperatures and under the influence of sunlight have never previously been noticed. J. Davy* apparently investigated the properties of mercuric chloride, and says the salt does not suffer decomposition when exposed in the state of powder to sunshine. The salt is also well-known to be volatile at high temperatures, for it melts at 265° and boils at 295°, but beyond some vague statements that mercuric chloride is more volatile than mercurous chloride, which is itself volatile only at about a red heat, no precise statement is made that I can find, that this body is at all volatile when in the solid state or at any temperature below its melting point.

Solutions of mercuric chloride are known to undergo slight change when exposed to sunlight, and the reaction is generally said to yield mercurous chloride, oxygen, and hydrochloric acid,† or by others oxychloride and hydrochloric acid. In order to verify this point some experiments were made by exposing such solutions to the rays of an Indian sun. After exposure for about six months a solution of the mercuric chloride gave a small quantity of a grey or greyish white precipitate, and also some prismatic crystals of moderate size, which were colourless and transparent. Both the crystals and the greyish white powder were found to be mercurous chloride. No metallic mercury could be detected. The decomposition of the solution of mercuric chloride under the influence of sunshine is therefore parallel to the decomposition of the salt in the solid state as above described. The decomposition of the mercuric chloride is of course in both cases very incomplete.

It has been proved by Hannay‡ in his paper on "new processes of mercury estimation, &c.," that when a solution of mercuric chloride is evaporated a portion of the salt is volatilized with the aqueous vapour, and he made some quantitative experiments and showed, that in one case over 5 per cent. of the salt could thus pass away. He also states (p. 572) "that when solutions of mercuric chloride are evaporated or boiled in a room even when well ventilated, the salt which is [illegible]s thrown into the atmosphere is very injurious to the human system, in fact all

* Gmelin's Chemistry, Vol. 6, P. 55.
† Gmelin's Chemistry, Vol. 6, P. 55.
‡ Journ. Chem. Soc. 1873, P. 565-575.

the symptoms of mercury poisoning are strongly manifested." If, however, the solution of mercuric chloride contains hydrochloric acid or apparently other acids also, the salt does not volatilize at all when evaporated, and it would appear to be only when pure solutions are evaporated that this volatilization takes place.

The power which steam has of carrying forward vapours of other bodies which under ordinary circumstances are fixed or difficultly-volatile is well-known, and there is thus perhaps nothing very surprising that the vapour of a body which boils at 295° should be carried over by steam, but the fact that the addition of an acid such as hydrochloric to the solution renders the salt non-volatile with steam requires explanation. The possible reason why the volatility then ceases may perhaps be found in the fact proved by A. Ditte* that hydrochloric acid has the power of forming direct crystallizable compounds with mercuric chloride such as $HgCl_2$, $2HCl\ 7H_20$, &c. The behaviour of mercuric chloride in solution in water in being volatile and in yielding mercurous chloride in sunlight is thus almost parallel to the behaviour now observed with mercuric chloride in the solid state.

The next mercuric salt examined was mercuric bromide, which was placed in a sealed tube *in vacuo* with sodium hydrate in the upper part of the tube. After exposure to sunlight for about a year it was found that the end of the stick of sodium hydrate nearest the bromide for a space of about an inch had become coated with an incrustation. The incrustation was very thick at the end of the stick and of a dark grey brown colour; it was also tolerably thick over at least six-tenths of an inch of the hydrate and the remaining part was thinner and of a brown colour. This incrustation was examined and was found to consist almost entirely of mercuric oxide, of which there was rather a large amount, but a few small globules of metallic mercury were also detected. The mercuric bromide still in the tube was examined, and it was found that only a very few needle-shaped crystals were left after the mass was treated with boiling water. These needle-shaped crystals were apparently mercurous bromide but the quantity examined was small.

The action of mercuric bromide in sunlight and *in vacuo* is therefore almost parallel with that of mercuric chloride, but the bromide is sensibly less volatile at the ordinary temperature of the air than the chloride is. I have not been able to find any determination of the melting and boiling point of the bromide, but it is known that the salt can be sublimed, but at a higher temperature than the chloride.

* Compt. rend. 92, 353-355.

Very few of the mercurous compounds lend themselves to the detection of whether they are volatile at the ordinary temperature of the air or not, for it is known that many of them under the influence of light or of sunlight decompose. This is the case with mercurous oxide, iodide, &c. An attempt was, however, made to determine whether calomel would be volatilized *in vacuo* in sunlight; and, in the case of some experiments conducted in a manner similar to that previously described, it was shewn that a very small deposit of mercury was formed on the sticks of caustic soda. On examining, however, the mercurous chloride remaining in the tube after being exposed for some months to sunlight, it was found that the salt was of a grey instead of the original white colour. On testing the calomel carefully no trace of mercuric chloride could be detected, but free mercury was found in distinct quantities. The decomposition which therefore had taken place under the influence of sunlight was

$$Hg_2Cl_2 = 2Hg + Cl_2.$$

As mercury had been itself formed by the decomposition of the mercurous chloride, and as it is well-known that mercury is volatile, the presence of the mercury on the caustic soda is a little ambiguous, but from the manner in which the deposit took place, and from the similar nature of the action to that of mercuric chloride, which could be watched as the experiment went on, it appeared to be highly probable that the mercurous chloride itself was volatile in an exceedingly feeble manner at the temperatures experimented with.

As in the above experiments no actual record of the temperature could be given day by day or hour by hour, it is perhaps desirable that the general atmospheric temperatures during the experiments should be stated. All the experiments were made in Calcutta, where the average maximum monthly temperature during 1888 varied from 97° F. or 36° C. in June to 74° F. or 23° C. in January, while the highest maximum air temperature was 107·2° F or 40·7° C. The average minimum daily temperature on the other hand varied from 80° F. or 27° C. in June to 55° F. or 13° C. in December. The average monthly temperature of solar radiation in Calcutta in 1888 also varied from about 152° F. or 67° C. in May to 124° F. or 51° C. in January.

The very decided volatility of mercury and of such of its compounds as mercuric oxide, mercuric chloride, mercuric bromide, and perhaps even mercurous chloride in such a climate as Calcutta having been proved, it remains to give a word of warning to all those who use these substances in any way. In India, in particular, mercuric chloride is used rather freely, for many of the preparations which are largely used to preserve books from the attacks of insects contain mercuric

chloride as the active ingredient. Preparations, too, for preserving wood, fabrics, &c. and for protecting them from white ants and other destructive insects and animals frequently contain this substance, and it is but fair to state that mercuric chloride fulfils such purposes most effectually. Also some vermin and rat-poisons contain mercuric chloride as the active ingredient. Again, within the last few years I believe the use of mercuric chloride as an antiseptic in surgical and other cases has spread rapidly, and Lister* uses, I believe, a kind of gauze containing one per cent. of this salt or even cotton wool charged with five per cent. of it as a dressing in surgical cases. Mercuric chloride has undoubtedly a wonderful power of destroying germs of various kinds, and a solution of one part in 20,000 of water is said to effectively kill germs such as those of anthrax. In all such cases, however, it must be borne in mind that mercurial vapours may be under certain circumstances generated, and in persons who may be peculiarly susceptible to mercurial poisoning very unpleasant effects may be produced. Two cases of mercurial poisoning in Europe which are on record can in my opinion only be explained by the volatility of mercurial chloride which has now been proved.

The two cases are described by H. Hager† (who is I believe connected with the Imperial Health Office, Berlin) and the following is a translation of his desceription :—‡

"What sad consequences breathing and living in rooms, to the walls of which atoms of mercuric chloride adhere may have, the writer intends to illustrate by two examples, the first of which will be sufficient to condemn the use of the substance as a disinfectant.

"'An apothecary, Mr. Z., addressed the writer with reference to a kind of disease from which he had been suffering for some years, and of which no medical advice had been able to relieve him. His gums were dreadfully livid in appearance, his teeth had lost their hold and had fallen out one after the other, he had lost his hair, &c., &c. ; Mr. Z. complained also of a peculiar weakness in his stomach and had lost all his former strength. Symptoms of mercurial poisoning were at once recognized. The advice which was given to Mr. Z. was to search for the seat of the poison, to take up the boards of the floor and examine the sand under the boards optically and chemically, &c. The advice was followed but the search proved abortive. Finally, however, it was found that a wooden staircase had been attacked by fungi some years

* British Med. Journ. October 23rd, 1884.

† Chemisches Central Blatt No. 17 and 18, 1886.

‡ I am indebted for these references to Mr. P. Brühl.

previously, and to save it from destruction it had been painted with oil-paint to which some corrosive sublimate had been added. The staircase was removed, and soon the normal conditions returned. The other inhabitants had suffered much less or not at all; from which it appears that some persons are more liable to mercurial poisoning than others.'

"'The other instance is the following:—A landowner had poisoned rats by means of corrosive sublimate, the rats chiefly infesting his stable. His coachman, a sober and robust young man, who used to sleep in the stable, became pale, lost his appetite and easily got tired. When on a visit at the gentleman's, the writer happened to see the servant, and when on his advice the boards were taken up the remains of 40 rats were found. The foundations were renewed, fresh sand being used for the purpose; all holes in the walls were closed with cement, and the servant was soon cured.' Here the corrosive sublimate was prevented to a certain extent from evaporating by the ammonia disengaged from the dung; the doors of the stable remained open during the warmer part of the day, and nevertheless the servant was poisoned by the mercurial vapour. These two cases ought to suffice to prove that mercuric chloride is a dangerous and malicious enemy."

Hager in his paper apparently traces these cases of poisoning principally to the small particles of solid mercuric chloride which may have been mechanically thrown off into the air, but, in view of the undoubted volatility of this salt in the solid state and even at ordinary atmospheric temperatures, it is much more probable that the poisoning was produced simply by the vapour of mercuric chloride. It might of course be argued that the amount of mercuric chloride vapour would be so small as to be unable to produce mercurial poisoning, but mercuric chloride is certainly as volatile as mercury is itself, and there is a case on record proving that mercury gives off sufficient vapour at the ordinary temperature of the air to cause salivation. This is described by Burnett.* He says, "A ship on the Spanish coast was carrying a cargo of mercury Some of the mercury had escaped from the packages and got into the hold. All the exposed metal surfaces in the ship appear to have become coated with mercury in consequence, and the whole ship's company were effected with violent symptoms of salivation."

If therefore such cases of mercurial poisoning as are described by Hager, can take place from the use of mercuric chloride at European air temperatures, the very greatest care should be taken in a country like India where such violently poisonous substances as mercuric chloride are used in preserving books from the attacks of insects, as a vermin-

* Phils. Trans. 1823, P. 402.

killer, &c. and where such high air temperatures prevail. It is probably the fact that the custom in India of having almost all doors and windows constantly open has proved a safeguard against such poisoning in the case of libraries, etc., where mercuric chloride has been and is being used, but it does not appear to be desirable to rely on this fact, and it would be safer to discontinue altogether the use of such an insidious poison as mercuric chloride for the purposes above described.

X.—*Some Applications of Elliptic Functions to Problems of Mean Values. (First Paper).*—*By* ASUTOSH MUKHOPADHYAY, M. A., F. R. A. S., F. R. S. E.

[Received July 25th;—Read August 1st, 1888.]

(With a Woodcut.)

CONTENTS.

§ 1. Expression for the area common to an ellipse and a concentric circle intersecting it.
§ 2. Mean value of the common area when the intersecting circle is of variable radius.
§ 3. Expression for the angle of intersection of the ellipse and the circle.
§ 4. Mean value of the angle of intersection.
§ 5. Mean value of the angle of intersection of the lines joining the opposite corners of the figure formed by the intersection of the ellipse and the circle.
§ 6. Mean value of the arc of the circle intercepted by the ellipse.

§ 1. *Expression for Common Area.*

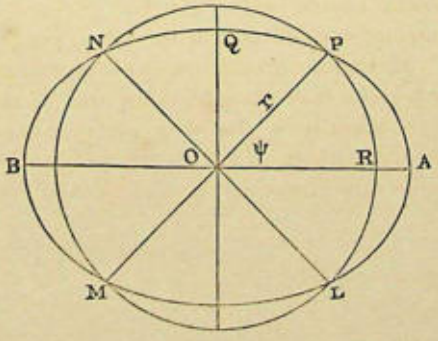
The object of the present paper is to discuss some problems of Mean Values which are chiefly interesting from the mode in which the application of Elliptic Functions simplifies the calculations.

In the first place, let us consider an ellipse and a concentric circle intersecting it; then, if the ellipse be NPA, and the circle NPR, the area of the portion common to both the curves may be found as follows, *viz.*, the ellipse being

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

and the circle,

$$x^2 + y^2 = r^2,$$



the coordinates (α, β) of P, the point of intersection of the two curves, is easily found, *viz.*,

$$\alpha = a\left(\frac{r^2-b^2}{a^2-b^2}\right)^{\frac{1}{2}}$$

$$\beta = b\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}}$$

Hence, if ψ be the angle which the central radius vector OP makes with OR, which is the axis of x, we have

$$\sin\psi = \frac{\beta}{r} = \frac{b}{r}\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}}$$

$$\cos\psi = \frac{\alpha}{r} = \frac{a}{r}\left(\frac{r^2-b^2}{a^2-b^2}\right)^{\frac{1}{2}}$$

$$\tan\psi = \frac{\beta}{\alpha} = \frac{b}{a}\left(\frac{a^2-r^2}{r^2-b^2}\right)^{\frac{1}{2}}.$$

Now, the whole area common to the two curves is

$$4.\mathrm{QORP} = 4\ (\text{sector POR} + \text{sector POQ}).$$

But

$$\text{sector POR} = \tfrac{1}{2}r^2\psi = \frac{r^2}{2}\sin^{-1}\left\{\frac{b}{r}\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\}.$$

Again, from the equation of the ellipse,

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1,$$

we have the polar equation

$$\rho^2 = \frac{a^2b^2}{a^2\sin^2\theta + b^2\cos^2\theta},$$

so that

$$\text{sector POQ} = \tfrac{1}{2}\int_{\psi}^{\frac{\pi}{2}}\rho^2 d\theta$$

$$= \tfrac{1}{2}a^2b^2\int_{\psi}^{\frac{\pi}{2}}\frac{d\theta}{a^2\sin^2\theta + b^2\cos^2\theta}$$

$$= \tfrac{1}{2}ab\left\{\tan^{-1}\left(\frac{a}{b}\tan\theta\right)\right\}_{\theta=\psi}^{\theta=\frac{\pi}{2}}$$

$$= \frac{\pi ab}{4} - \frac{ab}{2}\left\{\tan^{-1}\left(\frac{a^2-r^2}{r^2-b^2}\right)^{\frac{1}{2}}\right\}.$$

But it is easy to prove that

$$\tan^{-1}\left\{\left(\frac{a^2-r^2}{r^2-b^2}\right)^{\frac{1}{2}}\right\}+\sin^{-1}\left\{\left(\frac{r^2-b^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\}=\frac{\pi}{2}.$$

Hence the

$$\text{sector POQ}=\tfrac{1}{2}ab\sin^{-1}\left\{\left(\frac{r^2-b^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\}.$$

Therefore, finally, the whole area common to the two curves is

$$=2ab\sin^{-1}\left\{\left(\frac{r^2-b^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\}+2r^2\sin^{-1}\left\{\frac{b}{r}\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\}$$

For purposes of verification, we may note that, when $r=a$, this becomes πab, and when $r=b$, it reduces to πb^2, as are geometrically evident.

§ 2. *Mean value of the Common Area.*

Let us now investigate the average area common to an ellipse and a concentric circle of variable radius which always intersects it. Let A be the common area when the radius of the circle is r; then the required mean is given by

$$\mathrm{M}=\frac{\int_b^a \mathrm{A}\,dr}{\int_b^a dr},$$

whence

$$(a-b)\,\mathrm{M}=\int_b^a \mathrm{A}\,dr$$

But, from the formula proved in § 1, we have

$$\mathrm{A}=2ab\sin^{-1}\left\{\left(\frac{r^2-b^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\}+2r^2\sin^{-1}\left\{\frac{b}{r}\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\}$$

Hence,

$$\int_b^a \mathrm{A}\,dr=2ab\,\mathrm{P}+2\mathrm{Q},$$

where

$$\mathrm{P}=\int_b^a \sin^{-1}\left\{\left(\frac{r^2-b^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\}dr$$

$$Q = \int_b^a r^2 \sin^{-1} \left\{ \frac{b}{r} \left(\frac{a^2 - r^2}{a^2 - b^2} \right)^{\frac{1}{2}} \right\} dr.$$

Consider now

$$P = \int_b^a \sin^{-1} \left\{ \left(\frac{r^2 - b^2}{a^2 - b^2} \right)^{\frac{1}{2}} \right\} dr.$$

Let

$$\frac{r^2 - b^2}{a^2 - b^2} = \sin^2 \xi,$$

so that, when

$$r = a, \quad \xi = \frac{\pi}{2},$$

$$r = b, \quad \xi = 0,$$

and

$$r^2 = a^2 \sin^2 \xi + b^2 \cos^2 \xi,$$

$$r dr = (a^2 - b^2) \sin \xi . \cos \xi . d\xi,$$

$$dr = (a^2 - b^2) \frac{\sin \xi . \cos \xi . d\xi}{(a^2 \sin^2 \xi + b^2 \cos^2 \xi)^{\frac{1}{2}}}.$$

Hence,

$$P = (a^2 - b^2) \int_0^{\frac{\pi}{2}} \frac{\xi . \sin \xi . \cos \xi . d\xi}{(a^2 \sin^2 \xi + b^2 \cos^2 \xi)^{\frac{1}{2}}}$$

$$= \int_0^{\frac{\pi}{2}} \xi . d \left\{ (a^2 \sin^2 \xi + b^2 \cos^2 \xi)^{\frac{1}{2}} \right\}$$

Integrating by parts we have

$$P = \left\{ \xi (a^2 \sin^2 \xi + b^2 \cos^2 \xi)^{\frac{1}{2}} \right\}_{\xi = 0}^{\xi = \frac{\pi}{2}}$$

$$- \int_0^{\frac{\pi}{2}} (a^2 \sin^2 \xi + b^2 \cos^2 \xi)^{\frac{1}{2}} d\xi.$$

$$= \frac{\pi a}{2} - \int_0^{\frac{\pi}{2}} (a^2 \sin^2 \xi + b^2 \cos^2 \xi)^{\frac{1}{2}} d\xi.$$

Next consider

$$Q = \int_b^a r^2 \sin^{-1} \left\{ \frac{b}{r} \left(\frac{a^2 - r^2}{a^2 - b^2} \right)^{\frac{1}{2}} \right\} dr.$$

Let

$$\frac{b}{r}\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}} = \sin\phi,$$

so that, when

$$r=a, \qquad \phi=0,$$
$$r=b, \qquad \phi=\frac{\pi}{2},$$

and

$$r^2 = \frac{a^2b^2}{a^2\sin^2\phi + b^2\cos^2\phi}$$
$$rdr = \frac{a^2b^2(b^2-a^2)\sin\phi\cos\phi\,d\phi}{(a^2\sin^2\phi+b^2\cos^2\phi)^2}$$
$$dr = \frac{ab(b^2-a^2)\sin\phi\cos\phi\,d\phi}{(a^2\sin^2\phi+b^2\cos^2\phi)^{\frac{3}{2}}}.$$

Hence,

$$Q = a^3b^3(a^2-b^2)\int_0^{\frac{\pi}{2}} \frac{\phi\sin\phi\cos\phi\,d\phi}{(a^2\sin^2\phi+b^2\cos^2\phi)^{\frac{5}{2}}}$$

$$= -\tfrac{1}{3}a^3b^3\int_0^{\frac{\pi}{2}} \phi.\,d\left\{(a^2\sin^2\phi+b^2\cos^2\phi)^{-\frac{3}{2}}\right\}$$

Integrating by parts, we get

$$Q = -\tfrac{1}{3}a^3b^3\left\{\frac{\phi}{(a^2\sin^2\phi+b^2\cos^2\phi)^{\frac{3}{2}}}\right\}_{\phi=0}^{\phi=\frac{\pi}{2}}$$

$$+\tfrac{1}{3}a^3b^3\int_0^{\frac{\pi}{2}} \frac{d\phi}{(a^2\sin^2\phi+b^2\cos^2\phi)^{\frac{3}{2}}}$$

$$= \tfrac{1}{3}a^3b^3\int_0^{\frac{\pi}{2}} \frac{d\phi}{(a^2\sin^2\phi+b^2\cos^2\phi)^{\frac{3}{2}}} - \frac{\pi b^3}{6}.$$

Therefore, we have

$$(a-b)\,M = \pi a^2 b - \frac{\pi b^3}{3}$$

$$-2ab\int_0^{\frac{\pi}{2}} (a^2\sin^2\xi + b^2\cos^2\xi)^{\frac{1}{2}}\,d\xi$$

$$+\tfrac{2}{3}a^3b^3\int_0^{\frac{\pi}{2}}\frac{d\phi}{(a^2\sin^2\phi+b^2\cos^2\phi)^{\frac{3}{2}}}.$$

To effect further reductions, we observe that generally

$$\int_0^{\frac{\pi}{2}}(a^2\sin^2\theta+b^2\cos^2\theta)^{\frac{1}{2}}\,d\theta=\int_0^{\frac{\pi}{2}}(a^2\cos^2\theta+b^2\sin^2\theta)^{\frac{1}{2}}\,d\theta,$$

for, putting

$$\theta=\frac{\pi}{2}-\theta',$$

so that, when

$$\theta=\frac{\pi}{2},\qquad \theta'=0,$$

$$\theta=0,\qquad \theta'=\frac{\pi}{2},$$

$$d\theta=-d\theta',$$

we get, by substitution,

$$\int_0^{\frac{\pi}{2}}(a^2\sin^2\theta+b^2\cos^2\theta)^{\frac{1}{2}}\,d\theta=\int_0^{\frac{\pi}{2}}(a^2\cos^2\theta'+b^2\sin^2\theta')^{\frac{1}{2}}\,d\theta',$$

$$=\int_0^{\frac{\pi}{2}}(a^2\cos^2\theta+b^2\sin^2\theta)^{\frac{1}{2}}\,d\theta,$$

as the variable is of no consequence in a definite integral. By a similar reasoning, we have

$$\int_0^{\frac{\pi}{2}}\frac{d\phi}{(a^2\sin^2\phi+b^2\cos^2\phi)^{\frac{3}{2}}}=\int_0^{\frac{\pi}{2}}\frac{d\phi}{(a^2\cos^2\phi+b^2\sin^2\phi)^{\frac{3}{2}}},$$

and in general

$$\int_0^{\frac{\pi}{2}}(a^2\sin^2\phi+b^2\cos^2\phi)^n\,d\phi=\int_0^{\frac{\pi}{2}}(a^2\cos^2\phi+b^2\sin^2\phi)^n\,d\phi,$$

which is a particular case of the more general formula

$$\int_0^{\frac{\pi}{2}}f(\sin x)\,dx=\int_0^{\frac{\pi}{2}}f(\cos x)\,dx.$$

Therefore, we have

$$(a-b)\,\mathrm{M} = \pi a^2 b - \tfrac{1}{3}\pi b^3 + \tfrac{2}{3}a^3 b^3 \int_0^{\frac{\pi}{2}} \frac{d\xi}{(a^2\cos^2\xi + b^2\sin^2\xi)^{\frac{3}{2}}} - 2ab\int_0^{\frac{\pi}{2}} (a^2\cos^2\xi + b^2\sin^2\xi)^{\frac{1}{2}}\, d\xi.$$

Now, we have

$$\int_0^{\frac{\pi}{2}} \frac{d\xi}{(a^2\cos^2\xi + b^2\sin^2\xi)^{\frac{3}{2}}} = \frac{1}{a^3}\int_0^{\frac{\pi}{2}} \frac{d\xi}{(1-e^2\sin^2\xi)^{\frac{3}{2}}},$$

where the eccentricity of the ellipse is given by

$$e^2 = \frac{a^2-b^2}{a^2}.$$

But we have generally*

$$\int_0^{\theta} \frac{d\theta}{(1-e^2\sin^2\theta)^{\frac{3}{2}}}.$$

$$= \frac{1}{1-e^2}\left\{\int_0^{\theta} (1-e^2\sin^2\theta)^{\frac{1}{2}}\, d\theta - \frac{e^2\sin\theta\cos\theta}{(1-e^2\sin^2\theta)^{\frac{1}{2}}}\right\}.$$

Therefore, we get

$$\int_0^{\frac{\pi}{2}} \frac{d\xi}{(a^2\cos^2\xi + b^2\sin^2\xi)^{\frac{3}{2}}} = \frac{1}{a^3}\int_0^{\frac{\pi}{2}} \frac{d\xi}{(1-e^2\sin^2\xi)^{\frac{3}{2}}}$$

$$= \frac{1}{a^3(1-e^2)}\int_0^{\frac{\pi}{2}} (1-e^2\sin^2\xi)^{\frac{1}{2}}\, d\xi.$$

We have also

$$\int_0^{\frac{\pi}{2}} (a^2\cos^2\xi + b^2\sin^2\xi)^{\frac{1}{2}}\, d\xi = a\int_0^{\frac{\pi}{2}} (1-e^2\sin^2\xi)^{\frac{1}{2}}\, d\xi,$$

where, as before,

$$e^2 = \frac{a^2-b^2}{a^2}.$$

Hence,

$$(a-b)\,\mathrm{M} = \pi a^2 b - \frac{\pi}{3}b^3 + \frac{2}{3}\,\frac{b^3}{1-e^2}\int_0^{\frac{\pi}{2}} (1-e^2\sin^2\xi)^{\frac{1}{2}}\, d\xi$$

* See Dr. Schlœmilch's *Théorie des Intégrales et des Fonctions Elliptiques*, par Dr. Graindorge, (1873), p. 14.

$$-2a^2b\int_0^{\frac{\pi}{2}}(1-e^2\sin^2\xi)^{\frac{1}{2}}\,d\xi$$

$$=\pi a^2b-\frac{1}{3}\pi b^3-\frac{4}{3}a^2b\,\mathrm{E}_1$$

where

$$\mathrm{E}_1=\int_0^{\frac{\pi}{2}}(1-e^2\sin^2\xi)^{\frac{1}{2}}\,d\xi$$

so that E_1 is the complete elliptic integral of the second kind with the eccentricity for modulus. Therefore,

$$\mathrm{M}=\frac{1}{3}\frac{b}{a-b}\left\{\pi(3a^2-b^2)-4a^2\mathrm{E}_1\right\}.$$

If l be the perimeter of the ellipse, we have

$$l=4a\int_0^{\frac{\pi}{2}}(1-e^2\sin^2\xi)^{\frac{1}{2}}\,d\xi=4a\,\mathrm{E}_1.$$

Hence, finally, we have the

THEOREM. The average area common to an ellipse and a concentric circle of variable radius which always intersects it is

$$\frac{1}{3}\frac{b}{a-b}\left\{\pi(3a^2-b^2)-al\right\},$$

where a, b are the semiaxes, and l the perimeter of the ellipse.

§ 3. *Expression for Angle of Intersection.*

If ω be the angle of intersection of the ellipse and the circle, its value may be easily calculated as follows. The coordinates of the point of intersection P being α, β, we have

$$\alpha=\frac{a}{\sqrt{a^2-b^2}}\sqrt{r^2-b^2},$$

$$\beta=\frac{b}{\sqrt{a^2-b^2}}\sqrt{a^2-r^2}.$$

The tangent to the circle at P is

$$\alpha x+\beta y=r^2,$$

and the tangent to the ellipse is

$$\frac{\alpha x}{a^2}+\frac{\beta y}{b^2}=1,$$

whence we have

$$\tan\omega = \frac{-\frac{b^2}{a^2}\frac{a}{\beta}+\frac{a}{\beta}}{1+\frac{b^2}{a^2}\frac{a^2}{\beta^2}}$$

$$= \frac{a^2-b^2}{a^2}\cdot\frac{a}{\beta}\cdot\frac{a^2\beta^2}{a^2\beta^2+b^2a^2}$$

$$= \frac{1}{ab}\left\{(a^2-r^2)(r^2-b^2)\right\}^{\frac{1}{2}}.$$

Hence,

$$ab\tan\omega = \sqrt{(a^2-r^2)(r^2-b^2)}.$$

§ 4. *Mean Value of Angle of Intersection.*

Let us now find the mean value of the angle of intersection of an ellipse and a concentric circle of variable radius which always intersects it. Let ω be the angle of intersection when the radius of the intersecting circle is r; then, if Ω be the mean value required, we have

$$\Omega = \frac{\int_b^a \omega\, dr}{\int_b^a dr},$$

whence

$$(a-b)\,\Omega = \int_b^a \omega\, dr.$$

Integrating by parts, we have

$$(a-b)\,\Omega = \Big[r\omega\Big]_{r=b}^{r=a} - \int_{r=b}^{r=a} r\,d\omega.$$

Now, from § 3, we have

$$ab\tan\omega = \left\{(a^2-r^2)(r^2-b^2)\right\}^{\frac{1}{2}}$$

which shews that, when

$$r=a, \qquad \omega=0,$$
$$r=b, \qquad \omega=0,$$

so that the integrated part vanishes at both limits. We also easily calculate by logarithmic differentiation that

$$\frac{d\omega}{dr} = \frac{ab(a^2+b^2-2r^2)}{r(a^2+b^2-r^2)(a^2-r^2)^{\frac{1}{2}}(r^2-b^2)^{\frac{1}{2}}}.$$

Substituting, therefore, in the equation

$$(a-b)\,\Omega = \Big[\, r\omega \,\Big]_{r=b}^{r=a} - \int_{r=b}^{r=a} r\,d\omega,$$

we have

$$(a-b)\,\Omega = -\,ab \int_b^a \frac{a^2 + b^2 - 2r^2}{(a^2 + b^2 - r^2)(a^2 - r^2)^{\frac{1}{2}}\,(r^2 - b^2)^{\frac{1}{2}}}\,dr.$$

Assume

$$(a^2 - r^2) = (r^2 - b^2)\tan^2\theta,$$

so that, when

$$r = a, \qquad \theta = 0$$

$$r = b, \qquad \theta = \frac{\pi}{2},$$

and we have also the relations

$$\begin{aligned} a^2 + b^2 - 2r^2 &= (b^2 - a^2)\cos 2\theta, \\ a^2 + b^2 - r^2 &= a^2\sin^2\theta + b^2\cos^2\theta, \\ a^2 - r^2 &= (a^2 - b^2)\sin^2\theta, \\ r^2 - b^2 &= (a^2 - b^2)\cos^2\theta, \\ dr &= \frac{(b^2 - a^2)\sin\theta\cos\theta}{(a^2\cos^2\theta + b^2\sin^2\theta)^{\frac{1}{2}}}\,d\theta. \end{aligned}$$

Making these substitutions, we have

$$(a-b)\,\Omega = \int_0^{\frac{\pi}{2}} \frac{ab\,(a^2 - b^2)\cos 2\theta\,d\theta}{(a^2\cos^2\theta + b^2\sin^2\theta)^{\frac{1}{2}}\,(a^2\sin^2\theta + b^2\cos^2\theta)},$$

or

$$\frac{\Omega}{ab\,(a+b)} = \int_0^{\frac{\pi}{2}} \frac{(1 - 2\sin^2\theta)\,d\theta}{(a^2\sin^2\theta + b^2\cos^2\theta)(a^2\cos^2\theta + b^2\sin^2\theta)^{\frac{1}{2}}}$$

$$= \int_0^{\frac{\pi}{2}} \frac{d\theta}{(a^2\sin^2\theta + b^2\cos^2\theta)(a^2\cos^2\theta + b^2\sin^2\theta)^{\frac{1}{2}}}$$

$$-2\int_0^{\frac{\pi}{2}} \frac{\sin^2\theta\,d\theta}{(a^2\sin^2\theta + b^2\cos^2\theta)(a^2\cos^2\theta + b^2\sin^2\theta)^{\frac{1}{2}}}.$$

Putting

$$\cos^2\theta = 1 - \sin^2\theta, \qquad n = \frac{a^2 - b^2}{b^2}, \qquad k^2 = \frac{a^2 - b^2}{a^2},$$

we get

$$\frac{b\,\Omega}{a+b} = \int_0^{\frac{\pi}{2}} \frac{d\theta}{(1+n\sin^2\theta)(1-k^2\sin^2\theta)^{\frac{1}{2}}}$$

$$-2\int_0^{\frac{\pi}{2}} \frac{\sin^2\theta\, d\theta}{(1+n\sin^2\theta)(1-k^2\sin^2\theta)^{\frac{1}{2}}}$$

$$= \mathrm{P} - 2\mathrm{R}.$$

But, from a known formula (*), we have

$$\mathrm{R} = \frac{1}{n}(\mathrm{F}-\mathrm{P})$$

Therefore,

$$\frac{\Omega\, b}{a+b} = \mathrm{P} + \frac{2}{n}(\mathrm{P}-\mathrm{F}) = \left(1+\frac{2}{n}\right)\mathrm{P} - \frac{2}{n}\mathrm{F} = \frac{a^2+b^2}{a^2-b^2}\mathrm{P} - \frac{2b^2}{a^2-b^2}\mathrm{F}.$$

This shews that the average value of the angle of intersection of the two curves may be expressed in terms of two complete elliptic integrals of the first and third kind. It is interesting to note that the result depends simply on the ratio of the axes of the ellipse, *viz.*, if $b = a\lambda$, we have

$$(1-\lambda)\,\Omega = \left(\lambda + \frac{1}{\lambda}\right)\mathrm{P} - 2\lambda\,\mathrm{F}.$$

Hence we may enunciate the

THEOREM. The average value of the angle of intersection of an ellipse and a concentric circle of variable radius which always intersects it is

$$\frac{1+\lambda^2}{\lambda(1-\lambda)}\,\mathrm{P} - \frac{2\lambda}{1-\lambda}\,\mathrm{F}$$

where λ is the ratio of the axes $\left(=\frac{b}{a}\right)$, and F, P denote complete elliptic integrals of the first and third kind respectively, the modulus being $(1-\lambda^2)$ and the parameter $\frac{1-\lambda^2}{\lambda^2}$.

§ 5. *Mean Value of another angle.*

If we join the opposite corners of the curvilinear area formed by the intersection of the circle and the ellipse, the joining lines will evidently intersect in the common centre of the two curves; we shall now proceed to investigate the average value of the acute angle included by these two diameters.

* See Dr. Schloemilch's *Théorie des Intégrales et des Fonctions Elliptiques*, par Dr. Graindorge, (1873), p. 63; Cayley's *Elliptic Functions*, p. 15, § 33.

Since the angle POR $= \psi$, we have to find the average value of 2ψ. If, therefore, Γ be the average value required, we have

$$\Gamma = \frac{\int_b^a 2\psi . dr}{\int_b^a dr},$$

whence

$$\tfrac{1}{2}(a-b)\Gamma = \int_b^a \psi\, dr.$$

Integrating by parts, we have

$$\tfrac{1}{2}(a-b)\Gamma = \Big[r\ \psi \Big]_{r=b}^{r=a} - \int_{r=b}^{r=a} r\, d\psi.$$

But, from the formulas in § 1, we have

$$\tan\psi = \frac{\beta}{a} = \frac{b}{a}\left(\frac{a^2-r^2}{r^2-b^2}\right)^{\frac{1}{2}},$$

so that, when

$$r = a, \qquad \psi = 0$$
$$r = b, \qquad \psi = \frac{\pi}{2}.$$

Therefore,

$$\tfrac{1}{2}(a-b)\Gamma = -\frac{\pi b}{2} - \int_{r=b}^{r=a} r\, d\psi.$$

Assume

$$r^2 = a^2\cos^2\eta + b^2\sin^2\eta$$

so that

$$a^2 - r^2 = (a^2-b^2)\sin^2\eta,$$
$$r^2 - b^2 = (a^2-b^2)\cos^2\eta,$$

and, accordingly,

$$\tan\psi = \frac{b}{a}\tan\eta$$

$$\sec^2\psi\, d\psi = \frac{b}{a}\sec^2\eta . d\eta$$

$$d\psi = \frac{ab}{a^2\cos^2\eta + b^2\sin^2\eta}\, d\eta$$

$$r\, d\psi = \frac{ab}{(a^2\cos^2\eta + b^2\sin^2\eta)^{\frac{1}{2}}}\, d\eta.$$

Therefore

$$r\,d\psi = \frac{b}{(1-e^2\sin^2\eta)^{\frac{1}{2}}}\,d\eta.$$

We have also, when

$$r = a, \qquad \eta = 0$$
$$r = b, \qquad \eta = \frac{\pi}{2}.$$

Therefore, finally,

$$\tfrac{1}{2}(a-b)\,\Gamma = -\frac{\pi b}{2} + b\int_0^{\frac{\pi}{2}} \frac{d\eta}{(1-e^2\sin^2\eta)^{\frac{1}{2}}}$$
$$= b\left(\mathrm{F} - \frac{\pi}{2}\right),$$

and

$$\Gamma = \frac{b}{a-b}\,(2\,\mathrm{F} - \pi),$$

which shows that the average value of the angle between the diameters can be expressed in terms of a complete elliptic integral of the first kind with the eccentricity for modulus. If l be the perimeter of the ellipse, since we have

$$l = 4a\int_0^{\frac{\pi}{2}} (1-e^2\sin^2\eta)^{\frac{1}{2}}\,d\eta$$

and

$$\frac{1}{4}\frac{d}{de}\left(\frac{l}{a}\right) = -e\int_0^{\frac{\pi}{2}} \frac{d\eta}{(1-e^2\sin^2\eta)^{\frac{1}{2}}} = -e\,\mathrm{F},$$

we may enunciate the

THEOREM. The average value of the acute angle of intersection of the diameters of the curvilinear quadrilateral formed by the intersection of an ellipse and a concentric circle of variable radius is

$$\frac{b}{b-a}\left\{\pi + \frac{1}{2e}\frac{d}{de}\left(\frac{l}{a}\right)\right\}$$

where a, b are the semi-axes, e the eccentricity, and l the perimeter of the ellipse.

§ 6. *Mean Value of Intercepted Circular Arc.*

We shall now investigate the average value of the two circular arcs PL and MN intercepted by the ellipse. Since, $\mathrm{PR} = r\psi$, we have

to find the mean value of $4r\psi$; so that, if σ be the average value required, we have

$$\sigma = \frac{\int_b^a 4r\psi . dr}{\int_b^a dr},$$

whence

$$(a-b)\sigma = 4\int_b^a r\psi\, dr.$$

Now, from the formulas proved in § 1, we have

$$\sin\psi = \frac{b}{r}\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}}.$$

Therefore,

$$(a-b)\sigma = 4\int_b^a r \sin^{-1}\left\{\frac{b}{r}\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}}\right\} dr$$

Assume

$$\frac{b}{r}\left(\frac{a^2-r^2}{a^2-b^2}\right)^{\frac{1}{2}} = \sin\phi,$$

so that, when

$$r = a, \quad \phi = 0,$$
$$r = b, \quad \phi = \frac{\pi}{2},$$

and we have

$$r^2 = \frac{a^2b^2}{a^2\sin^2\phi + b^2\cos^2\phi}$$
$$rdr = \frac{a^2b^2(b^2-a^2)\sin\phi\cos\phi\, d\phi}{(a^2\sin^2\phi + b^2\cos^2\phi)^2}.$$

Hence, by substitution,

$$(a-b)\sigma = 4\int_0^{\frac{\pi}{2}} \frac{a^2b^2(a^2-b^2)\phi\sin\phi\cos\phi\, d\phi}{(a^2\sin^2\phi + b^2\cos^2\phi)^2}$$

$$= -2a^2b^2\int_0^{\frac{\pi}{2}} \phi\, d\left\{(a^2\sin^2\phi + b^2\cos^2\phi)^{-1}\right\}$$

Integrating by parts, we have

$$(a-b)\,\sigma = -2a^2b^2\left[\frac{\phi}{a^2\sin^2\phi + b^2\cos^2\phi}\right]_{\phi=0}^{\phi=\frac{\pi}{2}}$$

$$+ 2a^2b^2\int_0^{\frac{\pi}{2}}\frac{d\phi}{a^2\sin^2\phi + b^2\cos^2\phi}$$

$$= \pi b\,(a-b).$$

Therefore,

$$\sigma = \pi b.$$

Hence we have the

THEOREM. If an ellipse is intersected by a concentric circle of variable radius, the average value of the circular arc intercepted is πb.

25*th July*, 1888.

XI.—*Some Applications of Elliptic Functions to Problems of Mean Values. (Second Paper).*—*By* Asutosh Mukhopadhyay, M. A., F. R A. S., F. R. S. E.

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Contents.

§ 1. Introduction.
§§ 2—5. First case.
(§ 2). Expression for common volume.
(§ 3). Expression for the mean value.
(§ 4). Geometric interpretation.
(§ 5). Canonical form for volume.
§ 6. Second case.

§ 1. *Introduction.*

In my first paper on "Some Applications of Elliptic Functions to Problems of Mean Values," which was read before the Society in August last,* I discussed, among other questions, the problem of determining the average area common to an ellipse and a concentric circle of variable radius always intersecting it; the present paper is devoted to a discussion of the corresponding space-analogue. Given the ellipsoid,

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1, \qquad (1)$$

* See above, pp. 190—213; P. A. S. B. (1888), pp. 184—5. For a full analysis of the present paper, see P. A. S. B. (1888), pp. 207—8.

we have to determine the average value of the volume common to this ellipsoid and the concentric sphere

$$x^2+y^2+z^2=r^2 \qquad (2)$$

which always intersects it. We have obviously two distinct cases, according as *four* or *two* vertices of the ellipsoid are exterior to the sphere: in the first case, we have

$$a > b > r > c,$$

and in the second case

$$a > r > b > c,$$

so that the limits of r are, in the two cases,

$$\left.\begin{matrix} r=b \\ r=c \end{matrix}\right\} \qquad \left.\begin{matrix} r=a \\ r=b \end{matrix}\right\}$$

respectively. In the following investigation, we shall consider the two cases separately.

§§ 2—6. *First Case.*

§ 2. *Expression for the Common Volume.*

Suppose four vertices of the ellipsoid to be exterior to the sphere, and let V be the portion of the common volume lying in the positive octant; then if ν be the portion of the sphere outside the ellipsoid in the same octant, we have

$$V=\tfrac{1}{6}\pi r^3-\nu \qquad (3).$$

If z', z'' be the ordinates of the spherical and the ellipsoidal surface respectively, corresponding to the same system of values of x and y, we have

$$\nu=\int\int (z'-z'')\,dx\,dy,$$

where

$$z'^2=r^2-x^2-y^2$$
$$\frac{z''^2}{c^2}=1-\frac{x^2}{a^2}-\frac{y^2}{b^2}.$$

Hence

$$\nu=\int\int \left\{(r^2-x^2-y^2)^{\frac{1}{2}}-c\left(1-\frac{x^2}{a^2}-\frac{y^2}{b^2}\right)^{\frac{1}{2}}\right\} dx\,dy \qquad (4)$$

Eliminating z between (1) and (2), we have for the equation of the curve of projection on the coordinate plane of xy

$$\left(1-\frac{c^2}{a^2}\right)x^2+\left(1-\frac{c^2}{b^2}\right)y^2=r^2-c^2 \qquad (5).$$

For integrating $z'\,dx\,dy$, put

$$x=\rho\cos\omega, \qquad y=\rho\sin\omega,$$

which gives

$$z'\,dx\,dy = \sqrt{r^2-\rho^2}\;\rho\,d\rho\,d\omega,$$

and, by the same substitution, (5) is transformed into

$$\rho' = ab\sqrt{\left\{\frac{r^2-c^2}{a^2b^2-c^2(b^2\cos^2\omega+a^2\sin^2\omega)}\right\}} \qquad (6)$$

Similarly, to integrate $z''\,dx\,dy$, put

$$\frac{x}{a}=\rho\cos\omega, \qquad \frac{y}{b}=\rho\sin\omega,$$

which gives

$$z''\,dx\,dy = abc\sqrt{1-\rho^2}\;\rho\,d\rho\,d\omega,$$

and the same substitution transforms (5) into

$$\rho'' = \sqrt{\left\{\frac{r^2-c^2}{a^2\cos^2\omega+b^2\sin^2\omega-c^2}\right\}} \qquad (7)$$

By these two substitutions, the formula (4) becomes

$$v = \int\int\sqrt{r^2-\rho^2}\;\rho\,d\rho\,d\omega$$

$$-abc\int\int\sqrt{1-\rho^2}\;\rho\,d\rho\,d\omega. \qquad (8)$$

In the first double integral, the limits are

$$\left.\begin{matrix}\rho=0\\ \rho=\rho'\end{matrix}\right\} \qquad \left.\begin{matrix}\omega=0\\ \omega=\frac{\pi}{2}\end{matrix}\right\}$$

and in the second

$$\left.\begin{matrix}\rho=0\\ \rho=\rho''\end{matrix}\right\} \qquad \left.\begin{matrix}\omega=0\\ \omega=\frac{\pi}{2}\end{matrix}\right\}.$$

We obtain immediately

$$\int_0^{\rho'}\sqrt{r^2-\rho^2}\;\rho\,d\rho = \frac{r^3}{3}-\frac{c^3}{3}\left\{\frac{a^2b^2-r^2(b^2\cos^2\omega+a^2\sin^2\omega)}{a^2b^2-c^2(b^2\cos^2\omega+a^2\sin^2\omega)}\right\}^{\frac{3}{2}}$$

$$\int_0^{\rho''}\sqrt{1-\rho^2}\;\rho\,d\rho = \frac{1}{3}-\frac{1}{3}\left\{\frac{a^2\cos^2\omega+b^2\sin^2\omega-r^2}{a^2\cos^2\omega+b^2\sin^2\omega-c^2}\right\}^{\frac{3}{2}}$$

The formula (8) reduces to

$$v=\frac{\pi}{6}(r^3-abc)-\tfrac{1}{3}c^3\,\mathrm{A}+\tfrac{1}{3}abc\,\mathrm{B}$$

where the values of A and B are given by

$$\mathrm{A}=\int_0^{\frac{\pi}{2}}\left\{\frac{a^2b^2-r^2(b^2\cos^2\omega+a^2\sin^2\omega)}{a^2b^2-c^2(b^2\cos^2\omega+a^2\sin^2\omega)}\right\}^{\frac{3}{2}}d\omega \qquad (10)$$

$$B=\int_0^{\frac{\pi}{2}}\left\{\frac{a^2\cos^2\omega+b^2\sin^2\omega-r^2}{a^2\cos^2\omega+b^2\sin^2\omega-c^2}\right\}^{\frac{3}{2}}d\omega \qquad (11)$$

Therefore, finally, from (3) we get

$$V=\frac{\pi}{6}abc+\tfrac{1}{3}c^3A-\tfrac{1}{3}abcB \qquad (12)$$

§ 3. *Expression for the Mean Value.*

We now proceed to calculate the mean value of the volume common to the sphere and the ellipsoid. If M be the average value sought, we have

$$\frac{M}{8}=\frac{\int_c^b V\,dr}{\int_c^b dr},$$

which gives

$$\frac{b-c}{8}M=\int_c^b V\,dr$$

$$=\tfrac{1}{6}\pi abc\int_c^b dr+\tfrac{1}{3}c^3\int_c^b A\,dr-\tfrac{1}{3}abc\int_c^b B\,dr,$$

whence

$$\frac{3(b-c)}{c}\left\{\frac{M}{8}-\frac{\pi abc}{6}\right\}=c^2\int_c^b A\,dr-ab\int_c^b B\,dr. \qquad (13)$$

To calculate

$$\int_c^b A\,dr,$$

substitute in (10)

$$\lambda^2=\frac{a^2b^2}{b^2\cos^2\omega+a^2\sin^2\omega},$$

so that

$$\lambda\,d\lambda=-a^2b^2(a^2-b^2)\frac{\sin\omega\cos\omega\,d\omega}{(b^2\cos^2\omega+a^2\sin^2\omega)^2},$$

$$\cos^2\omega=\frac{a^2}{\lambda^2}\cdot\frac{\lambda^2-b^2}{a^2-b^2},\qquad \sin^2\omega=\frac{b^2}{\lambda^2}\cdot\frac{a^2-\lambda^2}{a^2-b^2},$$

$$d\omega=-ab\frac{d\lambda}{\lambda(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}},$$

and for

$$\omega = \frac{\pi}{2} \quad , \qquad \lambda = b$$
$$\omega = 0 \quad , \qquad \lambda = a.$$

Therefore

$$A = ab \int_b^a \left(\frac{\lambda^2 - r^2}{\lambda^2 - c^2}\right)^{\frac{3}{2}} \frac{d\lambda}{\lambda (a^2-\lambda^2)^{\frac{1}{2}} (\lambda^2 - b^2)^{\frac{1}{2}}}.$$

Hence, since λ is independent of r, we have

$$\int_c^b A dr = ab \int_b^a \frac{d\lambda}{\lambda (a^2-\lambda^2)^{\frac{1}{2}} (\lambda^2-b^2)^{\frac{1}{2}} (\lambda^2-c^2)^{\frac{3}{2}}} \int_c^b (\lambda^2 - r^2)^{\frac{3}{2}} dr.$$

Substituting

$$r = \lambda \sin \phi$$
$$dr = \lambda \cos \phi \, d\phi,$$

we get

$$\int_c^b A \, dr = ab \int_b^a \frac{\lambda^3 \, d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}} (\lambda^2-b^2)^{\frac{1}{2}} (\lambda^2-c^2)^{\frac{3}{2}}} \int_{\sin^{-1}\frac{c}{\lambda}}^{\sin^{-1}\frac{b}{\lambda}} \cos^4 \phi . \, d\phi.$$

But

$$\int \cos^4 \phi \, d\phi = \tfrac{5}{8} \sin \phi \cos \phi - \tfrac{1}{4} \sin^3 \phi \cos \phi + \tfrac{3}{8} \phi.$$

Hence, finally,

$$\int_c^b A \, dr = ab \int_b^a \frac{f(\lambda) \, \lambda^3 \, d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}} (\lambda^2-b^2)^{\frac{1}{2}} (\lambda^2-c^2)^{\frac{3}{2}}} \qquad (14)$$

where

$$f(\lambda) = \frac{5}{8} \frac{b}{\lambda} \sqrt{1 - \frac{b^2}{\lambda^2}} - \frac{5}{8} \frac{c}{\lambda} \sqrt{1 - \frac{c^2}{\lambda^2}}$$
$$- \frac{1}{4} \frac{b^3}{\lambda^3} \sqrt{1 - \frac{b^2}{\lambda^2}} + \frac{1}{4} \frac{c^3}{\lambda^3} \sqrt{1 - \frac{c^2}{\lambda^2}}$$
$$+ \frac{3}{8} \sin^{-1} \frac{b}{\lambda} \quad - \frac{3}{8} \sin^{-1} \frac{c}{\lambda}. \qquad (15)$$

To calculate

$$\int_c^b B \, dr,$$

substitute in (11)

$$\mu^2 = a^2 \cos^2 \omega + b^2 \sin^2 \omega,$$

so that

$$\mu\, d\mu = -(a^2-b^2)\sin\omega\cos\omega\, d\omega$$

$$\cos^2\omega = \frac{\mu^2-b^2}{a^2-b^2}\quad,\qquad \sin^2\omega = \frac{a^2-\mu^2}{a^2-b^2},$$

$$d\omega = -\frac{\mu\, d\mu}{(a^2-\mu^2)^{\frac{1}{2}}(\mu^2-b^2)^{\frac{1}{2}}},$$

and for

$$\omega = \frac{\pi}{2}\quad,\qquad \mu = b,$$

$$\omega = 0\quad,\qquad \mu = a.$$

Therefore

$$\mathrm{B} = \int_b^a \left(\frac{\mu^2-r^2}{\mu^2-c^2}\right)^{\frac{3}{2}} \frac{\mu\, d\mu}{(a^2-\mu^2)^{\frac{1}{2}}(\mu^2-b^2)^{\frac{1}{2}}}.$$

Hence, since μ is independent of r, we have

$$\int_c^b \mathrm{B}\, dr = \int_b^a \frac{\mu\, d\mu}{(a^2-\mu^2)^{\frac{1}{2}}(\mu^2-b^2)^{\frac{1}{2}}(\mu^2-c^2)^{\frac{3}{2}}} \int_c^b (\mu^2-r^2)^{\frac{3}{2}}\, dr.$$

Substituting

$$r = \mu\sin\phi$$
$$dr = \mu\cos\phi\, d\phi,$$

we have

$$\int_c^b \mathrm{B}\, dr = \int_b^a \frac{\mu^5\, d\mu}{(a^2-\mu^2)^{\frac{1}{2}}(\mu^2-b^2)^{\frac{1}{2}}(\mu^2-c^2)^{\frac{3}{2}}} \int_{\sin^{-1}\frac{c}{\mu}}^{\sin^{-1}\frac{b}{\mu}} \cos^4\phi\, d\phi,$$

or putting

$$\int_{\sin^{-1}\frac{c}{\mu}}^{\sin^{-1}\frac{b}{\mu}} \cos^4\phi\, d\phi = f(\mu),$$

we have

$$\int_c^b \mathrm{B}\, dr = \int_b^a \frac{f(\mu)\,\mu^5\, d\mu}{(a^2-\mu^2)^{\frac{1}{2}}(\mu^2-b^2)^{\frac{1}{2}}(\mu^2-c^2)^{\frac{3}{2}}},$$

or, since the variable is of no consequence in a definite integral, we get

$$\int_c^b \mathrm{B}\, dr = \int_b^a \frac{f(\lambda)\,\lambda^5\, d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{3}{2}}}. \qquad (16)$$

Substituting from (14) and (16) in (13), we have

$$\frac{3(b-c)}{c}\left\{\frac{M}{8}-\frac{\pi abc}{6}\right\}=c^2\int_c^b A\,dr-ab\int_c^b B\,dr$$

$$=-ab\int_b^a \frac{f(\lambda).\lambda^3(\lambda^2-c^2)\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{3}{2}}}$$

$$=ab\int_a^b \frac{f(\lambda)\lambda^3\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}}.$$

Therefore, finally,

$$\frac{3(b-c)}{abc}\left\{\frac{M}{8}-\frac{\pi abc}{6}\right\}=\int_a^b \frac{f(\lambda)\lambda^3\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}} \qquad (17)$$

where $f(\lambda)$ has the value defined in equation (5); this equation gives the required mean value.

To evaluate this definite integral, we notice that there are six terms in $f(\lambda)$, say

$$f(\lambda)=P_1+P_2+Q_1+Q_2+R_1+R_2,$$

where

$$P_1=\frac{5b}{8}\frac{(\lambda^2-b^2)^{\frac{1}{2}}}{\lambda^2}$$

$$P_2=-\frac{5c}{8}\frac{(\lambda^2-c^2)^{\frac{1}{2}}}{\lambda^2}$$

$$Q_1=-\frac{b^3}{4}\frac{(\lambda^2-b^2)^{\frac{1}{2}}}{\lambda^4}$$

$$Q_2=\frac{c^3}{4}\frac{(\lambda^2-c^2)^{\frac{1}{2}}}{\lambda^4}$$

$$R_1=\frac{3}{8}\sin^{-1}\frac{b}{\lambda}$$

$$R_2=-\frac{3}{8}\sin^{-1}\frac{c}{\lambda}.$$

Now,

$$-\int_a^b \frac{P_1\lambda^3\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}}$$

$$=\frac{5b}{8}\int_a^b \frac{\lambda\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}},$$

$$=\frac{5b}{16}\int_{a^2}^{b^2} \frac{du}{(a^2-u)^{\frac{1}{2}}(u-c^2)^{\frac{1}{2}}}, \qquad [u=\lambda^2.$$

$$= \frac{5b}{8}\left[\sin^{-1}\left(\frac{u-c^2}{a^2-c^2}\right)^{\frac{1}{2}}\right]_{u=a^2}^{u=b^2}$$

$$= \frac{5b}{8}\left[\sin^{-1}\left(\frac{b^2-c^2}{a^2-c^2}\right)^{\frac{1}{2}} - \frac{\pi}{2}\right]$$

$$= -\frac{5b}{8}\cos^{-1}\left(\frac{b^2-c^2}{a^2-c^2}\right)^{\frac{1}{2}}. \qquad (18)$$

Again,

$$\int_a^b \frac{P_2\,\lambda^3\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}}$$

$$= -\frac{5c}{8}\int_a^b \frac{\lambda\,d\,\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}},$$

$$= -\frac{5c}{16}\int_{a^2}^{b^2} \frac{du}{(a^2-u)^{\frac{1}{2}}(u-b^2)^{\frac{1}{2}}}, \qquad [u=\lambda^2.$$

$$= -\frac{5c}{8}\left[\sin^{-1}\left(\frac{u-b^2}{a^2-b^2}\right)^{\frac{1}{2}}\right]_{u=a^2}^{u=b^2}$$

$$= \frac{5\pi c}{16}. \qquad (19)$$

Again,

$$\int_a^b \frac{Q_1\,\lambda^3\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}}$$

$$= -\frac{b^3}{4}\int_a^b \frac{d\lambda}{\lambda(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}},$$

$$= \frac{b^3}{8}\int_{\frac{1}{a^2}}^{\frac{1}{b^2}} \frac{dv}{(a^2v-1)^{\frac{1}{2}}(1-c^2v)^{\frac{1}{2}}} \qquad \left[v=\frac{1}{\lambda^2}.\right.$$

$$= \frac{b^3}{4ac}\left[\sin^{-1}\left\{\frac{c^2(a^2v-1)}{a^2-c^2}\right\}^{\frac{1}{2}}\right]_{v=\frac{1}{a^2}}^{v=\frac{1}{b^2}}$$

$$= \frac{b^3}{4ac}\sin^{-1}\frac{c}{b}\left(\frac{a^2-b^2}{a^2-c^2}\right)^{\frac{1}{2}}. \qquad (20)$$

Again,

$$\int_a^b \frac{Q_2\,\lambda^3\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}}$$

$$= \frac{c^3}{4}\int_a^b \frac{d\lambda}{\lambda(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}}$$

$$= -\frac{c^3}{8}\int_{\frac{1}{a^2}}^{\frac{1}{b^2}} \frac{dv}{(a^2v-1)^{\frac{1}{2}}(1-b^2v)^{\frac{1}{2}}} \qquad \left[v=\frac{1}{\lambda^2}.\right.$$

$$= -\frac{c^3}{4ab}\left[\sin^{-1}\left\{\frac{b^2(a^2v-1)}{a^2-b^2}\right\}^{\frac{1}{2}}\right]_{v=\frac{1}{a^2}}^{v=\frac{1}{b^2}}$$

$$= -\frac{\pi c^3}{8ab}. \qquad (21)$$

In order to evaluate the parts involving R_1, R_2, let us first assume

$$d\Omega = \frac{\lambda^3\,d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}},$$

and substitute

$$\lambda^2 = a^2\cos^2\psi + b^2\sin^2\psi$$
$$\lambda\,d\lambda = -(a^2-b^2)\cos\psi\sin\psi\,d\psi$$
$$a^2-\lambda^2 = (a^2-b^2)\sin^2\psi$$
$$\lambda^2-b^2 = (a^2-b^2)\cos^2\psi,$$

which give

$$d\Omega = -\frac{a^2\cos^2\psi + b^2\sin^2\psi}{(a^2\cos^2\psi + b^2\sin^2\psi - c^2)^{\frac{1}{2}}}\,d\psi$$

$$= -\frac{c^2 + \left\{(a^2-c^2) - (a^2-b^2)\sin^2\psi\right\}}{\left\{(a^2-c^2) - (a^2-b^2)\sin^2\psi\right\}^{\frac{1}{2}}}\,d\psi$$

$$= -\frac{c^2}{(a^2-c^2)^{\frac{1}{2}}}\frac{d\psi}{(1-k^2\sin^2\psi)^{\frac{1}{2}}} - (a^2-c^2)^{\frac{1}{2}}(1-k^2\sin^2\psi)^{\frac{1}{2}}\,d\psi,$$

where

$$k^2 = \frac{a^2-b^2}{a^2-c^2}.$$

Hence we have

$$\Omega = -\frac{c^2}{(a^2-c^2)^{\frac{1}{2}}}\mathrm{F}(k,\psi) - (a^2-c^2)^{\frac{1}{2}}\mathrm{E}(k,\psi), \qquad (22)$$

and since for

$$\lambda = b, \qquad \psi = \frac{\pi}{2},$$
$$\lambda = a, \qquad \psi = 0,$$

we have also

$$\left[\Omega\right]^{\lambda=b} = -\frac{c^2}{(a^2-c^2)^{\frac{1}{2}}} F_1 - (a^2-c^2)^{\frac{1}{2}} E_1$$

and

$$\left[\Omega\right]^{\lambda=a} = 0,$$

since the elliptic integrals F and E are taken between 0 and ψ.
Now

$$\int_a^b \frac{R_1 \lambda^3 \, d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}}$$
$$= \frac{3}{8}\int_{\lambda=a}^{\lambda=b} \sin^{-1}\left(\frac{b}{\lambda}\right).\, d\Omega$$
$$= \frac{3}{8}\left[\Omega \sin^{-1}\frac{b}{\lambda}\right]_{\lambda=a}^{\lambda=b} + \frac{3b}{8}\int_{\lambda=a}^{\lambda=b} \frac{\Omega \, d\lambda}{\lambda(\lambda^2-b^2)^{\frac{1}{2}}}$$
$$= \frac{3\pi}{16}\left[\Omega\right]^{\lambda=b} - \frac{3b(a^2-b^2)^{\frac{1}{2}}}{8}\int_0^{\frac{\pi}{2}} \frac{\Omega \sin\psi \, d\psi}{a^2\cos^2\psi + b^2\sin^2\psi}. \quad (23)$$

Similarly, we have

$$\int_a^b \frac{R_2 \lambda^3 \, d\lambda}{(a^2-\lambda^2)^{\frac{1}{2}}(\lambda^2-b^2)^{\frac{1}{2}}(\lambda^2-c^2)^{\frac{1}{2}}}$$
$$= -\frac{3}{8}\int_{\lambda=a}^{\lambda=b} \sin^{-1}\left(\frac{c}{\lambda}\right).\, d\Omega$$
$$= -\frac{3}{8}\left[\Omega \sin^{-1}\frac{c}{\lambda}\right]_{\lambda=a}^{\lambda=b} - \frac{3}{8}\int_{\lambda=a}^{\lambda=b} \frac{\Omega \, d\lambda}{\lambda(\lambda^2-c^2)^{\frac{1}{2}}}$$
$$= -\frac{3}{8}\left[\Omega\right]^{\lambda=b} \sin^{-1}\left(\frac{c}{b}\right)$$
$$+ \frac{3c(a^2-b^2)}{8}\int_0^{\frac{\pi}{2}} \frac{\Omega \sin\psi\cos\psi \, d\psi}{(a^2\cos^2\psi + b^2\sin^2\psi)(a^2\cos^2\psi + b^2\sin^2\psi - c^2)^{\frac{1}{2}}} \quad (24)$$

The required average value of the volume is obtained by substituting from (18), (19), (20), (21), (23), and (24) in (17), *viz.*, we have

$$\frac{b-c}{abc}\,\mathrm{M} = \frac{\pi}{2}\left(\frac{8b}{3} - c - \frac{2c^3}{3ab}\right)$$

$$- \frac{5b}{3}\cos^{-1}\left(\frac{b^2-c^2}{a^2-c^2}\right)^{\frac{1}{2}} + \frac{2b^3}{3ac}\sin^{-1}\frac{c}{b}\left(\frac{a^2-b^2}{a^2-c^2}\right)^{\frac{1}{2}}$$

$$- \frac{\pi}{2}\left(1 - 2\sin^{-1}\frac{c}{b}\right)\left\{\frac{c^2}{(a^2-c^2)^{\frac{1}{2}}}\,\mathrm{F}_1(k) + (a^2-c^2)^{\frac{1}{2}}\,\mathrm{E}_1(k)\right\}$$

$$- \frac{b\,(a^2-b^2)^{\frac{1}{2}}}{a^2-c^2}\int_0^{\frac{\pi}{2}} \frac{\Omega \sin\psi\, d\psi}{\epsilon^2 - k^2\sin^2\psi}$$

$$+ \frac{c(a^2-b^2)}{(a^2-c^2)^{\frac{3}{2}}}\int_0^{\frac{\pi}{2}} \frac{\Omega \sin\psi\cos\psi\, d\psi}{(\epsilon^2 - k^2\sin^2\psi)(1-k^2\sin^2\psi)^{\frac{1}{2}}}, \qquad (25)$$

wherein

$$\epsilon^2 = \frac{a^2}{a^2-c^2},$$

and Ω is expressed in terms of elliptic functions by equation (22).

These two integrals occuring in the expression for M, can be expressed in terms of Jacobi's functions, *viz.*, putting

$$\xi = \int \frac{d\psi}{\sqrt{1-k^2\sin^2\psi}},$$

we have

$$\psi = am\ \xi$$
$$d\psi = dn\ \xi.\ d\xi$$
$$\sin\psi = sn\ \xi$$
$$\cos\psi = cn\ \xi$$
$$(1-k^2\sin^2\psi)^{\frac{1}{2}} = dn\ \xi,$$

and

$$\int (1-k^2\sin^2\psi)^{\frac{1}{2}}\, d\psi = \int dn^2\,\xi.\, d\xi$$

$$= \xi - k^2\int \sin^2\xi.\, d\xi,$$

(22),

$$\frac{}{(a^2-c^2)^{\frac{1}{2}}}\,\xi - (a^2-c^2)^{\frac{1}{2}}\,\xi + k^2(a^2-c^2)^{\frac{1}{2}}\int sn^2\xi.\, d\xi$$

$$= -\frac{c^2}{(a^2-c^2)^{\frac{1}{2}}}\,\xi - (a^2-c^2)^{\frac{1}{2}}\left(\mathrm{Z}\xi + \xi\frac{\mathrm{E}}{\mathrm{K}}\right),$$

so that the integrals become

$$\int \frac{\Omega\, sn\, \xi .\, dn\, \xi .\, d\xi}{e^2 + dn^2\, \xi}$$

and

$$\int \frac{\Omega\, sn\, \xi .\, cn\, \xi .\, d\xi,}{e^2 + dn^2\, \xi}$$

respectively.

It can easily be shown as follows that the result is expressible in terms of circular and logarithmic functions only when the ellipsoid degenerates into a prolate or an oblate spheroid. Thus, consider the portion of the definite integral in (17) which is due to R_1 and R_2; then since

$$R_1 + R_2 = \tfrac{3}{8} \sin^{-1} \left\{ \frac{b\sqrt{\lambda^2 - c^2} - c\sqrt{\lambda^2 - b^2}}{\lambda^2} \right\},$$

this portion becomes

$$\frac{3}{8} \int_a^b \frac{\lambda^3}{(a^2-\lambda^2)^{\frac{1}{2}} (\lambda^2 - b^2)^{\frac{1}{2}} (\lambda^2 - c^2)^{\frac{1}{2}}} \sin^{-1} \left\{ \frac{b\sqrt{\lambda^2 - c^2} - c\sqrt{\lambda^2 - b^2}}{\lambda^2} \right\} d\lambda.$$

Assume

$$\lambda^2 = \frac{b^2 - 2bc\cos\theta + c^2}{\sin^2\theta},$$

which gives

$$\sqrt{\lambda^2 - b^2} = \frac{b\cos\theta - c}{\sin\theta}$$

$$\sqrt{\lambda^2 - c^2} = \frac{b - c\cos\theta}{\sin\theta}$$

$$b\sqrt{\lambda^2 - c^2} - c\sqrt{\lambda^2 - b^2} = \lambda^2 \sin\theta$$

$$\lambda\, d\lambda = -\frac{(b\cos\theta - c)(b - c\cos\theta)}{\sin^3\theta}\, d\theta$$

Substituting, we get

$$\frac{3}{8} \int \frac{\theta\, (-b^2 + 2bc\cos\theta - c^2)\, d\theta}{\sin^2\theta \left\{ -a^2\cos^2\theta + 2bc\cos\theta + a^2 - b^2 - c^2 \right\}^{\frac{1}{2}}}$$

$$= \frac{3}{8} \int \frac{\theta}{\sin^2\theta} \sqrt{-a^2\cos^2\theta + 2bc\cos\theta + a^2 - b^2 - c^2}$$

$$- \frac{3}{8} \int \frac{\theta\, d\theta}{\sqrt{-a^2\cos^2\theta + 2bc\cos\theta + a^2 - b^2 - c^2}}.$$

In order that these may be reducible to logarithmic and trigonometric functions, the expression under the radical must be a perfect square, the condition for which is

$$b^2c^2 = a^2(b^2 + c^2 - a^2)$$

or

$$(c^2 - a^2)(b^2 - a^2) = 0$$

therefore, either

$$c^2 = a^2$$

or

$$b^2 = a^2$$

§ 4. *Geometric Interpretation.*

It is interesting to remark that the geometry of the ellipsoid furnishes an interpretation of the quantity called Ω in (22). First consider the ellipsoid

$$\frac{x^2}{\alpha^2} + \frac{y^2}{\beta^2} + \frac{z^2}{\gamma^2} = 1;$$

then if S be its superficial area, we have, by Dr. Jellett's theorem,*

$$S = 2\pi\gamma^2 + 2\pi\alpha\beta \int_0^1 \frac{(1 - e^2 e'^2 x^2)\, dx}{(1 - e^2x^2)^{\frac{1}{2}}(1 - e'^2x^2)^{\frac{1}{2}}},$$

where

$$e^2 = \frac{\alpha^2 - \gamma^2}{\alpha^2}, \qquad e'^2 = \frac{\beta^2 - \gamma^2}{\beta^2}.$$

Hence, if d S be an element of the superficial area, we have

$$\frac{d\,S - 2\pi\gamma^2 .\, dx}{2\pi\alpha\beta} = \frac{1 - e^2 e'^2 x^2}{(1 - e^2x^2)^{\frac{1}{2}}(1 - e'^2x^2)^{\frac{1}{2}}}\, dx.$$

Assume

$$ex = \sin\theta, \qquad e\,dx = \cos\theta .\, d\theta$$

Therefore

$$\frac{d\,S - \frac{2\pi\gamma^2}{e}\cos\theta\, d\theta}{2\pi\alpha\beta} = \frac{1}{e}\frac{1 - e'^2\sin^2\theta}{\left(1 - \frac{e'^2}{e^2}\sin^2\theta\right)^{\frac{1}{2}}} d\theta$$

$$= \left(\frac{1}{e} - e\right)\frac{d\theta}{\left(1 - \frac{e'^2}{e^2}\sin^2\theta\right)^{\frac{1}{2}}} + e\left(1 - \frac{e^2}{e^2}\sin^2\theta\right)^{\frac{1}{2}} d\theta,$$

which is an expression of the same form as $d\Omega$.

* *Hermathena*, vol. iv, 1883, p. 477.

If now, we assume

$$\alpha=\sigma a, \qquad \beta=\sigma.\frac{ac}{b}, \qquad \gamma=\sigma c,$$

where σ is a constant to be suitably chosen presently, we have

$$e^2=\frac{a^2-c^2}{a^2}, \qquad e'^2=\frac{a^2-b^2}{a^2},$$

$$\frac{e'^2}{e^2}=\frac{a^2-b^2}{a^2-c^2}=k^2, \qquad \frac{1}{e}-e=\frac{c^2}{a\,(a^2-c^2)^{\frac{1}{2}}}.$$

Therefore

$$\frac{dS-2\pi\,\dfrac{\sigma^2c^2a}{\sqrt{a^2-c^2}}\cos\theta\,d\theta}{2\pi\sigma^2\,\dfrac{a^2c}{b}}$$

$$=\frac{c^2}{a\sqrt{a^2-c^2}}\,\frac{d\theta}{\sqrt{1-k^2\sin^2\theta}}+\frac{\sqrt{a^2-c^2}}{a}\sqrt{1-k^2\sin^2\theta}\,d\theta.$$

As σ is an arbitrary quantity, we may, for the sake of symmetry, assume

$$\sigma=\frac{1}{ac},$$

so that now

$$\alpha=\frac{1}{c}, \quad \beta=\frac{1}{a}, \quad \gamma=\frac{1}{a}$$

and

$$\frac{dS-\dfrac{2\pi}{a\sqrt{a^2-c^2}}\cos\theta\,d\theta}{\dfrac{2\pi}{bc}}=-\frac{d\Omega}{a}.$$

Hence if dS be the superficial element of the ellipsoid whose axes are reciprocal to those of the given ellipsoid, we have

$$S+\frac{2\pi}{abc}\,\Omega=\frac{2\pi}{a\sqrt{a^2-c^2}}\sin\theta,$$

which is the geometrical relation in question furnishing the meaning of Ω.

§ 5. *Canonical Form for Volume.*

It may be observed that the expression for the common volume furnished by (12) involves two definite integrals A, B, whose values as given in (10) and (11) are not expressed in terms of known functions. They may easily be reduced to the standard elliptic forms, but that would only increase the difficulty of integration with respect to r. Thus, from (10), we have

$$A=\int_0^{\frac{\pi}{2}}\left\{\frac{b^2(a^2-r^2)+a^2(b^2-r^2)\tan^2\omega}{b^2(a^2-c^2)+a^2(b^2-c^2)\tan^2\omega}\right\}^{\frac{3}{2}}d\omega.$$

Substitute

$$a^2(b^2-r^2)\tan^2\omega=b^2(a^2-r^2)\cot^2\theta,$$

so that for

$$\omega=\frac{\pi}{2},\quad \theta=0$$

$$\omega=0,\quad \theta=\frac{\pi}{2}.$$

Again, from the above transformation,

$$\tan\omega=\frac{b}{a}\left(\frac{a^2-r^2}{b^2-r^2}\right)^{\frac{1}{2}}\cot\theta$$

$$\sec^2\omega\,d\omega=-\frac{b}{a}\left(\frac{a^2-r^2}{b^2-r^2}\right)^{\frac{1}{2}}\frac{d\theta}{\sin^2\theta}$$

$$\sec^2\omega=\frac{a^2b^2-r^2(b^2\cos^2\theta+a^2\sin^2\theta)}{a^2(b^2-r^2)\sin^2\theta},$$

whence

$$d\omega=-ab(a^2-r^2)^{\frac{1}{2}}(b^2-r^2)^{\frac{1}{2}}\frac{d\theta}{a^2b^2-r^2(b^2\cos^2\theta+a^2\sin^2\theta)}$$

Making these substitutions and putting

$$e^2=\frac{a^2-b^2}{b^2-c^2}\frac{r^2-c^2}{a^2-r^2},\quad \beta^2=\frac{b^2-c^2}{b^2}\frac{r^2}{r^2-c^2},$$

we get

$$A=\frac{a}{b(b^2-c^2)^{\frac{3}{2}}}\frac{(b^2-r^2)^2}{(a^2-r^2)^{\frac{1}{2}}}\int_0^{\frac{\pi}{2}}\frac{d\theta}{(1-\beta^2e^2\sin^2\theta)(1-e^2\sin^2\theta)^{\frac{3}{2}}}.$$

But since

$$\frac{1}{(1-\beta^2e^2\sin^2\theta)(1-e^2\sin^2\theta)}=\frac{\beta^2}{\beta^2-1}\frac{1}{1-\beta^2e^2\sin^2\theta}-\frac{1}{\beta^2-1}\frac{1}{1-e^2\sin^2\theta}$$

we have

$$\int_0^{\frac{\pi}{2}}\frac{d\theta}{(1-\beta^2e^2\sin^2\theta)(1-e^2\sin\theta)^{\frac{3}{2}}}$$

$$=\frac{\beta^2}{\beta^2-1}\int_0^{\frac{\pi}{2}}\frac{d\theta}{(1-\beta^2e^2\sin^2\theta)(1-e^2\sin^2\theta)^{\frac{1}{2}}}$$

$$-\frac{1}{\beta^2-1}\int_0^{\frac{\pi}{2}} \frac{d\theta}{(1-e^2\sin^2\theta)^{\frac{3}{2}}}$$

But from a well-known transformation,* or from the identity

$$\frac{d}{d\theta}\frac{\sin\theta\cos\theta}{(1-e^2\sin^2\theta)^{\frac{1}{2}}}=\frac{1}{e^2}(1-e^2\sin^2\theta)^{\frac{1}{2}}-\frac{1-e^2}{e^2}\frac{1}{(1-e^2\sin^2\theta)^{\frac{3}{2}}},$$

we have at once

$$\int_0^{\frac{\pi}{2}} \frac{d\theta}{(1-e^2\sin^2\theta)^{\frac{3}{2}}}=\frac{1}{1-e^2}\int_0^{\frac{\pi}{2}} (1-e^2\sin^2\theta)^{\frac{1}{2}}d\theta,$$

and consequently

$$\int_0^{\frac{\pi}{2}} \frac{d\theta}{(1-\beta^2e^2\sin^2\theta)\,(1-e^2\sin^2\theta)^{\frac{3}{2}}}$$

$$=\frac{\beta^2}{\beta^2-1}\int_0^{\frac{\pi}{2}} \frac{d\theta}{(1-\beta^2e^2\sin^2\theta)\,(1-e^2\sin^2\theta)^{\frac{1}{2}}}$$

$$-\frac{1}{(1-e^2)(\beta^2-1)}\int_0^{\frac{\pi}{2}} (1-e^2\sin^2\theta)^{\frac{1}{2}}d\theta$$

$$=\frac{b^2-c^2}{b^2}\cdot\frac{r^2}{b^2-r^2}\,\Pi_1(-\beta^2e^2, e)$$

$$-\frac{b^2(b^2-c^2)}{c^2(a^2-c^2)}\cdot\frac{(a^2-r^2)(r^2-c^2)}{(b^2-r^2)^2}\,\mathrm{E}_1(e)$$

By making a similar transformation, we have, from (11),

$$\mathrm{B}=\int_0^{\frac{\pi}{2}} \left\{\frac{(a^2-r^2)+(b^2-r^2)\tan^2\omega}{(a^2-c^2)+(b^2-c^2)\tan^2\omega}\right\}^{\frac{3}{2}}d\omega$$

$$=\frac{1}{(b^2-c^2)^{\frac{3}{2}}}\frac{(b^2-r^2)^2}{(a^2-r^2)^{\frac{1}{2}}}\int_0^{\frac{\pi}{2}} \frac{d\theta}{(1-\beta'^2e^2\sin^2\theta)\,(1-e^2\sin^2\theta)^{\frac{3}{2}}},$$

where

$$\beta'^2=\frac{b^2-c^2}{r^2-c^2}$$

* See my paper on "Poisson's Integral," J. A. S. B. 1888, vol. lvii, pt. ii, pp. 100—106.

and

$$\int_0^{\frac{\pi}{2}} \frac{d\theta}{(1-\beta'^2c^2\sin^2\theta)\,(1-c^2\sin^2\theta)^{\frac{3}{2}}}$$
$$=\frac{b^2-c^2}{b^2-r^2}\,\Pi_1(-\beta'^2c^2,\,e)$$
$$-\frac{b^2-c^2}{a^2-c^2}\,\frac{(a^2-r^2)\,(r^2-c^2)}{(b^2-r^2)^2}\,\mathrm{E}_1(e).$$

Making these substitutions in (12), we get

$$\mathrm{V}=\frac{\pi abc}{6}$$
$$-\frac{ac}{3b}\cdot\frac{b^2-r^2}{(b^2-c^2)^{\frac{1}{2}}(a^2-r^2)^{\frac{1}{2}}}\left\{b^2\Pi_1(-\beta'^2c^2,e)-r^2\Pi_1(-\beta^2c^2,e)\right\};$$

and since

$$\frac{b-c}{8}\mathrm{M}=\int_c^b \mathrm{V}\,dr,$$

we have, by substituting for V and eliminating M between this equation and (25), a remarkable relation connecting four definite integrals.

§ 6. *Second Case.*

We now proceed to the consideration of the second case where only two of the vertices of the ellipsoid, *viz.*, the extremities of the longest axis, are outside the intersecting sphere, so that we have

$$a \succ r \succ b \succ c.$$

It is not necessary to repeat the whole of the previous calculation for this case, as by Prof. Catalan's beautiful transformation,* it may be made to depend on the preceding investigation. Thus, if we put

$$x=ax',\ y=by',\ z=cz'$$
$$\frac{r}{a}=c',\ \frac{r}{b}=b',\ \frac{r}{c}=a',$$

equations (1) and (2) are transformed into

$$x'^2+y'^2+z'^2=1$$
$$\left(\frac{x'}{a}\right)^2+\left(\frac{y'}{b}\right)^2+\left(\frac{z'}{c}\right)^2=1.$$

We have also

$$c' \prec 1,\ b' \succ 1,\ a' \succ 1$$
$$c' \prec b' \prec a'$$
$$a' \succ b' \succ 1 \succ c'.$$

* Problèmes de Calcul Integral par E. Catalan, *Journal de Mathematiques* (Liouville), ser. i, t. vi (1841) pp. 113—140; cf. p. 139.

Hence these two surfaces have the same relation as the sphere and the ellipsoid in the present case. The volume common to these two surfaces may, therefore, be obtained from (12) by putting

$$a=a',\quad b=b',\quad c=c',\quad r=1.$$

Hence, remembering that

$$dx\,dy\,dz=abc\,dx'\,dy'\,dz',$$

we infer that the volume common to the surfaces

$$x^2+y^2+z^2=r^2$$

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$$

when

$$a \nearrow r \nearrow b \nearrow c$$

is obtained from (12) by writing

$$a=\frac{r}{c},\quad b=\frac{r}{b},\quad c=\frac{r}{a},\quad r=1,$$

and then multiplying the result by abc.

Making these transformations in (10) and (11), we find, calling the new values of A, B, $\frac{a^3}{r^3}$B', $\frac{a^3}{r^3}$A', respectively,

$$\frac{a^3}{r^3}B'=\int_0^{\frac{\pi}{2}}\frac{a^3}{r^3}\left\{\frac{r^2-(b^2\sin^2\omega+c^2\cos^2\omega)}{a^2-(b^2\cos^2\omega+c^2\sin^2\omega)}\right\}^{\frac{3}{2}}d\omega \quad \ldots\ldots \quad (26)$$

$$\frac{a^3}{r^3}A'=\int_0^{\frac{\pi}{2}}\frac{a^3}{r^3}\left\{\frac{r^2(b^2\cos^2\omega+c^2\sin^2\omega)-b^2c^2}{a^2(b^2\cos^2\omega+c^2\sin^2\omega)-b^2c^2}\right\}^{\frac{3}{2}}d\omega \quad \ldots \quad (27)$$

Making these substitutions in (12) and multiplying the result by abc, we get for the required volume

$$V=\tfrac{1}{6}\pi r^3-\tfrac{1}{3}a^3A'+\tfrac{1}{3}abc\,B'.$$

Hence, if M be the average value required, we have

$$\frac{M}{8}=\frac{\int_b^a V\,dr}{\int_b^a dr}$$

so that

$$\frac{a-b}{8}M=\int_b^a V\,dr$$

$$= \frac{\pi}{24}(a^4 - b^4) - \frac{1}{3}a^3 \int_b^a A'dr + \frac{1}{3}abc \int_b^a B'dr$$

which gives

$$\frac{3(a-b)}{a}\left\{\frac{M}{8} - \frac{\pi}{24}(a+b)(a^2+b^2)\right\}$$

$$= -\frac{1}{3}a^2 \int_b^a A'dr + \frac{1}{3}bc \int_b^a B'dr \qquad \ldots\ldots\ldots\ldots (28)$$

If we compare the right hand side of this equation with the right hand side of (13), we find that, if in (13) we interchange a and c, we obtain exactly the same expression as in (28); similarly, the values of A′ and B′ in (26) and (27) are derivable from the values of A and B in (10) and (11) by interchanging a and c in the latter; hence, the value of the right hand side in (28) is obtained from the value of the right hand side of (13) by interchanging a and c in the latter.

XII.—*A Descriptive List of the* Uredineæ *occurring in the Neighbourhood of Simla (Western Himalayas).* Pt. II. Puccinia.—*By* A. Barclay, M. B., *Bengal Medical Service.*

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(With Plates XII., XIII., & XIV.)

In this second instalment of a descriptive list of the *Uredineæ* of Simla (commenced in this Journal, Vol. LVI, Pt. II, No. 3, 1887), I propose giving the characters of all the *Puccinia* with which I am acquainted, dividing them artificially into two classes, (*a*) those occurring on hosts other than the grasses (and sedges), and (*b*) those on the grasses and sedges. The former list is, I believe, fairly complete, but doubtless many additions will be made in future to the latter. These fungi on grasses are often so inconspicuous that they readily escape even trained observation.

I had hoped to have completed the list of Æcidial forms by describing those on the *Coniferæ*, one on *Jasminum grandiflorum*, L., and another on *Geranium*, sp., before proceeding to the teleutosporic forms; but, as I must delay the publication of a description of the former until I shall have filled up certain gaps in my notes of them by further observation, I think it better to proceed with the other forms rather than to delay the whole series, more especially as my recent absence from India for a year has already interfered with work too long.

In the list now given, sixteen species are described in the first list, of which three, I believe, are new; and nine in the second list, of which four are perhaps new. In the case of those species which occur on grasses, it is extremely difficult to decide which should be considered new, and which should not. Any classification of them must remain extremely imperfect until their life-histories are known. Of the new species in the first list, that which I have named *Puccinia Rosæ* is interesting in giving rise to a powerful odour, and in possessing an all-pervading mycelium in the shoots attacked. *P. Galii*, Pers., exhibits an instance of very unusually long retained power of germination in the uredospores. *P. Rubiæ* appears to be a complete autœcious Uredine in which æcidial fructification has dropped out.*

I have arranged the species in List I. under group headings *Leptopuccinia*, *Micropuccinia*, &c., as is done by Winter in his work†; but I

* As this paper was passing through the press, I have been able to confirm this, and further details will be found in 'Scientific Memoirs by Officers of the Army of India', Part V.

† Die Pilze Deutschlands, &c.

have not attempted the same subdivision in List II., because I am by no means sure that uredospores are not produced in those cases in which I do not happen to have found them.

List I.

a. (Leptopuccinia).

1. Puccinia Rosæ, nov. sp.

on *Rosa macrophylla*, Lindl.

This curious fungus does not occur in Simla, but is abundant at Narkanda, some forty miles distant from Simla towards the interior. It is curious in several respects. In the first place the mycelium pervades the whole of the tissues of the shoots attacked, and almost every leaf in such a shoot bears spores. The affected shoots are paler in colour than normal and somewhat hypertrophied.

All attacked leaves are discoloured and much smaller and thicker than the normal ones. The diminished size is due to the fact that apparently only the young leaves are attacked and, when attacked, are arrested in growth. Another peculiarity in this fungus is that, when the spores are formed, the whole affected part of the plant has a most offensive fœtid smell, which I can only compare with the smell of the stalk of flowers of certain *Arisæma*. It is a smell which suggests the attraction of flies to the part; but I never actually saw flies thus attracted. The only other *Puccinia* emitting a powerful odour with which I am acquainted is *P. suaveolens*, (Pers.), and this fungus likewise gives rise to deformity in the host's tissues. The fungus is so far away from Simla that I have had no opportunity for closely studying it. The mycelium appears to be perennial, but I have not been able to prove this. The teleutospore pustules are large, brown, and powdery, the spores being very deciduous, breaking off from their beds with only a fragment of stalk adhering to them. This fungus is met with in May and June: after that the parts bearing the fungus wither.

The spores when examined by transmitted light are orange-red, falling off readily from their beds with generally only a small fragment of stalk adhering. The spores measure about 36 μ in total length, and 18 to 22 μ in width at the septum. The epispore is very characteristically marked by longitudinal, or more frequently oblique, striation passing continuously over both cells, giving the spore a twisted appearance somewhat like the ovary of orchids. These striæ are interrupted ridges, as may readily be seen in empty spores after germination (Figs. 6, 7, Pl. XII). Placed in water they germinate readily immediately after ripening. The upper cells germinate first usually. The yellow contents of the spore wander

into the germ tube. The promycelium divides into four compartments, but usually only the distal three bear sporidia, though occasionally all four do so. Sterigmata are formed at the middle of the compartments, excepting in the case of the terminal cell, where the sterigma is terminal. The promycelium of the lower cells emerges from a point near the septum. The sporidia measure 10 μ in diameter.

2. Puccinia Urticæ, Barclay.

on *Urtica parviflora*, Roxb.

I have described this *Puccinia* elsewhere,* but will here briefly recapitulate its characters. The leaves in autumn (October) often bear numerous pustules on the under surface, varying from the size of an ordinary pin's head to 3 mm. in diameter. These pustules are very convex towards the under surface of the leaf with a corresponding concavity above. The invaded areas are at first pale yellow both above and below, but afterwards become brown below and orange yellow with a pale green margin above. The pustules consist of aggregations of minute circular prominent spore beds. The spores are firmly adherent, brown, thickened at the apex, and vary greatly in size and shape (Fig. 9, Pl. XII). One of average size measures 40 μ in total length (upper cell 18 μ and lower 22 μ) and 17 μ in greatest breadth. Double-headed spores are not uncommon. They germinate immediately after ripening in water, throwing out promycelia in 24 hours, the upper from the apex and the lower from a point near the septum. The sporidia measure 12 × 8 μ. No uredospores are ever formed so far as my observations extend. This *puccinia* has no connection whatever with the life history of the well known *Æcidium Urticæ*, Schum.

3. Puccinia Saxifragæ ciliatæ, nov. sp.

on *Saxifraga ligulata*, Wal., var. *ciliata*, Royle.

This, so far as I am aware, is an uncommon parasite, and I have found it only in two localities. In one place, I found it in July, in the other, as early as the end of February. An attacked leaf displays a large number of minute dark chesnut-brown pustules about the size of an ordinary pin's head, always on the lower surface, each surrounded by a conspicuous yellow zone (Fig. 7, Pl. XIII). The unburst pustules are of a pale rosy yellow colour. They are very irregularly scattered over the surface of the leaf, and their positions beneath are indicated above by red spots. The spore beds are well raised and hemispherical. The spores are light brown

* *Æcidium Urticæ*, Schum., var. *Himalayense*, 'Scientific Memoirs by Medical Officers of the Army of India' 1887, Part II, p. 38.

and firmly adherent to their beds, breaking off with a long piece of the stalk adhering (70 μ long in one case measured). Each cell has a clearly defined nuclear space (Fig. 8 *a*, *b*, Pl. XII). The free end of the spore is considerably thickened and pointed. The spore is elongated, spindle-shaped, well constructed at the septum, and narrowing at both ends (Fig. 8, Pl. XIII.) The whole spore measures when moist from 51—65 μ in length, the upper cell from 26—36 μ in length by 16 μ in greatest breadth, and the lower from 25—31 μ in length by 14 μ in greatest breadth. The septum measures 11—12 μ in breadth and the thickening at the free end 6—11 μ in depth. After lying 24 hours in water some spores germinated throwing out short promycelia with colourless contents. The upper promycelium emerges from a point to one side of the apex, and the lower from a point near the septum. They did not go on to the formation of sporidia.

Remarks.—These characters do not agree with those given by Winter,* for *P. Saxifragæ*, Schlechtd., or *P. Adoxæ*, D. C. In the former case, the teleutospore pustules are aggregated together in irregular and variously coloured areas (seldom isolated), and the spores are deciduous and much smaller than those of the Simla species. The teleutospore beds of *P. Adoxæ* likewise coalesce, and the spores are deciduous and considerably smaller (30—45 μ long). In one point, however, there is a resemblance: in both the free end has often a pale lengthened thickening or projection. But, as *P. Adoxæ* is an autœcious *Eupuccinia*, I am inclined to regard the Simla species provisionally as distinct.

4. Puccinia Circææ, Pers.

on *Circæa alpina*, Linn.

This fungus is met with at higher elevations than Simla, namely, about 9000 feet. I found it occurring plentifully in the forests near the "Chor" mountain. Each attacked leaf usually displays numerous dark brown pustules on its lower surface (50 and more) varying in size from a minute point to 1 to 2 m. m. in diameter, and each surrounded by a zone of discolouration. Examined with a lens each pustule is seen to consist of numerous minute hemispherical beds aggregated together. The teleutospores are firmly adherent and when scraped off become detached with a long piece of stalk adherent and usually come off in masses. The spores are very small, brown, elongated, constricted at the septum, much thickened at the free end with the lower cell narrowing towards the stalk (Fig. 11, Pl. XIV). The free end is more or less pointed. Herbarium specimens of spores when moistened measure from 30 to 32 μ in total length (the upper and lower cells being usually equal in length)

* Loc. cit.

and 7 to 9 μ in width at the septum. The apical thickening is 6 to 7 μ in depth.

Remarks.—This fungus is probably identical with *P. Circææ*, Pers. I only once visited the locality where it occurs, in October, and do not know therefore whether earlier spores of a somewhat different character are formed as is the case with *P. Circææ*.

b. Micropuccinia.

5. Puccinia Geranii silvatici, Karsten.

on *Geranium nepalense*, Sweet.

During April to June I have on several occasions found this plant attacked by a *Puccinia*-bearing mycelium with this peculiar character that, when it attacks the stem, as it frequently does, it gives rise to very considerable hypertrophy of the host's tissues. The fungus is by no means a common one and usually attacks the leaf blades, distorting and crumpling them (Fig. 10, Pl. XII), and forming spore beds in little dark reddish brown pustules on the under surface. A few isolated pustules occasionally open on the upper surface. The pustules are aggregated together in patches of various size, but generally large, sometimes involving half the whole surface of the leaf. On the leaf, the individual pustules are so closely packed together that a superficial examination would induce one to believe that the whole patch is one large spore bed. When the stem or petiole is attacked, the individuality of each pustule is more marked probably because of the hypertrophy always attending such cases. In one specimen I found the fungus had attacked a node of the stem where three shoots were given off, causing great hypertrophy (Fig. 11, Pl. XII) with pale rosy discoloration of the superficial tissues. Petioles were often found attacked and hypertrophied. The pustules on the stem and petioles were often oblong or linear. The mycelium apparently has a distinct preference for invading the vascular tissues, because, even when the leaf blade is attacked, it is frequently observed that the mycelium runs mainly along a main nerve, which is then hypertrophied, and the space in the angle between two attacked nerves is often filled with numerous confluent pustules. The upper surface of the leaf, opposite the spore pustules below, is paled and somewhat reddish. Small patches of invasion on the leaf blade are usually convex above, the lower or concave surface bearing the spore beds.

The spores are brown and powdery very easily detached from their beds with only a small fragment of stalk adhering. The upper and lower cells are usually equal in size, and there is little or no constriction at the septum. They are very uniform as a rule in size and shape (Fig. 12, Pl. XII).

A fresh typical spore just moistened measured 30 μ in total length (15 μ to each cell) and 16 μ in breadth at the septum. Spores which had lain some hours in water measured on an average as follows:—whole length 30.6 μ; length of upper cell 15·6 μ; length of lower cell 14·8 μ; breadth at septum 17·6 μ. Among the spores were some fine paraphyses. There is a curious tendency in these spores to divide into more than two cells: for example I once saw a spore divided into 4 cells each 10 μ in length, the breadth of the septa being 19 μ; on two other occasions I saw a spore divided into 3 cells suggesting a comparison with *Phragmidium* spores. The epispore is beset with coarse warts or tubercles over both cells. I frequently placed these spores in water with a view to observing their germination, but on two occasions only succeeded in seeing commencing germination only in the upper cell. In one case after five days I saw a spore with a promycelium from the free end of the spore 22 μ long and 8 μ broad with colourless granular contents. In another case I saw the same after 48 hours, but in neither case did development proceed any further.*

Remarks.—I have named this species provisionally *Pucc. Geranii silvatici*, Karsten, but it is quite possibly a new species. It does not agree with the characters of *P. Geranii*, Cda.

c. Hemipuccinia.

6. Puccinia Roscoeæ, nov. sp.

on *Roscoea alpina*, Royle.

In September the leaves of this plant are often found attacked with a *Puccinia*-bearing fungus. Small pustules with a tendency to coalesce are found on the under surface of leaf blades, each surrounded by an area of paled tissue. Sometimes neighbouring areas coalesce, but as a rule each pustule remains distinct from its neighbour. Each pustule usually contains some uredospores also, which are oval, beset externally with a few spines, containing orange-yellow matter, and measuring 28 × 18 μ when moist (Fig. 1, Pl. XII). The teleutospores measure when moistened 32 μ in total length each, all being nearly equal in size (16 μ in length). The upper cell is usually somewhat broader than the lower, measuring 17 μ against 15 μ, and is thickened at its free extremity. The spore is constricted at the septum (Fig. 1, Pl. XII). These spores commence to germinate readily in water at once after ripening, but I have not observed the formation of sporidia. These are probably formed only

* As this paper was passing through the press, I observed the complete development of promycelia in the normal way. The promycelia are short and bear sporidia measuring 12 × 6 μ. Secondary sporidia are occasionally formed.

after the spores have rested for a time. I only observed the germination immediately after ripening when a promycelium was emitted from each cell, that from the upper emerging from the apex, the other from a point near the septum (Fig. 1, Pl. XII). The promycelium measures about 6 μ in diameter. I never observed the uredospores germinate.

7. Puccinia flosculosorum, (Alb. et Schw.)

on *Taraxacum officinale*, Wigg.

The leaves of this plant are frequently seen from Spring to Autumn bearing dark brown pustules mostly on their upper surfaces. Generally only the youngest entire leaves are thus attacked. Little or no discolouration of the leaf tissue is at first occasioned.

Each pustule contains numerous *Puccinia* and a few uredospores. These uredospores are chestnut-brown with resistent epispores beset with spines, and thus resemble Uromyces teleutospores rather than uredospores; but their germination reveals their true character (Fig. 3, Pl. XII). When wetted, they are round or oval, measuring 24 μ in diameter, sometimes 28 × 22 or 20 μ (Fig. 2, Pl. I). Each uredospore has two germ pores. A few pale single-celled spores may also be found (Fig. 2, Pl. XII) with vacuoles, but these are probably immature uredospores.

The teleutospores are readily detached from their beds with only a fragment of stalk adhering. They are chestnut-brown, slightly constricted at the septum, rounded at both ends and thickened at neither (Fig. 2, Pl. XII). They measure when wetted 36 μ in total length and 22 μ wide at the septum, which usually divides the spore into two equal parts. The epispore of both upper and lower cell of the spore is distinctly tuberculated. I never succeeded in getting these spores to germinate.

Remarks.—This is probably *P. flosculosorum* (Alb. et Schw.) or *P. Taraxaci*, Plow, the characters of the uredo- and teleuto-spores agreeing in every respect. But while the European species is associated with æcidial fructification, this is never found in Simla. Two varieties of the European species are described,* (*a*) *Forma crepidis* and (*b*) *Forma Hieracii* (Schum.) The former (*a*) is associated with an *æcidium*, the latter (*b*) is not. Magnus produced teleutospores of the latter (*b*) by-sowing æcidiospores from *Taraxacum* on the leaves of *Hieracium*, sp. As we have no form (*b*) in Simla and no *Æcidium* on *Taraxacum*, it would appear that form (*b*) with its associated *Æcidium* is an entirely different fungus.

* Winter, loc. cit., p. 207.

8. Puccinia Galii, Pers.

on *Galium aparine*, D. C.

This fungus may be found very largely distributed in autumn, commencing about October. Small circular dark brown pustules are formed on the under surfaces of the narrow leaves with often a paled yellowish area on the corresponding opposite or upper surface. Each leaf usually contained two, or three, or even more such pustules I once counted 13 pustules on a single leaflet. These pustules contained *Puccinia* spores, with always a few uredospores, but, although I looked carefully earlier in the season, I never found simple uredo pustules.

The uredospores are oval, measuring 23 × 20 μ when well moistened, with a brown tuberculated epispore. These spores germinate readily in water, throwing out a simple germ tube after the usual manner of uredospores (Fig. 5, Pl XII). One such germ tube measured 0·315 mm. in length and 5 to 6 μ in diameter. Into this tube the protoplasm of the spores wandered, collecting in the distal end. Each spore appears to have two germ pores, but only one germ tube is emitted. A curious feature about those uredospores is the comparatively long time they retain their vitality. In a cultivation of teleutospores with material collected in October, and set in water on the 26th March following, all the uredospores present, of which there were several, germinated in 24 hours, whilst the teleutospores still remained *in statu quo*.

The teleutospores are brown bodies, not easily detached from their beds, and breaking off with a portion of stalk adhering. In each cell a distinct nuclear vesicle is seen. The spore is constricted in the middle at the septum, and the free end is considerably thickened. The septum usually divides the spore into equal halves (Fig. 4, Pl. XII). The whole length of the spore when well moistened is about 44 μ, and the breadth at the septum 14 μ. The greatest breadth of the upper cell is 21 μ, whilst that of the lower is 16 μ. The portion of stalk adherent to the detached spore is generally about 30 μ in length. The thickening of the free end of the spore is 7 to 13 μ. The above are average measurements, but the spores are not very uniform in size. These spores germinate freely in spring throwing out *promycelia* from the apex of the upper cell, or from a point a little to one side of it, and from a point near the septum of the lower cell. The *promycelia* as usual divide into 4 cells each forming a sporidium at the extremity of a sterigma. The sporidia measure about 13 × 9 μ and germinate by throwing out a narrow germ tube 2 μ in diameter.

Remarks.—I have named this *P. Galii* and not *P. Valantiæ*, Pers., as on the whole, the characters of the teleutospore agree better with

those of the former. Moreover, the latter is a *Leptopuccinia* without uredospores. On the other hand, the uredospores of the former are somewhat larger than those I have described above, and the European species is associated with an *autœcious aecidium*, which we never find in Simla. Another difference in the Simla species is that the spore beds are always isolated, small, and circular, whilst those of *P. Galii* have a tendency to coalesce into irregular masses.

9. Puccinia Acetosæ, Schum.

on *Rumex nepalensis*, Spr.

This fungus is very common in Simla and is chiefly remarkable for an apparent lichenoid symbiosis between the mycelium and the chlorophyll-containing cells of the host, such as is described by Dr. D. D. Cunningham, F. R. S., in *Ravenelia*.*

The areas of the leaf blade invaded by the mycelium remain brilliantly green long after the rest of the leaf is yellow. The parasite is first met with in October, when the leaves may be seen to bear dark brown minute circular pustules, often with a distinctly circinate arrangement, both on the upper and lower surfaces, often in extraordinarily large numbers. At this time, if the spores be examined, they will be found to consist of round or oval single-celled bodies of a pale brown colour measuring from 24 μ in diameter to 28 × 21 μ. These spores are easily detached from their beds without any portion of the stalk adhering as a rule. They have a fairly stout epispore beset with well marked warts, and are thickened very slightly at the free end (Fig. 13, Pl. XII). The contents are sometimes finely granular throughout, but frequently several oil globules are found in the granular protoplasm. These are uredospores, and they germinate readily in water, throwing out very long simple germ tubes. I have found uredo pustules with a few teleutospores in them in March on green leaves, and the spores from them germinate very readily. I do not know whether these pustules had developed recently, or whether they had remained over from the previous autumn. My impression is that they were of quite recent formation. Later, the same pustules produce *puccinia*, which are brown, rounded, and with little or no constriction at the septum (Fig. 13, Pl. XII). These spores are very readily detached from their beds, breaking off with only a minute fragment of the stalk adhering. They have a characteristic knob-like thickening at the free end. The total length of the moistened spores varies from 40 to 32 μ, and the breadth at the septum from 18 to

* On a new Genus of the Family *Ustilagineæ*, 'Scientific Memoirs by Medical Officers of the Army of India,' Part III, p. 31.

22 μ. The average length is 35 μ, and the average breadth at the septum, which usually divides the spore into two equal parts, is 19·8 μ. I have never observed the germination of these spores.

Remarks.—These characters agree on the whole with those of *P. Acetosæ*, and I think there can be no doubt that the European and the Simla forms are identical. In the Simla species I have never observed pustules on the petiole or stalk as in the European species.

10. Puccinia helvetica, Schröter.

on *Rubia cordifolia*, Linn.

In July, soon after the rains have commenced, this plant puts out new leaves, which are early attacked by a uredo-bearing fungus, differing from most similar fungi in the uredo-pustules being brown and being intimately associated with spermogonial production. On the upper surface of the leaf, a number of pale yellow circular patches are seen, irregularly scattered about, each measuring about 3 mm. in diam. (Fig. 5, Pl. XIII.) The number of pustules on each leaf varies from one to 120, and even more. Within the paled circular area, a circle of minute brown uredo pustules are produced, which sometimes remain separate, but which sometimes coalesce laterally, and within this brown circle, in the centre of the yellow patch, is a group of spermogonia. Viewed from the lower surface (Fig. 4, Pl. XIII) of the leaf, the yellow discoloration is less marked, but the circinate arrangement of uredo pustules is even better marked than above, and, in the centre, on the lower surface also, is a smaller group of spermogonia. The circles of brown uredo pustules on the upper and lower surfaces of the leaf are exactly opposite each other.

Those brown pustules contain brown uredospores, borne singly on stalks, with a few paraphyses among them. The spores, which are oval, are readily detached, coming off without any portion of stalk adhering, although the place of union with the stalk is generally clearly recognisable on the detached spore. The spores have a well defined epispore beset with sharp spines, and, when just wetted with water, measure on an average 26·8 × 21·2 μ. The stalks measure about 50 μ in length. These uredo pustules are found also on the petioles and stalks.

In the autumn, when the persistent leaves are drying, they are covered with black teleutospore beds, mostly exhibiting the same circinate arrangement above described, but many are also isolated as shown in (Fig. 6, Pl. XIII). These teleutospore pustules are mostly on the upper surface of the leaf, but a great many are formed also on the under surface. The dried leaves remain attached to the dry stalks throughout

the winter, and, indeed, do not fall off until the rains commence, when they fall, but by this time new young leaves have already been unfolded. It would thus appear that the teleutospores germinate at the commencement of the rains, infecting the new leaves, though a few experiments I made with a view to verifying this did not succeed.* If infection of the new leaves by the teleutospores on the old ones does actually take place, we have an autœcious Uredine in which the æcidial fructification has dropped out, for I am quite certain that no æcidium is produced by this fungus. It, however, remains to be proved that the teleutospores give rise to the production of uredospores. In the meantime, the fungus must be classed with such forms as *P. suaveolens*, (Pers.), *P. Oreoslini* (Strauss), and *P. Vincæ*, D. C., among the *Hemipuccinia*, all of which produce spermogonia together with uredo- and teleuto-spores, without any æcidium.

The teleutospores are plump brown spores, constricted at the septum, with well marked apical thickening, which is rounded usually, but which is sometimes conical either in the centre or laterally. The lower cell narrows towards the stalk, which is long and adherent. The surface of the epispore is smooth (Fig. 14, Pl. XII). Each cell usually displays a clear nuclear vesicle. The freshly gathered spores, when moistened, measure from 49 to 54 μ in total length (upper cell from 25 to 30 μ, and lower 24 μ) and 13 to 15 μ at the septum. The apical thickening is 8 to 9 μ in depth.

Remarks.—I have called this *P. helvetica* with some hesitation. In the European species no mention is made of the existence of spermogonia, a prominent and invariable feature in the Simla species; but the measurements of the uredo and teleutospores correspond fairly well.

11. Puccinia Menthæ, Pers.

on *Origanum vulgare*, Linn.

While writing this list, I found, in March, this host harbouring a *Puccinia*-bearing fungus. Some plants were very extensively attacked, bearing dark brown pustules on the under surface of the blade. The pustules are small, round, and hemispherical, and do not tend to coalesce. Sometimes each leaf bears a very large number of such isolated pustules, sometimes only one. The position of these pustules is indicated on the upper surface of the leaf by dark spots surrounded by a zone of slightly paled tissue. The pustules contain both brown uredospores and teleutospores, the former the more numerous (at this season at any rate). Both spores are very easily detached from the spore bed.

* As this paper was passing through the press, I succeeded in reproducing the uredo stage with the sporidia of teleutospores gathered in the preceding autumn.

The uredospores are light brown, mostly round, some oval or pyriform, with a tuberculated or spiny epispore. They measure, when just moistened, about 25 μ in diameter. They germinate very readily in water, throwing out an ordinary germ tube, simple and unbranched. When germinating, they are seen to possess 2 to 3 germ pores.

The teleutospores fall off easily, with a short piece of stalk adhering. They are brown, rounded at both ends, little or not at all constricted at the septum, without apical thickening as a rule, and with a tuberculated or spiny epispore. When just wetted, they measure about 28 μ in total length by 20 μ at the septum. The septum divides the spore into two equal halves. These spores also germinate readily at once. The promycelium is short, and usually produces 3 to 4 sporidia on very short sterigmata. The sporidia are oval, measuring 8·5 × 6·5 μ to 10 × 8 μ. They germinate readily, throwing out a fine long germ tube (Figs. 15, 16, Pl. XII).

Remarks.—I have called this *P. Menthæ*, provisionally, as the uredospores and teleutospores agree in characters with those of that species. It must be observed, however, that the æcidium is unknown here, and I have therefore placed the parasite under *Hemipuccinia*, and not under *Autœupuccinia*, as is of course done in Europe, where the æcidium also occurs on the same host. In this respect, both this Indian species and that on *Taraxacum officinale* (see above) are interesting in being unaccompanied by æcidial fructification. Biological evidence may show, later, either that the species is distinct from the European, or that the æcidial fructification on the same host in Europe is not genetically related with the uredo- and teleuto-spores.

d. Eupuccinia (hetercœcious).

12. Puccinia Pollinlæ, Barclay.

on *Pollinia nuda*, Trin.

This is an exceedingly abundant species, and is related to the *Æcidium* on *Strobilanthes Dalhousianus*, Clarke (*Æcidium Strobilanthis*, Barclay*). Uredopustules are situated mostly on the under surface of the leaf, and are not numerous: they are oval or shortly linear. The uredospores are pale brown, and the epispore is beset with tubercles. They measure on an average 21·6 × 20·2 μ.

The teleutospore beds are usually very numerous on each attacked leaf, mostly in the lower surface; they are long, linear, and black. The spores germinate readily immediately after ripening, as well as after a

* On the Life History of a new *Æcidium* on *Strobilanthes Dalhousianus*, Clarke. 'Scientific Memoirs by Medical Officers of the Army of India,' Part II, Calcutta, 1887.

winter rest. They are firmly adherent, and a portion of stalk remains on detached spores. The spores are rounded at both ends, but little constricted at the septum, and with the free end slightly thickened. The epispore is studded with fine tubercles. The spores measure 36 μ in total length, and 16 μ at the septum. The upper promycelium emerges from the apex of the spore, a little to one side, and the lower from a point near the septum. The sporidia measure from $10 \times 6\ \mu$ to $12 \times 7\ \mu$ (see also J. A. S. B., Vol. LVI, Pt. II, No. 3, 1887).

13. Puccinia Caricis, Schum.

on *Carex setigera*, Don.

This is a widely distributed species and stands in genetic relationship with *Æcidium Urticæ*, Schum, var. *Himalayense*, Barclay.*

Uredopustules are not very numerous, and are found on the upper surfaces of the leaves: they are inconspicuous, small, brown, and linear or oblong. The spores are elliptical or pyriform, and are beset with prominent tubercles. They are pale yellow, and measure on an average from $19{\cdot}8 \times 13{\cdot}5\ \mu$ to $19{\cdot}2 \times 12{\cdot}8\ \mu$.

The teleutospore pustules are minute, circular, and black, mostly on the upper surfaces of the leaves. The spores are dark brown, firmly adherent, constricted at the septum, thickened at the free end, and usually narrowing towards the stalk. They germinate readily immediately after ripening as well as after a winter rest. They measure on an average 56 μ in total length and 15 μ at the septum. The promycelium of the upper cell emerges from the apex, and that of the lower, from a point near the septum. Four sporidia are formed usually on each promycelium, measuring $12 \times 8\ \mu$.

c. Epuccinia (antœcious.)

14. Puccinia Violæ, Schum.

on *Viola serpens*, Wall.

15. Puccinia Fragariæ, Barclay.

on *Fragaria vesca*, Linn.

For descriptions of these two *Puccinia*, see J. A. S. B., Vol. LVI, Part II, 1887.

16. Puccinia Pimpinellæ, Strauss.

on *Pimpinella diversifolia*, D. C.

I have described the characters of this fungus in the Journal of

* 'Scientific Memoirs by Medical Officers of the Army of India,' Part II, 1887.

this Society above quoted. I then noted that the teleutospores are formed in autumn, and that I had not observed their germination. Early this Spring (middle of February), however, I observed a few young *seedlings* with teleutospore pustules on the young green leaves of the same characters as those I found in autumn, and these germinated early in March in water. The promycelium of the upper cell emerges from the upper half of the upper cell, but not from its apex (*see* Fig. 12, Pl. XIII), whilst that from the lower cell emerges from a point nearer the stalk than the septum, and takes a course in a direction opposite to that of the upper promycelium. The sporidia are long narrow bodies, about 26 μ to 18 μ in length and 8 μ in width, on short pointed sterigmata, and the promycelial tube opposite a sterigma is about 10 μ in diameter. The sporidia frequently germinate while still attached to the promycelium.

Early in March, I found similar young seedlings already attacked by an *Æcidium*, but, although I made several attempts to reproduce the *æcidium* with these freshly gathered and germinable teleutospores, I did not succeed. I am therefore forced to believe that the teleutospores are not genetically related with the *æcidium*-bearing fungus on the same host. The matter requires further investigation.

LIST II.

17. Puccinia Arundinellæ, nov. sp.

on *Arundinella setosa*, Trin., and *A. Wallichii*, Nees.

This fungus is not uncommon. The teleutospore beds are oval or slightly linear on the under surface of the blade. The uredo pustules are peculiarly brilliant brick red, and are formed in July and August. The teleutospores are brown bodies slightly constricted at the septum, somewhat thickened at the free end, and breaking off usually with a long portion of stalk adhering (Figs. 7, 8, Pl. XIV). In each cell a nuclear vesicle is often present. The whole length of the spore when moistened is about 46 μ, of which 24 μ belong to the upper cell, and 22 μ to the lower. The breadth at the septum is about 20 μ. After a winter's rest, these spores readily germinate in water, each cell throwing out a characteristic promycelium. That from the upper cell usually emerges first from the apex of the spore, while that from the lower cell issues from a point near the septum (Fig. 7, Pl. XIV). Each promycelium forms four sporidia on as many sterigmata, and the sporidia, which are oval or kidney-shaped, measure on an average 10 × 7 μ, varying from 9 × 5 μ to 11 × 7 μ. The portions of stalk adhering to the spore measure 110 to 120 μ in length.

This fungus on *A. Wallichii* is not common. It forms linear black pustules on the lower surface of the leaf. I have not found uredospores on this host. The teleutospores are brown, rounded at both ends, equally divided into two by the septum, not constricted at the septum and thickened at the free end. Freshly gathered spores moistened measure on an average 40 μ in total length and 18 μ at the septum. The thickening at the free end measures about 8 μ in depth. The free end is usually rounded, but sometimes more or less pointed. The spores break off from their beds with a long piece of stalk adhering (Fig. 11, Pl. XIII).

Remarks.—I have grouped these two fungi together, as the teleutospores resemble one another closely; but subsequent observation may prove them to be distinct. It is I believe a new species.

18. Puccinia Andropogi, Schw.

on *Andropogon tristis*, Nees.

This is not a common fungus, and I have only found teleutospores. Pustules of these spores are formed on the lower surface of the leaf; they are linear or oval, tending to coalesce, and very numerous on each attacked leaf. The spores are firmly adherent, in long stalks, brown, rounded usually at both ends, and thickened at the free end. The spore is slightly constricted at the septum (Fig. 13, Pl. XIV). Freshly gathered spores, when moistened, measure from 34 to 41 μ in total length; the upper cell varies from 17 to 21 μ and the lower from 16—20 μ. The width at the septum is 16 to 22 μ, and the apical thickening about 8 μ in depth.

Remarks.—Two species of *Puccinia* on species of *Andropogon* are described in America,* one referred to *P. Phragmitis* (Schum) and the other to *P. Andropogi*, Schw. If the Indian species is identical with either, it is more probably with the latter, and I have therefore named it accordingly for the present.

19. Puccinia Anthistiriæ, nov. sp.

on *Anthistiria anathera*, Nees.†

The leaves, haulms, and glumes of this grass are often attacked by a fungus, bearing large conspicuous beds of sooty black teleutospores, sometimes so confluent, and so largely involving the surface area of the part attacked as to suggest the idea that it is one of the *Ustilagineæ*. Small linear or oval beds are also met with, and indeed the large beds are the result of the coalescence of these primarily small beds. The

* Bulletin of the Illinois State Laboratory of Natural History, vol. ii, art. iii, Parasitic Fungi of Illinois, pt. i, by T. J. Burrill, 1885.

† I am not quite certain that this host has been correctly determined: it may prove to be a species of *Bromus*.

spores are very firmly adherent, and, when scraped off, become detached with a long piece of stalk attached (Fig. 6, Pl. XIV). The spores are spindle-shaped, pale brown when seen by transmitted light, well constricted at the septum, and with a distinct apical thickening. Each cell of the spore usually displays a clearly defined nuclear vesicle. The fresh spore, when moistened, measures on an average 45·6 μ; the upper cell is usually a little longer than the lower, which contracts towards the stalk. The width at the septum is about 13 μ, and the thickening at the free end is 6 to 7 μ. Towards the end of March these spores germinate in the usual way. The sporidia are oval, and measure 8 × 6 μ. I have not met with any uredospores on this grass.

Remarks.—This is probably a new species.

20. Puccinia Chrysopogi, nov. sp.

on *Chrysopogon gryllus*, Linn.

This is a very abundantly distributed parasite, forming well raised plump, oval, or broadly linear dark brown pustules: they germinate very readily in spring in water. After 24 hours in a water cultivation they were observed to have thrown out long promycelia, into the distal ends of which the orange-yellow contents of the spore had wandered. The end of the promycelium divides into four cells, each of which produces a sporidium on unusually long sterigmata. The sporidium (14 × 12 μ), which is oval, often germinates while still attached to the sterigma, forming a secondary sporidium. The germ tube of the primary and secondary sporidium is often slightly spiral (Fig. 10, Pl. XIV). The promycelium of the upper cell emerges from a point near the apex of the cell, and that from the lower from a point near the septum (Fig. 9, Pl. XIV). The promycelia were often observed to acquire unusual forms, such for example as is represented in the figure, where the promycelium of the upper cell has divided into three cells, two of which have thrown out remarkably long and stout sterigmata, which, however, remained sterile. The cultivation was in water. The spores are slightly constricted at the septum, and the apex is little if at all thickened. On an average the moistened spore measures 43 μ in total length, and 24 μ at the septum. [illegible] cell a well defined nuclear vesicle is usually seen. The de[illegible]ore has usually a very small portion of the stalk adhering to [illegible]es are firmly set in their beds.

[illegible]utospores are preceded by uredospores, which are round or [illegible]d bodies. *Young* teleutospores are often seen in fully [illegible]opustules. The uredospores measure, when moistened, [illegible]eter to 33 × 26 μ, the average being 28·7 × 26·5 μ.

[illegible]is is probably a new species.

21. Puccinia coronata, Corda.

A. on *Brachypodium sylvaticum*, Beauv.

This fungus is not very common, and is usually found in localities where an Æcidium on *Rhamnus dahuricus*, Pall., occurs. I have already expressed my belief that it is related to this æcidium,* although I have not been able to prove it by experiment. The teleutospore beds form very minute black points on the upper surfaces of the blade, sometimes arranged linearly; but they never coalesce to form linear beds. The uredo pustules are much larger, orange-yellow, and also on the upper surface of the leaf.

The uredospores are pale saffron-yellow bodies, with a finely punctated epispore, measuring when just moistened 20 to 24 μ in diameter (Fig. 3, Pl. XIII). They germinate in the usual way by throwing out a single germ tube. There are three or four germ pores, but only one germ tube is emitted (Fig. 5, Pl. XIV).

The teleutospores are brown with the characteristic crown of generally regularly arranged processes (Fig. 3, Pl. XIII and Figs. 1, 4, Pl. XIV). They are borne on short stalks, and each cell usually displays a well defined nuclear vesicle. The total length of the just moistened spores is 38 to 44 μ, the upper cell measuring from 18 to 22 μ, and the lower, 19 to 26 μ; the width at the septum is 10 to 11 μ. The spor[illegible] narrows gradually towards the stalk, and is scarcely at all constricte[illegible] at the septum. They do not germinate until after a winter's rest. In the spring they germinate freely; the promycelium from the upper cell emerging from a point immediately under the crown (Fig. 1, Pl. XIV), and that from the lower cell, from near the septum. Four sporidia are usually formed at the ends of short pointed sterigmata (Fig. 1, Pl. XIV). The sporidia are oval bodies measuring on an average 11 × 6·8 μ, varying from 10 × 6 μ to 13 × 9 μ. They germinate readily (Fig. 2, Pl. XIV). The promycelium at the base measures 6 to 7 μ, but opposite the sterigmata only 4 to 5 μ.

B. on *Chrysopogon cæruleus*, Nees.

This is an uncommon parasite resembling the above in the teleuto-spores being coronated, but I am inclined to think it is a distinct [illegible] because the spores themselves have a different form, and the [illegible] processes is usually very irregular, contrasting with the u[illegible] crown of the fungus above described. Other noteworth[illegible] are the following:—The teleutospore pustules are *lineo*[illegible] lower surface of the leaf. Uredopustules are placed a[illegible]

* J. A. S. B. vol. lvi, pt. ii, no. 3, 1887.

surface, and these are produced throughout the winter, as I have found them late in autumn, and very early in February, whilst I have never found the uredo pustules of the foregoing fungus after summer.

The uredospores are circular, oval or pyriform, and, when just moistened, vary from 17 μ in diameter to 26 × 21 μ. Their contents are pale orange-yellow, but their coloured matter is characteristically confined to the centre of the spore, leaving a colourless periphery about 2 μ in depth; the epispore is smooth (Fig. 3, *b*, Pl. XIV).

The teleutospores are adherent, falling off with a small portion of stalk attached. The crown processes, as already noted, are remarkably irregular, and the individual processes are often very long (Figs. 9, *a*, *b*, *c*, Pl. XIII and Fig. 3, *a*, *c*, Pl. XIV). The freshly gathered spores, when just moistened, have the following dimensions:—whole length 43 to 55 μ, the mean being 49 to 50 μ; the upper cell on an average 25 μ long, and the lower 24 μ; the breadth at the septum 8 to 12 or 14 μ. These spores, I found, germinated very freely in water so early as the 15th Feburary, when most other teleutospores were still incapable of doing so, and when the spores of the foregoing fungus only commenced to germinate, without proceeding to the formation of sporidia. The lower cell usually germinated first. Four sporidia are usually formed on each promycelium; these are oval and measure about 9 × 7 μ.

C. on *Agrostis Hookeriana*, Manw.

A third form occurs on *Agrostis Hookeriana* with characters more nearly resembling form B. than form A. The teleutospores are almost identical in form and measure 44 to 50 μ in total length, and 8 to 10 at the septum (Fig. 12, Pl. XIV). In the absence of biological data, however, it is impossible to say definitely whether all these forms belong to one species, but until these are forthcoming they may conveniently be grouped together. I have not seen any uredo form on *Agrostis*.

22. Puccinia Graminis, Pers.

on *Festuca gigantea*, Vill.

In certain localities this *Puccinia* is very abundant. The teleutospore beds are very narrow and long, forming black lines on the upper surface of the blade. These pustules, when not very numerous on a single leaf, are generally found on the distal half, but otherwise the whole of the upper surface is uniformly involved.

Saffron-yellow uredopustules, mostly on the lower surface, precede the formation of teleutospores. The uredospores are round or oval, and orange-yellow, with an epispore beset with spines. The orange-yellow contents are often aggregated in the centre, leaving the periphery filled

with granular uncoloured matter. The fresh spores measure on an average 30·6 × 27·6 μ varying from 28 μ in diameter to 32 × 28 μ.

The teleutospores are long, narrow, and characteristically square shaped (Fig. 10, Pl. XIII), the free end being squarely thickened. The total length of the fresh spore, when moistened, varies between 34 and 41 μ; the upper cell measuring 16 to 20 μ in length, and the lower, 17 to 21 μ. At the septum the breadth of the spore is 8 to 10 μ.

Remarks.—I have named this *P. graminis*, as I find Plowright* mentions the same host as bearing this species, although the measurements of my teleutospores are smaller than those given by him. The Berberry æcidium, as I have already noted, is very common in Simla.

23. Puccinia Caricis filicinæ, nov. sp.

on *Carex filicina*, Nees.

This is not a common fungus, and is usually very inconspicuous, bearing very minute circular teleutospore beds (resembling in this respect the same beds of *P. caricis* on *Carex setigera*, which, though small, are yet considerably larger than those on *Carex filicina*). Only a few minute spore beds are usually formed on each leaf, and always on the lower surface. Spore beds are also occasionally formed on the sheath. I have not seen any uredo pustules on this plant.

The teleutospores are borne on long stalks, and are firmly adherent. They are brown, much constricted at the septum, and thickened at the free ends (Fig. 1, Pl. XIII). When freshly gathered and moistened, a representative spore measured 44 μ in total length, of which 24 μ belonged to the upper cell, and 20 μ to the lower. The breadth at the septum was 12 μ, and the apical thickening was 8 μ in depth. These spores germinate freely in spring in water, after a winter's rest. The promycelium of the upper cell emerges from the apex, through a pore which is clearly visible before germination, and that of the lower, from a point near the septum. Each promycelium usually produces four sporidia in the usual way (Fig. 2, Pl. XIII). The sporidia are oval, somewhat more pointed at the attached end than at the free end, and measure 9 × 6 μ to 12 × 6 μ. These sporidia usually emit a germ tube from the side, and not from either end.

Remarks.—I frequently placed these teleutospores on leaves of *Urtica parviflora*, Roxb., but the well known *Æcidium Urticæ*, Schum, was never produced. It is therefore certainly distinct from *P. Caricis*, Schum. The characters of *P. limosæ*, Magnus, and *P. silvatica*, Schröter, do not agree with those above described.

The former is connected with an *Æcidium* on *Lysimachia*, and we

* British *Uredineæ* and *Ustilagineæ*, Plowright, Keegan, Paul, Trench & Co., 1889.

have no corresponding Æcidium in Simla, and the latter, with an Æcidium on *Taraxacum*, and we have similarly no corresponding Æcidium here. The only Æcidium on any member of the *Compositæ* that I have met with is that on *Myriactis nepalensis*, Less., and I have never found it actually in Simla.* I must therefore regard this *Puccinia* as a new species, at any rate for the present.

DESCRIPTION OF THE PLATES.

Plate XII.

Fig. 1. *Puccinia Roscoeæ*, uredospore and two teleutospores; one with two promycelia. 2. *P. flosculosorum*, two uredospores and one teleutospore. 3. *P. flosculosorum*, uredospore germinating. 4. *P. Galii*, teleutospore. 5. *P. Galii*, uredospore germinating. 6. *P. Rosæ*, teleutospore showing commencing germination in upper cell, × 400. 7. *P. Rosæ*, teleutospore showing promycelium of upper cell with two sporidia, × 400. 8. *P. Rosæ*, sporidium germinating, × 250. 9. *P. Urticæ*, teleutospores, with branched promycelium from lower cell. 10. *P. Geranii silvatici*, natural appearance of attacked leaf, natural size. 11. *P. Geranii silvatici*, showing hypertrophied node caused by mycelium, natural size. 12. *P. Geranii silvatici*, teleutospore, after lying 24 hours in water, × 400. 13. *P. Acetosæ*, two uredospores and one teleutospore. 14. *P. helvetica*, teleutospore. 15. *P. Menthæ*, germinating teleutospore with sporidia. 16. *P. Menthæ*, germinating sporidium.

Plate XIII.

Fig. 1. *Puccinia Caricis filicinæ*, germinating teleutospore. 2. *P. Caricis filicinæ*, end of promycelium showing sporidial formation. 3. *P coronata*, from *Brachypodium silvaticum*, showing representative teleutospore and uredospore. 4. *P. helvetica*, lower surface of leaf in uredo stage. 5. *P. helvetica*, upper surface of leaf in uredo stage. 6. *P. helvetica*, upper surface of leaf in teleutospore stage. 7. *P. Saxifragæ ciliatæ*, natural appearance. 8,*a*. & 8,*b*. *P. Saxifragæ ciliatæ*, teleutospore. 9. *P. coronata*, from *Chrysopogon cæruleus*: *a*., showing an upper cell with promycelium and sterigmata, from which the sporidia have fallen: *b*., germinating sporidium: *c*., another teleutospore. 10. *P. graminis*, teleutospore. 11. *P. Arundinellæ* on *A. Wallichii*, teleutospore. 12. *P. Pimpinellæ*, germinating teleutospore with sprouting sporidia still attached.

Plate XIV.

Fig. 1. *Puccinia coronata*, from *Brachypodium sylvaticum*, teleutospore with promycelium. 2. *P. coronata*, germinating sporidia. 3. *P. coronata*, from *Chrysopogon cæruleus*; *a*. and *c*., forms frequently met with on this host: *b*., two uredospores are also shown. 4. *P. coronata*, typical teleutospore from *Brachypodium sylvaticum*. 5. *P. coronata*, germinating uredospore (*Brachypodium sylvaticum*) 6. *P. Anthistiriæ*, teleutospore. 7. *P. Arundinellæ*, on *A. setosa*, germinating teleutospore. 8. *P. Arundinellæ*, typical teleutospore. 9. *P. Chrysopogi*, germinating teleutospore, with abnormally long sterile sterigmata from upper promycelium; *b*., germinating sporidium. 10. *P. Chrysopogi*, germinating sporidium. 11. *P. Circææ*, teleutospore. 12. *P coronata*, from *Agrostis Hookeriana*. 13. *P. Andropogi*, teleutospore. 14. *P. Fragariæ*, teleutospore.

N. B.—*Unless otherwise specified all figures are* × 350.

* J. A. S. B. vol. lvi, pt. ii, no. 3, 1887.

XIII.—*Definitions of three new* Homoptera.—*By* M. L. Lethierry. *Communicated by* E. T. Atkinson, B. A.

[Received Feb. 28th;—Read April 3rd, 1889.]

The following descriptions refer to the small homopterons found in such abundance on the mango tree in the early part of the year and indeed up to the rains. Some account of these insects has been given in 'Indian Museum Notes,' Vol. I, No. 1; and their life-history is now being investigated.

Idiocerus niveosparsus.

Flavescens, fusco et albo-variegatus: vertice subtilissime aciculato-strigoso, medio infuscato, vertice utrinque puncto minutissimo nigro: fronte subtilissime aciculato-strigosa, flava; clypeo flavo, macula basali nigra: pronoto flavo, fusco-irrorato: scutello basi utrinque macula triangulari, medioque vitta angusta usque ad medium continuata, ibique punctis duobus minutis, nigris; summo apice albo: tegminibus nitidis, griseo-flavis, subpellucidis, venis fuscis, fascia subbasali interrupta alba, maculaque parva irregulari ad apicem corii alba; lateribus maculis duabus, una media, oblonga, altera apicali, nigris, spatio insigni albo-hyalino interruptis: corpore cum pedibus subtus fusco-variegato, unguiculis nigris.—Long. 4 millim. ♂, ♀. I. notato, Fabr., *affinis: maculis lateralibus nigris et spatio laterali hyalino tegminum distinctus.*

Hab. Saharanpur, Calcutta.

Idiocerus atkinsoni.

Elongatus, flavescens: vertice medio infuscato, puncto basali, punctoque laterali medio utrinque distinctissimo, nigris, ornato: fronte flava: clypeo flavo linea media longitudinali parva nigra, strigisque lateralibus minutissimis fuscis: pronoto flavo, linea longitudinali angusta media fusca, punctisque duabus anticis nigris: scutello basi utrinque macula triangulari nigra, medioque vitta angusta antice et postice dilatata, fusca, punctisque duobus fuscis: tegminibus subpellucidis, venis fuscis, immaculatis: corpore subtus cum pedibus flavo, unguiculis fuscis.—Long. 5 millim. ♂, ♀.

Hab. Calcutta, Baliganj.

Idiocerus clypealis.

Minor, flavescens: vertice flavo, aut immaculato, aut punctis duobus lateralibus (uno utrinque) nigris ornato: fronte flava, aut immaculata,

aut punctis duobus mediis nigris ornata : clypeo flavo, in medio semper vitta angusta nigra, ad basim latiori, ornato : pronoto flavo, immaculato : scutello flavo, basi utrinque macula obtuse triangulari nigra ornato : tegminibus flavis, nitidis, venis concoloribus, vena costali dilutius flava, intus in medio nigro angustissime cincta : corpore subtus flavo, macula laterali sat magna prosterni nigra : pedibus cum unguiculis flavis. Long. $3\frac{1}{2}$ *millim.* ♂, ♀. *Species pictura clypei insignis.*

Hab. Calcutta.

XIV.—*Notice of a Neolithic Celt from Jashpur in the Chota Nagpur District.*—*By* J. Wood-Mason, *Superintendent of the Indian Museum, and Professor of Comparative Anatomy in the Medical College of Bengal, Calcutta.*

(With Plate XV.)

An interesting stone implement of Neolithic age has recently been found, in lat. 22° 58′ N., long. 83° 41′ E., about one mile to the east of Bagicha, a village of the Tappa Kakea zemindary in the Jashpur State situated 30 miles W. N. W. of Jashpur and 31 miles E. S. E. of Bisrampur, in the Chota Nagpur District; it was obtained by the zemindar himself, who very kindly gave it up to Lálá Hirá Lál, an assistant in the Geological Survey of India, by whom it has been presented to the Indian Museum.

When received by me it was still covered with the red clayey earth of the spot in which it had been found.

It is a rather narrow double-edged celt with one face nearly level longitudinally and but slightly convex transversely, the other face longitudinally rather more strongly arched than the broader of the cutting edges, and the two sides plane; and when viewed from either side somewhat resemble a strung bow in outline.

It measures 163 mm. in extreme length, by 41·25 in breadth at the broader cutting edge, which is regularly arched, and 25·75 at the narrower cutting edge, which is irregularly arched, by 25·0 in extreme thickness in the middle; so that it is just about four times as long as it is broad at the broader cutting edge, whence it gradually tapers to its narrower cutting edge, which is equal in breadth to the extreme thickness of the stone.

It is weathered to a pale clay-brown colour.

The rock of which it is made appears to be a trap.

The accompanying plate renders a more detailed description unnecessary.

JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

Part II.—NATURAL SCIENCE.

No. III.—1889.

XV.—Noviciæ Indicæ. I. *Some additional Species of* Pedicularis.

By D. Prain. *Communicated by* Dr. G. King, F. R. S.

[Received Jan. 18th ;—Read Feb. 6th, 1889.]

The account of the genus *Pedicularis*, Linn., in the *Flora of British India*, vol. iv, pp. 306-317, was issued in January 1884 and since then Dr. King's Himalayan collectors have contributed several new forms. The details of a critical examination of the Indian material of this genus preserved at Calcutta, and also of that at Saharanpur, kindly lent for study by Mr. Duthie, are about to appear in another place; meanwhile, diagnoses of the forms new to India, arranged according to the method of the *Flora*, may prove of interest. The numbers of the inner serial list are those of the *Flora;* the references opposite are to descriptions and figures published between 1884 and 1889.

Series I. Cauline leaves whorled or opposite.

* *Upper lip beaked.*

1. (1). P. pectinata Wall.

α. Var. *typica;* leaves pinnatipartite segments pinnatifid, calyx teeth triangular acute. Wall., Cat. 420; Maxim., Mel Biol. xii, 810, t. 2, f. 25.

β. Var. *palans;* leaves pinnatisect segments pinnatipartite, calyx

teeth ovate acuminate. *P. pectinata* Wall. var. *pyramidata* Hook. *f.*, Flor. Brit. Ind. iv, 306 (syn. *P. pyramidata* exclus.). *P. pyramidata* Herb. Ind. or. H *f.* & T. T. (nec Royle).

The habit of this species and that of *P. pyramidata* vary equally; apparently intermediate forms prove on dissection to be either *P. pectinata* var. *palans* or *P. pyramidata* with much incised leaves. The geographical limits are distinct in the outer Himalayan ranges and hardly overlap in the inner. There is not at Saharanpur or at Calcutta an example of either variety of *P. pectinata* from Kashmir or from Afghanistan, where *P. pyramidata* seems to be the representing form. The diagnosis is as follows:—*P. pectinata*;—beak of corolla gradually tapering to middle then slender, tube sacculate in front at staminal insertion hardly exceeding calyx, lower half of galea erect, stamens inserted opposite top of ovary, filaments densely pilose at insertion as well as above: *P. pyramidata*;—beak of corolla slender from base, tube narrow straight half exceeding calyx, lower part of galea inclined forwards, stamens inserted above middle of tube, filaments glabrous at insertion, slightly hairy above.

2. [1]. P. PYRAMIDATA Royle.

Stem tall stout 3-4-fariously hairy, cauline leaves petioled whorled lanceolate pinnatisect or-partite, segments 2-pinnatifid, calyx teeth ovate acuminate entire, corolla tube half exceeding calyx, lip 3-fid obcordate substipitate central lobe small, beak long slender narrowed from base, stamens inserted above middle of tube glabrous at insertion sparingly hirsute above. *P. pyramidata* Royle, Benth. Scroph. Ind., 52; Lindley, Bot. Reg. n. s. xiv, Pl. Misc., 155; Benth., DC. Prodr. x, 565; Maxim., Mel. Biol. xii, 810, t. 2, f. 27.

WESTERN HIMALAYA: Lahul, (Hay! Brandis!); Kashmir, (Royle! Sedgwick!); Gilgit, (Biddulph! Tanner! Giles!); Afghanistan, (Collett! Aitchison!).

Stems 30-80 cm., Spikes 10-30 cm., rootstock stout, leaves 3-4-nately whorled, calyx 10 mm. glabrous or hirsute, corolla purple, tube 13-16 mm. hood inflated rectangularly curved, beak 14 mm. apex entire, ovary ovoid, stigma exserted, capsule 9-11 mm. hardly exserted ovate acuminate, seeds 3·25 mm. pale deeply furrowed and reticulated.

3. (3). P. TENUIROSTRIS Benth.; Maxim., Mel. Biol. xii, 811, t. 2, f. 26.

Add to description of F. B. I., iv, 307:—capsule ovate 10 mm. hardly exserted, seeds 3 mm. pale deeply furrowed and reticulated. Fruiting specimens (Duthie 1873!) have now been obtained; the type of this distribution preserved at Saharanpur still retains corollas.

4. (—). P. Oliveriana Prain.

Tall slender glabrous, leaves 4-nately whorled petioled ovate acute pinnatisect, segments lanceolate pinnatifid, spike interrupted, bracts lanceolate pinnatifid serrate, calyx campanulate, corolla tube slightly exceeding calyx, lip 3-lobed obcordate lateral lobes ovate twice as large as central orbicular, galea angularly curved deflexed beak long flexuous, stamens inserted in middle of tube filaments glabrous. *P. Oliveriana* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Eastern Himalaya: Phari, (Dr. King's collectors!).

Roots not collected, portions of stem gathered 20-30 cm., calyx 5-6 mm. 5-toothed teeth lanceolate acute serrate equal, corolla purple tube 7 mm. beak 10 mm., ovary ovate acuminate, stigma exserted; capsule not seen.

Repeats habit and foliage of *P. semitorta* Maxim.; diagnosed by the narrow simple bracts, the uncleft calyx and the edentulous throat.

5. (4). P. gracilis Wall.; Hook. *f.*

6. (5). P. porrecta Wall.

7. (6). P. brevifolia Don.

8. (—). P. instar Prain.

Glabrescent stems short or tall slender, cauline leaves few paired or whorled distant short ovate oblong or lanceolate pinnatifid pubescent segments crenate, spikes elongated interrupted, bracts foliaceous, calyx campanulate, corolla tube half exceeding calyx, lip 3-partite lobes obovate subequal, galea angularly bent beak narrow slightly decurved tip acute entire, stamens inserted above middle of tube filaments glabrous.

α. Var. *typica;* stems solitary tall simple strict, radical leaves evanescent petioled cauline 4-nately whorled sessile ovate oblong, beak shorter than lip, capsule broadly ovate ½ exserted. *P. instar* Prain; Maxim., Mel. Biol. xii, 815, t. 2, f. 32.

Eastern Himalaya: Ong-la-thang and Pey-kiong-la, 13,000 feet, (Dr. King's collectors!).

β. Var. *paradoxa;* stems single or many from base simple or branched dwarf erect or ascending, radical leaves densely tufted cauline opposite or 3-nately (rarely 4-nately) whorled all linear lanceolate petioled, beak as long as lip, capsule lanceolate acute ½ exserted.

Eastern Himalaya: Niapokri and Bijan, 11-12,000 feet, (Dr. King's collectors!).

Stems of *type* 30-60 cm., of var. *paradoxa* 3-8 cm., calyx 4-6 cm. 5-toothed not cleft upper tooth deltoid entire lateral ovate or lanceolate serrate corolla dark red tube 6-8 mm. beak of type 4 mm. of var. *paradoxa* 6 mm., filaments inserted midway between top of ovary and mouth of tube, ovary ovate mucronate apex oblique, stigma exserted, capsule of *type* 8 mm. of var. *paradoxa* 10-11 mm., seeds 1·5 mm. pale distinctly reticulated.

VAR. *typica* repeats habit, foliage, calyx and capsule of *P. denudata*, VAR. *paradoxa* those of *P. polygaloides*, two species that differ as widely in appearance as do the two varieties of *P. instar*. In these however a diagnosis may be effected by means of the stamens,—glabrous in *P. polygaloides*, hirsute in *P. denudata*; in *P. instar* VAR. *typica* the filaments are glabrous as they are in VAR. *paradoxa* and the forms are not separable as species.

9. [6]. P. CONFERTIFLORA Prain.

Stems dwarf or elongated usually branching from the base pubescent or villous, leaves oblong pinnatisect segments ovate incised serrate radical petioled densely tufted cauline opposite one or more paired subsessile, bracts laciniate segments 3-7 crested at tips, flowers subcapitate or with lowest pair or whorl shortly removed, calyx campanulate, corolla tube twice as long as calyx, lip 3-fid lateral lobes broadly ovate much wider than rounded central, galea angularly curved beak very long narrow slightly decurved apex obtuse entire slightly recurved, stamens inserted in middle of tube filaments glabrous. *P. confertiflora* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined. *P. brevifolia* Herb. Ind. or. H. f. and T. T. (nec. Don).

EASTERN HIMALAYA: Sikkim, (Hooker!); Chumbi and Phari, (Dr. King's collectors!).

Roots slender stems 6-15 cm. erect simple or many from base central erect the others ascending or decumbent, calyx 6-7 mm. 5-toothed teeth long narrow lanceolate upper entire the rest with entire bases and serrate tips, corolla pink or white tube 11 mm. lateral lobes of lip nearly meeting behind galea, beak 10 mm., ovary ovate apex mucronate, stigma exserted, capsule 10 mm. ovate lanceolate apex oblique $\frac{1}{2}$ exserted, seeds 1·25 mm. ovoid tawny distinctly reticulated.

Capsule and seeds resemble those of *P. instar* and *P. brevifolia*. Differs from both as to calyx and bracts; *P. instar* VAR. *paradoxa* is at once separable by its deeply 3-partite lower lip, *P. brevifolia* by its emarginate apex of beak.

10. (—). P. HEYDEI Prain.

Stems villous ascending simple, leaves densely pubescent lanceolate acute pinnatifid segments acute serrate radical long petioled tufted cauline 3-paired lower shortly petioled upper sessile, bracts foliar sessile, flowers few subspicate pedicels almost equalling calyx, calyx oblong villous, corolla tube $\frac{1}{2}$ longer than calyx, lip small sinuately 3-lobed lobes semi-rotund equal margin eroso-crenulate, galea angularly curved beak long falcate apex acute entire, stamens inserted above middle of tube filaments glabrous. *P. Heydei* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Western Himalaya: Lahul, (Watt!); Pangi, (Heyde!).

Roots tufted fusiform fleshy, stems numerous slender, calyx 8 mm. 5-toothed teeth lanceolate subequal upper entire the rest serrate, corolla dark red tube 12-14 mm., beak 8 mm. twice as long as lip, ovary ovate acuminate, stigma exserted, capsule ovate 11 mm. ⅓ exserted straight acuminate.

The villous habit of this species recalls *P. brevifolia* Don, with which some gatherings of it have been placed. The straight capsule, entire apex of beak, high staminal insertion, long corolla tube, and tufted fleshy roots indicate a closer alliance to *P. porrecta* than to *P. brevifolia*; its lanceolate leaves, however, at once distinguish it, and the calyx is quite different from that of *P. porrecta*, while the very small scarcely lobed lip removes it equally from both.

11. (7). P. flexuosa Hook. *f.*; Maxim., Mel. Biol xii, 810, t. 2, f. 35.

12. (—). P. chumbica Prain.

Dwarf stems simple slender glabrous tufted, leaves ovate oblong obtuse pinnatisect segments ovate serrate-dentate long petioled radical densely caespitose cauline opposite 1-paired or 0, bracts foliar shortly petioled, flowers few subcapitate pedicels short, calyx campanulate shortly cleft, corolla tube thrice as long as calyx, lip 3-sect lobes rotund subequal, galea angularly curved throat 2-sinuate beak long straight slender apex acute entire, stamens inserted below middle of tube filaments glabrous. *P. chumbica* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Eastern Himalaya: Chumbi, 11-12,000 feet, at Za-ne-gang and Put-lo, (Dr. King's collectors!).

Roots fibrous slender, stems 4-7 cm., calyx 5 mm. 5-toothed upper tooth entire subulate the others lanceolate serrate, corolla pink or purple tube 14-17 mm, beak 8 mm., anterior filaments inserted at middle of tube posterior opposite top of ovary, stigma exserted, capsule 11 mm. ½ exserted ovate lanceolate apex straight acute, seeds 1·25 mm. few ovate dark minutely reticulated.

In habit resembles *P. confertiflora* but with a much longer tube and with altogether different capsule and seeds that ally it to *P. flexuosa*.

13. (—). P. tenuicaulis Prain.

Stems slender decumbent or ascending, leaves long petioled 2-pinnatisect ultimate segments pinnatipartite radical caespitose cauline 1-2-paired opposite, bracts foliar, flowers axillary opposite distinctly pedicelled lower remote upper subcapitate, calyx campanulate slightly cleft, corolla tube slightly exceeding calyx, lip 3-fid lobes rotund lateral ½ exceeding central, galea angularly curved beak straight apex acute entire, stamens inserted in middle of tube anterior filaments hirsute. *P. tenuicaulis* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Eastern Himalaya: Chumbi, 11,000 feet, at Pan-ka-be-see-mo and Tan-ka-la, (Dr. King's collectors!); E. Nepal, at Pey-kiong-la, (Mr. Pantling's collectors!).

Stems short 8-12 cm. or elongate 20-25 cm. branching from base, calyx 6 mm. 5-toothed teeth entire upper lanceolate acute the others ovate obtuse, corolla pink tube 8 mm., beak 10 mm., ovary ovate lanceolate, stigma exserted, capsule 12 mm. narrowly lanceolate ½ exserted, seeds 2 mm. acutely ovate minutely reticulated.

Like a slender glabrous form of *P. flexuosa* from which, however, it is easily distinguished by the nonserrate calyx teeth, the entire apex of beak, and the much shorter corolla tube.

14. (—). P. Gammieana Prain.

Stems sparingly branched from base villo-pubescent, cauline leaves 2-3 pairs small shortly petioled ovate oblong obtuse 2-pinnate, bracts sessile pinnatipartite, flowers few subcapitate, calyx campanulate shortly pedicelled, corolla tube more than twice as long as calyx, lip 3-lobed lobes depressed rounded lateral twice as large as central, galea arcuate beak straight short deeply emarginate, stamens inserted in middle of tube anterior filaments bearded above. *P. Gammieana* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Eastern Himalaya: Lang-mang-nang-zo, 10,000 feet, (Pantling!).

Stems in the solitary Calcutta gathering 6-8 cm., roots simple fibrous slender, radical leaves 0 cauline very small 5-8 mm. by 2-4 mm., calyx 7 mm. deeply 5-toothed upper tooth lanceolate entire smaller than the others with narrow entire bases and expanded elliptic acutely serrate tips, corolla purple tube 16 mm., beak 4 mm., ovary ovoid apex acute, stigma exserted.

The corolla differs from that of *P. binaria* Maxim. only in having the lower lip ciliate and the central lobe of lip less depressed but the habit of this Himalayan plant is quite unlike that of Maximowicz' Szetschuan plant.

15. (—). P. schizorrhyncha Prain.

Dwarf stems tufted slightly pubescent, leaves long petioled oblong lanceolate acute pinnatipartite segments lanceolate serrate-dentate radical densely caespitose cauline opposite 1-paired or 0, bracts foliar petioled, flowers few subcapitate pedicels short, calyx tubular slightly cleft nerves pubescent, corolla tube slightly exceeding calyx, lip 3-partite margin ciliate lobes subobovate lateral slightly larger than central, galea arcuate subinflated beak short straight apex truncate bifid segments laciniate, stamens inserted above middle of tube anterior filaments densely hirsute. *P. schizorrhyncha* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Eastern Himalaya: Chumbi, (Dr. King's collectors!); Sikkim, (Jaffrey!); E. Nepal, (Mr. Pantling's collectors!).

Stems simple slender 4-6 cm. erect, roots fibrous tufted rootstock crowned with narrow scales, calyx 9 mm. 5-toothed teeth triangular subequal margins serrulate, corolla purple tube 10-12 mm., beak 4 mm. lateral segments each 3-fid, ovary ovoid, stigma exserted, capsule 10 mm. ovate apiculate slightly exserted, seeds ovoid trigonous grey distinctly reticulated.

16. (9). P. INTEGRIFOLIA Hook. *f.*; Maxim., Mel. Biol xii, t. 2, f. 23.

* * *Upper lip shortly or not beaked.*

17. (—). P. ALASCHANICA Maxim.

Stems stout branching from the base villous ascending, leaves 2-4-nately whorled petioled pinnatifid segments lanceolate decurrent serrate, lower bracts foliar upper with bases entire membranous tips foliaceous pinnatilobed or serrate, flowers sessile in interrupted spikes, calyx membranous inflated ovoid, corolla tube hardly as long as calyx, lip 3-fid lobes rotund lateral thrice as wide as central, galea inflated angularly curved beak conical apex truncate entire, stamens inserted opposite top of ovary anterior filaments bearded.

VAR. *typica;* whorls 4-leaved, calyx nerves and margin villous teeth serrate except upper, beak as long as galea. *P. alaschanica* Maxim., Mel. Biol. x., 91 and xii, 860, t. 5, f. 86, *a*.

EASTERN HIMALAYA: Chumbi and Phari, (Dr. King's collector!).

VAR. *tibetica;* stems short, leaves opposite, calyx densely pubescent teeth entire, beak distinctly shorter than galea. *P. alaschanica* VAR. *tibetica* Maxim., Mel. Biol. xii, 860. t. 5, f. 86, *b*.

EASTERN HIMALAYA: Phari, (Dr. King's collector!).

Stems of *type* 15-20 cm., of VAR. *tibetica* 5-8 cm., calyx 12 mm. 5-toothed teeth triangular subequal, corolla yellow tube 11 mm., beak in *type* 2-2·25 mm. in VAR. *tibetica* 1-1·5 mm., ovary ovoid, stigma exserted, capsule ovoid 11 mm. not exserted, seeds large 3 mm. pale deeply furrowed and reticulated.

DISTRIB. S. Mongolia; W. China.

18. (9). P. GLOBIFERA Hook. *f.*; Maxim., Mel. Biol. xii, 869, t. 5, f. 95.

19. (10). P. CHEILANTHIFOLIA Schrenk; Maxim., Mel. Biol. xii, 869.

20. (11). P. ROYLEI Maxim., Mel. Biol. xi, 288 and xii, 891, t. 4, f. 122. *P. verticillata* Bentn., DC. Prodr. x, 563 (pro parte nec Linn.); Hook. *f.*, Flor. Brit. Ind. iv, 309. *P. amœna* Adam. VAR. —; Maxim. Mel. Biol. x, 97.

This Himalayan species repeats the habit and foliage of *P. verticillata* Linn., which is, however, distinct. The diagnosis is as follows:—

P. Roylei; bracts pinnatisect or -partite, calyx deeply toothed hardly cleft upper tooth entire the others serrate, corolla tube bent in the middle obtusely, filaments inserted near middle of tube all glabrous anthers ovate acute, capsule ovate acuminate ⅓ exserted, seeds 1·25 mm. pale distinctly reticulated: *P. verticillata*; bracts ovate subentire, calyx hardly toothed cleft to the middle margin entire, corolla tube abruptly bent at junction of middle and lower third filaments inserted opposite top of ovary anterior pair hirsute anthers broadly elliptic muticous, capsule lanceolate acute more than ½ exserted, seeds 2 mm. nigrescent minutely reticulated.

Reichenbach *f*., (*Icon. Fl. Germ.*, *t.* 1762, *f.* 1-14) unfortunately omits the always present hairs from the anterior stamens of *P. verticillata*. Lange (*Bot. Tidskr. Kjob. iv*, *t.* 2, *f.* 3) figures the seeds of *P. verticillata*, which differ markedly from those of *P. Roylei*, very exactly.

21. (—). P. OPHIOCEPHALA Maxim.

Stems sparsely hirsute erect or ascending simple few leaved, leaves pinnatipartite lanceolate segments oblong subacute incised serrate radical long petioled caespitose cauline short petioled 2-4-nately whorled, calyx campanulate hardly cleft, corolla tube obtusely bent in middle expanded upwards longer than calyx, lip 3-lobed lobes obcordate emarginate lateral ½ exceeding central, galea slightly curved apex subacuminate, stamens inserted below middle of tube filaments glabrous. *P. ophiocephala* Maxim., Mel. Biol. xii, t. 5, f. 94.

NORTH-WEST HIMALAYA: Kamaon, 13-17,000 feet, Ralam Valley, Bidang and Lebang, (Duthie !); W. Nepal, Nampa Gadh, (Reid !).

Rootstock slender or stout crowned with scales, stems 6-15 cm., whorls 3-5-flowered usually approximate, calyx 9 mm. 5-toothed nerves pubescent upper tooth lanceolate or deltoid entire the others subequal serrate, corolla red tube 12 mm., staminal insertion a little above top of ovary, ovary ovoid disc anteriorly thickened, stigma exserted.

22. (12). P. DENUDATA Hook. *f.*; Maxim., Mel. Biol. xii, 867.

23. (35). P. POLYGALOIDES Hook. *f.*; Maxim., Mel. Biol. xii, 881, t. 5, f. 113.

This species, which has opposite leaves and repeats the habit and foliage of *P. instar* VAR. *paradoxa*, bears the same relationship to *P. denudata* which that variety bears to *P. instar* VAR. *typica*, except that the stamens of *P. polygaloides* are all glabrous those of *P. denudata* all hirsute.

24. (—). P. GIBBERA Prain.

Dwarf branched from the base stems prostrate 2-fariously hairy, leaves few radical evanescent cauline opposite distant ovate pinnatipartite segments pinnatifid petioles very long, bracts foliar, flowers

racemose distinctly pedicelled, calyx campanulate slightly cleft, corolla tube ½ longer than calyx bent forward and expanded at top, lip 3-lobed lobes rounded emarginate equal, galea straight erect apex acuminate, stamens inserted in middle of tube anterior filaments hirsute. *P. gibbera* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Eastern Himalaya: East Nepal, 13-14,000 feet, at Tha-moo-tsa, Esan-an-gi, Pey-kiong-la and Bijan, (Dr. King's collectors !).

Annual, roots slender, stems 2-15 cm. simple or once branched, racemes few flowered pedicels as long as calyx, calyx 4·5 mm. 5-toothed with crisp white hairs on nerves upper tooth minute the rest lanceolate with obtuse serrate apices, corolla rose-pink or white tube 6 mm. expanded at top, galea twice as wide as tube, ovary lanceolate, stigma subincluded, capsule lanceolate acute 9 mm. ⅓ exserted, seeds few (4-6) 3 mm relatively very large black hardly pitted.

Closely related to *P. pygmaea* Maxim. This, however, differs as to bracts, in the corolla tube being bent at the top and not in the middle, in the galea being erostrate, and in the anterior filaments being hirsute. The lanceolate capsule, the very large hardly pitted dark seeds, and the leaves seem to indicate considerable affinity with *P. flexuosa* and its allies.

25. (13). P. mollis Wall.; Maxim., Mel. Biol. xii, t. 4, f. 126.

26. (—). P. fragilis Prain.

Stems simple elongated sparingly hairy, leaves 3-nately whorled subsessile membranous elliptic acute pinnatipartite segments lanceolate mucronate serrate, flowers axillary pedicels very short, calyx wide campanulate, corolla externally puberulous tube straight cylindric twice as long as calyx, lip sub-quadrate 2-plicate above anteriorly 3-lobed lateral lobes narrowly ovate acute half as wide as central obovate cucullate projecting, galea slightly dilated straight with very short wide truncate beak, stamens inserted near base of tube anterior filaments hirsute near apex. *P. fragilis* Prain; Maxim, Mel. Biol. xii, t. 5, f. 83. *Pedicularis*, sp. C. B. Clarke, Jour. Linn. Soc. xxv, 51.

Assam: Khasia Hills, 5-6000 feet, (Mann !); Barêl Mts, 6-8000 feet, (Prain !). N. Manipur, 6500 feet, (Clarke, n. 42041).

Stems 15-30 cm. lower third decumbent nodes aphyllous bulbiferous above rooting below upper two thirds erect leafy, roots slender disc-bearing, flowers in axils of 3-7 topmost whorls, calyx 5 mm. not cleft teeth 5 narrowly linear lanceolate equal upper entire the others subserrate, corolla green tube 9 mm., lip marginally ciliate, beak 1·5 mm., ovary ovate acuminate, stigma included, capsule 5 mm. subglobose acuminate not exserted, seeds small 1 mm. spherical pale with dark lateral raphe distinctly reticulated.

A very distinct species semi-saprophytic in humid shady forests of the Assam range, in which parasitism was carefully looked for but could not be detected. Attachment of roots to decaying vegetable matter was made out in the field in the specimens obtained in the Barêl range.

27. (—). P. Kingii Prain.

Stems elongate very slender flexuose branching sparingly hairy, leaves opposite long petioled ovate pinnatisect segments subalternate 2-pinnatifid, flowers pedicelled racemose axillary, calyx campanulate deeply cleft, corolla straight tube wide cylindric twice as long as calyx, lip subquadrate 2-plicate above 3-lobed in front lateral lobes ovate acute half as wide as central rounded concave, galea slightly bent forward rounded in front apex cucullate, stamens inserted near base of tube anterior filaments distinctly bearded above. *P. Kingii* Prain; Maxim., Mel. Biol. xii, 895, t. 4, f. 127.

Eastern Himalaya: Sikkim, at Gang-tuk, (Dr. King's collectors !).

Rhizome slender crowned with few stoloniferous scales, stolons very slender 5-15 cm. with scales at tips, leaf segments nearer stem distinctly petioluled, flowers in leaf axils towards points of stem and branches, calyx 4 mm. membranous cleft to base anteriorly teeth 5 small entire deltoid upper very minute, corolla tube 8·5 mm., anther lobes acutely tailed tips exserted, ovary ovate disc slightly thickened anteriorly, stigma subexserted; capsule not seen.

A very distinct and remarkable species.

28. (14). P. pycnantha Boiss.; Hook. *f.*, Flor. Brit. Ind. iv, 310 (syn. *P. Alberti* exclus.).

Var. *typica;* bracts subentire, lip distinctly shorter than galea lobes rounded, stamens inserted just below middle of tube. *P. pycnantha* Boiss., Diagn., ser. i, xii, 45 and Flor. orient. iv, 484; Maxim., Mel. Biol. xi, 291 and xii, 895, t. 4, f. 127. *P. Olgae* Regel, Acta Hort. Petrop. vi, 348 and Plant. Fedsch., 61. *Pedicularis*, sp. Aitchison, Trans. Linn. Soc. n. s. iii, 9.

Western Himalaya: Gilgit, 9-10,000 feet, (Giles !); Afghanistan, Kuram valley, (Aitchison !). Distrib.: Northern Persia, Western Turkestan.

Var. *Semenowi;* bracts serrate, lip nearly equalling galea lobes shortly emarginate, stamens inserted opposite top of ovary. *P. Semenowi* Regel, Bull. Soc. Imp. Mosc. xli, 108 and Plant. Semenow., n. 810; Maxim., Mel. Biol. xi, 294 and xii, 894, t. 4, f. 129. *P. orthantha* Griseb. var. —; Maxim., Mel. Biol. x, 129.

Western Himalaya: Rantak-chu, (Falconer !); Kunawar, (Royle !); Astor, 13,000 feet, (Tanner !); Lahul, (Hay ! Stoliczka ! Watt !); Pangi,

11—16,500 feet, and Upper Sutlej, 17000 feet, (Heyde !); Hazara, (Stewart); Gilgit, (Giles !). Distrib.: Eastern Turkestan, Altyn and Alatau Mts.

P. Alberti has alternate, not opposite, leaves; its stamens too are all glabrous while the anterior pair in this species have hirsute filaments: though the leaves of *P. Alberti* much resemble those of *P. pycnantha* its centrifugal inflorescence allies it more closely to *P. Oederi* which also has alternate leaves.

29. (—). P. LYRATA Prain.

Dwarf, simple or many headed, pubescent, leaves opposite subcordate ovate obtuse widely crenate denticulate petioled, bracts foliar, flowers subracemose shortly pedicelled, calyx tubular hirsute pubescent, corolla tube straight ½ exceeding calyx, lip 3-lobed 2-plicate above lobes rotund eroso-crenulate subequal central emarginate, galea curved apex angularly cucullate prolonged shortly downwards then bifid with segments laciniate, stamens inserted near base of tube filaments glabrous. *P. lyrata* Prain; Maxim., Mel. Biol. xii, 890, t. 4, f. 135.

Eastern Hymalaya: Phari and Ting, (Dr. King's collector !).

Stems 3-6 cm., root slender branching, petioles of radical leaves as long as blade of cauline short, bracts sessile, calyx 8 mm. deeply 5-toothed hardly cleft upper tooth subulate the others with short narrow entire base and elliptic serrate-dentate lamina, corolla white tube 12 mm. slightly widened above glandular ciliate within, galea teeth 3-fid lowest segment subulate longer than the other two triangular, ovary lanceolate disc thickened in front, stigma included, capsule 14 mm. oblong-lanceolate acute nearly half exserted, seeds small 1·5 mm. ovoid rufous distinctly reticulated.

P. lutescens Franchet, to which this species is most nearly allied, differs by its shorter corolla tube, its 5-fid galea teeth, and its disc prolonged anteriorly into a spur.

30. (—). P. COMPTONIÆFOLIA Franchet.

Stems tall erect puberulous terete strict simple or sparingly branched above, leaves coriaceous shortly petioled 4-nately whorled linear oblong acuminate pinnatifid segments rounded margins cartilaginous minutely toothed, flowers short pedicelled numerous in interrupted spikes, bracts foliar mucronate-serrate longer than campanulate membranous calyx, corolla tube bent obtusely below middle expanded above three times as long as calyx, lip stipitate broadly ovate 2-plicate above shortly 3-fid lobes crenulate central rounded prominent smaller than ovate lateral, galea erect straight shortly beaked apex obliquely truncate with lateral subulate teeth below, stamens inserted opposite top of ovary filaments all pilose at insertion anterior pair hirsute above. *P. comptoniæfolia* Franchet; Maxim., Mel. Biol. xii, 871 t. 5, f. 96.

Burma: Shan Hills, Fort Stedman, 6000 feet, (Collett !). Distrib.: Yunnan.

Stems 80-100 cm. thicker than crowquill, roots not seen, spikes 8-12 cm., calyx not cleft 6 mm. irregularly 5-toothed glabrous teeth deltoid unequal entire margins villous, corolla dark red tube 14-16 mm. obtusely bent at top of calyx internally glandularly hairy, ovary ovate, stigma exserted, capsule 7·5 mm. ovate acuminate slightly exserted, seeds 2·5 mm. testa rufous distinctly reticulated.

31. (—). P. rex Clarke.

Stems tall erect glabrous simple or sparingly fastigiately branching above strict 4-angled or slightly 4-winged, radical leaves evanescent cauline petioled 4-nately whorled whorls alternate lower petioles dilated at base upper winged connate in a campanulate perfoliate sheath laminae elliptic pinnatisect rhachis winged segments lanceolate acute pinnatifid, bracts foliar connate at bases in membranous tubes longer than calyx, flowers laxly interruptedly spiked, calyx subsessile thinly membranous deeply cleft and bifid, corolla tube straight 2-3 times as long as calyx, lip stipitate strongly 2-plicate 3-lobed lateral lobes subrotund half the size of central cucullate projecting elliptic broader than long, galea curved hardly beaked bidentate below apex, stamens inserted opposite top of ovary filaments rufous-villous above. *P. rex* Clarke; Maxim., Mel. Biol, xii. 875, t. 5, f. 103.

Assam: Khasia Hills, (Mann! Clarke). Burma: (Brandis !). Distrib: Yunnan; Kwei-tschou.

Stems 40-120 cm. roots fusiform, spikes 8-30 cm. in 4-flowered whorls 20-30 mm. apart, bract sheaths 10-12 mm. deep, calyx 10 mm. cleft to base below and $\frac{1}{3}$-$\frac{1}{2}$ above segments deltoid entire or minutely 2 or 3-toothed at apex, corolla yellow tube 24-30 mm. 2-plicate like lip glandularly ciliate within, galea teeth long subulate, ovary ovate disc prolonged anteriorly as an erect conical spur equalling ovary, stigma included, capsule rhomboid hardly exserted from bract sheath, seeds 3 mm. elliptic black minutely reticulated.

Most nearly allied to *P. superba* Franchet, where also the flowers are sheathed by connivent bracts, but which has a very different calyx and corolla.

32. (—). P. collata Prain.

Dwarf stems slender 2-fariously hairy single or tufted, leaves long-petioled radical caespitose cauline 1-pair opposite or 0 oblong acute pinnatipartite segments ovate pinnatifid serrate, bracts foliar 2-pairs opposite, flowers 3 or 4, pedicelled, calyx oblong glabrous, corolla tube wide cylindric straight almost twice as long as calyx, lip 3-lobed 2-plicate lobes large rounded nearly equal, galea straight erect acuminate

2-dentate below apex, stamens inserted near base of tube anterior filaments bearded above. *P. collata* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Eastern Himalaya: Chumbi, at Cho-la, (Dr. King's collector!); Eastern Nepal, at Pey-kiong-la and Ny-e-gu, 11-13000 feet, (Mr. Pantling's collectors!).

Stems 1-4 cm., rootstock slender crowned with scales roots tufted fibrous, flowers opposite in both pairs of bracts, or in lower pair only with single terminal flower, calyx 10 mm. 5-toothed upper tooth entire subulate the others ovate obtuse serrate with short narrow entire bases, corolla pink tube 18 mm. dilated above externally lineate-pilose within glandularly hairy, ovary ovate lanceolate disc anteriorly thickened, stigma exserted; capsule not seen.

A very distinct dwarf species with large handsome flowers. The habit repeats that of dwarf forms of *P. Roylei*.

Series II. Cauline leaves alternate.

* *Upper lip beaked.*

33. (15). P. trichoglossa Hook. *f.*; Maxim., Mel. Biol. xii., 842, t. 3, f. 63.

34. (16). P. Clarkei Hook. *f.*; Maxim., Mel. Biol. xii., 840, t. 3, f. 60.

35. (17). P. lachnoglossa Hook. *f.*; Maxim., Mel. Biol. xii., 837, t. 3, f. 55.

36. (18). P. excelsa Hook. *f.*; Maxim., Mel. Biol. xii., 828, t. 3, f. 44.

37. (19). P. macrantha Klotzsch.

var. *typica;* leaves pinnatipartite, flowers rosy red, beak conical gradually narrowing, central lobe of lip as long as lateral lobes. *P. macrantha* Klotzsch in Reis. Pr. Wald., Bot., 108, t. 59; Hook. *f.*, Flor. Brit. Ind., iv, 311.

Western Himalaya: Garhwal, (Strachey and Winterbottom,); Kamaon, (Duthie, n. 3216!); Kunawar, (Hoffmeister!).

var. *lutescens;* leaves pinnatisect, corolla tube and lip yellow galea and beak dark purple, galea slightly crested beak slender narrow from the base, central lobe of lip shorter than lateral. *P. ochroleuca* Duthie; Maxim., Mel. Biol. xii., 790, t. 1, f. 5, (not of Schlosser).

Western Himalaya: Kamaon, 14-15000 feet, in Nipschang Valley; West Nepal, at Nampa Gadh, (Duthie nn. 3219! 5848!).

38. (—). P. Garckeana Prain.

Slender hirsute stems erect leafy, leaves petioled linear lanceolate pinnatifid segments mucronate dentate, flowers numerous axillary race-

mose long pedicelled, calyx cylindric hirsute distinctly cleft, corolla tube twice exceeding calyx, lip deeply trifid lateral lobes ovate central cuneate truncate projecting, galea falcate not inflated beak slender circinnate apex bifid, stamens inserted below apex of tube filaments hirsute anterior densely posterior sparingly. *P. Garckeana* Prain ; Maxim., Mel. Biol. xii, 788.

Eastern Himalaya : Chumbi, Phari, and Jongri, (Dr. King's collectors !).

Stems 5-15 cm. rootstock stout cylindric horizontal branching, pedicels longer than calyx lower pedicels elongating in fruit slender rigid erect 2-3 times as long as capsule, calyx 12 mm. distinctly reticulate-veined within 5-toothed teeth subequal elliptic serrate cristate, corolla dark red tube 22-30 mm. externally pubescent, beak 8 mm. as long as galea tips of apex segments acute, ovary ovate, stigma exserted, capsule ovate acuminate 18 mm. $\frac{1}{2}$ exserted, seeds 2 mm. rufous ovate subacute above distinctly reticulated.

39. (20). P. Elwesii Hook. *f.*; Maxim., Mel. Biol. xii, 793, t. 1, f. 8.

Add to description of F. B. I. iv, 312 :—capsule 15 mm. ovate acuminate $\frac{1}{2}$ exserted, seeds 2·5 mm. ovate pale distinctly reticulated appendaged below, with dark furrow on one side.

40. (2). P. robusta Hook. f.

41. (—). P. nepalensis Prain.

Dwarf glabrous tufted almost stemless, leaves mostly radical all long petioled linear lanceolate pinnatifid segments ovate mucronate-dentate, flowers few (3—5) long pedicelled axillary calyx cylindric with nerves sparingly haired cleft $\frac{1}{3}$ anteriorly, corolla tube twice as long as calyx, lip 3-lobed margin crenulate lobes truncate lateral ovate twice as large as central rounded, galea inflated reflexed at base then subfalcate with short vertical bifid beak, stamens inserted above middle of tube all filaments hirsute. *P. nepalensis* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Eastern Himalaya : E. Nepal, at Ka-gling, 13000 feet, (Dr. King's collector !).

Stems 0-1 cm. rhizome short roots tufted fleshy, pedicels 25-35 mm., calyx 15 mm. 5-toothed teeth elliptic serrate upper narrower others subequal, corolla purple tube 25-28 mm. beak 4·5 mm., ovary lanceolate stigma included capsule oblong oblique 20 mm. $\frac{1}{3}$ exserted, seeds 2 mm. pale broadly ovate reticulations distinct but shallow.

42. (—). P. Scullyana Prain.

Stems hirsute erect strict stout simple leafy, leaves petioled lanceolate acute pinnatipartite rhachis dentate segments oblong lanceolate

pinnatifid serrate dentate, flowers pedicelled axillary in dense racemes, calyx subglobose inflated hirsute corolla tube hardly as long as calyx, lip 3-lobed lateral lobes ovate twice as large as central orbicular, galea much inflated abruptly bent beak half as long as galea directed downwards deeply bifid, stamens inserted in middle of tube filaments hirsute. *P. Scullyana* Prain; Maxim., Mel. Biol. xii, 789, t. 1, f. 6.

CENTRAL AND EASTERN HIMALAYA:—Nepal, (Wallich! Scully!); Jongri, (Dr. King's collectors!).

Stems 24-50 cm. as thick as little finger, rootstock horizontal thick fleshy, leaves with white crisp hairs, pedicels shorter than calyx, calyx 20 mm. 5-toothed teeth equal ovate lanceolate deeply serrate, corolla yellow tube 18 mm. expanded above externally pilose, beak 4 mm. segments acute, ovary lanceolate stigma exserted, capsule ovate acuminate 23 mm. ½ exserted, seeds 3 mm. pale appendaged below, reticulations small but deep.

43. (21). P. MEGALANTHA Don.

VAR. *typica*; flowers numerous densely racemose, corolla tube 2-3 times as long as calyx, lateral lobes of lip twice as wide as irregularly triangular central. *P. megalantha* Don. Prodr. Flor. Nepal. 94; Wall., Cat. 411; Benth., DC. Prodr. x, 564; Regel, Gartenflora, t. 943; Hook. *f.*, Flor. Brit. Ind. iv, 312. *P. Hoffmeisteri* Klotzsch, Reis. Pr. Wald., Bot., 108, t. 60.

ALPINE HIMALAYA: Kashmir to Chumbi and Bhutan.

VAR. *pauciflora*; flowers few (3-6) axillary; corolla tube 4-5 times as long as calyx, lateral lobes of lip deeply emarginate 4-5 times as wide as subligulate central. *P. megalantha* VAR. *pauciflora* Prain; Maxim., Mel. Biol. xii, 793.

EASTERN HIMALAYA: Chumbi and Jongri, (Dr. King's collectors!).

Corolla tube, of *type* 50-55 mm., of VAR. *pauciflora* 80 mm. Flowers in West Himalaya golden-yellow, in Nepal pink galea with yellow tube and lip, in Sikkim and Bhutan rose-purple, in S. Tibet dark purple.

44. (22). P. BICORNUTA Klotzsch.

45. [26]. P. ELEPHANTOIDES Benth.

Stems pubescent simple stout erect leafy, leaves petioled linear oblong pinnatifid segments obtuse crenate, flowers numerous crowded racemose pedicelled, calyx inflated glabrous, corolla tube hardly exceeding calyx, lip deeply 3-lobed lateral lobes ovate ½ wider than central oblong, galea slightly inflated beak narrow very long slender flexuous apex reflexed obtuse entire, stamens inserted near apex of tube filaments glabrous. *P. elephantoides* Benth., Scroph. Ind. 53, and DC. Prodr, x, 564; Maxim., Mel. Biol. xii, t. 1, f. 4.

Western Himalaya :—Kashmir, (Royle, Sedgwick !).

Stems as thick as goose quill, pedicels half as long as calyx, calyx 15 mm. 5-toothed slightly cleft teeth ovate serrate upper ½ the size of others densely reticulate between the nerves, corolla yellow or with galea and beak purple, tube 15 mm., beak 24 mm. margins of filaments undulate, ovary lanceolate acute, stigma exserted, capsule not seen.

Repeats habit and foliage, calyx, corolla tube and lip of *P. bicornuta* from which, however, it differs in the throat not being contorted and in the beak, which is nearly twice as long and is quite entire at apex. Apparently uncommon and not reported either at Calcutta or Saharanpur since collected by Dr. Royle till communicated by Major Sedgwick, R. E. in 1885. In Sedgwick's plant the hood and beak are dark purple the tube and lower lip golden yellow.

46. (23). P. bella Hook. *f.*; Maxim., Mel. Biol. xii. t. 1, f. 3.

47. (—). P. Przewalskii Maxim.

Dwarf almost stemless, radical leaves tufted narrowly oblong imbricate-crenate densely pubescent, flowers few axillary pubescent, calyx cylindric slightly cleft, corolla tube almost thrice as long as calyx, lip deeply 3-lobed lobes rounded subequal, galea erect slightly inflated beak straight bifid halfway, stamens inserted near top of tube filaments all hirsute. *P. Przewalskii* Maxim., Mel. Biol. x, 84, and xii, 787, t. 1, f. 2.

Eastern Himalaya :—Phari, (Dr. King's collector !). Distrib : N. Tibet ; China, Kansu and Szetschuan.

Rootstock fusiform somewhat slender, calyx densely hirsute 11 mm. 5-toothed upper tooth entire very small the others crested anterior pair smaller than lateral, corolla rose-pink tube 30 mm. puberulous externally, beak 7 mm. segments slightly expanded at tips, ovary oblong, stigma subincluded, capsule oblong oblique shortly cuspidate.

48. (—). P. Daltoni Prain.

Densely pubescent stems short erect, leaves petioled linear pinnatifid segments ovate mucronate-dentate flowers axillary pedicels very long, calyx cylindric ⅓ cleft anteriorly densely hirsute, corolla tube ½ exceeding calyx lip 3-fid margin crenulate lobes rounded lateral ½ larger than central, galea inflated slightly reflexed then arcuately curved beak straight ½ bifid stamens inserted above middle of tube filaments all hirsute. *P. Daltoni* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined. *P. asplenifolia* var. *pubescens* Hook. *f.*, Flor. Brit. Ind. iv, 315. *Pedicularis* n. 20, Herb. Ind. Or. H. *f.* and T. T.

Eastern Himalaya : Sikkim, Donkia-la, (Hooker ! Dr. King's Collector !), and Ze-lep-la, (Dr. King's Collector !) ; Chumbi, Perm-la and Chum-la-ree, (Dr. King's Collectors !) ; Phari, (Dr. King's Collector !).

Stems 2-6 cm. high, 2-20 from stout branching rhizome, petioles slightly dilated at base, pedicels 25-60 mm. rigid elongating in fruit, calyx 10-12 mm. 5-toothed segments elliptic serrate upper smallest, corolla red tube 16 mm. distinctly widened at apex nearly glabrous externally, beak 5 mm. segments with acute tips, capsule oblong oblique shortly cuspidate nearly ½ exserted, seeds ovoid pale distinctly reticulated.

49. (24). P. SIPHONANTHA Don ; Hook. *f.*

VAR. *typica ;* leaf segments lanceolate, corolla tube 4-5 times as long as calyx, throat acutely bidentate. *P. siphonantha* Don, Prodr. Flor. Nepal., 95 ; Wall., Cat. 417 ; Benth., DC. Prodr. x, 565. *P. Hookeriana* Wall., Cat., 421 ; Benth., Scroph. Ind. 53, and DC. Prodr. x, 564. *P. himalayca* Klotzsch, Reis. Pr. Wald., Bot., 107, t. 58.

In two very distinct forms :—α. "*siphonantha vera* ", with short decumbent stems or stemless, leaf segments contiguous = *P. siphonantha* Don ; Wall. ; Benth. ll. cc., the more usual form in Sikkim and Nepal, comparatively unusual in Kamaon and not apparently occurring in Kashmir or W. Tibet ; and β. "*Hookeriana* ", with long ascending or erect stems, leaf segments distant subalternate = *P. Hookeriana* Wall. ; Benth. ll. cc. and = *P. himalayca* Klotzsch l. c., the form characteristic of Kashmir and W. Tibet but occasionally reported from Sikkim also. There are, however, forms intermediate in habit and as the floral structure is identical they cannot be looked upon as distinct varieties.

VAR. *brevituba ;* leaf segments ovate, corolla tube 2-3 times as long as calyx, teeth of throat obtuse or almost absent. *P. Elephas* Boiss., Diag., Ser. i ; iv, 81, and Flor. orient., iv, 489 ; Benth., DC. Prodr. x, 565. *P. punctata* Dene, Jacquem. Voy., Bot., 111, t. 122 ; Benth., DC. Prodr. x, 565.

Also in two very distinct forms :—γ. "*Elephas* ", with short stems and contiguous imbricate leaf-segments = *P. Elephas* Boiss. ll. cc. as to description but excluding "Griffith 1060 " which has apex of beak entire and is, as Sir J. D. Hooker points out, *P. rhinanthoides :*—and δ. "*punctata* " with tall rigid erect stems and distant alternate leaf-segments = *P. punctata* Dene ; Benth. ll. cc., frequently distributed with specimens of form β. as "*P. Hookeriana.*" Specimens intermediate as to foliar characters certainly occur but "*punctata* " differs from Wall. Cat. 421 by its shorter tube, indistinct teeth, and very large lower lip the lateral lobes of which embrace the throat and meet behind the galea ; these characters though constant are not however of specific value.

The forms of VAR. *typica* repeat the habit and foliage of the two forms of *P. longiflora*, those of VAR. *brevituba* repeat the habit and foliage of the two varieties of *P. rhinanthoides.*

P. labellata Jacquem. is excluded from *P. siphonantha* by its entire apex of beak, its edentulous throat, its inflated galea and its 5-toothed calyx, while *P. Hoffmeisteri* Klotzsch, an original specimen of which Dr. Garcke of Berlin has kindly sent to the Calcutta herbarium, is *P. megalantha* Don, VAR. *typica*.

50. (27). P. LONGIFLORA Rudolph, Mem. Acad. St. Petersb., iv, 345, t. 3, (1811); Bunge, Ledeb. Flor. Ross. iii, 276; Maxim., Mel. Biol. x, 86. *P. tubiflora* Fischer, Mem. Soc. Mosc., iii, 58, (1812); Steven, Monogr. Pedic., 30; Benth., DC. Prodr. x, 565; Hook. *f.*, Flor. Brit. Ind. iv, 314. *P. tubiformis* Klotzsch, Reis. Pr. Wald., Bot. 106, t. 57.

51. (26.) P. RHINANTHOIDES Schrenk.

VAR. *typica*; stems short 5-10 cm., beak 6 mm. as long as galea shorter than lip, anterior stamens sparingly hirsute. *P. rhinanthoides* Schrenk, Enum. Pl. Nov., i, 22; Benth., DC. Prodr. x, 565; Bunge, Ledeb. Flor. Ross. iii, 276.

Not in India. DISTRIB: Alatau, (Schrenk); Hindoo Koosh, (Griffith 1060 !); Turkestan, Ishomori, (A. Regel !).

A gathering from Tehri-Garhwal with short stems 3 cm. high, (Duthie 576 !), has the short beak of VAR. *typica* with the stout stems and densely hairy anterior stamens of the following variety which it thus connects with the typical plant.

VAR. *labellata*; stems stouter 8-40 cm., beak 10-14 mm. longer than galea and equalling or exceeding lip, anterior stamens densely hirsute. *P. labellata* Jacquem., Dene, Jacquem. Voy., Bot., 117, t. 123; Benth., DC. Prodr. x, 565; Maxim., Mel. Biol. x, 83, and xii, 792. *P. rhinanthoides* Hook. *f.*, Flor. Brit. Ind. iv, 313, excluding synonyms.

52. (—). P. GRUINA Franchet.

Branching from base central stem erect others decumbent stems hirsute leafy, leaves very small short-petioled pinnatipartite segments distant oblong recurved margins cartilaginous serrate, flowers axillary racemose distant long pedicelled, calyx hirsute campanulate, corolla tube slightly exceeding calyx, lip broader than long 3-lobed lateral lobes rhomboid 4 times as large as central orbicular, galea inflated bidentate beak long slender apex decurved acute entire, stamens inserted above middle of tube filaments hirsute. *P. gruina* Franchet; Maxim., Mel. Biol. xii, 799, t. 1, f. 15.

BURMA-YUNNAN FRONTIER: Momyen, (Anderson !). DISTRIB: Yunnan.

Roots slender fibrous, central stem 8-10 cm. sparingly shortly branched, decumbent stems simple rooting below, pedicels longer than calyx, calyx 6 mm. 5-toothed teeth equal ovate acute with narrow entire bases and deeply retroserrate margins above, corolla red tube 7·5 mm., beak 10 mm., ovary oblong lanceolate, stigma hardly exserted.

Momyen, the locality of the single Calcutta gathering, is just within the Yunnan frontier, technically therefore this species does not deserve a place in the Indian Flora; as, however, when Upper Burma becomes botanically better known this is likely to be met with the diagnosis is given here.

53. (25). P. CARNOSA Wall.; Maxim., Mel. Biol. xii, t. 3, f. 52.

54. (28). P. MICROCALYX Hook. *f.*; Maxim., Mel. Biol. xii, 852, t. 4, f. 71.

55. [29]. P. ALBIFLORA Prain.

Dwarf tufted glabrous stems short or 0, cauline leaves 0 radical numerous caespitose long petioled oblong-lanceolate pinnatisect segments distant ovate mucronate-dentate, flowers few shortly pedicelled subcapitate or the lower scattered lower alternate upper subopposite, calyx cylindric-campanulate hardly cleft, corolla tube twice as long as calyx lip 3-lobed lobes rounded lateral ½ exceeding central galea arcuately curved beak conical falcate apex obtuse crenulate not bifid, stamens inserted in middle of tube filaments glabrous. *P. albiflora* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined. *P. asplenifolia* VAR. *albiflora* Hook. *f.*, Flor. Brit. Ind. iv, 315.

EASTERN HIMALAYA; Sikkim, (Hooker, Dr. King's Collectors !).

Stem 0-8 cm., rootstock slender with few ovate scales, bracts ½ longer than calyx 3-sect dilated at base, calyx 8-10 mm. 5-toothed teeth lanceolate entire obtuse except upper smallest acute, corolla white tube 20-24 mm. uniform throughout beak 3·5 mm., ovary lanceolate stigma subexserted; capsule not seen.

56. (29). P. WALLICHII Bunge, Bull. Sc. Acad. St. Petersb. viii, 251, (*name only*), and Walp. Rep. iii, 415. *P. asplenifolia*, Wall., Cat. 416A, (not of Floerke and excluding specimen B). *P. asplenifolia*, Hook. *f*, Flor. Brit. Ind. iv, 315, (not of Floerke, and excluding varieties and synonyms).

This differs from *P. albiflora* in having both pairs of stamens hirsute, in its wide subinflated calyx, its numerous lanceolate rhizome scales and its few radical leaves. Wall. Cat. 416B is *P. Oederi* Vahl, VAR. *heteroglossa*.

57. (30). P. FLAGELLARIS Benth.; Hook. *f.*

58. (31). P. FURFURACEA Wall.; Maxim., Mel. Biol. xii, t. 3, f. 50.

59. [31]. P. PANTLINGII Prain.

Stems single or several from base unbranched rigid tall leafy 3-5-fariously hairy above, leaves long-petioled furfuraceous beneath broadly ovate pinnatilobed lobes ovate serrate, flowers axillary in dense racemes pedicelled, calyx campanulate hirsute, corolla tube widened above as long as calyx, lip 3-lobed margin ciliate lateral lobes ovate thrice as

large as central orbicular, galea inflated bent at a right angle beak straight apex bifid segments emarginate, stamens inserted opposite top of ovary anterior filaments puberulous. *P. Pantlingii* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined. *P. furfuracea* VAR. *integrifolia* Hook. *f.*, Flor. Brit., Ind. iv, 316. *Pedicularis* n. 30, Herb. Ind. or H. *f.* and T. T.

EASTERN HIMALAYA: Sikkim, (Hooker, Pantling !) ; Chumbi, (Dr. King's collectors !).

Rootstock slender, stems as thick as goose quill strict 30-40 cm. calyx 8 mm. nerves densely pilose 5-toothed not cleft teeth large upper deltoid entire others ovate incised serrate, corolla red-purple tube 8 mm., beak 8 mm. inner lobe of apex segments larger, capsule 17 mm. broadly lanceolate acuminate ½ exserted, seeds 2 mm. ovate acute black hardly reticulated.

Very similar and nearly allied to *P. furfuracea* Wall. but with less incised leaves and more rigid thicker stems. The diagnosis is as follows :—*P. furfuracea ;* calyx glabrous ⅔ cleft in front 5-or 3-toothed teeth minute, or margin not toothed, corolla pale pink or white tube somewhat longer than calyx, lobes of lip all truncate emarginate eciliate, galea glabrous throat 2-sinuate apex of beak deeply bifid segments emarginate outer lobes large ovate, filaments glabrous, capsule narrowly lanceolate acuminate ⅔ exserted ; *P. Pantlingii* ; calyx hirsute not cleft 5-toothed teeth large, corolla dark-purple tube not exserted, lobes of lip rounded entire margin ciliate, galea furfuraceous throat entire apex of beak less deeply bifid segments emarginate outer lobes triangular minute, anterior filaments puberulous, capsule wide lanceolate acuminate ½ exserted. The flower and fruit in *P. Pantlingii* are larger than in *P. furfuracea*, in which calyx is 6 mm., corolla 10 mm., capsule 14 mm.

60. (—). P. REGELIANA Prain.

Dwarf stemless, leaves pinnatisect segments ovate pinnatifid toothed, flowers axillary long pedicelled, calyx campanulate nerves hirsute, corolla tube ½ longer than calyx expanded above, lip 3-fid lobes rounded lateral ½ exceeding central, galea much inflated arcuate throat 2-dentate beak very short truncate apex entire, stamens inserted above middle of tube anterior filaments densely posterior sparingly hirsute. *P. Regeliana* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA : Phari and Jongri, (Dr. King's collectors !).

Roots slender fibrous, leaves long-petioled, pedicels stout 2-4 times as long as calyx, calyx 10 mm. 5-toothed ⅓ cleft in front teeth serrate upper smallest lateral larger than anterior pair, corolla purple tube 15-18 mm., galea with teeth directed downwards and crested above as far as the origin of beak, beak 1·5 mm., ovary ovate, stigma exserted,

capsule 18 mm. narrowly ovate apex acuminate ½ exserted, seeds few 2·5 mm. ash grey striate but hardly reticulated.

Repeats habit and foliage of *P. acaulis* Wulff. but is smaller in all its parts. The calyx teeth are smaller and the galea is widely different; the capsule on the other hand is larger.

61. (—). P. ODONTOPHORA Prain.

Stems short puberulous several from rootstock, leaves long petioled radical few finally evanescent cauline 1-2 alternate pinnatisect segments pinnatifid, flowers few axillary rather crowded shortly pedicelled, calyx campanulate, corolla tube twice as long as calyx slightly widened above, lip 3-lobed lobes ovate later ½ exceeding central, galea 2-dentate slightly inflated widely arcuately curved beak straight apex emarginate, stamens inserted in middle of tube anterior filaments densely hirsute throughout posterior sparsely hirsute below glabrous above. *P. odontophora* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA:—Sikkim, Na-tong, (Dr. King's collectors!); Phari, Do-tho, (Dr. King's collector!).

Rootstock creeping with squamous nodes and crowned with scales, stems 2-4 cm. calyx 7 mm. 5-toothed teeth entire upper tooth and lower pair deltoid intervening subulate, corolla tube white 13 mm. with dorsal line of hairs outside extended along erect portion of galea which is bidentate anteriorly, inflated part of galea and beak pink, beak 5 mm., ovary ovoid, stigma exserted; capsule not seen.

A very distinct species.

62. (?32). P. CURVIPES Hook. *f.*; Maxim., Mel. Biol. xii, 919.

Not yet received in flower. Add to locality of F. B. I. iv, 316;—ASSAM: Naga Hills, 9000, (Clarke!).

63. (33). P. DOLICHORRHIZA Schrenk, Enum. Pl. Nov. ii, 23; Walp. Rep. iii, 426; Bunge, Ledeb. Flor. Ross. iii, 291; Benth., DC. Prodr. x, 570; Maxim., Mel. Biol. x, 117 and xii, 905, t. 6, f. 146. *P. cabulica* Benth., DC. Prodr. X, 575. *P. fissa* TURCZ.? Hook. *f.*, Flor. Brit. Ind. iv, 316.

WESTERN HIMALAYA: Iskardo, (Dr. Falconer's collectors!); Ladak, (Henderson!); Gilgit, (Tanner!, Giles!); Hindu Koosh, (Griffith, [3941 Kew distribution]!, Giles!); Afghanistan, Kurzar, (Griffith, [1143 Journ.]!).

Gilgit and W. Tibet gatherings quite agree with specimens of *P. dolichorrhiza* received from St. Petersburg; it is not possible to separate *P. cabulica* from *P. dolichorrhiza* even as a variety.

* * *Upper lip shortly or not beaked.*

64. (34). P. OEDERI Vahl in Hornem., Oekon. Plantel., ed. ii,

580, (1806) and ed. iii, 674; Hartm., Flor. Skand., 199; Caruel in Parlatore, Flor. Ital. vi, 429; Reichb. *f.*, Flor. Germ. xx, 76, t. 1759, f. 2; Lange, Nomenclator Flor. Dan., 2; Trautv., Increm. Flor. Ross. iii, 77. *P. versicolor* Wahlenberg, Veg. Helvet., 118, (1813) and Flor. Suec. i, 389; Hartm., Vet. Ak. Handl., 135; Steven, Monogr. Pedic., 52; Reichb,, Iconog. i, 31, t. 14; Ledeb., Flor. Altaic. ii, 437; Turcz., Flor. Baic.-Dahur. iii, 375; Bunge in Ledeb. Flor. Ross. iii, 300; Walp., Rep. iii, 428; Royle, Illustr. t. 72, f. 2; Benth., DC. Prodr. x, 578; Maxim., Mel. Biol. x, 133 and xii, 918, t. 7, f. 177; Hook. *f.*, Flor. Brit. Ind. iv, 316. *P. flammea* Oeder, Flor. Dan., t. 30, (1761); Allioni, Flor. Pedemon. i, 63; Haencke in Jacquin. Collectan. ii, 70; Poiret in Lamk, Encyclop. v, 135; (*not* P. flammea *Linn.*). *P. flammea* VAR. *major* Wahlenberg, Flor. Lappon., 168, (1812). *P. hirsuta* Smith in Rees, Cyclop. vol. xxvi, (1819); (*not* P. hirsuta *Linn.*).

VAR. *typica*; galea wider and shorter than tube, central lobe of lip not projecting, calyx teeth triangular equal apices acute.

WESTERN HIMALAYA:—Kashmir, (Royle!); Tibet, (Falconer!, Thomson!, Stoliczka!, Brandis!, Ellis!). DISTRIB: Arctic and Alpine Europe; Arctic and Alpine Siberia; Arctic America.

The Kashmir and Tibet plant is the same as the Dahurian form having the calyx hirsute and the teeth, except the upper, serrate; the lobes of the lip are entire as in the Scandinavian and Arctic form, (*P. Oederi* Vahl), where the calyx is also hirsute but all the calyx teeth are entire, and not emarginate as in the Swiss plant, (*P. versicolor* Wahlbg, Veg. Helvet. 118), where the calyx teeth are also entire the calyx being glabrous.

VAR. *heteroglossa*; galea narrower than in type and as long as tube, central lobe of lip projecting, calyx teeth narrowly lanceolate all, or upper excepted, with expanded orbicular serrate tips. "*An eadem ac P. asplenifolia?*" Wallich in sched., Wall. Cat., 416 B.

WESTERN AND CENTRAL HIMALAYA:—Kamaon, (Royle!, Wallich!, Collett!, Duthie!, Reid!); Nepal, (Scully!). DISTRIB: N. Tibet, N. China, E. Kansu.

The Kamaon form is Wall. Cat. 416B which that author only doubtfully referred to his *P. asplenifolia*. It may be the plant intended by Royle, (Ill., t. 72, f. 2), since he there figures a plant with small lower lip, which is true of this, and since Kamaon specimens of this obtained by him are preserved at Saharanpur. But the lip of his figured plant is too small even for this form and he cites Kashmir in the text as its locality; his Kashmir specimens are true VAR. *typica* only. The various Kamaon gatherings exactly agree;—calyx hirsute upper tooth linear lanceolate acute, lip of corolla ½ smaller than in VAR.

typica margin crenulate central lobe ovate lanceolate, galea ½ longer than in VAR. *typica* as narrow as tube. Dr. Scully's Nepal gathering differs considerably;—calyx glabrescent all the teeth with ovate expanded tips, corolla lip 3 times as large as in VAR. *typica* margin entire lobes orbicular, galea narrower than tube. The greatest difference is in the much larger lip; perhaps VAR. *heteroglossa* should be considered a species distinct from *P. Oederi* with the Nepal plant as a definite variety of this new species.

65. (—). P. PRAINIANA Maxim.

Erect strict stout hirsute stem leafy simple, leaves oblong linear sessile deeply pinnatifid segments oblong acute deeply irregularly serrate, bracts linear oblong serrulate at apex, flowers densely spiked, calyx campanulate hirsute, corolla tube slightly exceeding calyx, lip 3-fid lobes obovate equal margins ciliate, galea sparsely hairy navicular beakless, stamens inserted in middle of tube filaments glabrous. *P. Prainiana* Maxim., Mel. Biol. xii, 844, t. 3, f. 66.

EASTERN HIMALAYA: Chumbi, at Lu-ma-poo, (Dr. King's collector!).

Stem 30-40 cm., upper bracts shorter than flowers, calyx 16 mm. 5-toothed upper tooth entire deltoid the others lanceolate serrate, corolla yellow tube 17 mm., galea rounded in front hiant, ovary ovoid, stigma exserted; capsule not seen.

Repeats habit and foliage of *P. Clarkei*. Is nearly allied to *P. rudis* Maxim. and was originally distributed from Calcutta under that name; it is, however, as Mr. Maximowicz points out, perfectly distinct.

66. (26). P. PERROTTETII Benth.; Maxim., Mel. Biol. xii, t. 1. f. 1.

67. (—). P. CORYMBOSA Prain.

Stems stoutish short irregularly angular or flattened 2-3 fariously hairy branching, leaves petioled pubescent fleshy oblong acute narrowed at the base crenate lobes serrate, bracts sessile, flowers capitate and very shortly pedicelled at apices of stem and branches, calyx oblong pubescent fleshy, corolla tube twice as long as calyx slightly expanded above, lip 3-fid lobes oblong equal, galea hardly inflated widely arcuately curved and scarcely beaked, stamens inserted opposite top of ovary filaments glabrous. *P. corymbosa* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

BURMA: Shan Hills, Pwehla and Tamakan, 4000 feet, (Collett!); Maymyo Hill, 4000 feet, (Dr. King's collector!).

Stems 10-15 cm., branches axillary subcorymbose, roots fibrous, bracts wide-based serrate crenate ½ longer than calyx, calyx 11 mm. deeply 2-fid, ½ cleft in front teeth ovate crested tube densely pubescent externally and reticulated between the nerves within, corolla

tube white 18-24 mm., lip white with pink margin, galea rose-pink, ovary ovate lanceolate, stigma exserted.

Evidently nearly allied to *P. crenata* Maxim. which differs in having smaller flowers (22 mm. in place of 35-38 mm.), calyx not cleft both lobes 2-dentate and not reticulated internally, galea distinctly beaked, lip with ciliate margin, and anterior filaments bearded.

68. (—). P. Colletti Prain.

Very tall stems purpurascent pubescent terete rigid strict sparingly fastigiately branched towards apex, leaves and bracts coriaceous subscabrid ovate acute sessile crenulate serrate, flowers axillary sessile densely spiked, calyx coriaceous oblong densely pilose deeply 2-fid, corolla tube exceeding calyx expanded above glandular ciliate internally, lip widely stipitate 3-fid lobes orbicular equal, galea externally furfuraceous arcuately curved with short truncate beak emarginate at apex, stamens inserted near base of tube filaments rufous villous at insertion, glabrous above. *P. Collettii* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

Burma: Shan hills, Koni, 4000 feet, and Toungyi, 5000 feet, (Collett !).

Stems 120 cm., rootstock stout horizontal, bracts longer than calyx, calyx 14 mm. $\frac{1}{2}$ cleft in front, $\frac{1}{3}$ behind, segments wide below, lanceolate above, tips obtuse entire, corolla purple tube 16 mm. ovary lanceolate acuminate, stigma exserted.

A very striking species with considerable affinity to *P. zeylanica* but with galea larger in proportion to tube and very different foliage and habit.

69. (37). P. zeylanica Benth.; Maxim., Mel. Biol. xii, t. 3, f. 45.

Insufficiently represented.

70. (—). Pedicularis sp. with alternate leaves.

Manipur: Sirohifurar, (Watt !).

In leaf only; certainly not the same as any in the above list; seems a member of the section "Siphonanthae," and is possibly conspecific with one or other of the Yunnan species of that section.

[Mr. Maximowicz in a letter received since the above was written says of this plant that it "looks like a *Siphonantha* or (less so) a *Comosa*." He does not recognise in it any of the Yunnan species (of which he has given full descriptions in Mel. Biol. xii); it should therefore be a species yet to be described.]

XVI.—*Natural-History Notes from H. M. Indian Marine Survey Steamer* 'Investigator,' *Commander* Alfred Carpenter, R. N., D. S. O., *commanding.*—No. 10. *List of the* Pleuronectidæ *obtained in the Bay of Bengal in* 1888 *and* 1889, *with descriptions of new and rare species.*—*By* Alfred Alcock, M. B. (Aber.), *Surgeon-Naturalist to the Marine Survey.*

[Received and Read August 9th, 1889.]

(With Plates XVI.—XVIII.)

Contents.

§ 1. Introduction.
§ 2. List, with Descriptions, of the Shallow-Water Forms obtained during Season 1888-89.
§ 3. List, with Descriptions, of the Shallow-Water Forms obtained during Seasons previous to 1888-89.
§ 4. Descriptions of the Deep-Sea Forms obtained from Commencement of Survey to Date.

§ 1. *Introduction.*

This paper gives merely a list of the *Pleuronectidæ* obtained by the trawl and dredge in the Bay of Bengal during two seasons' work of H. M. I. M. Survey Steamer 'Investigator,' with descriptions of new and rare species. Complete synonomies are not given, mainly because the systematic exploration of the Bay can only be regarded as begun, and it would be premature to catalogue any one group until the whole basin has been more thoroughly explored.

This initial list contains the names of 29 species, of which 11 appear to be new to science, 3 are rare species not before met with in Indian waters, while the remaining 15 are well-known forms.

Again, of these 29 species, 23 are from the Orissa coast and the Ganjam coast north of Gopalpur, 3 are from the deeper open waters of the northern end of the Bay, while 2 are from the east coast of Ceylon, and 1 from Cocanada. These last 6 species are the fruit of occasional dredgings, so that we are left with 23 species representing four months regular trawling off the Orissa coast, or rather off the eastern coast of the peninsula between False Point on the north and Gopalpur on the south—a region nearly corresponding with the debouchement of the Máhánaddi Delta.

The physical features here are those of all Indian deltas where the land is making precarious advances on a shoaling muddy sea. Low-lying wastes of drifting sand alternate with still lower-lying estuarine swamps; the coast line presents the unbroken level of a recently formed

alluvium; the bed of the sea is an almost imperceptible slope of fine sand and mud, and the more or less turbid waters are consequently so shallow that the twenty-fathom line is distant from five to thirteen miles from shore, while the hundred-fathom line ranges from fifteen to twenty-two miles, as was determined by the 'Investigator' in her recent survey. Towards the south the sea deepens, and the bottom becomes more sandy.

The waters of this region swarm with crustaceans and fishes. *Penæidæ*, *Paguridæ*, and all the families of the Brachyura exist in the greatest abundance, while the surface waters are crowded with the lower crustacea and with crustacean larvæ. The commonest fishes are *Sciæna*, *Kurtus*, *Polynemus*, *Equula*, *Arius*, *Pellona*; *Carcharias Scyllium*, *Trygon*; and, among the Pleuronectids, *Pseudorhombus* and *Cynoglossus*.

§ 2. *List, with Descriptions, of the Shallow-Water Fishes obtained (in the above region) during season* 1888-89.

1. Psettodes erumei, (Bloch).

Günther, Catalogue, iv, 402; Day, Fishes of India, p. 422, pl. xci, fig. 4.

Met with from False Point to Ganjam, from 10 to 23 fathoms.

2. Arnoglossus macrolophus, n. sp., Pl. XVIII, Fig. 2.

D. 88-90. A. 67. L. Lat. 55.

Body rather elongate, its height being one-third of the total length. The length of the head is contained nearly $4\frac{1}{2}$ times in the total, and is equal to its height. The lower jaw projects slightly. The snout is obtuse, almost as long as the eye, and excavated in front of the upper eye.

Eyes on the left side, large, their diameter being contained nearly $3\frac{3}{4}$ times in the length of the head. A large patent nostril in the excavation of the snout above the upper eye; and two in front of the interorbital space, the anterior being valved. Cleft of mouth very oblique. The length of the maxilla is contained $2\frac{1}{2}$ times in the length of the head. A single row of small sharp close set uniform teeth in each jaw. The head of the vomer is very prominent. The tongue is styliform. Gill-cleft very wide: the margin of the operculum forms a semicircle. Gill-rakers distant, short, slender, and without any serrations. Integument covered with small scales, strongly and sharply ctenoid on the coloured, cycloid, thin, and excessively deciduous on the blind side. The scales invest the base of the caudal and the lower third of the rays of the vertical fins, at least on the coloured side.

BOTANIC GARDEN CALCUTTA

Lateral line with a semi-circular curve above the pectoral. *Fins.* The dorsal fin begins in front of the anterior nostril and extends exactly up to the base of the caudal: its first six rays are prolonged, the longest being more than half the total length of the body. The anal is separated from the ventral by a median double-toothed spine, and extends exactly up to the base of the caudal: its rays are similar to the posterior rays of the dorsal. The caudal consists of 17 branched rays, of which the longest are one-sixth the total length of the body: it is obtusely pointed. The pectoral is much more developed on the coloured side, where it is as long as the head exclusive of the snout, and consists of 9 rays: the right pectoral is one-third less than the left in length, and consists of 6 rays. The ventrals are both well developed, and both coloured: the left has 6 rays arranged in a line from the throat to the anal, the right is of the usual form.

Colours in life, dull smoky brown with a circumferential row of ill-defined dark blotches just inside the vertical fins, and others along the lateral line. Both ventrals nearly black. Coloured pectoral with a transverse black band in its posterior half.

Total length $3\frac{5}{16}$ inches.

Locality of capture, 5 miles south of Ganjam in 25 fathoms, on a clean sandy bottom. Only one specimen.

3. Brachypleura xanthosticta, n. sp., Pl. XVII, Fig. 3.

B. 6. D. 68-69. A. 44-46. L. lat. 30.

Body rather elongate, its height being one-third of the total length. The length of the head is one-fourth of the total and equal to its height. The lower jaw projects and forms the tip of the snout, and there is a sharp knob at the symphysis. The snout is pointed and is as long as the eye. Eyes on the right side, large, being one-fourth of the head-length in diameter; they are separated by a sharp ridge; the upper is in advance and is very oblique. Nostrils in front of the interorbital space, the anterior being valved: on the left side they are very inconspicuous and are placed almost on the dorsal profile. Mouth wide and forming an almost vertical arch: the maxilla extends behind the level of the lower mid-orbit and is slightly over half the length of the head. Numerous close-set, pointed, conical, curved teeth in both jaws and on the strongly projecting head of the vomer: those in the premaxilla are arranged in a double series anteriorly, and *those in the lower jaw are in a double series throughout*, the inner row being incurved, while at the symphysis they are in a thick patch. Gill-cleft very wide. Margin of the opercle trilobed. Gill-rakers few, distant, lanceolate and coarsely serrated on their upper surface. Integument covered with large, thin

deciduous scales, which are finely ctenoid on the coloured, cycloid on the blind side. *Lateral line with a wide curve above the pectoral. Fins.* The dorsal begins almost on the upper lip of the blind-side, below the nostrils on that side: the 4th to the 10th rays are elongated *in the male only*, the 5th to the 7th being nearly half the total length of the body. The anal arises some distance behind the ventrals, its rays are rather less than one-third the body height in length. All the rays of the vertical fins are simple. The caudal has 16 rays, its shape is rhomboidal, and its length one-fifth of the total. The pectorals are set on very obliquely on the coloured and almost horizontally on the blind side: they have 11 rays, and the right (coloured) is rather longer than the left and equal to the caudal. The ventrals have 6 rays; the left arises behind the right. *Colours during life*—body and fins on right side a light sandy brown with numerous longitudinal rows of large bright-orange spots. *Internal anatomy*: there is a simple saccular stomach; the intestine is short and has three long diverticula arising at different levels behind the pylorus.

The length ranges from $3\frac{3}{4}$ in. to $4\frac{3}{8}$ in.

Captured 28 miles S. W. of Puri, and 5 miles S. of Ganjam, on both occasions in 25 fathoms and on a clean sandy bottom.

This fish goes beyond the confines of the genus *Brachypleura* (Günther, Cat. iv. 419) in the double row of teeth in the lower jaw, and in the curved lateral line; but one hesitates to construct a new genus on these characters, when there are so many other important points of agreement.

4. Pseudorhombus russellii, (J. E. Gray).

Günther, Cat. iv. 424; *Pseudorhombus arsius*, Day, Fishes of India, p. 423, but not *Pleuronectes arsius* of Hamilton-Buchanan's description, Fishes of Ganges, pp. 128 and 373.

Met with commonly near river-mouths and in estuaries.

5. Pseudorhombus javanicus, Bleeker.

Günther, Cat. iv. 427; Day, Fishes of India, p. 424.

Met with every where from 7 to 23 fathoms. The specimens taken from hard sand are more brightly coloured than those from muddy bottoms.

6. Pseudorhombus malayanus, Bleeker.

Bleeker, Atlas Ichthyologique, tom. vi, pp. 7-8. pl. ccxxxiv, fig 2.

Bleeker distinguishes this species from *P. russellii* by its scales, which are ctenoid on both sides, and by the concavity of the lower

border of the preopercle. But for these characters it is impossible to distinguish the one species from the other, even by colour. Found in the more shallow and turbid waters.

7. Pseudorhombus triocellatus, (Bloch).

Günther, Cat. iv, 428; Day, Fishes, 424; Bleeker, Atl. Ichth. tom. vi, p. 29, pl. ccxxxix, fig. 1.

This is a very common species. It was taken everywhere usually in 7 to 8 fathoms and on sandy bottoms, where its coloration is much more brilliant than in turbid waters.

8. Rhomboidichthys azureus, n. sp., Pl. XVI, Fig. 3.

D. 84. A. 64. L. l. circ. 55.

This species approaches very closely to the description of *R. leopardinus* (Günther, Cat. iv, 434), but its scales are much less numerous —55 rows instead of 80,—and they are remarkably deciduous.

Body oval, its height being a little over half its length, without the caudal. The head is short and deep, with the anterior profile concave between the eyes, its length $3\frac{3}{4}$ in the total without the caudal, and considerably less than its height. The snout projects conspicuously, its length is hardly half the diameter of the eye, and in the male it bears a short horizontal horn. The length of the eye is two-sevenths of the length of the head; the inner orbital margins are very sharp and in the male knobbed. The lower eye is nearly half a length in advance. The interorbital space is deeply concave, scaly only in its posterior half, and in the male is nearly one diameter, in the female half a diameter of the eye in width.

The nostrils on the blind side are very minute.

The cleft of the mouth is narrow and almost vertical; the length of the maxilla is contained $3\frac{1}{4}$ times in the head-length. Teeth in a single series in the upper and a double series in the lower jaw; they are close-set, sharp and uniform like the teeth of a comb Gill-rakers few and distant, on the first arch there are only six. Integument covered with delicate deciduous scales, which are ctenoid on the coloured, cycloid on the blind side. Lateral line with very prominent tubes, and with a strong curve above the pectoral. *Fins.* Dorsal with its longest rays in the anterior part of its last half, where they equal nearly half the head-length. A projection of the humeral arch forms a sharp spine in front of the anal fin.

Length of caudal $5\frac{3}{4}$ in the total; there are 17 rays. The pectoral on the coloured side is the more developed, having 10 rays, while the right has only 9. The left ventral is much longer and broader than the

right, and occupies the whole median line from the throat to the anal fin: each has six rays. *Colours during life*—dull smoky brown with a series of darker blotches round the coloured side inside the vertical fins. Vertical fins with dark speckles. The male with ten or eleven small brilliant azure spots arranged in two rows on the snout and in front of the interorbital space. Length: male $3\frac{1}{4}$ inches, females $3\frac{3}{8}$ to $4\frac{5}{16}$ inches.

Met with in 7 to 13 fathoms, from 8 to 20 miles S. W. of Puri on muddy bottoms, and once on clean sand.

The fish next to be described might, at first sight, be taken for the immature form of some larger *Pleuronectid*. But after due consideration, and after finding a second very similar yet quite distinct form, I venture to describe both as new, and to provisionally unite their common characters into the diagnosis of a new genus, for which the name *Scianectes*, in allusion to the delicate transparency of the tissues, is suggested.

SCIANECTES, gen. nov.

Jaws and dentition equal on both sides. Dorsal fin commencing before the eye, on the snout. Body pyriform and delicate. Mouth small, the length of the maxillary being less than one-third of the length of the head. Teeth minute in a single series in both jaws. Vomerine teeth. Eyes on the left side and close together. All the rays of the vertical fins simple, elongated, weak, and filamentous. Scales minute, membranous, and deciduous. Lateral line with a curve above the pectoral. Gill-membranes united at the throat. Gill-rakers distant and short.

9. SCIANECTES LOPHOPTERA, n. sp, Pl. XVI, Fig. 2.

B. 5? D. 86-88. A. 66.

Body pyriform, transparent and delicate, its height being contained $2\frac{4}{5}$ in the total, without the caudal. Head short, its length being $3\frac{1}{3}$ in the total without the caudal, and three-fourths of its height. Snout obtuse, barely equal to the eye in length. Eyes on the left side situated in the extreme anterior part of the head, separated from each other by a longitudinally grooved ridge; the lower slightly in advance; their diameter one-fifth of the head-length. The cleft of the mouth forms an almost vertical arch. The length of the maxilla is one-fourth the length of the head. Minute teeth in a row in both jaws, and on the vomer. Gill-cleft very wide. Opercle almost membranous. Gill-rakers in the form of distant delicate spines.

Integument covered with minute, delicate, excessively deciduous scales. Lateral line salient, with a semicircular curve above the pectoral,

and continued on to the end of the caudal. Vertical fins of striking height, extremely weak and slender. The longest dorsal rays, which are near the middle of the fin are equal to the head-length in height, and the longest anal rays are slightly longer. The interneural and interhæmal spines are very elongate. The pectoral is much more developed on the coloured side, where if laid forward it reaches to the vertical from the hinder edge of the upper (posterior) orbit.

The ventrals are distinct from the anal: the left is more expanded than the right.

The caudal is long and pointed, being contained five times in the total: it has 17 rays.

Colours in life. Transparent white with minute black dots. Three narrow black lines along the body, one of which is the lateral line, while the others follow the lines of origin of the interneural and interhæmal spines respectively. Vertical fins black with irregular milk-white blotches. Left ventral black. Left pectoral grey tipped with black. On the right side, owing to the transparency of the body, the three black lines of the coloured side shew through. Length, $3\frac{1}{2}$ inches.

Two specimens were taken in 68 fathoms 16 miles E. of the mouth of the Devi river in the Máhánaddi delta, from a soft bottom of very fine sand. The second species of Scianectes will be described among the fishes from a deeper and more open part of the Bay.

10. Solea ovata, Richardson.

Günther, Cat. iv, 472; Day, Fishes, p. 426, pl. xciii, fig. 1.

Met with everywhere, more often on a soft bottom of fine sand and mud, but also on hard sand.

11. Solea oculus, n. sp., Pl. XVIII, Fig. 3.

D. 98. A. 65. L. l. 100-102.

This species resembles *Solea hartzfeldii* (Günther, Cat. iv. 471, and Bleeker, Atlas. Ichth. tom. vi, p. 25, pl. ccxlvi, fig. 1,), from which it differs in the form and arrangement of the dorsal and ventral fins, in the proportions of the head to the body, and in coloration.

Body ovate, its height one-third of the total length. Head with a symmetrically rounded profile, its height being a little greater than its length, which is nearly $4\frac{1}{2}$ in the total. The snout forms a rostral hook, which curves round behind the symphysis of the lower jaw, touching the vertical from the front edge of the anterior eye. Eyes situated in the middle of the head, the upper half-way in advance of the lower: their diameter is $6\frac{1}{2}$ in the head-length, and they are about half a diameter apart.

On the coloured side two nostrils in front of the lower eye and nearly on the upper lip, the anterior forming a tube nearly equal to the eye in length, the posterior being a small foramen. On the blind side two nostrils, of which the anterior is perforated in a large fleshy sucker-like papilla.

The cleft of the mouth forms a semicircle with the convexity forwards and upwards, its angle reaches the vertical from the middle of the lower eye. Small villiform teeth in the jaws on the blind side. Gill-cleft narrow. No fringe beneath the lower jaw. Integument invested with small scales ctenoid on both sides. The lateral line is straight on the coloured side, but on the blind side it has a Y-shaped break just behind the gill-cleft.

Fins. The dorsal extends from the tip of the rostral hook to the base of the caudal, and the anal is continuous with the right ventral, the united fins extending from the point where the rostral hook opposes the lower jaw to the base of the caudal. The basal fourth of the vertical fins, both rays and interradial membrane, is regularly and evenly invested, on the coloured side only, with rows of small scales.

The caudal has 18 rays; its length is one-eighth of the total. Ventrals with 5 rays: the coloured ventral continuous with the anal, and left ventral connected with its fellow and with the anal by a flap of skin.

Pectorals absent.

Colours during life. Ground colour light brown, intersected by a most elegant network of irregular light olive-green lines forming a somewhat pentagonal pattern. Along the dorsal curve are five large, perfect, and complicated ocelli with light-green centre, brown irides, and light green margins. Four similar ocelli along the ventral curve, and another smaller one at the base of the caudal. A few small incomplete ocelli along the lateral line, and numerous dark brown dots and rings scattered all over the body. Fins transparent grey-green, every fourth or fifth ray uniform dark brown, and the intermediate rays streaked with brown.

Length 4 inches. Two specimens.

Taken in 7 fathoms, from a hard sandy bottom, about 32 miles S. W. of Puri.

12. Synaptura quagga, (Kaup).

Günther, Cat. iv, 485. [*Synaptura zebra* of Day, Fishes of India, p. 430, but not Cantor, nor Bloch's descrip.]

Found all along the coast in 7-10 fathoms.

13. Synaptura cornuta, (Kaup).

Day, Fishes of India, p. 430, pl. xciv, fig. 4. *Aesopia cornuta*, Kaup, Günther, Cat. iv, 487.

Only one specimen was obtained, a female, in 7-8 fathoms.

14. Cynoglossus carpenteri, n. sp., Pl. XVIII, Fig. 1.

D. circ. 100. A. circ. 80. V. 4. C. 10. L. lat. circ. 95.

This species is one of those which has on the left side two nostrils, one of them interorbital, and three lateral lines.

Body tapering acuminately backwards from the gill-opening, the ventral profile bulging strongly just behind the head, and the tail long and slender. The height of the body is nearly $3\frac{1}{2}$ in the total length, and equal to the length of the head. The snout is an obtuse-angled triangle, and is one-third the length of the head. The rostral hook ends behind the symphysis of the lower jaw. The eyes are prominent, in length one-tenth of the head, separated by a concave space narrower than the eye: the upper is nearly half a length in advance. Two nostrils on the coloured side, one in front of the inter-orbit, the other in front of the lower eye, and tubular. Mouth large, its angle is a whole eye-length behind the posterior border of the lower (hinder) orbit and equidistant between the tip of the snout and the gill-opening. Lips not fringed. Tongue very large, completely filling the mouth. The gill-cleft is high. The opercle is conspicuously expanded below and behind, and the branchiostegal rays and membrane extend a considerable distance behind its edge, giving the appearance of a broad fringe. The integument is invested with small strong scales, which on the blind side and anterior half of the coloured side are cycloid, and on the posterior half of the coloured side sharply ctenoid. Three lateral lines on the left side, the middle separated from the upper by 17, and from the lower by 22 rows of scales at the respective points of greatest divergence: none on the right. *Fins:* one ventral united with the anal. The vertical fin-rays are delicate; the longest are nearly equal to the snout in length.

Colours in life. Left side uniform bright chestnut-brown; the fins a brighter red-brown; the caudal in the female specimen black. The whole of the opercle is blue-black, owing apparently to the pigmentation of the gill-membrane, the extension backwards of which beyond the opercle is black. Intestine nearly one-third longer than the body and convoluted, without diverticula. The ovary of the female was enlarged and crowded with eggs $\frac{1}{14}$ of an inch in diameter.

Length of male $6\frac{1}{2}$ inches, of the female $6\frac{3}{4}$ inches.

Two specimens were taken in 68 fathoms, 68 m. E. of the mouth of the Devi river in the Máhánaddi delta, on a soft bottom of very fine sand.

I have named this species after the distinguished officer in charge of the Marine Survey of India, Commander Alfred Carpenter, R. N., D. S. O., the pioneer of scientific hydrography in India.

15. Cynoglossus macrolepidotus, Bleeker.

Günther, Cat. iv, 496; Day, Fishes of India, p. 434, pl. xcvi, fig. 3.

Met with usually on soft and muddy bottoms, in 7 to 10 fathoms, off the central part of the delta, where it is exceedingly common, and grows to a length of one foot.

16. Cynoglossus oligolepis, Bleeker.

Günther, Cat. iv, 496; Day, Fishes of India, p. 433, pl. xcv, fig. 4.

This species was always found with *C. macrolepidotus*, chiefly on soft bottoms, in 7 to 10 fathoms, where it reaches a length of nearly fifteen inches.

17. Cynoglossus quadrilineatus, Bleeker.

Günther, Cat. iv, 497; Day, Fishes of India, p. 435.

Met with by the 'Investigator' only on bottoms of hard sand, in 6 to 10 fathoms, in the southerly part of the region, 15 to 30 miles S. W. of Puri.

18. Cynoglossus lida, Bleeker.

Günther, Cat. iv, 498; Day, Fishes of India, p. 436, pl. xcvii, fig. 3.

A number of specimens were taken on one occasion, with a large number of *C. quadrilineatus*.

19. Cynoglossus intermedius, n. sp. ?

D. 106. A. 85. L. l. 100-103. V. 4. C. 10.

This is a form which has characters similar to those of both *C. lida* and *C. bengalensis*. Only one specimen was taken at the same time with *C. quadrilineatus*, to which also it has a strong superficial resemblance, and with *C. lida*. In appearance it is hardly to be distinguished from the latter, but the ventral fin is united with the anal, the scales are more numerous and less ctenoid, and the head is proportionately longer. In appearance it would not be confounded with the specimens of *C. bengalensis* in the Indian Museum, though the description is not remarkably different In describing it from a single specimen it is not yet intended to establish a new species.

Symmetrical semicircular snout, abruptly pointed tail.

On the left side two lateral lines separated by 14 rows of scales;

and two nostrils, one in front of the interocular space, the other in front of the lower angle of the lower eye. One lateral line on the blind side. Length of head $4\frac{1}{2}$ in the total and a little more than its height. Length of eye $10\frac{1}{2}$ in the head; the upper eye slightly in advance. Interocular space two-thirds the length of the eye in width. The rostral hook ends beneath the eye. The angle of the mouth is in the vertical from the posterior border of the lower orbit and nearer to the gill-opening than to the tip of the snout. Lips not fringed. The length of the snout is $2\frac{1}{3}$ in the head-length. The height of the body is a little over one-fourth of the total length. One ventral fin united with the anal. The height of the vertical fins is one-fifth the height of the body. Scales ctenoid on both sides. Sepia-coloured, each scale with a light centre and with a dark spot near the middle of its posterior margin.

Total length $8\frac{1}{4}$ inches.

In 7 fathoms on a bottom of hard sand 32 miles S. W. of Puri. The specimen is a female.

20. Cynoglossus puncticeps, (Richardson).

Günther, Cat. iv, 500; Day, Fishes of India, p. 437, pl. xcvii, fig. 1.

A single male specimen was taken in 8 fathoms on a soft bottom, off Puri.

21. Cynoglossus brevis, Günther.

Günther, Cat. iv, 500; Day, Fishes of India, p. 437, pl. xcvii, fig. 2.

A single female specimen was taken, on a clean sandy bottom, in 7 to 8 fathoms, off the Chilka Lake bar.

22. Cynoglossus semifasciatus, Day.

Day, Fishes of India, p. 436, pl. xcvii, Fig. 5.

A single specimen was got in 6 to 10 fathoms on a soft bottom, north-east of Puri.

23. Cynoglossus melanopterus, Bleeker.

Günther, Cat. iv. 502. [*Cynoglossus monopus*, Bleeker Atlas Ichth. tom. vi, p. 38, pl. ccxlv, fig. 4.]

Six specimens of a fish which appears to be this species were taken in 7 fathoms, between 30 and 35 miles S. W. of Puri. They were caught in the small hand-dredge, which came up full of grass-like sea-weed. The movements of this fish, when placed in a large tub of water, were singularly rapid, and it is surprising that it should have been caught in the very narrow mouth of a slow-moving dredge. The larger specimens differ from Bleeker's description in the following particulars: (1) the number of transverse rows of scales is over 120; (2) the lateral

lines are separated by 18 to 19 scales at the level of greatest divergence; and (3) the upper lateral line is sinuous.

During life, the eyes of this Cynoglossus almost resemble the stalked eyes of a gastropod mollusk.

There is a simple saccular stomach, and a simple intestine much convoluted, and exceeding in length the total length of the fish.

This completes the list of the Orissa Coast collection.

Here also may be mentioned the following, as its habitat is very similar to that of the Orissa fishes :—

26. PLAGUSIA BILINEATA, (Bloch).

Günther, Cat. iv, 492 : Day, Fishes of India, p. 431.

Taken on a muddy bottom in 4 to 5 fathoms, near the Sacramento shoal, off the Godávari Delta.

§ 3. *List, with Descriptions, of the Shallow Water Forms obtained during Seasons previous to* 1888-89.

24. ARNOGLOSSUS POLYLEPIS, n. sp., Pl. XVI, Fig. 1.

D circ. 82. A. circ. 60. L. l. 90 to 100.

Body oval, its height being a little over half the total length, without the caudal. Length of head a little over one-third the same length; its height greater than its length; its dorsal profile slightly concave in front of the upper eye. Length of the snout not much more than half the length of the eye, which is one-third the length of the head. The lower eye in advance. The interorbital space is a grooved ridge. Nostrils on the coloured side both sub-tubular. Mouth large, the maxilla being two-fifths the length of the head. Teeth small, sharp and uniform, in a single series in both jaws; in the upper jaw close-set like the teeth of a comb; in the lower jaw extending further backwards on the right side.

Gill-rakers rather close; lanceolate.

Integument clothed with very small deciduous scales, which are ctenoid on the coloured, cycloid on the blind side. Lateral line on the coloured side with a strong curve above the pectoral, on the blind side gradually rising without a marked anterior curve. First two rays of the dorsal fin broad and thickened in their basal half, tapering above. The longest dorsal rays, just behind the middle of the fin, are a little more than one-fourth the body height: behind them the rays rapidly shorten, giving the fin an angular outline. The longest anal rays, about the middle of the fin, are two-sevenths of the body height, and the rays behind them diminish in the same way as the posterior dorsal rays. There

is a sharp median pre-anal spine. Left pectoral the more developed, consisting of 8 rays while the right has but six. The left ventral originates in front of the right and is more expanded: both have 6 rays. The caudal has 17 rays, and is $5\frac{1}{2}$ in the total length. Colours in spirit. Olive brown, with numerous small but complete dark rings, a series of which form a ring round the body just inside the vertical fins. Two conspicuous dark ocelli along the straight part of the lateral line, and another on the posterior limb of the curved part.
Fins speckled with black.

Total length $3\frac{5}{16}$ inches. Taken in 34 fathoms off the E. coast of Ceylon.

25. Samaris cristatus, Gray, Pl. XVII, Fig. 4.

Günther, Cat. iv, 420.

D. 80. A. 52. L. lat. 75.

Height of body nearly $2\frac{3}{4}$ in the total, without caudal. Length of head nearly $4\frac{1}{4}$ in the total without the caudal; its height being much greater. Length of snout about half the length of the eye; lower jaw slightly prominent. Eyes large, their length $2\frac{3}{4}$ in the head length; the lower barely in advance; separated from each other by a prominent sharp ridge. Pupil with a semilunar flap from the iris above and below. On the coloured side a long tubular nostril overhangs the upper lip, in front of a simple perforated nostril. Mouth small; its cleft oblique: maxilla one-third the length of the head. Teeth villiform; in several bands in both jaws. Gill-cleft wide. Scales very small, ctenoid on the coloured, cycloid on the blind side. The dorsal fin commences on the snout, its first ray being connected with a flap of coloured skin which passes obliquely across the snout, behind the mouth, on the blind side. The first thirteen rays are elongated, so that, when laid back, they reach in two specimens to the 67th ray, and in one beyond the base of the caudal. These rays are broad and stout. The remaining dorsal rays are slender, those in the posterior fourth being longer than the rest, and equal to half the height of the body. The longest anal rays are equal to, and opposite these. The right pectoral, which consists of four stout rays, is elongate, and equal to the greatest height of the head: it is set on very obliquely. There is no pectoral fin on the left side. Ventrals with 5 rays, those of the right fin elongate, and spatulate at their free ends; the first ray being of nearly equal length with the pectoral. Left ventral well developed, but not prolonged. Caudal with 16 rays, inclined slightly downwards; its length is about one-fifth of the total. Sepia-coloured, in spirit, beautifully mottled with purple-brown and black, in a sinuous ring round the whole side: outside this the

ground colour is lighter. The colours and their arrangement recall the appearance of certain stone-encrusting lichens. Snout white: anterior prolonged dorsal rays black at the base, and pure milk-white throughout their free extent: the rest of the dorsal fin, and the anal, dark sepia with black blotches and a row of small white dots: pectoral black: right ventral striped black and white: left ventral grey tipped with black. The total length of the specimens ranges from 2 to $2\frac{3}{4}$ inches.

Taken in 34 fathoms, off the E. coast of Ceylon.

§ 4. *Descriptions of the Deep-Sea Forms obtained from the Commencement of the Survey to date.*

Three new deep-sea fishes have next to be described, namely, a second species of the new genus *Scianectes*, and two species of the genus *Aphoristia*.

27. Scianectes macrophthalmus, n. sp., Pl. XVI, fig. 4.

B. 6. D. 88. A. 68.

Body pyriform, transparent and very delicate; its height not quite $2\frac{2}{3}$ in the total, without caudal. The length of the head is one-third of the total, without caudal, and the height rather more. The snout is obtuse and half as long as the eye. Eyes on the left side, their diameter $3\frac{2}{5}$ in the length of the head; the lower slightly in advance, and separated from the upper by a downward shelving ridge. Cleft of mouth nearly vertical: the maxilla being $3\frac{1}{2}$ to $3\frac{2}{3}$ in the length of the head. Minute teeth in a row in each jaw, and in a patch on the vomer. Gill-cleft wide; opercles thin; branchiostegal rays prolonged. Gill-rakers distant, lanceolate. Body covered with minute, thin, and very deciduous scales. Lateral line salient: it has a rather shallow curve above the origin of the pectoral, and is continued along the caudal. The dorsal fin commences on the snout; its longest rays are a little more than half the length of the head, and slightly shorter than the longest anal rays. Interneural and interhæmal spines long. A small median pre-anal spine. The pectoral is more developed on the coloured side, where if laid forward it reaches to the middle of the lower (anterior) eye. Ventrals six-rayed; the left more expanded than the right. Caudal long and pointed, with 17 simple rays; its length one-fifth of the total. Colours—left side white, with a few minute black dots. The body is traversed by three narrow black longitudinal lines, one of which is the lateral line, while the others follow respectively the outlines of the tips of the neural and hæmal spines; vertical fins black; left pectoral grey at its base and black in its posterior two-thirds; left ventral black; prolongation of the left branchiostegals and membrane black. Total length $3\frac{1}{8}$ inches. One specimen.

Taken 40 miles S. W. of Akyab, in 100 fathoms.

The two species of *Aphoristia* have certain points in common: both sides of the body are coloured, there are two nostrils on the eye side, the cleft of the mouth is almost horizontal, and the anterior dorsal rays are rather widely separated and inter-connected by membrane only at their bases.

28. Aphoristia gilesii, n. sp., Pl. XVII, Fig. 2.

D. 97-98. A. 83-85. C. 14. V. 4.

Body lanceolate; its greatest height, which is anterior to the vertical middle, is just over one-fourth of the total. The head is much expanded downwards in the opercular region; its length is contained $4\frac{1}{2}$ times in the total, and is $5\frac{2}{3}$ times the length of the snout, the outline of which anteriorly is abruptly truncated.

The snout and jaws are covered with small scales.

The eyes are well within the anterior third of the head, and almost exactly on the same level: their length is nearly one-eighth that of the head. The interocular space is scaly, the scales encroaching on the margins of the eyes. A simple perforated nostril in the anterior part of the interorbit, and a tubular one about half as long as the eye midway between the lower eye and the tip of the snout. No nostrils on the blind side. Cleft of mouth horizontal, with a slight down-curve at its angle, which is in the vertical from the middle of the eye.

Dentition feeble; on the blind side only. Gill-cleft narrow and low: branchiostegal rays and membrane prolonged downwards and backwards considerably beyond the edge of the operculum. Scales of moderate size, ctenoid on both sides, and so deciduous that their number could not be correctly counted. The dorsal fin begins over the middle of the upper eye: its first eight rays are separated by wide interspaces, and (apparently) connected by membrane only at their bases: the longest rays are near the middle of the fin and are contained $2\frac{2}{7}$ times in the body height. The distance of the origin of the anal from the snout is equal to the body-height: the longest anal rays are slightly longer than the longest dorsal.

The ventral arises between the gill-covers, and is separated from the origin of the anal by little more than an eye-length. Length of caudal $8\frac{2}{3}$ in the total.

Both sides are coloured, recorded in life as "Earth colour with parallel brown lines." In spirit, it is yellow with numerous fins parallel brown lines extending along the body from head to caudal: fins brown. Total length, $4\frac{3}{4}$ inches. One specimen.

Locality. Lat 20.° 17′ N. Long 88.° 51′ E. 193 fathoms. I have

named this species after Dr. G. M. Giles, who, in the 'Investigator,' has added so many deep-sea fishes to the Indian collection.

29. Aphoristia wood-masoni, n. sp., Pl. XVII, Fig. 1.

B. 5. D. 90. A. 78. C. 14. V. 4. L. lat. circ. 85. L. tr. circ. 34.

Body lanceolate; its greatest height, which is just behind the vertical middle, is $4\frac{1}{3}$ in the total. Head much expanded in the opercular region; its length $5\frac{5}{7}$ in the total, and $4\frac{2}{3}$ times the length of the snout, which terminates in an abrupt straight edge.

Snout and jaws covered with small scales. Eyes situated just within the anterior third of the head; the upper very slightly in advance; their length one-seventh that of the head.

The interocular space is scaly, with two rows of scales, which encroach on the margins of the eyes. There is a simple nostril between the eyes anteriorly, and a tubular nostril as long as the eye midway between the lower eye and the tip of the snout. Cleft of mouth horizontal, with a slight down-curve at its angle, which hardly passes behind the vertical from the front edge of the lower eye. Dentition feeble, and more developed on the blind side. Gill-cleft low: branchiostegal rays and membrane prolonged beyond the opercular edge. Scales ctenoid on both sides: rather deciduous. The dorsal fin begins above the middle of the upper eye: its first two rays are approximated, but the next seven are separated by wide interspaces and connected together only in their lower part: the longest dorsal rays, near the middle of the fin, are contained $3\frac{2}{3}$ times in the body height, and the longest anal rays are slightly longer. The distance of the origin of the anal from the snout is equal to the body-height. The ventral is separated from the anal by almost its own length. Length of the caudal one-ninth of the total. Colours in spirit, bluish-grey on both sides, with a broad blue-black band all round each side, occupying the whole extent and breadth of the regions of the inter-neural and interhæmal spines, and very numerous parallel black lines extending from snout to caudal through the middle of each row of scales: opercle black: fins black, except the caudal which is grey. Total length 5 inches. One specimen.

Dredged $7\frac{1}{2}$ miles E. of North Cinque Island (Andamans), in 490 fathoms, by Professor Wood-Mason on board the 'Investigator.'

EXPLANATION OF THE PLATES.

Plate XVI.

Fig. 1. *Arnoglossus polylepis*, n. sp.
Fig. 2. *Scianectes lophoptera*, n. sp.
Fig. 3. *Rhomboidichthys azureus*, n. sp., female.
Fig. 4. *Scianectes macrophthalmus*, n. sp.

Plate XVII.

Fig. 1. *Aphoristia wood-masoni*, n. sp.
Fig. 2. *Aphoristia gilesii*, n. sp.
Fig. 3. *Brachypleura xanthosticta*, n. sp., male.
Fig. 4. *Samaris cristatus*, Gray.

Plate XVIII.

Fig. 1. *Cynoglossus carpenteri*, n. sp., female.
Fig. 2. *Arnoglossus macrolophus*, n. sp.
Fig. 3. *Solea oculus*, n. sp.

XVII.—*Natural History Notes from H. M.'s Indian Marine Survey Steamer* 'Investigator,' *Commander*, Alfred Carpenter, R. N., D. S. O., *Commanding. No.* 12. *Descriptions of some new and rare species of Fishes from the Bay of Bengal, obtained during the season of* 1888-89.—*By* Alfred Alcock, M. B. (Aber.), *Surgeon-Naturalist to the Survey.*

[Received Sept. 13th ;—Read November 6th, 1889.]

(With Plate XXII.)

The fishes described in this paper were taken by the trawl during the last season's survey work on the East Coast of the peninsula. There are in all ten species, of which seven are new to science, while the remaining three appear for the first time as Indian fishes.

One only is a strictly shore fish : the others were obtained in depths ranging from 25 to 68 fathoms, most of them in the greater depth.

The deep-sea forms met with by the 'Investigator' will be considered separately ; but from this present account of the produce of a few occasional hauls of the trawl, made, when time permitted, in the course of delimiting the hundred-fathom line, it will be seen how rich and how full of promise are the extra-littoral waters of India.

Though the fishes now described are from the off waters of the East Coast, some of them were met with in other localities, and these localities are also recorded.

Family Percidæ.

An *Apogon*-like fish, near *Chilodipterus*, *Pomatomus*, and *Scombrops*, its closest resemblance being to the last, was taken on two occasions in moderate depths. It is distinguished from *Scombrops* most conspicuously by the structure of the spinous dorsal, and of the preoperculum. In recognition of its nearest alliance I propose the name *Parascombrops*, diagnosed by the following characters.

Seven branchiostegals. Jaws with canines : villiform teeth on palate and vomer : tongue smooth. Two separate dorsal fins, the first with 9 spines. Anal with 2 spines. Operculum naked, with weak spines. Preoperculum with a double serrated edge. Scales large and deciduous. Pseudobranchiæ.

Parascombrops pellucidus, g. et sp. nov., Pl. XXII, Fig. 1.

B. 7. D. 9/$\frac{1}{9}$. A. $\frac{2}{9}$. L. lat. circ. 28. Cæc. pyl. 5. P. 17. V. 1/5. C. 24.

Body rather elongate and compressed ; its height a little more than one-fourth the total. Head compressed and somewhat angular, with

well-developed muciferous cavities: its length (excluding a membranous extension backwards of the operculum) $3\frac{1}{2}$ in the total. The lower-jaw is strongly prominent, with a strong sub-symphysial knob, which forms the tip of the snout. Preoperculum with a double border: the outer border recurved at its angle and strongly serrated there and along its horizontal limb; the inner with three small spines at its angle. Operculum naked, with two weak spines; its angle has a membranous extension backwards to the level of the anterior third of the pectoral fin. Snout, with the projecting lower jaw, as long as the eye, which is $3\frac{1}{2}$ in the head as above limited. Interorbital space narrower than the eye, nearly flat from side to side, and marked with obliquely converging lines which bound the muciferous cavities of the skull. Nostrils large.

Cleft of mouth very oblique, and wide: the mandibles emarginate on either side of the symphysis. Villiform teeth in premaxillæ, vomer, palatines, and front of mandibles: in addition, a pair of strong fang-like canines anteriorly in the upper jaw, and four large and five or six small upstanding recurved teeth on each side of the lower, and a single similar tooth of medium size near the symphysis. Gill-cleft wide: gill-rakers close-set, numerous, and nearly half as long as the eye. Scales excessively deciduous: one from the abdomen is $\frac{3}{16}$ of an inch in diameter, with a vertical, crenated posterior edge. The dorsal fins are separated by an interspace equal to three-fourths the length of the eye: the spinous is considerably the higher: the 1st spine is small, the 3rd is the longest and is equal to two-thirds of the body height, the 4th is nearly as long. The 1st anal spine is short, the 2nd as long as the eye. Caudal forked almost to its base, forming two distinct lobes. Pectoral delicate; its length equals the distance from the tip of the snout to the anterior pre-opercular edge. Ventral long, reaching two-thirds of the distance to the anal: its spine is long, having its outer edge set-close with small uniform recurved spines. Colours in life, transparent light brown suffused with the pink reflex of the great vessels: opercular and visceral regions like burnished silver.

Total length $3\frac{5}{16}$ inches. The intestine is long and much coiled; and there are five very large pyloric cæca.

Taken in 68 fathoms 16 miles east of the Devi mouth of the Máhánaddi delta. A similar sized female specimen with ripe ovaries was taken in 65 fathoms (temperature 62° Fahr.) in Lat. 20° 18′ N., Long. 90° 50′ E.

Family Scorpænidæ.

Two species of *Sebastes* were obtained in less depths than the above. One of them appears to be *Sebastes serrulatus*, (Richardson); and I venture to describe it under that name.

SEBASTES SERRULATUS. Pl. XXII, Fig. 2.

Richardson, Report on the Ichthyology of the Seas of China and Japan, p. 215; Günther, Cat. ii., 106.

D. 12/$\frac{1}{5}$. A.$\frac{3}{5}$. L. lat. circ. 45; P. 15. V. 1/5. C. 3/14/3.

Body compressed; its height $3\frac{1}{8}$ in the total, and equal to the length of the head. Head uniformly scaly, with all its crests low and crenated. Preorbital edge crenate; preopercular border dentate; operculum with a single weak spinous point. The occipital and temporal regions are traversed each by a rugose ridge; and the cheek is crossed, from preorbital to pre-opercular angle, by a broad double-crested crenate ridge. Snout deep with a narrow excavation between the premaxillæ: its length is equal to that of the eye, which is $3\frac{3}{4}$ in the head-length. The interorbital space is a deep scaly furrow ending anteriorly in a pit. The supraorbital ridge is three crested, the edge of each crest being crenated. Cleft of mouth very oblique. The maxilla reaches beyond the level of the middle of the eye; its hinder expanded end is scaly, and its anterior two-thirds has a median longitudinal upstanding serrated crest.

Each limb of the lower jaw is traversed by three parallel serrated crests with scaly interspaces. Tongue free. Villiform teeth in the jaws and on the projecting head of the vomer: none on the palate. Gill-opening wide: the last gill-cleft is reduced to a small foramen. Scales very thick, of moderate size, bluntly-ctenoid on the back and sides, cycloid on the abdomen. The first two and the third and fourth dorsal spines are isolated: the first is short; the third, fourth, and fifth are of equal length—two-fifths of the head. The soft dorsal is separated from the spinous by a deep notch; its middle rays are half the length of the head; its last ray is double. The 3rd anal spine is the longest and strongest. The length of the caudal is a little more than one-fourth the total. The pectoral is broad and long with a scaly base: it reaches as far as the posterior edge of the base of the anal. The ventral rays are equal in length to the anal. Colours in life, bright scarlet, with a series of five indefinite transverse red-brown bands not reaching the abdomen: a large iridescent dark-blue circular patch on the operculum: pectoral rays bright yellow: irregular rows of dark brown blotches on the fins. Length, $4\frac{1}{2}$ inches.

One specimen taken off Ganjam in 23 fathoms, on a soft bottom.

SEBASTES MUCIPARUS, sp. n., Pl. XXII, Fig. 3.

B. 7. D. 12/$\frac{1}{5}$. A.$\frac{3}{5}$. L. lat. 70. P. 19. V. 1/5. C. 2/16/1.

Height of body $3\frac{3}{4}$, length of head about 3, in the total. Snout sharp, as long as the eye, which is $3\frac{3}{4}$ in the head-length; with a wide

inter-maxillary notch, into which the knobbed symphysis of the lower jaw fits. A pair of upstanding nasal spines, and a pair of short nasal filaments. The pre-orbital margin has four spiny points; the preoperecular margin four sharp spines and a short filament; and the operculum two diverging bony stays ending in flat spines. The interorbital space narrows in the middle, where its width is only half an eye-length; along its floor is a median groove with serrated edges. The supra-orbital ridge is sharp and salient, with four large reverted spines, and with a short supra-ocular filament below. Two sharp reverted spines, one behind the other, in the occipital region; and a row of three in the temporal region. A strong ridge, with six similar spines, extends across the cheek. Cleft of mouth oblique; the maxilla, which is naked, reaches the vertical from the hinder margin of the orbit. Villiform teeth in both jaws and on the very strongly projecting head of the vomer: none on the palate. Tongue free. A large muciferous canal, with several distant large circular openings, extends along the free margin of the preoperculum and the limb of the lower jaw up to the symphysis. Gill-opening wide. One strong humeral spine.

Scales ctenoid; small, and becoming very minute on the head and abdomen. The lateral line shows as 22 double keel-like spines. 1st dorsal spine very short; the 4th and 5th are the longest and strongest—equal to $\frac{5}{12}$ the body height in length: the middle rays of the soft dorsal are equal to half the body height. 1st anal spine very short, the 2nd stout, the 3rd the longest, but slender. The length of the caudal is about $4\frac{1}{3}$ in the total: that of the pectoral is a little greater than the body height. The ventral spine is very strong. Colours: body and fins bright red: a series of four transverse broad dark bands across the back and sides, and irregular rows of dark-red and brown spots on the fins: a black blotch in the posterior part of the spinous dorsal. Total length, $3\frac{3}{4}$ inches.

Captured 26 miles N. by E. of Gopalpur in 45 fathoms: bottom mud.

One specimen.

MINOUS INERMIS, sp. n., Pl. XXII, Fig. 4.

B. 7. D. $\frac{1}{12}$. A. $\frac{3}{10}$. P. 11/1. V. 1/5 C. 13.

Distinguished by feeble armature of head, and flexible spines.

Head and body much compressed. Height of body about one-fourth, length of head about one-third of the total. Edge of pre-orbital with two short flat diverging spines. Preoperculum with a spine at its angle, and dentations along its lower edge. Operculum with two weak diverg-

ing stays not, or hardly, projecting as spines. A low crenate ridge across the cheek; and a similar ridge across the occipital, and another across the temporal region. Snout as long as the eye, or one-fourth the length of the head. Interocular space narrower than the eye; with a median longitudinal groove; and bounded by thin sharp crenate supra-orbital ridges.

Cleft of mouth wide and oblique. The maxilla is much expanded behind. A barbel about the middle of the limb of the lower jaw. Villiform teeth in the jaws and palatines. Gill-opening wide: the posterior gill-cleft is a small foramen. Gill-rakers close-set and numerous. Integument comparatively thin, without scales: it invests all the fins. The lateral line shows as 17 to 18 tubular papillæ. All the fin-rays are simple. Dorsal fins continuous, the soft portion being the higher: all the spines are weak and flexible, the 1st being very small. Anal spines hidden, the 1st being visible only on reflecting the skin. Caudal about one-fifth of the total length. Pectoral as long as the head: its free filament reaches to the 3rd anal ray. Ventral nearly half as long as pectoral. Colours in life:—rosy red with white and gray mottlings and minute black dots; throat and barbels white; pectoral, ventral, and anal fins edged with black. Total length $2\frac{3}{4}$ inches.

Taken in 70 fathoms, east of the Sacramento shoal on the Godávari coast.

Two specimens; the body of one of them almost completely invested by a colony of hydroid polyps (*Podocoryne*, sp.).

Family Sciænidæ.

Sciæna opiticeps, sp. n.

D. 10/$\frac{1}{27}$. A. $\frac{2}{7}$. L. lat. $\frac{60}{50}$. L. Tr. $\frac{6\text{-}7}{16\text{-}18}$ (usually 16).

P. 20. V. 1/5. C. 17.

Body elongate low and compressed; head long low and pyramidal. The dorsal profile makes a straight ascent, at an angle of about 23°, from the tip of the snout to the first dorsal spine, and thence abruptly makes an almost straight descent, at an angle of about 10° with the horizon, to near the base of the caudal. Height of the body $4\frac{1}{4}$ to $4\frac{1}{3}$, length of head $3\frac{1}{3}$ to $3\frac{2}{3}$, in the total. The height of the head equals its length behind the middle of the orbit. The snout is acutely pointed; its length is equal to a diameter and a half of the eye, which is $5\frac{1}{2}$ in the head-length; not overhanging the mouth. The upper jaw overlaps the lower, so that when the mouth is shut the anterior canine-like teeth project like fangs. The tip of the snout has three large pores, and a free bi-lobed flap of skin with a wide pocket-like pore between the lobes, each

lobe with a similar pore. The interorbital space is nearly flat from side to side, and as broad as the eye is long. Nostrils large. Mouth oblique; the maxilla reaches the vertical from the posterior border of the orbit. Lips thick, and beset with filiform papillæ, the upper lip most thickly so. Villiform teeth in both jaws: in the premaxillæ an outer row of sharp curved teeth of which the anterior four are canine-like; in the mandibles an inner row of distant sharp conical teeth. Preopercular margin finely serrated, with some small spiny teeth at its angle: two weak opercular points. Gill-rakers on the inner edge of first arch bacillate; on the other arches in the form of sharply-toothed double-crowned tubercles. Scales ctenoid, except on snout and infra-orbital. All the dorsal spines weak and flexible; the 1st very small, the 3rd and 4th the highest and equal to nearly half the body height. 1st anal spine almost invisible; the 2nd a little longer than the eye, and not half the length of the rays. Pectorals large and falciform, in length equal to the head without the snout, or to the body height. Ventrals two-thirds the length of the pectorals. Caudal a sharp-pointed wedge; its length $5\frac{1}{2}$ to $5\frac{3}{4}$ in the total. Colours in life: back silvery shot with metallic green and red; belly like burnished silver: a blue blotch on operculum; pectorals yellow, the other fins grey suffused with orange. The stomach with its cæcum occupies nearly the whole length of the abdominal cavity: its walls are very thick, and in addition to the simple tubular follicles of the mucosa, there are some coiled tubular glands in the submucosa. There are six pyloric appendages. The air-bladder is large and strong, with a long terminal spur and 28 lateral arborescent appendages on each side.

The largest specimen is 11 inches long.

Localities: off the Máhánaddi delta in 5 to 9 fathoms; and off the Godávari delta in 4 to 5 fathoms.

Family Trachinidæ.

An *Uranoscopus* which agrees in almost every detail with *Uranoscopus cognatus* (Cantor) was taken at two or three stations near shore; and *Champsodon vorax* (Gthr.) was found three times in deep water.

Uranoscopus cognatus.

Cantor, Catalogue of Malayan Fishes, p. 21, (or J. A. S. B. Oct. 1849, p. 1003); Günther, Cat. ii, 227.

Our specimens have not the pectoral rays tipped with scarlet; and the 15th dorsal ray seems to be only a branch from the base of the 14th. Some have a small supra-ocular filament. There are 24 vertebræ. The

opercular border is completed by a tough membranous extension upwards of the suboperculum. Of the three pairs of spines beneath the lower jaw, the anterior are the sharp ends of the clavicles, and the others are processes from the pubic bones. A specimen dissected had the ovaries much enlarged, the ova being $\frac{1}{35}$ of an inch in diameter.

Length of largest specimen, $5\frac{3}{4}$ inches.

Localities: Off False Point, in 10 fathoms: 28 miles S. W. of Puri, in 25 fathoms: 5 miles south of Ganjam, in 25 fathoms.

Champsodon vorax.

Günther, Proc. Zool. Soc., 1867, p. 102; and Zool. Challenger, vol. i, pt. vi, pp. 52, 43, and 56, pl. xxiii, fig. A, and vol. xxii, p. 49.

Our specimens all have the radial formula D. 5/21, A. 19. There is a pair of sharp diverging spines on each pre-orbital margin, and a similar pair on the lower border of the preoperculum. Two parallel ridges pass from the snout, above each eye, to the occiput, where they diverge to terminate in a sharp bifid spine on the tympanic region. There are transverse rows of small milk-white (in spirit) papillæ on the head and body. Diameter of scales $\frac{1}{60}$ inch, the free edge with four or five sharp teeth about two-thirds the diameter of the scale in length. Colours in life:—dorsum metallic green; belly silvery: spinous dorsal black: caudal with a dark base and black edge.

Total length of the largest specimen 5 inches.

Localities: 16 miles E. of mouth of Devi river in the Máhánaddi delta, in 68 fathoms: [Bay of Bengal, Lat. 20° 18′ N. Long 90° 50′ E., in 65 fathoms, bottom temperature 65° Fahr.: 40 miles S. W. Akyab, in 100 fathoms, bottom temperature 62° Fahr.]. In the 'Investigator' collection from the Malabar coast is a single specimen an inch and a half long, taken in 28 fathoms.

Family Pediculati.

Specimens of a small *Lophius* were taken on one occasion in a moderate depth. It bears a close resemblance to *L. setigerus* (Wahl), but I am unable to identify it with the descriptions of that fish, and propose to regard it as a distinct species.

Lophius indicus, sp. n.

D. 3/3/8. A. 6-7. C. 8. P. 23. V. 5.

Cephalic disk enormous; half the total length, including caudal; its vertex studded with spinous tubercles, and its margin completely fringed with skinny appendages which are continued along the middle

line of the body and tail to the base of the caudal. Long diameter of the eye about one-tenth the head length. The supra-orbital margin prominent, with two large simple spines. Interorbital space concave; two eye-lengths in breadth. Mouth as broad as the disk: the anterior part of its floor, with the tongue and upper surface of the branchial arches, coloured like the body. Teeth sharp and depressable inwards: in two series in the upper, three in the lower jaw, the outer series in both jaws being very small. Two teeth on each side of the vomer, and three or four in a row on the palatines. Gills three. Branchiostegals five. Humeral spine bifid. First dorsal spine slender, naked, and ending in a tuft: the second with a fringed edge: the third bristle-like.

Colours in life: dorsum dark grey reticulated with narrow black vermicular lines: belly and throat colourless. The stomach is a globular sac; the intestine long and coiled; and the two pyloric appendages very large and long. Total length; $1\frac{3}{4}$ inches.

Locality: 5 miles S. of Ganjam, in 25 fathoms, on a clean sandy bottom.

Among the 'Investigator' collections is a specimen of this fish $3\frac{3}{8}$ inches long, taken in 28 fathoms off the Malabar coast. In this specimen the humeral spine has two smaller diverging spines at its base.

Family Cottidæ.

Prionotus alepis, sp. n., Pl. XXII, Fig. 5.

This little fish seems to be very closely allied to *Prionotus birostratus* (Richardson), from which it differs in having a scale-less integument. Before describing it, its points of community with *P. birostratus* may be reviewed, after Jordan and Hughes' scheme (Proc. U. S. Nat. Mus. 1886, vol. ix, pp. 327-338).

Dorsal spines 10, rays 13: anal rays 11. Mouth comparatively large, the maxilla being two-fifths of the head-length, and the mandible extending to the vertical from the front edge of the eye. No cross groove on the top of the head. Free rays of pectoral tapering, and not expanded at the tip. Black patch on spinous dorsal diffused over more than two spines, and not ocellated. Preopercular spine with a distinct smaller one at its base. Gill-rakers slender and tapering.

Pre-orbital produced beyond the snout. Spines on the head well-developed. Pectoral fins truncated.

Description.

D. 10/13. A. 11. P. 12/3. V. 1/5. C. 20.

Head of enormous relative size, being longer (caudal excluded), higher, and wider than the compressed body. Outline of the body triangular, with a crescentic expansion at the base of the caudal. Snout

bill-shaped, with two horizontal, advanced, serrated horns formed by the prolongation of the preorbitals, and with a strong median knob. The eyes, which are rather more than two-sevenths the length of the head, diverge from one another behind, where they are a little more than a diameter apart. The concave interorbital space is bounded by prominent sharp supra-orbital margins, in the middle of which is a broad upstanding spine with recurved tip. On each side of the origin of the spinous dorsal is a sharp serrated occipital spine, as long as the eye. Operculum with a transverse ridge ending in a small spine. Preoperculum with two spines at its angle, one behind the other; and three dentations along its lower border. Mouth large and broad. Minute teeth in jaw, palate, and vomer.

Gill-openings wide: the branchiostegals a good deal uncovered by the operculum, in repose. Gill-rakers close-set; in form like long pointed bristles. No scales. The lateral line, which consists of 16 close-set prominent tubes diminishing in size from before backwards, extends only as far as the vertical from the 1st dorsal ray. The spinous dorsal is higher than the soft; the 2nd, 3rd, and 4th spines are the strongest and highest, being rather over half the height of the head. The anal rays are longer than the soft dorsal rays. The caudal is very large, deeply forked, and half as long as the head. The pectoral reaches as far as the base of the last anal ray; and the first free ray nearly as far. The ventral is four-fifths the length of the pectoral: its spine is very strong and sharp. Colours in life: body light sea-green with two irregular lines of purple-brown blotches along the dorsum: head mottled with tortoise-shell, green, and blue: spinous dorsal light brown, with an oval black patch extending from the third to the sixth spines: soft dorsal transparent grey, traversed by an oblique dark band: anal ventrals and caudal transparent grey, the last with a V-shaped dark band at its base. Pectorals mottled and blotched with green, brown, orange, and yellow: their free filaments rosy red.

Two specimens, the longer of which is $1\frac{7}{16}$ inch.

Taken in 68 fathoms, 16 miles east of the mouth of the Devi river in the Máhánaddi Delta.

The discovery of a *Prionotus* in the Indian Seas is highly interesting.

Family Muræniдæ.

In the same very productive 68 fathoms haul a most curious Muræniд was obtained. In Dr. Günther's scheme (Günther, Cat. viii, 19-20), it would come between the *Myrina* and the *Ophichthyina*, having a dentition similar to some Ophichthyines, with a Myrine tail. Its most peculiar character is found at the tip of the snout, where there is a boss

of bone, formed apparently by an expansion of the premaxillaries, covered with teeth. I do not think this fish can be placed in any hitherto established genus; and I propose for it the generic name *Bathymyrus*, with the following diagnosis (after Dr. Günther's scheme) :—

Branchial openings in the pharynx are wide slits. Tail longer than the trunk. Heart situated immediately behind the gills. Muscular and osseous systems well-developed. Gill-openings separated by an interspace. Nostrils labial. Tongue not entirely free. End of the tail surrounded by the fin. Pectorals well-developed. Dorsal fin commencing immediately behind the gill-opening. Teeth in the jaws uniserial. Inter-maxillary forming the end of the snout.

Bathymyrus echinorhynchus, gen. et sp. n., Pl. XXII, Fig. 6.

Body cylindrical anteriorly, compressed posteriorly. Tail longer than the body by one-half. Head, excluding the branchiostegal region, one-seventh of the total: cylindrical, tapering slightly: the muciferous cavities well-developed. The snout projects beyond the lower jaw; it is as long as the eye, which is one-fifth of the head as above limited; and its tip is formed by a massive upward and lateral expansion, studded with small curved teeth, of the premaxillaries. The nostrils are in contact with the margin of the upper lip; the anterior being tubular and situated near the end of the snout, the posterior being valved and placed in front of the lower border of the eye. The gape of the mouth extends a little behind the vertical from the posterior border of the orbit. There is a single series of close-set, uniform, small sharp teeth in the maxillæ and in the mandibles: a few similar teeth on the vomer at its junction with the premaxillaries, and a cluster of sharp down-curved teeth on the extra-oral rostral expansion of the premaxillaries. The tongue is long and attached up to its tip by an extensible frenum. The gill-openings extend obliquely from the upper edge of the base of the pectoral almost to the middle line of the abdomen, where they are separated by a narrow interspace. The gill-laminæ are long, coarse, and cylindrical. The branchiostegal region is one-third the length of the head. There is an oblique bony stay across the operculum. The integument is scaleless. The pectorals are longer than the greatest body height. The dorsal begins above the origin of the pectorals. The caudal is well-developed, confluent with the vertical fins, and with a truncated tip. Colours in life, transparent grey with numerous minute specks of black.

Total length of the single specimen $10\frac{1}{2}$ inches.

Locality: 16 miles east of the mouth of the Devi river in the Máhánaddi delta in 68 fathoms.

I have to record my deep obligations to Professor Wood-Mason for the advice and help which he has so kindly given me in all my work.

XVIII.—*The Ethiopian and Oriental Representatives of the Mantodean Subfamily* Vatidæ.—*By* J. Wood-Mason, *Superintendent of the Indian Museum, and Professor of Comparative Anatomy in the Medical College of Bengal, Calcutta.*

[Read November 6th, 1889.]

Genus 1. Danuria, Stål.

Danuria, Stål, Öfv. Kongl. Vet.-Akad. Förh. 1857, p. 169; 1872, p. 387, ♂; Bih. Kongl. Vet.-Akad. Handl. 1877, pp. 69-70, ♂ ♀.—Saussure, Mél. Orthopt. 1870, t. i, p. 309.

Distribution.—South and East-African sub-regions of the Ethiopian Region.

1. Danuria thunbergi, Stål.

Danuria thunbergi, Stål, Öfv. Kongl. Vet.-Akad. Förh. 1857, p. 169; 1872, p. 383, ♂.—Saussure, Mél. Orthopt. 1870, t. i, p. 444, pl. v, figs. 66, 66*a*, 67, ♂ ♀.—de Bormans, Ann. Soc. Ent. Belg. 1881, vol. xxv, p. 23.

Hab.—Natal (*Stål*); South Africa (*Saussure, de Bormans*).

2. Danuria bolauana, Saussure.

Danuria bolauana, Saussure, Bull. Entom. Suisse 1869, t. iii, p. 79, ♂; Mél. Orthopt. 1870, t. i, p. 310, ♂.—de Bormans, Ann. Soc. Ent. Belg. 1881, vol. xxv, p. 22.

Hab.—Zanzibar (*Saussure*); South Africa (*de Bormans*).

3. Danuria superciliaris, (Gerstaecker).

Mantis (*Danuria?*) *superciliaris*, Gerstaecker, Arch. f. Naturgesch. 1869, xxxv Jahrg., i Band, S. 210, et v. d. Decken's Reisen in Ost-Afrika, iii Band, ii Abt., S. 15, Taf. 1, fig. 7, 7*a*., 7*b*., ♀ nymph.

Hab.—Wanga, East-Africa.

Possibly an immature female of the preceding.

4. Danuria elongata, de Borre.

Danuria elongata, de Borre, Liste d. Mant. Mus. Roy. Hist. Nat. Belg. 1883, p. 19, ♂.

Hab.—Southern Guinea.

5. Danuria buchholzi, Gerstaecker.

Danuria buchholzi, Gerstaecker, Beitrag z. Kennt. Orthopt.-Fauna Guinea's 1883, p. 55, ♂.

Hab.—Akkra, Gold Coast.

Genus 2. Popa, Stål.

Popa, Stål, Öfv. Kongl. Vet.-Akad. Förh. 1857, p. 169; 1871, p. 386; Bih. Kongl Sv. Vet.-Akad. Handl. 1877, p. 70.

Distribution.—South-African and Malagasy sub-regions of the Ethiopian Region.

6. Popa undata, (Fabr.).

Mantis undata, Fabr., Ent. Syst. 1793, t. ii, p. 19, no. 28, ♀.—Charpentier, Orthopt. Desc. et Depict. 1841, tab. 38, ♂ ♀.

Theoclytes? undata, Serville, Hist. Nat. d. Orthopt. 1839, p. 152, ♀.

Popa spurca, Stål, Öfv. Kongl. Vet.-Akad. Förh. 1857, p. 189; et 1872, p. 387, ♂.

Popa undata, Bates, P. Z. S. 1863, p. 473.—Saussure, Mél. Orthopt. 1872, t. ii, p. 79, ♀ (redesc.).

Two males differ from seven females from British Caffraria, and agree with a very large (63 mm. long) male from Delagoa Bay, in the Indian Museum, in the absence of lobes in the posterior legs, the sole character upon which *P. spurca* is founded by Stål, who was acquainted only with the male sex, of which lobeless hindlegs would appear to be a very usual, if not an invariable, peculiarity.

Bates had already united these two supposed species.

Hab.—Cape of Good Hope (*Charpentier, Serville*); Natal (*Stål, Bates*); South Africa (*Saussure*); Bedford, British Caffraria; Delagoa Bay; Madagascar (*Bates*).

Genus 3. Heterochæta, Westwood.

♂ ♀. Body greatly elongated, bacilliform, without foliaceous lobes and spines.

Head between the points of the sharp conical corneal spines nearly twice as wide as the pronotum at its dilatation; vertex concave, its median and sub-median lobes lower than its extensive lateral lobes, which with the eyes are bent forwards at obtuse angles to the rest of the vertex.

Organs of flight coloured: tegmina with the marginal field irregularly reticulate, the anterior radial forked just before the apical fourth, the posterior radial simple, the anterior prong of anterior ulnar simple, the posterior 4-branched, the dividens anastomosed with the posterior ulnar just before the posterior margin, and the plicate vein reaching the margin, but sending its three or four branches through the anal gusset, which is hence venose: wings with the anterior area narrow and the anterior ulnar simple and unbranched.

Forelegs: coxæ obclavate, with the inner crest armed at base with lobate saw-like teeth; femora narrow, sinuous above, weakly arched below, where they are armed on the outer edge with 5 very long and sharp spines, on the inner edge with 13 alternately shorter and longer, and on the disk with 4. Posterior legs without foliaceous lobes, but furnished with genicular spines; tibiæ slightly thickened fusiformly, five-crested; 1st tarsal joint hardly longer than the two next together.

Distribution.—East-African sub-region of the Ethiopian Region.

7. Heterochæta tenuipes, Westwood.

Toxodera tenuipes, Westwood, Ann. Nat. Hist. 1842, vol. viii, p. 272.

Toxodera (*Heterochæta*) *tenuipes*, Westw. Arc. Entom. 1842, vol. i, p. 163, pl. 41, ♀.—

Heterochæta tenuipes, Gerstaecker, Beit. z. Kennt. Orthopt.-Fauna Guinea's 1883, p. 56, ♀ et ♂ nymph.

Hab.—West and East-Africa: Senegal (*Westwood*); Bagamojo, Zanzibar mainland (*Gerstaecker*).

Genus 4. Heterochætula, nov.

♂ ♀. Sexes alike. Body small, delicate, long, slender, bacilliform. Head transverse, depressed, nearly horizontal, pentagonal; vertex much produced above the level of the eyes, distinctly divided by notches and grooves into five lobes, a median, two sub-median, and two lateral, the median with the inner parts of the sub-median forming the upper, the outer parts of the sub-median and the lateral with the eyes to the corneal spines on each side, the two superolateral, and the corneal spines to the labrum on each side, the two infero-lateral sides of the pentagon; middle of vertex concave or convex or level according as the median lobe or the sub-median lobes are the higher or all are of equal height; eyes compressed, laterally very salient, with a short simple or a bifid non-faceted corneal spine at the upper and outer angle; facial shield a transverse band deeply indented by the antennæ and not very distinctly defined basally, and concave apically; a small tubercle between the antennal scrobe and the eye on each side homologous with the curved ridge in *Toxodera*.

Pronotum transversely convex, transversed from the base to beyond the middle of the anterior lobe by a fine raised median line, which at the apex of the posterior and throughout in the anterior lobe is lodged in a shallow groove; its deflexed sides very finely toothed and its disk very minutely and sparsely granulose.

Terminal tergum of the abdomen transverse, truncated at the extremity. Cerci short, broadly foliaceous.

Organs of flight coloured. Tegmina: the veinlets of the marginal field long and very oblique and rarely branched and anastomosed so as to form a reticulum with very long and narrow meshes, posterior radial simple, anterior prong of anterior ulnar ♂ 2-branched, ♀ 1-branched, posterior prong ♂ 2-branched, ♀ 3-branched, dividens not quite reaching the margin, plicate vein reaching the margin, but sending its two branches through the anal gusset, which is hence venose, all the veins straight and much more oblique than in the preceding genus. Wings with the anterior area narrow and the anterior ulnar simple.

Forelegs of the same proportions is in the preceding; the coxæ above depressed and unarmed; femora armed below on the outer edge with 4 spines (order of length 2, 1, 3, 4), on the inner edge with 13 or 14 alternately shorter and longer (up to the 10th, which is followed by 2 or 3 short ones, the series being completed in each case by one which is somewhat longer than any of the rest), and on the disk with 4; tibiæ blunt roof-shaped. Posterior legs without foliaceous lobes, but provided with genicular spines; lateral genicular lobes of feebly 4-cristate femora short or acuminately produced; tibiæ filiform, terete above, feebly bicristate below; 1st joint of tarsus not longer then the next two taken together.

Distribution.—Indian sub-region of the Oriental Region.

8. Heterochætula tricolor, W.-M.

Heterochæta tricolor, Wood-Mason, Ann. & Mag. Nat. Hist. 1876, vol xviii, ser. 4, p. 441, ♀.

Hab.—♀, Calcutta, Bengal (*type*); ♂ ♀, Khurda, Orissa (*var.*).

9. Heterochætula fissispinis, n. sp.

Ripe Nymph. Corneal spines bifid. Submedian lobes of vertex conically or triangularly prolonged above the median so as to form an occipital concavity for the reception of the rounded anterior end of the pronotum. Anterior femora triangularly produced in the mid dorsal line over the knee joint, with the last long spine of their lower and inner margin preceded by three shorter ones. Lateral genicular lobes of the four posterior femora acuminately produced, especially in the anterior pair, in which they are twice the length of those of the posterior pair. Tip of abdomen broken off.

Length of pronotum 14 millims., of which the anterior and posterior lobes are respectively 3·75 and 10·25; of anterior coxa 6·66, femur 8.

Hab.—Bangalore, Mysore.

Genus 5. ÆTHALOCHROA, W.-M.

Æthalochroa, Wood-Mason, Ann. & Mag. Nat. Hist. 1877, vol. xix, ser. 4, p. 308, ♂ ♀.

Arsacia, Stål, Bih. Sv. Kongl. Vet.-Akad. Handl. 1877, Bd. iv, No. 10, p. 70, ♀.

♂ ♀. Sexes alike. Body greatly elongated, bacilliform.

Head of moderate size, not wider than the dilatation of the pronotum; occiput concave; vertex divided by grooves into five lobes, two lateral, which are always conoidally produced or swollen, two sub-median, which may or may not be produced, and one median forming a horizontal transversely convex elevation of considerable antero-posterior extent which widens slightly to its abrupt termination immediately above and behind the stemmata in a vertical flat area with a semicircular or symmetrically sinuous prominent margin, which appears to coincide with the forks of the epicranial suture and may or may not be produced in the middle line into a horn, which may be simple or bifid; furnished at the ocular margins of the forehead with a small spine-like tubercle and lower down at the same margin with a faint wrinkle, on each side; eyes higher than broad, strongly prominulous, tumid, and furnished at the upper and outer angle, or at the junction of the upper and the lateral parts of their contour, with a conical non-faceted spine or at least with a minute round flat smooth tubercle; stemmata large on a three-way tubercle; facial shield pentagonal with its basal angle obtuse and somewhat projecting; clypeus with a strong mesially interrupted sub-apical transverse ridge; labrum convex; antennæ setaceous, much shorter than the prothorax.

Prothorax granulose: pronotum greatly elongated, steeply roof-shaped as to its slightly bowed posterior lobe, with the top of the ridge surmounted in the female by a prominent raised median dorsal line extending into the anterior lobe, which dorsal line is present in the male only for a short distance from the two ends of the pronotum; gradually widening from the dilatation to either end.

2-6 sterna of abdomen with a short sharp carina ending in a point at the middle of their hinder margin, ♂ 7-8 sterna emarginate at the extremity; terga with a raised median line which is produced to a point at the hinder end and increases, the point concomitantly decreasing, in strength to the extremity of the abdomen; 10th tergum flatly roof-shaped, short, about twice as broad as long, rounded at the extremity. Cerci broadly foliaceous, spatulate, rounded or truncate-rounded at the extremity.

Organs of flight when closed hardly extending beyond the apex of the fifth abdominal segment; their marginal fields subcoriaceous, semiopaque, the rest of the tegmina membranous, ♀ semi-transparent,

♂ hyaline, the rest of the wings membranous, ♂ hyaline or at most obsoletely tesselated, ♀ more or less distinctly and extensively tesselated with pellucid brown: longitudinal veins of tegmina very slightly and widely sinuous, almost straight; anterior radial forked at or just before its apical third, posterior radial simple, anastomosed to the anterior for a short distance soon after its origin, becoming again free at the stigma, which is indistinct, colourless, and in the radio-ulnar interspace; anterior prong of anterior ulnar 1 or 2-branched, posterior prong 4 to 5-branched; dividens running to posterior margin or into posterior ulnar; plicata sending its main stem direct to the margin, its branches through the anal gusset, which is hence venose; and the transverse veinlets curved: wings with distinct anal emargination, unbranched anterior ulnar, and first plicate vein forked at or before the end of its basal third.

Anterior coxæ triquetrous, their crests, especially the posterior, granulose-spinulose, the anterior or upper expanded at the apex into a short foliaceous lobe; femora with their upper margin concave, cristate at the apex, their lower armed on the outer edge with 5 spines, of which the first two are sub-equal and longer and the last three sub-equal and shorter, on the inner edge with 12-14 alternately shorter and longer, of which the two last are long ones, and on the disk with 3 small ones; tibiæ weak, curved, slightly enlarged to either end from their thin middle, but especially to the armed end, terete above to within a little of the apex, which is faintly crested, paucispinose, being armed only on the apical fifth of their outer edge and on the apical half of their inner edge, terminal claw long and rather abruptly hooked.

Posterior legs rather short, strongly crested; femora prismatic, without genicular spines, with four crests, which may or may not be expanded into foliaceous lobes and in the latter case are spinulose; their knee-lobes short, submucronate-triangular; tibiæ triquetrous, equal to or a trifle longer than the femora, with three crests, one dorsal and two ventral, with or without foliaceous lobes, in which latter case they are 5-sided and fusiformly enlarged; first tarsal joint short, only about as long as the two following taken together.

Distribution.—Indian and [South Indian and]* Ceylonese subregions of the Oriental Region.

The discovery of two species with well-developed corneal spines has led to the detection of vestiges of those structures in the typical species.

* The brackets are intended to indicate that no representative of the genus has yet been recorded from the portion of the subregion the name of which is enclosed.

10. ÆTHALOCHROA ASHMOLIANA, (Westw.)

Vates ashmolianus, Westw., Ann. Nat. Hist. 1842, vol. viii, p. 272; Arcana Entomol. 1843, vol. ii, p. (note †) ♀.

Æthalochroa ashmoliana, Wood-Mason, Ann. & Mag. Nat. Hist. 1877, vol. xix, ser. 4, p. 308, ♂ ♀.—P. Z. S. 1878, p. 584.

Arsacia ashmoliana, Stål, Bih. Sv. Vet.-Akad. Hand. 1877, Bd. iv, no. 10, p. 75, ♀.

♂ ♀. Margin of anterior end of median lobe of vertex bisinuous with a minute blunt projection on each side of the middle line. Eyes with a minute, slightly convex circular non-faceted spot or tubercle representing a corneal spine.

Tegmina: a finger-print-like mark at the base forming a curved band across the closed organs of flight, a marbling along the marginal field, and some short streaks on the longitudinal veins—deep rich brown, and some obscure brown blotches on the membrane, which in the ♀ is clouded with greyish whity-brown, but in the male is almost perfectly hyaline; the anterior and posterior prongs of the anterior ulnar are respectively 1- and 4-branched; the dividens runs to the posterior margin.

Wings: ♂ the anterior margin and apex marbled with dark brown and the rest hyaline: ♀ the anterior margin and apex more extensively and deeply marbled with dark brown; a tesselated pellucid violet-fuscous blotch of greater or less extent near the base of the posterior area, which is followed by broken and anastomosed concentric waves of the same colour, and also of varying extent and intensity, extending between the seventh plicate vein and the anterior margin to the outer margin, and, when less developed, leaving an ante-apical roundish patch of sub-hyaline in the anterior area.

Four posterior femora with three sub-triangular foliaceous lobes near the apex, one on the upper or posterior of the dorsal crests, and two on the two ventral crests, all arched proximally and sub-dentate distally; tibiæ with one foliaceous lobe extending from the knees to the middle of the joint on its dorsal crest and with their two ventral crests foliaceously expanded throughout increasingly from the base, so much so in a female from Ceylon that the joint when viewed from below has a long spatulate outline.

Total length, ♂ 100, ♀ 115 millims.; length of pronotum ♂ 33, ♀ 40, of which the anterior and posterior lobes are respectively, ♂ 7·6, ♀ 9·5 and ♂ 25·4, ♀ 30·5; width of prothorax at supracoxal dilatation, ♂ 4·5, ♀ 5·6, at hinder extremity, ♂ 3·6, ♀ 4.5; length of abdomen, ♂ 46, ♀ 52, width at middle, ♂ 3·5, ♀ 5; length of tegmina, ♂ 45, ♀ 55, width at middle, ♂ 9, ♀ 11, near base ♂, 11 ♀ 12·5; length of wings, ♂ 42, ♀ 52, breadth ♂ 22·5, ♀ 27; length of fore coxa,

♂ 15, ♀ 16·5; femur, ♂ 16·5, ♀ 19·75, breadth at angulation ♂ 2, ♀ 3; tibia, from base to insertion of tarsus, ♂ 12, ♀ 15; of immediate femur, ♂ 12·5, ♀ 15·5; tibia, ♂ 12·5, ♀ 15·5; of posterior femur, ♂ 15, ♀ 19; tibia, ♂ 15, ♀ 19; of antennæ, ♂ 23, ♀ 18; of cerci, ♂ 7·5, ♀ 8·5; width ♂ 2, ♀ 2·6.

Hab.—Bombay (var. *simplicipes*); Calcutta, Berhampur, and Jalpiguri, Bengal; "N. India" (var. *insignis*); Ellore, Godavery District, Madras Presidency (*Sir Walter Elliott's drawings*); Colombo, Ceylon.

11. Æthalochroa affinis, n. sp.

♂. Anterior end of median lobe of vertex produced upwards in the middle line into a small blunt spine or tubercle. Eyes with a sharp regularly conical non-faceted corneal spine.

Organs of flight coloured as in the preceding. In the tegmina the anterior and posterior prongs of the anterior ulnar are 2- and 4-branched respectively and the dividens is anastomosed with the posterior ulnar.

Legs as in the preceding. Fore tibiæ with 4-5 spines outside and 7-8 inside.

Total length 78·5 millims.; length of pronotum 26, of which the anterior and posterior lobes are respectively 6 and 20, breadth at supracoxal dilatation 4, at hinder end 3·25; length of meso- and metanotum with seg. med. 14; of abdomen without seg. med. 38, breadth at middle 4; length of tegmina 36·5, breadth near base 9, at middle 7; length of wings 35, breadth 20; length of fore coxa 11, femur 14, breadth at angulation 3, length of tibia, from base to insertion of tarsus, 10; of intermediate femur 9, tibia 9; of posterior femur 11, tibia 11; of antennæ (broken); of cerci 5·5, breadth 1·75.

Hab.—Sind.

12. Æthalochroa spinipes, n. sp.

♂. The lateral and sub-median lobes of the vertex are more pointed than in the preceding and the anterior end of the median lobe is produced upwards into a bifid process. The eyes bear a blunt conical, almost finger-shaped, corneal spine. Antennæ greyish whity-brown.

The organs of flight are almost perfectly pellucid and almost colourless throughout, only the marginal field of both pairs being slightly opaque and obsoletely mottled with brownish, and the posterior area of the posterior pair presenting faint vestiges of the basal blotch with succeeding waves of amethystine fuscous which forms so conspicuous a feature in the female of the typical species. In the tegmina the anterior and posterior prongs of the anterior ulnar are respectively 2- and 5-branched and the dividens is anastomosed with the posterior ulnar.

The fore tibiæ 4-spined outside and 7-spined inside; the last spine on each side more oblique than the rest. The posterior legs bear no foliaceous lobes: the femora are all armed on each of their two ventral crests with six small spines, so that the spines of the one crest are opposite to those of the other, and the four mean spines subequal and larger than the two extreme in each case; the tibiæ are fusiformly thickened, five-sided, bearing five crests, one double dorsal, two lateral, and two spinulose ventral, the intervals between which are transversely nearly level.

Total length 73 millims.; length of pronotum 23, of which the anterior and posterior lobes are respectively 5 and 18, breadth at dilatation 3, at hinder end 3; length of meso- and metanotum with seg. med. 11·5; of abdomen without seg. med. 33·5, breadth at middle 2·5; length of tegmina 31, breadth near base 7·5, at middle 6; length of wings 32, breadth 16·5; length of fore coxa 10, femur 11·5, breadth at angulation 2, length of tibia, from base to insertion of tarsus, 8; of intermediate femur 7, tibia 7·25; of posterior femur 9·75, tibia 10; of antennæ 16; of cerci 5·25, breadth 1·65.

Hab.—Karachi, Sind.

Genus 6. Paradanuria, W.-M.

Paradanuria, Wood-Mason, Ann. & Mag. Nat. Hist. 1877, vol. xix, ser. 4, p. 220, ♀ nymph.

♀ (nymph). Body elongated, small and delicate, slender bacilliform. Integument granulose and longitudinally coarsely paucirugose.

Head depressed, thin, horizontal, higher or rather longer than broad, rather broader than the prothorax at its dilatation, with vertex, forehead, and face in the same plane; vertex with its lateral lobes produced above and slightly outwards over the eyes to a blunt tubercle, so as to form an occipital concavity for the reception of the rounded fore end of the pronotum, its median lobe on the disk elevated into a huge convex boss, which is roundly prominent posteriorly or superiorly, appearing in a front view to project above the concave occipital line, and is separated anteriorly or inferiorly by a transverse groove from the subquadrate stemmatal eminence, which bears a blunt conical tubercle at the middle of its posterior margin. Eyes narrow, wall-sided, with the upper part of their contour at right angles to the lateral and a short stout bluntly mammilliform non-faceted corneal spine at the angle.

Pronotum roof-shaped with distinct rounded dilatation, and a raised dorsal line, which is continued to the extremity of the abdomen.

Terminal tergum of abdomen triangular with arched sides. Cerci foliaceous extending by fully $\frac{2}{3}$rds of their length beyond the extremity of

the 7th sternum, equalling in length the four terminal abdominal terga taken together, and widening from the base to the apex, which is divided by a shallow notch into two points.

Anterior legs long and slender; coxæ expanded along the apical fourth of their anterior crest into a conspicuous dentate foliaceous lobe; femora nearly straight above, weakly arched below, with acute genicular lobes and a conspicuous supra-genicular lobe at obtuse angles to the upper margin, armed below on the outer edge with 6 spines, of which the first is equal to the third and the 2nd to the 6th form a slighty decreasing series, on the inner edge with 12 alternately shorter and longer, and on the disk with 3; tibiæ as broad as high, above terete, perfectly straight and uniformly wide throughout from base to insertion of tarsus. Posterior legs very short; the femora stout, slightly tapering at both ends, prismatic, with four strong crests, a blunt ridge on each side between the dorsal and ventral crests, the upper or posterior of the ventral crests foliaceous, long slender genicular and supragenicular lobes, but no genicular spines; tibiæ rather longer than the femora, above terete, below bicristate; 1st joint of tarsus not quite so long as the three succeeding taken together.

Distribution.—Indian sub-region of the Oriental Region.

Winged specimens of this genus will be described and figured by Professor Westwood in his forthcoming '*Revisio Mantidarum*.'

13. Paradanuria orientalis, W.-M.

Paradanuria orientalis, Wood-Mason, Ann. & Mag. Nat. Hist. 1877, vol. xix, ser. 4, p. 220, ♀ nymph.

Hab.—Bangalore, Mysore.

Genus 7. Euthyphleps, nov.

♀. Body long, rather small and delicate, slender bacilliform. Integument granulose and spinulose especially in the prothorax.

Head somewhat depressed; vertex slightly declivous, its median lobe separated from the submedian lobes by two longitudinal depressions of the disk, the latter triangularly produced backwards, upwards, and outwards so as to form an occipital cavity for the reception of the fore end of the pronotum; forehead and face convexly more declivous, so that, when the head is viewed from the side, the eyes appear to be separated from the submedian lobes of the vertex by a deep notch one side of which is formed by the eyes, the other by the submedian lobes, and the bottom by the narrow lateral lobes of the vertex. Stemmata large, on a considerable eminence, which bears a

spike-like erect tooth at the middle of its hinder margin, and is separated off from the vertex by a transverse groove. Eyes narrow, oval, convex laterally, produced above the level of the lateral lobes of the vertex, armed at the upper and outer angle with a large stout blunt somewhat curved finger-shaped non-faceted corneal spine.

Pronotum roof-shaped with transversely convex sides, surmounted by a raised dorsal line, which is continued to the extremity of the abdomen.

Abdominal sterna produced in the middle of their hinder margin; terga 1-7 produced in the middle posteriorly to a delicate filamentous process, the last a broadly concave-truncate triangle with the sides arched. Cerci broadly foliaceous, 13-jointed, broadest at the antepenultimate joint, reaching but little beyond the 7th sternum, the upper apex of their last four joints produced so that their upper margin is bluntly dentate and their apex bifid.

Organs of flight extending nearly to the extremity of the abdomen. Tegmina semiopaque, sub-coriaceous, parallel-sided; the marginal field irregularly reticulate; the longitudinal veins of anterior area nearly parallel to the margins with their interspaces narrow and divided by false veins; the posterior area and its gusset produced, with its longitudinal veins very oblique; the anterior prong of anterior ulnar simple and unbranched, posterior prong 6-branched; the dividens anastomoses with the posterior ulnar some distance before the margin, the 4-branched plicata goes to the margin, its 1st and 2nd branches running parallel with it, but dissolving into a common reticulum at varying distances from the margin, and its 3rd and 4th traversing the anal gusset, which is hence venose. Wings hyaline except in the anterior margin and apex; apex blunt not extending far beyond that of the posterior area; anal emargination slight, obtuse-angular; anterior ulnar forked at about the junction of second and apical thirds of its length.

Fore-legs long and slender; coxæ expanded for fully the apical third of their anterior crest into a conspicuous dentate foliaceous lobe; femora narrow, slightly sinuous above, that is to say, faintly convex basally and then shallowly concave to the apex, which is produced, as in the preceding genus, forwards and upwards over the femoro-tibial articulation into a supragenicular spine, below weakly arched at base, armed on the straight outer edge with 5 spines, on the inner with 11, and on the disk with 3; tibiæ straight, paucispinose, terete above. Posterior legs similar but longer and slenderer than in the preceding genus, and furnished with curved acicular genicular spines longer than the genicular lobes, the lateral ones of which are longer than the dorsal.

Distribution.—Himalo-[Chinese] subregion of the Oriental Region.

14. Euthyphleps rectivenis, n. sp.

♀. Body the colour of a dead twig.

Tegmina semitransparent pale yellowish brown with the marginal field and a long linear streak on the basal half of the anterior prong of the anterior ulnar opaque bright cinnamon-brown. Wings hyaline with the anterior margin semitransparent pale yellowish brown and a decreasing series of four or five streaks on the veins at the apex cinnamon brown.

Fore tibiæ armed on the outer edges with 4-4 and on the inner with 6-7 spines, the last of which is strongly directed obliquely towards the apex.

Posterior legs with a slight lobe on the upper or posterior dorsal crest and a well developed one on the upper or posterior ventral crest, which is divided, by a more (posterior pair) or less (intermediate pair) distinct emargination, into two lobes, a smaller trilobulated proximal and a larger crescent-shaped obsoletely dentate distal.

Total length 70 millims.; length of pronotum 19·5, of which the anterior and posterior lobes are respectively 4·25 and 15·25, breadth at supracoxal dilatation 3·25; length of meso- and metanotum with seg. med. 13; of abdomen without seg. med. 33, breadth at middle 2·75; length of tegmina 43, breadth at middle 7; length of wings 39, breadth 17; length of fore coxa 10, femur 16, breadth 1·75, length of tibia, from base to insertion of tarsus, 11; of intermediate femur 10, tibia 10·25; of posterior femur 12, tibia 14; of antennæ 19; of cerci 3·5, breadth 2.

Hab.—Kulu, Kangra, N.-W. Himalayas, 3,600 feet (*A. Graham Young*).

Genus 8. Toxoderopsis, nov.

♂ ♀. Body greatly elongated, bacilliform.

Head similar to that of the genera *Toxodera* and *Paratoxodera*, but not nearly so wide, its long axis forming with that of the eyes a much narrower angle; median and submedian lobes of the vertex a little higher than the lateral lobes, slightly arched, separated by a transverse groove from the prominent eminence which bears the large stemmata, and is produced at the middle of its upper or hinder margin into a short erect process, which may be acute or blunt and sub-bifid; eyes oval, convex, produced slightly above the level of the lateral lobes of the vertex, and bearing at their upper and outer angles a long sharp slender incurved conical non-faceted corneal spine; a small tubercle close to the inner and anterior margin of each eye, representing the curved ridge in *Toxodera*; facial shield divided into three parts, one

median prominent semicircular below and between the antennæ, and two lateral sunken subquadrate, between which and the eyes a very narrow space intervenes.

Prothorax subrugose, and roughly granulose, especially on the edges of the pronotum, much elongated, but shorter than in *Toxodera* and *Paratoxodera*, being not quite equal in length to the basal $3\frac{1}{2}$ segments of the abdomen exclusive of seg. med., quite straight from end to end; the posterior lobe of its pronotum less steeply roof-shaped with the sides slightly convex transversely and the ridge line, which is distinctly compressed, especially in front, very sharp, and feebly arched longitudinally; the anterior lobe with a raised median line lodged in a shallow furrow, enlarged at the extremity in ♂, as in *Æthalochroa*.

Abdomen smooth and polished, without foliaceous lobes, subparallel-sided, very slightly and gradually widening, and bluntly carinate above, from the base of the 4th to the apex of its 6th segment, thence narrowing more rapidly to its extremity, the last four segments forming a carinated roof-shaped mass with serrated sides; terga 1-6 with a notch accompanied by a very small and delicate filamentous process at the middle of the hinder margin; sterna with the posterior margin arcuately prominent, subcarinate, but without foliaceous duplicatures of the integument, in the middle line at hinder end; 10th tergum triangular a little broader than long. Cerci foliaceous, lanceolate, acutely bifid, as in *Toxodera*.

Organs of flight in shape and structure very similar to those of *Toxodera*, both pairs having the apex anterior, and the tegmina, the interspace between the posterior radial and the anterior prong of the anterior ulnar wide and multicellular. In the tegmina, the marginal field is opaque and only moderately wide, irregularly and strongly reticulate the stigma, which is long and linear, lies as obliquely as possible upon the posterior radial, extending a very short distance into the interspace on each side of the vein; the anterior prong of the anterior ulnar, like the posterior radial, simple, the posterior prong being 3 or 4-branched; the dividens anastomoses with the posterior ulnar, and may or may not give off an anterior branch which does not do so; the plicata runs either direct, or after anastomosis with the posterior ulnar, to the posterior margin, but in either case sends all its branches through the anal gusset, which is hence venose. In the wings there is a distinct anal emargination and a simple and unbranched anterior ulnar.

Anterior legs long and slender; coxæ with the anterior crest for the apical two-fifths of its length expanded into a conspicuous dentate foliaceous lobe; femora narrow, above nearly straight and carinate, the carina ending in a sharp supra-genicular lobe somewhat

longer than the lateral lobes, also almost straight below, where they are armed on the outer edge with 5 or 6 spines, on the inner edge with 11, and on the disk with 3; tibiæ straight, terete above, paucispinose, the spines in a single short series decreasing from the apex.

Posterior legs short and weak; femora prismatic, slightly tapering to both ends, with four strong crests and a strong blunt crooked ridge on each side giving them the appearance of being bent down near the apex, with three equal acuminate genicular lobes and an acicular genicular spine, which is longer than the lobes in the anterior pair, with the two dorsal crests slightly lobed and the upper or posterior ventral crest expanded into a foliaceous lobe, which is divided into two or more lobules; tibiæ longer than the femora, terete above, (?) obsoletely bicristate below; first tarsal joint shorter than the two succeeding joints taken together.

Distribution.—Indian sub-region of the Oriental Region.

This genus is closely allied to *Toxodera* and *Paratoxodera*, agreeing with both, amongst other things, in the oblique truncation of the extremities, resulting in the forward position of the apices, of the organs of flight, and with the former, but not with the latter, in the radio-ulnar cell of its tegmina being wide and multicellular, and in the anal cerci being lanceolate and acutely bifid at the extremity; but it may be distinguished readily from both by the possession of a distinct though small frontal horn, foliaceously amplified fore coxæ, paucispinose fore tibiæ, with the spines of each side in a single short and decreasing series, 6-spined fore femora, a short first joint to its four posterior tarsi, a simple and unlobed abdomen, a straight pronotal long axis, and a venose anal gusset to its tegmina.

15. Toxoderopsis spinigera, n. sp., Westw. & W.-M.

Toxodera spinigera, Westwood, MSS.

♀. Dark vandyke-brown the colour of a dead twig or of rotten leaves.

The frontal horn is a sharp spike-like projection.

Tegmina with the marginal field opaque dark vandyke-brown, an opaque whity-brown longitudinal streak extending from the base to beyond the middle of the wing immediately posterior to the anterior radial, diffusing itself along each side of the veins of the disk, and including the long polished stigma and the base of the anterior radial, the anal area smeared with dark vandyke-brown, and the longitudinal veins marked with somewhat blurred and smear-like spots and streaks of the same colour, especially at the apex, where every vein has a streak at its extremity. The posterior fork of the anterior radial is distinctly 4-

branched on one side, indistinctly so on the other. The dividens gives off an anterior branch which is connected both with its own main stem and with the posterior ulnar, thus furnishing the only instance known to me in which this vein is branched. The main stem of the plicate runs to the posterior margin direct.

Wings pellucid, increasingly from the base very pale smoky-quartz-colour, with the opaque anterior margin, the longitudinal veins, and the very fine, though very distinct, transverse veinlets, all increasingly from the base, and with streaks on the apical ends of the veins of the anterior area, vandyke-brown.

The fore femora, which have three pale rings especially well marked on the inner and under sides, are armed below on the outer edge with 6 spines and on the inner with 11; and the tibiæ with 3 on the outer edge and 7 on the inner edge.

The dorsal crests of the four posterior femora are slightly produced triangularly opposite to the bend in the lateral ridges; and the upper or posterior ventral foliaceous lobe is divided by a narrow rounded emargination into two lobules, one much smaller and proximal, the other much larger and distal, which are again subdivided by angular notches into two obliquely pointed lobes.

The upper angle of the penultimate joint of the cerci though acute is not produced.

Total length 93 millims.; height of head 4, breadth between the points of the corneal spines 6·75, length of corneal spines 1·25; of pronotum 28·75, of which the anterior and posterior lobes are respectively 5·75 and 23, breadth at supracoxal dilatation 4, at hinder end 4·25; length of meso- and metanotum with seg. med. 16; length of abdomen without seg. med. 47, breadth at middle of 4th seg. 4, at apex of 6th seg. 6·25; length of tegmina 47·5, breadth at middle 8·25; length of wings 42·5, breadth 19; length of fore coxa 14·5, femora 19·5, breadth 2; length of tibia from base to insertion of tarsus 13; of intermediate femur 7·5, tibia 9·5, 1st tarsal joint 2; of posterior femur 8·25, tibia 11, 1st tarsal joint 2·25; of antennæ (absent); of cerci 8, breadth 2.

Hab.—Bombay.

16. Toxoderopsis taurus, n. sp.

♂ ♀. Smaller. Colouring the same.

The frontal horn is truncate and in the female distinct bifid.

In the tegmina the main stem of the plicata runs to the margin after anastomosis with the dividens, which is simple and unbranched.

The fore femora are armed below with ♀ 5—5, ♂ 5—6 spines only on the outer edge and with ♀ 10—11, ♂ 11—11 on the inner; and the

tibiæ with ♂ ♀ 4—4 on the outer edge and ♀ 7—8, ♂ 6—7 on the inner.

In the posterior femora, the upper or posterior dorsal crest bears two or three saw-like teeth and the distal lobule of the ventral foliaceous lobe is divided right to its base and has a minute sharp spinule in front of it, of which but slight traces are to be seen in the other species.

The upper angle of the penultimate joint of the cerci is as much produced and as sharp as the tips of the terminal.

Total length ♂ 78, ♀ 88 millims.; length of pronotum, ♂ 21·5, ♀ 26·5, of which the anterior and posterior lobes are respectively ♂ 4·5, ♀ 5·75 and ♂ 17, ♀ 20·75, breadth at supra-coxal dilatation ♂ 3·5, ♀ 4, at hinder end ♂ 3·5, ♀ 4; length of meso- and metanotum with seg. med. ♂ 15·5, ♀ 16; length of abdomen without seg. med. ♂ 39, ♀ 42, breadth at middle of 4th seg. ♂ 2·75, ♀ 3·5, at apex of 6th ♂ 4·5, ♀ 6; length of tegmina ♂ 37, ♀ 44, breadth at middle ♂ —, ♀ 7·5; length of wings ♂ 36, ♀ 40, breadth ♂ — ♀ —; length of fore femur ♂ 15·5, ♀ 18, tibia, from base to insertion of tarsus, ♂ 10, ♀ 12; length of intermediate femur ♂ — ♀ 7·25, tibia ♂ — ♀ 10·25, 1st tarsal joint ♂ — ♀ 2; of posterior femur ♂ — ♀ 8·5 tibia ♂ — ♀ 11, 1st tarsal joint ♂ — ♀ 2·75; of cerci ♂ (broken off), ♀ 6·25, breadth ♀ 2.

Hab.—♂ Sind; ♀ Khurda, Orissa (*W. C. Taylor*).

The two succeeding genera differ from all the preceding in having the fore tibiæ multispinose on both edges, with the spines of both edges divided at irregular intervals into several irregular series by some of their number being longer and stouter than the others, and in having a long first joint to their four posterior tarsi, and from all except *Heterochæta* and *Heterochætula* in not having the upper crest of the fore coxæ in the slightest degree foliaceously amplified at the apex.

Genus 9. Toxodera, Serville.

Toxodera, Serville, Ann. Soc. Ent. Fr., 1837, t. vi, p. 27.—Hist. nat. d. Orthopt. 1839, p. 168, ♂.

♂ ♀. Sexes alike. Body greatly elongated, bacilliform.

Head broad, triangular; vertex between the eyes regularly arched, divided by two broad and shallow discal impressions into a median and two submedian lobes, which are separated from the unarmed stemmatal eminence by a transverse groove, and the two latter of which are limited off by fine grooves from the ample lateral lobes, which, with the eyes, are almost in the same plane with the rest of the vertex, being scarcely at all bent forwards; a strong ridge curves inwards and upwards on each side from a point at the ocular margin which is opposite to the

anterior margin of the antennal scrobe to the ends of the epicranial suture and is so directed at its upper end that it would if continued far enough pass into the groove which separates the lateral from the submedian lobes of the vertex; the facial shield has not shared in the widening of the head, a wide space intervening between it and the eyes; it may be described as a transversely elongated rectangular plate giving off a broad tongue-shaped process from its upper or basal margin, or as a broad isosceles triangle the two adjacent equal sides of which are deeply indented by the antennal scrobes. The eyes are compressed and somewhat drawn out superolaterally, where they bear a huge straight slender conical non-faceted spine. Stemmata large on a prominent cuboidal frontal eminence.

Prothorax very greatly elongated, as long as the abdomen to the middle of the sixth segment. Pronotum with its lateral margins granulose, becoming spinulose in front, deflexed in the posterior, nearly horizontal in the anterior lobe, which is bent up at an obtuse angle to the posterior lobe, is transversely convex, bears a few tubercles on each side of the middle line, and presents on its posterior enlarged end a broad and shallow longitudinal depression, which is continuous with a similar one on the enlarged anterior end of the posterior lobe, which is higher than broad, so strongly compressed as to be very steeply roof-shaped, and, with the sternal region, so strongly arched as to have the form of a bow, being concave ventrally and correspondingly convex dorsally, where it is surmounted by a blunt rather ill-defined raised line, on which, especially anteriorly, where some are collected into a small clump deforming the surface, are a few small mammilliform tubercles, and which at the ♀ broadly truncate-rotundate, ♂ triangularly produced (?), posterior end gives off a very narrow spirally coiled leathery process.

Mesonotum, metanotum, and seg. med. with a very strong raised dorsal line, which is continued decreasingly to the end of the 4th abdominal tergum, where it ends to begin again at the anterior end of the fifth tergum to be continued increasingly to the last.

The abdomen is of uniform width to the 6th segment, thence tapering in slightly arched outlines to its rounded extremity; all its terga bear in the middle line posteriorly a fringed cup-shaped foliaceous lobe the upper lip of which terminates in a delicate recurved filament, and which in the 5th and 6th is large, in the 5th very large, and conspicuous; ♀ sterna 2-6 with subequal foliaceous sub-quadrant-shaped duplicatures of the integument at middle of hinder margins; 10th tergum semioval, roof-shaped, $1\frac{1}{2}$ times as broad as long. Cerci foliaceous, lanceolate, divided at the extremity by a deep notch into two sharp points, extending by more than two-thirds of their length beyond the abdomen.

Organs of flight equally well-developed in the two sexes, when closed, not quite reaching up to the foliaceous lobe of the 5th tergum, obliquely truncate at the extremity, so that the apex in both is subacute and falls just behind the anterior margin, and that there is no anal emargination in the hinder pair. All the longitudinal veins remarkably straight.

Tegmina with the marginal field tolerably expanded at base, irregularly reticulate, and semiopaque, the anterior radial forked at junction of outer and middle third and its upper prong running to the apex, the posterior radial simple, the stigma long and narrow placed as obliquely as possible across the radio-ulnar interspace and extended on to the two bounding veins, the anterior prong of the anterior ulnar forked, the cellules of the wide middle part of interspace between the anterior ulnar and the posterior radial in five transverse rows, the posterior prong of the anterior ulnar 2-branched, the dividens anastomosed with the posterior ulnar some distance short of the margin, the plicate, which all but reaches the posterior margin, broken up into a reticulum contributed to by its three branches, none of which enters the anal gusset, which is hence reticulate. Wings with the anterior ulnar simple.

Legs tolerably long and slender. Fore coxæ strongly triquetrous, spinulose on the front crest, rough on the others, the front and outer ones produced at apex to sharp rough spines; femora strongly curved, obclavate, strongly sinuous and carinate above and angulate-rounded near the base below, at the apex trispinose, armed on the outer edge of the lower margin with 6 spines, on the inner edge with 14, on the disk with 3; femoral brushes thick, on distinct eminences; tibiæ multispinose, the spines divided into several irregular series by long spines, the 1st, 8th, 12th, 16th, 19th, and 22nd of the inner edge, and the 1st, 5th, 7th, 9th, 11th, and 13th of the outer edge, being subequal and longer than any of those between them. Four posterior femora shorter than the tibiæ, 4-crested, with a ridge on each side, both dorsal crests and the posterior ventral crest furnished with large lobulated foliaceous lobes, lateral genicular lobes long, but only half the length of the curved supra-genicular lobe, which is equal in length to the acicular genicular spines, tibiæ filiform, terete, without a trace of a crest either above or below, their calcaria acicular; 1st joint of tarsus long, longer than the three following taken together.

Distribution.—Malayan subregion of the Oriental Region.

17. Toxodera denticulata, Serville.

Toxodera denticulata, Serville, op. et loc. supra cit. pp. 25 et 169, pl ii, et pl. v, ♂.

♀. Differs only in its larger size, and in having the tegmina a little more clouded with the brown blotches larger and deeper-coloured, and the posterior lobe of the pronotum more bowed.

The fore tibiæ are armed on the inside, right with 23 spines, of which the 1st, 8th, 12th, 16th, 19th and 22nd, left with 22, of which 1st, 7th, 11th, 15th, and 18th, the 7th short one being absent, and on the outside, right (malformed) with 10, of which 1st, 4th, and 7th, left with 13, of which 1st, 5th, 7th, 9th, 11th, and 13th, from the apex are subequal and stouter and longer than any of the rest.

Total length 150 millims.; height of head 7, breadth between ips of corneal spines 13·5, length of corneal spines 2·5; length of pronotum in a straight line 57, of which the anterior and posterior lobes are respectively 11·25 and 46, breadth at supra-coxal dilatation 7·25, at hinder end 6, at middle of posterior lobe 3·9; height at middle of posterior lobe 5·9; length of meso- and metanotum with seg. med. 23; of abdomen without seg. med. to end of ovipositor, 70, to end of 10th tegmina 66, breadth at middle of 4th segment 6·5, height of foliaceous lobe of 5th tergum 10, of 6th tergum 8; length of tegmina 67·5, breadth at middle 14, of marginal field 3·25; length of wings 60, breadth 31; length of fore coxa 22, femur 30, breadth at angulation 3, length of tibia, from base to insertion of tarsus, 22·25, 1st tarsal joint 6; of intermediate femur without genicular lobes 22·5, tibia 27·5, 1st tarsal joint 7; of posterior femur without genicular lobes 22, tibia 32, 1st tarsal joint 10, lateral genicular lobes 3, supra-genicular lobe 5, genicular spines 5, of antennæ 43; of cerci 14, breadth 3·5.

Hab.—Java.

Genus 10. Paratoxodera, nov.

♀. Body greatly elongated, slender bacilliform.

Head much as in the preceding genus, but the lateral lobes of the vertex with the eyes distinctly bent forwards at an obtuse angle to the median and submedian lobes, and the facial shield broad triangular.

Prothorax also much as in the preceding, but the posterior lobe of its pronotum is straight; furnished in the mid dorsal line with three conspicuous equidistant thorn-like horns, the one basal thin and foliaceous springing entirely from the raised dorsal line, and the two others stout, rigid and hard, minutely bifid developed from the disk; and triangularly produced at its hinder end.

5th and 6th abdominal terga with large erect foliaceous lobes which do not end in a recurved filament; the preceding terga having only rudiments of lobes; sterna 3-4 with subequal quadrant-shaped foliaceous duplicatures of the integument at the hinder end. Cerci short, extending very little beyond the seventh sternum, broad pyriform in outline, their upper third bent outwards and downwards at an obtuse angle to the remainder.

The organs of flight do not reach beyond the end of the fourth abdominal tergum, but they are of much the same shape and structure, the chief differences being that in the tegmina the stigma is triangular and in the radio-ulnar interspace, extending on to the two bounding veins, the posterior prong of the anterior ulnar is 7-branched, the interspace between the anterior prong of this vein and the posterior radial is simple, not wide and multicellular, and the anal gusset is venose, being traversed by the posterior branch of the plicate; and that in the wings a slight anal emargination is present.

The crests of the fore coxæ are not produced at the apex; the femora and tibiæ are of similar shape and structure, but the former are 7-spined on the outside and 15—16-spined on the inside.

The four posterior legs are also similar, but the lateral genicular lobes are not acuminately produced, and the posterior calcaria of the tibiæ are foliaceous, lanceolate.

Distribution.—The Malayan sub-region of the Oriental Region.

This genus is very closely allied to *Toxodera*, with which it agrees in the peculiar and remarkable character of the armature of the fore tibiæ, in the anterior lobe of the pronotum being tilted upwards at an obtuse angle to the posterior, and in having large erect and anteriorly buttressed foliaceous lobes at the hinder end of the 5th and 6th terga with rudiments of similar ones, which no doubt stood erect during the larval life of the animal, on all the preceding terga of the abdomen; but it differs therefrom, amongst other things, in having the fore femora 7-spined below on the outer edge, the posterior lobe of the pronotum quite straight and cornigerous, the radio-ulnar cell of the tegmina simple and similar to the other cells of the disk, the anal gusset of the tegmina venose, and the anal cerci very short and broad pyriform in outline, in characters, in fact, which, in my estimation, amply justify the foundation of a new genus.

18. Paratoxodera cornicollis, n. sp.

♀. Body and legs brown the colour of a twig, with the hinder end, including the foliaceous appendage which arises therefrom, whity-brown.

Foliaceous horn at base of pronotum very strongly hooked and produced forwards, the second horn erect, divided transversely into two sharp points, and the third, which is inclined forwards and rather larger than the second, divided longitudinally into two points.

Marginal field of tegmina to anterior radial, which is thrice annulated with whity-brown, and a large irregular triangular mottling

extending therefrom in the transverse direction nearly halfway across the discoidal area and in the longitudinal direction for about two-thirds of the distance between the stigma and the apex, opaque rich vandyke-brown, the rest of the organs semitransparent whity-brown with a touch of grey.

Anterior margin of wings semitranslucent whity-brown marbled, with the veins at the apex streaked, with vandyke-brown, the rest hyaline with the veins whity-brown.

Fore tibiæ armed on the inner edge with, right 32 spines, of which number the 1st, 8th, 14th, 19th, and 23rd, left 34, of which the 1st, 10th, 16th, 21st, 27th, and 29th, and on the outer edge with, right 18 spines, of which the 1st, 8th, 12th, and 16th, left 19, of which the 1st, 8th, 11th, and 15th, are much larger than the rest, the basal fourth and the basal third respectively being unarmed.

In the four posterior femora, the foliaceous lobe of the posterior or upper ventral crest is divided by a wide and deep rounded emargination into two bifid lobules, of which the distal is the larger; that of the upper dorsal crest, into three, of which the proximal is small and simple, the middle is rather larger and bifid, and the distal much larger and also bifid; and that of the lower or anterior dorsal crest, into two, of which the proximal is the larger and bilobed and the distal is the smaller and only obscurely sub-divided.

Male unknown.

Total length 112 millims.; height of head 5, breadth between tips of corneal spines 8·5, length of corneal spines 1·5; length of pronotum 44, of which the anterior and posterior lobes are respectively 5·6 and 38·4, breadth at supracoxal dilatation 4, near hinder end 4, at middle 2·5, height at middle 2·6; length of meso- and metanotum with seg. med. 16; of abdomen without seg. med., to end of 10th tergum 51, to end of cerci 54, breadth at middle of 4th segment 6, height of foliaceous lobe of 5th tergum 10·5, of 6th tergum 2·5; length of tegmina 43, breadth at middle 8·25, of marginal field 2·25; length of wings 41, breadth 21; length of fore coxa 15·5, femur 19, breadth at angulation 2·75, length of tibia form base to insertion of tarsus 15·25; of intermediate femur 13·5, tibia 14, 1st tarsal joint 4·5; of posterior femur 14, tibia 16·25, 1st tarsal joint 5·5; of antennæ (wanting); of cerci 5, breadth 3·6.

Hab.—Java.

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XIX.—*On the Tortoises described as* Chaibassia.

By R. Lydekker, B. A., F. G. S.

[Received September 4th ;—Read Nov. 6th, 1889.]

(With two Wood-cuts.)

In endeavouring to determine the true affinities of the shell of a fossil tortoise in the British Museum, obtained many years ago from the Siwalik Hills, and which I have described and figured in the 'Palæontologia Indica'* as a form apparently allied to *Nicoria* (*Clemmys*) *trijuga*, a certain peculiarity in the relation of the hypoplastrals to the carapace suggested that it might prove to be identical with the imperfectly known existing form described as *Chaibassia tricarinata* (Blyth). Unfortunately, the British Museum possesses no recent example of that form, and I, therefore, wrote to my friend Mr. J. Wood-Mason, requesting the loan of a specimen by the aid of which it could be decided whether the fossil shell was or was not an allied type. In reply to this application, I received two specimens, one of which was the shell of a female collected by Prof. V. Ball in Sirguja, Chota Nagpur, while the second was a male specimen, preserved in spirit, which was obtained from the Naga Hills in Assam, and was one of the types of *Chaibassia theobaldi*, Anderson.

A comparison of the two specimens with the Siwalik fossil at once showed that we had to do with a form so closely allied to *Chaibassia tricarinata* that it was in all probability specifically identical; and the question then arose whether there was any justification for the separation

* Series x, vol. iii. p. 176, pl. xxi, fig. 4.

of the Assamese *C. theobaldi* from the typical Bengal form, and also whether there were good grounds for regarding *Chaibassia* as entitled to generic distinction. In attempting to decide these points, I had the advantage of consulting with my friend Mr. G. A. Boulenger, of the British Museum, to whom all students of the Chelonia are so much indebted for his recently published 'Catalogue'* of that order; and, after careful comparison and examination, we both came to the conclusion that *Chaibassia theobaldi* was not separable from *C. tricarinata*, and also that the genus *Chaibassia* itself was not a valid one. Having arrived at these conclusions, it seemed advisable to put them on record, and, since the type of this so-called genus was first described in the 'Journal of the Asiatic Society of Bengal,' it appeared most appropriate to bring them to the notice of the same Society.

The tortoise on which the genus *Chaibassia* was subsequently founded was originally described by Blyth† under the name of *Geoemyda tricarinata* upon the evidence of a specimen obtained from Chaibassa, in Chota Nagpur, Lower Bengal. I have had no opportunity of examining the type specimen, even if that still exists, but, since the above-mentioned female shell from the neighbouring region of Sirguja in the same district agrees in all respects with the description of the type, it may be safely regarded as specifically the same.

In founding the genus *Chaibassia*, Mr. W. Theobald‡ appears to have taken his description from the two specimens already alluded to as having been obtained from the Naga Hills, which he regarded (and, as it now appears, rightly) as identical with the so-called *Geoemyda tricarinata*. These specimens showed that this tortoise differed from *Geoemyda* by the presence of a temporal or zygomatic arcade, and Mr. Theobald accordingly defined his new genus as "habit of *Geoemyda*, but zygomatic arch complete." In the course of his description it is, however, incidentally mentioned that *Chaibassia tricarinata* may be distinguished from *Nicoria (Melanochelys) trijuga* by the brown instead of white colour of the iris; thereby implying a close similarity between the two forms. A difference in the claws of the two species is also noticed. Having thus incidentally mentioned the similarity of *C. tricarinata* and *N. trijuga*, it is very remarkable that Mr. Theobald should not have clearly stated what he regarded as the generic distinction between the two, and that the two forms were placed respectively in the so-called families *Testudinidæ* and *Emydidæ*, which have no real distinctive features, and have therefore been united by Mr. Boulenger.

* Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum: London, (1889).

† J. A. S. B., vol. xxiv, p. 714 (1856). ‡ Cat. Rept. British India, p. 6 (1876).

. Three years later Dr. J. Anderson* gave a further description of *Chaibassia*, in which he described it as allied to *Geoemyda*, but with a bony temporal, or zygomatic arch, the feet not webbed, and the hypoplastrals usually attached to the carapace only by ligament.† The Assamese form was here described under the name of *C. theobaldi*, and was stated to differ from the type species by the contour of the first vertebral shield, the longer facial portion of the head, and certain slight details of coloration.

In his 'Catalogue of Chelonians,'‡ Mr. Boulenger introduced the genus *Chaibassia*, on the authority of Anderson, after *Geoemyda*, stating that its characters required further investigation, and omitting it from the number of well-authenticated genera. The characters of the two so-called species were likewise given, as culled from the description of Messrs. Theobald and Anderson.

On comparing the shell of the male specimen from the Naga Hills (of which a lateral view is given in Fig. 1, A) with that of the typical female shell from Chota Nagpur (Fig. 1, B. C.), it is at once apparent that the slight difference in the contour of the first vertebral shield, and also the slight variation in colour, are but individual peculiarities; and that still more marked variations occur in the large series of specimens of *Nicoria trijuga* preserved in the British Museum. There has, indeed, been no opportunity of comparing the heads of the Assam and Bengal forms, but I cannot regard the alleged longer muzzle of the former as anything more than an individual variation. There is, indeed, one very striking difference between the two shells, *viz.*, that, whereas in the Bengal specimen the hypoplastrals join the carapace merely by a ligamentous attachment, in the Assam specimen there is a perfect sutural union between the two. In the face, however, of the resemblance of the two specimens in all other respects, it appears, both to Mr. Boulenger and myself, that we have again to do with a variation which cannot be regarded as of more than individual importance, although, as will be shown below, it is one which appears to be of comparatively common occurrence. The result, then, of this comparison is to show that *Chaibassia theobaldi* is not specifically separable from the tortoise described as *O. tricarinata*.

With regard to the generic position of this form it will be evident from the preceding observations that the occasional ligamentous union of the hypoplastrals with the carapace can be of no importance from this

* Zoological Results of Yunan Expeditions, pp. 718-720 (1879).

† Some confusion in this description is pointed out by Boulenger 'Catalogue,' p. 139, note

‡ P. 139.

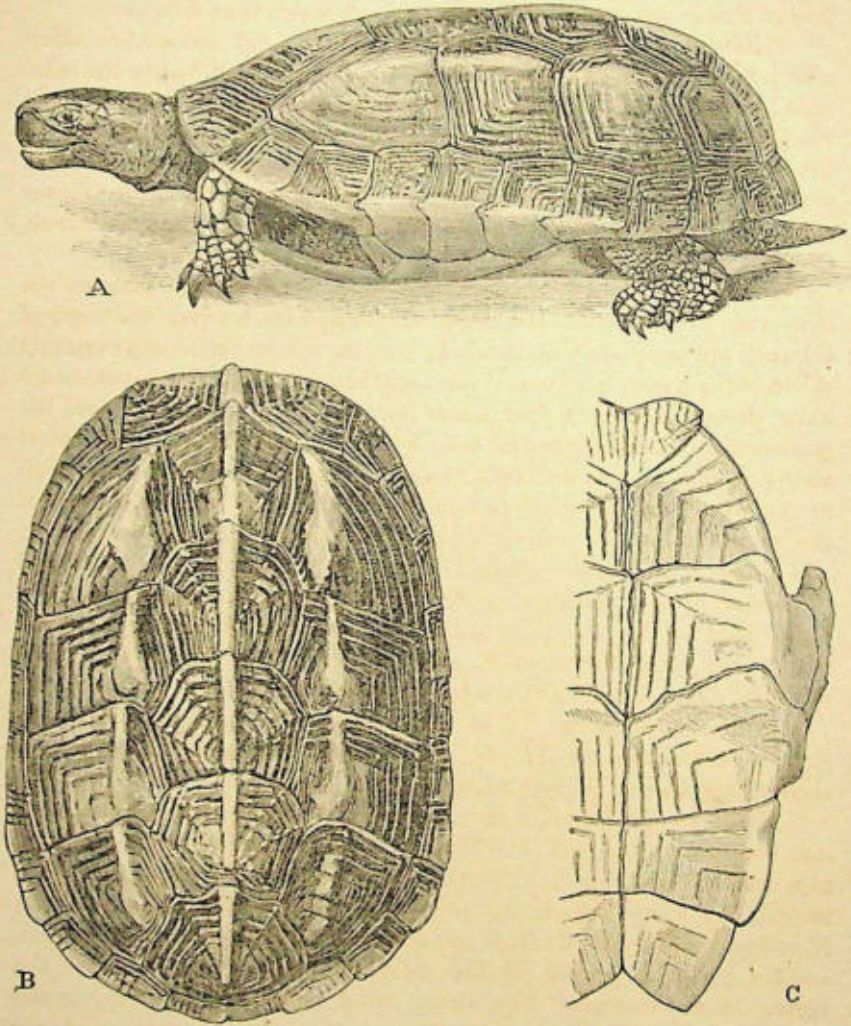

Fig. 1. *Nicoria tricarinata*, ⅓ nat. size. *A*. Lateral view of a male from the Naga Hills. *B*. Dorsal view of the carapace of a female from Chota Nagpur. *C*. Left half of the plastron of the same individual.

point of view. Further, on comparison with the representatives of the Oriental and Neotropical genus *Nicoria* (*Melanochelys*), it appears that the chelonian under consideration agrees in all respects with the definition of that genus given by Mr. Boulenger,* which is as follows:

"Neural plates mostly hexagonal, short-sided behind, or alternately tetragonal or octagonal. Plastron extensively united to the carapace by suture, with short axillary and inguinal buttresses, just reaching the first and fifth costal plates respectively; entoplastron intersected by the humero-pectoral suture. Skull with a bony temporal arch; alveolar surface without a median ridge; choanæ between the eyes. Upper surface of head covered with undivided skin. Digits with a short web, or without. Tail short, not longer in the young than in the adult."

In the Sirguja specimen, with the exception of the one between the hyo- and hypoplastrals, the whole of the sutures between the bones of the shell are completely obliterated; but, on raising the second vertebral shield of the Assam specimen, it was seen that the underlying neural bones have the characteristic features of *Nicoria*; while, on the plastron, the intersection of the entoplastral bone by the sulcus dividing the humeral and pectoral shields is distinctly visible. The short axillary and inguinal buttresses are also displayed in the female shell; while the skull of the male exhibits the undivided skin on the upper surface, the presence of a temporal arcade, the absence of an oral ridge, and the position of the posterior nares (choanæ) on the transverse line of the orbits. The digits have an almost imperceptible web, and in this respect approximate to the South American *N. annulata*, in which the web is totally wanting. The shortness of the tail is well shown in the figure.

It appears, therefore, to be quite clear that the genus *Chaibassia* should be included in *Nicoria*, and that the one species of the former should be known as *Nicoria tricarinata*.

Mr. Boulenger† divides the six species of *Nicoria* recognised by him into two groups, the first of which is characterized by its tricarinate carapace, and includes the Oriental *N. spengleri* and *N. trijuga*, while the second has a unicarinate carapace, and is exclusively American. In *N. trijuga* and apparently in *N. spengleri* the digits are distinctly webbed, and the posterior portion of the carapace slopes gradually from the vertex to the margin. The almost total absence of webbing in the present species, and the abrupt descent of the posterior portion of the carapace, indicate terrestrial habits; and it thus appears that *N. tricarinata* is a representative of the Oriental *tricarinate* group of the genus occupying an analogous position to that held in the Neotropical *unicari-*

* Catalogue, pp. 118, 119.

† *Loc. cit.*

nate group by *N. annulata*. In respect of coloration, *N. tricarinata* is strictly comparable with *N. trijuga*, and especially with the varieties *thermalis* and *edeniana*, in which the carapace is black, with more less distinctly yellow carinæ; but the uniformly yellow plastron is very distinctive of the present form, which may be defined as follows.

Carapace elongately oval, somewhat vaulted, with a sudden descent from the vertex to the posterior margin, and tricarinate. Vertebral shields as broad as, or broader than, long (with the exception in some cases of the first), and much narrower than the costals; nuchal long and narrow. Plastron moderately large; the width of the bridge considerably exceeding that of the posterior lobe, which is broadly notched; front lobe comparatively long and narrow; in some cases a ligamentous union between hypoplastrals and carapace. Pectoral and abdominal shields nearly equal in size; the longest longitudinal suture is between the pectorals, the shortest between the femorals; suture between the humerals as long as that between the anals, and a little shorter than that between the gulars; an axillary but no inguinal shield. Upper jaw not hooked, notched mesially; the width of the mandible at the symphysis is less than the diameter of the orbit. Digits without distinct web. Tail shorter than the head. Carapace dark brown or black, with the ridges deep yellow; plastron pale or orange-yellow. Head and neck brownish, with an orange stripe from the nostrils over the eyes, and a paler patch on either side near the mandible; iris brown.

Length of carapace usually about, 13 to 14·5 centimètres.*

Hab. Bengal and Assam.

That the present form is almost exclusively terrestrial is shown by the practical absence of webbing in the digits, and the contour of the posterior portion of the carapace, which approximates to that obtaining in *Testudo*. The ligamentous union of the hypoplastrals with the carapace in certain individuals is an interesting feature as showing an approximation to *Cyclemys*, where the union between the plastron and carapace is entirely ligamentous, and there is also in the adult a transverse hinge between the two lobes of the plastron itself. The occasional occurrence of this partial ligamentous union in the present form affords a curious comment on the divisions of the *Testudinata* into sections according to the nature of the union between the carapace and the plastron which have been proposed by some writers. By all authors previous to Mr. Boulenger, *Emys*, *Cistudo*, and *Cyclemys* on the one hand and *Clemmys* and *Nicoria* on the other, had been approximated, or generically united, in the system, on the ground of the presence or absence of the plastral hinge.

* Dr Anderson gives the length of the shell of the Assam form as 16 centimètres but in the male it s only 13 centimètres.

Having now sufficiently discussed the affinities of the recent form it remains to say a few words in regard to the fossil shell, of which a figure of the dorsal aspect is given in Fig. 2. The contour of the carapace is so essentially that of the recent form that there can be but little hesitation in referring the fossil specimen to the recent species. This conclusion is confirmed by the circumstance (which first led me to think that the fossil was allied to the so-called *Chaibassia*) that the hypoplastrals had a ligamentous union with the carapace, as is shown by the smooth surface on the inner side of the inguinal marginals. The fossil shell is, however, decidedly larger than that of the existing race, its length when entire having been about 17 centimètres. The first and second vertebral shields are also relatively wider than in either of the existing examples; while all the vertebrals tend to assume a more decided balloon-shape in the fossil, which it may therefore be convenient to regard as a distinct race under the name of *Nicoria tricarinata*, var. *sivalensis*. The fossil specimen agrees with the recent Sirguja example in the total obliteration of all the sutures between the component bones of the carapace.

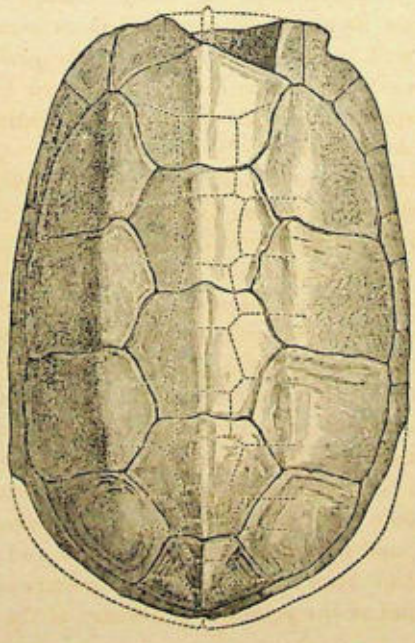

Fig. 2. Carapace of *Nicoria tricarinata*, var. *sivalensis*, from the Pliocene of the Siwalik Hills, ½ nat. size. The neural bones are restored in outline from *N. trijuga*.

XX.—*E'tude sur les Arachnides de l' Himalaya recueillis par* MM. Oldham *et* Wood-Mason *et faisant partie des collections de l' Indian Museum. 1re Partie. Par* E. Simon. *Communicated by* The Superintendent of the Indian Museum.

[Received Oct. 9th;—Read Nov. 6th, 1889.]

1. Æluillus quadrimaculatus, sp. nov.

♀. Long. 5.7 mm.

Cephalothorax sat elongatus, postice ampliatus, niger, pilis fulvo-cinereis, marginem versus sensim albidioribus, crebre vestitus. Pili oculorum supra fulvi infra oculos albidi. Pili clypei densi, longi, et albidi. Oculi antici viridi-metallici, in linea modice recurva. Oculorum series postica cephalothorace non multo angustior. Abdomen oblongum, antice obtuse truncatum, fulvo-cinereo dense pubescens, maculis elongatis quatuor biseriatis nigris notatum, subtus omnino albido-pubescens. Sternum fuscum, nitidum, parce albo-pilosum. Pedes-maxillares luridi, anguste fusco-annulati. Pedes fulvi, confuse fusco-annulati, albo-cinereo-hirsuti, numerose aculeati. Tarsi quatuor antici metatarsis breviores. Patella cum tibia parium 3tii et 4ti circiter æquilonga, sed articuli 3i paris robustiores. (Vulva haud plane adulta).

Jaonsar, Siri, 5000 pieds, *(Oldham)*.

Species abdomine quadrimaculato, cephalothorace elongato fere ut in genere *Phlegra*, tarsis anticis metatarsis brevioribus eximie distincta.

2. Phlegra icioides, sp. nov.

♀. Long. 5 mm.

Cephalothorax elongatus, humilis, parte cephalica nigra, parte thoracica fusco-ravida, vitta media angusta vittaque marginali latiore luridis notata, supra pallide flavido marginem versus albido-pubescens. Pili oculorum et clypei crebrissimi et albidi. Oculi antici valde inæquales, in linea plane recta. Oculi seriei 2æ paulo ante medium, inter laterales anticos et posticos siti. Oculorum series tertia cephalothorace vix angustior. Abdomen longe oblongum, pallide testaceum omnino albido-pubescens, utrinque crebre fusco-punctatum et reticulatum, in parte prima vitta longitudinali lineam mediam fuscam includente, in parte secunda arcubus transversis acutis 3-4 testaceis fuscisque notatum, subtus omnino testaceum. Sternum obscure fuscum. Chelæ, oris partes, pedes-maxillares, pedesque omnino flavo-lurida, tibiis anticis inferne 2-3, metatarsis 2-2 breviter aculeatis, tibiis metatarsisque posticis parce aculeatis, metatarsis aculeo exteriore parvo, aculeis interioribus parvis binis atque aculeis apicalibus ordinariis tantum instructis, patellis

cunctis muticis. Vulvæ area fulva, simplex, plana, postice margine transverso in medio leviter angulato, limitata.

Jaonsar, Siri, 5000 pieds, (*Oldham*).

Species valde insignis, cephalothorace humili, pedibus posticis parce aculeatis, patellis muticis etc. fere ut in genere *Icio*. *P. semiglabratæ*, E. Sim., ex Hispania, sat affinis.

3. Homalattus mus, sp. nov.

♀. Long. 5 mm.

Cephalothorax niger, coriaceus, crebre et longe albido-cinereo-pilosus, circiter æque longus ac latus, utrinque ample rotundus, supra fere planus. Pili oculorum fulvi. Pili clypei nivei, crebrissimi et longissimi, chelis fere omnino obtectis. Oculi antici in linea subrecta, inter se sat late remoti. Abdomen late oblongum, depressum, nigrum, supra albido-cinereo, utrinque fulvo-pubescens, in lateribus lineis obliquis abbreviatis albis 1-4 sectum. Pedes antici robustissimi, femore late clavato, nigri tarso rufescenti, pedes reliqui obscure fusci, metatarsis tarsisque dilutioribus sed fusco-annulatis, cuncti cinereo albidoque hirsuti. Tibiæ anticæ robustissimæ, aculeis binis interioribus subapicalibus tantum armatæ, metatarsi brevissimi (tarsis breviores) aculeis robustis binis muniti. Pedes-maxillares parvi et graciles, rufescentes, tarso infuscato leviter depresso. Plaga vulvæ simplex, plagula media obtuse triquetra, medio depressa et antice aperta notata.

Jaonsar, Siri, 5000 pieds, (*Oldham*).

4. Plexippus paykulli, Aud. in Sav., Eg. Ar. 1827, Pl. VII, F. 22.

Jaonsar, Thadyar, 2500 pieds; Siri, 5000 pieds, (*Oldham*).

5. Pencetia viridana, Stoliczka, J. A. S. B. XXXVIII, 1889, p. 220, Pl. XX, F. 1 (*Sphasus*).—*Pencetia viridana*, E. Sim., Ann. Gen. xx, 1884, p. 326. *? Pencetia prasina*, Thorell, Ann. Gen. 1887, p. 325.

Jaonsar, Thadyar, 2500 pieds, (*Oldham*).

6. Selenops montigena, sp. nov.

♀. Long. 11 mm.

S. malabarensi, E. Sim., valde affinis et subsimilis, differt oculis mediis anticis lateralibus evidentius minoribus, metatarsis anticis inferne 3-3 aculeatis (in *S. malabarensi* 2-2 tantum aculeatis), vulvæ area plana, nigra, subrotunda, antice stria arcuata limitata et plagulam anguste longitudinalem ovatam includente (in *S. malabarensi* plaga anteriore subrotunda vel cordiformi fulva et margine postico crasso

fusco postice inciso notata).—Cephalothorax læte fusco-castaneus, regione frontali obscuriore, pallide lurido-pubescens. Abdomen ovatum, depressum, antice truncatum, fusco-testaceum crebre pallide lurido-pubescens. Sternum pedesque fulvo-rufescentia.

Jaonsar, Kumia, 6000 pieds, (*Oldham*).

7. GASTERACANTHA UNGUIFERA, sp. nov.

♀. Long. tot. 5 mm. Long. scuti 3·5 mm.; lat. scuti 5·5 mm.

Cephalothorax obscure fusco-rufescens, nitidus sed parum dense transversim rugatus, crasse albido-pilosus, parte cephalica alta, apice profunde sulcata. Oculi medii subæquales, aream trapeziformem latiorem quam longiorem et antice quam postice multo angustiorem occupantes. Clypeus oculis mediis anticis non multo latior. Scutum abdominale fere $\frac{1}{3}$ latius quam longius, transversim ovatum et leviter excavatum, aculeis sex armatum, aculeis lateralibus 1is parvis conicis et acutis, lateralibus 2is sat brevibus sed crassissimis, apice abrupte angustioribus acutis et leviter uncatis, aculeis posticis lateralibus non multo minoribus, ad basin crassis, ad apicem valde attenuatis atque acutis; scutum supra sat regulariter granosum sed in medio sensim lævius, punctis ocelliformibus ordinariis impressum, obscure flavum aculeis ravidis, vel olivaceum et zonis transversis dilutioribus confusis notatum, vel antice linea longitudinali et macula media obtuse triquetra læte flavis decoratum. Venter sat crebre granosus, ater utrinque leviter fulvo-notatus, tuberculo medio maximo munitus. Sternum valde granosum, atrum, antice macula dilutiore parum expressa notatum. Pedes breves et robusti, obscure ferruginei, metatarsis tarsisque dilutioribus, articulis cunctis apice latissme fusco-annulatis.

♂. Long. 3 mm.

Cephalothorax fere ut in femina sed fronte medio paulo prominentiore et clypeo retro-obliquo. Scutum abdominale fere ut in femina sed magis quadratum, supra atrum, ad marginem leviter fulvo-variatum, aculeis sex brevioribus et cunctis conicis subsimilibus instructum. Venter plica transversa elevata munitus sed tuberculo carens. Pedes paulo longiores, tibiis anticis ad basin leviter depressis, tibia 1i paris intus, prope basin, aculeis binis brevibus sed validis et dentiformibus atque ad apicem aculeo simili instructa. Pedes-maxillares breves et robusti, atri, tarso supra ferrugineo.

Jaonsar, Thadyar, 2600 pieds, (*Oldham*).

Species valde insignis, aculeis lateralibus 2is fere ut in *Stanneoclavi* mucronatis eximie distincta, sectionem novam in genere *Gasteracantha* (sensu stricto) formans.

8. Glyptogona excelsa, sp. nov.

♀. Long. 4·5 mm.

Cephalothorax brevis, obscure fulvo-rufescens, marginem versus infuscatus, parte thoracica valde declivi et glabra, parte cephalica antice attenuata levissime acclivi et crasse albo-setosa. Oculi medii æquales, aream subquadratam et subverticalem occupantes. Oculi quatuor antici (antice visi) lineam leviter procurvam formantes. Clypeus altus sed area oculorum mediorum paulo angustior. Abdomen breve, subrotundum sed postice in tuberculum crassum et obtusum elevatum, supra albidum, postice nigricanti marginatum. Venter nigricans, maculis binis elongatis et utrinque prope mammillas puncto parvo albidis notatus. Sternum, chelæ, et partes oris nigræ. Pedes breves et robusti, luridi, femoribus quatuor anticis, basi excepto, infuscatis, articulis reliquis ferrugineis, pedes quatuor postici femoribus, tibiis, metatarsisque ad apicem fusco-annulatis, tarsis fuscis, patellis tibiisque anticis supra deplanatis, aculeis paucis albis instructis. Vulvæ uncus crassus et brevis, ovatus apice attenuatus et obtusus, scapum ungue obtectum, subquadratum, nigrum, parte media rufula sulcata munitum.

Jaonsar, Dartar, 4500 pieds, (*Oldham*).

A *G. sextuberculata*, Keyserl., valde differt imprimis abdomine supra unituberculato, oculis mediis inter se æquis, clypeo area oculorum mediorum paulo angustiore etc.*

9. Cyclosa spirifera, sp. nov.

♀. Long. 6·7 mm.

Cephalothorax angustus et longus, luridus, tenuiter fusco-punctatus, parte cephalica postice macula dilutiore V-formante notata et vittis obliquis fuscis discreta, parte thoracica ad marginem infuscata. Oculi medii postici subcontigui, antici posticis plus duplo majores. Clypeus angustissimus. Abdomen longe oblongum, antice acuminatum et in tuberculum obtusum subverticale elevatum, postice in tuberculum longius, utrinque ad basin obtuse mucronatum, productum, supra albo-flavidum, in lateribus fulvum, fusco-reticulatum et oblique albo-segmentatum. Venter crebre albido-punctatus. Sternum pallide fuscum, inæquale, antice vitta transversa, utrinque maculis binis magnis et macula apicali minore albidis notatum. Partes oris chelæque fusco-rufescentes. Pedes-maxillares pedesque luridi, femoribus, præsertim anticis, annulo submedio fusco et supra et infra interrupto, tibiis metatarsisque annulo medio annuloque apicali angustissimis et parum expressis (annulo apicali tibiæ 4i paris excepto) notatis, metatarsis cunctis et pedibus sex posticis muticis, femoribus tibiisque anticis aculeis paucis brevibus

* cf. E. Simon, Ann. Soc. Ent. Fr. 1884, p. 327.

et debilibus armatis. Vulvæ uncus rufulus, transversim plicatus, haud longior quam latior, late cordiformis, apice breviter et abrupte angustior atque inflexus, scapum crassum convexum et transversum, fusco-nitidum, utrinque rotundum, incisura media parva et acute triquetra notatum.

♂. Long. 5 mm.

Cephalothorax fusco-castaneus, in medio longitudinaliter dilutior, parte thoracica latiore et ovata. Abdomen minus et brevius, antice obtusum haud elevatum, postice breviter et obtusissime productum. Pedes pallide luridi, latius et distinctius fusco-rufescenti annulati, metatarsis parce aculeatis, tibia 2i paris tibia 1i paris paulo crassiore, levissime curvata et intus aculeis nigris, robustis et biseriatis (3-4) armata. Pedes-maxillares breves et robusti, fusci, bulbo rufulo disciformi, lamina apicali maxima fusca apice valde spiraliter contorta, carinata atque acuta, insigniter munito.

Jaonsar, Thadyar, 3500 pieds, (*Oldham*).

10. Cyclosa fissicauda, sp. nov.

♀ (pullus). Long. 3 mm.

Cephalothorax obscure fuscus subniger, regione oculari leviter dilutiore, parte cephalica convexa, sulco semicirculari profundo discreta, parte thoracica fovea media parva sed profunda et rotunda impressa. Abdomen breviter ovatum, antice rotundum, paulo ante medium tuberculis binis obtusissimis, ad apicem tuberculo majore crasso, apice obtuse bifido, munitum, supra testaceum, crebre fusco-variatum, subtus atrum, maculis albis binis transversim elongatis vittam fere formantibus et utrinque, secundum mammillas, punctis albis parvis binis ornatum. Sternum fuscum, antice vitta transversa, utrinque maculis binis maculaque apicali albidis subconfluentibus ornatum. Pedes robusti et breves, submutici, femoribus ad apicem fusco-annulatis, patellis tibiis metatarsisque sex anterioribus ad apicem et in medio angustissime fusco-cinctis, posticis apice distinctius annulatis, tarsis cunctis apice fuscis.

Jaonsar, Dartar, 4500 pieds, (*Oldham*).

Cyclosæ oculatæ, Walck., affinis sed certe distincta.

11. Epeira camilla, sp. nov.

♀. Long. 6·5 mm.

Ep. dromadariæ, Walck., valde affinis et subsimilis, differt area oculorum mediorum antice quam postice evidentius latiore et oculis mediis anticis evidentius majoribus, vulvæ carinis scapi parallelis (in *E. dromadaria* antice convergentibus). Cætera ut in *E. dromadaria*.

Jaonsar, Deota, 7700 pieds, (*Oldham*).

12. Epeira laglaizei, E. Simon, Ann. Soc. ent. Fr. 1877, p. 77.—*Epeira thelura*, Thorell, Rag. Mal. etc., ii, 1878, p. 84. *Epeira laglaizei*, Thorell, *l. c.*, iii, 1881, p. 119.

Jaonsar, Thadyar, 2500 pieds, (*Oldham*).

13. Epeira himalayana, sp. nov.

♀. Long. 7·5 mm.

Cephalothorax pallide luridus, lævis, parce albo-pilosus. Area oculorum mediorum vix longior quam latior et antice quam postice latior, oculi medii antici posticis paulo minores. Oculi laterales a mediis sat late remoti, inter se anguste separati, anticus postico paulo major. Clypeus oculis mediis anticis non multo latior. Abdomen breviter ovatum, antice leviter acuminatum, supra albo-opacum, in medio punctis impressis minutis quatuor et utrinque punctis nigris parvis elongatis (lineiformibus) quatuor uniseriatis ornatum, subtus fulvo-testaceum et maculis albidis confusis quatuor, quadratum formantibus, notatum. Sternum, chelæ, pedesque lurido-rufescentia. Pedes breves et robusti, aculeis ordinariis numerosis fulvis et pellucentibus armati. Vulvæ uncus sat brevis et crassus, non multo longior quam latior, apice attenuatus sed obtusus et marginatus, fulvus et superne transversim rugatus.

Jaonsar, Deota, 7700 pieds; Bujkoti, 9000 pieds; Kumia, 6000 pieds, (*Oldham*).

E. alpicæ, L. Koch, valde affinis et subsimilis, differt area oculorum mediorum paulo breviore, oculis lateralibus utrinque disjunctis, abdomine antice magis acuminato et punctis elongatis nigris quatuor utrinque ornato, aculeis pedum fulvis etc.

E. prædatæ, Cambr., ex Yarkand, certe affinis est *E. himalayana* sed verisimiliter distincta.

14. Epeira nympha, sp. nov.

♀. Long. 6 mm.

Cephalothorax obscure fulvus, crasse albido-pilosus, parte cephalica paulo dilutiore et postice macula albida V-formante notata. Oculi medii subæquales, aream circiter æque latam et longam, et antice quam postice non multo latiorem, occupantes. Oculi laterales a mediis non late remoti, æqui, et inter se angustissime separati. Clypeus oculis mediis anticis haud latior. Abdomen circiter æque longum ac latum, antice late rotundum, postice breviter attenuatum atque obtusum, fulvum, crebre testaceo-punctatum, utrinque vitta albidiore sinuosa sæpe intus anguste fusco-marginata notatum, subtus fulvum, vitta media lata

paulo obscuriore, anguste et parum distincte testaceo-marginata, notatum. Sternum castaneum. Chelæ obscure fulvæ apice dilutiores. Pedes sat longi et graciles, fulvi, femoribus ad apicem tibiis metatarsisque ad basin atque ad apicem, tarsisque ad apicem pallide fusco-annulatis, aculeis paucis, gracillimis fuscis, metatarsis, præsertim anticis, submuticis. Vulvæ uncus sat brevis et latus, subparallelus, apice obtusus et marginatus supra fulvus planus et transversim rugatus, scapum transversum, utrinque, secundum basin unci, subquadratum.

Jaonsar, Deota, 7700 pieds, (*Oldham*).

E. triguttatæ, Fabr., ex Europa, sat affinis.

15. Epeira minutalis, sp. nov.

♀. Long. 5 mm.

Cephalothorax obscure luridus, antice paulo dilutior, parce et crasse albido-setosus, parum convexus et antice sat attenuatus, oculi nigro-cincti. Oculi medii aream paulo longiorem quam latiorem et antice quam postice vix angustiorem occupantes, antici posticis paulo minores, laterales subæquales et subcontigui, a mediis non late remoti. Abdomen sat longe ovatum, antice attenuatum et tuberculis humeralibus obtusis munitum, postice leviter attenuatum atque obtusum, supra fulvo-olivaceum et in parte secunda vittis fuscis binis flexuosis, figuram foliiformem designantibus, ornatum, interdum latius nigricanti-marginatum. Venter vitta media lata et parallela nigra et postice, secundum mammillas, utrinque puncto albido notatus. Sternum nigrum. Chelæ castaneæ. Pedes sat longi, luridi, femoribus ad apicem, tibiis metatarsisque in medio atque ad apicem fusco-rufescenti-annulatis, tarsis apice infuscatis, aculeis ordinariis nigris, parum longis. Vulvæ uncus fulvus, sat brevis, triquetrus, apice attenuatus et subacutus, scapo obtecto.

Jaonsar, Deota, 7700 pieds, (*Oldham*).

Species valde insignis inter *E. dioidiam* et *dromadariam*, Walck.

16. Larinia quadrinotata, sp. nov.

♀ (pullus). Long. 8 mm.

Cephalothorax angustus et longus, pallide luridus, crasse et longe albo-hirsutus, linea media fusca oculos haud attingente sed antice in maculam parvam ampliata, notatus. Area oculorum mediorum paulo longior quam latior, medii postici inter se juxte contigui, antici posticis paulo majores. Oculi quatuor antici, antice visi, lineam leviter recurvam formantes, medii a lateralibus quam inter se remotiores. Abdomen angustissimum, longum et parallelum, apice in caudam obtusam breviter productum, albido-cinereum, parce albido-setosum, linea media

integra albidiore et punctis nigris quatuor notatum, subtus longitudinaliter infuscatum, mammillis fuscis nigricanti-limbatis. Sternum, chelæ, partes oris pedesque omnino lurida, aculeis pedum sat numerosis tenuibus, cunctis albidis et pellucentibus. (Vulva haud adulta).

Jaonsar, Deikhera, 4000 pieds ; Thadyar, 2500 pieds, (*Oldham*).

L. chlorei, Sav., ex Ægypto et *L. pubiventri*, E. Sim., ex Asia centrali, affinis, imprimis differt ventre infuscato.

17. Cercidia punctigera, sp. nov.

♀. Long. 4·5 mm.

Cephalothorax niger, parte cephalica dilutiore et rufescente parce rugosa, longe et crasse albido-setosa, lata vix attenuata et valde convexa. Oculi medii æqui, aream subquadratum occupantes. Clypeus oculis mediis anticis circiter duplo latior. Abdomen late oblongum, ad marginem anticum obtuse prominens, utrinque levissime sinuosum, ad apicem obtuse et breviter trimucronatum, mucrone medio lateralibus paulo majore et bilobato, supra subplanum, duriusculum, sat crebre et subtiliter impressum, albido-flavidum, fusco-atomarium, tuberculis albidioribus et nigro-cinctis. Venter niger, crebre testaceo punctatus. Sternum chelæque nigra. Pedes breves, robusti et fere mutici, obscure luridi, femoribus ad apicem, tibiis metatarsisque ad basin atque ad apicem late fusco-annulatis, annulis tibiarum anticarum sæpe confluentibus. Vulvæ uncus parvus, angustus et rectus, scapum magnum, tripartitum, parte anteriore (sub ungue) fulva ovato-transversa, partibus posticis crassis, fuscis obliquis marginem formantibus.

♂. Long. 3·5 mm.

Cephalothorax antice magis attenuatus, lævis, nitidus, fusco-rufescens, parte cephalica postice dilutiore et testacea. Abdomen fere parallelum, antice posticeque obtusum, haud mucronatum, duriusculum et impresso-punctatum, supra fusco-olivaceum, vitta media albida, in medio anguloso-dentata, et lineam mediam fulvam includente, notatum. Venter niger, utrinque testaceo-marginatus. Pedes luridi, confuse fusco-rufescenti annulati, quatuor antici reliquis robustiores et evidenter longiores, tibiis haud incrassatis, sat numerose aculeatis, metatarsis muticis. Pedes-maxillares breves et robusti, tarso insigni, superne ad basin in tuberculo magno erecto, obtuso et compresso producto.

Jaonsar, Deota, 7700 pieds ; Bujkoti, 9000 pieds, (*Oldham*).

18. ? Argyroepeira angustata, Stoliczka, J. A. S. B., XXXVIII, 1889, p. 241, Pl. XX, F. 7, (sub *Nephila*).

De nombreux individus mais tous très jeunes, ce qui laisse des

dontes sur leur détermination.—Peut-être faudrait-il les rapporter a *Meta mixta* Cambridge du Yarkand.

Jaonsar, Deota, 7700 pieds; Dartar, 2500 pieds; Lokhar, 6900 pieds, (*Oldham*).

19. Nephila maculata, Fabr., Ent. Syst., II, 1793, p. 425, (*Aranea*).

Dehra Dun, 2300 pieds, (*Wood-Mason*).

20. Miagrammopes extensa, sp. nov.

♀. Long. 10·5 mm.

Cephalothorax luridus, pilis pronis plumosis albidis sat dense vestitus, multo longior quam latior, antice posticeque fere recte sectus, postice sensim attenuatus, supra fere planus sed utrinque, pone oculos, impressione arcuata notatus. Oculi longe ante medium siti, parvi, subæqui (medii lateralibus vix minores), lineam recurvam formantes, medii inter se quam a lateralibus multo remotiores. Abdomen pallide-luridum, albido-pubescens, supra linea media obscuriore ramosa notatum, longissimum et subparallelum, antice recte sectum. Partes oris pedesque luridi, pedes antici et postici ad extremitates paulo obscuriores et rufescentes, femoribus anticis parcissime et minute fusco-punctatis. Pedes antici reliquis multo longiores et robustiores, femoribus validis cylindraceis, tibiis metatarsisque leviter compressis, metatarsis 4i paris tibiis plus duplo brevioribus, paulo crassioribus et compressis, inferne rugosis, superne, in parte basali, leviter excavatis et calamistro, dimidium articulum saltem occupante, munitis.

♂ (pullus). Femina subsimilis sed metatarso 4i paris inferne setis claviformibus validis regulariter uniseriatis instructo superne calamistro munito. Pedes-maxillares (haud adulti) breves, inflati et pellucentes.

Jaonsar, Thadyar, 3500 pieds, (*Oldham*).

21. Theridion subvittatum, sp. nov.

♀. Long. 3 mm.

Cephalothorax brevis, lævis, nitidus, fusco-luteus, marginem versus leviter dilutior, parcissime albido-pilosus. Oculi antici æqui, sat late et æque distantes, in linea sat procurva. Oculi postici in linea plane recta, medii paulo majores et a lateralibus quam inter se remotiores. Area mediorum circiter æque longa ac lata et antice quam postice latior, medii antici posticis minores. Clypeus verticalis, area oculorum latior. Abdomen magnum, globosum sed antice obtusissime et levissime emarginatum, albido-opacum, antice macula media, utrinque vitta marginali, postice ampliata, nigricantibus notatum, subtus fusco-testaceum et prope

plicam epigasteris punctis binis parvis albis notatum. Sternum fusco-rufescens, lævc, nitidum, longius quam latius, postice longe attenuatum, coxæ posticæ spatio articulo paulo angustiore a sese distantes. Partes oris subnigræ. Chelæ clypeo longiores. Pedes modici, antici reliquis longiores et paulo robustiores, luridi, femore tibiaque anticis ad apice late rufulo fulvove annulatis. Vulva simplex.

Jaonsar, Siri, 5000 pieds, (*Oldham*).

T. vittato, Walck., sat affine sed differt pictura et forma abdominis et proportione oculorum. *T. incerto*, Cambr. (ex Yarkand), affine sed cephalothorace lævi et abdomine nigro-marginato certe differt.

22. Cedicus bucculentus, sp. nov.

♀. Long. 13 mm.

Cephalothorax nigro-piceus in medio leviter rufescenti-tinctus sublævis, parte cephalica vix attenuata et valde convexa. Oculi postici in linea subrecta, parvi (laterales mediis paulo majores), medii a lateralibus quam inter se paulo remotiores sed spatio diametro oculi fere duplo majore inter se sejuncti. Oculi antici in linea leviter procurva, medii minutissimi ad sese appr[illegible]inquati, laterales mediis duplo majores et late ovati. Oculi laterales prominuli. Abdomen oblongum, atrum, fulvo-pubescens, prope medium maculis parvis binis testaceis subgeminatis, in parte apicali arcubus transversis valde angulosis 4-5 testaceis decoratum. Venter obscure fulvo-testaceus. Sternum fulvo-rufescens nitidum. Chelæ nigræ, validissimæ, ad basin valde geniculatæ et prominentes, præsertim in parte apicali, rugosæ, margine inferiore sulci dentibus quinque, ultimis duobus reliquis majoribus, margine superiore dentibus quatuor, ultimo majore. Pedes robusti et breves, fusco-rufescentes, femoribus, præsertim inferne, dilutioribus, aculeis longis ordinariis, tarsis posticis utrinque aculeis paucis munitis. Vulvæ plaga fusca, plana, subrotunda, postice fovea sat minuta testacea in parte secunda plagulam parvam rufulam subquadratam includente notata.

Jaonsar, Kumia, 6000 pieds, (*Oldham*).

C. mœrenti, E. Sim., ex Asia centrali, affinis, præsertim differt armatura chelarum, pictura abdominis, et structura genitali.

23. Clubiona hygina, sp. nov.

♀. Long. 7·5 mm.

Cephalothorax fulvo-rufescens, antice leviter sensim infuscatus, haud nigro-marginatus, pilis pallide luteo-sericeis vestitus, stria brevi sed profunda. Oculi postici æqui a sese late et fere æque distantes. Oculi antici æquidistantes et spatiis diametro oculi angustioribus a sese se-

juncti, medii majores rotundi, laterales ovati atque obliqui. Abdomen late oblongum, supra fusco-violaceum, pallide luteo-sericeo-pubescens, subtus paulo dilutius. Mammillæ, sternum, pedesque fulvo-rufescentia. Tibia cum patella 4i paris cephalothorace circiter æquilonga. Chelæ fusco-rufulæ nitidæ haud rugatæ, robustæ, sed non geniculatæ. Pedes aculeis ordinariis, tibia 3i paris inferne aculeis binis uniseriatis, basilari altera multo minore. Vulvæ area magna, fulva, convexa, postice leviter prominens et obtuse secta, antice fovea longitudinali parva sed profunda impressa.

Jaonsar, Deota, 7700 pieds, (*Oldham*).

C. germanicæ, Thorell, ex Europa, affinis, imprimis differt structura vulvæ.

24. Anyphæna soricina, sp. nov.

♀. Long. 7·4 mm.

Cephalothorax obscure fulvo-rufescens, pilis longis cinereo-albidis fulvisque dense vestitus, regione oculorum infuscata et parte cephalica linea media exillima nigricanti-notata. Oculi postici in linea evidenter procurva, medii inter se quam a lateralibus remotiores. Oculi antici inter se parum disjuncti in linea levissime procurva (subsecta), medii lateralibus minores. Area mediorum trapeziformis, multo longior quam latior. Clypeus oculis anticis vix angustior. Abdomen late ovatum convexum, cinereo-lividum, supra parce et inordinate fulvo-violaceo punctatum. Plica ventralis fere in medio sita. Mammillæ fulvæ. Sternum lurido-testaceum. Partes oris chelæque fusco-rufescentes. Chelæ læves, margine inferiore sulci serie dentium parvorum 4-5 munito. Pedes modice longi (4, 1, 2, 3), fulvo-olivacei vel rufescentes, fusco-variati, subannulati et sublineati, metatarsis tarsisque infuscatis, aculeis ordinariis numerosis et longis. Vulvæ plaga sat parva, nigra postice leviter attenuata et truncata, antice fovea parva, ovato-longitudinali profunda impressa.

Jaonsar, Deota, 7700 pieds, (*Oldham*).

A. accentuatæ, Walck., affinis, differt imprimis linea oculorum antica levissime procurva (in *A. accentuata* recta), area vulvæ minore, pedibus posterioribus anterioribus paulo longioribus, etc.

XXI.—*Notes on Indian Rotifers.**—*By* H. H. Anderson, B. A.

[Received Sept. 10th;—Read December 4th, 1889.]

(With Plates XIX—XXI.)

For the last few months I have devoted what little time I could spare for work with the microscope to the study of Rotifers with the twofold view of seeing what species already known to science I could find in our Calcutta tanks and of discovering new forms. I commenced on water and weed brought from the tanks on the further side of No. 2 Bridge, Entally, and I have found these so rich in specimens that I have not yet turned elsewhere for my materials. I propose to give in this paper a list of the known species that I have been able to determine, with notes as to frequency of occurrence, date on which observed, and other details which may be of use to future observers. I have also described some that I believe to be new forms, but I have confined myself to those which are species of some known genus. I have drawings and descriptions of others in my notebooks for which new genera will, I think, have to be framed, but these I have reserved for further investigation. I have followed throughout Hudson's and Gosse's classification and nomenclature, and have based this paper on their book. As, however, their work includes descriptions of British Rotifers mainly, and only the most important of non-British species, there is some uncertainty whether some of the forms which I have imagined to be new may not be already known. I have studied Ehrenberg and Pritchard for continental forms, as well as such papers in scientific journals as I have been able to get access to, so I trust I have not here described as discoveries what have already been discovered. This paper is, I hope, only a first instalment, for our weedy tanks teem with Rotifera, and I have no doubt that a few months more work would enable me to give a second list as long as this one.

Order 1. RHIZOTA.

Family I. **Floscullariadæ.**

1. Flosculaeia ornata, Ehrenberg.

Common, in many tanks, at all seasons, size $\frac{1}{75}''$, often much less.

* Communicated by the Microscopical Society of Calcutta, before which it was read on Sept. 9th, 1889.

2. Floscularia campanulata, Dobie.

Only seen once or twice, size $\frac{1}{70}$".

3. Floscularia ambigua, Hudson.

Fairly common, on *Utricularia*, during the rains, size $\frac{1}{50}$".

4. Floscularia tenuilobata, n. sp., Pl. XIX.

Lobes five, linear, knobbed, composing almost the whole of the corona, the undivided portion being almost nothing. Knobs hemispherical with the flat surface inclined at an angle with the inner surface of the lobe. Setæ long, radiating from the knobs, smaller ones on the whole length of the lobe and on the smaller edge of the corona between their bases. The long linear lobes with their peculiarly shaped heads, and the very small undivided portion of the corona, are distinctive. The lobes seem capable of independent motion and have the appearance in certain positions of being jointed on to the neck. The neck is much narrower than the body, which again tapers gradually to its long and narrow foot, so that the creature has a somewhat spindle-shaped appearance. The internal structure corresponds with that of other Floscules, except that it seemed to me that the buccal orifice from the vestibule into the crop was situated at the side rather than at the centre of the crop, and that the tube leading from the one to the other hung against the wall of the crop. I note that, in the figure originally drawn by me, there is a projection at the base of the corona which looks like an antenna. I have not been able to verify this by subsequent observation. This species is a fine handsome creature from $\frac{1}{30}$" to $\frac{1}{25}$" in length. It is not at all shy, and I found it in great profusion last year (1888) during the rains on leaves of a species of *Utricularia*. I first saw it in 1887, and described it at a meeting of the Microscopical Society in the autumn of that year.

Family II. Melicertadæ.

5. Melicerta ringens, Schrank.

I have only come across a few specimens in Entally tanks: these, I saw in November, 1888. Mr. W. J. Simmons, however, tells me that he has found this species in great profusion in water taken from tanks in the Botanical Gardens.

I came across one specimen of a *Melicerta* with a tube very fluffy and irregular in shape differing greatly from the regular compact tube of *M. ringens*. The pellets, oval in shape, were not fæcal, as I observed

them in process of formation in the cup beneath the chin. I was unable to discover any essential difference of structure.

6. Limnias ceratophylli, Schrank.

Is extremely common and often occurs in large clusters.

7. Limnias annulatus, Cubit.

I have only come across this species once, in water taken from a gumlah in my orchid house, but on that occasion I found plenty of specimens.

On the same date, January 21st, 1889, and in the same water, I found one specimen resembling *annulatus*, but differing from it in having the ridges very wide apart, *i. e.*, more than $\frac{1}{1000}''$. The ridges were not so decided as in *annulatus*, but still plainly visible, the antennæ were very short and not prominent in retraction. The tube was transparent, but far more covered with débris than the tube of *annulatus* usually is.

8. Cephalosiphon limnias.

Several specimens were seen, December 9th, 1888, but it is far from common in these Entally tanks.

9. Œchistes stephanion, n. sp., Pl. XX, Fig. 2.

It differs from most *Œchistes* in having a very small corona, the diameter of which is not more than half that of the body. The chin is very prominent, the distance from its tip to the upper wreath being almost as great as the breadth of the corona itself. The cilia of the secondary wreath are larger and stronger below the chin than above it, and the outline of the margin on which they are situated is very clear and sharply defined. Immediately below the lowest point of the wreath are situated the ventral antennæ, which are very short and inconspicuous, the setæ on them being with difficulty distinguished from the lowest cilia, with which they are almost in the same line. By watching the head of the *Œchistes*, when closed, very carefully with a high power (900 diameters), I saw what I take to be the dorsal antenna, which, as the animal unfolded, I was able to follow to their position as minute pimples on the dorsal side of the neck at the edge of its upper fold just at the bottom of the corona. The jaws are many-toothed, the gastric glands round and clear. The substance of the body is granular, somewhat opaque, far more so than in most Rotifers; owing to this opacity the vascular system is seen with difficulty. The cloacal aperture is situated half way down

the side. It is a curious fact that, though far above the top of the tube, the mouth of the cloaca, when ejecting matter, was raised and projected just as is done by those species which have long tubes in order to eject the fæcal matter over the top of the tube. The foot is long; when fully extended more than twice the length of the body: the lower portion is generally wrinkled. The tube is very short. In habit the creature is bold, expanding freely and rarely retracting, indifferent to sharp taps on the glass slip or to movements of it. It resembles *E. serpentinus*, but the foot is comparatively much shorter, and, though I looked carefully, I could see no horns or hook. It differs from other *Œchistes* in the smallness of the corona, the position and small size of the ventral antennæ, and the very short tube. It is rare.

10. Megalotrocha alboflavicans.

Very common. I have found it swarming at all seasons. There is considerable variety in shape and size, the most striking form being one in which the body is very large and inflated, the viscera having the appearance of being hung in the centre of a crystalline vase. In such specimens the ringed appearance of the body as shewn in Ehrenberg's figures is very marked. I note that Hudson has not drawn these rings in the plates in his book, though my own experience is that they are more or less visible in all our Indian specimens. I noticed some clusters in which the epidermis at the base appeared spotted, but with a higher power it could be seen that this appearance was due to the presence of fine short spines or projections apparently of the same substance as the epidermis. This spined epidermis remained as a sort of sheath or empty skin when by pressure the cluster was broken up. In these specimens the gastric glands were larger and more prominent than in the normal type. Some specimens, apparently full grown, for they had eggs in the cluster, were only $\frac{1}{30}''$ in length; the larger clusters contained specimens $\frac{1}{12}''$ long. Great as is the difference in size and shape I hesitate to divide them into different species as there were intermediate forms which seemed to link them all together. Further and more careful study may, however, show points of difference which I have overlooked.

The so-called white opaque spots are, in our Indian species, as seen by direct illumination brownish green by daylight, brown by gaslight. They are in most cases granulated in structure but in many there were clear spaces, sometimes two or more clear spaces in one spot. As I have never seen British specimens I cannot say whether this is a peculiarity; I find no mention of it either in Pritchard or in Hudson and Gosse.

The male of this species has not, I believe, been previously observed. I met with several specimens in the month of February. They were

moving in and out of clusters of the female, but I did not see actual connection. There is a certain amount of resemblance to the male of *Lacinularia*, the chief difference being the presence of a very large, clear, circular space situated in front of the sperm sac which had all the appearance of a contractile vesicle, though I did not see any contraction. The body is cylindrical with a foot projecting from the lower side. The foot glands are very large; the large nervous ganglion has branches to the antennæ and to the two eyes, and one proceeding backwards embracing the top of the contractile vesicle. The integument, which is very transparent, occasionally takes the ringed appearance noted above as occurring in the female. There is a regular network of muscles (these are not clearly shown in the figure). The cilia surrounding the head are large, setting up a strong current. The length is $\frac{1}{150}''$, the breadth $\frac{1}{300}''$.

Order II. BDELLOIDA.

Family III. **Philodinadæ.**

I have come across several different species of this family, but have not been able to differentiate them with satisfaction to myself. I note here those only about which I feel a tolerable amount of certainty.

11. Philodina citrina, Ehrenberg.

Fairly common at all seasons.

12. Philodina hirsuta, (?), Pl. XX, Fig. 4.

This species is extremely common, and may be the *P. hirsuta* mentioned by Pritchard. There are fine hair-like spines all over the surface of the body, but the colour is not pale yellow, nor is the foot "prolonged by dorsal spines." The antenna is long and straight. The distinction between stomach and intestine is very clearly marked, and the latter is large. Two clear round (salivary) glands are very noticeable. It is very common, and is almost always attached to the stems of *Vorticella*, *Epistylis*, &c. It apparently leads a very sedentary life, for I have had specimens under observation for hours without their moving from their attachment. The contraction of the stem to which they have fixed themselves does not seem to disturb them, and, as soon as it uncoils, they unfold their wheels even before the *Vorticella* or *Carchesium* has opened out. I have often seen a couple attached on each side of the stem of a *Vorticella* just below the bell, and sometimes more than two. The fine hair-like spines are variable both in length and position, in

some cases covering the whole body, in others noticeable only on parts, but they are never absent from the greater part of the body.

13. Rotifer vulgaris, Schrank.

Here, as elsewhere, deserves its name.

14. Rotifer macroceros, Gosse.

Many specimens seen.

15. Rotifer mento, n. sp., Pl. XX, Figs. 5 & 5, *a*.

It is with much hesitation that I describe this species, for when I mentioned to a microscopist of considerable experience that I had found a *Rotifer* inhabiting a tube, he smiled incredulously and said that I must either have been mistaken or that the *Rotifer* had made use of a tube built by some other creature. However, as its other characteristics are, it seems to me, sufficient to mark it as a new species, I shall describe them first. The characteristic which is the most striking on casual observation is the very distinct and projecting chin, with the buccal funnel running down from it in a way that reminds one of a *Melicerta*. The corona is small; the dorsal antenna very long and mobile; the frontal column is thick, short, and stout, with the appearance of a hook at its upper end; the eyes are round and bright and of a moderate size; the jaws have two teeth; the body is deeply fluted and wanting in transparency, so that the intestines were not very easily made out. It is viviparous: a young one was seen in the body of one specimen which must have been nearly as long as its parent; the wreath of the unborn rotifer was often in motion, though I did not, at any time, observe the jaws move. With relation to the tube; I have seen at different times over a dozen specimens of this species. (In all cases the water was taken from the same tank.) Every specimen except one was inhabiting a tube, and these tubes were all of the same character and all small in comparison to the size of the creature. The tube resembled that of an *Œchistes*, its substance appeared to be transparent, but it was so thickly covered with foreign matter that it was practically opaque. The first specimen I had under observation for nearly six hours and it did not leave its tube. I turned the piece of weed over, then tore the tube off the weed, and, though the *Rotifer* was now able to swim about dragging its tube after it, it did not leave its hold. Finally, I crushed the tube, and the *Rotifer* then swam off; and I was able to see that it had the foot of its genus. When disturbed the *Rotifer* contracted and curled itself into the tube. This was not a mere contraction of the body, but it took

a distinct curve which enabled it to fit itself into the tube, so that, short as the latter is, the whole body of the rotifer is protected by it. This fact seems to me to go far towards proving that the rotifer is accustomed to live in a tube, though whether it makes it own tube or occupies empty tubes made by other creatures, I am not in a position to decide.

Length about $\frac{1}{50}$". It is rare.

16. Actinurus ovatus, n. sp., Pl. XX, Figs. 6 & 6, *a*.

Though differing in some particulars from the diagnosis of this genus as given in Hudson and Gosse's book, it can belong to no other. It has the extreme length and tenuity of form, the joints of the long and slender foot telescope into one another without sensible increase of diameter; the eyes are two, situated in the frontal column; the teeth are two, diverging. But in complete contraction the shape of the body does change. The joints of the foot fit into one another and may be drawn back right into the body without causing it to bulge, but the body itself is often lessened in length and increased in breadth till it becomes almost globular in shape. In this it resembles the genus *Rotifer*.

There is only one other known species of this genus, *Actinurus neptunius*. From this the species I am describing differs in the characteristic just mentioned of the contractility of the body. It also differs in the shape of the body, which is not cylindrical but wider posteriorly; viewed dorsally it is seen to be nearly twice as wide at the hinder end of the body as it is at the neck. A side view shows that the back rises in almost a straight line from the neck to near the extreme end of the body, where it suddenly falls to the foot. The ventral surface also is not flat but bulges slightly. When extended to its fullest, the length of the body is about three times its breadth, in *A. neptunius* it is about eight times as great.

The eyes are two, small, near the summit of the frontal column; the corona small, constantly protruded, and in constant motion. The mastax is not far from the corona, and has two gastric glands fairly large and visible. The digestive canal is perfectly straight when the creature is fully extended, and there is a clear distinction between the stomach and the intestine. The cloaca is situated at the bottom of the second joint of the foot. The spurs are small, not two-jointed, and the toes very long, often recurved. The surface of the body is deeply corrugated longitudinally, but in some specimens is very transparent and the viscera can easily be distinguished. These do not nearly fill the body cavity and strong muscles may be seen which assist in the contraction. I was unable to make out the vascular system.

In very many of the specimens there were living young in the

body cavity of their parents. In many cases, the young ones were longer than the length of their progenitor, and the long foot might be seen moving about, now drawn back into the body, and now extended to a considerable length around the viscera. The mastax and, in more than one instance, the cilia were in constant motion.

The frontal column when extended fully is tipped with cilia which vibrate actively. It was only on rare occasions, though, that I was able to see them, as they seemed to be rarely extended.

The habit of this *Actinurus* differs under different circumstances. As usually seen it is in constant motion, creeping actively or swimming over the field of view. But on one occasion I had enclosed a small Lemma leaf and the *Actinuri*, under the cover glass, took their places under this, fastening themselves well underneath, but so that their bodies projected when they were fully extended. On this occasion I was enabled to get a very satisfactory view of the organs and internal arrangement, though, owing to the thickness of the leaf, I could not use a high power.

There is one point on which I speak with some hesitation. I noticed in one specimen that there was only one tooth on one ramus and two on the other. I examined this specimen very carefully and several others also with a high power (750 diameters), and in several of the latter observed the same. In others I thought I could see the two teeth on both rami. In *Philodina erythrophthalma* an unequal number of teeth has been observed by Hudson, but in no species, as far as I know, has only one tooth been seen. But in several instances the one tooth, with the minute ridging parallel to it, was so very clear that I do not think I can have been mistaken.

The size of an average specimen when fully extended is $\frac{1}{15}''$ to $\frac{1}{20}''$ of which the body is about $\frac{1}{75}''$ and the foot $\frac{1}{250}''$, the breadth of the body at its widest $\frac{1}{150}''$. Contracted the same specimen would be about $\frac{1}{100}''$ long by $\frac{1}{125}''$ wide, but there is considerable variation in size.

Order III. PLOIMA.

Sub-order ILLORICATA.

Family X. **Notommatadæ.**

17. Notommata ansata, Ehrenberg.

First seen, December 14th, 1888. Not uncommon.

18. Notommata tripus, Ehrenberg.

Common.

19. Furcularia forficula, Ehrenberg.

Seen in water from the Botanical Gardens.

20. Furcularia longiseta, Ehrenberg.

The first specimen I saw had toes very little longer than the body. Other specimens obtained from the Botanical Gardens were nearer the normal.

21. Diglena forcipata, Ehrenberg.

Common.

Sub-order LORICATA.

Family XI. **Rattulidæ.**

22. Rattulus tigris, Müller.

Only one or two specimens seen.

Family XII. **Dinocharidæ.**

23. Scaridium longicaudum, Ehrenberg.

Common. In the specimens first seen the posterior dorsal surface had not the sharp, clear-cut projection shewn in the figure in Hudson and Gosse's book, but was rounded as in Ehrenberg's figures. I afterwards came across specimens in water from the Botanical Gardens which had the sharp projection. At a later period, in water from the Entally tanks, I found it in great profusion with rounded projections. One specimen observed had inside it an egg covered with spines.

24. Stephanops dichthaspis, n. sp., Pl. XX, Fig. 7.

In water from the Museum tank I came across this pretty little species, and it was fairly plentiful. The lorica is ovate, prolonged behind into a shield, which is deeply notched in the centre, and extends as far as the second joint of the foot. The neck is about half the breadth of the body and has a distinct shoulder. The occipital shield is semicircular, as broad as the body, and through it the head can be seen to have an oval, not peaked shape, with its eyes very wide apart. It approaches *S. lamellaris* and *S. muticus*, but differs from both in the shape of the neck and of the body, and especially in the prolongation of the shield behind. Length $\frac{1}{150}''$ to $\frac{1}{175}''$.

Family XIII. Salpinadæ.

I have had some difficulty in distinguishing between the species of this family, as different specimens of the same species differ greatly from one another.

25. Salpina brevispina, Ehrenberg.

Is very common.

26. Salpina eustala, Gosse.

Not uncommon. In some the alvine spines were only slightly incurved; in one the lumbar spine was irregular in shape, having a wavy appearance, and the sinus above the pectoral spine was less marked and less deep than usual.

27. Salpina macracantha (?), Gosse.

The anterior and posterior ends of the ventral side of the lorica were deeply excised, the spines, lumbar and alvine, were long, and in size and shape the specimens answered to the description and to the figures in Hudson and Gosse's work, but the surface of the lorica was most plainly stippled, though in the work mentioned it is expressly stated that the lorica surface is not stippled. Many specimens were examined and they all had the stippling.

28. Salpina, sp., Pl. XXI, Figs. 8 & 8*a*.

A fourth species seems to be intermediate between *S. macracantha* and *S. brevispina*, but it is so variable that I hesitate to make a new species of it. Its most obvious distinction from *S. brevispina* is its size, and, as I have had both specimens under observation at the same time, I think this may be of some weight, though size by itself is probably not of much value as a specific differential in our Indian species, which exhibit a tendency to run either larger or smaller than their European congeners. The sinus between the lumbar and alvine spines is not circular, but distinctly angled; Ehrenberg's figure of *S. brevispina*, however, has a somewhat angled sinus. The shell is narrower than Gosse draws it and has no bulge on the ventral surface just before the anterior opening, but Ehrenberg's figure has not these characteristics. The most important point of distinction is that the lumbar spine is a distinct spine, but this varies, for in some it is as long as in *S. macracantha*, and in others quite short, though never as short as in *S. brevispina*. Had I not had this species and *S. brevispina* under the microscope at the same time, I should have thought they were the same. It is as large as *S. macracantha*, but the spines are not usually as long, they are never incurved, and the

posterior ventral surface is not excised. It is very common. Its length is about $\frac{1}{50}''$.

Family XIV. **Euchlanidæ.**

29. Euchlanis macrura, Ehrenberg.

Not uncommon. It may be worth noting that one specimen was observed with well defined setæ on the foot. A few minutes afterwards it was seen and the setæ had gone, though there had been no disturbance of the slide or cover glass to account for this loss. If broken off they must have been broken by the creature itself as it swam about; it had plenty of water to swim in.

Family XV. **Cathypnidæ.**

30. Cathypna luna, Ehrenberg.

Very common.

31. Monostyla cornuta, Ehrenberg.

A very small specimen seen, total length only $\frac{1}{250}''$.

32. Monostyla quadridentata, Ehrenberg.

Not very common.

I obtained some specimens from the Museum tank on December 23rd, 1888 closely resembling this species, especially in having the typical horns. They differed, however, in the following points; the mallei were not shouldered, nor was the outline of the claws wavy, the horns also were straight, not curved. In a specimen killed with osmic acid the points of the dorsal and ventral plates were very distinct and were joined by a membrane. Length of lorica $\frac{1}{300}''$, total length $\frac{1}{250}''$.

33. Monostyla bulla, Gosse.

Not common.

Family XVI. **Coluridæ.**

34. Colurus caudatus, Ehrenberg.

The only specimen seen was much larger than the British species apparently is. It was, too, rather longer in proportion to its breadth.

35. Metopidia lepadella, Ehrenberg.

Only a few specimens seen; the one drawn by me was only $\frac{1}{100}''$ long.

36. Metopidia solidus, Gosse.

Very common. I found it, an one occasion, teeming in water which had been standing for many days, and in which *Paramœcia* swarmed.

37. Metopidia triptera, Ehrenberg.

Common.

38. Metopidia torquata, n. sp., Pl. XXI, Figs. 9 & 9*a*.

The most striking characteristic is the stippling of the shell, which is very slight, except around the anterior opening, to which it gives the appearance of a collar. It differs from *M. solidus*, also, in being much more oval in shape, in having a larger anterior opening, and in being more deeply incised on the anterior ventral surface. It differs from *M. lepadella* in its size, it is more than twice as big, and in its flatness, in which it resembles *M. solidus*, and in the shape of the openings both in front and behind. Length $\frac{1}{150}''$.

39. Metopidia angulata, n. sp., Pl. XXI, Fig. 10.

This pretty little form has a very distinctive shell. Seen dorsally the lorica curves outwards from both the anterior and posterior openings to meet in an angular point, the hinder curve being shorter than the front one. A stippled collar is also very evident, as are the two horns. Two contractile vesicles were seen in active operation. I did not see the frontal hook, so that possibly the species is not a *Metopidia*. The two eyes were small and inconspicuous. Length of lorica $\frac{1}{250}''$.

Family XVII. Pterodinadæ.

40. Pterodina intermedia, n. sp., Pl. XXI, Fig. 11.

The lorica is inflexible, nearly circular, and where *P. mucronata* has a sharp point this species has a semicircular projection. Slight unevenness of frontal outline occurs in *P. patina*, but in this there is a very distinct and regular projection. The surface is stippled and bosses are visible though not conspicuous. The gastric glands are long, broad, and rounded. Foliation is conspicuous. Length of lorica $\frac{1}{120}''$.

41. Pterodina, n. sp. ?

The peculiarity of this species (?) is its internal organization. Only one specimen was seen. It resembled *P. patina* in shape, &c., but it had only one gastric gland on the right side and this sloped downwards

round a clear space which I take to be a contractile vesicle, though I saw no contraction. The stomach is on the opposite side and the intestine below behind the foot. If this is not really a species, its internal arrangement differs most curiously from the type form.

Family XVIII. **Brachionidæ.**

42. Brachionus bakeri, Ehrenberg.

Specimens with the broad-based lateral spines drawn by Gosse, and with the occipital spines comparatively small, are of common occurrence. Others differ greatly from this type, the lateral spines being thin from their base and curved outwards, and the central occipital spines almost as long as the lateral ones, the intermediate pair being very distinct and far from obliterate.

43. Brachionus urceolaris, Ehrenberg.

Fairly common.

44. Brachionus militaris.

Many specimens seen.

45. Brachionus longipes, n. sp., Pl. XXI, Fig. 12.

The foot of this species is of extraordinary length. In a specimen measured after death the lorica was $\frac{1}{100}''$ and the foot $\frac{1}{75}''$ and it was wrinkled. In living specimens the foot is often extended so as to be three times as long as the lorica. In shape it resembles *B. urceolaris* from which it differs in some minor particulars. The occipital spines are somewhat more deeply cut, the pectoral edge rises considerably and has 4 undulations the two middle ones of which are slightly notched. Viewed dorsally the edge of the lorica appears round, and the spines bounding the orifice of the foot cannot be seen except through the shell; a ventral view shows that these spines are placed farther forward than the dorsal extremity of the lorica, and a side view shows that the dorsal edge of the lorica projects so that the shell from this edge to the spines is a curve inwards. The dorsal view of the foot-orifice, *i. e.*, of the spines and the space between them, is peculiar, the inner surface of the spines being rounded and the edge between their bases having an outward curve. Length of lorica $\frac{1}{100}''$, of foot $\frac{1}{75}''$ to $\frac{1}{50}'$ total $\frac{1}{40}''$ to $\frac{1}{30}''$.

46. Brachionus bidentata, n. sp., Pl. XXI, Fig. 13.

Occipital spines six, the outer the largest, each of these having a

smaller spine or tooth springing from its ventral surface. The pectoral edge rises abruptly from the base of the outer spines and is then nearly straight. The lateral spines are very small and those bounding the foot large rounded papillæ rather than spines. Length $\frac{1}{150}''$, breadth $\frac{1}{250}''$.

47. Noteus quadricornis.

Fairly common.

EXPLANATION OF THE PLATES.

Plate XIX.

Fig. 1. *Floscularia tenuilobata*, n. sp., × 150.

Plate XX.

Fig. 2. *Echistes stephanion*, n. sp., × 150.
Fig. 3. *Megalotrocha alboflavicans*, ♂, × 400.
Fig. 4. *Philodina hirsuta*, Pritchard ? × 300.
Fig. 5. *Rotifer mento*, n. sp , × 190.
Fig. 5*a*. The same showing the head, × 525.
Fig. 6. *Actinurus ovatus*, n. sp., × 50.
Fig. 6*a*. The same in the retracted condition showing a living young one coiled up in its body-cavity, × 100.
Fig. 7. *Stephanops dichthaspis*, n. sp., × 280.

Plate XXI.

Fig. 8. *Salpina*, sp , from the side, × 140.
Fig. 8*a*. Another specimen viewed partly from one side and partly from below, so as to show the ventral spines and the intervening sinus, × 140.
Fig. 9. *Metopidia torquata*, n. sp., dorsal view, × 400.
Fig. 9*a*. The same, ventral view, × 400.
Fig. 10. *Metopidia angulata*, n. sp., × 400.
Fig. 11. *Pterodina intermedia*, n. sp., × 150.
Fig. 12. *Brachionus longipes*, dorsal view of lorica, × 150.
Fig. 12*a*. „ „ ventral view of lorica, × 150.
Fig. 12*b*. „ „ side view of posterior end of lorica, × 150.
Fig. 12*c*. „ „ dorsal view of foot orifice, × 350.
Fig. 13. *Brachionus bidentata*, n. sp., ventral view of lorica, × 200.

N. B.—Figs. 7, 8, 8*a*., 9, 9*a*., 10, 12, 12*a*—*c*., and 13 have been drawn with the aid of the camera lucida.

XXII.—*Materials for a Flora of the Malayan Peninsula.*—*By* George King, M. B., LL. D., F. R. S., F. L. S., *Superintendent of the Royal Botanic Garden, Calcutta.*

[Received and read July 3rd, 1889.]

As the Calcutta Herbarium contains a rich collection of Malayan plants, I propose to publish from time to time a systematic account of as many of them as are indigenous to British provinces, or to provinces under British influence. In addition to the states on the mainland of the Malayan Peninsula, these provinces include the islands of Singapore and Penang, and the Nicobar and Andaman groups. The classification which I propose to follow is that of the late Mr. Bentham and Sir Joseph Hooker. It is unlikely that, with the scanty leisure at my command, I shall be able, under several years, to complete even the meagre account of the Flora of which the first instalment is now submitted. The orders will be taken up nearly in the sequence followed in the Genera *Plantarum* of Bentham and Hooker, and in the Flora of British India of the latter distinguished botanist. The natural orders now submitted are *Ranunculaceæ*, *Dilleniaceæ*, *Magnoliaceæ*, *Menispermaceæ*, *Nymphæaceæ*, *Capparideæ*, and *Violaceæ*. The order *Anonaceæ* should have come between *Magnoliaceæ* and *Menispermaceæ*; but, on account of its extent and difficulty, I have been obliged to postpone its elaboration pending the receipt of further herbarium material. It will however, it is hoped, soon be taken up.

Order I. RANUNCULACEÆ.

Annual or perennial herbs or shrubs. *Leaves* alternate or opposite. Stipules 0, or adnate to the petiole, rarely free. *Flowers* regular or irregular, 1-2-sexual. *Sepals* 5 or more, rarely 2 to 4, usually deciduous, often petaloid, imbricate or valvate. *Petals* 0 or 4 or more, hypogynous, imbricate, often minute or deformed. *Stamens* hypogynous; anthers usually adnate and dehiscing laterally. *Carpels* usually many, free, 1-celled; stigma simple; ovule one or more, on the ventral suture, anatropous, erect with a ventral, or pendulous with a dorsal raphe. *Fruit* of numerous 1-seeded achenes, or many-seeded follicles, rarely a berry. *Seed* small, albumen copious; embryo minute. Distrib. Abundant in temperate and cold regions: genera 30; known species about 310.*

* The above diagnosis of this order (copied from Sir Joseph Hooker's Flora of British India) covers the entire order, which is usually sub-divided into five sub-orders or tribes. Representatives of only one of these tribes (*Clematideæ*) have hitherto been discovered in the region under review. But, as exploration of the central mountain ranges proceeds, plants belonging to one or two of the other tribes

Tribe I. *Clematideæ.* Climbing shrubs. *Leaves* opposite. *Sepals* valvate, petaloid. *Carpels* 1-ovuled; ovule pendulous. Fruit of many achenes.

Petals 0	...	...	...	... 1. *Clematis.*
Petals many, linear	...	...		... 2. *Naravelia.*

1. Clematis, Linn.

Woody climbers. *Leaves* opposite, simple or compound, exstipulate. *Sepals* 4 to 8, valvate. *Petals* 0. *Stamens* many. *Carpels* many, with long tails. *Ovule* solitary, pendulous.—Distrib. Temperate climates; species about 100.

1. C. similacifolia, Wall. in Asiat. Research. xiii, 414. *Leaves* simple, (rarely pinnate) ovate, blunt, with broad sub-cordate bases, boldly 5-nerved, coriaceous, glabrous, entire or remotely serrate, 3 to 10 in. long by 1·5 to 5 in. broad; petioles nearly as long. *Panicles* axillary, few-flowered, 6 to 12 in. long. *Flowers* 1 to 1·5 in diam. *Sepals* 4 to 5, coriaceous, oblong, reflexed, outside dull brown tomentose, inside purple. *Filaments* linear, glabrous, the inner shorter with longer anthers. *Achenes* flat, pubescent, with broad margins and long feathery tails. A tall glabrous woody climber. DC. Prod., I., 10; Bot. Mag., t. 4259; H. f. et Th. Fl. Ind., i, 6; Hook. fil. Fl. Br. Ind., i, 3. Miq. Fl. Ind., Bat. I, Pt. ii, p. 2. *C. sub-peltata*, Wall., Pl As., Rar. I, t. 20. *C. Munroana*, Wight Ill., i, 5, t. 1. ? *C glandulosa*, Bl., Bijdr. i, 1.

Penang, Curtis; but probably occurring also in the Central Range of mountains in the Malayan Peninsula.

2. C. Gouriana, Roxb. Fl. Ind. ii, 670. An extensive climber, the young parts pubescent, adult glabrous. *Leaves* shortly petiolate, pinnate, 2-pinnate or 2-ternate, the *leaflets* shortly petiolulate, membranous, ovate to ovate-lanceolate, 5-nerved, sometimes sub-cordate, entire or irregularly dentate-serrate, 2 to 3 in. long by ·75 to 1·75 in. broad. *Panicles* many-flowered, longer than the leaves; *flowers* small (·3 to ·5 in. in diam.) greenish-white. *Achenes* narrowly oblong, pubescent, emarginate, with long silky tails. DC. Prod. i, 3; W. A. Prod. 2; Wight Ic. 933-4. H. f. et Th. Fl. Ind. 8; Hook. Fl. fil. Brit. Ind. i, 4. Miq. Ind. Fl. Bat. Vol. I, Pt. 2, p. 4. *C. cana* and *dentosa*, Wall. Cat. *C. javana*, DC. Prod. i, 7.

Not uncommon at low elevations in the Indo-Malayan region.

2. Naravelia, DC.

Climbing shrubs. *Leaves* 3-foliolate, terminal leaflet generally transformed into a tendril. *Sepals* 4 to 5. *Petals* 6 to 12, narrow, longer

may be found. I therefore think it better to let the diagnosis stand, than to modify it so as to include only the tribe *Clematideæ*.

than the calyx. *Achenes* long stipitate, with long-bearded style.—Distrib. Two E. Asiatic species.

N. LAURIFOLIA, Wall. Cat. Young parts puberulous, adult glabrous. *Leaflets* broadly ovate, shortly acuminate, entire, boldly 5-nerved, 4 to 6 in. long by 2·5 to 3 in. broad. *Panicles* longer than the leaves, many-flowered; *petals* long, linear, whitish green. *Achenes* cylindric, glabrous, with stout sericeous tails. Hook. fil. et Th. Fl. Ind. i, 3.; Hook. fil. Fl. B. Ind. i, 7: Miq. Fl. Ind. Bat. I, pt. ii, 2. *N. Finlaysoniana*, Wall. Cat. 468 (with diseased fruit). *Clematis similacina*, Bl. Bijdr. I, 1.

Common throughout the whole Indo-Malayan region to the Philippines.

ORDER II. DILLENIACEÆ.

Trees, shrubs or herbs, sometimes climbing. *Leaves* alternate, simple, entire or toothed (pinnatipartite in *Acrotrema*), exstipulate with sheathing petioles, or more rarely with lateral deciduous stipules. *Flowers* yellow or white, often showy. *Sepals* 5, imbricate, persistent. *Petals* 5 (rarely 3 or 4) deciduous. *Stamens* many, hypogynous, many-seriate; anthers innate, with lateral slits or terminal pores. *Carpels* 1 or more, free or cohering in the axis; styles always distinct; ovules amphitropous, solitary or few and ascending, or many and attached to the ventral suture. *Fruit* of follicles, or indehiscent and sub-baccate. *Seeds* solitary or many, arillate, testa crustaceous, raphe short, albumen fleshy; embryo minute, next the hilum.—Distrib. Chiefly tropical; species about 210.

Tribe I. *Delimeæ*. Filaments thickened upwards; anthers short, cells remote oblique.

Carpel solitary ... ... 1. *Delima*.
Carpels 2-5 ... ... 2. *Tetracera*.

Tribe II. *Dilleniceæ*. Filaments not thickened upwards; anthers with parallel cells.

Carpels 3; stemless herbs, leaves all radical, large... 3. *Acrotrema*.
Carpels 5-20; seeds arillate ... ... 4. *Wormia*.
Carpels 5-20; seeds not arillate ... ... 5. *Dillenia*.

1. DELIMA, Linn.

Woody climbers. *Leaves* parallel-veined. *Flowers* many, in terminal panicles, hermaphrodite, white. *Sepals* 5. *Petals* 2 to 5. Stamens many; filaments dilated upwards; cells much diverging. *Ovary* solitary, subglobose, narrowed into a subulate style; ovules 2 to 3, ascending. *Follicles* ovoid, coriaceous, 1-seeded. *Seed* with a cupular toothed aril.

1. D. SARMENTOSA, Linn. *Leaves* 3 to 5 in., obovate, ovate or broadly lanceolate, obtuse or acute, quite entire, serrate or crenate, appressed pilose; both surfaces scabrid; nerves 9 to 11 pairs, straight, ascending, prominent: length 2·5 to 3·5 in., breadth 1 to 2 in., petiole ·4 to ·5 in. *Flowers* ¼ to ½ in. in diam., in tomentose or pilose spreading panicles that are often leafy. *Sepals* reflexed. DC. Prod. i. 69; Wall. Cat. 6632; Bot. Mag. t. 3058. Miq. Fl. Ind. Bat. I, pt. ii, 7; Hook. Fl. Fl. B. Ind. I, 31. *D. intermedia*, Bl. Bijdr. *Tetracera sarmentosa*, Willd.; Roxb. Fl. Ind. ii. 645. *Leontoglossum scabrum*, Hance in Walp. Ann. iii. 812.

Var. 1. GLABRA; fruit glabrous.

Var. 2. HEBECARPA; fruit hairy. *D. hebecarpa*, DC. Prod. i, 70; Deless. Ic. Sel. t. 72; Wall. Cat. 6633. *D. intermedia*, Blume. *Davilla hirsuta*, Teysm. et Binn. *Delimopsis hirta*, Miq.

2. D. LÆVIS, Maingay MSS. *Leaves* oblong-lanceolate to narrowly elliptic, acute, entire, the base cuneate or rounded; nerves 8 to 9 pairs, ascending, prominent; upper surface smooth, shining; the lower puberulous; neither of them scabrid; length 5 to 7·5 in., breadth 2 to 3·5 in., petiole ·8 in., broad. *Flowers* ·5 in. in diam., in narrow tomentose leafless panicles longer than the leaves. *Sepals* reflexed.

Malacca, Maingay No. 10. Collected only by the late Dr. Maingay.

2. TETRACERA, Linn.

Climbing shrubs or trees, smooth, scabrid, or pubescent. *Leaves* with parallel lateral veins. *Flowers* in terminal or lateral panicles, hermaphrodite or partially 1-sexual. *Sepals* 4 to 6, spreading. *Petals* 4 to 6. *Stamens* many, filaments dilated upwards, anther-cells distant. *Carpels* 3 to 5; ovules many, 2-seriate. *Follicles* coriaceous, shining. *Seeds* 1 to 5, with a fimbriated or toothed aril.—Distrib. All tropical; species about 25.

1. T. ASSA. DC. Prod. i. 68. Young branches striate, pubescent or sub-strigose. *Leaves* 2 to 5 in. long, ovate-lanceolate, acuminate, obscurely sinuate or serrate, glabrous except the nerves beneath. *Panicles* axillary and terminal, shorter than the leaves, few-flowered. *Follicles* several-seeded. W. and A. Prod. 5; Hassk. Pl. Rar. Jav. 177. Hook. fil. and Th. Fl. Ind. i, 63: Hook, fil. Fl. B. Ind. I. 31: Miq. Fl. Ind. Bat. I, Pt. ii. 8.

Common throughout Indo-Malaya, at low elevations.

2. T. EURYANDRA, Vahl. Symb. iii, 71. Young branches tomentose. *Leaves* rigid, 3 to 4 in. long, oblong or obovate-oblong, entire or obscurely sinuate, above glabrous except the midrib, below minutely tomentose when young. *Panicles* terminal and axillary, shorter than the leaves,

few-flowered. *Follicles* several-seeded. DC. Prod. I, 68: Roxb. Fl. Ind. ii, 646; H. f. et Th. Fl. Ind. i, 63; Hook. fil. Fl. Br. Ind. I, 32: Miq. Fl. Ind. Bat. Vol. I, pt. ii, 8. *T. lucida*, Wall. Cat.

Straits Settlements, at low elevations. Distrib. Moluccas and New Caledonia.

3. T. MACROPHYLLA, Wall. Cat. 6628. Young branches pubescent. *Leaves* broadly elliptic to obovate-elliptic, 5 to 7 in. long, margin sub-sinuate, scabrid on both surfaces. *Panicle* terminal, longer than the leaves, many-flowered. *Sepals* rotund, not ribbed. *Follicles* 1-seeded. Hook. fil. et Th. Fl. Ind. I, 63: Hook. fil. Fl. Br. Ind. I, 32; Miq. Fl. Ind. Bat. Vol. 1, pt ii, 8.

Straits Settlements, in tropical forests. Distrib. Sumatra.

4. T. GRANDIS, King, n. sp. A large tree. Young branches and inflorescence shortly velvety-tomentose. *Leaves* large, coriaceous, broadly elliptic, rarely slightly obovate, the apex truncate and minutely apiculate; the edges obscurely crenate or undulate toward the apex, entire below, recurved when dry; the base rounded or slightly narrowed: upper surface scabrous, lower minutely tomentose: nerves stout, 14 pairs, straight, erecto-patent; length of blade 8 to 10 in., width 5 to 5 in., petiole about 5 in., stout. *Inflorescence* in little-branched, lateral or terminal panicles a foot or more long. *Flowers* shortly pedunculate. *Sepals* 5, broadly ovate, sub-acute, concave, ribbed and tomentose externally, 5 in. long. *Petals* about as long as the sepals but narrower, glabrous. *Anthers* truncate, narrowed to the long slender filaments. *Follicles* with a slender curved beak.

Perak. Scortechini, No. 90*b*.

Said by Father Scortechini to be a very large tree.

3. ACROTREMA, Jack.

Perennial stemless herbs with woody rhizomes. *Leaves* large, parallel-nerved, with sheathing deciduous stipules. Scape short axillary, bracteolate. *Flowers* large, yellow. *Sepals* 5. *Petals* 5. *Stamens* numerous, in 3 bundles which alternate with the carpels; filaments filiform, anthers erect, with longitudinal porous dehiscence. *Carpels* 3, slightly cohering: styles subulate, recurved; ovules 2 or more. *Fruit* of 3 irregularly dehiscing follicles. *Seed* with a membranous aril; the testa crustaceous, pitted.—Distrib. ten species, of which 8 are endemic in Ceylon, 1 Peninsular-Indian, and 1 Indo-Malayan.

A. COSTATUM, Jack in Mal. Misc. ex. Hook. Misc. ii, 82. Whole plant covered with stiff rufous or golden hairs, especially when young. *Leaves* obovate, the margins dentate-ciliate; the base narrowed, sagittate; upper surface strigose, often blotched with white, petiole short. *Racemes*

shorter than the leaves, 8 to 10-flowered, setose; bracteoles minute, lanceolate. *Flowers* an inch in diam. *Stamens* about 15. Hook. fil. and Th. Fl. Ind. i, 65: Hook. fil. Fl. Br. Ind. I, 32; Miq. Fl. Ind. Bat. Vol. I, Pt. ii, 10. *A. Wightianum*, W. and A. Prod 6: Wight Ill. t. 9.

Straits Settlements; in damp shady spots at elevations of 500 to 2500 feet. Common.

4. Wormia, Rottb.

Trees, sometimes lofty; or shrubs. *Leaves* broad, sub-coriaceous; lateral nerves many, strong, parallel; petioles usually with deciduous stipular wings. *Flowers* large, in terminal racemes or panicles. *Sepals* 5. *Petals* 5. *Stamens* indefinite, in several series, nearly free; anthers linear, erect, cells opening by 2 pores. *Carpels* 5 to 10, scarcely cohering in the axis; ovules numerous. *Fruit* of indehiscent or follicular 3- or more-seeded carpels. *Seeds* with a fleshy aril. Distrib. Tropical Asia and Australia, and one in Madagascar; species about 9.

Sect. I. *Capellia*, Blume (genus). Inner row of stamens much longer than the outer and arching over them.

1. W. suffruticosa, Griff. Notul, iv. 706; Ic. iv. t. 649, f. 1. A small tree. Young parts floccose. *Leaves* with short, broadly winged, petioles; broadly elliptic or sub-obovate-elliptic, blunt or acute, dentate, glabrous except the 12-20 pairs of nerves which are sparsely pilose beneath; length of blade 7 to 9 in.; breadth 4 to 5·5 in.: petiole ·5 to 1·5 in. *Racemes* about as long as the leaves, leaf-opposed; pedicels ·5 to 1 in. long. *Flowers* 3 to 4 in. in diam., yellow. *Sepals* broadly ovate, nerved, glabrous. *Petals* obovate, crenulate. *Carpels* 5 to 7, 3 to 5-seeded. Hook. fil. Fl. Br. Ind. I, 35. *W. excelsa*, H. f. and Th. Fl. Ind. I, 67 (not of Jack). *W. subsessilis*, Miq. Fl. Ind. Bat. Suppl. i. 618; Ann. Mus. Lugd. Bat. i. 315, t. 9.

Malacca, Singapore; extends to Sumatra, Banka, Borneo and probably to other islands of the Archipelago.

2. W. oblonga, Wall. A tree. Young branchlets thin, sparsely tomentose, the old glabrous. *Leaves* rather distant, on moderate channelled (not winged) petioles, oblong to elliptic, acute at base and apex, entire or distantly serrate or sub-serrate, nerves 9 to 12 pairs: length of blade 6 to 8 in., breadth 3 to 3·5 in.; petiole 1·5 in. *Cymes* terminal or leaf opposed, few-flowered, shorter than the leaves, tomentose; pedicels about 1 in., thickened above, tomentose. *Flowers* 3 to 5 in. in diam. *Sepals* ovate-rotund, tomentose externally. *Petals* obovate, entire, veined, yellow. *Carpels* 8 to 10. H. f. & Th. Fl. Ind. i, 67: Hook. fil. Fl. Br. Ind. i, 35: Miq. Fl. Ind. Bat. Vol. 1, pt. ii, p. 11.

Straits Settlements in more or less dense forest. Distrib. Sumatra

Sect. II. *Euwormia.* Filaments all erect and nearly equal in length.

3. W. PULCHELLA, Jack. Mal. Misc. ex. Hook. Comp. Bot. Mag. I, 221. A shrub. Young parts glabrous. *Leaves* on short narrowly winged petioles, obovate or obovate-oblong, obtuse, entire, truncate or retuse, sometimes mucronate, thickly coriaceous, glabrous; nerves 5 to 7 pairs; length of blade 2·5 to 4 in., breadth 1·5 to 2·5 in.; petiole ·75 in. *Flowers* solitary or in small cymes, axillary or terminal, 2 in. in diam.; pedicels 2 in. long. *Sepals* broadly ovate, glabrous. *Petals* ovate. *Carpels* about 5. *Seeds* few, with pulpy arillus. H. f. and Th. Fl. Ind. I, 68: Hook. fil. Fl. Br. Ind. I, 36; Miq. Fl. Ind. Bat. Vol. I, Pt. ii, p. 11.

Perak and Malacca; at elevations under 1,000 ft. Distrib. Sumatra.

4. W. MELIOSMÆFOLIA, King, n. sp. A small tree, the young parts and leaf-petioles softly fulvous-tomentose. *Leaves* crowded near the apices of the branches, coriaceous, obovate-lanceolate to obovate-elliptic, acute or acuminate, entire or minutely and remotely serrate, base acute, glabrous above except the 14 to 18 pairs of spreading pubescent nerves, under surface minutely tomentose; length of blade 5 to 8 in., breadth 3 to 4 in., petiole about 1 in. *Flowers* about 3 in. in diam., axillary, solitary, on slender tomentose peduncles 2 in. long, or in few-flowered linear-bracteolate cymes; peduncles 1 in. long. *Sepals* ovate-oblong, velvety-tomentose externally, glabrous internally. *Petals* oblanceolate, pale yellow, veined, wavy. *Stigmas* about 12, linear, recurved. *Follicles* with several compressed, arillate seeds. *Dillenia meliosmaefolia*, Hook. fil. & Th. Fl. Br. Ind. I, 36.

Malacca, Perak.

Originally described as a *Dillenia* by Sir Joseph Hooker who had not seen the fruit.

5. W. SCORTECHINII, King, n. sp. A tree 60 to 70 feet. Branchlets thick, scarred, puberulous or glabrous. *Leaves* coriaceous, obovate-oblong, shortly acuminate, undulate-crenate, narrowed to the petiole: upper surface shining, glabrous except the midrib and nerves which are minutely pubescent as is the under surface: nerves prominent on the under surface, 26-30 pairs each ending on the margin of the leaf in a tuft of hairs; length of blade 4 to 6·5 in., breadth 2 to 3; petiole ·5 to 2 in., winged and expanded at the base. *Cymes* supra-axillary, sub-terminal, dichotomous, pubescent; bracteoles oblong, ·3 in. long; pedicels ·25 in. long. *Flowers* when expanded about 1 in. broad. *Sepals* 5, puberulous externally, broadly ovate, coriaceous. *Petals* 0. *Anthers* equal in length to the filaments, slightly hairy. *Ovaries* 3 to 5, usually 4. *Ripe fruit* unknown.

Perak. Father Scortechini.

Collected only by Scortechini who left a MS. description of it under the name *Wormia apetala*. But, as that name is pre-occupied by a species of Gaudichaud, I have rechristened it after its lamented discoverer. In his description Father Scortechini says that, although he opened many buds, he never could find any trace of petals. In stamens this agrees with the *Euwormia* section of *Wormia*: but whether it is really a *Wormia* and not a *Dillenia* cannot be settled until ripe fruit is found.

Species of which flowers are unknown.

6. W. Kunstleri, King, n. sp. Young branches thick, rugose pubescent. *Leaves* on channelled petioles, obovate-oblong, blunt, the base narrowed, slightly sinuate-crenate, glabrous except the pubescent midrib and 18 to 22 pairs of nerves: length of blade 6 to 8 in., breadth 3·5 to 4 in.; petiole nearly 2 in. *Cymes* leaf-opposed, few-flowered, tomentose; peduncles about 1 in. *Sepals* broadly ovate, glabrous, thick. Young *seeds* arillate.

Perak. King's collector No. 5905. The only specimens have unripe fruit.

5. Dillenia, Linn.

Characters of *Wormia* except that the flowers are more often solitary and are sometimes white; the carpels are rather more numerous, are never dehiscent, cohere in the axis, and are enveloped in the thickened accrescent calyx; while the seeds are exarillate.

1. D. indica, Linn. A tree: the young branches tomentose. *Leaves* crowded at the ends of the branches, coriaceous, lanceolate or ovate-lanceolate, sharply serrate, glabrous above, pubescent beneath especially on the 30 to 40 pairs of stout nerves: length of blade 8 to 12 in., breadth 3 to 4 in., petiole 1 to 1·5 in., channelled, sheathing at the base. *Flowers* 6 to 9 in. in diam., solitary, axillary, on short tomentose pedicels 2 to 3 in. long. *Sepals* orbicular, concave, fleshy. *Petals* white, obovate-oblong, undulate. Inner *stamens* longer than the outer and arching over them. *Pistils* about 20; the stigmas lanceolate, recurved, radiating. *Carpels* 1-celled with many reniform hairy seeds. Ham. Linn. Trans. XV, 99: H. f. and Th. Fl. Ind. I. 69, Hook fil. Fl. Br. Ind I, 36; Martelli in Malesia III, 154. *D. speciosa*, Thunbg, Linn. Trans. i, 200: DC. Prod. i, 76; Roxb. Fl. Ind. ii, 651; W. & A. Prod. 5; Wight Ic. 823; Miq. Fl. Ind. Bat. Vol. I, Pt. ii, 11. *D. elliptica*, Thunbg. Linn. Trans. I, 200.

Tropical Forests of the Indo-Malayan Region. Distrib. India, Ceylon.

2. D. ovata, Wall. A tree, the branchlets as thick as a quill, softly tomentose. *Leaves* coriaceous, ovate or obovate-rotund, apex sub-

acute, rounded or emarginate; minutely denticulate or sub-entire; glabrous above except the 16 to 20 pairs of sub-horizontal pubescent nerves, fuscous-tomentose beneath; blade 3·5 to 7 in. long by 2·75 to 3·5 in. broad, petiole about 1 in. tomentose. *Flowers* solitary 6 to 8 in. in diam.; peduncles stout, tomentose, 2·5 in. long. *Sepals* reflexed, ovate, concave, thick, minutely adpressed-tomentose in the middle externally, the margins and inner surface glabrous. *Petals* obovate, yellow, veined. *Stigmas* about 15, long, linear, recurved. H. f. and Th. Fl. Ind. I, 70; Hook. fil. Fl. Br. Ind. I, 36: Miq. Fl. Ind. Bat. Vol. 1, Pt. ii, 12.

Penang and Perak. In tropical forests.

I have seen no ripe fruit of this, nor have I found any description of the ripe fruit. I am therefore unable to say whether the sepals and seeds are those of a *Dillenia* or a *Wormia*. This comes near *D. aurea*, but the panicles are much laxer and the petioles longer.

3. D. AUREA, Sm. Ex. Bot. 93, t. 92. A tree, the branchlets as thick as the little finger, glabrous, scabrid: young parts rufous-sericeous. *Leaves* obovate, blunt or acute, crenate-dentate, glabrous above except the 20 pairs of pubescent, bold, sub-transverse nerves; under surface softly puberulous: length of blade 5 to 8 in.: breadth 3 to 4·5 in.: petiole 1·25 to 2 in., sheathing at the base. *Flowers* solitary, from shortened branches, 4 to 5 in. diam.; peduncles stout, 1 in. or more. *Sepals* oblong, obtuse, concave, fleshy, adpressed-pubescent externally when young, when old glaucous. *Petals* obovate, yellow, veined. *Stigmas* about 10, linear, radiate. DC. Prodr. i. 76; Wall Cat. 6624; H. f. & T. Fl. Ind. 70. Hook. fil. Fl. Br. Ind. I, 37: Miq. Fl. Ind. Bat. Vol. I, pt. ii, 12; Martelli in Malesia III, 155. *D. ornata*, Wall. Pl. As. Rar. i, 21, t. 23: Cat. 947. *D. speciosa*, Griff. Notul. iv, 703. *Colbertia obovata*, Bl. Bigdr. 6.

Throughout the Indo-Malayan region, at low elevations.

4. D. RETICULATA, King, n. sp. A large tree. *Leaves* very coriaceous, obovate-elliptic, obtuse?, dentate; the base truncate, cordate; upper surface glabrous except the impressed midrib and nerves, which are pubescent; under surface pubescent, the midrib and nerves very strong; reticulations minute, very bold, areolar; nerves 32 to 36 pairs, sub-horizontal; length of blade 10 to 18 in., breadth 7 to 12 in., petiole 2 to 3 in. winged, much expanded at the base. *Cymes* lateral and terminal, short, branching, 10 to 12 flowered, pubescent; pedicels stout, bracteolate. *Sepals* thick, broadly elliptic to orbicular, 1 in. in diam., pubescent externally. *Petals* oblong, concave, 1·5 in. long. *Stamens* in many series; the outer inflexed, introrse; the inner erect and extrorse. *Pistils* about 9, puberulous; stigmas linear, radiating, ovules ex-arillate.

Perak. Father Scortechini.

Ripe fruit is unknown and it is possible that the seeds may be arillate. It has, however, the facies of a *Dillenia* rather than of a *Wormia*. In leaf this resembles *D. eximia*, Miq., but that plant has broader leaves much more narrowed to the base. It also resembles *D. grandifolia*, Wall., but is distinguished by its closer nerves and remarkable areolar reticulations.

Species imperfectly known.

5. D. GRANDIFOLIA, Wall. *Leaves* oblong-lanceolate, acute, serrate, softly hairy above, tomentose beneath; nerves about 40 to 50 pairs, transverse: length of blade 24 in., breadth 9 in.; petioles stout, 5 to 6 in. long, densely tomentose as is the midrib. H. f. & Th. Fl. Ind. I, 71; Hook. fil. Fl. Br. Ind. I, 38. Miq. Fl. Ind. Bat. Vol. I, pt. ii, 12.

Penang and Malacca.

Known only by a few imperfect specimens in Herb. Wallich. *D. eximia*, Miq., from Sumatra, is a species also known only by a few leaf specimens which I have examined. The two differ as above described and may belong to *Wormia*.

ORDER III. MAGNOLIACEÆ.

Trees or shrubs, sometimes climbing, often aromatic, wood-tissue with glandular markings. *Leaves* alternate, quite entire or toothed, stipulate or not. *Flowers* axillary and terminal, often showy, white, yellow or red, sometimes unisexual. *Sepals* and petals very deciduous, hypogynous, arranged in whorls of 3. *Stamens* indefinite, hypogynous, filaments flattened or terete, free or monadelphous; anthers basifixed, adnate cells bursting longitudinally. *Carpels* indefinite, free or partly cohering in one whorl, or in several on an elongate axis; styles short or rarely long, stigmatose on the inner surface; ovules 2 or more, on the ventral suture, anatropous or amphitropous. *Fruit* baccate, or follicular, or of woody dehiscent carpels, which are sometimes arranged in a cone. *Seeds* solitary or few, sometimes pendulous from a long funicle, testa single and crustaceous, or double, the outer fleshy; albumen granular or fleshy and oily; embryo minute, cotyledons spreading, radicle short, blunt, next the hilum.—Distrib. Chiefly natives of the tropical and temperate Asiatic mountains and United States, a few are Australian; species about 80.

Tribe I. *Magnoliæ*. *Flowers* bisexual. Erect shrubs or trees. *Stipules* conspicuous, convolute and embracing the leaf-buds, deciduous. *Carpels* on an elongated axis.

Carpels not separating from the carpophore; dehiscing dorsally.

Carpophore sessile, carpels closely packed.
Fruit, elongate, cylindric, ovules ? ... 1. *Magnolia.*
„ ovoid, ovules 6 ... ... 2. *Manglietia.*
Carpophore stalked, carpels distant ... 3. *Michelia.*
Carpels when ripe separating from the sessile carpophore and dehiscing ventrally ... 4. *Talauma.*
Tribe II. *Winterieæ.* Flowers usually bisexual. Shrubs or small trees. Stipules 0. Carpels in one whorl 5. *Illicium.*
Tribe III. *Schizandreæ.* Flowers unisexual. Climbing shrubs. Leaves exstipulate.
Carpels of fruit capitate ... ... 6. *Kadsura.*

1. Magnolia, Linn.

Trees or shrubs. *Leaves* evergreen or deciduous; buds enveloped in the convolute stipules, which are connate in pairs. *Flowers* large, terminal. *Sepals* 3. *Petals* 6 to 12, 2 to 4-seriate. *Stamens* numerous, many-seriate, filaments flat; anthers adnate, introrse. *Gynophore* sessile. *Carpels* many, imbricated on a long axis, 2-ovuled, persistent; stigmas decurrent on the ventral suture. *Fruit* an elongated axis, with persistent adnate 1-2-seeded dorsally dehiscing follicles. *Seeds* pendulous from the carpels by a long cord; outer walls of testa fleshy: albumen oily.—Distrib. Temp. N. America, temp. and trop. E. Asia and Japan; species about 16.

M. Maingayi, King, n. sp. A tree. Young branches and inflorescence densely clothed with pale shaggy hair. *Leaves* membranous, oblanceolate-oblong or obovate, acuminate, narrowed to the rounded base; upper surface glabrous, the lower glaucous, the midrib sparsely villous; nerves 16 to 20 pairs; length of blade 6 to 8 in., breadth 2·5 to 3 in., petiole ·3 in. *Flowers* terminal, solitary, shortly pedunculate, buds ovoid, the stipular hood villous like the pedicel. *Sepals* 3, oblong. *Petals* about 6, of the same shape as the sepals but smaller, yellowish-white, glabrous, 1 to 1·3 in. long. *Ovaries* villous. *Ripe fruit* cylindric, 1·5 in. long by ·6 in. diam.; the individual carpels ovoid, not beaked, ·35 in. long, villous.

Malacca, (Maingay No. 17), Perak, Penang; in dense low forest up to 2,500 feet.

2. Manglietia, Blume.

Trees; foliage and inflorescence of *Magnolia*. *Sepals* 3. *Petals* 6 or more, 2- or more-seriate. *Stamens* very numerous, many-seriate; anthers linear, adnate, introrse. Gynophore sessile. *Ovaries* many, cohering in an ovoid head; stigma decurrent on the ventral suture;

ovules 6 or more. *Fruit* ovoid; carpels persistent, dehiscing dorsally. *Seeds* as in *Magnolia*.—Distrib. Mountains of tropical Asia; species 5.

1. M. Sebassâ, Miq. Ann. Lugd. Bat. IV, 71. A shrub. Adult branches with pale shining bark; young tawny villous, as are the petioles and spathoid hood of calyx. *Leaves* coriaceous, oblong or oblanceolate, acute, much narrowed at the base, glabrous and shining on both surfaces, bullate; nerves 14 to 20 pairs, prominent; length of blade 11 to 14 in., breadth 4·5 to 7 in., petiole 1 in., much thickened at base. *Flowers* solitary, terminal, on villous peduncles 2 to 3 in. long. Spathoid hood densely adpressed fulvous-sericeous. *Sepals* and petals about 9, fleshy, pale yellow, from obovate to oblong, abruptly contracted into a claw at the base, nearly 2 in. long. *Stamens* with very stout filaments. *Pistils* about 20. *Ripe carpels* (*fide* Miquel) oblong, lenticellate. Miq. Fl. Ind. Bat. Suppl. 367.

Perak, Kunstler; in dense jungle, at elevations of about 1500 feet: only once collected. Distrib. Sumatra.

The specimens collected by the late Mr. Kunstler are without fruit. They agree in other respects with the Sumatran specimens on which Miquel founded the species.

2. M. glauca, Bl. Bat. Verh. IX, 149. A tall glabrous tree. *Leaves* coriaceous, oval or obovate-oblong, slightly acuminate, the edges slightly recurved when dry, glaucescent beneath; nerves 12 to 14 pairs, not prominent; length of blade 5 to 7 in., breadth 2·5 to 3 in.; petiole ·75 to 1·5 in. *Flowers* terminal, solitary, on annulate peduncles 1 to 1·5 in. long, yellowish, about 1·5 in. long. Stipular hood broadly ovate, glabrous. *Sepals* and petals 9, greenish-yellow, oblong, sub-acute, those internal smaller. *Filaments* short. *Pistils* numerous. *Ripe fruit* ovoid, the size of a hen's egg, glabrous. *Seeds* with a red fleshy arillus. Bijdr. 8; Fl. Jav. *Magnol.* 22, t. 6. Miq. Fl. Ind. Bat. Vol. I, pt. 2, p. 15.

Perak at 3,000 feet. Distrib. Java.

3. M. Scortechini, King, n. sp. A tree. The young branches, stipules and under surfaces of the leaves minutely rufous-pubescent. *Leaves* thinly coriaceous, lanceolate, narrowed to base and apex, the latter subacute; upper surface shining, reticulations minute, distinct on both surfaces; nerves about 12 pairs; length of blade 3·5 to 4 in, breadth 1·25 in., petiole ·3 to ·4 in. *Flowers* solitary, axillary, on annulated pedicels shorter than the petioles: stipular hood rufous, silky. *Sepals* and petals about 12, similar, ·5 in. long, linear-lanceolate. *Stamens* linear. *Fruit* ovoid (young ·5 in. long) on a short gynophore, rufous-pubescent. *Carpels* 6 to 8.

Perak. Father Scortechini.

The only specimens of this have unripe fruit. The ovaries have

only 1 ovule, but apparently it is a *Manglietia* and I put it into this genus provisionally. The small rufous leaves, shining on the upper surfaces, and small axillary flowers mark it as distinct from any other Indo-Malayan *Magnoliad.*

3. Michelia, Linn.

Trees. *Leaves* as in *Magnolia*. *Flowers* axillary, solitary or terminal. *Sepals* and petals similar, 9 to 15 or more, 3- or more-seriate. *Stamens* as in *Magnolia*. Gynophore stalked. *Carpels* in a loose spike, stigma decurrent; ovules 2 or more. *Fruit* a lax or dense elongate spike of coriaceous dorsally dehiscing carpels. *Seeds* of *Magnolia*.—Distrib. About 15 species; temp. and trop. Mountains of India.

1. M. Champaca, Linn. A tall tree, the branchlets pubescent. *Leaves* membranous, ovate-lanceolate, acuminate, rather abruptly narrowed to the base, shining above, pale and glabrous or puberulous beneath; main nerves thin, 12 to 16 pairs; length of blade 4·5 to 9 in.; breadth 2·25 to 3·5 in.; petiole 1 to 1·5 in. *Flowers* yellow, solitary, axillary or terminal, shortly pedunculate; buds narrowly ovoid, the stipular hood silky. *Sepals* oblong. *Petals* about 15, narrowly oblong, 1 in. long. *Ripe fruit* 3 to 6 in. long: individual carpels ovoid, lenticellate, woody. DC. Prodr. i, 79; Roxb. Fl. Ind. ii, 656; W. & A. Prod. i, 6; Wight Ill. i, 13; Blume Fl. Jav. *Magnol.* t. 1, Bijdr. 7; H. f. & T. Fl. Ind. 79. Hook. fil. Fl. Br. Ind. I, 42: Miq. Fl. Ind. Bat. Vol. I, pt. ii, 16; *M. rufinervis*, DC. l. c. 79; Bl. Bijdr. 8; *M. Doldsopa*, Ham. ex DC. l. c.; Don Prodr. 226; Wall. Tent. Fl. Nep. t. 3; *M. aurantiaca*, Wall. Cat., Plant. As. Rar. t. 147. *M. Rheedii*, Wight Ill. i. 14, t. 5, f. 6. *M. pubinervia*, Bl. Fl. Jav. *Magnol.* p. 14, t. 4.

In temperate forests in the Straits Settlements, but not common. Distrib. India.

2. M. montana, Bl. in Verh. Bat. Gen. IX, p. 153. A glabrous tree. *Leaves* thinly coriaceous, shining, obovate or obovate-rotund, shortly and abruptly apiculate, rather suddenly narrowed to the base; nerves 10 to 12 pairs, thin, spreading; length of blade 6-7·5 in., breadth about 4 in.; petiole, slender ·75 in. *Flowers* white, 1·5 in. in. diam., solitary, terminal or axillary, on annulate peduncles about ·5 in. long. Buds cylindric. *Sepals* and petals about 8, oblanceolate or lanceolate. *Pistils* 3 to 4. *Carpels* usually single, sub-globular, 1·5 in. long, the walls lenticellate, woody, ·5 in. or more thick. Bl. Bijdr. 7, Fl. Jav. *Magnol.* p. 15, t. 5; Miq. Fl. Ind. Bat. Vol. I, Pt. ii, 17.

Perak, at low elevations. Java, on the mountains. Distrib. Eastern Himalaya.

Specimens from the E. Himalaya have less obovate leaves, and rather

larger flowers on longer peduncles: but in other respects they agree with the Java plant. This species is readily distinguished by its enormously large, solitary, woody carpels.

4. Talauma Juss.

Trees or shrubs. *Leaves* and inflorescence of *Magnolia*. *Sepals* 3. *Petals* 6 or more, in 2 or more whorls. *Stamens* very numerous, many-seriate: anthers linear, introrse. *Gynophore* sessile. *Ovaries* indefinite, 2-ovuled, spiked or capitate: stigmas decurrent. *Carpels* woody, separating from the woody axis at the ventral suture, and dehiscing so as to leave the seeds suspended from the axis by an elastic cord. *Seeds* of *Magnolia*. Distrib. Tropics of Eastern Asia, & South America: Japan. Species about 18.

1. T. lanigera, Hook. fil. & Th. Fl. Br. Ind. I, 40. A small tree. Young leaves, petioles and branches, the peduncles, outer surface of the stipular involucre enveloping the calyx, and the ovaries densely fulvous-tomentose. *Leaves* sub-coriaceous, oblong or oblanceolate, abruptly and shortly acuminate, narrowed at the base, when adult shining and glabrous except on the lower half of the midrib below; length of blade 9 to 12 in., breadth 2·5 to 4 in.; petiole 1 to 1·5 in., thickened below. *Sepals* and petals white, ovate, tomentose at the very base. *Ripe fruit* 3 to 4 in. long by 2 in. broad; the carpels glabrescent when quite ripe, beaked, 1·5 in. long.

In open forest on low hills; Perak and Malacca.

From Miquel's description of his *T. villosa*, (Fl. Ind. Bat. Suppl. 366,) that species and this must be very closely allied; and, if they are identical, Miquel's name, dating 1860, must take precedence of Hf. & T.'s, which was published in 1875.

2. T. Andamanica, King, n. sp. A glabrous shrub or small tree. *Leaves* sub-coriaceous, oblanceolate-oblong, rarely lanceolate, the apex (usually rather abruptly) acute, below gradually narrowed to the petiole; both surfaces shining; main nerves 10 to 14 pairs, thin but prominent below; length of blade 7 to 10 in., breadth 2·5 to 3·5 in.; petiole ·5 to 1 in., expanded at the base. *Flowers* solitary, sub-globose, 1·5 in. long: on thick terminal annulated pubescent peduncles 1 in. long: stipular hood of calyx glabrous. *Sepals* 3. *Petals* 6 ovate or obovate. *Ripe fruit* globose, pyriform, 1·5 in. long; the individual carpels rhomboid, 6 in. long and nearly as broad, shortly beaked: seeds ·4 in. long.

Andaman Islands, on Mount Harriet.

In leaf this closely resembles *T. Rabaniana*, H. f. and Th., but has smaller flowers and fruit. The individual carpels of this are not more than a third the size of those of *T. Rabaniana*, which are more than 1 inch long and narrowly oblong and not rhomboidal.

3. T. MUTABILIS, Bl. Fl. Jav. *Magnol.* p. 35, t. 10, 11, 12, fig. B. A glabrous shrub. *Leaves* oblong-lanceolate, acute at either end, slightly unequal at the base, sub-coriaceous, shining on both surfaces; nerves about 12 pairs, spreading; length of blade 5 to 8 in., breadth 2·25 to 2·75 in.; petiole ·75-8 in., thickened at the base, minutely muriculate when dry as is the midrib. *Flowers* solitary, terminal, on annulate peduncles about 1·5 in. long: stipular hood fuscous-villous. *Sepals* 3, broadly ovate. *Petals* 6, in 2 whorls, broader than the sepals, sometimes obovate, concave, connivent, passing from rosy green to reddish brown. *Ripe fruit* ovoid, 1·5 to 2 in. long, pubescent at first, ultimately glabrous: individual carpels, rhomboid, lenticellate, with blunt recurved beaks ·75 to 1·25 in. long. Korth. in Ned. Kruik. Arch. II, 98; H. f. and Th. Fl Ind. I, 74; Hook. fil. Fl. Br. Ind. I, 40; Miq. Fl. Ind. Bat. Vol. I, pt. ii, 14: *Manglietia Candollei*, Wall. Cat. (not of Bl.).

In the Straits Settlements, in shady damp spots near water. Distrib. The Malayan Archipelago.

A very variable shrub of which Blume distinguishes 3 varieties. All the specimens I have seen from the Straits have glabrous leaves: but Blume and others describe the leaves as often pubescent or even pilose below.

4. T. KUNSTLERI, King, n. sp. A tree, 25 to 30 feet high; glabrous, except the peduncle and unripe carpels. *Leaves* oblong-lanceolate, acuminate at base and apex, thinly coriaceous, both surfaces shining, nerves 10 to 14 pairs, length of blade 6 to 9 in., breadth 1·75 to 2·5 in.; petiole ·5-1·25 in., slender, the base much thickened. *Flowers* terminal, solitary, on ovoid, scarcely expanding, ·85 in. long, erect pubescent annulate peduncles 1 in. long. *Sepals* 3 and petals 6 scarcely exceeding the stamens, broadly elliptic, fleshy, glabrous, waxy white. *Anthers* sessile, more than ·5 in. long. *Pistils* 6 to 8, linear, pubescent. *Ripe fruit* ovoid, pointed, 1·25 in. long and ·75 in. in diam.; individual carpels ·75 to 1 in. long, with short stout sub-terminal beaks.

Perak, in dense forest at elevations of from 3,500 to 4,000 feet.

I here subjoin a description of a new species from Sumatra.

5. TALAUMA FORBESII, King, n. sp. A small tree or shrub; glabrous except the peduncles which are adpressed villose. *Leaves* oblong-lanceolate, acuminate both at base and apex, green and shining on both surfaces, thinly coriaceous, nerves 12 to 15 pairs, length of blade 4·5 to 6 in., breadth 1 to 1·5 in. *Flowers* terminal, solitary, erect, ·75 in. long, on stout peduncles. *Stipular hood* of calyx densely covered with adpressed, fulvous silky hair; buds pointed. *Sepals* and petals about the same length, white, nearly glabrous. *Ripe fruit* 1·25 in. long; the individual carpels ·6 in. long, ovate, rugose, with short terminal beak. *Seeds* 4 in. broad, by 3 in. long, the base compressed.

Sumatra, on Kaiser's Peak &c. at elevations of 5,000 to 6,500 feet. Forbes, Nos. 1853, 2066 and 2204.

This resembles T. *pumila*, but its leaves are not glaucous beneath and they have more nerves: moreover the flowers are smaller and not drooping, the petals ovate and not obovate, and the carpels are only about half the length of those of that species.

5. Illicium, Linn.

Evergreen aromatic shrubs or small trees. *Leaves* quite entire, pellucid-dotted. *Flowers* bi-sexual or unisexual, solitary or fascicled, yellow or purplish. *Sepals* 3 to 6. *Petals* 9 or more, 3- many seriate. *Stamens* indefinite, filaments thick: anthers adnate, introrse. *Ovaries* indefinite, 1-seriate, 1-ovuled; style subulate, recurved. *Fruit* of spreading compressed hard follicles. *Seeds* compressed, testa hard, shining; albumen fleshy. Distrib. North America, China, Indo-Malaya; species about 6.

T. Cambodianum, Hance in Journ. Bot. 1876, p. 240. A small glabrous tree. *Leaves* opposite or in whorls of 3 or 4, coriaceous, oblanceolate or obovate-lanceolate, rarely lanceolate, acuminate, entire; length of blade 3 to 4·5 in., breadth 1 to 2 in., petiole less than 5 in. *Flowers* red to white, 4 in. in diam., on long, slender, axillary pedicels, solitary or in groups of 3 or 4. *Sepals* 3 or 4, rotund. *Petals* about 9, diminishing in size inwards, ovate-oblong, blunt. *Stamens* 9 to 13 in a single row, the filaments about as long as the anthers. *Follicles* 8 to 12, beaked, radiate. *Pierre*, Flore Forestiere de la Cochin Chine, t. 4.

Perak, in dense forests at elevations of from 3,600 to 7,000 feet.

There is some variability as to the shape and size of the sepals: sometimes they are triangular and much smaller than the petals, in other specimens they resemble the petals both in size and shape. The stamens also vary in number, but they never form more than a single row. The texture of the leaves in some plants is thin and membranous, in others almost coriaceous. It is possible there may be two species included in this.

T. evenium, King, n. sp. A small glabrous tree. *Leaves* very coriaceous, opposite or in whorls of 3, oblanceolate or obovate-oblong, the apex with an abrupt blunt short acumen, the base elongate-cuneate, gradually narrowed to the short thick petiole; nerves undistinguishable (when dry); length of blade 3·5 to 5 in., breadth 1·25 to 2 in.: petiole ·3 in. or less. *Flowers* globular, 2 in. in diam., pedicellate, solitary or in 2 to 3- flowered racemes; pedicels with a few minute bracteoles near the apex, about 1 in. long. *Sepals* and petals 8 or 9, rotund, fleshy, similar, or the former a little smaller. *Stamens* 30 to 50, in several rows,

filaments shorter than the anthers; connective of outer stamens narrow, of the inner broad. *Female flowers* unknown.

Perak, Scortechini.

This species was collected only once by the late Father Scortechini. All the flowers which I have seen are male; and, as no unisexual species of this genus has hitherto been described, I have modified the generic definition accordingly. This differs from *T. Cambodianum* in having very coriaceous leaves with shorter petioles, smaller flowers, and much more numerous stamens.

6. KADSURA, Kaempfer.

Climbing glabrous shrubs. *Leaves* exstipulate. *Flowers* unisexual, white, yellow or reddish, axillary, or in the axils of scales near the base of short lateral leafy branches. *Sepals* and *petals* 9 to 12, imbricate in about 3 series. ♂ *Stamens* 5 to 15 or more, in a spiral series; filaments very short, free or subconnate, often fleshy; anthers free or subimmersed in a fleshy head of confluent filaments, cells small remote. ♀ *Ovaries* many, densely imbricated; stigma sessile; ovules 2 to 4. *Fruit* a globose head of indehiscent, fleshy, 1-seeded carpels. *Seeds* 1 or 2, suspended, albumen fleshy, testa crustaceous; embryo minute.—Distrib. Temp. and subtrop. Asia: species about 7.

1. K. SCANDENS, Bl. Fl. Jav. *Schizandreæ*, p. 9, t. 1. A woody glabrous climber 30 to 40 feet long; the bark dark-coloured, irregularly striate. *Leaves* coriaceous, broadly ovate to ovate-oblong, shortly acuminate, entire, the base rounded very slightly decurrent towards the petiole; main nerves about 5 pairs, sub-erect; length of blade 4 to 6 in., breadth 2 to 4 in.; petiole about 1 in., expanded at the base. *Flowers* axillary, with a few from the trunk below the leaves, solitary, on bracteolate peduncles, those of both sexes similar. *Calyx* of 3 triangular sepals much shorter than the petals and united at the base. *Petals* ovate-oblong, blunt, fleshy, erecto-patent, sub-concave. *Male flowers* with numerous short, cuneate, equal, stamens densely packed on an ovoid, fleshy, receptacle; the connective fleshy, the anthers sub-truncate, 2-celled. *Female flowers* without stamens, the ovaries numerous, compressed; the stigmas sessile, elongate, fleshy. *Ripe fruit* sub-globose, 2 to 2·5 in. in diam.; the individual carpels sessile, globose or subcompressed, fleshy, mucronate or beaked, less than ·5 in. in diam. Miq. Fl. Ind. Bat. Vol. I, Pt. ii, 19; *K. cauliflora*, Bl. l. c. p. 11, t. 2; *Sarcocarpon scandens*, Bl. Bijdr. 21.

Perak, Penang; at low elevations. Distrib. Java, Sumatra, and probably in the other islands of the Archipelago.

2. K. CAULIFLORA, Bl. Fl. Jav. *Schizand.* 11, t. 2. A stout woody

climber, 30 to 40 feet long; bark of young shoots dark, smooth; that of the main stem corky, furrowed, lenticellate. *Leaves* ovate-rotund or broadly ovate, slightly and rather abruptly acuminate, the base broad and rounded; nerves 5 to 7 pairs, ascending; length of blade 6 to 7 in., breadth 3·4 to 4·5 in., petiole 1 to 1·5 in. *Flowers* usually from the stem below the leaves, solitary or fascicled, on bracteolate peduncles; rarely axillary. *Sepals* and *petals* as in the last, but larger and more ovate. *Carpels* on pedicels ·5 in. long. Miq. Fl. Fl. Ind. Bat. Vol. I, pt. 2, p. 19.

Perak, Scortechini and King's Collector.

This is very near *K. scandens*, but has corky bark, larger leaves, larger and less orbicular petals, and the flowers are mostly on the old wood and rarely axillary.

3. K. ROXBURGHIANA, Arn. in Jard. Mag. Zool. and Bot. II, 546. A glabrous woody and stout climber, with rough bark. *Leaves* membranous, ovate, obovate or oblong, acute or shortly acuminate, entire, the base narrowed; main nerves 7 to 8 pairs, not prominent; length 4 to 6 in., breadth 1·75 to 2·5 in., petiole ·5 in. *Flowers* 5 in. in diam., axillary, solitary, on bracteolate pedicels ·5 in. or more long. *Sepals* and *petals* rotund, concave, fleshy. *Filaments* connate into a column, the upper the smaller. *Ripe fruit* globose, 1 to 2 in. in diam. *Carpels* cuneate with rounded tops. Hook. fil. & Thoms. Fl. Ind. I, 83; Hook. fil. Fl. Br. Ind. I, 45. *Kadsura japonica*, Wall. Tent. Fl. Nep. t. 12. *Uvaria heteroclita*, Roxb. Fl. Ind. ii, 663.

Andamans. Distrib. The base of the Eastern Himalaya and Khasia Hills.

4. K. LANCEOLATA, King, n. sp. A slender woody climber, 20 to 30 feet long. *Leaves* thinly coriaceous, lanceolate or ovate-lanceolate, slightly unequal-sided, acuminate, the base cuneate or rounded, edges slightly recurved when dry; nerves obscure, about 12 pairs; length of blade 3 to 4 in., breadth 1·5 in., petiole ·35 in. *Flowers* solitary, axillary, globular, 3·5 in. in diam., on minutely bracteolate peduncles shorter than the petioles. *Sepals* about 3, triangular, much smaller than the petals. *Petals* about 9, rotund or broadly ovate, cream-coloured, fleshy, slightly concave. *Stamens* as in *K. scandens*. *Ripe fruit* globular, ·75 in. in diam. or less. *Pistils* numerous, the stigmas minute, subterminal. *Carpels* ovoid, the apices truncate, the minute, lateral stigmas persistent.

Perak, at elevations of from 500 to 1,000 feet.

A smaller plant than *K. scandens*, with smaller truncate carpels.

ORDER IV. ANONACEÆ. To be taken up subsequently.

Order V. MENISPERMACEÆ.

Climbing or twining, rarely sarmentose, shrubs. *Leaves* alternate, entire or lobed, usually palminerved; stipules 0. *Flowers* small or minute, solitary fascicled cymose or racemed, dicœcious, sometimes 3-bracteolate. *Sepals* 6 (rarely 1 to 4, or 9 to 12), usually free, imbricate in 2 to 4 series, outer often minute. *Petals* 6 (rarely 0 or 1 to 5), free or connate. ♂ *Flowers: Stamens* hypogynous, usually one opposite each petal, filaments free or connate; anthers free or connate, 2-celled. Rudimentary carpels small or 0. ♀ *Flowers: staminodes* 6 or 0. *Ovaries* 3 (rarely 1, or 6 to 12); style terminal, simple or divided; ovules solitary (2 in *Fibraurea*), usually amphitropous. *Ripe carpels* drupaceous, with the style-scar subterminal, or by excentric growth subbasal. *Seed* usually hooked or reniform, often curved round an intrusion of the endocarp (condyle Miers), albumen even or ruminate or 0; cotyledons flat or semiterete, foliaceous or fleshy, appressed or spreading.—A large tropical order; genera 32; species about 100.

Tribe I. *Tinosporeæ*. *Flowers* 3-merous. *Ovaries* usually 3. *Drupes* with a subterminal rarely ventral or subbasal style-scar. *Seed* oblong or subglobose; albumen copious or scanty; cotyledons foliaceous, usually spreading laterally.

Drupes with a terminal or subterminal style-scar.

Sepals 6; petals 6; filaments free ...	... 1. *Tinospora.*
Sepals 9; petals 6; filaments free ...	... 2. *Tinomiscium.*
Sepals 6; petals 0; filaments free ...	... 3. *Fibraurea.*

Drupes with a subbasal style-scar.

Sepals 6; filaments all connate ...	... 4. *Anamirta.*
Sepals 9; outer filaments free ...	... 5. *Coscinium.*

Tribe II. *Cocculeæ*. *Flowers* 3-merous. *Ovaries* usually 3. *Drupe* with a subbasal rarely subterminal style-scar. *Seed* horse-shoe shaped, albumen copious; embryo slender, cotyledons linear or slightly dilated.

Sepals 3 to 10, all imbricate; petals 4 to 6, stamens 6 to 10, ovaries 3 to 6, style canaliculate sub-3-lobed	... 6. *Hypserpa.*
Sepals 9, the inner 3 valvate; petals 3 or 6, ovaries 3, style compressed ...	... 7. *Limacia.*
Petals 6; ovaries 3 to 6; styles subulate	... 8. *Cocculus.*
Petals 6; ovaries 3; style forked ...	... 9. *Pericampylus.*

Tribe III. *Cissampelideæ*. *Flowers* 3 to 5-merous. *Ovaries* usually solitary. *Drupe* with a subbasal style-scar; endocarp dorsally muricate or echinate. *Seed* horse-shoe-shaped, albumen scanty; embryo linear, cotyledons appressed.

Sepals 6 to 10, free; petals of ♂ and ♀ 3-5, free...	10. *Stephania.*
Sepals 4, free; petals of ♂ 4 connate, of ♀ 1 ...	11. *Cissampelos.*

Sepals 4 to 8, connate; petals of ♂ 4 to 8 connate,
of ♀ 1, anthers sessile on a central column ... 12. *Cyclea.*

Tribe IV. *Pachygoneæ. Flowers* usually 3-merous. *Ovaries* usually 3. *Drupes* with a subbasal or ventral style-scar. *Seed* curved, hooked or inflexed, albumen 0; cotyledons thick fleshy.

Sepals 8; petals 2; stamens 4 or 8 ... ... 13. *Antitaxis.*

1. Tinospora, Miers.

Climbing shrubs. *Flowers* in axillary or terminal racemes or panicles. *Sepals* 6, 2-seriate, inner larger membranous. *Petals* 6, smaller. *Male flower: stamens* 6, filaments free, the tips thickened: anther cells obliquely adnate, bursting obliquely. *Female flower: staminodes* 6, clavate. *Ovaries* 3; stigmas forked. *Drupes* 1-3, dorsally convex, ventrally flat; style-scar subterminal: endocarp rugose, dorsally keeled, ventrally concave. *Seed* grooved ventrally or curved round the intruded sub-2-lobed endocarp; albumen ventrally ruminate; cotyledons foliaceous, ovate, spreading.—Distrib. Species about 8, tropical Asiatic and African.

1. T. crispa, Miers Contrib. III, 34. Young shoots glabrous, the older bark warted. *Leaves* membranous, glabrous, ovate-cordate or oblong-acuminate, entire or repand, sometimes sub-sagittate; length of blade 2 to 6 in., breadth 1 to 4 in., petiole 1 to 3 in. *Racemes* from the old wood, solitary or fascicled. *Flowers* 2 to 3, in the axils of ovate fleshy bracts, ·15 in. long, campanulate, green. *Stamens* adnate to the base of the petals, anthers quadrate. *Drupe* elliptic-oblong, pale yellow, about 1·5 in. long or less. Hook. fil. Fl. B. Ind. I, 96; H. f. & T. Fl. Ind. 183; Miq. Fl. Ind. Bat. I, pt. i, 78; Kurz For. Flor. Burmah, I, 52. *Menispermum crispum*, L. *M. verrucosum*, Roxb. Fl. Ind. iii, 808. *M. tuberculatum*, Lamk. *Cocculus crispus*, DC. Prodr. i. 97; Hassk. Pl. Jav. Rar. 166. *Cocculus coriaceous*, Bl. Bijd. 25. *C. verrucosus*, Wall. Cat. 4966 A. B.

In all the provinces, but apparently not very common. Distrib. Malayan Archipelago: tropical British India.

2. T. uliginosa, Miers Contrib. iii, 35. All parts glabrous, the branches terete, the lax brown bark bearing many 4-lobed warts. *Leaves* subcoriaceous, remote, ovate or ovate-oblong, acuminate, sub-repand-sinuate or entire, the base cordate 5-nerved; venation prominent; length of blade 3 to 4 in., breadth 1·5 to 2 in.: petiole slender, swollen at the base, 1 to 2 in. long. *Racemes* slender, axillary, longer than the leaves: pedicels 1-flowered. *Drupe* as in *T. crispa*, but with thinner endocarp. Hook. fil. Fl. B. Ind. i. 97. Hook fil. & Thoms. Fl. Ind. 105. *Cocculus petiolaris*, Wall. Cat.

Malacca, Maingay. Distrib. Java and Borneo.

A species of which I have seen no good specimen. The foregoing description is chiefly copied from Miers.

4. Tinomiscium, Miers.

A scandent shrub, juice milky. *Flowers* racemed. *Sepals* 9, with 3 bracts. *Petals* 6, oblong, margins incurved. *Male flower: stamens* 6, filaments flattened; anthers oblong, adnate, bursting vertically. *Rudimentary carpels* 3. *Female flower* unknown. *Drupes* much compressed, ovoid-oblong, style-scar terminal; endocarp much compressed, dorsally convex, ventrally flat or slightly concave, not intruded. *Seed* almost flat, oblong; cotyledons quite flat, nearly as broad as the thin layer of albumen, very thin, closely appressed; radicle short cylindric.—Distrib. 3 E. Asiatic species.

T. petiolare, Miers Contrib. iii, 45, t. 94. Young shoots and rachises of inflorescence brown-tomentose: bark of older branches nearly glabrous, pale brown, deeply striate, very sparsely verrucose. *Leaves* membranous, glabrous, ovate-oblong, obtuse or shortly and suddenly acuminate, entire, the base rounded or truncate, 5-nerved, the nerves all sparsely pubescent and 2 of them small; length of blade 4 to 8 in., breadth 2 to 4·5 in.; petiole 2 to 5 in., slender. *Racemes* fasciculate on stem tubercles, 4 to 8 in. or even 12 in., long. *Flowers* ·35 in. in diam.; sepals puberulous. *Drupe* elongate-ovoid, compressed, 1·25 in. long, and ·75 in. broad; endocarp rugose, woody. Miq. Fl. Ind. Bat. i. pt. i, 87; Hook. f. Fl. B. Ind. i. 97.

Common in the Straits Settlements. Distrib. Sumatra.

Anamirta, Miers.

Climbing shrubs. *Flowers* in panicles. *Sepals* 6, with 2 appressed bracts. *Petals* 0. *Male flower: anthers* sessile, on a stout column, 2-celled, bursting transversely. *Female flower: staminodes* 9, clavate, 1-seriate. *Ovaries* 3, on a short gynophore: stigma sub-capitate, reflexed. *Drupes* on a 3-fid gynophore, obliquely ovoid, dorsally gibbous, style-scar sub-basal; endocarp woody. *Seed* globose, embracing the sub-globose hollow intruded endocarp; albumen dense, of horny granules: embryo curved; cotyledons narrow, oblong, thin, spreading.

1. A. Loureiri, Pierre Flore Forest. Cochin Chine, t. 110. Glabrous; bark of the younger branches brown, that of the older pale and slightly striate. *Leaves* sub-coriaceous, shining, ovate-rotund to broadly elliptic, abruptly and shortly acuminate, entire, the base sometimes minutely cordate 5-nerved and with 4 small pits between the nerves at

their junction with the petioles; length of blade 4 to 5 in., breadth 3·5 to 4 in.; petiole 3 to 3·5 in. slender, swollen and bent at the base. *Racemes* extra-axillary, slender, branched, 3 to 6 in. long. *Male flowers* sessile, 1 in. in diam., anthers 9. *Female flower* unknown; ripe inflorescence stout, woody, a foot or more long: pedicel of ripe fruit much thickened, clavate, rugose; *ripe drupe* transversely ovoid, sub-compressed, 1·25 long by nearly 1·5 broad; pericarp, thick, fibrous, pulpy; endocarp woody, rugose.

Malacca, Maingay No. 116, 115 (in part). Perak, common. Distrib. Cochin-China.

An enormous climber, often with a stem 4 in. in diameter. The leaves and male flowers are excellently figured by M. Pierre, who however does not appear to have seen the ripe fruit.

Fibraurea, Loureiro.

Glabrous climbing shrubs. *Leaves* ovate to oblong, 3-nerved. *Flowers* in panicles, *Sepals* 6, with 3 minute bracts, inner larger. *Petals* 0. *Male flower: stamens* 6, filaments clavate: anthers terminal, adnate; cells spreading, bursting vertically. *Female flower: staminodes* 6. *Ovaries* 3, ovoid, 2-ovuled; stigma sessile, punctiform. *Drupes* 1-seeded, oblong, terete, style-scar subterminal; endocarp oblong, dorsally convex, ventrally flattened and channelled, hardly intruded. *Seed* oblong, terete, reniform on a transverse section; albumen copious, horny; cotyledons foliaceous, longitudinally curved, oblong, very thin; radicle short, cylindric.

1. F. chloroleuca, Miers Contrib. iii, 42. Glabrous, the branches striate; bark of the young branches brown, of the old pale. *Leaves* coriaceous, ovate-oblong, shortly acuminate; the base rounded, 5-nerved (2 of the nerves joining the central one half an inch above the base); venation inconspicuous; length of blade 5 to 9 in., breadth 2·5 to 4 in.; petiole 2 to 4 in., rather slender but swollen and curved towards the base. *Panicles* extra-axillary, or from the stem below the leaves, slender, lax, their branches horizontal, 3 to 8 in. long. *Male flowers* 2 in. in diam., shortly pedicellate; filaments clavate, flattened. *Female flower* unknown; the ripe female inflorescence slender, stouter than the leaf-petioles, about 1 foot long. *Ripe drupes* on rather slender terete pedicels which are capitate at the apex and ·5 in. long, ovoid, smooth, pulpy, rather more than 1 in. long, ·75 in. in diam., endocarp smooth.

Malacca, Perak; not uncommon. Distrib. Sumatra, Borneo.

This appears to me to be a different plant from Loureiro's *F. tinctoria*, the type of which is in the British Museum.

7. Coscinium, Colebrooke.

Climbing shrubs. *Flowers* in dense globose heads. *Sepals* 6, with a bract, orbicular. *Petals* 3, large, spreading, elliptic. *Male flower: stamens* 6, filaments cylindric, 3 inner connate to the middle; anthers adnate, outer 1- inner 2-celled, bursting vertically. *Fem. flower: staminodes* 6. *Ovaries* 3-6, subglobose; styles subulate, reflexed. *Drupes* globose; endocarp bony. *Seed* globose, embracing a globose intrusion of the endocarp; albumen fleshy, ruminate in the ventral face; embryo straight, cotyledons orbicular, spreading, thin, sinuate, laciniate, or fenestrate.—Distrib. Species 2; tropical Asiatic.

1. C. fenestratum, Colebrooke in Trans. Linn. Soc. xiii, 65. Young shoots faintly striate, shortly tomentose, often ferruginous. *Leaves* coriaceous, very slightly peltate, rotund-ovate, acute or shortly acuminate, the base truncate and sometimes sub-sinuate, shining above, yellow-tomentose beneath, except the 7 stout glabrous nerves; reticulations prominent; length of blade 5 to 7 in., breadth 4 to 6 in.; petiole 2 to 3 in., swollen and bent at base. *Flowers* in small pedunculate heads, in extra-axillary racemes shorter than the leaves. *Petals* orbicular and, like the sepals, persistent. *Ripe drupes* on stout pedicels with capitate apices, globose, tomentose, ·75 in. in diam.; cotyledons laciniate. Miers in Hook. Bot. Mag. t. 6458; Contrib. iii. 22, t. 88; H. f. & T. Fl. Ind. 178. Hook. fil. Fl. Brit. Ind. i. 99. *C. Maingayi*, Pierre Fl. Coch Chine. *C. Wallichianum* and *Wightianum*, Miers in Tayl. Ann. Ser. 2, vii. 37, Contrib. iii. 23. *Menisp. fenestratum*, Gærtn.; DC. Prod. i. 103; Roxb. Fl. Ind. iii. 809. *Cocculus Blumeanus*, Wall. Cat. 4971, partly: *Pereira medica*, Lindl. Fl. Med. 307.

Straits Settlements, at low elevations, not so common as the next. Distrib. Ceylon, and perhaps some of the Malayan Islands.

The Ceylon specimens have larger leaves and a more condensed inflorescence than the Malayan; but the flowers are alike. Pierre's species *C. Maingayi* is founded on Maingay's Malacca specimens (Kew. Distrib. 117) but I cannot see that they differ specifically from his No. 118, or from Wallich's.

2. C. Blumeanum, Miers Contrib. iii, 23. Young shoots sub-striate, tawny-tomentose. *Leaves* coriaceous, peltate, oblong, elliptic, rarely ovate-rotund, obtuse or acute, the base rounded or truncate, sometimes sub-sinuate, shining above, white-tomentose beneath, the 7 nerves bold and prominent on lower surface as are the reticulations, length of blade 8 to 12 in., breadth 4 to 7 in.; petiole 4 to 6 in, swollen at base and apex. *Male inflorescence* 5 in. long, racemose, densely ferruginous-tomentose; the flower heads ·35 in. in diam. *Female inflorescence* from the stem, 8 in. long, its branches horizontal: drupes globular, tomen-

tose. Hook. fil. & Thoms Fl. Ind. 179; Hook. fil. Fl. B. Ind. i. 99: Miq. Fl. Ind. Bat. i. Pt. 1, 77: *Cocculus Blumeanus*, Wall. Cat. 5971 partly.

Climbing like the last on high trees. I have not seen specimens of the ripe drupe.

LIMACIA, Loureiro.

Climbing shrubs or small trees: flowers in racemes or panicles. *Sepals* 9, tomentose, in three series; the two outer smaller, ovate; the inner large, rotund, concave, valvate. *Petals* 3 or 6, small, (as large as the outer 3 sepals), obovate, clawed, glabrous, embracing the stamens. *Stamens* 3 or 6, free, sub-equal; filaments short, erect, thickened upwards; anthers connivent, cordate, 2-lobed. *Fem. flower: sepals* and *petals* as in male; *staminodes* 6, clavate. *Ovaries* 3, hirsute. *Style* short. *Drupes* 3, usually 1 by abortion, obovoid or reniform, fleshy; style-scar subbasal; endocarp 3-celled, the 2 lateral cells empty. *Seed* elongate, embracing the intruded endocarp; embryo slender, the cotyledons linear, plano-convex. Distrib. Tropical Asia.

1. L. TRIANDRA, Miers Contrib. iii, 112. Branches closely striate, puberulous when young, glabrous when adult. *Leaves* membranous, ovate-lanceolate, acuminate, 3-nerved above the rounded base, length of blade 3 to 5 in., breadth 1·5 to 2 in., petiole about ·5 in. *Racemes* supra-axillary, shorter than the leaves, usually solitary, puberulous; bracts and and flowers minute. *Stamens* 3, free, the filaments cuneate; anthers large, the cells divergent. Hook. fil. Fl. B. Ind. i. 100; Miq. Fl. Ind. Bat. i. pt. 1, 80. Kurz For. Flor. Burm. i, 55; H. f. & T. Fl. Ind. 188. *L. Amherstiana* and *Wallichiana*, Miers l.c. 112, 113. *Menisp. triandrum*, Roxb. Fl. Ind. iii. 816. *Cocculus triandrus*, Colebrooke in Trans. Linn. Soc. xii. 64; Wall. Cat. 4962, 4959 C. 4958 L.

Penang. Distrib. Burmah.

2. L. OBLONGA, Miers Contrib. iii. 109. Scandent or shrubby; branches minutely striate, rusty-puberulous when young. *Leaves* membranous, glabrous, oblong-lanceolate or broadly elliptic, acute or mucronate; the base rounded, 3-nerved; reticulations few, bold, pubescent like the nerves and petiole; length of blade 4 to 7 in., breadth 2·25 to 3·5 in., petiole ·75 to 1·25 in. *Male panicles* slender, extra-axillary, usually in pairs, much longer than the leaves, branched, rusty-pubescent. *Stamens* 6, filaments thickened upwards but not cuneate. *Female inflorescence* much shorter. *Drupe* transversely reniform, compressed, glabrous, pulpy, rugose when dry, ·75 in. long, stylar scar on a sub-basal projecting horn. Hook. fil. & Th. Fl. Ind. 189; Hook. fil. Fl. B. Ind. i. 100; Miq. Fl. Ind. Bat. i. Pt. i, 80. *Cocculus oblongus*, Wall. Cat.

Common in all the Straits Settlements.

Miers remarks that Wallich describes the species as a bush. Mr. Kunstler, who collected it at various places in Perak, describes one set of his specimens (No. 6184) as bushes of 8 to 10 feet: the other he describes as climbers. Between the male flowers of these two I can detect no difference. The species is at once recognised by the length of the panicles of male flowers.

3. L. VELUTINA, Miers Contrib. iii. 110. Whole plant, but especially the young branches, olivaceous-tomentose. *Leaves* thinly coriaceous, ovate-oblong, often slightly obovate, obtuse, acute or shortly and finely acuminate, the base acute or rounded; when adult glabrous and shining above except the midrib; beneath olivaceous-pubescent; 3-nerved; length of blade 3·5 to 5·5 in., breadth 1·5 to 2 25 in.; petiole 5 to ·75 in., stout, terete. *Cymes* shorter than the petiole, umbellate, in axillary fascicles of 2 to 6. *Male flowers* small. *Stamens* 6, filaments much thickened upwards; anthers large, 2-celled. *Drupes* 1 or 2, transversely reniform, very little compressed, sparsely tomentose; otherwise as in the last. Hook. fil. Fl. Br. Ind. I. 100; Miq Fl. Ind. Bat. i. Pt. i, 80; Kurz For. Flor. Burmah I, 55; H. f. & T. Fl. Ind. 189. *L. inornata*, Miers l. c. iii. t. 109. *Cocculus velutinus*, Wall. Cat. 4970.

Var. GLABRESCENS, leaves nearly glabrous. *L. distincta*, Miers Contrib. iii, 111, t. 109.

In Forests in the Straits Settlements. Distrib. Sumatra.

A slender climber 15 to 20 feet long: readily recognised by the yellowish olivaceous tomentum, and short cymose inflorescence.

4. L. KUNSTLERI, King, nov. spec. Branches, petioles, and nerves of leaves softly pubescent. *Leaves* sub-coriaceous, glabrous, pale beneath, shortly petiolate, lanceolate, mucronate, the base cuneate, 3-nerved; reticulations wide, distinct; length of blade 1·5 to 2·5 in., breadth ·5 to 1 in., petiole 2 in. *Cymes* pedunculate, axillary, solitary, little longer than the petioles; or in terminal racemes. *Male flowers* small. *Stamens* 6, the filaments short, clavate; anthers large, cordate, 2-celled, connivent.

North Coast of Singapore near the Sea; King's Collector, No. 70.

This very distinct species has been gathered only once. Only the male flowers are known, but they are unmistakeably those of a *Limacia*. The species is distinguished by its shortly petiolate small leaves, and numerous short cymes which (toward the end of the branches) are arranged in racemes.

HYPSERPA, Miers.

Climbing shrubs. *Flowers* in short axillary cymes. Parts of flower varying in number. *Sepals* in three rows, the outer 3 bractiform

and hairy: the inner 6 to 8 much larger; all imbricate, glabrous. *Petals* 4 to 6, smaller than the inner sepals, oblong, incurved at the apex, rather fleshy. *Stamens* 6 to 10, free, in two series; filaments compressed, thickened upwards: anthers ovate, 2-celled. *Female flower* (*fide* Miers) *Sepals* 8, oblong, all imbricate. *Petals* 5 or 6, oblong, concave. *Staminodes* 6, clavate. *Ovaries* 6, rarely 3. Style very short. *Drupes* 2-3, transversely ovate, fleshy; endocarp bony, sub-globose, slightly compressed, with radiating grooves, and with a single lunate cell: embryo terete, slender; radicle as long as the cotyledons.

1. H. TRIFLORA, Miers Contrib. iii, 102. Branches striate, the youngest pubescent. *Leaves* small, sub-coriaceous, shining, glabrous, oblong-lanceolate, tapering gradually to the rather blunt minutely mucronate apex; the base rounded, 3-nerved; reticulations fine, but rather obscure, as are the nerves; length of blade 1·5 to 3·5 in., breadth ·5 to 1·25 in., petiole ·3 to ·5 in. *Cymes* about 3-flowered, little longer than the petioles, usually solitary, axillary and supra-axillary, the female shorter.

Malacca; Griffith, Maingay (Kew Distrib., 123): Perak; Scortechini, King's Collector. Distrib. Sumatra.

The Perak specimens agree with the types of Miquel's *Limacia microphylla* from Sumatra in Herb. Calcutta; and they do not agree in externals with the Indian *L. cuspidata*. Ripe fruit of this is unknown. But the flowers are so different from those of *Limacia* that I think it ought not to be included in that genus, and I further venture to think that Miers's genus *Hypserpa* has a sufficiently sure basis on the structure of the flowers alone.

10. COCCULUS, DC.

Climbing or sarmentose shrubs, rarely suberect. *Petiole* not dilated at the base. *Flowers* in panicles. *Sepals* 6, 2-seriate, outer smaller. *Petals* 6, smaller, usually auricled. *Male flower: stamens* embraced by the petals; anthers sub-globose, cells bursting transversely. *Female flower: staminodes* 6 or 0. *Ovaries* 3 to 6: styles usually cylindric. *Drupes* laterally compressed; endocarp horse-shoe-shaped, dorsally keeled and tubercled, sides excavate. *Seed* curved, albumen fleshy; embryo annular; cotyledons linear, flat, appressed.—Distrib. All warm climates.

1. C. KUNSTLERI, King, n. sp. Glabrous; the branches striate, pale. *Leaves* membranous, with long petioles, peltate, rotund, acute; nerves 9, radiating from the petiolar insertion, thin but prominent on the pale under surface; length of blade 3·25 to 4 in., breadth about ·25 in. or less; petiole slender, terete, about 3 in. long. *Panicles* in fascicles of 2 to 4 from flat warty tubercles on the stem, narrow, the lateral branches only about ·5 in. long, few-flowered. *Sepals* imbricate, glabrous. *Petals* 6,

each embracing a stamen. *Filaments* free, clavate; anthers broad, 4-celled. *Ripe drupes* 1 to 1·25 in. long, and about 6 in. broad, narrowly sub-obovoid, compressed; pericarp of a thin pulp; endocarp horny, narrowly horse-shoe-shaped, the edge boldly ridged, the sides with deep radiating grooves and the central part with a deep vertical hollow: embryo sausage-shaped, bent along the circumferential chamber of the endocarp.

Perak, Ulu Bubong; King's collector, Nos. 4417 and 10282.

This has the flower of *Cocculus*, but the fruit of *Stephania*. It comes nearest to the Indian *C. macrocarpus*, which has a similar though smaller fruit, and, like that species, would belong to Miers' genus *Diploclisia*. It must be near *D. pictinervis* of that author.

11. Pericampylus, Miers.

A climbing shrub. *Leaves* subpeltate; petioles slender, articulate. *Flowers* in axillary cymes. *Sepals* 6, with 3 bracts, outer smaller, inner spathulate. *Petals* 6, cuneate. *Male flower: stamens* 6, filaments cylindric; anthers adnate, bursting transversely. *Female flower: staminodes* 6, clavate. *Ovaries* 3; styles 2-partite, segments subulate. *Drupes* subglobose; endocarp horse-shoe-shaped, dorsally crested and echinate, sides excavated. *Seed* curved; cotyledons elongate, flat, scarcely broader than the radicle.

1. P. incanus, Miers Contrib. iii. 118, t. 3. Young branches minutely tomentose, not striate. *Leaves* membranous, orbicular-reniform, obtuse or acute, sometimes slightly retuse, mucronulate, the base truncate or sub-cordate; upper surface pubescent or glabrescent, lower tomentose; nerves usually 5; length of blade 2 to 4 in., breadth about ·5 in. or more; petiole 1 to 2 in. *Cymes* pedunculate, axillary, in fascicles of about 4, 2-3-chotomous. *Flowers* minute, crowded. *Petals* 6, obovate, larger than the sepals. *Ripe drupe* the size of a pea. Hook. fil. Fl. Br. Ind. i. 102; Hf. & Th. Fl. Indica, 194; Miq. Fl. Ind. Bat. i. Pt. 1, 83. *P. aduncus, assamicus,* and *membranaceus,* Miers *l. c.* 119-122. *Cocculus incanus,* Coleb. in Trans. Linn. Soc. xiii. 57. *Cissampelos mauritiana,* Wall. Cat. 4980 (not of DC.). *Menisp. villosum,* Roxb. Fl. Ind. iii, 812 (not of Lamk.).

A common climber. Distrib. British India, Java, Sumatra, and probably in other parts of the Malayan Archipelago.

12. Stephania, Loureiro.

Climbing shrubs. *Leaves* usually peltate. *Flowers* in axillary, cymose umbels. *Male flower: sepals* 6 to 10, free, ovate or obovate. *Petals* 3 to 5, obovate, fleshy. *Anthers* 6, connate, encircling the top of the

staminal column, bursting transversely. *Female flower: sepals* 3 to 5. *Petals* of the male. *Staminodes* 0. *Ovary* 1; style 3 to 6-partite. *Drupe* glabrous; endocarp compressed, horse-shoe-shaped, dorsally tubercled, sides hollowed and perforated. *Seed* almost annular; cotyledons long, slender, ½-terete, appressed.—Distrib. Tropics of the Old World.

1. S. HERNANDIFOLIA, Walp. Rep. i, 96. Young branches striate, glabrous. *Leaves* membranous, broadly ovate-rotund, acute or acuminate, rarely obtuse, peltate; the base truncate, emarginate or sub-cordate; glabrous or sparsely pubescent; nerves about 10 radiating from the petiolar insertion, dark-coloured on the pale or glaucous under surface, reticulations open; length of blade 2·5 to 5 in., breadth 2·25 to 3 in. petiole 1·75 to 2 in. *Umbels* on long slender peduncles, many-flowered. *Petals* 3 to 4. *Drupes* red, pisiform, compressed. Hook. fil. Fl. Br. Ind. i, 103; Hf. & T. Fl. Ind. 196; Miq. Fl. Ind. Bat. i, Pt. 1, 83. Miers Contrib. iii. 222. *S. intertexta, latifolia,* and *hypoglauca,* Miers *l. c.* 224, 226, 227. *Cissampelos hernandifolia,* Willd.; DC. Prodr. i. 100; Roxb. Fl. Ind. iii. 842; Wall. Cat. 4977 D, E, F, G, H, K. *C. discolor,* DC. *l.c.* i. 101; Bl. Bijdr. 26. *C. hexandra,* Roxb. *l.c.* iii. 842. *Clypea hernandifolia,* W. & A. Prodr. i. 14; Wight Ic. t. 939. *Steph. discolor,* Hassk. Pl. Jav. rar. 168.

Common in shady places. Distrib. The Malayan Archipelago, British India, Australia, Africa.

13. CISSAMPELOS, Linn.

Suberect or climbing shrubs. *Leaves* often peltate. *Male flowers* cymose. *Sepals* 4, 5 or 6, erose. *Petals* 4, connate, forming a 4-lobed cup. *Anthers* 4, connate, encircling the top of the staminal column, bursting transversely. *Female flower:* racemed, crowded in the axils of leafy bracts. *Sepals* 2 (or sepal and petal 1 each), 2-nerved, adnate to the bracts. *Staminodes* 0. *Ovary* 1; style short, 3-fid or 3-toothed. *Drupe* ovoid, style-scar sub-basal; endocarp horse-shoe-shaped, compressed, dorsally tubercled, sides excavated. *Seed* curved; embryo slender; cotyledons narrow, ½-terete, appressed.—Distrib. All hot climates,

1. C. PAREIRA, Linn. Young branches pubescent. *Leaves* usually peltate, membraneous, orbicular-reniform or cordate, obtuse and mucronate, rarely acute, base truncate to cordate, above glabrescent, below pubescent to tomentose; length 1·8 to 3 in., breadth rather greater, petiole 1 to 3 in. *Male cymes* 2 or 3, axillary, slender. *Female racemes* with large reniform or orbicular bracts. *Ripe drupes* scarlet, sub-globose, hirsute, ·2 in. in diam., Hook. fil. Fl. Br. Ind. i. 104; H. f. & Th. Fl. Indica 198; Miq. Fl. Ind. Bat. i. Pt. 1. 85; DC. Prod. i. 100; Miers' Contrib. iii. 139: *C. caapeba,* Linn. Roxb. Fl. Ind. iii. 842. *C. convo-*

lenlacea, Willd. Wall. Cat. 4979; W. & A. Prod. i. 14; Roxb. *l. c.* *C. orbiculata*, *discolor* and *hirsuta*, Ham. DC. *l. c.* 101. *C. diversa*, *grallatoria*, *eriantha*, *elata* and *delicatula*, Miers *l. c.* 187-189. *C. sub-peltata*, Thw. Enum. 13 & 399; Miers *l. c.* 195. *Menispermum orbiculatum*, Linn.

A common climber in all parts of the Settlements. Distrib. Everywhere in the Tropics.

14. Cyclea, Arnott.

Climbing shrubs. *Leaves* usually peltate. *Flowers* in axillary panicles; *Male flower: sepals* 4-8, connate into an inflated 4-5-lobed calyx. *Petals* 4 to 8, more or less connate into a 4 or 8-lobed corolla. *Anthers* 4 to 6, connate, crowning the staminal column, bursting transversely. *Female flower: sepal* 1, oblong. *Petal* 1, orbicular. *Ovary* 1; style short, 3 to 5-lobed, lobes radiating. *Drupe* ovoid, style-scar subbasal; *endocarp* horse-shoe-shaped, dorsally tubercled, sides convex, 2-locellate (as in *Limacia*). *Seed* curved; cotyledons slender, ½-terete, appressed. —Distrib. Tropical Asia.

1. C. peltata, H f. & Th. Fl. Indica, 201. Branchlets striate, reflexed, pubescent or glabrous. *Leaves* coriaceous, peltate, deltoid or orbicular-ovate, acute or acuminate, often mucronate, the base truncate to cordate; above glabrous or glabrescent, beneath pubescent to tomentose, the 9 nerves rather prominent, length of blade 4·5 to 5·5 in., breadth 3·5 to 4 5 in.; petiole ·2 to 2·5 in., reflexed, pubescent or tomentose, striate. *Panicles* usually longer than the leaves, the males often much branched and spreading and a foot long, the females smaller. *Calyx* campanulate, 4-lobed, glabrous or pilose externally. *Corolla* much smaller. *Drupe* pisiform, pilose; endocarp much tuberculate. Hook. fil. Fl. Br. Ind. i. 104: Miq. Fl. Ind. Bat. i. Pt. 1, 86; Miers Contrib. iii. 236; *C. barbata*, *Arnottii*, *versicolor*, *laxiflora* and *pendulina*, Miers *l. c.* *Menisp. peltatum*, Lamk. *Cocculus peltatus*, DC. Prod. i. 96. *Clypea Burmanni*, W. & A., in part. *Cyclea Burmanni*, Arnot in Wight Ill. i. 22. *Rhaptomeris Burmanni*, Miers in Tayl. Ann. Ser. 2, vii. 41.

Not common in the Straits Settlements. Distrib. Java, British India, Ceylon.

2. C. elegans, King, nov. spec. Young branches spirally striate, puberulous, as are the petioles and panicles; otherwise glabrous. *Leaves* slightly peltate, membranous, shining on both surfaces, the reticulations minute, distinct, ovate to ovate-oblong, shortly acuminate, the base rounded or cordate, 7-nerved (4 of the nerves minute); length of blade 3 to 4 in., breadth 1·5 to 2 in., petiole about 1 in. *Male* and *female*

panicles sub-equal, slender, solitary, axillary, shorter than the leaves. *Male flowers* crowded, minute; anthers about 4, broad. *Drupes* pisiform, slightly compressed, pulp thin, endocarp boldly tubercled.

Perak; at elevations of from 1500 to 2000 feet; King's collector, Scortechini. A slender creeper 15 to 25 feet long: not common.

Antitaxis, Miers.

Climbers or shrubs with penninerved leaves. *Pedicels* 1-flowered, numerous, in axillary fascicles, flowers dioecious. *Male flower: sepals* eight, in decussate pairs, the two outer pairs oblong, pubescent; the two inner pairs rotund, concave, glabrous, imbricate, all increasing in size inwards. *Petals* 2, smaller than fourth row of sepals, rotund, concave. *Stamens* 4 or 8, filaments clavate, anthers sub-globose. *Female flower* unknown. *Drupes* 1-3 (usually 1) sub-globose, or pyriform: endocarp brittle, thin, sub-reniform, 1-celled. *Seed* sub-globular, concave ventrally, albumen none; cotyledons oblong, semi-terete, thick, incurved; radicle minute.—Distrib. Eastern Archipelago.

1. A. lucida, Miers Contrib. iii. 357. A glabrous climber, bark of young shoots dark and smooth, that of old shoots pale and warted. *Leaves* coriaceous, shining, oblong or sub-obovate-oblong, acute or acuminate, the base slightly narrowed, nerves about 6 pairs, obscure, as are the reticulations; length of blade 3 to 3·5 in., breadth 1·25 to 1·5 in., petiole ·5 in. *Female flowers* (male unknown) in fascicles. *Drupes* 1 to 3, (usually solitary) pyriform, glabrous, shining, about ·5 in. long, pericarp pulpy; endocarp thin, brittle.

On Ulu Bubong in Perak, King's collector. Distrib. Java.

A slender creeper from 40 to 60 feet long. *Male flowers* of this are unknown, and I put it into this genus on account of the structure of the fruit and from its general resemblance to *A. fasciculata*, Miers, which however differs in being non-scandent and in having tomentose drupes. Kurz's species *A. calocarpa*. has 8 stamens (although he describes it as having only 4), and is also a climber with glabrous drupes. I have modified Miers' description of the genus as to the number of stamens and other particulars.

Order VI. NYMPHÆACEÆ.

Aquatic perennial herbs. *Leaves* usually floating, often peltate, margins involute in vernation. *Scapes* 1-flowered, naked. *Floral-whorls* all free, hypogynous or adnate to a fleshy disk that surrounds or envelops the carpels. *Sepals* 3 to 5. *Petals* 3 to 5, or many. *Stamens* many. *Carpels* 3 or more in one whorl, free or connate, or irregularly sunk in pits of the disk; stigmas as many as carpels, peltate or decurrent; ovules few,

or many and scattered over the walls of the cells, anatropous or orthotropous. *Fruit* formed of the connate carpels, or of separate and indehiscent carpels, or of the enlarged turbinate flat-topped disk with the nut-like carpels sunk in its crown. *Seeds* naked or arilled; albumen floury or 0; embryo enclosed in the enlarged amniotic sac.—Distrib. Temperate and tropical; genera 8, species 30-40.

Suborder I. *Nymphææ.* *Sepals* 4-6. *Petals* and *stamens* indefinite. *Carpels* confluent with one another or with the disk into one ovary. *Ovules* many. *Seeds* albuminous.

Sepals, petals and stamens ½-superior, inserted on the disk which is confluent with the carpels ... 1. *Nymphæa.*

Sepals inferior; petals superior; carpels sunk in the torus ... ... 2. *Barclaya.*

Suborder II. *Nelumbieæ.* *Sepals* 4-5. *Petals* and *stamens* indefinite. *Carpels* irregularly scattered, sunk in pits of the turbinate disk. *Ovules* 1-2. *Seeds* exalbuminous... ... ... 3. *Nelumbium.*

1. Nymphæa, L.

Large herbs; rootstock creeping. *Flowers* expanded, large, floating on long radical scapes. *Sepals* 4, adnate to the base of the disk. *Petals* in many series, inner successively transformed into stamens, all adnate to the disk. *Filaments* petaloid; anthers small, linear, introrse. *Ovaries* many, 1-seriate, sunk in the fleshy disk and forming with it a many-celled syncarp crowned by connate, radiating, stig[illegible]: ovules many, anatropous. *Fruit* a spongy berry ripening under [illegible]r. *Seeds* small, buried in pulp.—Distrib. Species 20, most temp[illegible]e and tropical regions.

1. N. stellata, Willd. *Leaves* elliptic, deeply cordate, entire or with obtuse shallow sinuate teeth, often blotched with purple below, 6 to 8 in. long. *Flowers* 1·5 to 9 in. in diam., blue (white, or pink in varieties), petals 10 to 30, linear-lanceolate. *Stamens* 10 to 50, anthers with apical appendages. *Stigmatic rays* 10 to 25. *Fruit* 1·5 to 2 in. in diam. *Seeds* sub-striate. Hook. fil. Fl. B. Ind. i. 114: Hook fil. & Th. Fl. Ind. i. 243: Wight Ic. $\frac{1}{5}\frac{0}{5}$: Miq. Fl. Ind. Bat. i. Pt. ii. 90.

Common throughout the warmer parts of the Indo-Malayan region. Distrib. Australia.

Var. 1. versicolor, Hf. & Th. *l. c.* *Flower* and *leaves* intermediate between this and the next; the former white, rose or blue. *N. versicolor*, Roxb. Hort Beng. 41; Fl. Ind. ii. 577; Bot. Mag. t. 1189; Wall. Cat. 7257. *N. punctata*, Edgew. in Trans. Linn. Soc. xx. 29. *N. Edgeworthii* and *N. Hookeriana*, Lehm. der Gatt. Nymph. 7 and 21.

Var. 2. parviflora. Hf. & Th. *l. c.* *Leaves* and *flowers* much

smaller than in the last, the latter usually blue and sometimes not more than 1 to 2 in. in diam. *N. stellata*, Willd. W. & A. Prod. i. 17.

2. BARCLAYA, Wallich.

Aquatic herbs with short villous root-stocks and floating leaves. *Peduncles* elongate, sometimes extra-axillary. *Flowers* pink or claret-coloured. *Sepals* 5, inserted at the base of the ovary. *Petals* numerous, 3-seriate, united below into a tube which is confluent with the carpels. *Stamens* in many series inserted within the corolla tube, filaments slender, short, reflexed; the anthers pendulous, the outer imperfect. *Ovaries* about 6 to 8, confluent, the apex conical; styles tri-angular, connivent into a 10-rayed cone, stigmatiferous within: ovules numerous, orthotropous, parietal. *Berry* globose, pulpy, crowned with the corolla-tube and annular torus. *Seeds* elliptic, albumen floury, embryo small.

1. B. MOTTLEYI, Hook. fil. in Trans. Linn. Soc. xxiii. 157, t. 21. *Leaves* rotund, the apex sometimes bluntly apiculate, the base deeply cordate, glabrous on the upper surface, otherwise tomentose as are the peduncles; length 3 in., breadth 3·5 in., petiole 3 to 7 in. *Sepals* tomentose externally with long glabrous sub-apical tails. *Petals* linear, pink or red. *Seeds* echinate.

In ponds at low elevations in the Forest. Malacca, Griffith; Maingay, Perak, Scortechini, Wray, King's collector. Distrib. Borneo, Motley, Lobb.

Var. KUNSTLERI, King. *Leaves* ovate-rotund, cordate, the under surfaces and petioles pubescent or glabrous, as are the peduncles: *petals* claret-coloured [illegible]s rugose, occasionally echinate.

In similar situations with the last. Perak; King's collector, Scortechini, Wray. The leaves of this are thinner in texture than those of the typical form.

2. B. LONGIFOLIA, Wall. in Trans. Linn. Soc. xv. 442, t. 18. *Leaves* oblong, obtuse, the base cordate, glabrous or glabrescent, length 6 to 8 in., breadth 1 to 1·5 in., petiole 4 to 8 in. *Sepals* glabrous or glabrescent with short apical tails. *Petals* oblong, reddish within, green externally. *Seeds* echinate, Hook. fil. Fl. B. Ind. i. 115; Hook. Ic. Pl. t. 809, 810; Griff. Notul. 218, t. 57; H. f. & T. Fl. Ind. 246.

Andamans. Distrib. Burmah.

3. NE[illegible]ss.

An erect large water herb [illegible]y juice; rootstock stout, creeping. *Leaves* raised high above [illegible] water, peltate. *Flowers* rose-red white or yellow. *Sepals* 4-5, inserted on the top of the scape, caducous. *Petals* and stamens many, hypogynous, many-seriate, caducous. *Anthers*

with a clubbed appendage. *Ovaries* many, 1-celled, sunk in the flat top of an obconic fleshy torus, attachment lateral; style very short, exserted, stigma terminal, dilated; ovules 1-2, pendulous. *Carpels* ovoid, loose in the cavities of the enlarged spongy torus; pericarp bony, smooth. *Seed* filling the carpel, testa spongy, albumen 0; cotyledons fleshy, thick, enclosing the large folded plumule.—Distrib. Species 2, one Asiatic and Australian; the other W. Indian.

1. N. SPECIOSUM, Willd. *Leaves* 2 to 3 feet in diam., concave, glaucous. Peduncles and petioles 3 to 6 feet long, smooth, or with small scattered prickles. *Flowers* 4 to 10 in. diam.; petals elliptic, rose, rarely white. *Fruiting torus* flat-topped 2 to 4 in. diam. *Ripe carpels* ovoid, about ·5 in. long. Wight & Arn. Prodr. i. 16; Roxb. Fl. Ind. II. 647; Wight Ill. i. t. 9; H. f. & T. Fl. Ind. 247; Miq. Fl. Ind. Bat. i. Pt. 2, p. 91. *N. asiaticum*, Rich. in Ann. Mus. xvii. 249, t. 9. *Nelumbo Indica*, Poir. Encycl. iv. 453. *Nelumbo*, Smith Exot. Bot. i. 59, t. 31, 32. *C. mysticus*, Salisb. Ann. Bot. ii. 75. *Nymphæa Nelumbo*, Linn.

In stagnant water thoroughout the Indo-Malayan region. Distrib. Persia, China, Japan and tropical Australia.

ORDER VII. CAPPARIDEÆ.

Herbs, shrubs or trees, erect or climbing. *Leaves* simple or palmately 3 to 9-foliolate; stipules 2 or 0, sometimes spinescent. *Inflorescence* indefinite; flowers solitary, racemed, corymbose or umbelled, regular or irregular, usually 2-sexual. *Sepals* 4, free or connate, valvate or imbricate, rarely open in bud. *Petals* 4 (rarely 2 or 0), hypogynous or seated on the disk, imbricate or open in bud. *Stamens* 4 or more, hypogynous or perigynous, or at the base of or on a long or short gynophore. *Disk* 0, or tumid, or lining the calyx-tube. *Ovary* sessile or stalked, 1-celled; style short or 0; stigma depressed or capitate; ovules indefinite, on 2 to 4 parietal placentas, amphi- or campylo-tropous. *Fruit* capsular or berried. *Seeds* angled or reniform, exalbuminous; embryo incurved.—Distrib. Genera 23, species 300, chiefly tropical.

1. CLEOME, Linn.

Herbs. *Leaves* simple or digitately 3 to 9-foliolate. *Flowers* solitary or racemed, yellow, rose or purple. *Sepals* 4, spreading. *Petals* 4, regular or ascending. *Stamens* 6 to 20, sessile on the disk. *Ovary* sessile or with a short gynophore; style short or 0; ovules many, on 2 parietal placentas. *Capsule* oblong or linear, valves 2, separating from the seed-bearing placentas. *Seeds* reniform. Distrib. Species about 80, chiefly tropical.

1. C. Hullettii, King, n. sp. A much-branched, sub-decumbent, small shrub; the stem striate, puberulous, and with a few short prickles in distant pairs. *Leaves* dimorphous; those of the lower part of the stem petiolate, trifoliolate, the leaflets obovate; those of the upper part simple, sessile, ovate; all pubescent and from ·5 to ·75 in. long. *Flowers* solitary, axillary, about ·5 in. in diam. *Stamens* 6. *Pedicels* slender, much longer than the leaves. *Capsules* terete, striate, glabrous, about 1·5 in. long: seeds large, muricate.

Singapore, in dry place by road-sides.

This is allied to the Peninsular Indian species *C. aspera*, Koen, and *C. Burmanni*, W. & A., but differs from both in its dimorphous leaves.

2. C. viscosa, Linn. An erect, glandular-pubescent, viscid herb. *Leaves* the lower with long petioles, the upper sometimes sub-sessile, 3 to 5-foliolate; leaflets obovate or ovate. *Flowers* in terminal corymbs, on long pedicels. *Petals* yellow, reflexed, about ·5 in. long. *Stamens* 12 to 20. *Capsule* glandular-pubescent, striate, narrowed to the apex, 2 to 3·5 in. long. *Seeds* small, reniform, transversely ridged. Hook. fil. Fl. Br. Ind. i. 170; Miq. Fl. Ind. Bat. i. Pt. 2, 97. Bl. Bijdr. 52; DC. Prodr. i. 242; Wall. Cat. 6968. *Polanisia icosandra*, W. & A. Prodr. 22; Wight Ic. t. 2.—Rheede Hort. Mal. ix. t. 33.

A common weed at low elevations in the tropics.

2. Gynandropsis, DC.

An annual, glandular-pubescent or glabrate herb. *Leaves* 5-foliolate, long-petioled. *Flowers* racemed. *Sepals* 4, spreading. *Petals* 4, spreading, long-clawed, open in bud. *Stamens* 6, filaments adnate below to the slender gynophore, spreading above. *Ovary* stalked, ovules many. *Capsule* elongate, stalked: valves 2, separating from the seed-bearing placentas. *Seeds* reniform, black, scabrous.

1. G. pentaphylla, DC. Prod. i. 238. An erect, glabrous, or pubescent, spreading herb. *Leaves* on long petioles, quinate, the leaflets sessile, obovate or cuneate, acute or obtuse, entire or serrulate, 1 to 1·5 in. long. *Flowers* whitish or purple, in terminal racemes, ·35 to ·8 in., in diam., bracts 3-foliolate. *Capsules* cylindric, pointed, striate, nearly glabrous, 2 to 4 in. long. Hook. fil. Fl. Br. Ind. i. 171: Miq. Fl. Ind. Bat. i. Pt. 1, 96. W. & A. Prod. 21: *G. affinis*, Bl. Bijdr. 51. *Cleome pentaphylla*, Linn. Roxb. Fl. Ind. ii. 126.

Abundant in waste ground all over the tropics.

3. Capparis, Linn.

Trees or shrubs, erect, decumbent or climbing, unarmed, or with stipular thorns. *Leaves* simple, rarely 0. *Flowers* white or coloured,

often showy. *Sepals* 4, free, imbricate in 2 series, or 2 outer subvalvate. *Petals* 4, sessile, imbricate. *Stamens* indefinite, inserted on the torus at the base of the long gynophore. *Ovary* stalked, 1 to 4-celled; stigma sessile; ovules many, on 2 to 6 parietal placentas. *Fruit* fleshy, rarely bursting by valves. *Seeds* many, imbedded in pulp, testa crustaceous or coriaceous; cotyledons convolute.—Distrib. Species 125, natives of all warm climates, except N. America.

Synopsis of Species.

Fruit globose or sub-globose.
- Flowers solitary, axillary ... ... 1. *C. Larutensis.*
- „ umbellate ... ... 2. *C. sepiaria.*
- „ racemose ... ... 3. *C. Scortechinii.*

Flowers supra-axillary, in rows of 2 or 3.
- Leaves 3 to 4 in. long ... ... 4. *C. micracantha.*
- „ 5 to 7 in. long ... ... 5. *C. pubiflora.*

Fruit much elongate, cucumber-shaped.
- Fruit 4 to 7 in. long ... ... 6. *C. Finlaysoniana.*
- „ 3 in. long. ... ... 7. *C. cucurbitina.*

1. C. Larutensis, King, n. sp. Scandent, the young branches and petioles densely covered with minute, rusty, sub-deciduous, tomentum. *Stem* sub-striate; prickles in pairs, short, hooked. *Leaves* glabrous, coriaceous, oblong-lanceolate, obtuse or retuse, the midrib prominent, the 5 or 6 pairs of nerves obscure; length 1 to 1·25 in., breadth 4 in., petiole ·2 in. *Flower-pedicels* solitary, glabrous, more than half as long as the leaves. *Flowers* ·75 in. in diam., white to pink. *Sepals* fleshy, glabrous, the outer pair ovate; the inner rotund, concave. *Petals* oblong, glabrous. *Stamens* about 12. Gynophore slender, nearly 2 in. long. *Fruit* globose, with an apical beak.

Perak, at Laroot, on trees. King's Collector, No. 5103.

A woody climber, 30 to 40 feet long. The petals change from white to pink. Ripe fruit is unknown. This must be near *C. erythrodasys*, Miq.

2. C. sepiaria, Linn. A scrambling shrub. Branches divaricate, with rather distant pairs of short recurved thorns, sub-striate, the younger puberulous. *Leaves* membranous, shortly petiolate, ovate to oblong, pubescent or glabrescent, nerves 4 or 5 pairs. *Flowers*, ·35 to ·5 in. in diam., in terminal umbels, the pedicels slender, ·5 in long; buds globose. *Sepals* oblong. *Petals* narrow, white. *Ovary* apiculate, gynophore ·25 to ·5 in. long. *Fruit* pisiform, black. Hook. fil. Fl. Br. Ind. i. 177: Miq. Fl. Ind. Bat. i. pt. 2, 101: DC. Prod. i. 247: Roxb. Fl. Ind. ii. 568: W. & A. Prod. 26: Camb. in Jacq. Voy. Bot. t. 22: Dalz. & Gibs. Bomb. Flora, 10: Kurz. For. Fl. Burm. i. 66.

In hot dry places at low elevations, but not common in the Straits Settlements. Distrib. India, Ceylon, Philippines, Timor, Australia.

3. C. Scortechinii, King, n. sp. Scandent; young parts, and the inflorescence at all stages densely and minutely ferruginous-tomentose; older branches with 1 or 2 striæ, glabrescent; thorns stipular, in pairs, much shorter than the petioles, hooked. *Leaves* coriaceous, broadly lanceolate, acuminate, much narrowed at the base, smooth and shining above and the nerves obsolete; under surface ferruginous-tomentose when young, but becoming glabrescent, the midrib and 6 pairs of nerves bold and prominent; length 5 to 8 in., breadth 2 to 3 in., petiole ·5 in. *Flowers* 1·5 in. in diam., on short lateral, leafly, bracteate, woody racemes. *Bracts* petiolate, ovate-acuminate, ·75 in. long, deciduous. *Sepals* rotund, concave, tomentose externally. *Petals* pink, broadly elliptic, sub-obovate, blunt, notched, the base cuneate, glabrous. *Stamens* more than 20. *Fruit* globose, 3·5 to 4 in. in diam.; the gynophore transversely wrinkled, 2·5 in. long and ·6 in. in diam.

Batang Padang district in Perak. King's Collector No. 8083. Scortechini, 191.

The fruit of this has been only once collected. The species is a fine creeper, 15 to 20 feet long. It closely resembles *C. trinervia*, Hf. & Th. in many respects: but the leaves are not triple but pinnate-nerved.

4. C. micracantha, DC. Prod. i. 247. Shrubby, not scandent, glabrous. Branches minutely striate; the spines in pairs, stipular, one-third the length of the petioles, divergent, polished, not hooked. *Leaves* thinly coriaceous, shining, minutely reticulate, broadly lanceolate to oval, acute, mucronate; the base narrowed or rounded; midrib stout, nerves 7 to 8 pairs; length 3 to 4 in., breadth 1·5 in., petiole ·3 in. *Flowers* on short pedicels, 2 or 3 in a line, supra-axillary, 1 to 1·5 in. in diam. *Sepals* and *petals* oblong; the former puberulous, the latter white. *Stamens* 15 to 20, shorter than the gynophore. *Fruit* sub-globose, smooth. Hook. fil. Fl. Br. Ind. i. 179: Miq. Fl. Ind. Bat. i. pt. 2, 99: Blume. Bijdr. 52. *C. conspicua* and *C. Finlaysoniana*, Wall. Cat. 6991 and 6992 A (not B).

Generally diffused at low elevations throughout the Malayan region. Distrib. Burmah. Sir Joseph Hooker gives the size of the ripe fruit (which I have not seen) as 2 to 3 in. in diam.

5. C. pubiflora, DC. Prod. i. 246; var. *Perakensis*, Scortechini, MSS. A straggling shrub 15 feet long, branched from the ground. Branchlets compressed, striate, glabrous; thorns in pairs, minute. *Leaves* membranous, elliptic-oblong, shortly acuminate, the base narrowed or rounded, glabrous on both surfaces, nerves (9 to 10 pairs) and reticulations rather prominent; length 5 to 7 in., breadth 2 to 2·5 in.; petiole ·25 in., stout,

channelled. *Flowers* 1 in. in diam. on long slender pedicels, 2 or 3 in a line, supra-axillary. *Sepals* oblong, concave, the two inner recurved, the two outer pubescent externally. *Petals* white, oblong, the two posterior united at the base by a gland so as to form a short spur. *Stamens* numerous. *Gynophore* about 1 in. long, pubescent as is the ovary.

Perak. Scortechini.

Collected only once, and without fruit. In Father Scortechini's field notes, he remarks that the petals are pubescent above and round the margin of the gland, and have a purple blotch.

A straggling but non-scandent shrub, almost unarmed, the thorns being very small. This variety differs from the type as described by De Candolle, and by Decaisne from Timor (Nouv. Ann. du Muséum, ii, 436) in having the venation of its leaves more straight and erect; otherwise it agrees.

6. C. Finlaysoniana, Wall. Hook. fil. Fl. Br. Ind. I, 179. Scandent, glabrous; the spines stipular, nearly straight, in pairs, very short, with broad bases and blackish rather blunt tips. *Leaves* coriaceous, shortly petiolate, broadly lanceolate to elliptic, shortly acuminate, slightly narrowed to the base; the under surface pale (yellow when dry) the midrib and 6 pairs of nerves very bold; reticulations minute, distinct on the upper surface; length 6 to 7·5 in., breadth 2·25 to 3 in., petiole under ·5 in. *Flowers* (*fide* Hook. fil.) solitary or in pairs, supra-axillary, larger than in *micrantha*. *Sepals* lanceolate, acute, glabrous. *Ripe fruit* solitary, on a long stout stalk of which 1·5 in. is pedicel and the remaining 1·5 in. carpophore, cylindric, tapering to the apex, 4 to 7 in. long, and 1 to 1·5 in. in diam., yellowish-red, glabrous. *Seeds* ovoid, smooth, ·4 in. long.

Singapore, Wallich: Ulu Bubong in Perak.

Sir Joseph Hooker, who describes this species in the Flora of Brit. India from Wallich's Singapore specimens (which are accompanied by no field notes), is in doubt whether this is erect or scandent. Kunstler's field notes on the Perak specimens show it to be a creeper 20 to 30 feet long. It does not appear to be a common plant.

Species of which the flowers are unknown.

7. C. cucurbitina, King, n. sp. Scandent; branchlets finely striate, nearly glabrous; the thorns stipular, in pairs, hooked, very sharp, much shorter than the petiole. *Leaves* glabrous, shining, more or less broadly lanceolate or oblong-lanceolate, shortly acuminate, the base narrowed or rounded; main nerves 8 or 9 pairs anastomosing in bold intramarginal arches, the secondary nerves bold as is the midrib,

the reticulations distinct; length 5·5 to 7·5 in., breadth 1·75 to 2·25 in.; petiole under ·5 in., slender. *Flowers* unknown. *Fruit* cylindric, tapering to each end, the apex shortly beaked; when ripe orange-coloured, 3 in. long, and 1·5 in. in diam.; gynophore nearly ·75 in., pedicel 1·25 in., slender. *Seeds* ovoid, smooth, ·4 in. long.

Ulu Bubong, Perak. King's Collector, Nos. 10027 and 10795.

A creeper, 20 to 30 feet long; allied to *C. Finlaysoniana*, Wall. by its curious cucumber-like fruit, but with different leaves. Flowers have not as yet been collected.

8. Capparis Kunstleri, King, n. sp. Scandent, the branches glabrescent: thorns stipular, in pairs, hardly ·1 in long. *Leaves* membranous, oblong-lanceolate or oblanceolate, acute, the base narrowed, both surfaces glabrous, midrib and 7 pairs of sub-horizontal curving nerves prominent below; length of blade 4·5 to 5·5 in., breadth 1·5 to 2·25 in., petiole ·5 in. *Fruit* axillary, solitary, globose, 1·5 to 2 in. in diam., deep yellow; gynophore about 2 in. long, stout; pedicel rather shorter.

Gunong Bubu, in Perak, at an elevation of 800 feet, King's Collector, No. 8337.

A creeper, 40 to 60 feet long. Only fruiting specimens have been collected.

4. Roydsia, Roxb.

Large unarmed woody climbers, branches spotted white. *Leaves* simple. *Flowers* yellow, racemed or panicled. *Calyx* 6-partite, segments 2-seriate, tips a little imbricate. *Petals* 0. *Stamens* indefinite, inserted above the base of the short cylindric gynophore. *Ovary* ovoid, 3-celled from the prolongation of the placentas; styles 3, subulate, or single and undivided; stigmas small, terminal; ovules many, 2-seriate in the angles of the cells. *Fruit* fleshy, with a woody 3-valved, 1-celled, endocarp, 1-seeded. *Seed* erect, cotyledons fleshy, unequal, longtitudinally folded, the larger embracing the smaller.—Distrib. Species 3, tropical Asiatic.

1. R. parviflora, Griff. Notul. iv. 578; Ic. Pl. Asiat. t. 607, f. 1. A semi-scandent shrub, 4 to 8 feet high, glabrous, except the puberulous inflorescence and tomentose sepals. *Leaves* membranous, oblanceolate to obovate-elliptic, or sub-rotund, with an abrupt short blunt acumen; both surfaces shining, the midrib bold; primary nerves 5 or 6 pairs, prominent on the under surface, as are the intermediate nerves and reticulations; length 3·5 to 4 in., breadth 1·5 to 2·25 in.; petiole ·5 to 6 in., slightly thickened in the upper half. *Flowers* in long naked racemes arranged in a terminal leafless panicle much longer than the leaves, shortly pedicellate, ·2 in. in diam. *Sepals* 6, valvate, linear-oblong, sub-acute, densely tomentose on both surfaces, reflexed. *Stamens*

20: filaments equal, not compressed: anthers innate. *Pistil* as long as the stamens; gynophore shorter than the glabrous, 2-celled, ovoid ovary. *Stigmas* 3, globular, minute. *Fruit* unknown. Hook fil. Fl. Br. Ind. i. 409.

Perak. King's Collector, No. 1611. Distrib. Burmah.

2. R. Scortechinii, King, n. sp. Scandent, glabrous except the minutely pubescent inflorescence and sepals. *Leaves* membranous, elliptic or obovate-elliptic, shortly and abruptly acuminate, narrowed to the base; upper surface shining; the lower pale, the midrib and 6 pairs of arching main nerves prominent: length of blade 5·5 to 6·5 in., breadth 3 in.; petiole 1·25 in., thickened in the upper half and bent in the middle. *Flowers* in terminal or axillary panicles or racemes, shortly pedicellate, ·25 in. in diam. *Sepals* 6, slightly imbricate in bud, united at their bases, linear-oblong, sub-acute, minutely tomentose on both surfaces, reflexed. *Stamens* 30; the filaments unequal, slender, compressed, united by their bases; anthers innate. *Pistil* as long as the stamens, the gynophore shorter than the ovary, puberulous. *Ovary* glabrous. *Style* twice as long as the ovary, cylindric; stigmas 3, sessile, ovate, small. *Ripe fruit* ovoid, smooth, yellow, 1·5 in. long and 1 in. in diam.; endocarp membranous.

Perak; Scortechini, King's Collector, Nos. 8464 and 4225: in open rocky places from 500 to 1200 feet.

In his field note on No. 8464, the collector describes this as "a splendid creeper 80 to 100 feet long"; in that on No. 4225, he says, "a tree 40 to 50 feet high." Fr. Scortechini's specimens have no notes. From the flexuose appearance of the dried twigs, I believe this is a creeper, and not a tree. This and the last belong to the section of *Roydsia* characterised by having an undivided style, for which Sir J. D. Hooker, (F. B. I. i. 409), proposes the sectional name of *Alytostylis*, but with an expression of doubt as to whether it should not be separated off as a genus. To this group belongs also the Philippine species *R. floribunda*, Planch. An undescribed species from Burmah in the Calcutta Herbarium (Gallatly No. 499) also falls into this section.

5. Crataeva, Linn.

Trees. *Leaves* 3-foliolate. *Flowers* large, yellow or purplish, polygamous. *Sepals* 4, cohering below with the convex lobed disk. *Petals* 4, long-clawed, open in bud. *Stamens* indefinite, adnate to the base of the gynophore. *Ovary* on a slender stalk, 1-celled; stigma sessile, depressed; ovules many, on 2 parietal placentas. *Berry* fleshy. *Seeds* imbedded in pulp.—Distrib. Species about 6, tropical and cosmopolitan.

1. C. macrocarpa, Kurz in Journ. Bot. 1874, p. 195, t. 148, figs. 8 to

10. A small glabrous tree with pale smooth bark. *Leaflets* sessile, or nearly so, sub-coriaceous, obliquely elongate ob-lanceolate, the middle one narrower than the outer, rather bluntly acuminate, the base much narrowed; upper surface shining, lower pale dull with the midrib and nerves prominent; length 4 to 5 in., breadth 1·75 in. to 2·25. *Flowers* hermaphrodite, in terminal corymbose racemes, 2 to 3 in. in diam. *Petals* obovate, obtuse, unguiculate. *Stamens* 10 to 15, longer than the petals; anthers small, lanceolate, obtuse. *Ovary* ovoid, glabrous, the gynophore as long as the filaments; stigma sessile, discoid; placentas 2, parietal, multiovulate. *Ripe fruit* on a stout lenticellate carpophore 3 inches long, ovoid, smooth, purple spotted with grey, 2·5 in or more long by 2 in. in diam. *Seeds* embedded in pulp., compressed ovoid-reniform, smooth on the sides, shortly tuberculate along the edge, nearly ·5 in. long by ·35 in. broad.

Malacca. Maingay (No. 125 Kew Distrib.), Scortechini No. 1771, King's Collector, No. 10461.

A species distinguished by its sessile leaflets and flat ovate-reniform tubercle-edged seeds. Kurz's figure of the seeds is bad; as he confessedly worked with imperfect material in describing this plant. I have seen no authentic specimens of *C. magna*, DC, or *C. membranifolia*, (Miq. Fl. Ind. Bat. Suppl. 387) but, judging from the descriptions, they probably refer to this plant; in which case the older name (*magna*) would stand.

2. C. HYGROPHILA, Kurz J. A. S. B. Part II, 1872 p. 292; Journ. Bot. 1874, 196 tab. 148, figs. 6, 7. A small glabrous tree, with pale striate lenticellate bark; the youngest branches dark-coloured. *Leaflets* membranous, very shortly petiolulate, obliquely lanceolate, acuminate at both base and apex, the lower surface glaucescent; nerves about 6 pairs, sub-horizontal; length 3 to 4·5 in., breadth 1 to 1·25 in., petiole ·1 in. *Fruit* axillary, solitary or in fascicles of 2 or 3, cylindric, the apex with a blunt beak when ripe, brownish, spotted with grey, 4 to 5 in. long and 1·5 in. or more in diam.; the carpophore and pedicel each about 2 in. long, dark-coloured and faintly lenticellate. *Seeds* embedded in pulp., ·5 in. in diam., compressed but not flat, reniform, shortly muricate over the greater part of the surface.

Trang; King's Collector No. 1412. Distrib. Burmah.

Kurz founded this species on specimens from Burmah (in young fruit) which are now in the Calcutta Herbarium. The Malayan specimens (in mature fruit) agree with these. Kurz's drawing of the seed is misleading. For it was made from a young seed which had neither acquired its full size, nor its characteristic tubercles. Flowers of this species are as yet unknown; but the ripe fruit shows that they cannot

be in racemes as in the other species. The seeds approach in appearence those of *C. dophosperma*, Kurz, but are more tuberculate.

Besides the foregoing, there are in the Calcutta Herbarium specimens from Perak (King's Collector No. 818) of a *Crataeva* with leaves and flowers like *C. Narvala*, Ham. It is, however, described as having a thorny stem,—a character, so far as I am aware, not known in this genus. This is probably a new species, but, in the absence of fruit, I do not venture to describe it. The seeds appear to me to afford in this variable genus safer characters than any other part.

Order VIII. Violaceæ.

Herbs or shrubs. *Leaves* alternate, entire or serrulate, stipulate. *Flowers* regular or irregular, 2-bracteolate. *Sepals* 5, persistent, equal or unequal, imbricate in bud. *Petals* 5, hypogynous, equal or unequal, imbricate or contorted in bud. *Stamens* 5, filaments short, broad; anthers free or connate, their cells often with apical processes; connective broad, produced beyond the cells. *Ovary* sessile, 1-celled; style simple; stigma capitate truncate or cupular, entire or lobed; ovules many, on 3 parietal placentas, anatropous. *Fruit* a 3-valved capsule. *Seeds* small, albumen fleshy; embryo straight, cotyledons flat.—Distrib. Genera 21, species 240; natives of temp. and trop. regions.

Tribe I. *Violeæ*. *Corolla* irregular; lower petal dissimilar. *Staminodes* 0. *Capsule* loculicidal.

Sepals produced at the base ... ... 1. *Viola*.

Tribe II. *Alsodeieæ*. *Corolla* regular. *Staminodes* 0. *Fruit* a loculicidal capsule.

2. *Alsodeia*.

1. Viola, Linn.

Herbs, rarely shrubby below. *Flowers*, on 1-, rarely 2-flowered peduncles, often dimorphic, some large petalled which ripen few seeds, others small petalled or apetalous and very prolific. *Sepals* produced at the base. *Petals* erect or spreading; lower largest, spurred or saccate at the base. *Anthers* connate, connectives of two lower often spurred at the base. *Style* clavate or truncate, tip straight or oblique; stigma obtuse, lobed or cupular. *Capsule* 3-valved. *Seeds* ovoid or globose.—Distrib. Species about 100, all temp. regions.

V. serpens, Wall. in Roxb. Fl. Ind. Ed. Wall. ii. 449 (not of Cat.), and DC. Prodr. i. 296; hirsute or glabrous, stolons or stems usually long, leafy and flowering; *leaves* ovate-cordate, obtuse or acute, crenate-serrate; stipules toothed or fimbriate, spur saccate; *sepals* acute; capsules

globose, few-seeded, glabrous or pubescent. Stigma very oblique or quite lateral, often minute and perforated. Hook. fil. Fl. Br Ind. i 184: Miq. Fl. Ind. Bat. i. pt. ii. 113; Royle Ill. 74, t. 18, f. 1; W. & A. Prodr. 32. *V. Wightiana* var. pubescens, Thwaites Enum. 20. *V. pilosa*, Blume Bijd. 57; Miq. Fl. Ind. Bat. i. pt. ii. 113.

Perak; on Ulu Batang Padang; L. Wray, Junior. Distrib. mountain ranges of India, and of the Malayan Islands.

2. Alsodeia, Thouars.

Trees or shrubs. *Leaves* alternate (rarely opposite), distichous; secondary nerves often numerous and parallel. *Stipules* rigid. *Flowers* small, axillary or terminal, solitary, fascicled, cymose or racemose, regular; peduncles with many bracts. *Sepals* 5, subequal, rigid. *Petals* 5, subequal, sessile. *Stamens* 5, inserted inside or upon an annular disk; with long or short often broad dorsal membranous connectival appendages, the cells of the anthers sometimes with apical linear processes. *Ovary* ovoid; style straight, stigma terminal; ovules few or many. *Capsule* 3-valved, few seeded. *Seeds* glabrous in the E. Ind. species.—Distrib. Species about 50, chiefly tropical American.

Sect. I. *Prosthesia*, Bl. (genus). Anthers with a subulate appendage from the apex of each cell, and a broad (usually dorsal) appendage from the connective.

1. A. Wallichiana, Hook. fil. and Th. Fl. Br. Ind. I, 187. A glabrous shrub. *Leaves* membranous, oblong-lanceolate to elliptic, shortly acuminate, entire or slightly serrulate, the base rounded or slightly narrowed; nerves 10 to 15 pairs, arching, prominent, their axils beardless; length of blade 9 to 12 in., breadth 2·5 to 5 in., petiole ·5 to 1·5 in.; yellowish when dry especially on the under surface: stipules linear-lanceolate, glabrous, ·75 in. long *Racemes* shorter than the petioles, with many deciduous linear bracteoles. *Flowers* 4 to 8, pedicellate. *Perfect male flowers;* sepals acute, erect, lanceolate, equal to or longer than the petals. *Petals* oblong. *Filaments* short, attached to a 5-lobed fleshy disc. *Anthers* ovate with a small apical process on each lobe in front, and a single large orbicular hooded membranous appendage rising from the dorsum. *Pistils* rudimentary, or none. *Perfect female flower; sepals* spreading, ovate-acute, shorter than the petals. *Petals* erect, oblong obtuse, their apices recurved. *Filaments* longer than in the perfect male, the anthers without pollen. *Ovary* sessile, ovoid-conic, smooth; style cylindric. *Fruit* subglobular, obtusely 3-angled, granular, ·35 in. long, dehiscing into 3 blunt valves. *Seeds* mottled.

Penang; Wallich. Perak; King's Collector, Scortechini.

The flowers in this species are practically unisexual and apparently

more frequently dicœcious than monœcious. In flowers where perfect stamens occur the ovary is either absent or rudimentary; and in plants with a well developed ovary the stamens, although in most cases perfectly formed, contain no pollen. These sexual differences are accompanied by slight differences in the leaves, those of the male plants being oblong-lanceolate, narrowed to the base and serrulate, while those with female flowers have entire elliptic leaves with rounded or slightly narrowed bases. Specimens of the former, collected in Penang, were issued by Wallich as No. 4024 of his Catalogue under the name *Pentaloba macrophylla;* while specimens of the female were issued as Nos. 7501 and 7513 (un-named, but with the notes by R. Brown). These notes are as follows: on No. 7501, "*Urticeae habitu; arborescens;*" and, on No. 7513, "*Indeterminata fruticosa, decumb.; foliis alternis integerrimis, coriaceis, impunctatis, glaberrimis, pedunculis axillaribus.*"

Wallich was wrong in referring this plant to the genus *Pentaloba* of Loureiro, for that author describes no appendages to its stamens. It belongs most certainly to the genus *Prosthesia* of Blume (Bijd. 866.)

2. A. Kunstleriana, King, n. sp. A glabrous shrub or small tree; the branchlets striate, sometimes lenticellate. *Leaves* subcoriaceous, oblong-lanceolate, acuminate or caudate-acuminate, sometimes minutely and obscurely serrulate, very much narrowed to the base; upper surface smooth and shining; lower dull, rough from the numerous short transverse secondary nerves and 14 to 16 pairs of prominent ascending main nerves; the midrib bold and subrugose; the reticulations minute and distinct; length of blade 6 to 10 in., breadth 2·25 to 3 in., petiole ·25 to ·5 in. *Stipules* lanceolate, ·25 in. long. *Female flowers* in axillary, often crowded, fascicles or very short racemes of 3 to 8, bracteolate, the pedicels longer than the leaf-petioles. *Sepals* ovate, obtuse, imbricate, strongly nerved, the edges ciliate, shorter than the petals. *Petals* erect, the tips not reflexed, ovate-acute, rigid. *Stamens* with short flat filaments, each inserted into the apex of a lobe of the deeply 5-lobed disc. *Anthers* (without pollen) broad, adpressed to the ovary, each with 2 linear anterior and one large dorsally-attached halbert-shaped membranous appendage, the latter conniving into a cone round the upper part of the ovary. *Ovary* sessile, ovoid-conic; the style exserted, cylindric. *Capsules* ovoid, glabrous, shining, smooth, ·5 in. long, dehiscing into three narrow compressed pointed valves; *seeds* one in each valve, ovoid, white, shining.

Singapore; Wallich, King's Collector: Perak; Scortechini, King's collector; at low elevations. This species is more often practically monœcious than *A. Wallichiana*, to which it is closely allied. It differs, however, from that species in its much more acuminate rougher leaves, and also in its capsules and seeds.

3. A. Maingayi, Hook. fil. Fl. Br. Ind. i. 188. A small tree, glabrous except the inflorescence. *Leaves* membranous, nearly sessile, elliptic, acute or sub-acuminate, serrulate, the base rounded; main nerves 10 to 12 pairs, prominent below as are the transverse secondary nerves; length 5 to 6 in., breadth 2·5 to 2·75 in., petiole ·15 in.; stipules lanceolate, ·25 in. long. *Umbels* axillary, solitary, on peduncles ·5 in. long, 8 to 16-flowered; the bracteoles, small, ovate. *Sepals* imbricate, ovate-rotund, or broadly ovate, obtuse, villous in the middle externally. *Petals* longer than the sepals, ovate, concave, villous in the middle externally and with a villous line along the midrib internally. *Stamens* with short, thick, densely tomentose filaments inserted on a thick, sub-glabrous, fleshy disc: connective tomentose behind. Anthers elongate-ovate, with 2 ovate setose anterior, and ·1 broad sub-terminal ovate, dorsal appendages. *Ovary* sub-globular, style thick, both densely villous-tomentose. *Capsule* ovoid, sparsely strigose, the valves acute. *Seeds* with a white spongy caruncle.

Malacca, Griffith.

4. A. membrancea, King, n. sp. A tree or shrub, the young branches shortly pubescent or tomentose. *Leaves* thin when dry, obliquely obovate-elliptic, shortly and rather abruptly acuminate, serrate, the base narrowed, rather unequal-sided, both surfaces glabrous, except the midrib and 6 to 8 pairs of pubescent arching nerves, the reticulations wide; length 5 to 7 in., breadth 2·5 to 3 in.; petiole pubescent, ·5 in. long; stipules subulate, pubescent, ·2 in. long. *Racemes* axillary, condensed, sessile, shorter than the petioles, few-flowered. *Sepals* 5, unequal, the outer 2 rather smaller than the inner, all broadly ovate-obtuse, pubescent externally. *Petals* 5, obovate-oblong, obtuse, the margins ciliolate with a few adpressed hairs on the back. *Stamens* 5, glabrous, the filaments very short, rising from a fleshy 5-lobed disc. *Anthers* broadly cordate or sub-reniform, with 2 small subulate processes on the apices of the cells and a large dorsal, cordate-acuminate, brown, membranous appendage as wide as the anther. *Ovary* sessile, ovoid, villose: style cylindric, glabrous; stigma cup-shaped. *Capsule* ovoid, glabrous, the valves in dehiscence blunt: seeds sub-globular with a beaked caruncle.

Perak at low elevations. Kings' Collector, Scortechini.

A shrub or small tree. This comes near *A. dasycaula*, Miq. in externals; but has fewer-nerved, more glabrous leaves.

5. A. Hookeriana, King, n. sp. A small glabrous tree, the branchlets lenticellate. *Leaves* membranous, shining, shortly petiolate, elongate-oblanceolate or lanceolate, apex shortly and rather bluntly acuminate, entire or obscurely serrulate, gradually narrowed below the middle to the base; nerves 7 to 9 pairs, arching, slightly prominent; length 5

to 8 in., breadth 1·5 to 2 in., petiole ·25 in.; stipules ovate, only ·1 in. long. *Racemes* axillary, and on the older branches from the axils of fallen leaves, numerous, rather dense when young, afterwards sparse and open, from ·75 to 1·5 in. long, bracteoles linear, pedicels as long as or longer than the flowers. *Sepals* ovate, equal, pubescent or glabrous. *Petals* lanceolate with linear blunt apex, longer than the sepals, glabrous, or pubescent along the midrib externally. *Stamens* glabrous, the filaments as long as the rather deep disc. *Anthers* broadly ovate, the base cordate, almost sub-reniform, the cells each with an apical point and with a broad membranous ovate acute dorsal appendage wider than the anther. *Ovary* sessile, pubescent; the style cylindric, glabrous; the stigma cup-shaped, truncate. *Capsule* ovoid, compressed, obtusely angled, glabrous, reticulate, ·5 in. long; the valves unequal, obtuse, compressed, sub-falcate: seeds sub-globose, pale, minutely mottled at the apex, the base with a papillate pitted caruncle.

Perak; at low elevations, Scortechini, Wray, King's Collector.

A tree from 20 to 30 feet in height; readily distinguished by its open, comparatively long, racemes. This closely resembles Blume's *Prosthesia Javanica*.

6. A. Wrayi, King, n. sp. A sub-glabrous shrub, the branchlets with pale brown puberulous bark, rarely lenticellate. *Leaves* membranous, glabrous, shining, shortly petiolate, oblanceolate, shortly acuminate, distinctly serrulate, narrowed to the base, length 3·5 to 4·5 rarely 6 to 7 in., breadth 1 to 2 in., petiole ·1 to 2 in.; stipules linear, only ·1 in. long. *Racemes* very short, crowded, axillary or extra axillary, ·25 in. long; bracteoles broadly ovate, pubescent. *Sepals* lanceolate, tomentose externally. *Petals* oblong, obtuse, thickened and tomentose along the midrib. *Stamens* from the inside of a disc which is as deep as the filaments are long. *Anther* ovate-cordate, with a dorsal, ovate-acute, membranous appendage as broad as itself, and a terminal apical processes on each cell. *Ovary* sessile, densely villous as is the base of the cylindric style: Stigma sub-capitate. *Capsule* minutely fulvous-velvetty when young, glabrous when old, ovoid with obtuse angles, 1·25 in. or more long and ·75 in. in diam.; the valves blunt, narrow. *Seeds* ovoid, brown, mottled, with sub-apical papillate pitted caruncle.

Perak; at low elevations; Scortechini, Wray, King's Collector.

A shrub 8 to 10 feet high. In respect of leaves very like *A. Hookeriana*, but smaller. The very short racemes, more hairy flowers and larger velvetty capsules distinguish it, however, from that species.

7. A. cinerea, King, n. sp. A glabrous shrub or small tree, the branchlets whitish, sparsely lenticellate. *Leaves* membranous, elliptic-ovate or lanceolate, sometimes oblanceolate, acuminate, narrowed at the base,

serrulate, pale when dry; nerves 8 to 10 pairs, slightly prominent below; length 4 to 6 in., breadth 1·5 to 2·5 in., petiole ·2 to ·4 in.; stipules scarious, pale, ovate-acute, striate, puberulous, ·25 in. long. *Racemes* terminal, 4 to 6 in. long, bearing numerous 2 to 5 flowered cymules; bracts broadly ovate, scarious, concave, striate. *Sepals* ovate, ciliolate. *Petals* oblong, obtuse, the apex undulate, erose or toothed, edges ciliolate. *Stamens* from the edge of a deep fleshy disc; filaments very short, glabrous: anthers ovate, with a broadly ovate appendage from the middle of the back curving over the apex, the cells divergent at the apex and each with a subulate terminal appendage. *Ovary* sessile, glabrous, globose: Style cylindric, with a few white adpressed hairs: stigma obliquely truncate, cup-shaped. *Capsules* ovoid, bluntly angled, glabrous, reticulate, ·75 in. long; valves blunt: seeds globose with an ovoid beaked hilum, pale, smooth.

Perak, at low elevations. King's Collector.

Var. *hirsutiflora*, King. *Sepals* tomentose externally; filaments sparsely villous; disc small: the cymules larger and the bracteoles longer and narrower than in the typical form.

Perak; Changkat Jerin. L. Wray, junior.

The whole plant when dried has a characterestic grey colour, and from this circumstance I have given its specific name.

Sect. II. *Pentaloba*. Anthers with a broad, usually terminal, appendage from the connective; but none from the cells.

8. A. LANCEOLATA, Wall. (*Pentaloba*) Hook. fil. Fl. Br. Ind. i. 188. All parts, except the inflorescence quite, glabrous; bark of the young branches pale. *Leaves* shortly petiolate, elongate-lanceolate, bluntly acuminate, the base much narrowed; nerves 9 to 12 pairs, sub-erect; slightly curved, prominent especially below, secondary venation transverse; length 5 to 8 in., breadth 1·25 to 1·75 in., petiole ·2 in. *Racemes* about ·5 in. long, 4 to 6-flowered, minutely bracteolate. *Flowers* on short pubescent pedicels. *Sepals* ovate, obtuse, thick, pubescent, about half as long as the petals. *Petals* lanceolate, acuminate, sparsely villous towards the middle. *Filaments* as long as the anthers, slender, glabrous, rising from a small glabrous disc; anthers linear-lanceolate with a single lanceolate terminal appendage. *Ovary* rudimentary in many flowers, sub-globose and, like the cylindric style, villous. *Fruit* sub-globose, minutely pubescent, ·35 in. long, valves in dehiscence beaked. Oudem. in Ann. Mus. Lugd. Bat. iii. 68; *Vareca lanceolata*, Roxb. Fl. Ind. i. 648. *Pent. lanceolata*, Arn. in Jard. Mag. Zoo. Bot. ii. 544.

Penang; Wallich, Stolickza, Curtis, King's Collector.

A shrub 6 to 8 feet high: apparently confined to Penang. This species is much more frequently truly hermaphrodite than some of

the others. The Sumatran species *A. dasypyxis*, Miq. comes very near this, but has longer racemes and more hairy fruit.

In *Alsodeia lanceolata*, Wall. there is a transition from *Pentaloba* to *Prosthesia*. Many of the specimens of *A. lanceolata* have the single terminal lanceolate appendage from the apex of the connective: others (Curtis's Penang specimen) have this appendage ovate and broader, while from the apex of each anther there is a rudimentary apical appendage, thus approaching *Prosthesia*.

9. A. Scortechinii, King, n. sp. A small glabrous tree, the branchlets usually pale brown. *Leaves* membranous, shortly petiolate, obliquely elliptic-lanceolate or oblanceolate, shortly and bluntly acuminate, irregularly serrulate; main nerves about 12 or 13 pairs, rather bold; secondary nerves transverse, slightly prominent below; length 7 to 9 in., breadth 2 to 3 in., petiole ·2 in. *Racemes* sessile, about ·5 in. long, several together, axillary or extra-axillary, about 3 to 5-flowered, with ovate bracteoles. *Flowers* pedicellate. *Sepals* puberulous, broadly ovate, much shorter than the petals. *Petals* 5, oblanceolate, with long bluntly acuminate exserted apices. *Stamens* glabrous, shorter than the petals; the filaments twice as long as the anthers, slender, rising from a deep, 5-lobed, slightly-notched disc; the anthers, short, ovate, with a single very small terminal appendage; ovary sessile, globose, glabrous, warted; style long, cylindric, glabrous or puberulous. *Ripe capsule* ovoid, pointed, rather more than ·5 in. long, glabrous, lenticellate; valves compressed, pointed. *Seeds* 2 in each valve, sub-rotund, whitish, carunculate.

Perak; King's Collector, Scortechini, Wray; at low elevations.

A large shrub or tree 20 to 25 feet high. Externally this much resembles *A. Maingayi*, but the flowers, and especially the anthers, differ much.

10. A. condensa, King, n. sp. A glabrous tree; the older branchlets pale, lenticellate. *Leaves* membranous, shortly petiolate, inequilateral, elliptic to elliptic-oblong, sub-acute, serrulate, gradually narrowed below the middle to the acute unequal base; shining above, darker and dull beneath; midrib and 13 to 15 pairs of prominent main nerves pale and sub-erect beneath, secondary nerves transverse; length 8 to 14 in., breadth 3 to 4·5 in., petiole ·25 to ·35 in.; stipules subulate, ·35 to ·5 in. *Panicles* axillary, crowded, much branched, spreading, 1 to 2·5 in. long, (longer in fruit) puberulous or glabrescent; the bracteoles numerous, ovate, acute. *Sepals* unequal; the outer 2 or 3 larger, rotund; the inner 3 or 2 ovate, pubescent on the back. *Petals* ovate, a little longer than sepals, rhomboid, with pale edges, villous on the back externally and along the midrib internally. *Stamens* glabrous, the filaments rather short, from a fleshy disc: anthers cordate, with a single terminal white

ovate membranous appendage. *Ovary* sessile, globose, glabrous. Style cylindric; Stigma cup-shaped. *Capsule* ovoid, pointed, glabrous, not lenticellate: valves compressed, pointed; seeds sub-globular, carunculate.

Perak, Scortechini, King's Collector; at low elevations.

A tree 30 to 40 feet high, approaching *A. Scortechini* in externals, but with different flowers.

11. A. FLORIBUNDA, King, n. sp. A shrub or tree, the young branches minutely fulvous-tomentose. *Leaves* membranous, shortly petiolate, oblong-lanceolate, ovate-lanceolate, sometimes elliptic, acute or acuminate, more or less obscurely serrulate; the base rounded, rarely acute; upper surface glabrous except the pubescent midrib and nerves; under surface minutely and softly tomentose, the midrib and 14 to 16 pairs of rather straight nerves and the transverse secondary nerves prominent; length 4·5 to 7 in, breadth 1·5 to 2·5 in., petiole ·1 to ·2 in.; stipules lanceolate, pubescent on the midrib, ·25 in. long. *Cymes* axillary, on peduncles 1 to 1·5 in. long, much branched, dichotomous, spreading, many-flowered; bracteoles oblong, obtuse, pubescent. *Sepals* unequal, the outer 3 ovate-rotund, the inner 2 ovate, all obtuse and pubescent. *Petals* ovate-oblong, obtuse, longer than the sepals, the apices usually reflexed. *Stamens* from a deep, pilose, 10-lobed, disc: filaments expanded and pilose towards the apex, contracted and glabrous below; anthers elongate-ovate, with a single connectival ovate terminal appendage. *Ovary* sessile, villous, tomentose; style cylindric, puberulous: stigma truncate, cup-shaped *Capsule* ovoid, obtusely angled, adpressed-pubescent, ·35 in. long; the valves blunt; seeds sub-globose, angled; caruncle long, narrow.

Perak, at low elevations; very common.

Distrib. Sumatra; Lampongs, Forbes, 1719; Padang, Beccari. P. S. 683.

Usually a tree, and sometimes attaining the height (*fide* Kunstler) of 70 feet. But also, according to the same collecter, found as a shrub 6 to 8 feet high. This is allied to the Burmese species *A. mollis*, H. f. and Th., which however, besides having the anthers of a *Prosthesia*, has much smaller cymes, and broader bracteoles and sepals.

12. A. ECHINOCARPA, Korth. in Ned. Kruidk. Arch. II, 360. A small tree, the young branches fulvous or ferruginous-tomentose. *Leaves* membranous, shortly petiolate, obovate or ovate-elliptic, abruptly and shortly acuminate, boldly and unequally serrate, the base rounded or narrowed; upper surface glabrous except the pubescent midrib and nerves; the lower softly pubescent, the midrib, 11 to 15 pairs of nerves and transverse secondary nerves pale and prominent: length 6·5 to 9 in., breadth 2·25 to 3·25 in., petiole ·1 to ·2 in.; stipules ·25 in. long ovate,

acute, pubescent margins the scarious. *Cymes* axillary and extra-axillary, sessile, condensed, 3 to 6-flowered; bracteoles lanceolate, keeled, pubescent. *Sepals* slightly unequal, ovate, obtuse, ribbed, tomentose externally, nearly as long as the petals. *Petals* oblong, obtuse, pubescent externally, glabrous internally. *Stamens* from a short glabrous disc; filaments longer than the anther, glabrous. *Anthers* narrowly ovate, the base cordate, with a single small terminal white appendage. *Ovary* sessile, densely villous, style sparsely villous: stigma truncate, cup-shaped. *Capsule* when ripe from 1 to 2 in. across, densely covered with brownish, tomentose, branched, felted fibres: valves compressed, blunt ·75 in. long: seeds sub-globose, compressed, smooth, the caruncle ovate. Hook. fil. Fl. Br. Ind. i. 188; Miq. Fl. Ind. Bat. i. pt. 2, 116; Oudem. Ann. Mus. Lugd. Bat. iii. 79; Miq. l. c. iv. 216; Pl. Jungh. i. 122.

Singapore, Malacca, Perak, Penang, at low elevations. Distrib. Sumatra, Bangka.

Usually a small tree 20 to 30 feet high. Sometimes shrubby.

13. A. CAPILLATA, King, n. sp. A small shrub, the young branches rufous-tomentose. *Leaves* membranous, shortly petiolate, lanceolate, acuminate both at apex and base, serrulate; upper surface glabrous except the pubescent nerves and midrib; lower rufous-pubescent; the nerves about 11 pairs, bold, as are the transverse veins; length 6 to 7 in., breadth 1·5 to 1·75 in., petiole ·25 in.; stipules lanceolate, pubescent externally. *Flowers* in small, sub-sessile, 3 to 5-flowered, axillary cymes. *Sepals* narrowly oblong, obtuse, tomentose externally. *Petals* linear-oblong, the apex sub-acute and reflexed, hairy along the midrib externally. *Stamens* alternating with the lobes of a deep, 5-lobed, glabrous disc; filaments slender, glabrous, longer than the anthers. *Anthers* small, ovate, each with an ovate acute small terminal appendage. *Ovary* sessile, globular, villous: style long, cylindric, sub-villous; stigma truncate, cup-shaped. *Capsule* ·5 in. long, rusty—pubescent externally and densely covered with unbranched, often hooked, soft, pubescent spines about 5 in. long and not felted. *Seeds* ovoid, smooth, pale, with dark semi-circumferential band, and an oblong carunculus.

Laroot in Perak, King's Collector No. 2462. A small bush 4 to 8 feet high. This comes near *A. echinocorpa* and *comosa*, but differs notably in its flowers and seeds.

Section III. Anther cells each with a terminal subulate appendage; no appendage from the connective.

14. A. COMOSA, King, n. sp. A shrub or small tree, the young branches densely ferruginous-tomentose. *Leaves* membranous, sub-sessile, oblong-oblanceolate, caudate-acuminate, serrulate, the base rounded; upper

surface glabrous; the lower pubescent, especially on the prominent midrib and 11 to 14 pairs of lateral nerves; length 5·5 to 7·5 in., breadth 1·5 to 2·5 in., petiole 2 in.; stipules subulate, ·3 in. long. *Flowers* in dense axillary bracteolate glomeruli. *Sepals* ovate, obtuse, tomentose. *Petals* lanceolate, acuminate, pubescent externally, and (like the sepals) with an apical tuft of hairs, glabrous internally. *Stamens* from a short minutely toothed glabrous disc, the filaments shorter than the anthers: anthers narrowly ovate, each cell with a terminal apical seta, but without any appendage from the connective. *Ovary* elongate, sparsely villous; style pubescent; stigma truncate, cup-shaped. *Capsule* ·5 in. long, flocculent-tomentose, densely covered with unbranched, subulate, soft, pubescent spines about ·5 in. long, not felted. *Seeds* pale, ovoid, smooth, with sub-terminal papillate caruncle.

Perak, Wray No. 3299 and 1254; King's collector Nos. 406 and 554.

Species imperfectly known.

15. A. PACHYCARPA, King, n. sp. A small tree; the young branches pale, glabrous, sparsely lenticellate. *Leaves* membranous, oblong-lanceolate to elliptic-lanceolate, sub-acuminate, minutely and rather irregularly serrulate, the base slightly narrowed: both surfaces glabrous, the lower darker in colour; nerves 11 to 14 pairs, thin, but prominent below; length 5 to 7 in., breadth 2 to 3 in., petiole ·4 in. *Sepals* rotund, pubescent, with thin glabrous edges. *Capsules* on short axillary branches, usually solitary, about 1·25 in. long; the valves boat-shaped, compressed, separating when ripe into two layers, the outer dark-coloured and pubescent, the inner pale, smooth, cartilaginous, and bearing the angular smooth carunculate seeds.

Perak, King's Collector No. 10235: Scortechini (without number).

A tree 20 to 25 feet high. Fresh flowers being unknown, the section of the genus to which this belongs cannot be determined. The capsules, however, show that it is a distinct species.

In addition to the foregoing, there are in the Calcutta Herbarium specimens of what appear to be five distinct species of this genus. The materials are, however, insufficient for accurate determination.

XXIII.—*On certain* Lycænidæ *from Lower Tenasserim.*

By William Doherty, *Cincinnati, U. S. A.*

[Received April 8th :—Read 3rd July, 1889.]

(With Plate XXIII.)

The following list includes most of the *Lycænidæ* taken by me in Tenasserim from January to March, 1889, inclusive. I have been unable to identify four or five *Arhopalas* near *A. vihara* and *metamuta*. And I can only mention the few species of *Lampides* and *Nacaduba* which I happened to pin. Consisting wholly of low-country species (with but one exception), taken in the driest part of the dry season, the list represents only a part of the Tenasserim *Lycænidæ*. When all the species are known, those of the mountains and those of the valleys, those of the wet season and those of the dry, it seems to me quite possible that the number may be doubled.

The Mergui species were taken at the Taw-jaung monastery a few miles from the town, in low-country forest near the coast. The species marked *Myitta* were taken at my various camps in the Tenasserim valley, near the Siamese border, east of Tavoy. Except one species—*Surendra florimel*—they were all taken below one thousand feet altitude.

After devoting much time to the study of the structure of butterflies, and filling several note-books with descriptions of the young larvæ, tarsi, scent-organs, prehensors, scales, etc, I had in 1887 the great misfortune to lose most of them in the Malay Archipelago, together with a great collection of insects. The chief survivors were my notes on the egg, a part of my drawings of prehensors, and the descriptions of a few genera and species partly of this family which had been prepared for publication in 1886, some of which will appear in Mr. de Nicéville's "Butterflies of India." I have therefore been obliged to commence afresh, and as yet my material is too small to achieve one of my principal objects, a proper classification of the *Lycænidæ*. So the following attempted generalizations must be held as provisional only.

In 1886, I divided the family into six subfamilies, based chiefly on the form of the egg To these another must be added, the *Liphyrinæ*, which besides our single Indian species, includes, perhaps, a few African forms. In four of the six other subfamilies, the egg seems to afford good characters for defining them, though a few small genera, which I have as yet studied but imperfectly, seem difficult to place. The two other groups, which I called the *Theclinæ* and *Amblypodinæ* had better be united, forming a large mass of genera and species very difficult to arrange. In the *Amblypodias* especially, the egg seems to lose much of

its systematic value, and varies to a remarkable extent in forms much alike in general structure and appearance. So it is with great hesitation that I propose four sections based partly on it. Typically they are all four distinct enough, but seem to be connected by certain low forms of *Arhopala*, underlying them as it were, as if indicating the original ancestors from which they all sprang.

Egg large, tubercular, indentations obscurely hexagonal,... ...	*Aphnæus* group.
Egg similar, not tubercular, ...	*Loxura* group.
Egg small, tubercular, indentations sharply cut, usually trigonal, ...	*Thecla* group.
Egg small, spiny, indentations sharply cut, tetragonal, ...	*Arhopala* group.

The *Aphnæus* group has the egg convex above (as in all the subfamily), yellowish, large and coarse, overlaid with a thick, rough, vesicular, white or yellowish crust, covered with large blunt whelks or knobs (often but little elevated) and indented with obscure hexagonal spaces. This type of egg reaches its extreme form in *Neocheritra*, in which the indentations are fewest and coarsest, while in *Chrysophanus* they are numerous, and in *Curetis* numerous and cut into hexagons with some distinctness. In *Amblypodia*, as now limited, the egg is much the same as in *Neocheritra*, and the genus had better be put here. It resembles the *Arhopalas* in some things, but its venation shows it to be a very isolated form. The male has a fifth subcostal branch wanting in the female, and the middle discocellular, like the upper, is oblique, and greatly thickened, seeming to be the basal part of the lower radial vein. In *Iraota*, another genus hard to place, there is no middle discocellular, the radials having a common origin. Most genera of the *Aphnæus* group have elongate wings, with the outer margin of the forewing more or less oblique, and the costal and subcostal veins somewhat crowded together, the cell being near the costa (remote in *Arhopala*), which is but little rounded. The hindwing has two tails in most of the genera.

The *Loxura* group is obviously an offshoot of the *Aphnæus* group. The egg is large and white, without tubercles. In the typical genera, *Loxura*, *Yasoda** and *Eoöxylides*†, it has a cornice round the flat, table-

* *Yasoda*, gen. nov. Differs from *Eoöxylides* in having but one tail; from *Loxura* in having only three subcostal veins (four in *Loxura*) in the forewing, and a large black sex-mark on the hindwing of the male above, on the lower median vein.

† I described this genus as *Marshallia*, naming it after Colonel G. F. L. Marshall, but the name turned out to be pre-occupied. As the name *Indoxylides*, which I proposed instead of it, seems to have reached Mr. de Nicéville too late to

like apex (which is less than half the diameter of the base), the surface very smooth, with numerous minute indentations, which, in occasional imperfectly developed specimens,* are distinctly hexagonal. The other three Indian genera—*Drupadia*, *Biduanda* and *Suasa*—are less peculiar, and *Suasa* is obviously related to *Zeltus*, *Cheritra*, and other normal aphnæiform genera. Their eggs lack the subapical carina. In *Drupadia* and *Biduanda*, they are hemispherical, with rounded indentations larger than in *Loxura*. In *Suasa* the indentations are large, shallow, and distinctly hexagonal, looking as if impressed with a die. These six genera form a series, approaching the *Aphnæus* group, but have some features in common. They are all protected. The forewing is short and broad, the outer margin erect, the costa strongly arched, the hindwing elongate posteriorly. The prehensors are elongate and of a peculiar facies.

An *Arhopala*, apparently *inornata*, Felder, and one or two obscure allied species undescribed from Malayana, have eggs somewhat as in *Loxura*, but coarser and without the cornice. This peculiarity is associated with others in the imago, on which I shall form the genus *Iois*, the position of which is uncertain.

The *Thecla* group has much smaller eggs nearly always greenish, the lines enclosing triangular spaces, six of them radiating from each tubercle, which is roughly spherical, constricted at the base. This sculpturing, which is very distinctly cut, is elsewhere found only in the concave eggs of certain *Lycæninæ*. The section is a very indistinct one, its members tending to unite severally with the *Aphnæus* or *Arhopala* groups. I have had few opportunities of studying *Zephyrus*, and have never examined the true *Thecla*. As a group they seem to have both wings short and broad, the costa much rounded, the veins slender, the hindwing usually with one tail. *Surendra* may be distinguished from *Zephyrus* by the obsolescent discocellular veins. So far as these are visible, they are very upright, the middle one of the forewing unusually long, differing widely in these respects from all the succeeding genera,

be incorporated in his key to the genera of the *Lycænidæ*, he has called it *Eoöxylides*. My description of the genus as well as those of my genera *Yasoda*, *Massaga*, *Araotes* and *Taraka*, all made in 1886, will appear in his next volume. I have recorded *Eoöxylides tharis* from Bassein, Burma, but it did not turn up in Tenasserim.

* These curious eggs are usually rough or discoloured, and the sculpturing differs more or less from that of the others. I have found them in all the sections of the *Lycænidæ*. They are usually exceedingly rare, but are more frequent in some *Arhopalas*, so that their eggs may fairly be called dimorphic. They are not immature, being quite hard, and at least occasionally produce perfect larvæ. I think they are atavisms, representing an earlier stage of development, the egg perhaps of some remote ancestor.

especially *Arhopala*. It includes four species resembling each other but slightly.

A number of species connect these genera with the *Arhopalas*. The egg varies greatly in these. *Panchala* (*ganesa*), *Acesina* and *Flos* (genus novum) are distinguished by the long costal vein of the forewing, and the structure of the third and fourth subcostal veins, which, after their separation, are short, very unequal, and very close to the costa. In *Panchala* and *Acesina*, the costa of the hindwing is slightly tilted up at the apex, there is no lobe (a tail in *Acesina* only), and the underside is dull-coloured. In *Flos* the costa of the hindwing is regularly rounded, there is a conspicuous lobe and a tail, and the underside is richly marked. The type is *apidanus*, and the genus is widely distributed, occurring from the Himalayas to the Austro-Malayan islands. *Darasana* has the subcostal veins as in *Panchala* and *Flos*, but a very short costal vein in the forewing, the cell of which is more remote from the costa. It has no lobe or tail, and seems a tolerably distinct genus. Some species of *Flos* have an egg with triangular spaces. The typical species have, however, a small green egg with rough vesicular raised lines enclosing hexagons, and very small irregular knobs at their intersection. The egg of *Mota massyla* is somewhat similar, but there are no tubercles, and the reticulation is more delicate. The wings are not unlike those of *Zephyrus* in structure with an additional tail; the colouring is somewhat as in *Flos*.

In the *Arhopala* group the egg is a remarkable one. It is also rather small, delicate, usually green with raised white lines enclosing quadrangles (as in the *Deudoriginæ*), and bearing acute spines at their intersection. This type of egg occurs in all the large swift-flying *Arhopalas*, and in many of the smaller and obscurer kinds. They all have the costal vein of the forewing shorter than in *Flos* and its allies, and the subcostal branches normal. They agree with those genera, and differ from the other *Theclinæ* in the position of the cell, which is remote from the costa, and in the length, and slightly oblique direction of the upper discocellular vein. A number of the obscurer species have eggs with tubercles and triangles as in the *Thecla* group, but I do not know any structural points by which they can be separated from the rest.

The *Arhopalas* are extremely uniform in structure, as in aspect, and on account of their great numbers are difficult to arrange. In them it would be advisable to admit generic distinctions wherever it is possible to make them.

The *Thecla* and *Arhopala* groups agree in many particulars, one of the most striking resemblances being that of the prehensors, which in all the genera known to me are short and thick, the branches of the

unci stout, the clasps broad and truncate. A careful examination will probably result in the separation of the *Aphnæus* and *Loxura* groups from these under the name *Aphnæinæ*.

The small subfamily of *Deudoriginæ* is characterised in the male by the lower organ of the prehensors, the clasps or *harpagones*, being aborted and functionless, adhering to the intromittent organ. The abdomen of the female is pointed, and ends in a pair of long ovipositors. The egg is very small, green, covered with very numerous tetragonal spaces, bordered by raised transparent lines, very delicately carved, with little button-like tubercles at their intersection. The hindwing has always a very prominent anal lobe, a single tail at the end of the lower median, and a distinct angle at the end of the middle median vein. *Deudorix* and its allies belong here, as well as *Araotes** and *Sithon*. The genera *Bindahara* and *Lehera*, which have also only one tail, can scarcely be included in any definition of the subfamily, nor *Neomyrina*, which has a very *Deudorix*-like egg.

The *Poritiinæ* come near the *Aphnæus* group of the *Theclinæ*, I believe, the reticulations being hexagonal. On account of their relations with the *Lemoniadæ* they might be placed at the head of the family. They can be distinguished by the joined costal and first subcostal veins of the forewings, a character occurring in *Sithon*, in many *Lycæninæ*, and also, I observe, in a remarkable insect described as *Hypolycæna libna* and *Logania andersonii*, Moore, from Mergui, which may possibly connect *Poritia* with the *Lycæninæ*. I have described the egg of *Poritia* in a former article. The base is quadrate, twice as long as wide, there is a square apex, two square sloping sides, and two vertical rhomboid ones.

The *Lycæninæ* are distinguished by their decidedly concave eggs, broadest above the middle. The reticulations are often irregular, and vary greatly on different parts of the surface. Those on the sides consist of small white knobs constricted at the base, from which spring either four or six elevated lines, forming quadrangles or triangles. In *Catopœcilma* the spaces are hexagonal, and in *Semanga* irregular. I include these genera here with much doubt; they are obviously transitional to the *Theclinæ*. The typical *Lycæna* group, containing the great majority of the subfamily, has hairy eyes, though the hairs are few and scattered in *Castalius* and *Zizera*. The *Pithecops* group consists of naked-eyed genera, of which the eggs of *Megisba* and *Pithecops* have tetragonal spaces, and *Neopithecops* triangular.

* *Araotes*, gen. nov. nearest *Sithon*, but with an additional subcostal vein in the forewing. The middle discocellular is obsolescent (distinct in *Deudorix* and its allies), the first subcostal touches the costal vein (united with it in *Sithon*, quite separate in the other *Deudoriginæ*), and there is but one tail (two in *Biduanda*, in which the type-species *lapithis* was placed by Mr. Distant).

I place here a few genera of dubious position. *Lycænæsthes* with its spiculate egg, flattened above, shows affinities with *Deudorix*, but is connected with the *Lycæninæ* by *Niphanda*, which (*N. tessellata*) has concave eggs. The egg of *Spalgis* is much flattened above, and delicately reticulated with irregular hexagons. Its position, like that of the following genera, can hardly be understood till the insects of tropical Africa, the great storehouse of low forms of *Lycænidæ*, are better known. Next to *Spalgis* I place the singular genus *Taraka* (mihi), of which the type is *Miletus hamada*, Druce. This genus greatly resembles *Neopithecops*, and like it is probably protected. It may be separated from it by the narrow cell nearer the costa, and by the oblique discocellulars. From *Spalgis* it differs in the antennæ, which are much as in the *Pithecops* group, slender, annulated, with a short, distinct terminal club, while *Spalgis* has short stout antennæ, gradually thickened. The prehensors of *Taraka* are wholly lycæniform. The egg is remarkable, and bears a decided resemblance to those of the *Gerydinæ*, with which Mr. Druce first placed it. The apex is flattened, a little concave, irregularly reticulate, with a strong crenulated carina projecting both upwards and outwards, around the margin. Seen from the side, it is irregularly quadrate, a little widest at base, the sides smooth. The genus is evidently related to *Liphyra* and the older and more generalized forms of the *Gerydinæ* included in the genera *Logania* and *Malais*.

I have made a careful description of *Taraka mahanetra*, a very rare Malayan species somewhat resembling *Castalius elna* in colouring. I caught but a single pair of this species, and both I believe are now lost. Generally, they agreed with *T. hamada* in structure, but the forefoot of the female (as well as that of the male) was imperfect, and the joints of the tarsi immovable. As it is just possible that this peculiarity may have been due to gynandromorphism, I merely mention it, and reserve *hamada* as the type of the genus. The egg of *mahanetra* I, unluckily, do not know. The description of this species will appear in Mr. de Nicéville's work.

The *Gerydinæ* can best be defined by the prehensors, the egg, very abnormal in most of the genera, approaching the lycæniform shape in *Logania* and *Malais*. The clasps (*harpagones*) are small and normal. Fortunately, they are very variable in shape, and afford good specific characters, which are especially valuable in the difficult genus *Logania* and in *Allotinus*. The *uncī* or upper organs are developed into immense knife-like blades, fitting into the tufted, scabbard-like, greatly elongate last joint of the abdomen. Each uncus has a branch, shaped something like a human femur or humerus, fitting to the middle of the under surface of the uncus with a ball-and-socket joint, and when at rest ap-

pressed to the edge of the blade, the tip, which is clavate and ends in a short hook not visible from the side, reaching the base of the uncus. This construction varies but little in all the genera and species of the group. A remarkable feature of the subfamily lies in the fore tarsi being in both sexes similar to the middle and hind ones, just as in *Papilio* or *Hesperia*. This also occurs, according to Mr. Trimen, in certain African genera, such as *Arrugia*, which from his account of them seem to belong to this group. The legs of *Gerydus* are curiously flattened in both sexes, those of *Allotinus* and *Paragerydus* are long and slender, those of typical *Logania* have the ends of the tibiæ swollen. One or two species hitherto included in this last genus have the legs slightly flattened and very short and stout, the tibiæ being thickest in the middle. These fully deserve to form a separate genus, for which I propose the name *Malais* It will include *L. marmorata* and *L. sriwa* (probably the same species), and one or two rare kinds undescribed, ranging from Pegu to Borneo. Since the preceding remarks were written, I have taken a true *Logania* in Upper Assam.

The egg is usually very much flattened, but, in *Logania* and *Malais*, it is scarcely more than twice as wide as high, as in many *Lycænas*. Except in *Paragerydus* and a few *Allotini*, which have much flatter eggs, there is usually a number of strong lateral horizontal carinæ, two, three, four, or five according to the species, either simple or broken into short teeth. These teeth are placed in vertical series, one above the other, giving the outer margin of the egg, and indeed the egg itself if it is much flattened, the appearance of a cogged wheel. Thus the usual oblique reticulations of the *Lycænidæ* give place on the outer border to vertical (the teeth) and horizontal (the carinæ) lines, a remarkable feature. The upper surface is, however, obliquely reticulated with delicate raised striæ.

This vertical reticulation is more pronounced in the egg of *Liphyra*, which, as might be expected from the strangeness of the insect itself, is very unlike that of other *Lycænidæ*. It shows, however, an unexpected resemblance to that of *Logania* and *Taraka*. The egg is of great size, green, overlaid with white, shaped something like a section or "drum" of a Doric column, but somewhat widest at the base, the height, breadth at apex, and breadth at base being to each other as 9, 13, and 15½. The top is marked with hexagonal reticulations, the lines turbinate in the middle, the margin deeply channelled, and then strongly carinate, the carina projecting both upwards and outwards, white, its contour even. The base is also obscurely carinate. The sides are crusted with white, and minutely indented, with about forty-five vertical ribs, slightly irregular and even (very rarely) anastomosing, extending also over the

outer part of the base, the inner part being green and minutely reticulated with hexagons. The prehensors I do not know. The foretarsi are, I believe, the same in both sexes, as in the *Gerydinæ*.

Liphyra brassolis flies slowly with a distinct humming sound and an uncertain circling flight, hesitating a long time before alighting. Whether it is, as it seems, a protected species, or whether, as I believe, it flies chiefly at twilight and so escapes capture, I do not know. No one would ever take it for a butterfly; few moths are more typically moth-like in flight. It is probably the oldest type of *Lycænid* existing, and unconnected with the rest, except through such primitive dwarf forms as *Taraka* and the smaller *Gerydinæ*. It is the only Asiatic representative of the subfamily *Liphyrinæ* and its nearest allies are apparently African.

A word deserves to be spoken on the subject of green butterflies, since it seems one little understood at home. Early in the century Horsfield professed to have found a green female of the Javanese *Arhopala eumolphus*, the true female of which is blue. Recently, Mr. Distant has described, as the female of *A. farquharii*, a butterfly bright green over the basal half of the wings above. Now, the real female of *farquharii* (perhaps the form described as *A. maxwellii*, Distant) is violet-blue and one of the most constant of butterflies. Of the green form mentioned, I took several specimens in the Malay Peninsula and in Borneo, and they were all males. It is a rare species undescribed, perhaps identical with the Horsfieldian form.

Grant Allen shows that, while greenish flowers are among the oldest, really green flowers are the most recently developed of all and among the most conspicuous. Very much the same thing is true of *Lepidoptera*. Pale green moths, like *Actias*, *Geometra*, and *Pachyarches*, are protected by their colouring, which is common to both sexes, and are quite hidden when resting among the leaves. Such seems also to be the case with *Lehera cryx**, a lycænid which is greenish on the *underside*, and may possibly be the case with some *Catopsilias*. But bright metallic-green is, I think, the latest developed colour among butterflies, and decidedly the most conspicuous. No one who has not seen it can imagine the brilliancy of *Arhopala farquharii* or *Ornithoptera brookeana* in the greenest jungle. The brightest of the metallic-blue butterflies look dim beside them. It may be confidently asserted of all such butterflies that, unless the species is protected, only the male is green. The protected *Ornithopteras* have sometimes assumed green colours as well as golden

* The underside is green or greenish in many South American *Theclas*, but such cases are very unusual in Eastern *Lycænidæ*.

and orange, and the female shares in this useful ornamentation to some extent. In non-protected butterflies the green is confined to the upper-side, and is quite invisible except during flight.* In the *Lycænidæ** it is found in many *Zephyri*, in some *Poritias* and *Massagas*,† in a few *Arhopalas*, and in *Lampides marakata*, a rare butterfly I discovered in the Malay Peninsula and named after its emerald tint above. Among all these, whenever the female is known, it is blue, orange, black, violet, or any other colour but green. The conservative and, in butterflies, unadorned sex, has not yet acquired the latest development in colours. It is also remarkable that the green colours seem to occur where the genus is most dominant. The Malay Peninsula and Borneo form the great centre of development of the genera *Arhopala* and *Lampides*, and it is there that most of the green species occur. The outlying *Arhopalas*, those of the North-West Himalayas, and the Timorian islands, are all blue. In *Zephyrus*, the green species are found only where the genus is best represented and most vigorous. *Zephyrus pavo*, a species found in the Bhutan and Assam hill-ranges, remote from the regular habitat of the genus, has, I discovered, the male blue and greatly resembling allied females from the Western Himalayas. The green and orange *Ornithopteras* also occur only in the heart of the *Ornithoptera* region. These remarks on green butterflies also apply in some degree to certain other *unusual* colours of great brilliancy, such as the shining coppery gold of *Ilerda brahma*, and the fiery red of *Thamala marciana*. It ought to be borne in mind that such colours must never be ascribed to a female without careful examination.

Subfamily THECLINÆ.

Arhopala Group.

1. Arhopala (Nilasera) centaurus, Hew.

Mergui, Myitta.

2. Arhopala anarte, Hew.

One male, Myitta. This is the form described, from Sumatra according to Kirby, by Hewitson in his Cat. Lyc. Brit. Mus., and is

* Some rare species of *Neocheritra* are green above in some lights, especially *N. martina*, a Bornean species. The allied *N. hypoleuca* was also figured by Hewitson as green, apparently by mistake. The *Neocheritras* are among the swiftest and shyest of butterflies, and the bright colours of their upperside are only seen during flight.

† *Massaga*, gen. nov. nearest *Deramas*, Distant, but with only four subcostal veins in the forewing, instead of five. From *Poritia* it differs in the upper radial vein, which arises from the subcostal, a little *beyond* the end of the cell; in the cell of the hindwing, and in the markings of the underside, which are not annular but simple and linear. Sexes very unlike. Type *Poritia pediada*, Hew.

altogether different from the female (from the Malay Peninsula) described by him under the same name in the Diurn. Lepid. afterwards, the male of which has been named *agnis* by Felder, who recognised Hewitson's error. *Anarte* is one of the most beautiful of Tenasserim butterflies.

3. Arhopala agnis, Felder.

One female, Mergui.

4. Arhopala anthelus, Doub.

Mergui, a very brilliantly coloured species.

5. Arhopala subfasciata, Moore.

Myitta. The costal and apical black is somewhat wider in the female, which does not differ greatly from the male.

6. Arhopala pastorella, n. sp, Plate XXIII, Fig. 12.

Male above light cerulean blue, brilliantly metallic, outwardly slightly violescent and less resplendent; forewing with a slender black marginal and costal line, hindwing blue from the costal vein to the submedian, a marginal black line. *Below* rather dark fuscous brown, the markings darker, bordered by slightly paler lines, only the basal spots annular, the other like parentheses, so ( ). *Forewing* with three in the cell, a transverse one below it, and one in the base of the lower median space. The transverse discal band is rather broad, the first four spots united and compact, the first small, close to the costa, the second broadest, the fifth and sixth dislocated inwardly, compactly united; a submarginal row of obscure dark spots bordered within and without by obscure paler touches. *Hindwing* with the basal spots of moderate size, annular, a transverse discal series of nine spots in a tolerably regular semicircle, all somewhat annular, none approaching the terminal cell-streak; a submarginal row of obscure dark cordate spots bordered with paler, a slight metallic green streak in the lower median space, and a similar band from the lower median to the submedian vein, both bordered with black. The lobe is small, black; there are slight projections at the end of the lower median and submedian veins, but no distinct tails; the outer margin is regularly rounded without undulations. Expanse two inches.

Myitta. In the colour of the upperside this butterfly perhaps resembles *A. lycænaria*, Felder, a small species and tailed. It is very near *agelastus*. But that species is more violet apically, and not distinctly metallic above; below, the transverse bands are more regular; the costal spot of the forewing absent, and the general colour duller, more fuscous and less rufous.

7. Arhopala agelastus, Hew.

A common species, Mergui, Myitta, where one or two similar forms

occur which may or may not be distinct from it Mr. de Nicéville has pointed out to me that on the forewing of the male of the allied *A. antimuta* there is a curious clouded disc, perhaps of the nature of a sex-mark. This is sometimes just traceable in *agelastus*.

8. Arhopala vihara, Feld.

Mergui. I obtained several species of this very difficult group, but not having access to authenticated specimens of the allied species *aroa*, *atosia*, *yendava*, etc., I am unable to identify them.

9. Arhopala metamuta, Hew.

Mergui, Myitta.

10. Arhopala davisonii, de Nice, MS.

Mergui, Myitta, Tavoy. This species, which is quite distinct from the preceding one, belongs to a most difficult group which can hardly, I think, be understood without a careful study of the prehensors. *A. davisonii* is one of the commonest and most ubiquitous of Malayan insects and is abundant in Borneo.

11. Arhopala duessa, n. sp., Pl. XXIII, Fig. 6.

Male above bright cerulean blue over fully half of the forewing, the apex widely, the costa and outer margin moderately, and the veins slenderly black. Hindwing with the cell and extreme base of the lower median space irrorated with blue scales. *Below* light brown, the costal and apical half of the forewing, including the upper half of the cell, and all the hindwing, glossed with pale violet, the markings violet brown with violet-whitish irides, only the basal ones annular. *Forewing* with three transverse spots in the cell, a double one in the basal part of the lower median space, a very broad compact dark transverse discal band unbroken from the costa to the submedian vein; the apex with a whitish patch. *Hindwing* with basal annular spots, an irregular one at the end of the cell, outwardly acuminate, and a very irregular transverse discal band of which the first and second spots are compactly united with the terminal cell-spot, the other five small and separate, forming an irregular chain; an outer discal pale fascia forming a large violet-whitish mass near the apex, the disc also clouded with whitish; an obscure submarginal line of pale violet lunules, the marginal line dark. No metallic subanal markings. Forewing distinctly undulated outwardly, hindwing without tails, lobes or undulations. Expanse $1\frac{1}{8}$ inch.

Two males, Myitta. I know no species closely resembling this. It may be allied to *bazalus*, but has no tail or lobe. The distribution of the blue on the upperside is very unusual.

12. Arhopala perissa, n. sp., Pl. XXIII, Fig. 11.

Male, above rich uniform purple blue over fully half the forewing and two-thirds of the hindwing. Forewing with the costal border and

lower angle narrowly, and the apex widely black. Hindwing with the costa widely and the outer margin narrowly black, the blue extending beyond the submedian vein. *Below* dull fuscous-brown, the markings but slightly darker, bordered by lines a little paler, only the basal spots on the hindwing annular, the others with straight borders. *Forewing* with three spots in the cell and a broad uniform band, unbroken and but slightly curved from the third subcostal to the lower median vein, the base of the lower median space and the upper and basal part of the inter-no-median space dark, separated distinctly from an outer pale area in that space; a submarginal line of obscure darker spots bordered by a slightly paler line. *Hindwing* with the basal spots small and well separated, a streak across the end of the cell extending to the submedian vein, and a transverse discal band dislocated outwardly below the lower subcostal vein, continuous in the next four spaces; submarginal markings as on the forewing, a metallic green fascia from the lower median to the submedian vein, and a touch of it in the lower median spot. The hindwing is distinctly undulate outwardly; it has no tail and but slight traces of a lobe. Expanse 1⅝ inch.

Myitta. I know no species closely resembling it. It is a richly coloured butterfly above, but the underside is unusually dull.

13. Arhopala mirabella, n. sp.

Male above bright violet-blue, dull violet in some lights, over fully five-sixths of the forewing, the marginal black band moderate and nearly equal on both wings. *Below* light fuscous, glossed with pale violet, the markings large, numerous, distinct and crowded, consisting of deep brown spots, paler in the middle, set in distinct violet-whitish rings or parenthetic lines. *Forewing* with the three usual cell spots large, a double series of costal marks, the transverse band much broken, the spot in the lower radial space (the fourth) extruded; no distinct marks below the cell, two submarginal violet-whitish lines, the inner lunular, the outer straight, obscure. *Hindwing* with the basal spots annular, the basal costal one obsolescent; the transverse discal band with only the first pair of spots continuous (the second touching the terminal cell-spot which is large, parenthetic), the others irregular, the third dislocated outwardly, the fifth inwardly; two submarginal lunular lines, the anal angle with three small black spots bordered with metallic green, behind which is a narrow irrorated whitish fascia. *Female* with the blue somewhat paler and covering only half the forewing, and the hindwing from the costal vein (basally) and the upper subcostal almost to the submedian; the dark border rather wide. Both sexes have a slender tail tipped with white, and a small, distinct lobe. Expanse 1½ inch.

A male from Mergui, a female from Myitta. Nearest *A. alitæus*,

Hew. from the Celebes, but seems to be darker below, with a broader black border above. From *achelous*, Hew. it also differs in the broader black border, and the apex of the hindwing below is not lilac. The blue above seems also darker and richer. From *aida*, de Nicéville, it differs in the strong violet gloss and the large and crowded annulations, occupying most of the cell of the forewing and extending thence nearly to the costa, on the underside; the upperside is very similar. The figure of *A. mirabella* was omitted by accident.

14. Arhopala belphœbe, n. sp., Plate XXIII, Fig. 18.

Male, above light, rather dull purple-blue over about half of the forewing, the dark border wide on the hindwing. *Below* much like *mirabella*, but the costal markings of the forewing are absent, and the transverse discal band is composed of spots nearly annular on the forewing and entirely so on the hindwing. The three upper spots on the forewing form a line outwardly oblique, the next two are united. *Hindwing* with the three basal spots small and crowded together, the others large, distinctly outlined with violet white, that at the end of the cell irregular, produced outwardly to a point in the lower median space as in *A. duessa;* the transverse band annular, nearly regular, composed of slightly united pairs, the middle pair out of line; a double line of obscure pale submarginal lunules on both wings. Expanse 1½ inch.

Myitta. This species is something like the female of the preceding one, but the blue is paler and more lilacine. It has no tail and scarcely any lobe. It has also some resemblance to *A. agesias* from Borneo.

15. Arhopala albopunctata, Hew.

Myitta. This species, like *A. theba* and *A. aronya* from the Philippines and a beautiful undescribed Celebesian species, mimics the genus *Lampides* both on the upper and underside, resembling *L. elpis* and its allies. Another *Arhopala* (*critala*, Felder, from the Moluccas) mimics the *danis* group of *Cyaniris* most faithfully.

16. Arhopala ammon, Hew.

Myitta. The Tenasserim form of this beautiful little species may be distinct from the Malayan one, but in the absence of an authentic specimen of the latter I cannot at present decide.

17. Arhopala farquharii, Distant.

This species seems quite distinct from *eumolphus*, not, as Mr. Distant says, on account of the dislocated transverse band of the forewing, which often occurs in *eumolphus*, but on account of the uniform dull brown colour of the underside, the pale rings enclosing slightly darker brown spots, while in *eumolphus* the wings are washed with bronzy grey, the ground colour varying in different places, the spots small and distinct, while the anal green area is usually obsolescent. The female of *farquharii*

is bright blue over fully half the forewing, its edge serrate, with a wide brown border on both wings, darkening where it borders on and deeply indents the blue subapically. The species is extremely uniform everywhere, and is abundant from Tavoy and Mergui to south-eastern Borneo.

18. Arhopala hellenore, n. sp., Plate XXIII, Fig. 7.

Nearest *eumolphus*. The green of the upperside is rather more tinged with golden, and the dark border is somewhat narrower on the forewing and much narrower on the hindwing, extending less than a third towards the base of the lower median space. *Below* both wings are conspicuously marked with whitish, which forms a large apical mass on the hindwing in which the transverse markings are very distinct, and across both wings in an obscure discal band. The subanal metallic green markings are obsolescent. The dark markings are large, as in *farquharii*, from which it seems quite distinct, though it may be the local Tenasserim form of *eumolphus*. One male, Mergui. Expanse $1\frac{7}{8}$ inch.

19. Arhopala maxwellii, Distant. (?).

I am uncertain whether, as Mr. de Nicéville suggests, the female taken by Mr. Biggs and figured by Mr. Distant as *A. maxwellii*, is really the female of *farquharii*, or whether, as I thought at first, it is the female of a male taken by me at Myitta. This is a dark violet-blue butterfly, very much like *agaba* above, but singularly like *farquharii* below, distinguished, however, by the large distinct basal spots of the hindwing, the large costal spot of the forewing opposite that at the end of the cell, and by the first four spots of the discal band forming a very regular quadrate mass. Neither by the figure nor the description can I distinguish it from *maxwellii*. But Mr Distant is much more likely to have obtained *farquharii*, which is abundant, than this species, which is rare, and Mr. de Nicéville's theory is probably correct. In that case my male remains unidentified.*

20. Arhopala (Satadra) agaba, Hew.

Myitta, Tavoy.

21. Arhopala (Satadra) aida, de Nice, MS.

Mergui, a very common species. In typical species of *Satadra*, such as *atrax* and *rama*, the tail and lobe are well developed, but in others they tend to disappear, so that it would be hard to define the genus.

22. Mahathala ameria, Hew.

Mergui, Myitta, common.

* Since this was written I have learned that Mr. de Nicéville will describe this species as *Arhopala adorea*.

Thecla Group.

23. Apporasa atkinsonii, Hew.

The genus and the species were both, I believe, founded on a single specimen of uncertain sex and with the tails broken off. I took one male and two females near Myitta, having spatulate tails much like those of *Mahathala*. They differed from that genus in the less acuminate apex of the hindwing, in the egg (which was covered with triangles and tubercles instead of quadrangles and spines, a difference apparently of small importance in these butterflies), and in the more undulate margin of the hindwing, which gives it a most peculiar appearance. But the insect has, when sitting on a tree-trunk, a marvellous resemblance to a patch of lichen, and the irregular outline adds to this effect. Mimicry of this sort is a sign of great flexibility of structure and such genera must be judged by severer canons than others; so that it is doubtful whether *Apporasa* can stand.

24. Darasana perimuta, Hew.

Mergui, Myitta.

25. Flos apidanus, Cram.

Mr. Distant makes no mention of the singular scarlet costal area at the base of both wings below in this species, though they had long ago been observed by Cramer and Godart. They are occasionally present, though much less marked, on the forewing of some of the Himalayan species of this genus, as Mr. de Nicéville has shown me.

One female, Mergui. This species is the type of my genus *Flos*, the life-history of which I hope to publish before long. I have taken it in Eastern Java, and slightly different forms occur in the Celebes and in the mountains of Sambawa. For a partial description of *Flos*, see above.

26. Flos abseus, Moore.

Myitta, agreeing perfectly with Sikkim specimens.

27. Flos artegal, n. sp., Pl. XXIII, Fig. 5.

Male, above, base azure, darkening outwardly to violaceous blue, quite violet in some lights; on the forewing the blue occupies less than half of the surface, the black border reaching the upper angle of the cell, and extending unusually far up the hind-margin. *Hindwing* with a blue area from the costal and upper subcostal veins to the submedian, its outer margin irregular, the black border wide. *Below, forewing* light brown, the costal half glossed with violet, a large triangular violet-whitish area (somewhat as in *Elymnias*) on the costa near the apex; three wide dark violet-brown transverse bands, edged with paler, one in the cell; the second across its end, extending from the second subcostal to the lower median; the third oblique, unbroken, with straight

sides, from the costa to the upper median, continued irregularly almost to the lower median; margin, except at the apex, dark, a marginal blackish line. *Hindwing* very deep chocolate brown, a paler, violet-glossed band, edged by a paler line, across it from the costa to the submedian vein, crossing the cell; beyond this a dark transverse band; apex with a large dark area, its margin violet-whitish; disc mostly glossed with violet, its lower part irrorated with violet-whitish scales; a dark submarginal fascia, rather wide and conspicuous subanally; an obscure metallic-green and black ocellus in the lower median space, and one on the lobe, the green extending to the submedian vein. The forewing is rounded outwardly, the hindwing slightly scalloped, with a distinct lobe and a very short tail at the end of the lower median vein. Expanse 1⅓ inch. In its small size and short tail it differs from the other species of the group. Two males, Mergui.

28. Surendra quercetorum, Moore.

Myitta.

29. Surendra amisena, Hew. (*Rapala amisena*, Dist.).

Mergui, Myitta. The female agrees well with Hewitson's figure, except that the transverse discal line of the forewing below is more irregular, and like that of his figure of *Surendra vivarna*. The male differs from Distant's figure in being more angulate, the forewing being acuminate and slightly falcate. The blue area above varies greatly, sometimes occupying less than a third of the forewing and a sixth of the hindwing, sometimes more than half of the forewing and a third of the hindwing. In this species the male has a short tail at the end of the lower median vein, but scarcely more than an angle at the end of the middle median; the lobe is much smaller than in S. *quercetorum*. The female has two tails, both slender, the outer the shorter.

30. Surendra florimel, n. sp., Pl. XXIII, Figs. 17, ♂; 4, ♀.

Male, above, rich purple-blue, from the costal vein to the hind margin, the blue area outwardly angled at the upper median vein, and occupying nearly half of the forewing. On the hindwing it extends from just below the lower subcostal to the submedian vein, leaving the upper part of the cell dark; a narrow black marginal line. *Below* the ground is light fuscous brown as in *amisena*, but with the cell and disc of the forewing much darker and the basal and apical half of the hindwing deep violet brown. *Forewing* with a short oblique dark streak in the middle of the cell, a larger one across its end, and one or two costal ones; a transverse discal line of joined lunules (separated in *amisena*) from the second subcostal to below the lower median, projecting outwardly below the lower radial vein; apex widely and outer margin narrowly pale fuscous. *Hindwing* with the transverse discal fascia con-

sisting of a broken, dull silvery line on a deep-brown ground, an obscure outer-discal transverse band, pale on the dark apical and dark on the pale abdominal ground; an obscure metallic patch in the lower median space.

Female, above, dull brown, a slightly paler area in the middle of the disc. Below the dark area of the forewing is confined to the neighbourhood of the median spaces on the disc, that of the hindwing to a band across the wing from the apex to the hind margin, crossing the end of the cell; a distinct whitish spot basally between the costal and subcostal veins, the inner transverse line united, crossing the dark area subapically; the outer one consisting of pale lunules bordered, especially outwardly, by a dark band, in which there are two dark subapical spots, the second larger. Expanse 1½ inch. This species has the hindwing strongly angled at the end of the middle median vein, and quite straight thence to the anal angle; there is no trace of tails or lobes. The forewing is not falcate in either sex. The egg and venation are as in *amisena* and *quercetorum*. It is a very distinct species, and the male is very richly coloured.

One male and several females taken on the pass near Wagung, Tavoy district, at 1,500 ft. altitude.

Loxura Group.

31. Loxura atymnus, Cram.

Mergui, Myitta.

32. Yasoda tripunctata, Hew.

Mergui.

33. Drupadia moorei, Distant, (*boisduvalii*, Moore).

Mergui, Myitta, common. I cannot find any constant difference between Mergui and Perak specimens. The genus *Drupadia* differs from *Biduanda* in having the third subcostal vein undivided (in *Biduanda* it is forked just before its termination) and a conspicuous sex-mark on the hindwing above, between the bases of the costal and subcostal veins. Nevertheless, the two are extremely similar in the entire structure of the egg, the larva, and the imago; and in any system of classification ought to be brought together.

34. Biduanda thesmia, Hew. (*fabricii*, Moore).

Mergui, Myitta. I cannot find any constant difference between Mergui and Perak specimens.

35. Biduanda melisa, Hew.

One male of this rare little species, Myitta. A similar kind occurs at high elevations in Perak, but whether it is this species or *B. scæva*, Hew., I am unable to say.

36. Biduanda nicevillei, n. sp., Plate XIII, fig. 16.

Male, above, violet (much richer and bluer than in *B. thesmia*), slightly paler in the middle of the forewing, a narrow, even black border. *Hindwing* with two subanal black spots bordered inwardly by an area irrorated with whitish scales; a marginal black and white line subanally, the cilia partly white, as well as most of the tails. *Below*, much like *B. melisa*, the markings more rufous, less fuscous, the basal spots simple, not annular, the transverse discal band and the outer margin of the forewing rufous brown and ferruginous of various shades, the apical part of the outer margin of the hindwing light ferruginous, the metallic green area large, extending unbroken from the upper median to the internal veins, the submarginal line straighter, and less undulated on both wings. Expanse an inch and a half, the species being larger than either *melisa* or *scudderii*. Two males, Myitta.

I name the species after Mr. Lionel de Nicéville, whose great work on Indian butterflies, equally important for the information which it contains, and for the impetus which it is certainly destined to give to the study of insects in the East, is now in progress.

37. Biduanda scudderii, n. sp., Pl. XXIII, Fig. 14.

Allied to *thesmia* and somewhat resembling the female of that species. Male, above, dark fuscous, an orange area occupying about a sixth of the forewing, including the lower angle of the cell, and the disc from the base of the lower radial to below the lower median vein; a somewhat large, obscure violet-blue subapical area (not refulgent in any light), not reaching the costa or the outer margin; the hind margin is also tinged with violet. *Hindwing* dull fuscous, a large dull violet area from the cell to the outer margin, between the lower subcostal and the lower median vein, from the cell to the marginal black line, its inner part densely irrorated with bluish-white scales, beyond which lies a transverse darker discal fascia; subanal area nearly black, cilia whitish subanally, tails chiefly black except at the tip. *Underside* much as in *thesmia*, expanse as in *melisa*. One male, Mergui.

I name the species after Mr. S. H. Scudder of Cambridge, Massachusetts, the first numbers of whose magnificent work on the New England butterflies I have just had the good fortune to meet with.

38. Suasa lisides, Hew.

Myitta.

Aphnæus Group (*Aphnæinæ ?*).

39. Ambly podia narada, Horsf.

The Mergui form (*andersonii*, Moore) seems identical with that found in the Malay Peninsula. It is of a brighter, richer blue than the North Indian variety.

40. Tichebra acte, Moore.

Mergui, Myitta. My single female (Myitta) is remarkable in having the white spots on the lower part of the hindwing united into a short very broad band, such as occurs in some specimens of *Cheritra freia*.

41. Cheritra freia, Fab.

Mergui, Myitta.

42. Bindahara phocides, Fab.

One female, Mergui.

43. Zeltus ætolus, Fab. (*etolus*).

Mergui, Myitta.

44. Sinthusa amba, Hew.

Myitta. Differs from *S. nasaka* in the richer blue of the forewing, and the much broader blue area of the hindwing.

45. Hypolycæna erylus, Godt.

Mergui, Myitta.

46. Chliaria othona, Hew.

Myitta.

47. Chliaria mergui, n. sp., Pl. XXIII, Fig. 2.

Male, above, dull indigo blue over half the forewing from the costal vein almost to the lower angle, and over the hindwing from the upper subcostal to the submedian vein; cilia dark, lobe with a marginal white line, tails edged and tipped with white. *Below* pearl grey, the apex of the forewing widely, and the costa slenderly light fulvous brown, both wings with a double reddish streak across the end of the cell, and a slender, straight, brighter fulvous, transverse discal fascia, very slenderly bordered with blackish and whitish lines. On the forewing this is nearly straight, unbroken, on the hindwing it is dislocated inwardly below the upper median, and again below the lower median. *Forewing* with an obscure darker submarginal line, cilia dark. *Hindwing* mostly grey, the apex slightly tinged with rufous, the lower and anal part whitish with two submarginal lunular bands, a large black spot, edged anally with orange but without metallic scales, between the lower medians; lobe black edged with white, a slender black edge-line, cilia basally whitish, outwardly dark. Tails much as in *othona*, the anal one longest.

A single male, Mergui. The species somewhat resembles *Zeltus ætolus*, though easily distinguished by the short tails and the absence of the blue reflections above. It has still more resemblance to *Sinthusa amba*. On account of the closely appressed costal and first subcostal veins, I place it in *Chliaria*, though its long narrow wings give it quite a different aspect.

48. Tajuria jangala, Horsf.

Mergui, Myitta.

49. Drina donina, Hew.

Mergui, Myitta, males only.

50. Dacalana vidura, Horsf.

Mergui. The specimens resemble those from the Malay Peninsula in all respects. As there seems to be some uncertainty about Horsfield's type, I have not substituted Mr. de Nicéville's name *Arrhenothrix* for *Dacalana*.

51. Thamala marciana, Hew. (*miniata*).

Mergui.

52. Horaga onyx, Moore.

Mergui. My specimens differ from Sikkim ones only in the ground colour of the underside, which is greenish yellow instead of ochreous brown. Only females taken.

53. Aphnæus lohita, Horsf.

Mergui, Myitta.

54. Curetis malayica, Feld.

My specimens are very inconstant, as is usually the case in this genus.

Subfamily DEUDORIGINÆ.

Genus Araotes, nov.

55. Araotes lapithis, Moore.

Mergui, Myitta, scarce.

56. Deudorix epiarbas, Moore, (*epijarbas*).

Myitta.

57. Rapala suffusa, Moore.

Mergui.

58. Rapala schistacea, Moore.

Mergui. An abnormal female was taken with the transverse discal band below wholly obsolete on both wings.

59. Rapala sphinx, Fab.

Two males, Myitta. The male of this species sometimes has and sometimes has not a large black patch of metamorphosed scales on the forewing above.

Subfamily PORITINÆ.

Genus Poritia.

In this genus the upper radial of the forewing originates at the end of the cell, so that there is a very short upper discocellular. The middle discocellular is upright and very slender, the lower obsolescent.

In the hindwing the discocellulars are also very slender, the upper rather long; the second bifurcation of the median vein is opposite the end of the cell. The apex of the forewing is rather rounded, the upper part of the outer margin being strongly rounded. The markings of the underside are annular and exceedingly variable. The sex-mark at the base of the hindwing of the male is a conspicuous tuft of black hairs on a dark ground. The hindwing of the female is less angled outwardly than in *Massaga*.

60. Poritia phraatica, Hew.

Mergui, common. My females have the ochreous areas small, even less than in Mr. Distant's figure. Mr. de Nicéville has one from the Malay Peninsula in which the hindwing is more than half ochreous. The male is very variable, but I have no specimen so green, or with so large and solid a coloured area as in Mr. Distant's figure. There is in all my specimens a triangular dark patch below the cell and a macular blue band across the apex.

61. Poritia hewitsonii, Moore, var. tavoyana, nov.

Myitta, Tavoy, common. The males are remarkably variable; many are wholly indistinguishable from those of *phraatica*. I have taken every variation from those resembling Mr. Distant's figure of *phraatica*, to those with an irregular blue area below the cell, wholly separate from a long submedian streak and a solid oblique subapical band. The underside varies greatly and does not differ from that of *phraatica*. The female is pale blue over fully a third of the forewing, and has more resemblance to the male than to the northern female with its small blue area. In the Tavoy form this extends from the cell to the hind margin, projecting in the interno-median space within an eighth of the outer margin; there is a blue spot in the cell and a variable subapical band sometimes obsolete. The blue area on the hindwing is variable but usually considerable. The ochreous discal spot of the forewing is occasionally present, though obscure.

Genus Massaga, nov.

I described this genus in 1886, the type being *M. clorinda*, which now turns out to be the male of *Poritia potina*, Hewitson. Lately, being dubious of its generic value, I asked Mr. de Nicéville to omit it in his "Butterflies of India," which he accordingly did. Subsequent examination and the discovery of the female have reassured me as to its distinctness.

In the forewing the upper radial originates a little beyond the cell, so that there is no trace of an upper discocellular vein; the middle discocellular is rather stout and oblique, the lower distinct, sinuous. In

the hindwing, the cell is longer than in *Poritia*, the upper discocellular short, very oblique, the lower long. The second forking of the median vein is considerably before the end of the cell. On the underside the ring-markings of *Poritia* are replaced by simple transverse lines. The apex of the forewing is more pointed, and is usually slightly falcate in both sexes, the upper part of the outer margin being slightly excised. The tuft of the male is inconspicuous in itself, but placed on a conspicuous ochreous patch. The hindwing of the female is conspicuously angled. The sexes are exceedingly unlike. The species are all very rare.

This genus is close to *Deramas* and *Zarona*, which it greatly resembles, but differs in having one subcostal vein less.

62. Massaga pediada, Hew., Pl. XXIII, Fig. 15.

Male, above, velvety black; forewing with the following markings rich bluish-green, varying according to the light, namely, one below the cell, clavate, one basal below the internal vein, its terminal part crossing the vein, one a little beyond the cell, oblique, consisting of three quadrate spots, a submarginal row of six spots, the last larger, subcordate. *Hindwing* with a longitudinal mark in the interno-median space from the base, united terminally with the inner of a row of three triangular spots crossing the disc; three submarginal spots in the same spaces as the discal ones, the middle small, lunular, the outer two semicircular, enclosing black spots, the subanal one largest. *Below* dull rufous brown with a pale violet gloss; forewing with a broken macular line of minute whitish spots across the disc, an outer-discal line of small and very obscure pale lunules, beyond which lies a pale band, the margin brighter rufous. *Hindwing*, base and costa dull rufous brown, most of the rest irrorated with whitish scales, an obscure darker transverse line with two sagittate marks on the median spaces, a submarginal dark zigzag line bordered inwardly by a pale line, a marginal bright reddish line bordered inwardly by slender black and white lines which do not extend to the apex.

Female, above blackish, cilia and costa paler. Below rufous brown, much lighter than in the male, a darker rufous streak across the end of the cell of both wings, a similar slender transverse discal fascia, continuous on the forewing, broken and lunular on the hindwing, a darker outer-discal line, obscure on the forewing, blackish subanally on the hindwing, placed in a paler band beyond a darker rufous one; some submarginal blackish scales near the anal angle of the hindwing, the margin of the forewing brighter rufous, hindwing with a brighter rufous marginal line bordered inwardly by slender black and white lines subanally.

63. Massaga potina, Hew. (? = *Simiskina fulgens*, Distant), Pl. XXIII, Fig. 3.

Male, above velvety black with the following rich blue markings varying according to the light, one below the cell, clavate, extending widely into the median spaces, one below the internal vein, with a spot above the end of it, a series of three spots a little beyond the end of the cell, the upper obscure, the lower quadrate; a submarginal series of six spots, the lower one large and cordate. *Hindwing* with a longitudinal mark in the interno-median space, from the base two-thirds to the outer margin, two discal spots in the next two spaces, three marginal crescents in these three spaces, the subanal one large with a streak outside of it beyond the submedian vein. *Below* rufous brown, brighter than in *pediada*; *forewing* with an obscure darker rufous streak across the end of the cell, a darker rufous line across the disc as far as the lower median, bordered outwardly by a darker bluish-tinged space, an outer-discal obscure lunular line, bordered inwardly by a paler bluish one and outwardly by a broad pale space, which is conspicuous and somewhat ochreous near the apex. Hind margin and interno-median space chiefly dull ochreous, shining; a bright reddish marginal line, cilia blackish. *Hindwing*, base and costa dark rufous-brown, the rest paler rufous, a brighter rufous streak closing the cell, a similar discal series of lunules irregularly placed, an obscure dark outer-discal lunular line obsolete subapically, bordered both inwardly and outwardly by a paler bluish space, and then by a brighter rufous one; a bright rufous marginal line bordered subanally by slender black and white ones, cilia dark.

Female, above bright orange-tawny, the apex and outer margin (not the costa) widely blackish, the ends of the three median and the internal veins brown or even orange, the orange area almost semicircular outwardly; the hind margin and the basal half of the interno-median space are always more or less irrorated with black scales, which also enter the base of the cell; a marginal rufous line, the cilia darker. *Hindwing* orange, generally strongly irrorated with black, the veins less so; an obscure submarginal band of darker quadrate spots; a rufous marginal line, the cilia darker. Some specimens have almost the whole upper surface orange, except the apex and margin of the forewing. *Below* light rufous brown, much paler than in the male, the markings darker ferruginous, resembling those of the male, but more distinct.

One male and five females (only one fresh), taken near Myitta, in the Tavoy district. The male differs from the male of *pediada* in having the markings larger, clearer, and not bluish-green, but blue. The underside is less dark and uniform. Both sexes are more falcate

than in *pediada*, and of larger size. The female generally sits on a leaf with half-open wings, and might easily be taken for a small *Cirrhochroa*, or sometimes for a *Loxura*. In any case its entire departure from the usual colours of the group indicates that it is likely to prove a mimic.

The female is somewhat variable. I have no doubt that it will turn out conspecific with *Poritia potina*,—from the Malay Peninsula—which I only know from Hewitson's figure.

It seems also probable that the insect named by Mr. Distant *Simiskina fulgens* and placed by him in the *Erycinidæ*, is identical* with or at least very closely allied to this species. Unfortunately, he gives no description of the genus, merely noting two particulars in which, it is true, it differs from all Eastern *Erycinidæ*, but agrees with the *Poritias* and with most other genera of the *Lycænidæ*. The figure faithfully represents a rather worn and faded female of this species.

The egg differs from that of *Poritia* in having the hexagonal reticulations very regular and delicate; it has the same extraordinary shape. It differs wholly from the eggs of the Eastern *Nemeobiadæ*, which are all round in horizontal section and without the slightest trace of reticulation.

Subfamily LYCÆNINÆ.

Genus of uncertain position.

64. Catopœcilma elegans, Druce.
Mergui, Myitta.

Lycæna Group.

65. Catochrysops strabo, Fab.
Mergui, Myitta.

66. Catochrysops pandava, Horsf.
Mergui.

67. Catochrysops cneius, Fab.
Mergui.

68. Nacaduba ardates, Moore.
Mergui, Myitta.

69. Nacaduba atrata, Horsf.
Myitta.

70. Nacaduba pavana, Horsf.
Myitta. Like *macrophthalma*, but with the lines of the underside slender and distinct, the basal ones absent.

* Mr. Distant has since informed me that this is not the case.

71. Nacaduba viola, Horsf.
Mergui, Myitta.
72. Nacaduba dana, de Nice, (?=*almora*, Druce).
Myitta.
73. Lampides ælianus, Fab.
Mergui, Myitta.
74. Lampides subdita, Moore.
Mergui, Myitta.
75. Lampides bochus, Cram.

I am not aware of any difference between *Jamides* and *Lampides*, and think it likely that the former genus will have to fall before the latter, which occurs earlier in Hübner. It is to be hoped that no more species of this genus will be described without an examination of the *prehensores*, which are fortunately of great diversity in the different kinds, as if to counterbalance their puzzling similarity in colours and markings.

76. Polyommatus bæticus, Linnæus.
Myitta.
77. Tarucus plinius, Fab.
Mergui.
78. Everes umbriel, n. sp., Pl. XXIII, Fig. 1.

Male, above black, the cilia of the hindwing and of the lower angle of the forewing whitish, except at the ends of the veins. *Below* grey-white (much whiter than in in *E. kala*) with the following blackish markings, the discal ones quadrate. *Forewing* with a streak across the end of the cell, a broad straight transverse discal band, inwardly dislocated below the middle median, the lower part outwardly oblique, outer margin widely dark, containing an inner lunular and an outer slender whitish fascia. *Hindwing* with a large subcostal, a smaller cellular and a minute abdominal spot all near the base, a streak across the end of the cell, and a broad discal transverse band broken into four quadrate masses of which only the upper two touch each other, the first covering two spaces, the second (strongly dislocated outwardly) three, and the third (nearer the base, oblique), two; the fourth being a small lunule between the submedian and the internal veins. Outer margin broadly dark, containing a row of whitish lunules (the subanal one orange) surrounding black spots of which the two subanal ones are touched with metallic green. A whitish submarginal and a black marginal line, both very slender, the cilia and the tip of the tail white.

The broad, unbroken, quadrate discal bands of the underside easily distinguish this peculiar species from *Everes kala*, de Nicéville, which has rows of round black spots instead. *E. kala* has somewhat the aspect

of a *Zizera* and *E. umbriel* that of a *Catochrysops*. Both species may turn out to be mimics. Since the above was written I have taken *kala* in the Naga Hills from 5,000 to 10,000 feet, along with species mostly Palæarctic, while *umbriel* is a purely tropical species, apparently not infrequent in Tenasserim. The type specimen of *kala* is in my opinion a male, so that these two species have wholly lost the usual blue colour of their allies, in this resembling *Everes nyseus*. That species, which seems also to occur near Myitta (though I did not capture any), differs slightly from the typical *Everes* in having the discocellular veins of both wings meeting at a perceptible angle, but it seems scarcely worth while to retain the genus (*Talicada*) which has been founded on it. I took two males of *umbriel* in the Tenasserim Valley, and observed one or two others.

79. Everes parrhasius, Fab.

Mergui.

80. Everes putli, Kollar.

Mergui, Myitta. These two species are wide-ranging. I have taken both in the islands of Sumba and Sambawa, east of Java.

81. Zizera pygmæa, Snell.

Mergui. This also occurs in Sumba and Sambawa.

82. Zizera sangra, Moore.

Mergui, Myitta.

83. Castalius roxus, Godt.

Mergui, Myitta. In this as well as in the preceding genus, the eyes are but slightly hairy.

84. Castalius ethion, Doub.

Mergui, Myitta.

85. Castalius rosimon, Fab.

Mergui, Myitta.

86. Cyaniris transpecta, Moore.

Myitta. I am not sure that this species is distinct from *puspa*.

87. Cyaniris placida, de Nice.

Myitta.

88. Cyaniris melæna, n. sp., Pl. XXIII, Fig. 13.

Male, above, dark dull blue, resplendent in some lights, the blue extending over less than half the surface of the forewing, sometimes extending above the upper radial vein beyond the cell, the black area very large occupying the upper part of the cell, widening at the lower angle, and extending over more than a third of the hind margin. On the hindwing the blue occupies hardly more than a third of the surface, and does not approach either the costal or abdominal margin. There is no whitish patch on the upper surface. Cilia whitish. *Below* grey-white

with a slight silvery lustre. *Forewing* with a streak across the end of the cell and a curved discal line of six dark streaks set in paler rings, the second, third, fourth and fifth outwardly oblique, the fifth and sixth removed inwardly: a submarginal row of joined ocellus-like spots, consisting of a dark lunule enclosing a pale, dark-pupilled spot, a marginal dark line. *Hindwing* with three distinct basal spots, a streak across the end of the cell, a very irregular series of discal spots, the first very large and black, near the costa, the second minute, near the first but more basal, the next four forming an oblique crescent (the fifth small, the sixth larger, nearer the base), the seventh large, removed outwardly, the eighth (between the submedian and the internal veins) smaller and nearer the base. The submarginal ocelli are as in the forewing, the inner lunular line more serrate. Female unknown.

This species, which is the darkest *Cyaniris* known, was taken in the Tenasserim Valley in February, but in the rains it is perhaps confined to higher lands. An apparently identical species is found in the Malay Peninsula at a considerable height, and seems to be *C. jynteana*, Distant (*nec* de Nicéville).

The genus *Cyaniris* is better represented in the tropics than is generally supposed. I have myself taken ten species, including *haraldus*, in the Malay Peninsula, eight confined to high elevations; also, seven in the mountains of Eastern Java and four in the Celebes, besides C. *duponchelii*, Godt. (?=*puspa*, Moore) in Sumba and Sambawa, and C. *akasa* in Sambawa at 4,500 feet elevation.

Pithecops Group.

89. Neopithecops zalmora, Butler.

Mergui, Myitta, commoner than *P. hylax*. The species occurs in Java and Sumba, but is rare in both. It is common from the Chittagong Hill Tracts to South-Eastern Borneo.

90. Pithecops hylax, Fab.

Myitta, Mergui, scarce.

91. Megisba malaya, Horsf.

Myitta, Mergui. The species occurs unchanged in Borneo, Java, Sumba, and Sambawa. Not being protected like the two preceding genera, it has acquired narrower and more pointed wings, and a much swifter flight.

Genera of Uncertain Position.

92. Niphanda cymbia, de Nicé.

One male, Myitta. I have taken the allied *N. tessellata* in Province Wellesley, and the Kedah State, Malay Peninsula, where it is very rare.

93. Lycænæsthes lycænina, Feld.

Mergui, Myitta.

94. Lycænæstiæs bengalensis, Moore.

Mergui, Myitta.

95. Spalgis epius, West.

Mergui, differing slightly from Indian specimens, the discal white patch on the forewing below conspicuous. The genus is found everywhere from the Himalayas to Amboyna (occurring in all the islands east of Java), and the species, if there are more than one, are very hard to make out. They live in the drier districts only, the larva apparently feeding on acacias.

96. Taraka hamada, Druce.

Myitta. I have also taken it in Eastern Java at 4-5000 feet elevation.

Subfamily GERYDINÆ.

Genus Malais, nov.

Differs from *Logania* in the short, thick, slightly flattened legs, the tibiæ being thickest in the middle.

97. Malais sriwa, Distant.

One female (Mergui) is obviously of this species. It is possibly distinct from *L. marmorata*, Moore, but the bad state of the types of that species makes its difficult to decide. I postpone a fuller description of the genus.

Of this genus another species occurs at Bassein, Burma; it is one of the smallest and obscurest of Indian butterflies. *Logania malayica* seems rare in the Malay Peninsula (where a number of allied forms occur), but it is rather common in South-Eastern Borneo. The genus is also represented in the Celebes. *Logania andersonii*, Moore, from Mergui, which is probably the *Hypolycæna libna* of Hewitson, is apparently not related to the *Gerydinæ*, though the wretched state of the sole type makes it difficult to say where it does belong. The venation is extraordinary. There are only three subcostal branches (according to Mr. de Nicéville's phraseology two nervules besides the nervure), the first of which is united with the costal vein for a very short distance.

98. Allotinus nivalis, Druce, (*Paragerydus nivalis*, Distant; *Logania substrigosa*, Moore).

This species must be placed in *Allotinus*, the third subcostal branch being emitted immediately before the end of the cell, leaving a short but distinct upper discocellular vein, as required by Felder's definition of the genus.

If *substrigosa* be distinct from *nivalis*, my specimens from Mergui and Myitta must be called by that name. But I believe that the two are merely extreme forms of a single species, in which the size and distinctness of the markings of the underside vary greatly. It is a common species from Tavoy to South-Eastern Borneo, and obviously mimics *Neopithecops zalmora*, Butler, from which it is indistinguishable when flying.

99. Allotinus alkamah, Distant.

This species represents the Javanese *A. subviolaceus*, Felder, from Mergui to South-Eastern Borneo. The sexes are much alike. In my Tenasserim females the disc of the hindwing is largely covered with bluish scales.

In some specimens of *Allotinus drumila* the third subcostal originates slightly before the end of the cell, leaving the upper discocellular very distinct, while in others it originates after the end of the cell and there is no upper discocellular just as in *Paragerydus taras*. It is also remarkable for the very irregular outline of the wings. This feature is lacking in *Allotinus multistrigatus*, in which the subcostal originates opposite the end of the cell, the upper discocellular being therefore minute.

100. Paragerydus horsfieldii, Moore, (*Allotinus aphocha*, Kheil).

This is the commonest of the *Gerydinæ* from the Chittagong Hill Tracts to South-Eastern Borneo, found in great numbers wherever there is deep shade. I am inclined to think that this species (and not *taras* with its conspicuous reddish apex and margin) is the *Allotinus unicolor* of Felder, but without examining the types of that species it is impossible to decide.

The cell in this species ends halfway* between the bases of the second and third subcostals, which in the male are approximate. On this character the genus *Paragerydus* has been formed, but it is improbable that it can be retained distinct from *Allotinus*. The following species seems to be structurally halfway between the two.

101. Paragerydus taras, n. sp., Pl. XXIII, Fig. 10.

Above, dark brown, deepest apically on the forewing, lacking both the elongate discal brand of the male, and the pale discal area of the female of *P. horsfieldii*. *Below* the ground is creamy whitish (dull bluish grey in *P. horsfieldii*, the striæ less numerous, especially discally and basally, and less evenly distributed; the apex of the forewing is widely tinged with rufous brown, the cilia rather long and also rufous brown; a rufous brown marginal line; the transverse macular discal band is

* In the female. In some males it is nearer the base of the second.

nearly as obvious as in *P. horsfieldii*, but is composed of slender, crescent-shaped markings, beyond which is a submarginal line of blackish dots, of which the subapical ones on the forewing, situated in the brown area, are touched outwardly with white.

In the male the forewing is longer and more acute than in *P. horsfieldii*, its outer margin but little curved, while in the female its upper portion is strongly convex. In the hindwing the degree of marginal undulation varies greatly, as is also the case with *horsfieldii*. The female is paler than the male and while flying has almost the air of a white butterfly.

The prehensores obviously differ from those of *horsfieldii*, the tips of the unci (*tegumina*) being rounded and but slightly oblique, while in *P. horsfieldii* they are very oblique and regularly tapering. As seen from the side, the clasps (*harpagones*) end in two processes separated by a deep sinus, the upper longest, and ending in a strong hook directed upwards. In *P. horsfieldii* the upper process is obsolescent, represented only by an angle in the upper contour of the other.

The types are from the Tenasserim Valley, east of Tavoy, Burma. I have also taken it in the Chittagong Hill Tracts. An apparently identical form occurs in the Malay Peninsula and South-Eastern Borneo, but I have no specimens now available for comparison.

The venation of this species is interesting. The origin of the third subcostal vein is immediately beyond the end of the cell, so that, as in *Paragerydus horsfieldii*, there is no upper discocellular vein. In the male, the second and third subcostal veins are remarkably approximate throughout, and the bifurcation of the latter is nearer the end of the cell than the apex of the wing. In this it resembles *Allotinus alkamah*.

102. Gerydus ancon, n. sp., Pl. XXIII, Fig. 8.

Male, *above*, forewing with the apex and outer margin black, and the base (as well as the hindwing) dull fuscous leaving about two-fifths of its area pure white. A white band extends obliquely from the costa one-fourth from the base, widening to the middle median vein two-thirds from the base, where it touches another white area extending from the middle median vein to the hind margin, of which it occupies the middle two-thirds, filling likewise nearly two-thirds of the interno-median space, and extending, except at its excised lower angle, within one-eighth of the outer margin, leaving the basal third of the interno-median space fuscous, and almost enclosing, with the superior band, an elongate black area occupying the basal part of the lower median space and united with the fuscous basal area. The upper median vein is swollen where it crosses the white band, from just beyond its origin one-fourth towards its termination. *Below* light rufous brown, the

white areas of the upperside reduced in size and set in a wide blackish area, a marginal dark line on the forewing, and a series of obscure dark submarginal dots on both wings. *Hindwing* with obscure mottlings of slightly different shades of pale brown; three of these between the costal and subcostal veins are bordered by transverse blackish lines; an irregular blackish fascia extends obliquely across the disc from the submedian space to the radial vein.

My single female lacks of course the swelling of the upper median vein. The hindwing is slightly angled in the middle. The lower white area of the forewing is much smaller, being narrow and oblique, occupying only one-third of the hind margin, bent inwardly just above the internal vein, its terminal quadrate portion (between the middle median vein and the middle of the interno-median space) being dehiscent outwardly along the line of the lower median vein. The underside is paler, less reddish and more variegated than in the male, with the markings very irregular. Expanse 2⅓ inches.

Two males and a female, from the Tenasserim Valley, Tavoy district.

103. Gerydus croton, n. sp., Pl. XXIII, Fig. 9.

Male, above, dark brown, the apical part of the forewing black, an obscure fuliginous whitish band extending obliquely from beyond the end of the cell to the middle median vein two-thirds from its origin, two obscure whitish spots beyond and below it, one on each side of the lower median vein, the lower sometimes obsolete. *Below* very dark, variegated with many shades of brown; the band is dull ochreous, broad and well marked, the upper of the two spots is large and but slightly separated from it, the lower very small, oblique and distinct, there are some costal markings, a subapical cordate spot, and three submarginal blackish dots. The *hindwing* has the basal half very dark with some paler brown transverse markings edged with dark, a blackish semicircular band with a slight bluish gloss extending across the wing beyond the cell, after which comes a semicircle of joined cordate reddish-brown maculæ, beyond which the ground is again dark, with a light brown marginal band near the apex.

Female, upperside. The band is more distinct and nearly white, extending obliquely almost to the costa and to the middle median vein two-thirds from its origin, the upper of the two spots separated from it only by the vein, the lower smaller and more isolated. *Below* much lighter and more variegated than the male, the dark submarginal dots forming a complete series on the forewing, the outer part of the hindwing pale brown, except a large sordid area centreing round the upper median vein. Expanse over two inches.

The lower angle of the forewing is in this species somewhat less produced inferiorly than in *G. ancon*, the hindwing of the female somewhat

more angled in the middle, the upper median vein of the forewing of the male is not swollen. The prehensors differ but slightly.

Three males and a female taken in the Tenasserim Valley. Like the preceding species it has a strong irregular flight (quite different from the feeble uncertain motions of the *Paragerydi* and *Loganias*), wheeling many times round the same circle, or up and down a certain length of the path, and would be difficult to catch but for its habit of returning again and again to the same leaf.

104. Gerydus boisduvalii, Moore.

One female from the Tenasserim Valley, Tavoy district.

105. Gerydus biggsii, Distant.

One female, Tenasserim Valley. These four species of *Gerydus* differ somewhat in the length of the cell which increases in the following order—*croton*, *ancon*, *boisduvalii*, *biggsii*. In the first, the end of the cell is immediately beyond the origin of the second subcostal, in the last halfway between those of the second and third, as in *Paragerydus*.

Another female *Gerydus* from the Tenasserim Valley resembles *G. biggsii*, but the white of the forewing occupies the whole disc and two-thirds of the cell, just reaching the hind margin and covering nearly half the area of the wing. The hindwing is all brown, and the underside much as in *biggsii*.

Subfamily LIPHYRINÆ.

I saw what I supposed to be a male of this species, near Myitta, flying slowly in the twilight. Having no net with me, I lost it. The species of *Allotinus* are also often seen flying almost till dark.

EXPLANATION OF PLATE XXIII.

Fig. 1 *Everes umbriel*, n. sp., ♂, p. 433.
„ 2 *Chliaria merguia*, n. sp., ♂, p. 427.
„ 3 *Massaga potina*, Hew., ♂, p. 431.
„ 4 *Surendra florimel*, n. sp., ♀, p. 424.
„ 5 *Flos artegal*, n. sp., ♂, p. 423.
„ 6 *Arhopala duessa*, n. sp., ♂, p. 419.
„ 7 *Arhopala hellenore*, n. sp., ♂, p. 422.
„ 8 *Gerydus ancon*, n. sp., ♂. p 438.
„ 9 *Gerydus croton*, n. sp., ♂, p. 439.
„ 10 *Paragerydus taras*, n. sp., ♂, p 437.
„ 11 *Arhopala perissa*, n. sp., ♂, p. 419.
„ 12 *Arhopala pastorella*, n. sp., ♂, p. 418.
„ 13 *Cyaniris melæna*, n. sp., ♂, p. 434.
„ 14 *Biduanda scudderii*, n. sp., ♂, p. 426.
„ 15 *Massaga pediada*, Howitson, ♂, p. 430.
„ 16 *Biduanda nicevillei*, n. sp., ♂, p. 426.
„ 17 *Surendra florimel*, n. sp , ♂, p. 424.
„ 18 *Arhopala belphœbe*, n. sp., ♂, p. 421.

XXIV.—*Index to the first five Papers on Indian* Rhynchota, *completing the Family* Pentatomidæ :—I, Journ. lvi, Pt. ii, p. 22, 1887 : II, *ib.*, p. 144 : III, *ib.*, lvii, p. 1, 1888 : IV, *ib.*, p. 118 : V, *ib.*, lviii, 20, 1889.—*By* E. T. Atkinson, B. A.

A.

Abeona, lvii, p. 146.
gladiatoria, 146.
serrata, 146.
ACANTHIA.
histeroides, lviii, 104.
Acanthosomina, lviii, p. 20.
Acanthosoma, lviii, p. 21.
alaticornis, 26.
aspera, 25.
binotata, 25.
cornutum, 31.
difficilis, 23.
distincta, 22.
dubia, 23.
elongata, 24.
forfex, 24.
hamata, lvii, 150.
heterospila, lviii, 29.
immunda, 26.
laevicornis, 23.
lineatum; 28.
megacephalum, 21.
nigricornis, 27.
proxima, 22.
punctatum, 36.
recurcum, 35.
rufescens, 30.
truncatula, 26.
uniguttatum, 28.
ACATALECTUS, lvi, p. 45.
clarus, 46.
magnus, 45.
Acesines, lvii, p. 131.
breviceps, 132.
Acrosternum, lvii, p. 118.
gramineum, 118.
Adria, lvii, p. 34.
parvula, 34.
Adrisa, lvi, p. 45.
clara, 46.
magna, 45.
Aednus, lvii, p. 14.
obscurus, 14.
similis, 14.
ventralis, 15.

Aelia.
crucifera, lvii, p. 48.
depressa, 31.
furcata, lviii, 104.
glandulosa, 98.
histeroides, 104.
nubila, lvii, 48.
rostrata, lviii, 107.
Aeliomorpha, lvii, p.
lineaticollis, 37.
AESCHRUS, lvii, p. 35.
obscurus, 36.
tuberculatus, 36.
Aeschrocoris, lvii, p. 35.
obscurus, 36.
tuberculatus, 36.
Aethus, lvi, p. 46.
badius, 54.
borrei, 47.
brevipennis, 59.
brunneus, 54.
elongatus, 56.
foveolus, 53.
impressicollis, 47.
indicus, 47.
maurus, 49.
opacus, 54.
palliditarsus, 56.
perosus, 47.
perpunctatus, 48.
pygmaeus, 55.
varians, 50.
Agaeus, lvii, p. 49.
mimus, 51.
tessellatus, 50.
Agathocles, lvii, p. 152.
limbatus, 153.
Agonoscelis, lvii, p. 48.
femoralis, 48.
indica, 48.
nubila, 48.
Alcimus, lvii, p. 66.
coronatus, 67.
flavicornis, 68.
Alphocoris, lvi, p. 186.
lixoides, 187.
AMACOSIA.

Amasenus, lvii, p. 160.
corticalis, 160.
Amauropepla, lvi, p. 198.
denticulata, 198.
Amaurus.
brevicornis, lviii, 92.
cupreus, 93.
inermis, 93.
Ambiorix, lvii, p. 144.
senescens, 144.
Amissus, lviii, p. 62.
Atlas, 63.
Amyntor, lvii, p. 153.
obscurus, 154.
AMYOTEA.
dystercoides, lvii, p. 182.
nigripes, 182.
Analocus.
misellus, lvii, p. 42.
Anaxandra, lviii, p. 30.
compacta, 34.
cornuta, 31.
fulvicornis, 33.
hamata, 34.
nigrocornuta, 32.
nigrolineata, 32.
rufescens, 30.
sigillata, 32.
tauriformis, 33.
Antestia, lvii, p. 135.
anchora, 135.
apicalis, 166.
cruciata, 137.
flavovaria, 140.
historio, 142.
modificata, 138.
pulchra, 136.
varipennis, 141.
Apines, lvii, p. 138.
concinna, 139.
Apodiphus, lvii, p. 4.
amygdali, 4.
hellenicus, 5.
APODIPHYA, lvii, p. 4.
amygdali, 5.
hellenica, 5.
Arctocoris, lvi, p. 189.

incisus, 189.
ARMA.
geometrica, lvii, p. 177.
lurida, 181.
spinidens, 177.
turbida, 183.
velata, 182.
ASIARCHA, lviii, p. 72.
nigridorsis, 72.
ASOPINA, lvii, p. 169.
ASOPUS, lvii, p. 181.
argus, 182.
armiger, 175.
chiropterus, 173.
coeruleus, 169.
dystercoides, 182.
geometricus, 177.
luridus, 181.
mactans, 182.
malabaricus, 182.
nigripes, 182.
ulceratus, 173.
verrucifer, 172.
ASPIDESTROPHUS, lvi, p. 200.
lineola, 200.
morio, 200.
ASPONGOPUS, lviii, p. 87.
alternans, 85.
amethystinus, 75.
brunneus, 87.
circumcinctus, 91.
depressicornis, 85.
fuscus, 90.
janus, 88.
marginalis, 90.
nepalensis, 90.
nigriventris, 89.
nigroaeneus, 91.
obscurus, 88.
ochreus, 89.
sanguinolentus, 89.
siccifolius, 89.
unicolor, 90.
vicinus, 88.
ASTYANAX, lvii, p. 129.
trimaculatus, 130.
ASYLA, lvii, p. 164.
indicatrix, 165.
ATELIDES, lviii, p. 94.
centrolineatus, 94.
ATELOCERA, lviii, p. 102.
furcatus, 102.
AUDINETIA, lvii, p. 176.
aculeata, 177.
spinidens, 177.
AXIAGASTUS, lvii, p. 128.
rosmarus, 129.

B.

BAGRADA, lvii, p. 58.
picta, 58.
BASICRYPTUS, lviii, p. 99.
illuminatus 99.
BATHYCOELIA.
indica, lvii, p. 145.
BELLOCORIS, lvi, p. 187.
BELOPIS, lvii, p. 9.
unicolor, 9.
BESSIDA, lvii, p. 84.
scutellaris, 84.
BLACHIA, lvii, p. 171.
ducalis, 171.
BOLACA, lvii, p. 69.
unicolor, p. 70.
BRACHYAULAX, lvi, p. 163.
oblonga, 164.
BRACHYPELTA, lvi, p. 49.
aterrimus, 50.
elevata, 50.
tristis, 50.
BRACHYPLATY's lvi, p. 26.
adjuncta, 30.
bistriga, 29.
burmeisteri, 29.
cognata, 29.
nitidus, 29.
radians, 27.
silphoides, 28, 29.
subaeneus, 28.
Vahlii, 27.

C.

CAENINA, lvi, p. 191.
variolosa, 191.
CALACTA, lvi, p. 24.
lugubris, 35.
rufo-notata, 24.
CALLIDEA, lvi, p. 166.
abdominalis, 181.
baro, 167.
basilica, 172.
bengalensis, 172.
coelestis, 178.
contraria, 191.
coxalis, 169.
dilaticollis, 181.
dispar, 149.
distinguenda, 167.
dorsalis, 179.
eques, 179.
fascialis, 189 : lvii, p. 184
formosa, 179.
gibbula, 190.
grandis, 166.
histeroides, 190.
lanius, 163.
lateralis, 182.
marginella, 178.
nobilis, 165.
ocellata, 149.
obtusa, 183.
ornata, 176.
patricia, 172.
porphyricola, 176.
pulchella, 177.
purpurea, 174.
Roylii, 182.
Schwaneri, 179.
scripta, 190.
sexmaculata, 168.
spinigera, 183.
Stockerus, 172, 174, 181.
Stollii, 175.
sumatrana' 181.
CALLIPHARA, lvi, p. 161, 164.
amethystina, 163.
baro, 167.
buquetii, 165.
dispar, 149.
grandis, 166.
Iris, 168.
nepalensis, 163.
nobilis, Fabr., 162.
nobilis, Linn., 165.
oblonga, 164.
obscura, 165.
CALLIPREPES, lviii, p. 47.
Grayi, 48.
CANTAO, lvi, p. 149.
dispar, 149.
ocellatus, 149.
rufipes, 149.
CANTHECONA, lvii, p. 173.
binotata, 174.
furcellata, lvii, p. 175.
tibialis, lvii, p. 174.
CAPPAEA, lvii, p. 21.
multilinea, 22.
taprobanensis, 22.
CARBULA, lvii, p. 43.
biguttata, 44.
fusca, 44.
obscura, 44.
scutellata, 45.
CARENOSCAPTUS, lvii, p. 127.
maculipes, 127.
CARPOCORIS, lvii, p. 29.
baccarum, 30.
nigricornis, 29, 183.
CATACANTHUS, lvii, p. 70.
aurantius, 71.
incarnatus, 71.
CAZIRA, lvii, p. 171.
chiroptera, 173.
internexa, 172.
ulcerata, lvii, p. 173.
verrucosa, 172, 173.
CECYRINA, lvii, p. 170.
platyrhinoides, 170.
Cephaloctenus, lvi, p. 37.
CEPHALOCTEUS, lvi, p. 37.
melolonthoides, 37.
CERATAULAX, lvi, p. 201.

CHILOCORIS, lvi, p. 57.
nitidus, 57.
parumpunctatus, 58.
piceus, 58.
CHRYSOCORIS, lvi, p. 166, 170.
andamanensis, 171, 177.
atriventris, 170, 171.
coxalis, 169.
dilaticollis, 171, 181.
elatus, 170, 172.
eques, 171, 179.
fascialis, lvii, p. 184.
grandis, lvi, p. 166.
hypomelaena, 171.
Iris, 168.
marginellus, 171, 178.
ornatus, 171, 176.
patricius, 170, 172.
porphyricolus, 171, 176.
pulchellus, 171, 177.
purpureus, 170, 174.
Stockerus, 181.
Stolii, 171, 175, 181.
viridis, 170, 175.
CIMEX,
ajer, lviii, p. 88.
amethystinus, 75.
anchora, lvii, p. 135.
aterrimus, lvi, p. 50.
aurantius, lvii, p. 71.
baccarum, 30, 31.
beryllus, 125.
bicolor, lvi, p. 60.
biguttatus, lvii, p. 44.
binotatus, 44.
bispinosus, lvi, p. 194.
boutanicus, lvii, p. 155.
brevipennis, lvi, p. 59.
brevicorne, lviii, p. 92.
brunneus, 87.
cappata, lvii, p. 183.
chinensis, lviii, p. 56.
cinerea, lvii, p. 183.
cinnamomeus, 23.
clavatus, lvi, p. 203.
coarctatus, 195.
coeruleus, lvii, p. 169.
cordiger, 184.
corneus, 183.
cribrarius, 31.
cruciatus, 137.
dama, 160.
dentatus, 7.
dispar, lvi, p. 149.
dominulus, lvii, p. 53.
Drurei, lvi, p. 153.
elector, lvii, p. 180.
eques, lvi, p. 179.
erynyii, lvii, p. 29.
fallax, 52.
fasciatus, lvi, p. 162.
festivus, lvii, p. 52, 53.
fimbriatus, 124.
flavescens, lvii, p. 143.
Frischii, 183.
fullo, 5.
furcellatus, lvii, p. 175.
gastricus, 14.
graminous, 118.
grandis, lvi, p. 166.
guttatus, lvii, p. 6.
gultigerus, 39.
hamatus, 150.
hemichloris, 120.
histrio, 142.
Hübneri, 143.
humeralis, 150.
incarnatus, 71.
Janus, lviii, p. 88.
javanicus, 55.
limbatus, lvii, p. 59.
luridus, 180.
mactans, 182.
malabaricus, 182.
marmoreus, 23.
maurus, lvi, p. 188.
melanopus, lvii, p. 71.
mucoreus, 5.
niger, lvi, p. 50.
nigricornis, lvii, p. 29.
nigripes, 71.
nobilis, Linn., lvi, p. 165.
nobilis, Fabr., 161.
nubilus, lvii, p. 48.
obscurus, lviii, p. 88.
ocellatus, 149.
oculatus, Fabr., lvi, p. 202.
oculatus, Fabr., lvii, p. 182.
ornatus, 54.
papillosus, lviii, p. 56.
patricius, lvi, p. 172.
pictus, lvii, p. 58.
picus, 23.
prasinus, 28.
purpureipennis, 183.
pustulatus, lvi, p. 165.
rubens, lviii, p. 75.
rubrofasciatus, lvii, p. 143.
Schranki, 183.
seladonicus, 118.
serratus, 150.
silphoides, lvi, p. 28.
sinensis, lviii, p. 56.
smaragdulus, lvii, p. 119.
spinidens, 177.
spinipes, lvi, p. 54.
spirans, lvii, p. 120.
Stockerus, lvi, p. 174.
Stollii, 175.
sulcatus, lvii, p. 7.
surinamensis, lviii, p. 88.
taurus, lvii, p. 159.
testudinaria, 183.
torquatus, 120.
tristis, lvi, p. 50.
uniguttatus, lviii, p. 28.
Vahlii, lvi, p. 27.
verbasci, lvii, p. 31.
viridissimus, Poda, 28.
viridissimus, Wolff, 120.
viridulus, 120.
CINXIA, lvii, p. 59.
limbata, 59.
CLINOCORIS, lviii, p. 35.
cruciger. 36.
maculatus, 37.
punctatus, 36.
recurvus, 35.
scutellata, 37.
CODOPHILA, lvii, p. 32.
maculicollis, 32.
COELOGLOSSA, lvi, p. 146.
COENINA, lvi, p. 191.
variolosa, 191.
COLPOPROCTUS, lviii, p. 87.
COMPASTES, lvii, p. 154.
boutanicus, 155.
spinosus, 155.
truncatus, 155.
COPTOSOMA, lvi, p. 30.
assamensis, 35.
atomarium, 31.
brevis, 35.
cicatricosa, 34.
cincta, 33.
cinctum, 32, 33.
circumscripta, 32.
cribraria, 31.
duodecimpunctata, 30.
fimbriata, lvii, p. 10.
integra, lvi, p. 35.
nepalensis, 32.
pardalina, 32.
parvula, 34.
punctiventris, 35.
sphaerula, 33.
tigrina, 35.
xanthochlora, 34.
COSMOCORIS, lvi, p. 166, 169.
CRATONOTUS, lvii, p. 47.
coloratus, p. 47.
CRESPHONTES, lvii, p. 134.
nigro-maculatus, 134.
CRESSONA, lviii, p. 96.
valida, 97.
CRITHEUS, lvii, p. 130.
lineatifrons, 131.
CUSPICONA, lvii, p. 147.
antica, 149.
curtispina, 148.
plagiata, 148.

smaragdina, 149.
virescens, 148.
CYCLOPELTA, lviii, p. 85.
obscura, 85.
siccifolia, 89.
tartarea, 86.
trimaculata, 86.
CYDNINA, lvi, p. 36.
CYDNUS, lvi, p. 46, 49.
apicalis, 55.
aterrimus, 50.
bicolor, 60.
brevipennis, 59.
brunneus, 54.
brunnipennis, 50.
carbonarius, 50.
cyrtomenoides, 50.
elongatus, 56.
indicus, 47.
laticeps, 52.
latipes, 39.
nigritus, 52.
nubilosa, 60.
oblongus, 56.
pallidicornis, 55.
proximus, 54.
rarociliatus, 55,
sanguinicollis, 50.
spinipes, Schrk, 50.
spinipes, Fabr., 54.
tristis, 50.
varians, 50.

D.

DALCANTHA, lviii, p. 80.
dilatata, 81.
inermipes, 81.
regia, 81.
Sancti Fargavii, 77.
Servillei, 80.
Stàlii, 81.
DALPADA, lvi, p. 202.
affinis, 205.
alternans, 205.
angulicollis, lvii, p. 1,
apicifera, 4.
aspersa, lvi, p. 202.
brevis, lvii, p. 4.
brevivitta, 2.
bulvifera, 1.
cinctipes, 4.
clavata, lvi, p. 203.
concinna, 204
confusa, lvii, p. 3.
consobrina, 4.
nigricollis, lvi, p. 204.
nodifera, lvii, p. 4.
obtusicollis, 26.
oculata, lvi, p. 202.
pilicornis, 203.
remota, lvii, p. 23.
tecta, 3.
triguttata, 1.
trimaculata, 1.
varia, lvi, p. 205.
versicolor, 203.
DALSIRA, lviii, p. 97.
glandulosa, 98.
DINIDORINA, lviii, p. 85.
DINIDOR, lviii, p. 85.
amethystinus, 76.
depressicornis, 85.
DIPLORHINUS, lviii, p. 101.
furcatus, 102.
quadricornis, 101.
DIPLOSTIRA, lvii, p. 127.
valida, 127.
DOLYCORIS, lvii, p. 30.
baccarum, 30, 31.
indicus, 32.
verbasci, 31.

E.

EDESSA.
amethystina, lviii, p. 75.
aurantia, lvii, p. 71.
brevicornis, lviii, p. 92.
dama, lvii, p. 160.
glandulosa, lviii, p. 98.
guttata, lvii, p. 6.
hamata, 150.
Janus, lviii, p. 88.
marmorea, lvii, p. 23.
nigripes, 71.
obscura, lviii, p. 88.
picus, lvii, p. 23.
rubens, lviii, p. 75.
taurus, lvii, p. 159.
ELASMOSTETHUS, lviii, p. 35.
ELASMUCHA, lviii, p. 35.
ELVISURA, lvi, p. 145.
Spinollae, 135.
EMBOLOSTERNA, lviii, p. 52.
taurus, 53.
ERTHESINA, lvii, p. 5.
acuminata, 7.
fullo, 5.
guttata, 6.
mucorea, 5.
EUCORYSSES, lvi, p. 166.
grandis, 166.
pallens, 167.
superbus, 166.
EURHYNCHIOCORIS, lviii, p. 51
sparsipunctatus, 51.
EUROSTUS, lviii, p. 69.
grossipes, 70.
validus, 69.
EURYASPIS, lvii, p. 132.
transversalis, 133.
EURYDEMA, lvii. p. 51.
albiventris, var., 52, 183.
Christophi, var., 184.
cruentatum, var., 52.
dauricum, 53.
decoratum, var., 183.
dominulum, 53, 183, 184.
Fallenii, var., 54.
festivum, 52, 183.
Hoffmanseggi, var., 54.
lhesgicum, var., 53.
maracandicum, var., 183.
mehadiense, var., 184.
multipunctata, 56.
ornatum, 54, 184.
pulchrum, 55.
sumatrana, 55.
ventralis, var., 54, 184.
Wilkinsi, 54.
EURYGASTER, lvi, p. 187.
cognatus, 188.
maurus, 187.
nigra, var., lvii, p. 183.
orientalis, lvi, p. 188.
signata, var., lvii, p. 183.
EURYSASPIS, lvii, p. 132.
EUSARCORIS, lvii, p. 41.
EUSTHENES, lviii, p. 63.
antennatus, 68.
cupreus, 67.
elephas, 64.
eurytus, 67.
Hercules, 66.
minor, 65.
Polyphemus, 68.
r bustus, 64.
saevus, 68.
scutellaris. 65.
Thesens, 67.
EYSARCORIS, lvii, p. 41.
distacta, 40.
dubia, 40.
epistomalis, 183.
guttigerus, 39.
Helferi, 183.
inconspicuus, 42, 183.
insocius, 43.
Mayeti, var., 42.
megaspilus, 42.
misellus, 42.
nepalensis, 39.
pseudoaeneus, 183.
rugulosus, var., 39.
simplex, 42.
ventralis, 41.

F.

FITHA, lvi, p. 191.
ardens, 191.

G.

Galostha, lvi, p. 166.

eques, 179.
Stockerus, 181.
Gampsotes. lvi, p. 52.
parallelus, 52.
Gellia, lviii, p. 105.
nigripennis, 105.
obtusa, 106.
GEOBIA, lvi, p. 45.
Geocorisae, lvi, p. 23.
Geotomus, lvi, p. 55.
abdominalis, 57.
elongatus, 56.
jucundus, 56.
minutus, 56.
pygmaeus, 55.
subtristis, 56.
GLOBOCORIS lvi, p. 30.
Glypsus, lvii, p. 179.
fascispinus, 179.
Gonopsis, lviii, p. 100.
rubescens, 100.
Graphosoma.
trimaculata, lvii, p. 130.
Gynenica, lvii, p. 45,
affinis, 46.
marginella, 46.

H.

Halyomorpha, lvii, p. 23.
murrea, 25.
picus, 23.
scutellata, 24.
timorensis, 23.
Halys, lvii, p. 7.
alternans, lvi, p. 205.
amygdali, lvii, p. 4.
assimilis, 10.
clavata, lvi, p. 203.
concinna, 204.
dentata, lvii, p. 8.
exsculpta, 4.
hellenica, 4.
mucorea, 5.
nigricollis, lvi, p. 204.
nubila, lvii, p. 48.
obscura, lvi, p. 204.
oculata, 202.
serricollis, lvii, p. 8.
serrigera, 7.
timorensis, 23.
versicolor. lvi, p. 203.
HOFFMANSEGIELLA, lvii, p. 148.
curtispina, 148.
Hoplistodera, lvii, p. 68.
incisa, 69.
trimaculata, 130.
virescens, 69.
Hotea, lvi, p. 184.
curculionides, 185.
diffusa, 186.
nigrorufa, 185.
Hyllus, lvii, p. 122.
aeruginosus, 123.
florens, 123.
Hypencha, lviii, p. 59.
apicalis, 60.
luctuosa, 59.
ophthalmica, 60.
Reriki, 60.
Hyperoncus, lvi, p. 148.
lateritius, 148.

J.

Jurtina, lvii, p. 145.
indica, 145.

L.

Lactistes, lvi, p. 42.
rastellus, 43.
truncato-serratus, 44.
vicinus, 43.
Lamprocoris, lvi, p. 181.
lateralis, 182.
obtusus, 183.
Roylii, 182.
spinigor, 183.
LAMPROPHARA, lvi, p. 164.
Laprius, lvii, p. 13.
gastricus, 14.
varicornis, 13.
LEGNOTUS, lvi, p. 59.
brevipennis, 59.
Lygaeus.
argus, lvii, p. 182.
hastatus, 107.
mactans, lvii, p. 182.
malabaricus, 182.

M.

Macrina, lviii, p. 102.
coccinea, 103.
dilatata, 102.
Macroscytus, lvi, p. 53
brunneus, 54.
expansus, 55.
foveolus, 53.
Mattiphus, lviii, p. 70.
aeruginosus. 71.
carrenvi, 71.
laticallis, 71.
nigridorsis, 72.
oblongus, 71.
Mecidea, lvi, p. 201.
indica, 201.
Megarhynchus, lviii, p. 106.
diversus, 108.
elongatus, 107.
hastatus, 107.
limatus, 108.
quadrispinosus, 104.
rostratus, 107.
testaceus, 107.
transversalis, 108.
truncatus, 107.
Megymenum, lviii, p. 91.
brevicorne, 92.
cupreum, 93.
inerme, 93.
Meratii, 93.
subpurpurascens, 93.
Melanophara, lvi, p. 199.
dentata, 199.
Menidaria, lvii. p. 133.
Menida, lvii, p. 139.
distincta, 141.
flavovaria, 140.
formosa, 140.
histrio, 142.
Signoretii, 139.
varipennis, 141.
Microdeuterus, lviii, p. 20.
Dallasi, 21.
megacephalus, 21.
Mormidea.
baccarum, lvii, p. 31.
florens, 123.
nigriceps, 165.
nigricornis, 29, 30.
socia, 165.
Muscanda, lviii, p. 83.
testacea, 84.
Myrocharia, lvii, p. 12.

N.

NEUROSCIA, lvii, p. 48.
grata, 48.
sulciventris, 48.
Nezara, lvii, p. 119.
pellucida, 143.
prasina, 119.
smaragdula, 119.
viridula, 119.
Niphe, lvii, p. 19.
cephalus, 20.
elongata, 20.

O.

Odontoscelaria, lvi, p 188.
Odontotarsus.
maurus, lvi, p. 188.
pictus, 188.
Odontotarsaria, lvi, p. 186.
Oestopis, lvii, p. 8.
terra, 9.
Oncomerus.
robustus, lviii, p. 64.
Oncylaspis, lvi, p. 24.
ruficeps, 25.
Orthoschizops, lvii, p. 10,
assimilis, 10.

OXYPRYMNA, lvi, p. 145.
Spinolae, 145.
OXYLOBUS, lviii, p. 79.
nigromarginatus, 80.

P.

PACHYCORIS.
curculionides lvi, p. 185.
nepalensis, 150.
punctulatus, 185.
PALOMENA, lvii, p. 27.
amplificata, 28.
Reuteri, 27.
spinosa, 27.
viridissima, 28.
PARAMECOCORIS.
gastricus, lvii, p. 14.
PARAMECUS, lvii, p. 17.
ruficornis, 17.
PELTOXYS, lvi, p. 59.
brevipennis, 59.
pubescens, 59.
PENTATOMA.
albonotata, lvii, p. 161.
aliena, 177.
anchora, 135.
arabica, 32.
aurantiacum, 71.
baccarum, 30, 31.
bengalensis, 161.
berylina, 120.
bimaculata, 44.
cephalus, 20.
chinensis, 120.
chloris, 120.
chlorocephala, 120.
coeruleum, 169.
concinna, 169.
confusa, 31.
crassiventre, 162.
crossota, 124.
cruciata, 135, 137.
decorata, 183.
elongata, 20.
fimbriata, Westw., 162.
fimbriata, Fabr., 124.
fimbriolata, Germ., 184.
fimbriolatum, H. S., 124.
flavicollis, 120.
flavicornis, 120.
formosa, 140.
grata, 48.
Halys, 23.
inconcisa, 163.
inconspicuum, 42.
indica, 161.
Janus, lviii, p. 88.
lateralis, Wlk., lvii, 163.
lateralis, Westw., 162.
latipes, 26.
Leei, 120.
lineatocollis, 37.
luridum, 181.
maculicollis, 32.
miscella, 42.
nepalensis, 39.
nigricornis, 29.
nigripes, 71.
obscura, 44.
ornata, 54.
pallicornis, 41.
pallida, 30.
parvula, 34.
picta, 52.
plicaticollis, 120.
propinqua, 120.
proxima, 120.
pulchra, Westw., 55.
pulchra, Dallas, 136.
punctipes, 39.
pusilla, 183.
smaragdula, 119.
subturida, 181
subsericea, 120.
taprobanensis, 22.
timorensis, 23.
trimaculata, 1.
tripunctigera, 120.
trispila, 164.
trivialis, 23.
unicolor, Westw., 120.
unicolor, Westw., 161.
varipennis, 141.
ventralis, 41.
verbasci. 31.
verrucosa, 172.
vicaria, 163.
violacea, 169.
PENTATOMIDAE, lvi, p. 23.
PENTATOMINA, lvi, p. 192: lvii, p 16.
PHYLLOCEPHALINA, lviii, p. 96.
PHYLLOCEPHALA. lviii, p. 97.
distans, 102.
furcata, 104.
glandulosa, 98.
PICROMERUS, lvii, p. 177.
nigrivitta, 178.
obtusus, 178.
robustus, 178.
spinidens, 177.
PIEZODORUS, lvii, p. 143.
rubrofasciatus, 143.
PIEZOSTERNUM, lviii, p. 82.
cribratum, 83.
firmatum, 83.
ingenuum, 83.
PLACOSTERNUM, lvii, 158.
alces, 160.
dama, 160.
cervus: 159.
taurus, 159.
PLATASPINA, lvi, p. 23.
PLATASPIS, lvi, p. 24.
nitens, 24.
nitidus, 29.
ruficeps, 25.
subaenea, 28.
Vahlii, 27.
PLATYCEPHALA, lvi, p. 26.
PLATYDIUS, lviii, p. 93.
subpurpurascens, 93.
PLATYPLEURUS, lvi, p. 187.
PLAUTIA, lvii, p. 124.
fimbriata, 124.
PLEXIPPUS, lvii, p. 18.
dorsalis, 18.
PODISUS, lvii, p. 180.
angustus, var., 181.
luridus, 180.
PODOPARIA, lvi, p. 192.
PODOPS.
bispinosus, lvi, p. 195.
limosus, 197.
luridus, 194.
niger, 196.
obscurus, 196.
spinifera, 196.
tarsalis, 195.
POECILOCHROMA, lvi, p. 150.
Childreni, lvi, p. 150.
Druraei, 153.
Hardwickii, 151.
interrupta, 155.
lata, 152.
obesa, 158.
ornata, 153.
pulchra, 256.
purpurascens, 156.
rufigenis, 158.
POECILOCORIS, lvi, p. 150.
anisospilus, 159.
Childreni, 157.
Druraei, 153.
Hardwickii, 150.
interruptus, 155.
latus, 152.
obesus, 158.
obsoletus, 154.
ornatus, 153.
pulcher, 156.
purpurascens, 156.
rufigenis, 158.
POECILOMETIS.
mistus, lvii, p. 23.
POSEIDON, lvi, p. 25.
malayanus, 26.
PRIONACA, lvii, p. 157.
exempta, 158.
lata, 158.

PRIONOCHILUS, lvii, p. 156.
octopunctatus, 157.
PYCANUM, lviii, p. 75.
amethystinum, 76.
amplicolle, 74.
Amyoti, 74.
angulatum, 73.
jaspideum, 78.
nigromarginatum, 80.
pallipes, 79.
ponderosum, 77.
pretiosum, 77.
rubens, 75.
rubidum, 78.
smaragdiferum, 73.
stabile, 78.
PYGOPLATYS, lviiii, p. 61.
acutus, 61.
minax, 62.
roseus, 61.

R.

RHAPHIGASTER.
albidens, lvii, p. 140.
apicalis, 166.
bisignatus, 167.
concinnus, 142.
flavolineatus, 143.
flavovarius, 140.
humeralis, 122.
macracanthus, 166.
oceanicus, 143.
orbus, 120.
patulus, lvii, p. 167.
prasinus, 119.
rubriplaga, 168.
smaragdulus, 120.
spectandus, 140.
spinosus, 122.
strachioides, 167.
subsericeus, 120.
torquatus, 120.
varipennis, 141.
virescens, 143.
RHYNCHOCORARIA, lvii, p. 147.
RHYNCHOCORIS, lvii, p. 149.
humeralis, 150.
octopunctatus, 157.
serratus, 150.

S.

SABAEUS, lvii, p. 121.
spinosus, 122.
SAGRIVA.
vittata, lviii, p. 96.
SASTRAGALA, lviii, p. 27.
binotata, 28.
heterospila, 29.
lineata, 28.
mustelina, 29.
parmata, 30.
rufispina, 29.
uniguttata, 28.
SCAPTOCORIS, lvi, p. 39.
callidus, 41.
molginus, 39.
tabulatus, 40.
SCHIZMATOPS, lviii. p. 100
SCHIZOPS, lviii, p. 99.
insignis, 100.
SCHYZOPS, lviii, p. 99.
SCIOCORIS, lvii, p. 11.
indicus, 12,
lateralis, 11.
varicornis, 13.
SCOPARIPES, lvi, p. 44.
longirostris, p. 45.
SCOTINOPHARA, lvi, p. 193.
affinis, 193.
bispinosa, 194.
coarctata, 195.
limosa, 197.
lurida, 194.
nigra, 196.
obscura, 196.
spinifera, 196.
tarsalis, 195.
SCUTELLARIA, lvi, p. 148.
SCUTELLERINA, lvi, p. 145.
SCUTELLERA, lvi, p. 161.
amethystina, 163.
Buquetii, 165.
cincta, 33.
dilaticollis, 181.
dispar, 149.
Druraei, 153.
eques, 179.
fasciata, 162.
Hardwickii, 151.
interrupta, 155.
laniae, 163.
lateralis, 182.
nobilis, 161.
oblonga, 164.
patricia, 172.
pulchella, 182.
purpurascens, 156.
rubropunctata, 147.
Stockerus, 174, 175.
trimaculata, lvii, p. 130.
SCYLAX, lvii, p. 34.
macrinus, 35.
porrectus, 35.
SEHIRUS, lvi, p. 60.
bicolor, 60.
SESHA.
manifesta, lvii, p. 171.
SIPHNUS, lviii, p. 57.
Alcides, 58.
dilatatus, 58.
Hector, 58.
SOLENOSTETHIUM, lvi, p. 146.
chinense, 147.
rubro-punctatum, 147.
SOLENOSTHEDIUM lvi, p. 146.
SOPHELA, lvi, p. 181.
spinigera, 183.
SPHAEROCORARIA, lvi, p. 147.
SPHAEROCORIS, lvi, p. 148.
lateritius, 148.
STENOZYGUM, lvii, p. 56.
speciosum, 57.
STIBAROPUS, lvi, p. 38.
brunneus, 39.
callidus, 41.
flavidus, 41.
latipes, 39.
minor, 42.
molginus, 39.
tabulatus, 40.
testaceus, 42.
STORTHECORIS, lvi, p. 197.
nigriceps, 197.
STIRETRUS.
coeruleus, lvii, 169.
STOLLIA, lvii, p. 38.
distacta, 40.
dubia, 40.
fuliginosa, 39.
guttigera, 39.
misella, 42.
rectipes, 40.
rugulosa, 39.
STRACHIA, lvii, p. 60.
afflicta, 61.
conspicua, 54.
crucigera, 60.
decorata, 184.
designata, 62.
dissimilis, 184.
festiva, 53.
flammula, 60.
herbacea, 54.
heterospila, 65.
inornata, 61.
limbata, 59.
liturifera, 62.
ornata, 54.
pardalis, 64.
pectoralis, 184.
picta, Hahn, 52.
picta, Dallas, 58.
platyspila, 64.
pulchra, 55.
pustulata, 184.
securigera, 63.
speciosa, 57.
strangulata, 61.
velata, 65.

T.

TARICHEA, lvi, p. 23.
chinensis, 35.
nitens, 24.
TECTOCORIS.
affinis, lvi, p. 150.
Childrenii, 157.
Hardwickii, 150.
interrupta, 155.
nepalensis, 163.
nobilis, 162.
oblonga, 164.
obscura, 165.
perplexa, 162.
purpurascens, 156.
TESSERATOMINA, lviii, p. 52.
TESSARATOMA, lviii, p. 53.
alternata, 75.
angularis, 55.
apicalis, 60.
chinensis, 56.
conspersa, 55.
cornuta, 53.
cuprea, 67.
furcifera, 57.
javana, 55.
javanica, 55.
luctuosa, 59.
malaya, 54.
nigripes, 54.
obscura, 85.
ophthalmica, 60.
ossa-cruenta, 56.
papillosa, Drury, 56.
papillosa, Blanch., 55.
picea, 60.
proxima, 55.
robusta, 64.
scutellaris, 65.
Sonneratii, 56.
taurus, 53.
timorensis, 55.
TETRARTHRIA, lvii, p. 159.
lineata, 160.
marginepunctata, 160.
quinquemaculata, 160.
tetraspila, 167.
variegata, 160.
TETRATOMA, lvii, p. 37.
TETRISIA, lvii, p. 168.
bruchoides, 168.
TETRODA, lviii, p. 103.
atomaria, 104.
bilineata, 105.
divaricata, 104.
histeroides, 104.
nigripennis, 105.
obtusa, 106.
transversalis, 108.
TETYRA.
baro, lvi, p. 167.
bispinosa, 194, 195.
cribraria, 31.
dispar, 149.
Druraei, 153.
eques, 179.
lurida, 194.
maura, 187, 188.
nobilis, 162.
patricia, 172.
picta, 188.
silphoides, 28.
Stockerus, 174.
Vahlii, 27.
THALMA, lviii, p. 94.
bigutta, 94.
THYREOCORIS.
austriacus, lvi, p. 188.
cinctus, 33.
circumscriptus, 32.
cribraria, 31.
duodecimpunctatus, 30.
nepalensis, 32.
nitidus, 29.
seminulus, 33.
septus, 28.
silphoides, 29.
sphaerula, 33.
Vahlii, 27.
variegatus, 33.
TOLUMNIA, lvii, p. 26.
latipes, 26.
TRITOMEGAS, lvi, p. 60.
bicolor, 60.
TROPICORARIA, lvii, p. 150.
TROPICORIS, lvii, p. 151.
laeviventris, 151.
punctipes, 152.
TYLONCA, lvi, p. 185.
TYPHLOCORIS, lviii, p. 47.
semicircularis, 48.

U.

UDANA, lvi, p. 202.
UROCHELA, lviii, p. 38.
bimaculata, 41.
discrepans, 42.
ferruginea, 43.
guttulata, 40.
obscura, 41.
pilosa, 40.
pulchra, 42.
quadripunctata, 39.
UROLABIDA, lviii, p. 47.
binotata, 49.
Chennelli, 50.
Grayii, 48.
histrionica, 48.
khasiana, 50.
semicircularis, 48.
tenera, 49.
uniloba, 49.
UROLABIDINA, lviii, p. 38.
UROSTYLINA, lviii, p. 38.
UROSTYLIS, lviii, p. 43.
fumigata, 45.
gracilis, 44.
histrionicus, 48.
lopoides, 46.
nigromarginatus, 46.
notulata, 44.
pallida, 44.
philoides, 45.
punctigera, 43.

V.

VIRBIUS, lviii, p. 73.
angulatus 73.

Z.

ZANGIS, lvii, p. 125.
beryllus, 125.
ZICRONA, lvii, p. 169.
coerulea, 169.
illustris, 169.

INDEX.†

☞ Names of New Genera and Species have an asterisk (*) prefixed.

Acanthodrilus, 111
Acesina, 412.
Acræa, 134
Acrotema, 361, 363
" costatum, 363
" Wrightianum, 364
Actias, 416
Actinurus, 352
" neptunius, 351
* " ovatus, 351, 358
Adelpha, 126
Æcidium, 238, 240, 242, 243, 245, 248, 250, 251
" setosa, 251
" Strobilanthis, 243
" Urticæ, 234, 250
" " var. Himalayense, 234, 244
" Wallichii, 251
*Ælurillus quadrimaculatus, 334
Æmona amathusia, 118, 124
" pealii, 124
Æsopia cornuta, 287
Æthalochroa, 310, 318
" affinis, 313
" ashmoliana, 312
" " var. insignis, 313
" " var. simplicipes, *ib.*
* " spinipes, *ib.*
Agarista, 131, 134
Agrostis, 249
" Hookeriana, 249, 251
Allotinus, 414, 415, 436, 437, 440
" alkamah, 437, 438
" aphocha, 437
" drumila, *ib.*
" multistrigatus, *ib.*
" nivalis, 436, *ib.*
" subviolaceus, *ib.*
" unicolor, *ib.*
Alsodeia, 399, 400
* " capillata, 407
* " cinerea, 403
" " var. hirsutiflora, 404
* " comosa, 407
* " condensa, 405
" dasycaula, 402
" dasypyxis, 405
" echinocarpa, 406, 407
* " floribunda, 406
* " Hookeriana, 402, 403
* " Kunstleriana, 401
" lanceolata, 404, 405
" Maingayi, 402, *ib.*
* " membranea, 402
" mollis, 406
* " pachycarpa, 408
* " Scortechinii, 405, 406
" Wallichiana, 400, 401
* " Wrayi, 403
Alsoleiceæ, 399
Alytostylis, 397
Amblypodia, 409, 410
" andersonii, 426
" narada, 426
Amblypodinæ, 409
Anamirta, 377, 379.
" Loureiri, 379
Andropogon, 246
" tristis, 246
Anonaceæ, 359, 376
Anthistiria anathera, 246
Antitaxis, 378, 388
" calocarpa, 388
" fasciculata, *ib.*
" lucida, *ib.*
Anyphæna accentuata, 344
* " soricina, 344
Apatura, 126
" iris, 126
" namouna, *ib.*
* " ulupi, 125, 134

† For a general Index to names used in the papers on *Rhynchota* other than *Coccidæ* in this volume and in the two preceding volumes, see pp. 441—448 of the present volume.

Apatura (Eulaceura) osteria, 125
Apaturidæ, 125, 126
Aphnæinæ, 413, 426
Aphnæus, 410, 411, 413, 426
„ lohita, 428
Aphoristia, 292, 293
* „ gilesii, 293, 295
* „ wood-masoni, 294, 295
Apogon, 296
Appias, 121
„ figulina, 121
„ hippoides, 120
„ leis, 121
„ nero, *ib.*
Apporasa, 423
„ atkinsonii, 423
Aranea, 342
*Araotes, 411, 413, 428
„ lapithis, 428
Argyroepeira angustata, 341
Arhopala, 409, 410, 411, 412, 417
„ achelous, 421
„ adorea, 422
„ agaba, *ib.*
„ agelastus, 418, 419
„ agesias, 421
„ agnis, 418
„ aida, 421
„ albopunctata, *ib.*
„ alitæus, 420
„ ammon, 421
„ anarte, 417, 418
„ anthelus, 418
„ antimuta, 419
„ aroa, *ib.*
„ aronya, 421
„ atosia, 419
„ bazalus, *ib.*
* „ belphœbe, 421, 440
„ critala, 421
„ davisonii, 419
* „ duessa, 419, 421, 440
„ eumolphus, 416, 421, 422
„ farquharii, 416, 421, 422
* „ hellenore, 422, 440
„ inornata, 411
„ lycænaria, 418
„ maxwellii, 416, 422
„ metamuta, 409, 419
* „ mirabella, 420, 421
* „ pastorella, 418, 440
* „ perissa, 419, 440
„ subfasciata, 418
„ theba, 421
„ vihara, 409, 419
„ yendava, 419
„ (Nilasera) centaurus, 417
„ (Satadra) agaba, 422
„ „ aida, *ib.*
Ari æma, 233
Arius, 280
*Arnoglossus macrolophus, 280, 295.
* „ polylepis, 280, 295
Arrhenothrix, 428
Arrugia, 415
Arsacia, 310
„ ashmoliana, 312
Arundinella setosa, 215
„ Wallichii, *ib.*, 216
Astictopterus, 131
Auteupuccinia, 243
Barclaya, 389, 390
„ longifolia, 390
„ mottleyi, *ib.*
„ „ var. Kunstleri, *ib.*
*Bathymyrus, 305
* „ echinorhynchus, *ib.*
Bdelloida, 349
Belenois, 121
Biduanda, 411, 413, 425
„ fabricii, 425
„ lapithis, 413
„ melisa, 425, 426
* „ nicevillei, 426, 440
„ scæva, 425
* „ scudderii, 426, 440
„ thesmia, 121, 425, 426
Bindahara, 413
„ phocides, 427
Brachionidæ, 357
Brachionus bakeri, 357
* „ bidentata, *ib.*, 358
* „ longipes, *ib.*, *ib.*
„ militaris, 357
„ urceolaris, *ib.*
Brachypleura, 282
* „ xanthosticta, 281, 295
Brachypodium silvaticum, 251
„ sylvaticum, 248, *ib.*
Bromus, 246
Byblia dæ, 126
Calliana pieridoides, 133
Callidula, 133
Capellia, 364
Capila jayadeva, 132
Capparideæ, 359, 391
Capparis, 392
„ conspicua, 394
* „ cucurbitina, 393, 395
„ erythrodasys, 393
„ Finlaysoniana, *ib.*, 394, 395, 396
* „ Kunstleri, 396
* „ Larutensis, 393
„ micracantha, *ib.*, 394, 395
„ micrantha, *ib.*
„ publiflora, 393, 394
„ „ var. Perakensis, 394
* „ Scortechinii, 393, *ib.*
„ sepiaria, 393
„ trinervia, 394
Carcharias, 280

Carchesium, 349
Carex filicina, 250
„ setigera, 244, *ib.*
Castalius, 413
„ elna, 414
„ ethion, 434
„ manluena, 134
„ rosimon, 434
„ roxus, *ib.*
Castanea indica, 1
„ tribuloides, *ib.*
Catapœcilma delicatum, 121
Cathypna luna, 355
Cathypnidæ, *ib.*
Catochrysops, 434
„ cneius, 432
„ pandava, *ib.*
„ strabo, *ib.*
Catopœcilma, 413
„ elegans, 432
Catopsilia, 121, 416
*Cedicus bucculentus, 343
„ mœrentus, *ib.*
Cephalosiphon limnias, 347
*Cercidia punctigera, 341
Cervidæ, 187
Cervus, 186
„ affinis, *ib.*
„ aristotelis, *ib.*
„ cashmeerianus, *ib.*
„ dybowskii, *ib.*, 187, 188
„ mantchuricus, 187
Cethosia, 126, 131
Chaibassia, 327, 328, 329, 331, 333
„ theobaldi, 327, 328, 329
„ tricarinata, *ib.*, *ib.*, *ib.*
Champoodon vorax, 301, 302
Charaxes, 126
Charaxidæ, *ib.*
Cheritra, 411
„ freia, 427
„ freja, 130
Chilodipteus, 296
Chliaria, 427
* „ merguia, *ib.*, 440
„ othona, 427
Chrysophanus, 410
Chrysopogon cæruleus, 248, 251
„ gryllus, 247
Circæa alpina, 235
Cirrhochroa, 432
Cissampelideæ, 377
Cissampelos, 386, *ib.*
„ caapeba, 386
„ convolvulacea, *ib.*
„ delicatula, 387
„ discolor, 386, *ib.*
„ diversa, 387
„ elata, *ib.*
„ eriantha, *ib.*
„ grallatoria, *ib.*
Cissampelos hernandifolia, 386
„ hexandra, *ib.*
„ hirsuta, 387
„ mauritiana, 385
„ orbiculata, 387
„ Pareira, 386
„ sub-peltata, 387
Cistudo, 332
Clematideæ, 359, 360
Clematis, 360
„ cana, *ib.*
„ dentosa, *ib.*
„ glandulosa, *ib.*
„ Gouriana, *ib.*
„ javana, *ib.*
„ Munroana, *ib.*
„ similacifolia, *ib.*
„ similacina, 361
„ sub-peltata, 360
Clemmys, 332
„ trijuga, 327
Cleome, 391
„ aspera, 392
„ Burmanni, *ib.*
* „ Hullettii, *ib.*
„ pentaphylla, *ib.*
„ viscosa, 392
Clubiona germanica, 344
* „ hysgina, 343
Clypea Burmanni, 387
„ hernandifolia, 386
Coccidæ, 1
Coccina, *ib.*
Coccineæ, 377
Cocculus, *ib.*, 384, 385
„ Blumeanus, 382
„ Blumeanus, 381, *ib.*
„ coriaceous, 378
„ crispus, *ib.*
„ incanus, 385
* „ Kunstleri, 384
„ macrocarpus, 385
„ oblongus, 382
„ peltatus, 387
„ petiolaris, 378
„ triandrus, 382
„ velutinus, 383
„ verrucosus, 378
Colbertia obovata, 367
Colubridæ, 355
Colurus caudatus, *ib.*
Comosa, 278
Compositæ, 251
Coniferæ, 232
Coscinium, 377, 381
„ Blumeanum, 381
„ fenestratum, *ib.*
„ Maingayi, *ib.*
„ Wallichianum, *ib.*
„ Wightianum, *ib.*
Cottidæ, 303

Cratæva, 397, 399
„ hygrophila, 398
„ lophosperma, 399
„ macrocarpa, 397
„ magna, 398
„ membranifolia, *ib.*
„ Narvala, 399
Cupitha, 132
Curetis, 410
„ malayica, 428
Cyaniris, 128, 435
„ akasa, 435
„ danis, 421
„ duponchelii, 435
„ haraldus, *ib.*
„ jyntcana. *ib.*
„ metæna, 434, 440
„ placida, 434
„ puspa, *ib.*. 435
„ transpecta, 434
Cyclea, 378, 387
„ Arnotlii, 387
„ barbata, *ib.*
„ Burmanni, *ib.*
„ elegans, *ib.*
„ laxiflora, *ib.*
„ peltata, *ib.*
„ pendulina, *ib.*
„ versicolor, *ib.*
Cyclemys, 332
Cyclosa fissicanda, 338
„ oculata, *ib.*
„ spirifera, 337
Cyllene, 133
Cynoglossus, 280, 290
„ bengalensis, 288
„ brevis, 289
„ carpenteri, 287, 295
„ intermedius, 288
„ lida, *ib.*
„ macrolepidotus, *ib.*
„ melanopterus, 289
„ monopus, *ib.*
„ oligolepis, 288
„ puncticeps, 289
„ quadrilineatus, 288
„ semifasciatus, 289
Cynthia, 126
Cyrestis, 130
Dacalana, 428
„ vidura, 130, 428
Danuria, 306
„ bolauana, *ib.*
„ buchholzi, *ib.*
„ elongata, *ib.*
„ superciliaris, *ib.*
„ thunbergi, *ib.*
Darasana, 412
„ perimuta, 423
Davilla hirsuta, 362
Delima, 361
Delima glabra, 362
„ hebecarpa, *ib.*
„ intermedia, *ib.*
„ lævis, *ib.*
„ sarmentosa, *ib.*
„ „ var. glabra, *ib.*
„ „ „ hebecarpa, *ib.*
Delimeæ, 361
Delimopsis hirta, 362
Deramas, 417, 430
Deudoriginæ, 412, 413, 428
Deudorix, 413, 414
„ epiarbas, 428
„ epijarbas, *ib.*
Diglena forcipata, 353
Dilipa morgiana, 125, 126
Dillenia, 361, 365, 366, 367, 368
„ aurea, 367
„ elliptica, 366
„ eximia, 368
„ grandifolia, *ib.*
„ indica, 366
„ meliosmæfolia, 365
„ ornata, 367
„ ovata, 366
„ reticulata, 367
„ speciosa, 366, *ib.*
Dilleniaceæ, 359, 361
Dillenieæ, 361
Dinocharidæ, 353
Diplochicia, 385
„ pictinervis, *ib.*
Doleschallinae, 126
Dophla derma, 122
„ dunya, *ib.*
„ evelina, *ib.*
Drina donina, 428
Drupadia, 411, 425
„ boisduvalii, 425
„ moorei, 425
Dyctis pealii, 124, 134
Elymniadæ, 124
Elymnias, 423
„ caudata, 124
Emydidæ, 328
Emys, 332
Eöoxylides, 410, 411
„ tharis, 411
Epeira alpica, 339
„ camilla, 338
„ dioidia, 340
„ dromadaria, 338, *ib.*
„ himalayana, 339
„ laglaizei, 339
„ minutalis, 340
„ nympha, 339
„ prædata, *ib.*
„ thelura, *ib.*
„ trigutta, 340
Epistylis, 349
Epuccinia, 244

Equula, 280
Erycinidæ, 126, 130, 432
Euchera, 133
Euchlanidæ, 355
Euchlanis macrura, *ib.*
Eulaceura osteria, 125
Euptœa, 119, 133
„ core, 119
„ kollari, *ib.*
„ linnæi, 131
„ midamus, 119, 131
Euptœopsis telearchus, 130
Eupuccinia, 235, 243
Euripinæ, 126
Eurytelidæ, *ib.*
Euthalia, 121, *ib.*
„ aconthea, 122
„ anyte, 122
„ durga, *ib.*, 123
„ franciæ, 122
„ garuda, *ib.*
„ jama, *ib.*
„ kesava, *ib.*
„ lubentina, *ib.*
„ nara, *ib.*
„ patala, *ib.*
„ phemius, *ib.*
„ sahadeva, *ib.*
„ telchinia, *ib.*
„ vasanta, *ib.*
*Euthyphleps, 315
* „ rectivenis, 317
Euwormia, 365, 366
Everes, 434
„ kala, 433, 434
„ nysens, 434
„ parrhasius, *ib.*
„ putli, *ib.*
* „ umbriel, 433, *ib.*, 440
Fapilo, 415
Felderia andersonii, 122
„ cocytina, *ib.*
„ iapis, *ib.*
„ lepidea, *ib.*
„ macnairi, *ib.*
„ satropaces, *ib.*, 123
Festuca gigantea, 249
Fibraurea, 377, 380
„ chloroleuca, 380
„ tinctoria, *ib.*
*Flos, 412, 423
„ abseus, 423
„ apidanus, 412, 423
* „ artegral, 423, 440.
Floscularia ambigua, 346
„ campanulata, *ib.*
„ ornata, 345
* „ tenuilobata, 346, 358
Floscullariadæ, 345
Forma crepidis, 238
„ Hieracii, *ib.*
Fragaria vesca, 244
Furcularia forficula, 353.
„ longiseta, *ib.*
Galium aparine, 239
Gasteracantha, 336
* „ unguifera, *ib.*
*Gehlota, 131
„ hypsina, *ib.*
„ pinwilli. *ib.*
Geocenyda, 328, 329
„ tricarinata, 328
Geometra, 416
Geranium, 232
„ nepalense, 236
Gerydinæ, 128, 414, 416, 436, 437
Gerydus, 415, 440
* „ ancon, 438, 439, 440
„ biggsii, 440
„ boisduvalii, *ib.*
* „ croton, 439, *ib.*
*Glyptogona excelsa, 337
„ sextuberculata, *ib.*
Gynandropsis, 392
„ affinis, 392
„ pentaphylla, *ib.*
Hamadryas, 126
Hebomoia, 121
Hemicoccina, 1
Hemipuccinia, 237, 242, 243
Herona, 122
Hesperia, 415
„ satwa, 132
Hesperiadæ, 126, 131, 133.
Hestias, 131
Heterochæta, 307, 321
„ tenuipes, 308
„ tricolor, 309
*Heterochætula, 308, 321
* „ fissispinis, 309
„ tricolor, *ib.*
Hieracium, 238
*Homalattus mus, 335
Horaga onyx, 428
Hymettus, 133
Hypolimnas, 126
„ anomala, 121
„ bolina, 120
„ jacintha, *ib.*
Hypolycæna erylus, 427
„ libna, 413, 436
Hypserpa, 377, 383, 384
„ triflora, 384
Icio, 335
*Idiocerus atkinsoni, 252
* „ clypealis, *ib.*
* „ niveosparsus, *ib.*
„ notatus, *ib.*
Ilerda brahma, 417
Illicium, 369, 374
Illoricata, 352
Indoxylides, 410

Ioïs, 417
Iraota, 410
Ismene, 132, 133
Ixias, 119, 120
Jamides, 433
Jasminum grandiflorum, 232
Junonia, 118. 126
Kadsura, 369, 375
„ cauliflora, 375
„ japonica, 376
* „ lanceolata, *ib.*
„ Roxburghiana, *ib.*
„ scandens, 375, *ib.*
Kallima, 126
Kerana, 131
Kermes, 1, 2
Kurtus, 280
Lacinularia, 349
Lampidæ, 409
Lampides, 417, 421, 433
„ ælianus, 433
„ bochus, *ib.*
„ elpis, 421
„ marakata, 417
„ subdita, 433
Lariuia chlorei, 341
„ pubiventri, *ib.*
* „ quadrinotata, 340
Lecanina, 1
Lehera, 413
„ eryx, 416
Lemoniadæ, 413
Lemoninæ, 126
Leontoglossum scabrum, 362
Lepidoptera, 416
Leptopuccinia, 332, 233, 240
Lethe, 124, 133
„ hyrania. 124
„ margaritæ, *ib.*
* „ naga, 123, 134
„ verma, 124
Lexias cyanipardus, 122, 123
„ dirtea, *ib.*, *ib.*
„ recta, 121
„ tenta, *ib.*
„ tentoides, *ib.*
Libythea, 126
Limacia, 377, 382, 383, 384, 387
„ Amherstiana, 382
„ cuspidata, 384
„ distincta, 383
„ inornata, *ib.*
„ Kunstleri, *ib.*
„ microphylla, 384
„ oblonga, 382
„ triandra, *ib.*
„ velutina, 383
„ „ var. glabrescens, *ib.*
„ Wallichiana, 382
Limenitis, 126
Limnias annulatus, 347
Limnias ceratophylli, 347
Liphyra, 414, 415
„ brassolis, 129, 416
Liphyrinæ, 409, 416, 440
Logania, 128, 414, 415, 436, 440
„ andersonii, 413, 436
„ malayica, 436
„ marmorata, 415, *ib.*
„ sriwa, 415
„ substrigosa, 436, 437
Lophius, 302
* „ indicus, *ib.*
„ setigerus, *ib.*
Loricata, 353
Loxura, 410, 411, 413, 425, 432
„ atymnus, 130, 425
Lumbricidæ, 110
Lumbricus, *ib.*, 111
„ novæ-hollandiæ, 111
Lycæna, 413, 415, 432
Lycænæsthes, 414
„ bengalensis, 436
„ lycænina, *ib.*
Lycænidæ, 121, 126, 127, 130, 409, 411 414, 415, 416, 416, 432
Lycæninæ, 127, 128, 411, 413, 414, 432
Lysimachia, 250
Magnolia, 369, 370, 371, 372
* „ Maingayi, 369
Magnoliaceæ, 359, 368, 370, 371, 373
Magnoliad, 371
Magnoliæ, 368
Mahathala, 423
„ ameria, 422
*Malais, 414, 415, 436
„ sriwa, 436
Manglietia, 369, 371
„ Candollei, 373
„ glauca, 370
* „ Scortechini, *ib.*
„ Sebassa, *ib.*
Mantis undata, 307
„ (Danuria) superciliaris, 306
Marshallia, 410
*Massaga, 411, 417, 429
„ clorinda, *ib.*
* „ hartertii, 128, 134
„ pediada, 430, 431, 432, 440
„ potina, 431, 440
Megalotrocha alboflavicans, 348, 358
Megisba, 413
„ malaya, 435
Melanitis, 118, 120
„ determinata, 118
„ ismene, *ib.*
„ leda, *ib.*
Melanochelys, 331
„ trijuga, 328
Melicerta, 346, 350
„ ringens, 346
Melicertadæ, 346

Menispermaceæ, 359, 377
Menispermum crispum, 378
„ fenestratum, 381
„ orbiculatum, 387
„ peltatum, *ib.*
„ triandrum, 382
„ tuberculatum, 378
„ verrucosum, *ib.*
„ villosum, 385
Meta mixta, 342
Metopidia, 356
* „ angulata, *ib.*, 358
„ lepadella, 355, 356
„ solidus, 356
* „ torquata, *ib.*, 358
„ triptera, 356
*Miagrammopes extensa, 342
Michelia, 369, 371
„ aurantiaca, 371
„ Champaca, *ib.*
„ Doldoopa, *ib.*
„ montana, *ib.*
„ pubinervia, *ib.*
„ Rheedii, *ib.*
„ rufinervis, *ib.*
Micropuccinia, 232, 236
Miletus hamada, 414
*Minous inermis, 299
Moniligaster, 111
Monostyla bulla, 355
„ cornuta, *ib.*
„ quadridentata, *ib.*
Morphidæ, 124, 126
Mota massyla, 412
Muræniдæ, 304
Mycalesis, 118
„ mineus, *ib.*
„ visala, *ib.*
„ (Sadarga) charaka, 123
„ „ oculata, *ib.*
Myitta, 409
Mynes, 126
„ calydonia, 127
Myriactis nepalensis, 251
Myrina, 304
Nacaduba, 409
„ almora, 433
„ ardates, 432
„ atrata, *ib.*
„ dana, 433
„ macrophthalma, 432
„ pavana, *ib.*
„ viola, 433
Naravelia, 360
„ Finlaysoniana, 361
„ laurifolia, 361
Nelumbiceæ, 389
Nelumbium, *ib.*, 390
„ asiaticum, 391
„ mysticum, *ib.*
„ speciosum, *ib.*
Nelumbo, *ib.*
„ Indica, *ib.*
Nemeobiadæ, 432
Neocheritra, 410, 417
„ hypoleuca, 417
„ martina, *ib.*
Neomyrina, 413
„ hiemalis, 160
Neopithecops, 127, 128, 413, 414
„ harpago, 128
„ zalmora, 435, 437
Neorina, 124
„ lowii, *ib.*
„ margaritæ, *ib.*
Neotropidæ, 126
Nephila, 341
„ maculata, 342
Neptidæ, 126
Neptis, *ib.*
Nicoria, 331, 332
„ annulata, *ib.*, *ib.*
„ edeniana, 332
„ spengleri, 331
„ thermalis, 332
„ tricarinata, 330, 331, 332
„ „ var. sivalensis, 333
„ trijuga, 328, 329, 331, 332, 333
„ „ var. edeniana, 332
„ „ „ thermalis, *ib.*
„ (Clemmys) trijuga, 327
„ (Melanochelys) 331
„ „ trijuga, 328
Nilasera centaurus, 417
Niphauda, 414
„ cymbia, 435
„ tessellata, 414, 435
Noteus quadricornis, 358
Notommata ansata, 352
„ tripus, *ib.*
Notommatadæ, *ib.*
Noviciæ Indicæ, 255
Nymphæa, 389
„ Edgeworthii, 389
„ Hookeriana, *ib.*
„ Nelumbo, 391
„ punctata, 389
„ stellata, *ib.*, 390
„ „ var. parviflora, 389
„ „ „ versicolor, *ib.*
„ versicolor, *ib.*
Nymphæaceæ, 359, 388
Nymphalidæ, 126, 127
Nymphalis, 126
Œchistes, 347, 348, 350
„ serpentinus, 348
* „ stephanion, 347, 358
Ophichthyina, 304
Origanum vulgare, 242
Ornithoptera, 416, 417
„ brookeana, 416
Orthezia, 2

Pachyarches, 416
Pachygoneæ, 378
Pademma, 119
Paguridæ, 280
Panchala, 412
„ ganesa, *ib.*
Pangeranopsis elephenor, 130
Papilio, 124, 415
„ helenus, 124
„ (Euptœopsis) telearchus, 130
„ (Pangeranopsis elephenor, *ib.*
Papilionidæ, *ib.*
Paradanuria, 314
„ orientalis, 315
Paragerydus, 415, 437, 440
„ horsfieldii, 437, 438
„ nivalis, 436, 437
„ taras, 437, 440
Paramæcia, 356
*Parascombrops, 296
„ pellucidus, *ib.*
Parata chromus, 133
*Paratoxodera, 317, 318, 319, 324
„ cornicollis, 325
Parthenos, 126
Pedicularis, 255, 263, 264, 270, 274, 278
„ acaulis, 275
„ alaschanica, 261
„ „ var. tibetica, 261
„ „ var. typica, *ib.*
„ Alberti, 264, 265
„ albiflora, 273
„ amœna, var. 261
„ aspleniifolia, 273, 276
„ „ var. albiflora, 273
„ „ „ pubescens, 270
„ bella, *ib.*
„ bicornuta, 269, *ib.*
„ binaria, 260
„ brevifolia, 257, 258, 259
„ cabulica, 275
„ carnosa, 273
„ cheilanthifolia, 261
„ chumbica, 259
„ Clarkei, 267, 277
„ collata, 266, 267
„ Collettii, 278
„ comptoniæfolia, 265
„ confertiflora, 258, 259
„ corymbosa, 277
„ crenata, 278
„ curvipes, 275
„ Daltoni, 270
„ denudata, 258, 262
„ dolichorrhiza, 275
„ elephantoides, 269
„ Elephas, 271
„ Elwesii, 268
Pedicularis excelsa, 267
„ fissa, 275
„ flagellaris, 273
„ flammea, 276
„ „ var. major, 276.
„ flexuosa, 259, 260, 263
„ fragilis, 263
„ furfuracea, 273, 274
„ „ var. integrifolia, 274
„ Gammieana, 260
„ Garckeana, 267, 268
„ gibbera, 262, 263
„ globifera, 261
„ gracilis, 257
„ gruina, 272
„ Heydei, 258
„ himalayca, 271
„ hirsuta, 276
„ Hoffmeisteri, 269, 272
„ Hookeriana, 271
„ instar, 257, 258
„ „ var. paradoxa, 257, 258, 262
„ „ „ typica, *ib.*, *ib.*, *ib.*
„ integrifolia, 261
„ Kingii, 264
„ labellata, 272
„ lachnoglossa, 267
„ longiflora, 271, 272
„ lutescens, 265
„ lyrata, *ib.*
„ macrantha, 267
„ „ var. lutescens, *ib.*
„ „ „ typica, *ib.*
„ megalantha, 269
„ „ var. pauciflora, 269
„ „ „ typica, *ib.*, 272
„ microcalyx, 273
„ mollis, 263
„ nepalensis, 268
„ ochroleuca, 267
„ odontophora, 275
„ Oederi, 265, 275, 276, 277
„ „ var. heteroglossa, 273, 276, 277
„ „ „ typica, 276, 277
„ Olgae, 264
„ Oliveriana, 257
„ ophiocephala, 262
„ orthantha, var. 264
„ Pantangii, 273, 274
„ pectinata, 255, 256
„ „ var. palaus, 255, 256
„ „ „ pyramidata, 256
„ „ „ typica, 255
„ Perrottetii, 277

Pedicularis polygaloides, 258, 262
„ porrecta, 257, 250
„ Prainiana, 277
„ Przewalskii, 270
„ punctata, 271
„ pycnantha, 264, 265
„ „ var. Semenowi, 264
„ „ „ typica, *ib.*
„ pygmaea, 263
„ pyramidata, 256
„ Regeliana, 274
„ Rex, 266
„ rhinanthoides, 271, 272
„ „ var. labellata, 272
„ „ „ typica, *ib.*
„ robusta, 268
„ Roylei, 261, 262, 267
„ rudis, 277
„ schizorrhyncha, 260
„ Scullyana, 268, 269
„ Semenowi, 264
„ semitorta, 257
„ siphonantha, 271, 272
„ „ Hookeriana, 271
„ „ var. brevituba, *ib.*
„ „ „(Elephas), *ib.*
„ „ „(punctata), *ib.*
„ „ typica, *ib.*
„ „ vera, *ib.*
„ superba, 266
„ tennicaulis, 259
„ tennirostris, 256
„ trichoglossa, 267
„ tubiflora, 272
„ tubiformis, *ib.*
„ versicolor, 276
„ verticillata, 261, 262
„ Wallichii, 273
„ zeylanica, 278
Pediculati, 302
Pellona, 280
Penæidæ, *ib.*
Penœtia prasina, 335
„ viridana, *ib.*
Pentoloba, 401, 404, 405
„ lanceolata, 404
„ macrophylla, 401
Percidæ, 296
Pereira medica, 381
Pericampylus, 377, 385
„ aduncus, 385
„ assamicus, *ib.*
„ incanus, *ib.*
„ membranaceus, *ib.*
Perichæta, 110, 111
„ affinis, 112
„ annulata, *ib.*
„ aspergillum, *ib.*
„ birmanica, *ib.*
Perichæta capensis, 112
„ darnleiensis, *ib.*
„ elongata, *ib.*
„ exigua, 111
„ fœa, 112
„ hasselti, *ib.*
„ houlleti, 110, 111, 117
„ indica, 112
„ japonica, *ib.*
„ musica, *ib.*
„ peregrina, *ib.*
„ quadragenaria, *ib.*
„ queenslandica, *ib.*
„ robusta, *ib.*
„ schmardæ, *ib.*
„ sieboldi, *ib.*
„ stuarti, 110
„ sumatrana, 112
Pericnyx, 110, 111
„ excavatus, *ib.*, *ib.*
„ mintosni, *ib.*, *ib.*
„ saltans, *ib.*, *ib.*
Philodina citrina, 349
„ erythrophthalma, 352
„ hirsuta, 349, 358
Philodinadæ, 349
Phlegra, 334
* „ icioides, *ib.*
„ semiglabratæ, 335
Phragmidium, 237
Pieridæ, 119, 126
Pimpinella diversifolia, 244
Pithecops, 128, 413, 414, 435
* „ fulgens, 127, 134
„ hylax, 127, 435
„ phœnix, 128
Plagusia bilineata, 290
Plantarum, 359
Plastingia, 132
„ callineura, *ib.*
„ latoia, *ib.*
* „ margherita, 131, 134
Plesioneura alysos, 131
„ curvifascia, *ib.*
„ leucocera, *ib.*
„ sumitra, *ib.*
Pleuronectes arsius, 282
Pleuronectid, 284
Pleuronectidæ, 279
Plexippus paykulli, 335
Ploima, 352
Podocoryne, 300
Polanisia icosandra, 392
Pollinia nuda, 243
Polynemus, 280
Polyommatus bæticus, 433
Pomatomus, 296
Popa, 307
„ spurca, *ib.*
„ undata, *ib.*
Poritia, 413, 417, 428, 430, 432

*Poritia hewitsonii, var. tavoyana, 429
„ pediada, 417
„ phalena, 129
„ phratica, 429
„ potina, 429, 432
Poritiinæ, 128
Poritiinæ, 513, 428
Potamis (Apatura) iris, 126
„ „ namouna, 126
* „ „ ulupi, 125
Precis iphita, 126
Prionotus, 304
* „ alepis, 303
„ birostratus, *ib.*
Prosthesia, 400, 301, 405, 406
„ Javanica, 403
Prothoë, 123, 126
„ angelica, 127
„ caledonia, *ib.*
„ regalis, *ib.*
„ „ var., 126
Psettodes erumei, 280
Pseudaxis, 187
Pseudergolis, 126
„ avesta, *ib.*
*Pseudopulvinaria, 1, 2
* „ sikkimensis, 2
Pseudorhombus, 280
„ arsius, 282
„ javanicus, *ib.*
„ malayanus, *ib.*
„ russellii, *ib.*
„ triocellatus, 283
*Pterodina, 356
* „ intermedia, *ib.*, 358
„ mucronata, 356
„ patina, *ib.*
Pterodinadæ, *ib.*
Puccinia, 232, 233, 234, 236, 237, 238, 239, 240, 242, 244, 246, 249, 251
„ Acetosæ, 240, 241, 251.
„ Adoxæ, 235
„ Andropogi, 246, 251
* „ Anthistiriæ, *ib.*, *ib.*
* „ Arundinellæ, 245, 251
„ Caricis, 244, 250
* „ „ filicinæ, 250, 251
* „ Chrysopogi, 247, 251
„ Circææ, 235, 236, 251
„ coronata, 248, 251
„ flosculosorum, 238, 251
„ Fragariæ, 244, 251
„ Galii, 232, 239, 240, 251
„ Geranii, 237
„ „ silvatici, 236, 237, 251
„ Graminis, 249, 250, 251
„ helvetica, 241, 242, 251
„ limosæ, 250
„ Menthæ, 242, 243, 251
„ Oreoslini, 242
Puccinia Phragmitis, 246
„ Pimpinellæ, 244, 251
„ Polliniæ, 243
* „ Rosæ, 232, 233, 251
* „ Roscoeæ, 237, 251
„ Rubiæ, 232
„ Saxifragæ, 235
„ „ ciliatæ, 234, 251
„ silvatica, 250
„ suaveolens, 233, 242
„ Taraxaci, 238
„ Urticæ, 234, 251
„ Valantiæ, 239
„ Vincæ, 242
„ Violæ, 244
Pulvinaria, 1, 2
Quercus incana, 1
Radena, 134
Ranunculaceæ, 359
Rapala amisena, 424
„ schistacea, 428
„ sphinx, *ib.*
„ suffusa, *ib.*
Rattulidæ, 353
Rattulus tigris, *ib.*
Ravenelia, 240
Remelana yajna, 134
Rhamnus dahuricus, 248
Rhoptomeris Burmanni, 387
Rhinopalpa, 126
Rhizota, 345
*Rhomboidichthys azureus, 283, 295
„ leopardinus, 283
Rosa macrophylla, 233
Roscoea alpina, 237
Rotifer, 350, 351
„ macroceros, 350
* „ mento. *ib.*, 358
„ vulgaris, 350
Roydsia, 396, 397
„ floribunda, 397
„ parviflora, 396
* „ Scortechini, 397
Rubia cordifolia, 241
Rumex nepalensis, 240
Sadarga charaka, 123
„ oculata, *ib.*
Salpina, 354, 358
„ brevispina, 354
„ eustala, *ib.*
„ macracantha, *ib.*
Salpinadæ, *ib.*
Salpinx, 119
Samaris cristatus, 291, 295
Sarcocarpon scandens, 375
Satadra, 422
„ agaba, *ib.*
„ aida, *ib.*
„ atrax, *ib.*
„ rama, *ib.*
Satarupa bhagava, 133

Satarupa narada, 133
Satyridæ, 118, 120, 123, 124, 126
Saxifraga ligulata, var. ciliata, 234
Scaridium longicaudum, 353
Schizandreæ, 369, 375
Sciæna, 280
* „ ophiceps, 300
Sciænidæ, *ib.*
*Scianectes, 284, 285, 292
* „ lophoptera, 284, 295
* „ macrophthalmus, 292, 295
Scombrops, 296
Scorpænidæ, 297
Scyllium, 280
Sebastes, 297
* „ muciparus, 298
„ serrulatus, 297, *ib.*
Selenops malabarensi, 335
* „ montigena, *ib.*
Semanga, 413
Sephisa dichroa, 125
Simiskina fulgens, 431, 432
Sinthusa amba, 427
„ nasaka, *ib.*
Siphonantha, 278
Siphonanthæ, *ib.*
Sithon, 413
Solea hartzfeldii, 285
* „ oculus, *ib.*, 295
„ ovata, 285
Spalgis, 414
„ epius, 436
Sphasus, 335
Sphinges, 133
Stanneoclavi, 336
Stephania, 377, 385
„ discolor, 386
„ hernandifolia, *ib.*
„ hypoglauca, *ib.*
„ intertexta, *ib.*
„ latifolia, *ib.*
*Stephanops dichthaspis, 353, 358
„ lamellares, 353
„ muticus, *ib.*
Strobilanthes Dalhousianus, 243
Suasa, 411
„ lisides, 426
Sunstus, 131, 132
Sumitra, 131
Surendra, 411
„ amisena, 424, 425
* „ florimel, 409, 424, 440
„ Quercetorum, 424, 425
„ vivarna, 424
Symphædra dirtea, 123
„ nais, 121
Synaptura cornuta, 287
„ quagga, 286
„ zebra, 286
Tagiades, 131, 133
Tajuria jangala, 427
Talauma, 369, 372
* „ Andamanica, 372
„ Cambodianum, 374, 375
* „ evenium, 374
* „ Forbesii, 373
* „ Kunstleri, *ib.*
„ lanigera, 372
„ mutabilis, 373
„ pumila, 374
„ Rabaniana, 372
„ villosa, *ib.*
Talicada, 434
Tanaecia, adima, 122, 127
„ anosia, 122
„ apiades, *ib.*, 127
„ cibaritis, 122
„ jahnu, *ib.*
„ nicevillei, *ib.*
„ pulasara, *ib.*
„ puseda, *ib.*
Taraka, 411, 414, 415, 416
„ hamada, 414, 436
„ mahanetra, 414
„ mihi, *ib.*
Taraxacum, 238, 251
„ officinale, 238, 243
Tarucus plinius, 433
Teracolus, 119, 120
Terias, *ib.*, *ib.*
Testudinata, 332
Testudinidæ, 328
Testudo, 332
Tetracera, 361, 362
„ Assa, 362
„ Euryandra, *ib.*
* „ grandis, 363
„ lucida, *ib.*
„ macrophylla, *ib.*
„ sarmentosa, 362
Thamala marciana, 417, 428
„ miniata, 428
Thecla, 410, 411, 412, 416, 423
Theclinæ, 130, 409, 412, 413, 417
Thelyphonus, 4, 5
* „ andersoni, 7, 11, 19
„ angustus, 6
„ assamensis, 6, 8, 19
„ beddomei, 9, 10
* „ binghami, 7, 8, 15
„ formosus, 6, 7, 8, 14, 16
„ indicus, 4, 7, 9, 10, 19
* „ insularis, 7, 8, 13, 19
* „ johorensis, 7, 11, 19
„ nigrescens, 4
„ psittacinus, 8
* „ rangunensis, 4, 8, 18
* „ saxatilis, 4, 7, 8, 17, 19
„ scabrinus, 8
„ sepiaris, 4, 10
* „ sylvaticus, 4, 8, 18
* „ wood-masoni, 7, 8, 12 19

Theoclytes undata, 307
Theridion incertum, 343
Theridion subvittatum, 342
„ vittatum, 343
Tichorra acte, 130
Tinomiscium, 377, 379
„ petiolare, 379
Tinospora, 377, 378
„ crispa, 378
„ uliginosa, *ib.*
Tinosporeæ, 377
Toxodera, 308, 317, 318, 319, 321, 325
„ denticulata, 323
„ spinigera, 319
„ tennipes, 308
„ (Heterochæta) tennipes, 308
*Toxoderopsis, 317
* „ spinigera, 319
* „ taurus, 320
Trachinidæ, 301
Trichera acte, 427
Trygon, 280
Typhæus, 110, 111, 115
„ gammi, 114, 115, 116
* „ masoni, 110, 112, 116, 117
„ orientalis, 114, 115
Uranoscopus, 301
„ cognatus, *ib.*
Urapteryx, 130
Uredineæ, 232, 250
Urtica parviflora, 234, 250
Ustilagineæ, 240, 246, 250
Utricularia, 346
Uvaria heteroclita, 376
Vanessa, 126
Vanessidæ, 126
Vareca lanceolata, 404
Vates ashmolianus, 312
Vatidæ, 306
Viola, 399
„ pilosa, 400
„ serpens, 244, 399
„ Wightiana, 400
Violaceæ, 399
Violareæ, 359
Violeæ, 399
Verticella, 349
Winteriæ, 369
Wormia, 361, 364, 366, 367, 368
„ apetala, 366
„ excelsa, 364
* „ Kunstleri, 366
* „ meliosmæfolia, 365
„ oblonga, 364
„ pulchella, 365
* „ Scortechinii, *ib.*
„ subsessilis, 364
„ suffruticosa, *ib.*
*Yasoda, 410, 411
„ tripunctata, 425
Zarona, 430
Zeltus, 411
„ ætolus, 427
„ etolus, *ib.*
Zephyrus, 411, 412, 417
„ pavo, 130, 417
Zizera, 413, 434
„ pygmæa, 434
„ sangra, *ib.*

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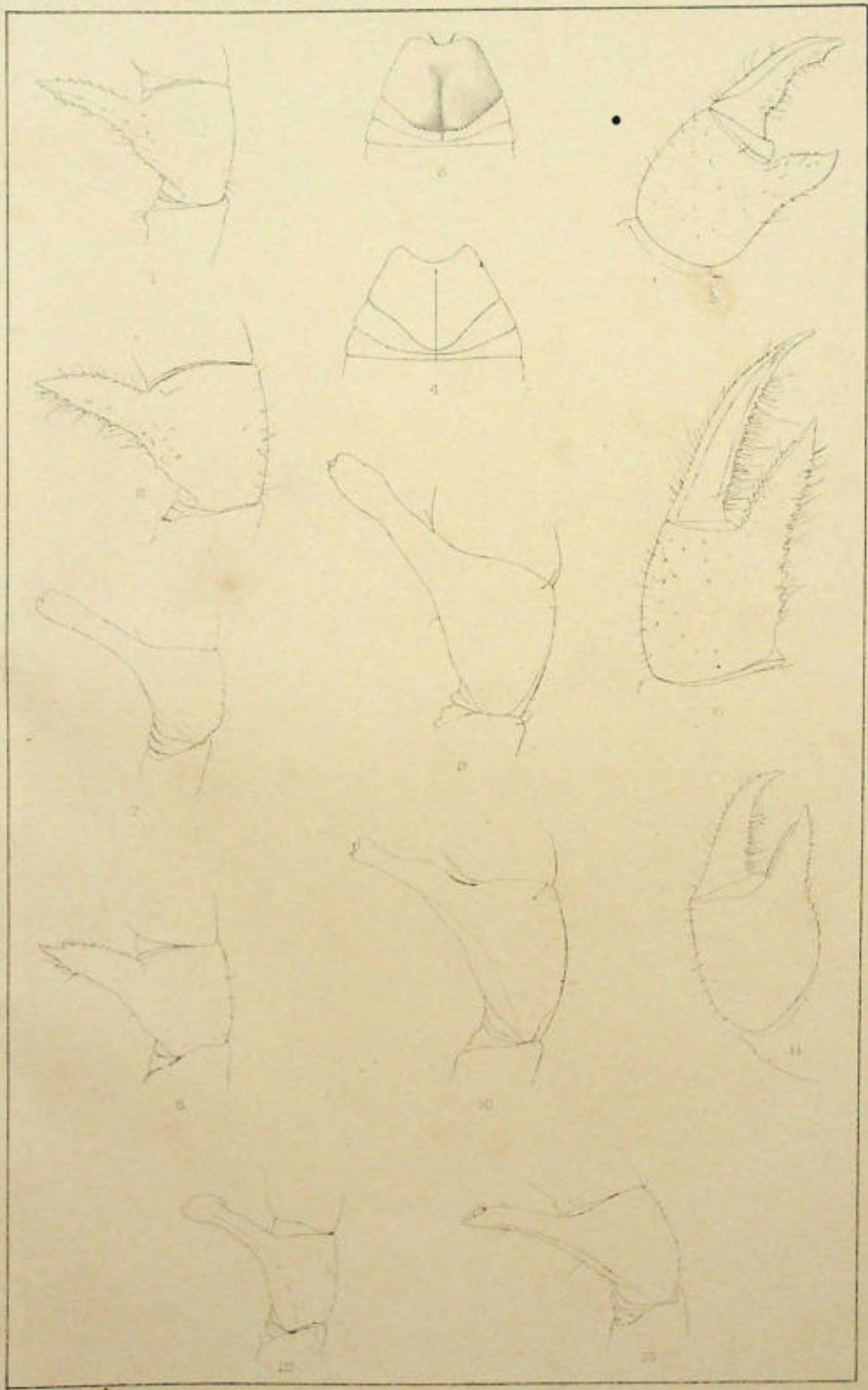
PSEUDOPULVINARIA SIKKIMENSIS, n. sp.



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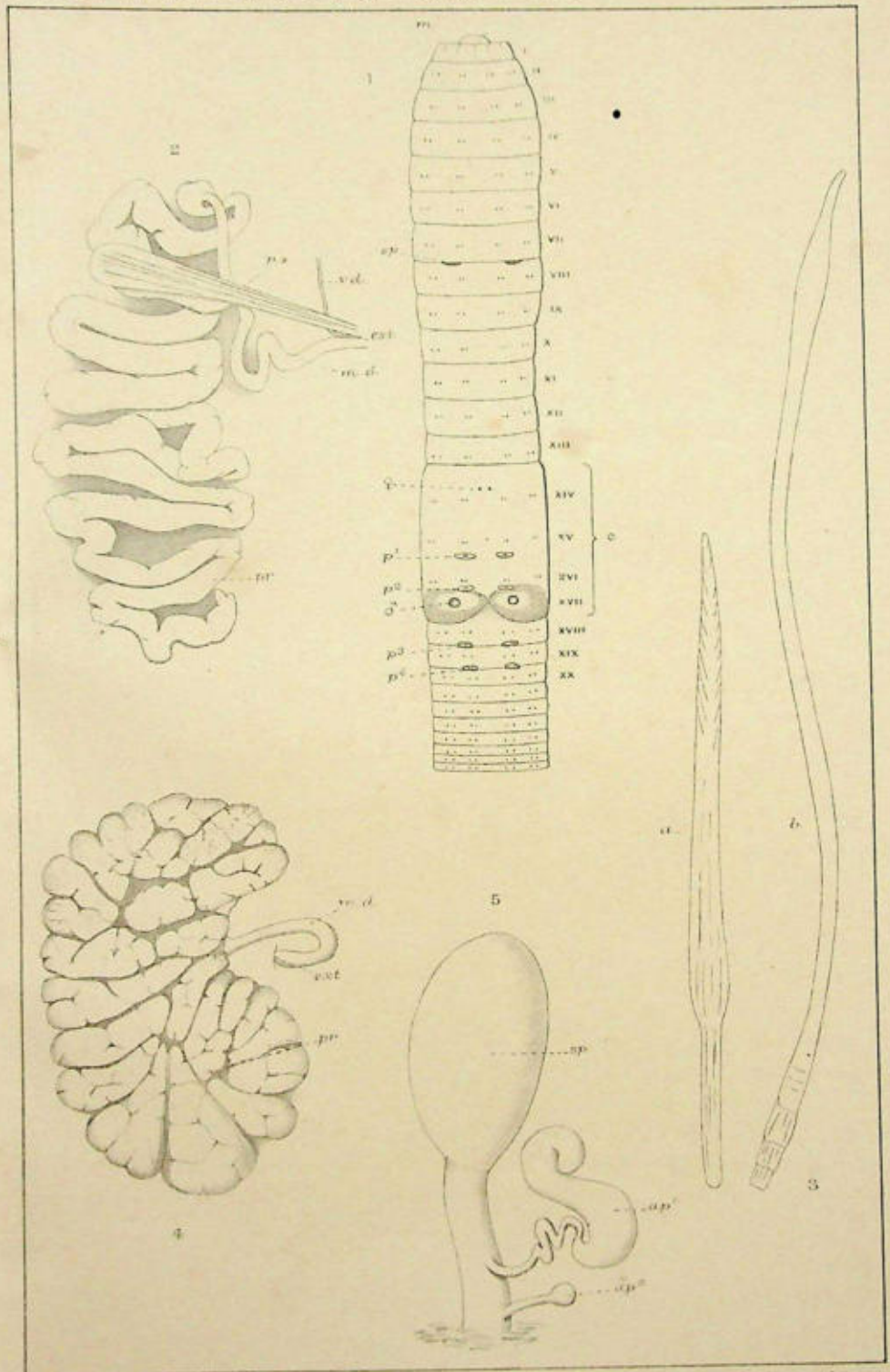

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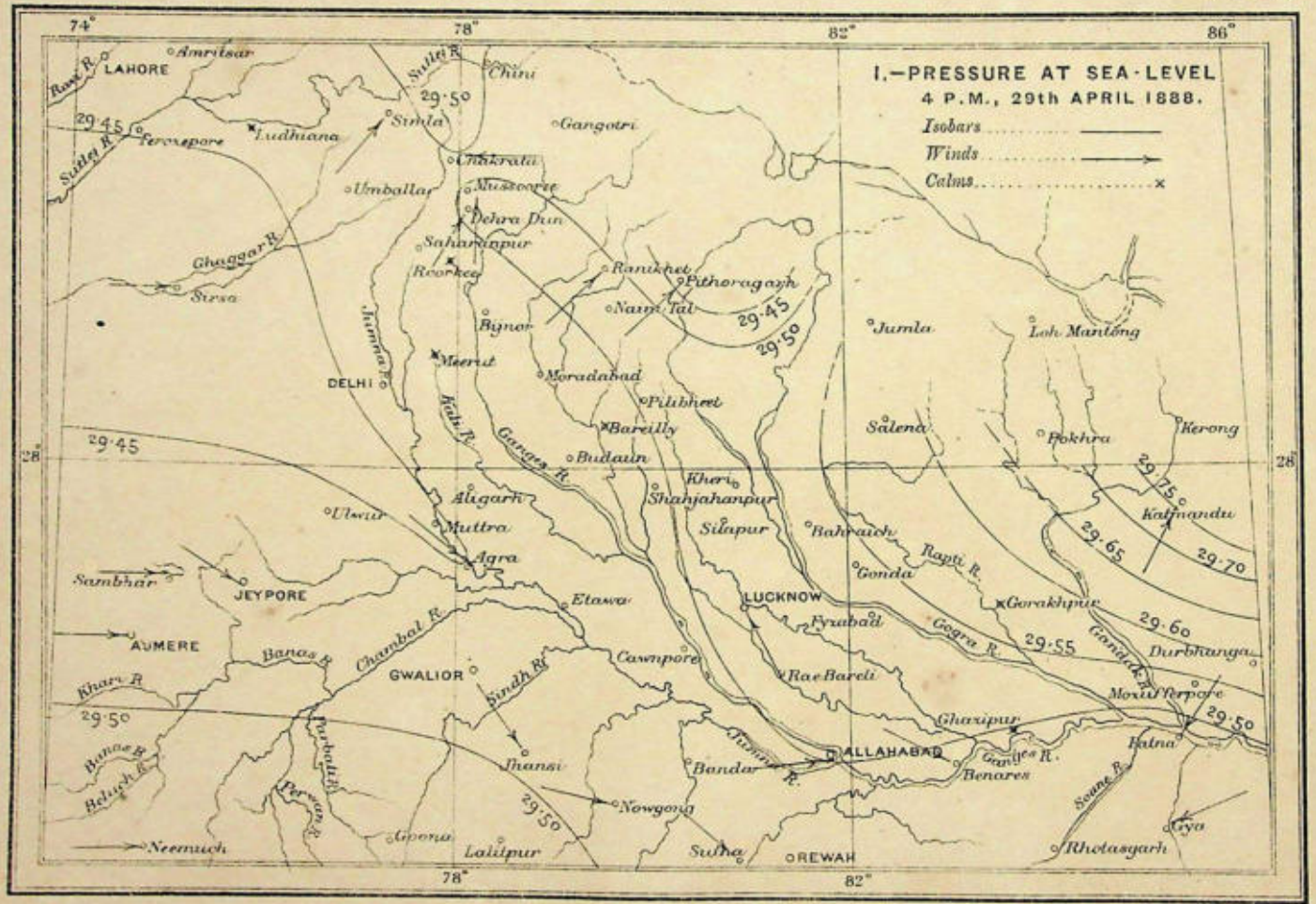

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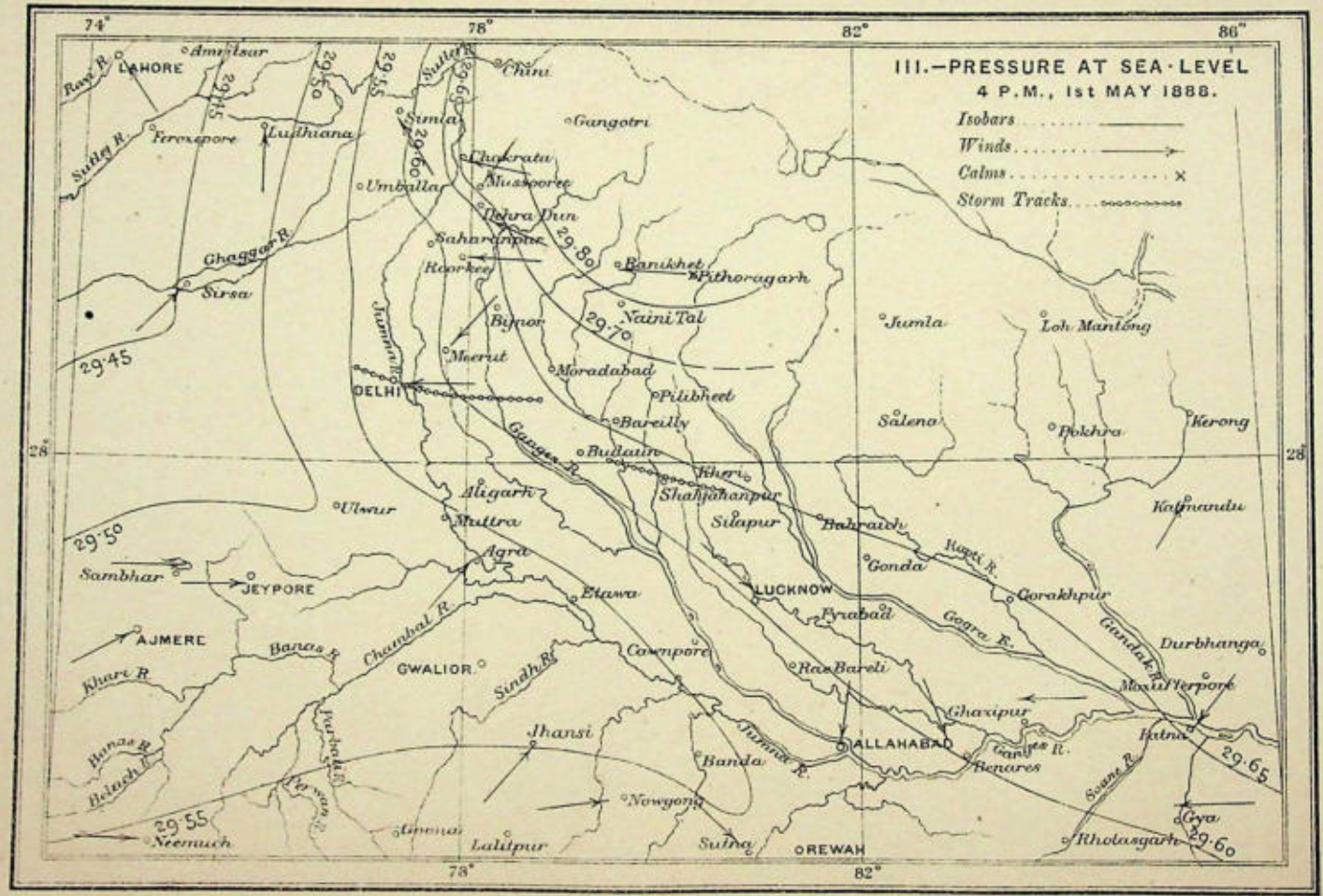

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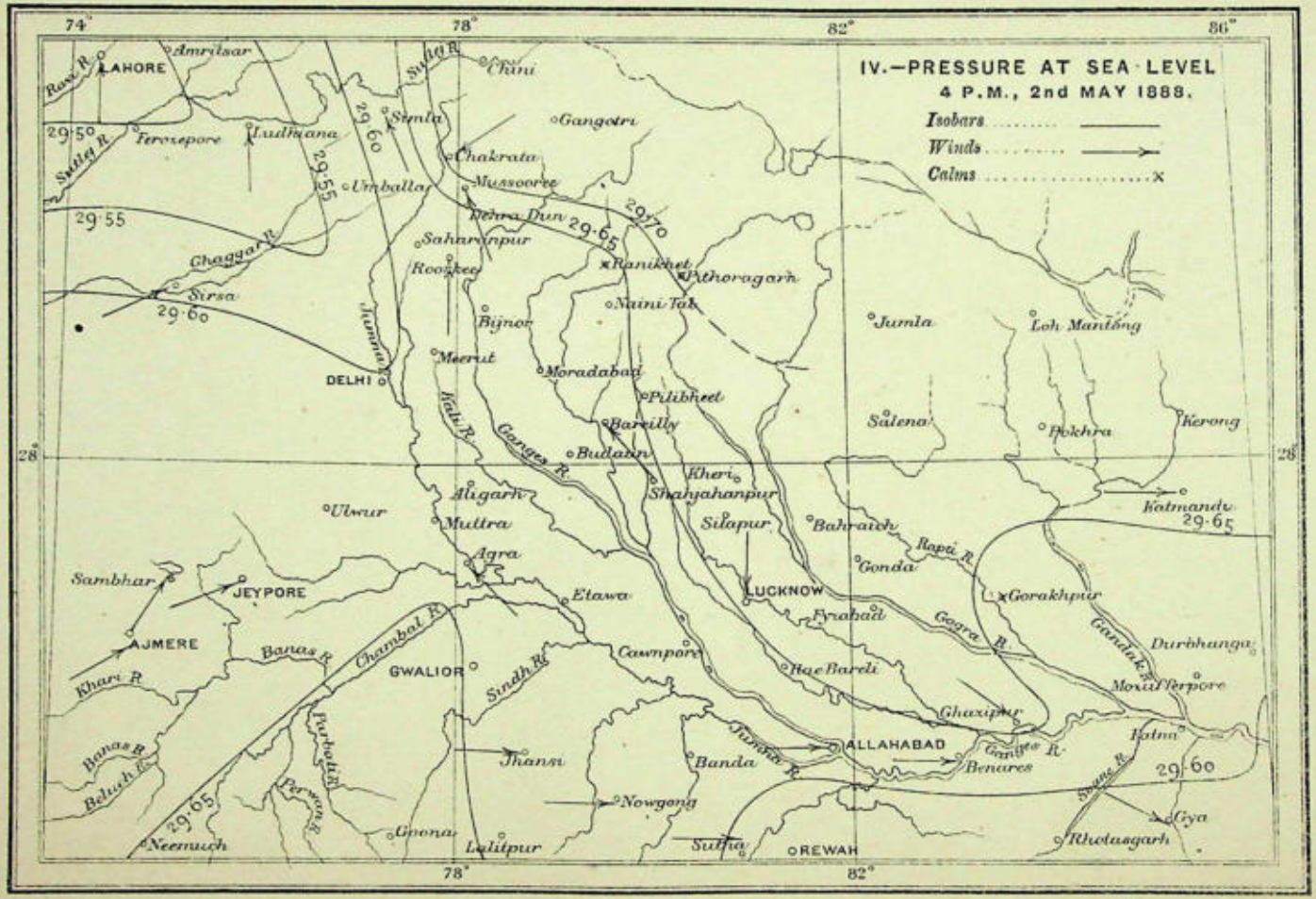

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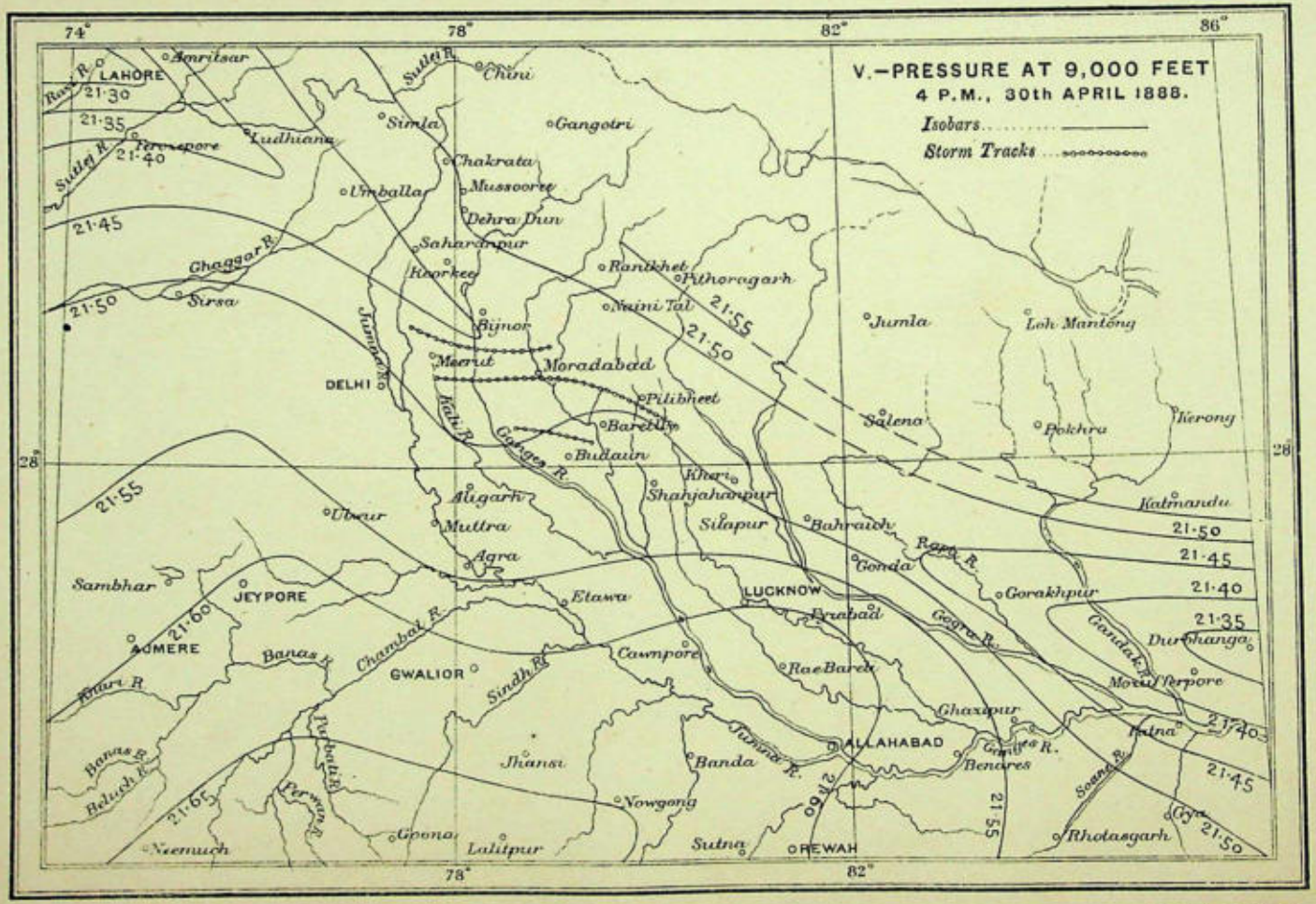

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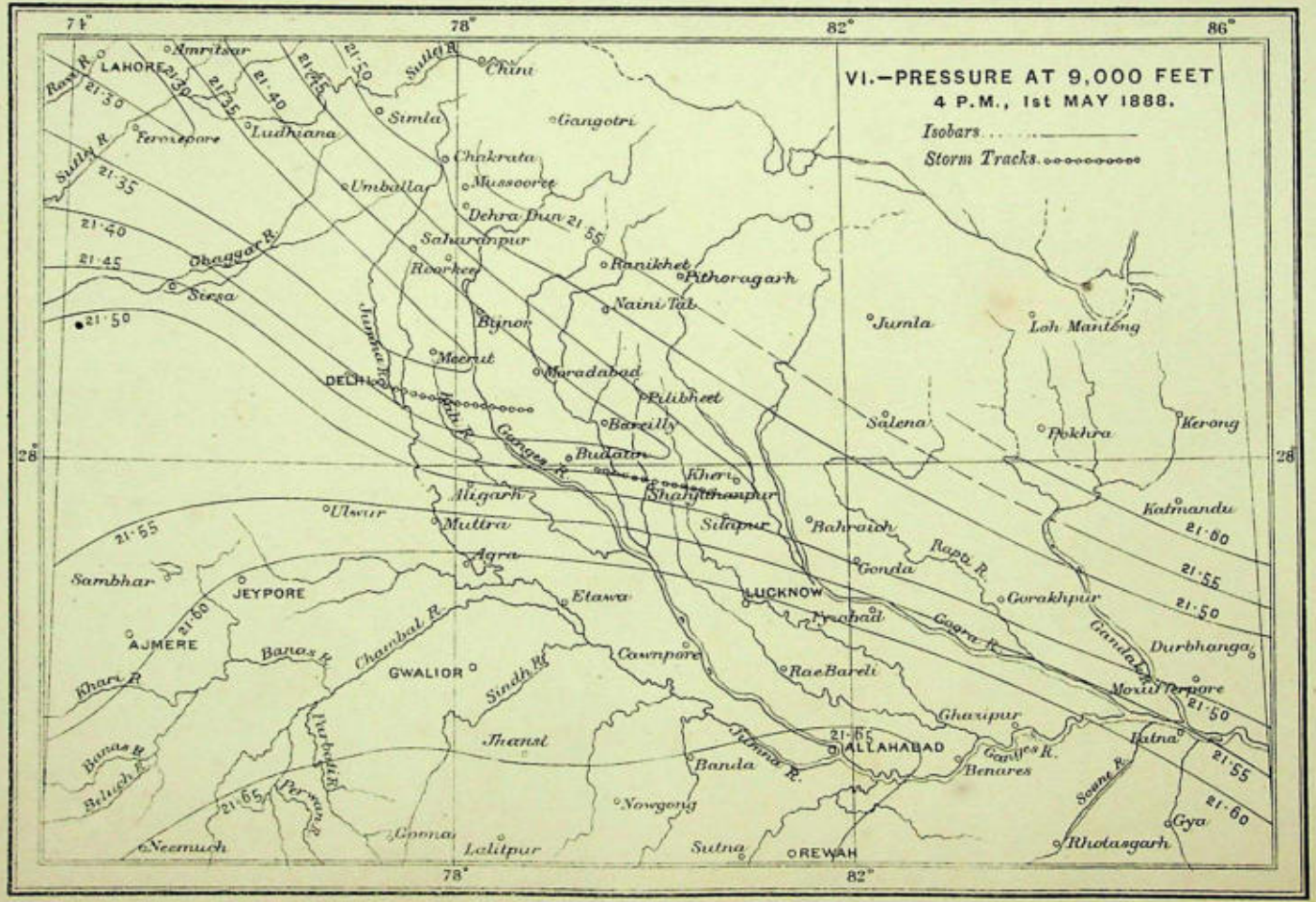

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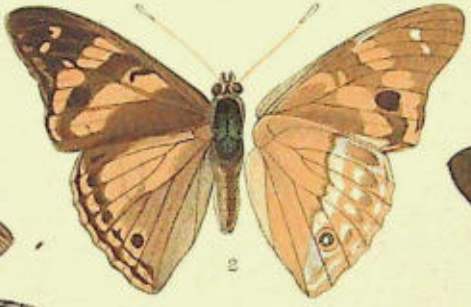

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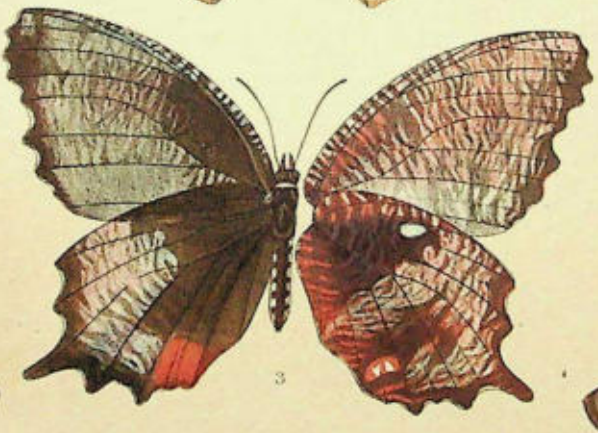

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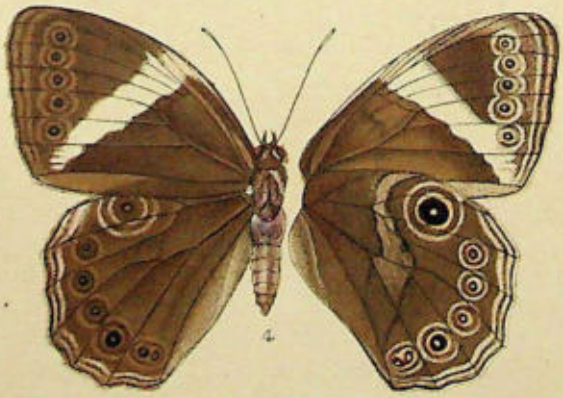

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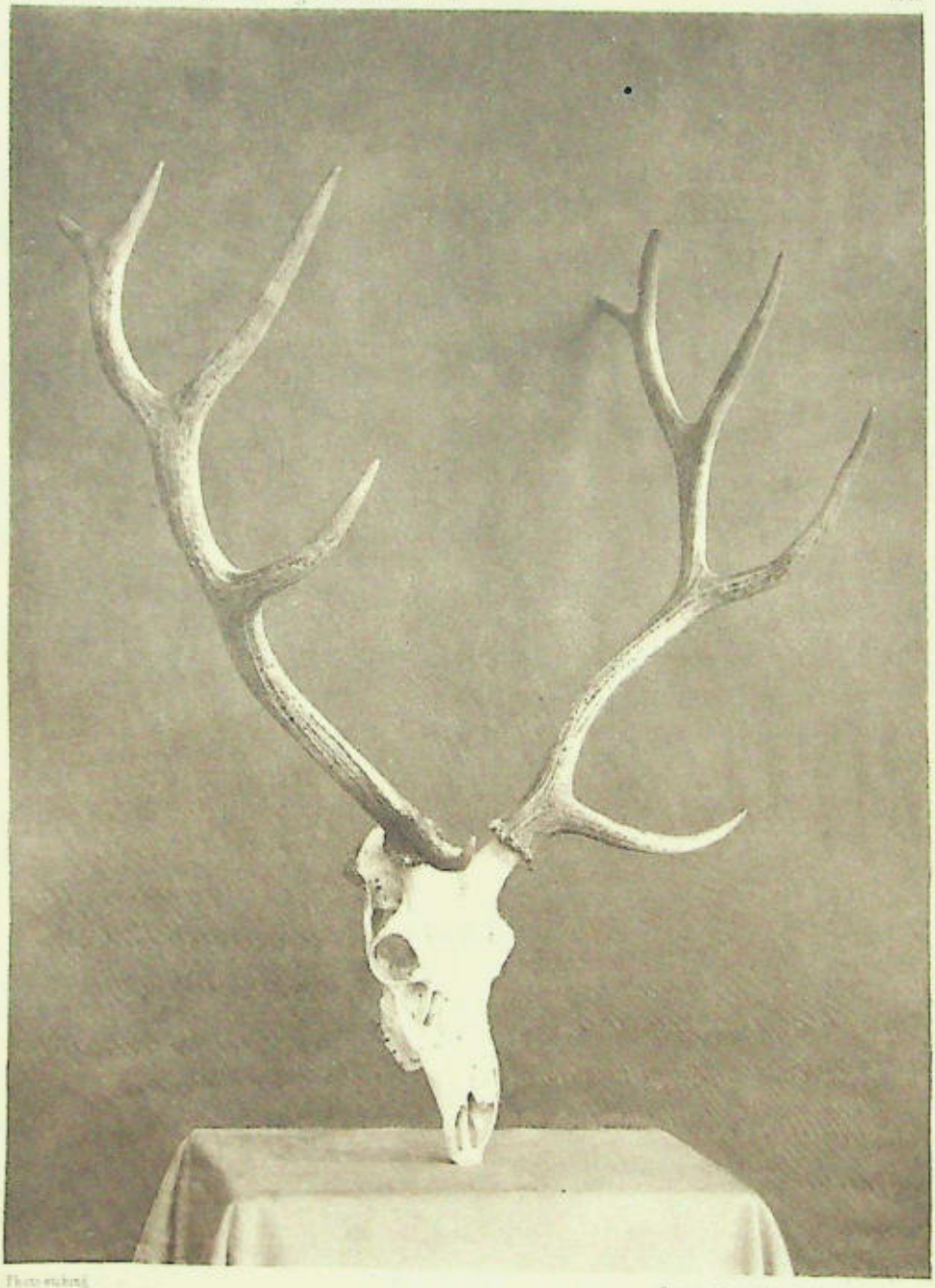

Photo-etching.

Survey of India Offices, Calcutta, March 1889.

CERVUS DYBOWSKII?

A.Barclay del.
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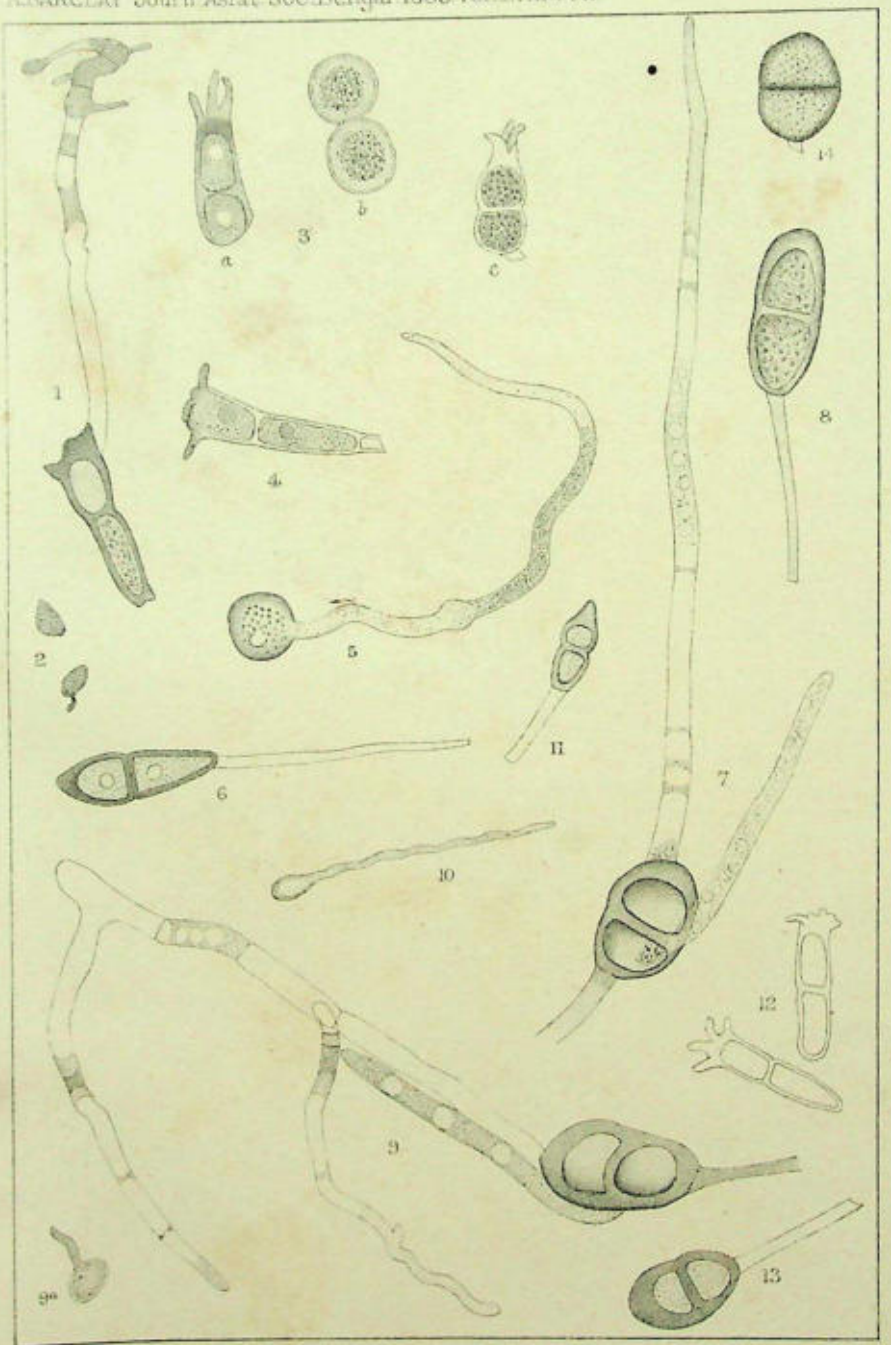

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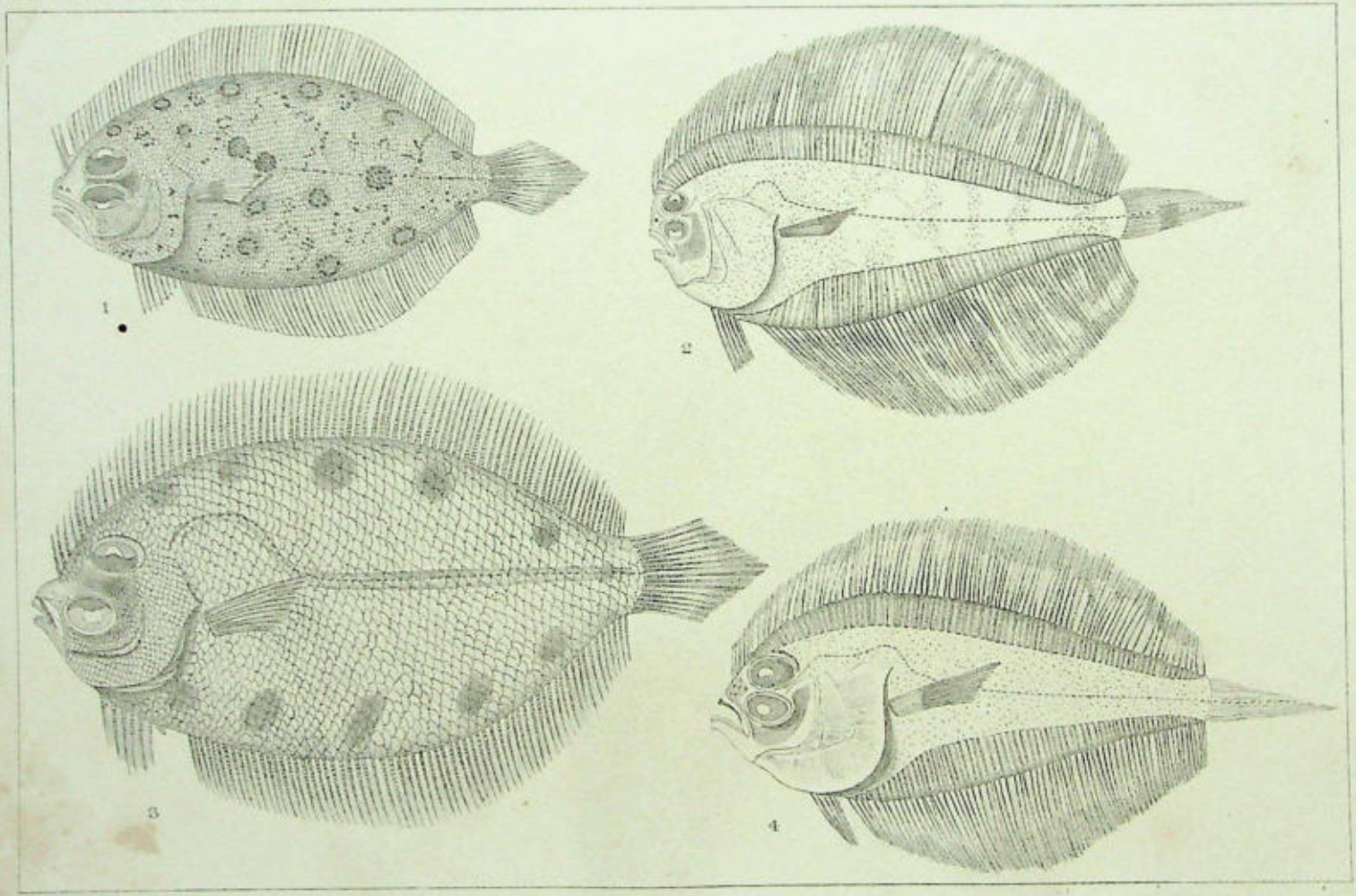

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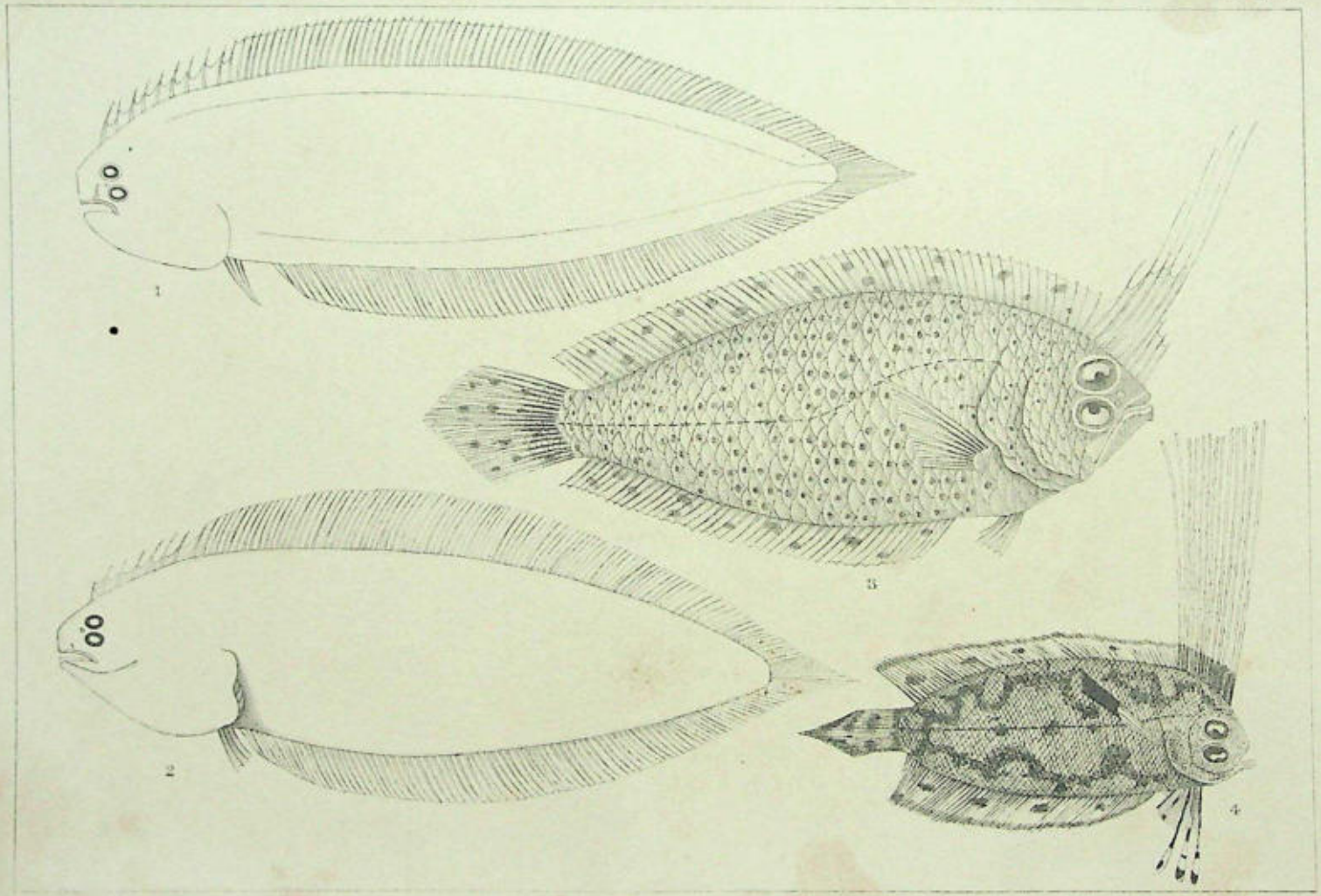
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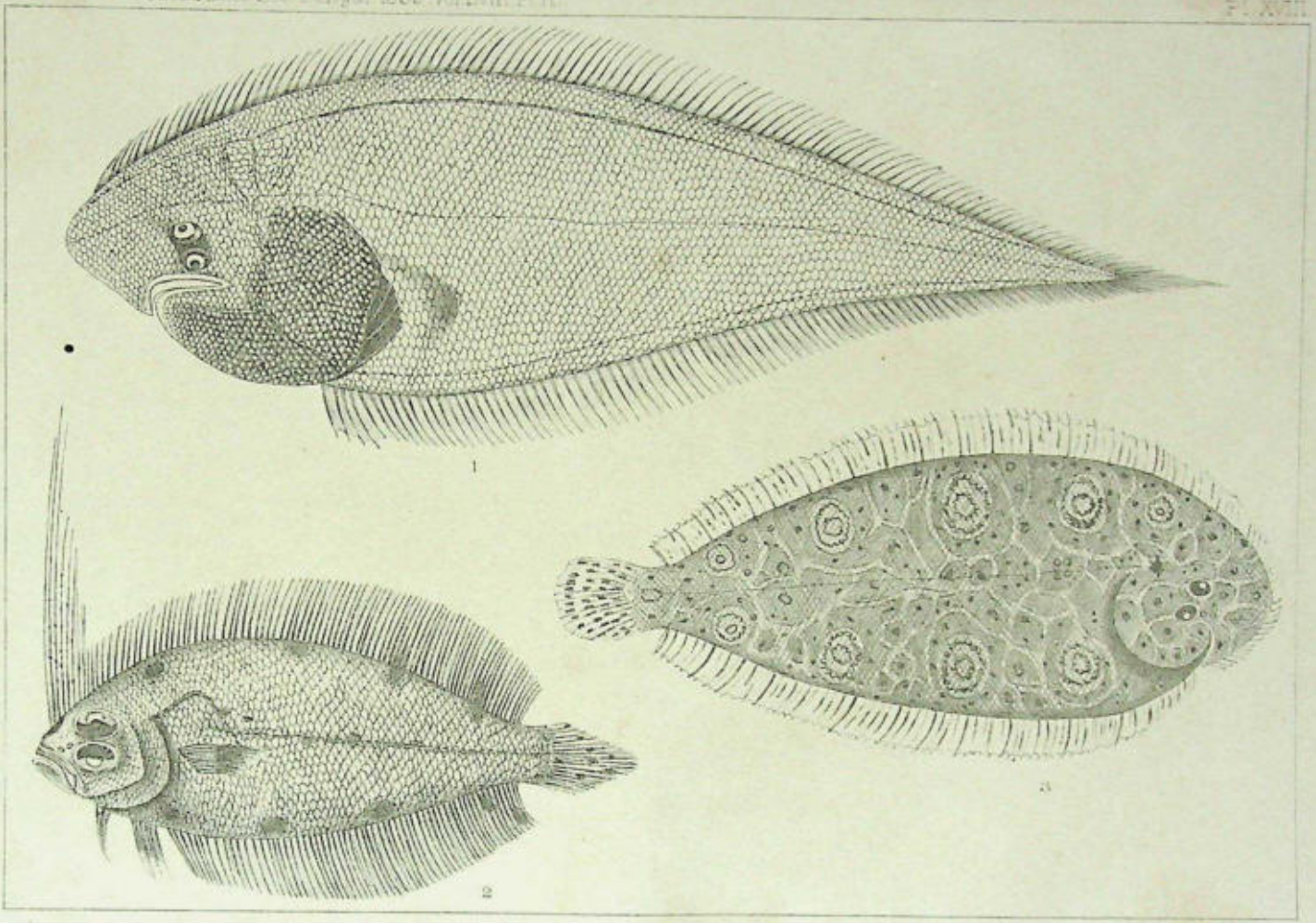

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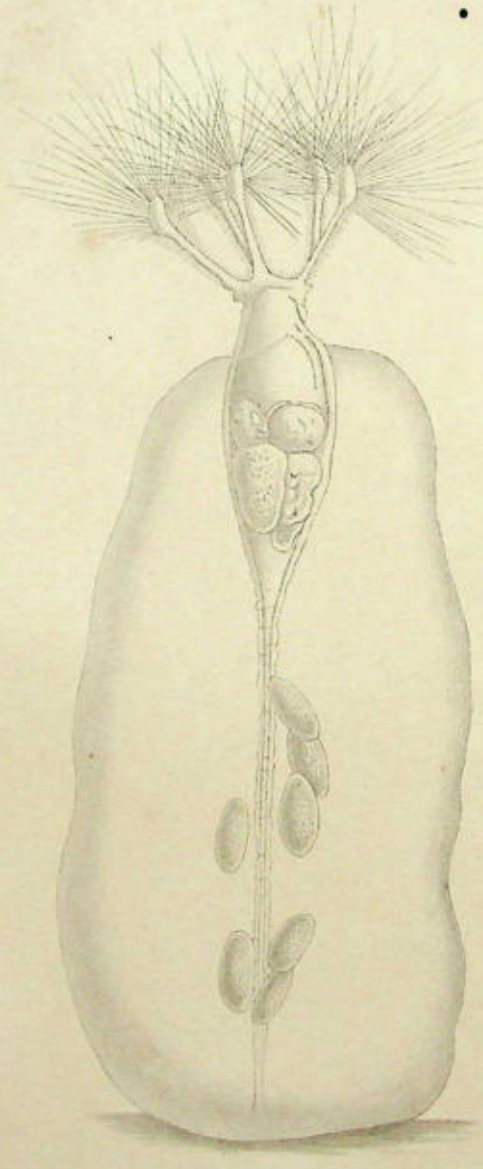

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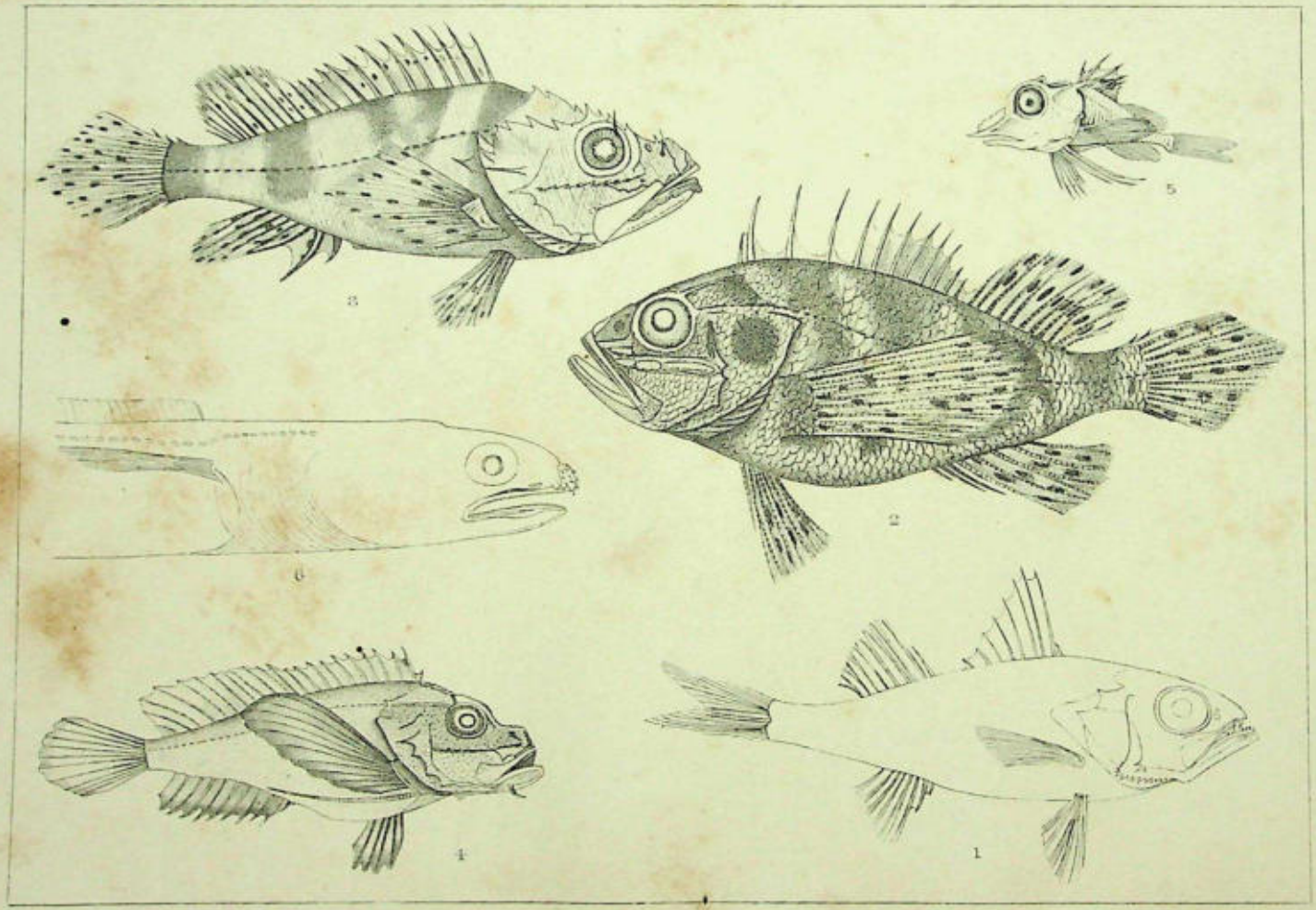

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JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

Part II.—NATURAL SCIENCE.

SUPPLEMENT.

No. I.—1889.

I.—*Catalogue of the* Insecta *of the Oriental Region.* No. 1. *Order* Coleoptera, *Family* Cicindelidæ.—*By* E. T. Atkinson, B. A.

The nucleus of the biological collections of the Indian Museum was formed from the old collections of the Asiatic Society, and, of late years, considerable attention has been devoted to the subject of rendering these collections more accessible to the public, and more useful in advancing the cause of biological research in India. It has been found that the first steps to be taken in these directions are the formation of correctly named collections, and the publication of catalogues, not only of the specimens actually in the Museum, but of the Oriental Region as a whole. Some progress has been made in this direction, our collections of insects are gradually being sent to specialists in Europe for identification, the catalogues of the Vertebrata are provided for, and we have already a catalogue of the Mollusca, and of the species of the various families of the animal kingdom found by Dr. Anderson in Mergui.

Amongst the Insecta, Mr. de Nicéville is bringing to completion his work on the Rhopalocerous section of the Lepidoptera, and Col. Swinhoe with Mr. Cotes, the catalogue of the Heterocerous section.

Both these works are confined to the insects of India, Burma, and Ceylon, and a supplement will have to be added to complete them for the Oriental Region. I have finished the Homopterous section of the Rhynchota, and the Hemipterous portion is passing through the press. This, too, deals with the Indian region only, and will have to be added to, by giving a list of the species found elsewhere in the Oriental Region. Mr. Wood-Mason has also, in the press a valuable catalogue of the *Mantodea*. By the 'Oriental Region' is understood the tract defined by Wallace* under that name, but for various reasons I have made the course of the river Yangtse, the northern boundary in China. I exclude the Chinese Provinces of Honan and Shantung,† all Chinese Turkistán, and the Alai range,‡ Persia and Afghánistán. On the south, a line is drawn to the south of Mindanao, along the southern coast of Borneo to Java, where Bali alone is included. Celebes, Lombok, and all the islands to the south are excluded. The Asiatic Society has been good enough to support this scheme for the cataloguing of our collections, or rather what they ought to contain, and I trust that we may be able to enlist workers to complete this necessary equipment of all real entomological work in India. When the collections of our Indian Museum are correctly named, it will be possible, with the aid of these catalogues, to give substantial assistance to all interested in the investigation of our rich Fauna, and when it is considered that only the surface of the Insect Fauna of India has been examined, it may safely be said that much that is new remains for workers in this field. I think that I am authorised to say that every facility will be afforded to students and collectors by the staff of our Indian Museum for naming their collections, and that it rests with voluntary workers to make our collection what it ought to be, the first in the world in species connected with the Oriental Region. The species identified, and in the Indian Museum, are shown in angular brackets, with the precise locality. The locality (*Hab.*) first given is the one generally quoted and given in the books referred to. References to manuscript and mere catalogue names have been omitted. In verifying the references, I have been able to correct some errors of omission and commission, and to give the actual dates for nearly every description of a species, and for every genus quoted, a matter in which previous catalogues have not always been careful, and one which I consider to be essential for the full study of a group.

* Geographical Distribution of Animals, i, 1876, p. 314.

† A few from Kiangsi are noticed as there is reason to believe that they occur further south.

‡ A few from the Pámir, from Stoliczka's collection, are noticed, though not belonging to the Oriental Region, the types being in the Indian Museum.

Family **CICINDELIDÆ.**

Latreille, Gen. Crust. et Ins., i, 1806, p. 172: Leach, Edinb. Enc., ix (i), 1815, p. 57: Lacordaire, Gen. Col., i, 1854, p. 1: Schaum, Naturg. Deutsch. Ins., i (i), 1856: Chaud., Bull. Mosc., xxxiii (4), 1860, p. 269, 303: Ann. Soc. Ent. Belg., xiii, 1870, p. 139: Leconte, Class. Col. in Smithsonian Misc. Coll., 1861-2.

The chief abbreviations used in the references to this family are:—

Brullé, Arch. Mus.—'Archives du Museum d' Histoire Naturelle,' Paris, 1839.

Chaud. Bull. Mosc.—Papers by Baron M. de Chaudoir in the 'Bulletin de la Société Impériale des Naturalistes de Moscou.'

Chaud. Mon.—Monograph of the genus '*Collyris*' in Annales de la Société entomologique de France, (4 ser.), iv, 1864, pp. 483-536.

Dej. Spec.—'Species general des Coléoptères de la collection de M. le Comte Dejean.' 6 Vols. Paris, 1825-38.

Fabr.—Systema Eleutheratorum of J. C. Fabricius, 2 Vols., 1801.

Guérin—Magazin de Zoologie by Guérin 1831-38; Magazin de Zoologie, d'anatomie comparée &c., 1839-48: and Revue et Magazin de Zoologie pure et appliquée (2 ser.) 1849-72: (3 ser.) 1873-76.

Herbst.—'Natursystem allerbekannten in- und aus-landischen Insekten.' Käfer pt 9 (1801), pt 10 (1806).

Mun. Cat.—'Catalogus Coleopterorum' by Dr. Gemminger and B. de Harold: 12 Vols. Munich 1868-76, the basis of this and all other catalogues of the Coleoptera.

Oliv. Ent.—'Entomologie ou Histoire Naturelle des Insectes.' 4 Vols, Paris, 1789-92. (Vol. ii, 1790).

Schmidt-Goebel.—'Faunula Coleopterorum Birmaniæ', 1846.

Wied.—Zoologisches Magazin, 2 vols, 1817-23.

Genus **CICINDELA.**

Linn., Syst. Nat., ii, 1735, p. 657: Lacordaire, Gen. Col., i, p. 17: Schaum, Berlin. Ent. Zeits., v, 1861 p. 68; vi, 1862 p. 122; Journ. Ent., ii (1863), 1866, p. 57: Mun. Cat., p. 8: Dokhtouroff, Rev. Mens. d'Ent., i, 1883, p. 66.

Abroscelis, Hope, Col. Man., ii, 1838, p. 19, 28.

Aenictomorpha, Chaudoir, Bull. Mosc., xxiii (1), 1850, p. 11.

Antennaria, Dokhtouroff, Rev. Mens. d' Ent., i, 1883, p. 68.

Calochroa, Hope, Col. Man., ii, 1838, p. 19.

Calochroma, Motsch., Et. Ent., 1862, p. 22.

Calomera, Motsch., *l. c.* p. 22.

Calostola, Motsch., *l. c.* p. 22.

Catoptria, Guérin, Rev. Mag. Zool., (2 s.), i, 1849, p. 146.

Cephalota, Dokhtouroff, Rev. Mens. d' Ent., i, 1883, p. 70.

Cheilonycha, Lacordaire, Mém. Soc. Roy. Liège, 1842, p. 107.

Cicindosa, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 173.

Cratohaerea, Chaudoir, Bull. Mosc., xxiii (1), 1850, p. 13.

Cylindera, Westwood, Jardine Mag. Zool. Bot., i, 1837, p. 251; Mod. Class. Ins., i, p. 54.

Ellipsoptera, Dokhtouroff, Rev. Mens. d' Ent., i, 1883, p. 70.

Eulampra, Chaudoir, Bull. Mosc., xxi (1), 1848, p. 10.

Eumecus, Motsch., Käfer Russlands, 1850, t. 5: Et. Ent., 1862, p. 22.

Euryarthron, Gúerin, Rev. Mag. Zool., (2 s.), 1849, p. 81.
Euryoda, Lacordaire, Mém. Soc. Roy. Liège, 1842, p. 108.
Habrocelis, Dokhtouroff, Rev. Mens. d' Ent., i, 1883, p. 69.
Habrodera, Motsch., Et. Ent., 1862, p. 22.
Habroscelimorpha, Dokhtouroff, Rev. Mens. d' Ent., i, 1883, p. 69.
Habrotarsa, Motsch., Et. Ent., 1862, p. 22.
Heptadonta, Hope, Col. Man., ii, 1838, p. 25.
Hypaetha, Leconte, Trans. Amer. Phil. Soc., xi, p. 28.
Laphyra, Dupont, Dej. Cat., (3ed.), 1837, p. 67.
Myriochile, Motsch., Et. Ent., 1862, p. 22.
Parmecus, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 172.
Prepusa, Chaudoir, Bull. Mosc., xxiii (1), 1850, p. 15.
Prodotes, Thomson, Ann. Soc. Ent. Fr. (3 s.) iv, 1856 p. 332.
Prothyma, Hope, Col. Man., ii, 1838, p. 27.
Rhopaloteles, Guérin, undescr. ?
Thopeutica. Chaudoir, undescr. ?

albina, Wied., Zool. Mag., i (3), 1819, p. 169, No. 17.
albida, Dejean, Spec., i, 1825, p. 125.
Hab. Bengal. [*Ind. Mus.* ? Berhampur].

albopunctata, Chaudoir, Bull. Mosc., xxv (i), 1852, p. 10.
Hab. N. India [*Ind. Mus.*, Simla].

amurensis, Morawitz, Bull. Acad. Imp. St. Petersb., v, 1862, p. 238; Bates, Trans. Ent. S. Lond., 1873, p. 227: 1883, p. 215.
? *Elisae*, Motsch., Bull. Mosc., xxxii (2), 1859, p. 487.
Hab. Yangtse Valley in China, Japan, Manchuria Ussuri.

analis, Fabr., Syst. Eleuth., i, 1801, p. 236; Lap. de Casteln., Hist. Nat. i, p. 20: Chaud. Bull. Mosc., xxv (i), 1852, p. 11.
Hab. Java, Sumatra, Borneo, [*Ind. Mus.*, Java].

anchoralis, Chevrolat, Rev. Zool., 1845, p. 97.
punctatissima, Schaum, Journ. Ent., ii (1863), 1866, p. 58.
Hab. Macao, Amoy. [*Ind. Mus.*, China].

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Hab. Borneo.

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Hab. Yunnan.

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Hab. N. India, Simla.

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Hab. India, Coromandel.

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Hab. Bombay.

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Hab. Balúchistán.

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Hab. India [*Ind. Mus.*, Malda].

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Hab. India [*Ind. Mus.*, Malda, Pankabári].

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Hab. Macao, Hongkong.

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Hab. India, Colombo (Bates) [*Ind. Mus.*, Berhampur].

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Hab. Hongkong.

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Hab. China, Hongkong to Yang-tse, Japan.

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Hab. Nepál, Kashmir [*Ind. Mus.*, Yunnan, Tenasserim, Pegu, Sibságar, Sikkim].

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Hab. China, Hongkong.

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Hab. N. India, Bengal, Madras.

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Hab. Philippines, Luzon.

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Hab. Philippines.

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Hab. Nepál.

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Hab. Java, Celebes.

exornata, Schmidt Goebel, Faun. Col. Birm., 1846, p. 1, t. 1, f. 7.
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Hab. India, Coromandel.

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Hab. Philippines, Luzon.

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Hab. Bengal.

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Hab. ? Indian Archipelago, Oceania.

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Hab. India.

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Hab. Assam, N. India.

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Hab. India [*Ind. Mus.* Jhelam valley].

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Hab. Burma, [*Ind. Mus.*, Pegu].

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Hab. Formosa, Fuchow, Shanghai, [*Ind. Mus.*, China].

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Hab. Philippines, Luzon.

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Hab. Diamond Harbour (River Hughli), Sibpur.

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Hab. Cambodia.

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Hab. iv. China, Japan, Moupin, Kiansi.

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Hab. Philippines, Luzon.

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„ *orientalis*, Dejean, Spec., i, p. 93.
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Hab. Philippines, Luzon.

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Hab. Laos.

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Hab. Philippines, Luzon.

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Hab. Macao, [*Ind. Mus.*, Hongkong, Pegu].

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Hab. Bengal.

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Hab. India, Moradabad (N. W. P.).

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Hab. Burm. [*Ind. Mus.*, Pegu].

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Hab. Nepál.

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Hab. India, Colombo (Bates), [*Ind. Mus.*, Arakan].

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Hab. Java.

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Hab. India.

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Hab. India, Malabar.

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Hab. Bengal.

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Hab. Australia, New Caledonia, Java.

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Hab. India, Pondichery [*Ind. Mus.*, S. India, Bangalore, Sittang valley, Arakan Sikkim, Malda, Calcutta, Andaman Islands].

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Hab. India.

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Hab. N. India, Sumatra, Java, Celebes, Macao, Hongkong, Philippines [*Ind. Mus.*, Sikkim, Pegu].

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Leguillioui, Guérin, Rev. Zool., 1841, p. 120.
Var. *niponensis*, Bates, Trans. Ent. S. Lond., 1883, p. 216.
Hab. India, Ceylon, Java, Sumatra, Borneo, Philippines, Japan, [*Ind. Mus.* Middle China].

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Hab. Philippines, Luzon.

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Hab. India, Malabar.

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Hab. Bengal, [*Ind. Mus.*, Birbhúm].

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Hab. Tibet.

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Var. *holosericea*, Fabr., Syst. Eleuth., i, 1801, p. 243.
Hab. Sumatra, Java, Borneo, Celebes.

vigintiguttata, Herbst, Natursyst. Ins., Käfer, pt. x, 1806, p. 174, t. 171, f. 9: Dejean, Spec., i, p. 108.
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Whithillii, Hope, Col. Man., ii, 1838, p. 23: Stettin. Ent. Zeit. xl, p. 456; xliii, p. 310.
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yunnana, Fairmaire Ann. Soc. Ent. Belg., xxxi, 1887, p. 88.
Hab. Yunnan.

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Hab. India.

Davidis, Fairmaire, Ann. Soc. Ent. Belg., xxxi, 1887, p. 88.
Hab. Moupin, N. Tibet.

Desgodinsii, Fairmaire, l. c., p. 87.
Hab. Yunnan, Tibet.

Genus **PRONYSSA**.

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nodicollis, Bates, *l. c.*, p. 267.
Hab. Darjiling [*Ind. Mus.*, Mungphu, Sikkim].

Genus **ODONTOCHILA**.

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Odontocheila, Lap. de Casteln., *l. c. supra*.
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Plochiocera, Hope, Col. Man., ii, 1838, p. 18.

heteromalla, MacLeay, Annul. Javan. (*ed. Leq.*), 1833, p. 107: van. d. Lind. Ess. Ins. Java, p. 10.
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Hab. Java, Celebes.

lucidicollis, Chaudoir, Rev. Mag. Zool., (2 s.), xxi, 1869, p. 23.
Hab. Philippines. •

Genus **MEGALOMMA**.

Westwood, Ann. Mag. N. H., viii, 1841, p. 203: Lacordaire, Gen. Col., i, p. 23: Mun. Cat., p. 31.
Physodeutera, Lacordaire, Mém. Soc. Roy. Sci. Liège, i, 1843, p. 111.

viridulum, Schönherr, Syn, Ins., i, 1806, p. 213; Dejean, Spec., i, p. 149; Lap. de Castelu. Hist. Nat. Ins. i, p. 20: Schaum, Journ. Ent., ii, p. 69.
vigilans, Westw., Ann. Mag. N. H., viii, 1841, p. 204.
Hab. India, Mauritius.

Genus **APTEROESSA**. •

Hope, Col. Man., ii, 1838, p. 159: Lacord. Gen. Col., i, p. 24: Mun. Cat., p. 32.

grossa, Fabr., Spec. Ins., i, 1781, p. 282: Oliv. Ent., ii, 33, p. 8, t. 2, f. 23; Hübner, Naturf., xxiv, p. 48, t. 2, f. 18: Hope, *l. c. supra*, p. 159, t. 1, f. 1.
Hab. India, Coromandel.

Genus **JANSENIA**.

Chaudoir, Cat. Coll., 1865, p. 55: Mun. Cat., p. 33.

chlorida, Chaudoir, Cat. Coll., 1865, p. 56.
Hab. India, Malabar.

Westermanni, Schaum, Berlin. Ent. Zeits., 1861, p. 75.
Hab. India, Madras.

Genus **DROMICIDIA**.

Chaudoir, Cat. Coll., 1865, p. 54: Mun. Cat., p. 34.

scrobiculata, Wied., Mag. Zool, ii (i), 1823, p. 65.
Hab. Bengal.

Genus **THERATES**.

Latreille, Regne Anim. (*ed.* 1), iii, 1817, p. 179: Lacord. Gen. Col., i, p. 28: Mun. Cat., p. 34: Schaum, Berlin. Ent. Zeits., iv, 1860, p. 182; vii, 1863, p. 67.
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Batesi, Thomson, Arch. Ent., i, 1857, p. 131: Schaum, Berlin. Ent. Zeits., 1860, p. 185.
Hab. Borneo.

bellulus, Bates, Ent. Mon. Mag., viii, 1872, p. 286.
Hab. Philippines.

caligatus, Bates, *l. c.*, p. 285.
Hab. Philippines.

Chennelli, Bates, Cist. Ent., ii, 1878, p. 335.
Hab. Nága Hills (Assam).

coeruleus, Latreille, Ic., i, 1822, p. 64, t. 1, f. 2.
javanicus, Gory, Mag. Zool., 1831, t. 39.
Hab. Java, New Guinea.

coracinus, Erichs., Nov. Acta Leop. xvi, Supp., 1834, p. 219: Klug, Jahrb., i, p. 43: Schaum, Berlin. Ent. Zeits., iv, 1860, p. 183.
fulvipennis, Chaudoir, Bull. Mosc., xxi (i), 1848, p. 15: Schaum, Berlin. Ent. Zeits., 1860, p. 183.
Hab. Philippines, Luzon.

dimidiatus, Dejean, Spec., i, 1825, p. 159: Schaum, Berlin. Ent. Zeits., 1860, p. 186.
humeralis, MacLeay, Annul. Javan., 1825, p. 11; Schaum, Berlin. Ent. Zeits., 1860, p. 186.
Var. *Dejeani*, Chaudoir, Ann. Soc. Ent. Fr., (4 s.), i, 1861, p. 410: Schaum, *l. c. supra*, 1862, p. 180.
Hab. Java.

erinnys, Bates, Ent. Mon. Mag., x, 1874, p. 269.
Hab. N. W. Borneo.

Everetti, Bates, Cist. Ent. ii, 1878, p. 334.
Hab. Philippines, Mindanao.

fasciatus, Fabr., Syst. Eleuth., i, 1801, p. 244: Schaum, Berlin, Ent. Zeit. 1863, p. 67.
Var. *flavilabris*, Fabr., *l. c.*, p. 244: Schaum, *l. c. supra*, 1860, p. 184.
„ *vigilax*, Schaum, *l. c.*, 1862, p. 179; Journ. Ent., ii, p. 72.
„ *fulvicollis*, Thomson, Mus. Scient., 1860, p. 42.
Hab. Borneo, Philippines (Mindanao), Batchian, Oceania.

princeps, Bates, Cist. Ent., ii, 1878, p. 335.
Hab. N. W. Borneo.

punctipennis, Bates, *l. c.*, p. 334.
Hab. Philippines, Mindanao.

Schaumi, Chaudoir, Cat. Coll., 1865, p. 55.
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Hab. Singapur, Sumatra.

Semperi, Schaum, Berlin. Ent. Zeits., 1860, p. 185, t. 3, f. 2, ♀.
manillicus, Thomson, Mus. Scient., 1860, p. 42.
Hab. Philippines, Luzon, Manilla.

spectabilis, Schaum, Berlin. Ent. Zeits., 1863, p. 68, t. 3, f. 1.
Hab. Borneo.

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acutipennis, Vanderlinden, Ess. Ins. Jav. (in Mém. Acad. Brux., v. p. 27) 1821, sep. p. 18, ♂: Dejean, Spec., v, p. 273, ♀.

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Hab. N. W. Borneo.

Wallacei, Thomson, Arch. Ent., 1857, p. 131: Schaum, Berlin. Ent. Zeits., 1860, p. 186.
Hab. Borneo, Sarawak.

Genus **TRICONDYLA**.

Latreille, Règne Anim., (*ed.* 1), iii, 1817, p. 179: Lacord., Gen. Col., i, p. 28: Mun. Cat., p. 35: Schaum, Berlin. Ent. Zeits., v, 1861, p. 75; vi, 1862, p. 182; Journ. Ent., ii (1863), 1866, p. 69.
Derocrania, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 297.

annulicornis, Schmidt Goebel, Faun. Col. Birm., 1846, p. 10: Berlin. Ent. Zeits., 1862, p. 184.
Hab. Burma.

Beccarii, R. Gestro, Ann. Mus. Civ. Gen., vi, 1875, p. 306.
Hab. Borneo, Sarawak.

brunnea, Dokhtouroff, Rev. Mens. d'Ent., i, 1883, p. 13.
Hab. Sumatra.

brunnipes, Motschulsky, Bull. Mosc., xxxvii, (3), 1864, p. 179.
Hab. Philippines.

cavifrons, Schaum, Berlin. Ent. Zeits., 1862, p. 182.
Hab. Philippines, Luzon.

concinna, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 298.
Hab. Ceylon, Kandy (Bates).

conicicollis, Chaudoir, *l. c.* xvii (3), 1844, p. 458; id., xxiv (2), 1861, p. 359.
Hab. Philippines.

coriacea, Chevrolat, Rev. Zool., 1841, p. 221: Chaud. Bull. Mosc., xxxiv (2), 1861, p. 359.
Hab. Ceylon, Trincomalee.

cyanea, Dejean, Spec. i, 1825, p. 161.
Hab. Java, Borneo.

cyanipes, Eschsch., Zool. Atlas, i, 1829, p. 6, t. 4, f. 2: Dejean, Spec., v, p. 274; Ic., i, p. 57, t. 6, f. 7: Chaud., Bull. Mosc., xxxiv (2), 1861, p. 359.
Hab. Philippines.

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Hab. Ceylon.

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Hab. Borneo, Sarawak.

femorata, Walker, Ann. Mag. N. H. (3 s.), ii, 1858, p. 202.
rugosa, Chaudoir, Ann. Soc. Ent. Fr., (4 s.), iii, 1863, p. 447.
Hab. Ceylon.

gibba, Chaudoir, Bull. Mosc., xxxiv (4), 1861, p. 358.
Hab. Cambodia.

gibbiceps, Chaudoir, *l. c.* xxxiii (4), 1860, p. 298.
Hab. Ceylon.

granulifera, Motsch., Et. Ent., 1857, p. 110, f. 3.
Hab. Ceylon, Colombo.

macrodera, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 300.
Hab. N. India, [*Ind. Mus.* Sikkim, Cachár, Sibságar, Pegu].

Mellyi, Chaudoir, *l. c.*, xxiii (i), 1850, p. 17.
Hab. N. India, Sub-Himálaya.

nematodes, Schaum, Journ. Ent., ii (1863), 1866, p. 61, t. 4, f. 1.
Hab. Ceylon, Bogawantalawa (Bates).

Nietneri, Motsch., Et. Ent., 1859, p. 25; 1862, p. 23.
laevigata, Chaud., Bull. Mosc., xxxiii (4), 1860, p. 299, ♀.
rhaphidioides, Schaum, Berlin. Ent. Zeits., v, 1861, p. 75, ♂: Journ. Ent., *ii*, p. 71.
var. *obscuripes*, Bates, Ann. Mag. N. H. (5 s.), xvii, 1886, p. 70.
Hab. Ceylon, Bogawantalawa, Balangoda (Bates).

ovicollis, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 178.
Hab. Philippines.

pedestris, Klug, Jahrb., 1834, p. 44: Schaum, Berlin. Ent. Zeits., 1861, p. 77: Chaud., Bull. Mosc., xxxiii (4), 1860, p. 299; xxxiv (2), 1861, p. 360.
aptera, var., Schaum, Journ. Ent., ii (1868), 1866, p. 70.
atrata, Brullé, Hist. Nat. Ins., iv, 1834, p. 106.
cyanea, var., Vanderlinden, Ess. Ins. Jav., 1821, p. 27.
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„ *variicornis*, Chaudoir, Ann. Soc. Ent. Fr., (4 s.), i, 1861, p. 139: Schaum, Berlin. Ent. Zeits, 1862, p. 184.
„ *violacea*, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 302.
Hab. Java, Celebes, Amboina, Ceram, Philippines.

planiceps, Schaum, Berlin. Ent. Zeits., 1862, p. 181.
Hab. Philippines.

pulchripes, White, Ann. Mag. N. H., xiv, 1844, p. 422.
Hab. Cochin China, Hongkong.

punctipennis, Chevrolat, Rev. Zool., 1841, p. 221: Chaud., Bull. Mosc., xxxiii (4) 1860, p. 300.
var. *globicollis*, Chaud., Bull. Mosc., xvii (3), 1844, p. 456; *id.*, xxxiii (4), 1860, p. 300.
„ *ricina*, Chaud., *l. c*, p. 457.
Hab. Philippines.

scitiscabra, Walker, Ann. Mag. N. H., (3 s.), ii, 1858, p. 51.
Hab. Ceylon.

sticticeps (*stricticeps*), Chaudoir, Rev. Mag. Zool., (2 s.) xvi, 1864, p. 74.
Hab. Malacca. [*Ind. Mus.*, Sikkim].

tuberculata, Chaudoir, Bull. Mosc., xxxiii (iv), 1864, p. 301.
Hab. India, ? China.

tumidula, Walker, Ann. Mag. N. H., (3 s.), iii, 1858, p. 50.
Hab. Ceylon.

ventricosa, Schaum, Berlin. Ent. Zeits., 1862, p. 180.
Hab. Philippines.

Wallacei, Thomson, Arch. Ent., 1857, p. 132.
crebrepunctata, Chaudoir, Rev. Mag. Zool., (2 s.), xv, 1863, p. 111.
Hab. Malacca, Borneo. [*Ind. Mus.*, Sinkip Island].

Genus **COLLYRIS**.

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Colliuris, Latreille, Hist. Nat. Anim. sans vertebr., iv, 1817, p. 677.

abbreviata, Motsch., Bull. Mosc., xxxiii (4), 1860, p. 178.
Hab. Java.

acrolia, Chaudoir, Bull. Mosc., *l. c.*, p. 288; *id.*, *Mon.*, p. 520, t. 8, f. 17: Schaum Berlin. Ent. Zeits., vi, 1862, p. 173.
Hab. Philippines, Luzon.

albitarsis, Erichson, Nova Acta Nat. Cur., xvi, 1834, p. 220: Chaud., *Mon.*, p. 511.
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Hab. Philippines.

amoena, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 295: *Mon.*, p. 527.
Hab. N. India.

andamana, Bates, Cist. Ent., ii, 1878, p. 335.
Hab. Andaman Islands. [*Ind. Mus.*, Andaman, Islands].

apicalis, Chaudoir, Rev. Zool., (2 s.), xvi, 1864, p. 105; *id.*, *Mon.*, p. 517.
Hab. Malacca.

Arnoldi, MacLeay, Annul. Javan., 1825, p. 10: Chaud., *Mon.*, p. 528, t. 9, f 20.
elegans, Vander Linden, Ess. Ins. Java, 1821, p. 23: Lap. de Casteln., Hist. Nat. Ins., i, p. 25.
Hab. Java.

attenuata, Redtenb., Hügel Kaschm., iv (2), 1844, p. 498: Chaud., *Mon.*, p. 523 t. 9, f. 19, 19*a*.
Hab. Kashmir, Simla. [*Ind. Mus*, Sikkim].

Bonelli Guérin, Voy. Belanger, Ins., 1834, p. 48, t. 2, f. 1: Lap. de Casteln., Hist. Nat. Ins., i, t. 2, f. 7: Chaud., *Mon.*, p. 503, t. 7, f. 7.
Var. *obscura*, Lap. de Casteln,, Et. Ent., 1834, p. 40, t. 1, f. 2.
„ ? *ruficornis*, Brullé, Arch. Mus., i, 1839, p. 139.
Hab. Java. [*Ind. Mus.*, Dhansiri valley].

caviceps, Klug, Jahrb. Ins., 1834, p. 35 : Chaud., *Mon.*, p. 491.
longicollis, Herbst, Natursyst. Ins., Käfer, pt. x, 1806, p. 215, t. 173, f. 9 (*nec* Fabr.).
Hab. India, Mysore [*Ind. Mus.*, Sikkim].

ceylonica, Chaudoir, *Mon.*, p. 529.
Hab. Ceylon, Bogawantalawa (Bates).

chloroptera, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 294 ; *id.*, *Mon.*, p. 522.
Hab. Singapur, Sumatra.

conicollis, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 176.
Hab. India.

crassicollis, Chaudoir, *Mon.*, p. 497, ♀.
Hab. India.

crassicornis, Dejean, Spec., 1825, p. 166 : Chaud., Bull. Mosc., xxxiii (i), 1860 p. 297 : *id.*, *Mon.*, p. 494, t. 7, f. 2.
Diardi, Mac Leay, Annul. Javan., 1825, p. 10.
MacLeayi, Brullé, Silb. Rev., ii, 1834, p. 101.
pleuritica, Schmidt Goebel, Faun. Col. Birm., 1846, p. 13, ♂.
Var. *gibbicollis*, Motsch., Et. Ent., 1857, p. 110, f. 4.
„ *purpurata*, Klug, Jahrb. Ins., 1834, p. 46.
Hab. N. India, Assam, Burma, Java, Sunda Islands, Moluccas, Hongkong. [*Ind. Mus.*, Andamans].

cribripennis, Thomson, Arch., Ent., i, 1857, p. 133 : Chaud., *Mon.*, p. 509.
Hab. Borneo, Sarawak.

cribrosa, Chaudoir, *Mon.*, p. 507.
? *melanopoda*, Schmidt Goebel, Faun. Col. Birm., 1846, p. 13 ; Chaud., *Mon.*, p. 508.
Var. *flavitarsis*, Brullé, Arch. Mus., i, 1839, p. 141.
„ *rufitarsis*, Klug, Jahrb. Insec., 1834, p. 45.
Hab. Burma, Java.

cruentata, Schmidt Goebel, Faun. Col. Birm., 1846, p. 14 ; Chaud., *Mon.*, p. 505.
Hab. India, Burma, Borneo.

cylindripennis, Chaudoir, Rev. Zool., 1864, p. 106 ; *Mon.*, p. 514, t. 8, f. 13.
Hab. Siam.

diffracta, Schmidt Goebel, Faun. Col. Birm., 1846, p. 17 ; Chaud., *Mon.*, 499.
Hab. Burma.

dimidiata, Chaudoir, *Mon.*, p. 521, t. 9, f. 18.
Hab. Malacca, Laos. [*Ind. Mus.*, Andamans].

discolor, Chaudoir, *Mon.*, p. 531.
Hab. Sumatra.

distincta, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 290 ; *Mon.*, p. 501.
Hab. India.

Dohrnii, Chaudoir, Bull. Mosc., l. c. *supra* p. 286 ; *Mon.*, p. 490.
Hab. Ceylon, Colombo.

dolens, Chaudoir, Berlin. Ent. Zeits., 1861, p. 399; *Mon.*, p. 510.
Hab. Borneo, Sarawak.

elongata, Chaudoir, *Mon.*, p. 509, ♀.
Hab. Malacca.

emarginata, Dejean, Spec., i, 1825, p. 165: MacLeay, Annul. Javan., p. 10: Chaud., *Mon.*, p. 506, t. 7, f. 8.
brevicollis, Klug, Jahrb. Ins., 1834, p. 46.
longicollis, Oliv., Ent., ii, 1790, 33, p. 7, t. 2, f. 17: Latreille, Gen. Crust., p. 176, t. 6, f. 8.
Hab. Borneo, Java. [*Ind. Mus.*, Sibságar, Assam].

fasciata, Chaudoir, Rev. Mag. Zool., (2 s.), xvi, 1864, p. 107; *Mon.*, p. 513, t. 8, f. 12.
Hab. Siam.

filiformis, Chaudoir, Bull. Mosc., xvi (3), 1843, p. 697; *Mon.*, p. 507, t. 8, f. 9.
Hab. Java.

flavicornis, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 292; *Mon.*, p. 512, t. 8, f. 11.
Hab. N. India, Malaya, Cochinchina.

formosana, Bates, Proc. Zool. S. Lond., 1866, p. 341.
Hab. Formosa.

fuscicornis, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 177.
Hab. India.

fuscitarsis, Schmidt Goebel, Faun. Col. Birm., 1846, p. 16: Chaud., *Mon*, p. 499.
cylindrica, Schmidt Goebel, *l. c.*, p. 15.
Hab. India, Burma, Malaya. [*Ind. Mus.*, Assam].

gibbicollis, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 178.
Hab. Assam.

Horsfieldi, MacLeay, Annul. Javan, 1825, p. 11: Chaud., *Mon.*, p. 532, t. 9, f. 23 *a—b*.
rugicollis, Klug, Jahrb. Ins., 1834, p. 46.
Hab. Java.

impressifrons, Chaudoir, *Mon.*, p. 500.
Hab. Cochinchina. [*Ind. Mus.*—?].

insignis, Chaudoir, Rev. Mag. Zool., (2 s.), xvi, 1864, p. 76; *Mon.*, p. 496, t. 7, f. 4, 4*a*, ♀.
Hab. Assam (Silhat). [*Ind. Mus.*, Sikkim].

leucodactyla, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p 297; *Mon.*, p. 530, t. 9, f. 21.
albitarsis, Thomson, Arch. Ent., i, 1857, p. 132.
? *leucopus*, Schaum, Berlin. Ent., Zeits., 1861, p. 79.
Hab. Borneo, Sarawak.

linearis, Schmidt Goebel, Faun. Col. Birm., 1846, p. 15: Chaud., *Mon.*, p. 528.
Hab. Burma, Siam.

lissodera, Chaudoir, *Mon.*, p. 532.
Hab. Borneo, Sarawak.

longicollis, Fabr., Mant. Ins., i, 1787, p. 185: Chaud., *Mon.*, p. 490, t. 7, f. 1.
Lafertei, Chaud., Bull. Mosc., xxxiii (4), 1860, p. 284.
Hab. N. India, Siam, Java, Borneo.

longicornis, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 176.
Hab. Burma.

Lundii, Crotch, Col. Hefte, v, 1869, p. 106.
aptera, Lund, Acta Soc. Hist. Nat. Hafn., i, 1790, p. 65, t. 6, f. 1, *nec* Oliv.: Schneid. Mag. i, p. 13: Fabr. Ent. Syst.. i, p. 169: Schaum, Stettin. Ent. Zeit., 1847, p. 50: Chaudoir, Bull. Mosc., xxxvii (4), 1860, p. 286; *Mon.*, p. 518, t. 8, f. 15.
Hab. Bengal.

macrodera, Chaudoir, Rev. Mag. Zool., (2 s.), xvi, 1864, p. 105: Chaud., *Mon.*, p. 536.
Hab. Malacca.

maculicornis, Chaudoir, Bull. Mosc., xxiii (i), 1850, p. 19; *Mon.* p. 524.
Hab. N. India, Simla.

major, Latreille, Ic. Col. Eur., i, 1822, p. 66, t. 2, f. 4, 5: Brullé, Hist. Nat. Ins., iv, t. 3, f. 1: Chaud., *Mon.*, p. 517, ♀.
Hab. Malacca.

Mniszechii, Chaudoir, Rev. Mag. Zool., (2 s.) xvi, 1864, p. 75; *Mon.*, p. 492.
Hab. Malacca, Laos.

modesta, Dejean, Spec., v, 1831, p. 275; Ic. Col. Eur., i, p. 58, t. 6, f. 8: Chaud. *Mon.*, p. 510.
Diardi, Latreille, Ic. Col. Eur. (1 *ed.*), 1822, p. 66.
tarsata, Klug, Jahrb. Ins., 1834, p. 45.
Hab. Malacca, Java. [*Ind. Mus.*, Sibságar, Assam].

moesta, Schmidt Goebel, Faun. Col. Birm., 1846, p. 14; Chaud., *Mon.*, p. 505.
Hab. Burma.

Mouhotii, Chaudoir, *Mon.*, p. 515.
Hab. Laos.

nigricornis, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 177.
Hab. India.

ortygia, Buquet, Ann. Soc. Ent. Fr., iv, 1835, p. 604: Chaud., *Mon.*, p. 502, t. 7, f. 6.
cribellata, Chaud., Bull. Mosc., xxxiii (4), 1860, p. 290, ♀.
var. *puncticollis*, Chaud., *l. c.*, p. 291, ♀.
Hab. Deccan, N. India, Java, Sunda Islands [*Ind. Mus.* Jhelam valley].

parvula, Chaudoir, Bull. Mosc., xxi (i), 1848, p. 17; *Mon.*, p. 527.
Hab. Bombay.

plicata, Schaum, Journ. Ent., ii (1863), 1866, p. 61: Chaud., *Mon.*, p. 520.
Hab. Philippines, Luzon.

plicaticollis, Chaudoir, *Mon.*, p. 534.
Hab. Ceylon.

postica, Brullé, Arch Mus., i, 1839, p. 138, t. 9, f. 8: Chaud., *Mon.*, p. 504, ♀.
Hab. Sumatra, Java.

procera, Chaudoir, *Mon.*, p. 501.
Hab. Bombay.

punctatella, Chaudoir, *Mon.*, p. 525.
Hab. Ceylon, Balangoda (Bates).

purpurata, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 171.
Hab. India.

Rhodopus, Bates, Cist. Ent., ii, 1878, p. 335.
Hab. N. Borneo.

Robynsii, Vander Linden, Ess. Ins. Jav., i, 1821, p. 24: Lap. de Casteln., Hist. Nat. Ins., i, p. 24: Chaud., *Mon.*, p. 535.

rubens, Bates, Cist. Ent., ii, 1878, p. 336.
Hab. Assam.

rufipalpis, Chaudoir, *Mon.*, p. 504.
Hab. N. India.

rufipes, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 175.
Hab. Bengal.

rugosa, Chaudoir, *Mon.*, p. 515.
Hab. —— ?

saphyrina, Chaudoir, Bull. Mosc., xxiii (i), 1850, p. 18; *Mon.*, p. 498, t. 7, f. 5.
Boysii, Chaud., *l. c.*, xxxiii (4), 1860, p. 288, ♀.
Hab. N. India.

sarawakensis, Thomson, Arch. Ent., i, 1857, p. 133: Chaud., *Mon.*, p. 531, t. 9, f. 22.
Hab. Borneo, Sarawak.

Saundersii, Chaudoir, *Mon.*, p. 496, ♀.
Hab. Ceylon, Colombo (*Bates*).

Smithii, Chaudoir, *Mon.*, p. 518.
Hab. India.

speciosa, Schaum, Journ. Ent., ii (1863), 1866, p. 62; Chaud., *Mon.*, p. 519, t. 8 f. 16.
Hab. Philippines, Luzon.

subclavata, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 289; *Mon.*, p. 495, t. 7, f. 3.
Hab. Deccan, N. India. [*Ind. Mus.*, Malda].

subtilis, Chaudoir, Rev. Mag. Zool., (2 s.), xv, 1863, p. 112; *Mon.*, p. 525.
Hab. Siam.

tenuicornis, Chaudoir, *Mon.*, p. 526.
Hab. Singapur.

terminalis, Chaudoir, *Mon.*, p. 509.
Hab. Malacca, Tringani.

tuberculata, MacLeay, Annul. Javan., 1825, p. 10: Chaud., *Mon.*, p. 516, t. 8, f. 14., *Audouinii*, Lap. de Castelu., Silb. Rev., iii, 1834, p. 36; Hist. Nat. Col., i. p. 24: Brullé, Hist. Nat. Ins., iv, p. 100.
longicollis, Dejean, Spec., i, 1825, p. 163; Ic. Col. Eur., i, p. 67, t. 2, f. 3: Chaud., Bull. Mosc., xxxiii (4), 1860, p. 296.
var. *Chevrolatii*, Guerin, Mag. Zool., 1838, cl. ix, t. 225, f. 1 a-c: Schaum, Berlin Ent. Zeits., 1861, p. 80.
Hab. Java.

variicornis, Chaudoir, *Mon.*, p. 530.
Hab. Assam (Silhat).

variitarsis, Chaudoir, Bull. Mosc., xxxiii (4), 1860, p. 295; *Mon.*, p. 523.
Hab. N. India.

violacea, Motsch., Bull. Mosc., xxxvii (3), 1864, p. 176.
Hab. Burma.

Waterhousei, Chaudoir, Rev. Mag. Zool., (2 s.), xvi, 1864, p. 104; *Mon.*, p. 521.
Hab. Philippines? Manilla.

xanthoscelis, Chaudoir, *Mon.*, p. 526.
Hab. Singapur.

CORRECTIONS and ADDITIONS:—

p. 5, after *bramani*, Dokhtouroff, for '*l. c.*,' read 'Rev. d' Ent.'
„ *Duponti*, Dejean, is a good species and is not a synonym of *aurulenta*, Fabr. The Indian Museum has examples from several districts in Assam, and from S. India.
„ 7, *dolens*, Fleutiaux, is a variety of *funebris*, Schmidt Goebel, and is found in Sikkim and Assam.
„ after '*elaphroides* Dokhtouroff, Rev.' omit 'Mens.'. This species is probably the same as C. *macilenta*, Chaudoir, *q. v.*
„ after '*Fauveli*, Dokhtouroff, Rev.' omit 'Mens.'

Whilst these pages were passing through the press, M. Fleutiaux has examined the Indian Museum collection and we get the following precise localities:—

Cicindela:—
calligramma, Schaum, Trivandrum.
chinensis, De Geer, N. India, Simla.
dolens, Fleut., var. of *funebris*, Sikkim, Assam.
fastidiosa, Dejean, Assam.
flavovittata, Chaudoir, Trivandrum.
funebris, Schmidt Goebel, Sikkim, Assam, Pegu.
grammophora, Chaudoir, Mahanadi.
lineifrons, Chaudoir, Pegu.
nitidus, Wiedemann, Malda, Pegu.
striatifrons, Chaudoir, Berhampur.
superba, Kollar, S. E. Borneo.
tetragrammica, Chaudoir, S. India.
viduata, Fabr., var. *holosericea*, Bengal

Whithilli, Hope, Poona, Bombay.
yunnana, Fairmaire, Sikkim.

Dromicidia:—
scrobiculata, Wiedemann, Malda.

Odontochila:—
? *heteromalla* MacLeay, Sikkim.

Add:—

Genus **TETRACHA**, Hope.

Col. Man., ii, 1838, p. 7: Mus. Cat., p. 3.

euphratica, Dejean, Spec., i, 1825, p. 7: J. Duval, Gen. Col. Carab., t. 1, f. 1: Coquerel, Ann. Soc. Ent. Fr., 1859, p. 615, t. 14, f, *a-f*.
algeriana, Guérin, Bull. Soc. Ent. Fr., 1846, p. xviii.
Hab. Spain, Algeria, Armenia [*Ind. Mus.*, Agra, N. W. P.].

II.—*Catalogue of the* Insecta.

Order Rhynchota.

Suborder Hemiptera-Heteroptera.

Family Capsidæ.

By E. T. Atkinson, B. A.

Astemmites, Laporte, Ess. des Hém., 1835, p. 36.
Capsini, Burm., Handb. Ent., ii, 1835, p. 263.
Bicelluli, Am. and Serv., Hist. Nat. Ins. Hém., 1843, p. 275.
Phytocoridae, Fieber, Eur. Hem., 1861, p. 26.
Isometopidae, Fieber, *l. c.*, p. 26.
Capsidae, Westw., Intr. Mod. Class. Ins., ii, 1840, p. 479: Reuter, Hem. Gymn. Eur., i, 1879, p. 13.

Mr. Distant in his introduction* to the *Capsidae* of Central America writes:—"The members of this family are readily recognised by the elongated and 4-jointed antennæ, of which the second joint is frequently more or less thickened at the apex, and the two terminal joints are more or less slender, and also, and principally, by the corium terminating in a distinctly differentiated section called the cuneus. If we except a very considerable knowledge of the Palæarctic *Capsidae*, and a less acquaintance with those of the Nearctic region, we may safely presume to say that those of the Ethiopian, Oriental, and Australian regions, are practically unworked and unknown." This statement as to our knowledge of the *Capsidae* is true to the present day as regards the Ethiopian, Oriental, and Australian regions. Dr. Stål did much for the *Capsidae* of Brazil, Dr. Berg, for those of the Argentine Republic, and Mr. Distant has described and figured a considerable number from Central America. To commence the study of the extra-European old world *Capsidae*, it seemed necessary to catalogue those already described from all countries, and I now present this list to my fellow-entomologists as my contribution to the work. No attempt has ever been made to make a complete catalogue of the described species, and, indeed, it would have still been impossible to achieve it were it not for the labours of Reuter, Puton, Lethierry, Horvath, Uhler, and Ferrari, and especially the great works of the first-named author, which must ever remain the principal guides to the study of the family.

The bibliographical table annexed gives the principal abbreviations used in this catalogue and the full title of the works referred to. Fieber's 'European Hemiptera' and Reuter's 'Hemiptera Gymnocerata Europæ,' are necessary aids to the student. For the fuller

* Biol. Centr.-Amer. Rhyn., 1883, p. 234.

synonymy of the older species, reference should also be made to Reuter's '*Revisio synonymica Heteropterorum palaearcticorum quæ descripserunt auctores vetustiores*' (Linnæus, 1758; Latreille, 1806): Helsingfors, 1888. In this laborious work, Herr Reuter arranges the synonymy on the basis of priority in the printed publication of recognisable descriptions of species, setting aside the compromises due to the 'law of prescription' or of 'continuity of use for a lengthened period,' and it is to be hoped that the results of his investigations will be accepted by all engaged in the study of this order, and that this list, which embodies those results, may be regarded as authoritative in the cases affected thereby.

I have not attempted to give references to merely faunistic catalogues, but the first table given below indicates the principal local lists in which the family of the *Capsidæ* is noticed. References to Walker's Catalogue of the Hemiptera-Heteroptera are also given. It is, however, to be carefully understood that these references do not imply the acceptance of Walker's synonymical notes, which are, as a rule, so untrustworthy that, perhaps, it would have been better to have omitted them.

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France—Reiber and Puton, 'Catalogue des Hémiptères d' Alsace et de la Lorraine.' Colmar, 1876.

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Italy—Ferrari, P. M.—'Hemiptera Agri Ligustici,' in Ann. Mus. Civ. Gen., vi, 1874; *ib.*, xii, 1878, p. 60: *id.*, 'Rhynchota Tridentina,' *ib.*, 1884.

Bohemia—Duda, L.—'Beitrage zur kenntniss der Hemiptera Faunen Bohmens,' in Wien. Ent. Zeit., Vol. V, 1886, p. 43.

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Tyrol—Gredler, V., 'Rhynchota Tirolensia, Hemiptera-Heteroptera, in Verh. Zool. bot. Ges. Wien, 1870, p. 90.

Holland—Vollenhoven, S. C. Snellen Van—Hemiptera-Heteroptera Neerlandica, 1878: 'Bijvoegsel tot de lijst der inlandische Hemiptera-Heteroptera,' in Tijdschr. v. Ent., xxii, 1879. Fokker, A. J.—'Catalogus der in Nederland voorkomende Hemiptera,' in *ibid.*, xxvi, 1883, p. 234; 1884, p. 113.

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Caucasus—Jakowleff, in Bull. Soc. Imp. Moscow, xlviii, 1874: xlix, 1875: lii, 1877, also 1880, 1883, and Trudi Russki Ent. xii, p. 3; xiii, p. 85.

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Div. I. **TERATODELLARIA**, Reuter, Bih. Vet-Aka. Handl., iii (i), 1875, p. 7 ; *id.*, Hem. Gymn. Eur., iii, p. 564.

Genus **TERATODELLA**.

Reuter, Bih. Vet. Aka. Handl., iii (i), 1875, p. 7 ; *id.*, Zool. Jahr., 1879, p. 508.

anthocoroides, Reuter, *l. c. supra*, 1875, p. 8.
Hab. France, ? Senegal.

Genus **CAMELOCAPSUS**.

Reuter, Bull. Soc. Ent. Fr., (5 s.), viii, 1878, p. cv.

oxycarenoides, Reuter, *l. c.*, p. cv.
Hab. Greece, Ætolia.

Div. II. **MYRMECORARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 564.

Genus **PITHANUS**.

Fieber, Crit., 1859, 16, t. 6, f. 13 ; Eur. Hem., p. 61, 239 : Dougl. & Scott, Brit. Hem., p. 280 : Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 25 ; *id.*, Rev. Caps., p. 119.

Maerkelii (*Capsus*), Herr. Schäff., Wanz. Ins., iv, 1839, p. 78, t. 132, f. 406 (*form. macr.*) : Kirschb., Rhyn. Wiesb., p. 204. sp. 28 : Flor, Rhyn. Liv., i, p. 513 : Fieber (*Pithanus*), Eur. Hem., p. 239 : Walk., Cat. Het., vi, p. 88 : Dougl. & Scott. Brit. Hem., p. 281, t. 10, f. 3 : Saund., Syn., p 278 : Reuter, Rev. Caps , p. 119.
flavolimbatus, Bohem., Vet.-Aka. Handl., 1849, p. 252 (*form. macr.*).
vittatus, Dahlb., *l. c.*, 1850, p. 205.
Hab. Europe, especially N. Europe [*Atk.*, Lille].

Marshalli, Dougl. & Scott, Ent. Mon. Mag., v, 1868, p. 114 : Walk. Cat. Het., vi, p. 88.
Hab. Syria, Algeria.

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Gorski, Anal. ad Ent. Prov. S.-W. Ross., i, 1852, p. 167: Fieb., Eur. Hem., p. 61, 238: Flor. Rhyn. Liv., i, p. 635: Walk. Cat. Het., vi, p. 160: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 25; *id.*, Rev. Caps., p. 117.

? **bimaculatus**, Motsch., Bull. Mosc., xxxii (2), 1859, p. 502.
Hab. Siberia, Amuria.

gracilis (*Globiceps*), F. Sahlb., Mon. Geoc. Fenn, 1848, p. 123: Boheman, Nya Svenska Hem., p. 70: Gorski (*Myrmecoris*), Anal., i, p. 168: Stein, Berlin. Monats., xiv, p. 424, t. 3, t. 8: Kirschbaum, Rhyn. Wiesb., p. 201, sp. 23, p. 268: Flor, Rhyn. Liv., i, p. 636: Fieber, Eur. Hem., p. 239, pt.: Walk., Cat. Het. vi, p. 160: Reuter, Abo. Hem., p. 71; *id.*, Rev. Caps., p. 118.
lithuanicus, Gorski, Anal. *l. c. supra*, p. 167, t. 2, f. 1.
var. *rufusculus*, Reuter, 1879: Puton, Cat., 1886, p. 45.
„ *fuscus*, Reuter, 1879: Puton, Cat., 1886, p. 45.
Hab. N. Europe, France.

rubricatus, Jakowleff, Bull. Mosc., lvi (4), 1882, p. 362.
Hab. Russia, Orenburg.

Genus **SPHINCTOTHORAX.**

Stål, Ofvers. Vet.-Aka. Förh., 1853, p. 260; Hem. Afric., iii, 1865, p. 17: Walk., Cat. Het., vi, p. 165.

leucophaeus (*Cyllocoris*), Germar, Silbermann. Rev. Ent., v, 1837, p. 135: Stål, Ofvers. Vet.-Aka., Förh., 1855, p. 36; Hem. Afric., iii, p. 17: Walk. *l. c. supra*, p. 165.
Hab. Caffraria.

Genus **HERDONIUS.**

Stål, Rio Jan. Hem., i, 1858, p. 55.

armatus, Stål, *l. c.* p. 56: Walk., Cat. Het., vi, p. 166.
Hab. Rio Janeiro.

Genus **CAMPONOTIDEA.**

Reuter, Ofvers Finska Soc. Förh., xxi, 1879, p. 176; *id.*, Zool. Jahr., 1879, p. 509.

Saundersi (*Myrmecoris*), Puton, Pet. Nouv. Ent., i No. 113, 1874, p. 452: Waterh. Aid Ident., Ins., t. 25: Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 181.
var. *Fieberi*, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 176; Berlin. Ent. Zeits., *l. c. supra*.
Hab. Greece, Smyrna.

Genus **GRYLLOCORIS.**

Bärenspang, Berlin. Ent. Zeits., 1859, p. 334: Fieber, Eur. Hem. p. 66, 263: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 25.
Aphanosoma, Costa, *teste* Puton, Cat., 1886, p. 45.

angusticollis, Bärensp., *l. c. supra*, p. 335, t. 6, f. 8: Fieber, Eur. Hem., p. 263: Walk., Cat. Het., vi, p. 77.
italicus, Costa, Cim. Regn. Neap. Cent., 1852.
Hab. Greece.

Genus **LAURINIA**.

Ferrari and Reuter, Ann. Mus. Civ. Gen. (2 s.), i, 1884, p. 481.

fugax, Ferrari and Reuter, *l. c.*, p. 482.
Hab. Tunis.

Div. iii. **MIRARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 565: Distant, Biol. Centr. Amer. Rhyn., 1883, p. 235: Uhler, list, p. 17 pt.

Genus **ACÈTROPIS**.

Fieber, pt., Crit. Phyt., 1859, 11, t. 6, f. 2; *id.*, Eur. Hem., p. 62, 244: Reuter, Bih Vet. Aka. Handl., iii (i), 1875, p. 8: Walker, Cat. Het., vi, p. 50.

carinata (*Lopus*), Herr. Schäff., Wanz. Ins., vi, 1842, p. 49, t. 197, f. 609: Kirschb., Rhyn. Wiesb., p. 194, sp. 8: Fieber, Eur. Hem., p. 244: Walker, Cat. Het., vi. p. 50.
marginata, Schummel, *teste* Fieber, Puton, Cat., 1886, p. 45.
Hab. Dantzig.

Gimmerthali, Flor., Rhyn. Liv., i, 1860, p. 428: Saund., Syn., p. 258.
seticulosa, Fieber, Eur. Hem., 1861, p. 244: Dougl. & Scott, Brit. Hem., p. 291, t. 10, f. 5: Walk., Cat. Het., vi, p. 50.
Hab. Nearly all Europe.

longirostris, Puton, Pet. Nouv. Ent., i, 1875, p. 511.
Hab. S. Russia, Sarepta.

Genus **COLLARIA**.

Provancher, Can. Nat., iv, 1872, p. 79; Uhler, List., p. 17.
Nabidea, Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 397; Reuter, Zool. Jahr., Arthr, 1879, p. 507.

explicata, Uhler, Ent. Am., ii, 1886, p. 230.
Hab. W. Indies.

infuscata (*Nabidea*), Uhler, List, 1886, p. 20.
Hab. United States.

Meilleuri, Provancher, Can. Nat., iv, 1872, p. 79: Uhler, Ent. Am., ii, 1886, p. 230.
coracina (*Nabidea*), Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 398; List, p. 20.
Hab. United States.

Genus **MIRIS**.

Fabricius, pt., Ent. Syst., iv, 1794, p. 183: Fieber, Eur. Hem., p. 62, 239: Dougl.

& Scott, Brit. Hem., p. 282: Walker, Cat. Het., vi, p. 48: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 8; *id.*, Rev. Caps. p. 17: Distant, Biol. Centr. Amer., Rhyn., 1883, p. 236: Uhler, List, p. 17.

Subg. *Brachytropis*, Fieber, Crit. Phyt., 1859, 6, t. 6, f. 18; *id.*, Eur. Hem., p. 62, 241.

Subg. { *Miris* (Fieber), Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 8.
Lobostethus, Fieber, Crit. Phyt., 1859, 8, t. 6, f. 19; *id.*, Eur. Hem. p. 62, 242.

Stenodema, Lap., Ess., 1832, p. 40: Spinola, Ess., p. 186: Reuter, Rev. Syn. Het., p. 238.

affinis, Reuter, Caps. Amer., 1875, p. 59: Uhler, Wheeler, Rep. Geogr. Explor. Un. St., v, Zool., 1875, p. 836, t. 42, f. 9; List, p. 17: Distant, Biol. Centr. Amer. Rhyn., p. 236.

instabilis, Uhler, Proc. Bost. Soc. N. H., 1871, p. 104; Bull. Un. St. Surv. ii, 1876, p. 316; iii, 1877, p. 413; Proc. Bost. Soc. N. H., 1878, p. 395; List, p. 17.

Hab. United States, Wisconsin, Maryland, N. Jersey, Colorado, Mexico [*Atk.*, Canada].

albopilosus, Lethierry, Ann. Mus. Civ. Gen., (2 s.) vi, 1888, p. 464.

Hab. Sumatra.

australis (*Brachytropis*), Wallengren, Ofvers. Vet.-Aka. Förh., xxxii (i), 1875, p. 135.

Hab. Africa, Transvaal.

Belangeri, Provancher, Nat. Can., iv, 1872, p. 78: Uhler, List, p. 17.

Hab. Canada.

calcaratus, Fallen, Hem. Suec., 1829, p. 131: Burm. Handb. Ent., ii (i), p. 265: Herr. Schäff., Wanz. Ins., iii, p. 39: Zett., Ins. Lapp., p. 280: Meyer, Rhyn. Schw., p. 34: Schill., Hem. Het. Siles., p. 52: F. Sahlb., Geoc. Fenn., p. 86; Kirschb., Rhyn. Wiesb., p. 193, sp. 4: Flor, Rhyn. Liv., i, p. 421: Fieber (*Brachytropis*), Eur. Hem., p. 241: Dougl. & Scott, Brit. Hem., p. 286: Walk., Cat. Het., vi, p. 48: Saund., Syn., p. 258: Reuter, Rev. Caps., p. 17: Uhler, Bull. Un. St. Surv., ii, 1876, p. 316; iii, 1877, p. 413.

dentatus, Hahn, Wanz. Ins. i, 1831, p. 15, t. 2, f. 8.

var. *griscescens*, Fieber, Eur. Hem., 1861, p. 241.

„ *virescens*, Fieber, *l. c.*, p. 241.

Hab. All Europe, Turkistan, Canada, United States [*Atk.*, Riveira, Hungary].

? **curticollis**, Costa, Cim. Regn. Neap. Cent, iii, 1852, p. 57.

Hab. Italy.

Dohrni, Stål, Freg. Eug. Resa, Hem., 1859, p. 254: Walk., Cat. Het., vi, p. 53; Berg, Hem. Arg., 1879, p. 118.

Hab. Patagonia.

dolabratus (*Cimex*), Linn., Syst. Nat. (ed. 10), 1758, p. 449: Fabr. Ent. Syst. iv, p. 183: Fallen, Mon. Cim., p. 107: Zett. Faun. Lapp., p. 501: Burm. Handb. Ent., ii (i), p. 267: Hahn, Wanz. Ins., ii, p. 75, t. 53, f. 160: Herr. Schäff., Wanz. Ins., iii, p. 45, t. 86, f. 261, 262: Westw., Mod. Class. Ins., ii, p. 122: Meyer, Rhyn. Schw., p. 38: F. Sahlb., Geoc. Fenn., p. 82: Kirschb.

Rhyn. Wiesb., p. 196, sp. 11: Flor, Rhyn. Liv., i, p. 437: Fieb., Crit. Gen. Phyt. (*Leptopterna*), 14; *id.*, Eur. Hem., p. 245: Dougl. & Scott (*Lopomorphus*), Brit. Hem., p. 297: Walk., Cat. Het., vi, p. 51: Saund., Syn, p. 261; Stål, Hem. Fabr., i, p. 90: Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 397: Reuter (*Leptopterna*), Rev. Caps., p. 31; (*Miris*), Rev. Syn. Het., p. 243.

abbreviatus, Wolff, Ic. Cim., iii, 1802, p. 116, t. 11, f. 110.

antenni-rectus, Goeze, Ent. Beytr., ii, 1778, p. 267.

? *deses*, Müller, Zool. Dan., 1767, p. 108.

? *frumentarius*, Poda, Ins. Græc., 1761, p. 60.

lævigatus, De Geer, Mém., iii, 1773, p. 292.

lateralis, Fabr., Gen. Ins., 1776, p. 300: Wolff, Ic. Cim., iii, p. 115, t. 11, f. 109: Latr.

porrectus, Geoffroy in Fourcr. Ent. Paris, 1785, p. 206.

recticornis, Gmelin, Syst. Nat., iv, 1788, p. 2185.

viparius, Scopoli, Ent. Carn., 1763, p. 135.

V-flavum, Goeze, Ent. Beytr., ii, 1778, p. 279.

var. *aurantiacus*, Reuter, Rev. Caps., p. 32.

„ *carinatus*, Dougl. & Scott, Brit. Hem., 1865, p. 294.

Hab. All Europe: E. United States [*Atk.*, Lille, Hungary].

dorsalis (*Capsus*), Say, Compl. Writ., ii, 1859, p. 438: Uhler, Proc. Bost. Soc. N. H., 1878, p. 396; List, p. 17: Walk., Cat. Het., vi, p. 52.

Hab. United States.

fuscicornis, Brullé, Canar. Ent., 1846, p. 82.

Hab. Canary Islands.

guatemalanus, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 236.

Hab. Guatemala, Quezaltenango, Volcano de Agua.

holsatus (*Cimex*), Fabr., Mant. Ins., 1787, p. 306; *id.* (*Miris*), Ent. Syst. iv, p. 184; Fallen, Mon. Cim., p. 111: Zett., Faun. Lapp, p. 502: Fallen, Hem. Suec. p. 132: Herr. Schäff., Wanz. Ins., iii, p. 41, t. 85, f. 256: Meyer, Rhyn. Schw. p. 36: Kolenati, Mel. Ent., ii, p. 99: F. Sahlb., Geoc. Fenn., p. 86: Kirschb. Rhyn. Wiesb., p. 194, sp. 7: Flor, Rhyn. Livl., i, p. 427: Fieber, Eur. Hem., p. 241: Dougl. & Scott, Brit. Hem., p. 283: Walk., Cat. Het., vi, p. 48: Saund., Syn., p. 259; Reuter, Rev. Caps., p. 20; *id.* (*Stenodema*), Rev. Syn. Het., p. 240.

holsaticus, Burm., Handb. Ent., ii (i), 1835, p. 265.

Hab. All Europe [*Atk.*, N. France, Genoa].

insuavis, Stål, Rio Jan. Hem., i, 1858, p. 45: Walk. Cat. Het., vi, p. 52: Berg, Hem. Arg., 1879, p. 117; Add. Emend., 1884, p. 63.

Hab. Brazil.

lævigatus (*Cimex*), Linn., Syst. Nat., (ed. 10), 1758, p. 449: Fabr., Syst. Rhyng. p. 252: Herr. Schäff., Wanz. Ins., iii, p. 43, t. 85, f. 259: Meyer, Rhyn. Schw., p. 35: Kolenati, Mel. Ent., ii, p. 98: Costa, Cim. Regn. Neap. Cent., iii, p. 31: Kirschb., Rhyn. Wiesb., p. 193, sp. 5: Fieber, Crit. Phyt., 12: Flor, Rhyn. Liv., i, p. 425: Fieber, Eur. Hem., p. 240: Dougl. & Scott, Brit. Hem., p. 284: Walk., Cat. Het., vi, p. 48: Saund., Syn., p. 259: Reuter, Rev. Caps. p. 19; Rev: Syn. Het., p. 238.

? *albolineatus*, Goeze, Ent. Beytr., 1778, p. 280.

? *frumentarius*, β, Poda, Ins. Gr., 1761, p. 60.
lateralis, Geoffroy in Fourcr., Ent. Par., 1785, p. 209.
pallidus, Harris, Exp. Engl. Ins., 1781, p. 90, t. 26, f. 9.
? *pallescens*, Donov., Brit. Ins., iii, 1794, t. 101, f. 6, 7.
? *testaceus*, Scopoli, Ent. Carn., 1763, p. 135.
? *tetragrammus*, Gmelin, Syst. Nat., iv, 1788, p. 2194.
virens, Hahn, Wanz. Ins., ii, 1834, p. 79, t. 54, f. 165.
Hab. Nearly all Europe [*Atk.*, Lille, Vosges, Stazzano, Hungary].

parvulus, Brullé, Canar. Ent., 1840, p. 82.
Hab. Canary Islands.

roseus, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 236, t. 23, f. 20.
Hab. Mexico, Oaxaca.

sericeus, Fieber, Eur. Hem., 1861, p. 240: Walk., Cat. Het., vi, p. 48.
Hab. Germany, Switzerland, Italy.

spurius, Stål, Freg. Eug. Resa, Hem., 1859, p. 254: Walk., Cat. Het., vi, p. 52.
Hab. Pana, Oceania.

? **vicinus**, Provancher, Nat. Can., iv, 1872, p. 77: Uhler, List, p. 17.
Hab. Canada.

virens (*Cimex*), Linn., Syst. Nat., (*ed.* 12) 1767, p. 730: Fabr., Syst. Rhyng., p. 254: Wolff, Ic. Cim., ii, p. 78, t. 8, f. 75: Lap., Ess., 1832, p. 40: Herr. Schaff., Wanz. Ins., iii, p. 42, t. 85, f. 257: Brullé, Hist. Ins., p. 409, t. 35, f. 3: Meyer, Rhyn. Schw., p. 35: Kolenati, Mel. Ent., ii, p. 99: F. Sahlb., Geoc. Fenn., p. 86: Costa, Cim. Regn. Neap. Cent. iii, p. 31: Kirschb., Rhyn. Wiesb., p. 193, sp. 6: Flor, Rhyn. Liv., i, p. 423: Fieber, Eur. Hem., p. 243; Walk., Cat. Het., vi, p. 49: Reuter, Rev. Caps., p. 18; Rev. Syn. Het., p. 237 (*Stenodema*).
laevigatus, Zett., Faun. Ins. Lapp., 1828, p. 501: Hahn, Wanz. Ins., ii, p. 76, t. 53, f. 161 (= Var. *testaceus*, Fallen, *teste* Reuter).
? *laevigatus*, var. *virescens*, Fallen, Hem. Suec., 1829, p. 131: Reuter, Rev. Caps., p. 19: *virescens*, Fieber, Eur. Hem., 1861, p. 242: Reuter, Rev. Caps. p. 19.
Var. *ruficornis*, Hahn, Wanz. Ins., ii, 1834, p. 135, t. 71, f. 220.
,, *fulvus*, Fieber, Weit. Beitrag Nat. Heilk., i, 1836, p. 101.
,, *lateralis*, J. Sahlberg, Vet.-Aka. Handl., xvi (4), 1878, p. 23.
Hab. All Europe, Turkistan, E. Siberia [*Atk.*, Vosges].

viridis, Provancher, Nat. Can., iv, 1872, p. 78: Uhler, List, p. 17.
Hab. Canada.

Genus **MEGALOCERAEA.**

Fieber, Crit. Gen., 1859, 9: Eur. Hem. p. 62, 243: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 8; *id.*, Rev. Caps., p. 21: Walk., Cat. Het. vi, p. 50.
Subg. *Notostira*, Fieber, Crit. Gen., 1859, 7; Eur. Hem., p. 62, 241: Reut. Bih., *l. c.*, p. 9.
,, *Megaloceraea*, Fieber, *l. c. supra*: Reut. Bih. *l. c.*, p. 9.
,, *Trigonotylus*, Fieber, Crit. Gen., 1859, 10, t. 6, f. 20; Eur. Hem., p. 62, 243: Reut., Bih., *l. c.*, p. 9.

brevipes, Jakowleff, Trudi Russki Ent., xi, 1880, p. 215.
Hab. Astrakhan.

costicollis (*Miris*), Berg, Hem. Arg., 1879, p. 118: *id.*, Add. Emend., 1884, p. 63.
Hab. Buenos Ayres.

debilis, Uhler, Hayden Surv. Mont., 1872, p. 408; Bull. Un. St. Surv., ii, 1876, p. 316.
Hab. Colorado, Montana, Wyoming.

erratica (*Cimex*), Linn., Syst. Nat., (*ed.* 10), 1758, p. 449: Fallen, Mon. Cim., p. 111; *id.*, Hem. Suec., p. 132: Hahn, Wanz. Ins., ii, p. 78, t. 54, f. 163, 164; *ib.* iii, p. 40: F. Sahlb., Geoc. Fenn., p. 87: Costa, Cim. Regn. Neap. Cent iii, p. 30: Kirschb., Rhyn. Wiesb., p. 192, sp. 1: Flor., Rhyn. Liv., i, p. 431: Fieber (*Notostira*), Crit. Phyt., 13; *id.*, Eur. Hem., p. 242: Dougl. & Scott, Brit. Hem., p. 287: Walk., Cat. Het., vi, p. 49: Saund. Syn., p. 259: Reuter, Rev. Caps. p. 21; *id* (*Notostira*), Rev. Syn. Het., p. 240.
caucasica, Kolen., Mel. Ent., ii, 1845, p. 97, ♂.
elongatus, Geoffr. in Fourcr., Ent. Par., 1785, p. 208.
fuscofasciatus, Goeze, Ent. Beytr., ii, 1778, p. 267.
hortorum, Wolff, Ic. Cim., 1804, p. 180, t. 16, f. 154; Spinola, Ess., 1837, p. 187.
pubicornis, Schrank, Verzeich. Ins. Bercht., 1785, p. 340.
quadrilineatus, Schrank, Faun. Boic. ii, 1801, p. 95.
tricostatus, Costa, Cim. Regn. Neap. Cent. iii, 1852, p. 58.
tritici, Curtis, Brit. Ent., xv, 1839, 701.
viridiusculus, Gmelin, Syst. Nat., iv, 1788, p. 2185.
? var. *ochraceus*, Fieber, Eur. Hem., p. 242.
Hab. All Europe, Turkistan [*Atk.*, Lille, Genoa, Hungary].

pulcher, Reuter, Caps. Americ., 1875, p. 59: Uhler, List, 17.
Hab. Texas.

recticornis (*Cimex*), Geoffroy in Fourcroy, Ent. Paris., 1785, p. 209: Reuter, Rev. Syn. Het., p. 241.
linearis, Fuessly, Verzeich. Schw. Ins., 1775, p. 26.
longicornis, Fallen, Mon. Cim., 1807, p. 108; *id.*, Hem. Suec., p. 129; Herr. Schäff., Wanz. Ins., iii, p. 43, t. 85, f. 258: Meyer, Rhyn. Schw., p. 37: Costa, Cim. Regn. Neap. Cent., iii, p. 32: Kirschb., Rhyn. Wiesb. p. 192, sp. 2: Flor, Rhyn. Liv., i, p. 434; Fieber, Crit. Phyt., 13; Eur. Hem., p. 243: Dougl. & Scott, Brit. Hem., p. 289: Walk., Cat. Het., vi, p. 50: Saund., Syn., p. 260: J. Sahlb., Notis. Skpts pro Fauna, Flora Fenn., 1871, p. 290, pt: Reuter, Rev. Caps., p. 22.
megatoma, Muls. & Rey, Ann. Soc. Linn. Lyon, 1852, p. 126.
? *virens*, pt, Rossi, Faun. Etrusc., 1790, p. 251.
Hab. All Europe [*Atk.*, Calais, Liguria].

Reuteriana, F. B. White, Ent. Mon. Mag., xv, 1878, p. 130.
Hab. New Zealand.

rubicunda, Uhler, Hayden Surv. Montana, 1872, p. 409; List, p. 17.
Hab. Colorado.

ruficornis, Geoffroy in Fourcr., Ent. Paris, 1785, p. 209: Fallen, Mon. Cim., p. 112: Zett. Faun. Lapp., p. 502: Fallen, Hem. Succ., p. 138: Herr. Schäff., Wanz. Ins., iii, p. 40: Meyer, Rhyn. Schw., p. 37: F. Sahlb., Geoc. Fenn., p. 87: Costa, Cim. Regn. Neap. Cent., iii, p. 32: Kirschb., Rhyn. Wiesb., p. 192, sp. 3: Flor, Rhyn. Livl., i, p. 435: Fieb., Crit. Phyt. 14; *id.*, Eur. Hem., p. 243: Dougl. & Scott, Brit. Hem., p. 295: Walk., Cat. Het., vi, p. 50: Saund., Syn., p. 260: Uhler, Hayden Mont. Surv. 1872, p. 409; List, p. 17: Reuter, Rev. Caps., p. 23; *id.* (*Trigonotylus*), Rev. Syn. Het., p. 242.

? var. *psammaecolor*, Reuter, Berlin, Ent. Zeits., xxix, 1885, p. 45.

„ *pulchellus*, Hahn, Wanz. Ins., ii, 1834, p. 119, t. 66, f. 200: Reuter, Berl. Ent. Zeits., xxix, 1885, p. 146.

Hab. All Europe: Turkistan: E. United States, Idaho, Colorado [*Atk.*, Lille, Genoa, Hungary].

Genus **DOLICHOMIRIS**.

Reuter, Ofvers. Finska Soc. Förh., xxv, 1884, p. 29.

linearis, Reuter, *l. c.*, p. 29.

Hab. Addah, W. Africa.

Genus **CREONTIADES**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 237.

rubrinervis (*Megacaelum*), Stål, Stettin, Ent. Zeit., xxiii, 1862, p. 321, ♀: Walk. Cat. Het., vi, p. 99: Distant, Biol. Centr. Amer. Rhyn., Uhler, List p. 17. p. 237, t. 23, f. 12.

Hab. Mexico., Guatemala, San Geronimo, Capetillo.

Genus **MINYTUS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 237.

amplificatus, Distant, *l. c.*, p. 238, t. 24, f. 1.

Hab. Guatemala, Cerro Zunil.

argillaceus, Distant, *l. c.*, p. 238.

Hab. Panama, Volcano de Chiriqui.

Genus **TERATOCORIS**.

Fieber, Crit. Gen. Phyt., in Wien. Ent. Zeits., 1859, 13; *id.*, Eur. Hem., p. 63, 245: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 9; Rev. Caps. p. 23: Walker, Cat. Het., vi, p. 51.

antennatus (*Capsus*), Bohem., Nya Svenska Hem., in Ofvers. K. Vet.-Aka. Förh., 1852, p. 76: Fieb. Eur. Hem., p. 246: Walk., Cat. Het., vi, p. 51: Saund. Syn., p. 260: Reuter, Rev. Caps., p. 24; *id.*, Berlin Ent. Zeits., xxv, 1881, p. 173.

var. *dorsalis*, Dougl. & Scott, Ent. Mon. Mag., ii, 1866, p. 218-19; Ent. Ann., 1866, f. 4; Cat., p. 26: Fieber, Wien. Ent. Monats., viii, 1864, p. 325: Walk., Cat. Het., vi, p. 52: *teste*, Reuter, Ent. Mon. Mag., xiv, 1877, p. 32.

var. *notatus*, Bärensprung, Berlin Ent. Zeits., 1859, p. 336: t. 6, f. 9: Fieber, Eur. Hem., p. 246; Walk., Cat. Het., vi, p. 51.
Hab. Scandinavia, Britain, France, Austria, Russia.

discolor, Uhler, Ent. Am., iii, 1887, p. 68.
Hab. N. America.

hyperboreus, J. Sahlb., Not. Fauna Fl. Fenn., 1867, p. 225; *id.*, Vet.-Aka. Handl., xvi (4), 1878, p. 24: Reuter, Rev. Caps., p. 25.
Hab. Lapland.

miraria, Uhler, Ent. Am., iii, 1887. p. 67.
Hab. Labrador.

paludum, J. Sahlb., Notis. Skpts pro Fauna Fl. Fenn., xi, 1871, p. 291: Reuter, Rev. Caps., p. 29.
antennatus, Flor, Rhyn. Liv., i, 1860, p. 433, pt. (*nec* Bohem.).
Hab. Scandinavia, Germany, Russia.

Saundersi, Douglas & Scott, Ent. Mon. Mag., v, 1869, p. 260: Walk., Cat. Het., vi, p. 52: Saund., Syn., p. 261: J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 24: Reuter, Caps. Syn., 1875, p. 4; *id.*, Rev. Caps., p. 27.
antennatus, Flor, Rhyn. Liv., 1860, p. 433, pt. (*nec* Bohem.).
Flori, J. Sahlberg, Notis. Skpts. Faun. Fl. Fenn., xi, 1871, p. 290.
longicornis, F. Sahlb., Mon. Geoc., 1848, p. 87: *excl. syn.* (*nec* Fallen).
Hab. Scandinavia, Russia, Britain.

viridis, Douglas & Scott., Ent. Mon. Mag., iv, 1867, p. 46, t. 1, f. 2: Walk., Cat. Het., vi, p. 51: Saund. Syn., p. 261: Reuter, Rev. Caps., p. 26.
hyperboreus, var. *d*, J. Sahlb., Not. Fauna Fl. Fenn., 1867, p. 225 Reuter, Medd. Soc. Fenn., ix, 1883, p. 136.
Hab. Britain, Scandinavia, Russia.

Genus **CALLIMIRIS**.

Reuter, Caps. Amer., 1875, p. 60: Uhler, List, p. 17.

tarsalis, Reuter, *l. c. supra*, p. 60: Uhler, List. p. 17.
Hab. United States, Texas, Wisconsin.

Uhleri, Reuter, *l. c.*, p. 60: Uhler, List, p. 17.
Hab. N. America.

Genus **ACTITOCORIS**.

(*Actinocoris*) Reuter, Meddel. Soc. pro Fauna Fl. Fenn., ii, 1878, p. 194.
Actitocoris, Reuter, Abo Hem., 1880, p. 167.

signatus, Reuter, Meddel. Soc. pro Fauna Fl. Fenn., ii, 1878, p. 195: Abo Hem., p. 167.
Hab. S. Finland.

Genus **OPHTHALMOMIRIS**.

(Reuter) Berg, Hem. Arg., Add. & Emend., 1884, p. 64.

Reuteri, Berg, *l. c. supra*, p. 63.
Hab. Argentine Republic, Uruguay.

Genus **LEPTOPTERNA.**

Fieber, Crit. Gen. 1859, g. 12, t. 6, f. 3; *id.*, Eur. Hem., p. 63, 244: Reut. Rev. Caps., p. 29: Walker, Cat. Het. vi, p. 51: Uhler, List, p. 17.
Lopomorphus, Dougl. & Scott, Brit. Hem., 1865, p. 293.

amœna, Uhler, Hayden Mont. Surv., 1872, p. 409; Bull. Un. St. Surv., 1876, p. 316; List, p. 17.
Hab. Idaho, Dakota.

ferrugata (*Miris*), Fallen, Hem. Suec., 1829, p. 129: Schill., Hem. Het. Siles., p. 52: Herr. Schäff., Wanz. Ins., iii, p. 46, t. 86, f. 263 ♂: Meyer, Rhyn. Schw., p. 39: F. Sahlb., Geoc. Fenn., p. 89: Kirschb. (*Lopus*), Rhyn. Wiesb., p. 196, sp. 12: Flor., Rhyn. Liv., i, p. 439: Dougl. & Scott (*Lopomorphus*), Brit. Hem., p. 295, t. 10, f. 6, ♂: Saund., Syn., p. 262: Reuter, Rev. Caps., p. 30.
discors (*Lopus*), Costa, Cim. Regn. Neap. Cent., iii, 1852, p. 57.
Hab. All Europe, Turkistan [*Atk.*, Lille].

pilosa, Reuter, Ofvers, Finska Soc. Förh., 1880, p. 13.
Hab. Spain.

Genus **TRACHELOMIRIS.**

Reuter, Caps. Amer., 1875, p. 61: Uhler, List, p. 17; Distant, Biol. Cent. Amer., Rhyn., p. 238.

oculatus, Reuter, Caps. Amer, 1875, p. 61: Uhler, List, p. 17.
Hab. Texas, New York.

oleosus, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 238, t. 24, f. 2.
Hab. Guatemala, Cerro Zunil, San Geronimo, Panama, Bugaba.

scenicus (*Miris*), Stål, Freg. Eug. Resa, Hem., 1859, p. 254: Walk. Cat. Het., vi, p. 52: Berg, Hem. Arg., 1879, p. 118; Add. Emend., 1884, p. 66.
Hab. S. Brazil.

Genus **PORPOMIRIS.**

Berg, Hem. Arg., Add. & Emend., 1884, p. 66.

picturatus, Berg, *l. c.*, p. 67.
Hab. Buenos Ayres.

Genus **XENETUS.**

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 239: Uhler, Ent. Am., 1887, p. 51.

ambiguus, Distant, *l. c.*, p. 239.
Hab. Panama, Volcano de Chiriqui.

bracteatus, Distant, *l. c.*, p. 240, t. 24, f. 4.
Hab. Guatemala, San Isidro, Zapote.

chryselectrus, Distant, *l. c.*, p. 240.
Hab. Guatemala, Pantaleon.

lanuginosus, Distant, *l. c.*, p. 239, t. 24, f. 3.
Hab. Guatemala, San Isidro, Zapote.

Genus **ZACYNTHUS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 240, 297.
Zacorus, Distant, *l. c.*, p. 240.

curvicornis, Distant, *l. c.*, p. 241.
Hab. Panama, Bugaba.

staphyliniformis, Distant, *l. c.*, p. 240, t. 24, f. 5.
Hab. Guatemala, Senahu.

Genus **ZOSIPPUS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 241.

inhonestus, Distant, *l. c.*, p. 241, t. 24, f. 6.
Hab. Panama, Tolé.

Genus **LYGDUS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 242.

simulans, Distant, *l. c.*, p. 242, t. 24, f. 16.
Hab. Panama, Volcano de Chiriqui.

Div. IV, **BRYOCORARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 565: Distant, Biol. Centr. Amer. Rhyn., p. 283.

Genus **MONALOCORIS**.

Dahlbom, K. Vet.-Aka. Handl., 1850, p. 209: Fieb., Eur. Hem., p. 61, 237: Dougl. & Scott, Brit. Hem., p. 278: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 22; *id.*, Rev. Caps., p. 95: Walk. Cat. Het., vi, p. 159.

? **bipunctipennis**, Walker, Cat. Het., vi, 1873, p. 159.
Hab. Ceylon.

filicis (*Cimex*), Linn. Syst. Nat. (*ed.* 10), 1758, p. 443: Wolff (*Acanthia*), Ic. Cim., ii, 1801, p. 46, t. 11, f. 42; Fallen (*Lygaeus*), Mon. Cim., p. 92; *id.* (*Phytocoris*), Hem. Suec., p. 108: Hahn, Wanz. Ins., ii, 1834, p. 86, t. 56, f. 172: Kolenati (*Bryocoris*), Mel. Ent., ii, p. 129: F. Sahlb. (*Capsus*), Geoc. Fenn. p. 113: Dahlbom (*Monalocoris*), K. Vet.-Aka. Handl., 1850, p. 209: Meyer, Rhyn. Schw., p. 71: Kirschb., Rhyn. Wiesb., p. 230, sp. 76: Flor, Rhyn. Liv., i, p. 539: Fieber, Eur. Hem., p. 238: Dougl. & Scott, Brit. Hem., p. 279, t. 10, f. 2: Saund., Syn., p. 278: Walk., Cat. Het., vi, p. 159: Uhler, Bull. Un. St. Surv. ii, 1876, p. 315; *id.*, iii, 1877, p. 413; List, p. 19: Reuter, Caps. Amer., 1875, p. 76; *id.*, Rev. Caps., p. 95; Rev. Syn. Het., p. 284.
Hab. Nearly all Europe: United States, Nebraska, N. Jersey, Wisconsin.

Genus **PSILORHAMPHUS.**

Stål, Ofvers. Vet.-Aka. Förh., 1870, p. 669.

albomaculatus, Stål, *l. c.*, p. 670, t. 7, f. 5: Walk., Cat. Het., vi, p. 161.
Hab. Philippines.

conspersus, Stål, *l. c.*, p. 669: Walk., *l. c.*, *supra*, p. 161.
Hab. Philippines.

consputus, Stål, *l. c.*, p. 670: Walk., *l. c.*, *supra*, p. 161.
Hab. Philippines.

BOTANICAL GARDEN. CALCUTTA.

Genus **PYCNODERES.**

Guérin, Ramon de la Sagra's Hist. Fisica Cuba, vii, 1856, p. 168.
Sizeonotus, Reuter, Caps. America., 1875, p. 77.

insignis, Reuter, Caps. America., 1875, p. 78: Uhler, List, p. 19.
Hab. Texas, N. York, N. Jersey.

quadrimaculatus, Guérin, *l. c. supra*, p. 169, t. 13, f. 12: Uhler, List, p. 19.
Hab. Cuba.

Genus **BRYOCORIS.**

Fallen, Hem. Succ., 1829, p. 105, pt.: Fieber, Eur. Hem., p. 61, 238: Walker, Cat. Het., vi, p. 160: Dougl. & Scott, Brit. Hem., p. 276: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 22; *id.*, Rev. Caps., p. 96.

pteridis (*Capsus*), Fallen, Mon. Cim., 1807, p. 105: Germar, Faun. Ins. Eur., Fasc. 10, 1813, t. 13: Zett., Ins. Lapp., p. 266: F. Sahlb., Geoc. Fenn., p. 124: Kolenati, Mel. Ent., ii, p. 129: Meyer, Rhyn. Schw., p. 114: Flor, Rhyn. Liv., i, p. 549: Fieb., Eur. Hem., p. 238: Dougl. & Scott, Brit. Hem. p. 177, t. 10, f. 1: Walk., Cat. Het., vi, p. 160: Saund., Syn., p. 278: Reuter, Rev. Caps., p. 96.
pulcher, F. Sahlb., Mon. Geoc., 1818, p. 93 (*form. macr.*).
Hab. Nearly all Europe.

Genus **CYRTOCAPSUS.**

Reuter, Caps. Americ., 1875, p. 78.

caligineus (*Capsus*), Stål, Freg. Eug. Resa, Hem., 858, p. 258: Reuter, Caps. Americ., 1875, p. 78: Uhler, List, 19: Walker, Cat. Het., vi, p. 92.
Hab. California.

Genus **HETEROCORIS.**

Guérin, Hist. Fis. Cuba, vii, 1856, p. 168: Walker, Cat. Het., vi, p. 101: Uhler, List, p. 19.

dilatatus, Guérin, *l. c. supra*, t. 13, f. 11: Uhler, List, p. 19: Walk., Cat. Het., vi, p. 101.
Hab. Cuba.

jamaicencis, Walker, Cat. Het., vi, 1873, p. 101.
Hab. Jamaica.

Genus **ECCRITOTARSUS**.

Stål, Rio Janeiro Hem., i, 1858, p. 57 : Distant, Biol. Centr. Amer. Rhyn., p. 283 ; Walker, Cat. Het., vi, p. 166.

atratus, Distant, Biol Centr. Amer, Rhyn., 1883, p. 285, t. 26, f. 20.
Hab. Panama, Bugaba.

crux-nigra, Stål, Rio Jan. Hem., i, 1858, p. 58 : Walk., Cat. Het., vi, p. 168.
Hab. Rio Janeiro.

dimidiatus, Stål, *l. c.*, p. 57 : Walk. *l. c. supra*, p. 167.
Hab. Rio Janeiro.

discifer, Stål, *l. c.*, p. 57 : Walk., *l. c. supra*, p. 167.
Hab. Rio Janeiro.

discipennis, Stål, *l. c.*, p. 58 : Walk., *l. c. supra*, p. 168.
Hab. Rio Janeiro.

elegans, Uhler, Ent. Am., iii, 1887, p. 149.
Hab. N. America.

erythronotus, Berg, Hem. Arg., Add. Emend., 1884, p. 81.
Hab. Uruguay.

Fairmairei, Stål, Rio Jan. Hem., i, 1858, p. 58 : Walk., Cat. Het., vi, p. 168.
Hab. Rio Janeiro.

fulvicollis (*Capsus*), Fabr. Syst. Rhyng., 1803, p. 244 : Stål, Hem. Fabr., i, p. 85 : Walk., Cat. Het., vi, p. 168.
Hab. S. America.

generosus, Stål, Stettin. Ent. Zeit. xxiii, 1862, p. 323, ♂ : Walk., Cat. Het., vi, p. 166 : Dist., Biol. Centr. Amer. Rhyn., p. 284, t. 22, f. 24 : Uhler, List, p. 19.
eucosmus, Stål, *l. c. supra*, p. 323 : Walk., Cat. Het., vi, p. 166.
Hab. Mexico, Guatemala, Zapote, San Isidro.

genetivus, Distant, Biol. Centr. Am. Rhyn., 1883, p. 284, t. 22, f. 25.
Hab. Mexico.

gibbus, Distant, *l. c.* p. 285.
Hab. Guatemala, Senahu.

Holmbergii, Berg, Hem. Arg., Add. Emend., 1884, p. 83:
Hab. Buenos Ayres.

hyalinus, Stål, Rio Jan. Hem., i, 1858, p. 58 : Walk., Cat. Het., vi, p. 168.
Hab. Rio Janeiro.

incurvus, Distant, Biol. Centr. Amer. Rhyn , 1883, p. 285, t. 26, f. 19.
Hab. Guatemala, San Geronimo, Cerro Zunil.

leucopus, Stål, Rio Jan. Hem., i, 1858, p. 58 : Walk., Cat. Het., vi, p. 168.
Hab. Rio Janeiro.

longulus, Stål, *l. c.*, p. 58 : Walk., *l. c., supra*, p. 168.
Hab. Rio Janeiro.

lutescens, Stål, *l. c.*, p. 57 : Walk., *l. c. supra*, p. 167.
Hab. Rio Janeiro.

mundulus, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 323: Walk., Cat. Het., vi, p. 166: Distant, Biol. Centr. Amer. Rhyn., p. 285, t. 23, f. 19.
Hab. Mexico.

niger, Stål, Rio Jan. Hem., i, 1858, p. 58: Walk., Cat. Het., vi, p. 168.
Hab. Rio Janeiro.

nigripes, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 284.
Hab. Mexico, Guatemala, Cubilguitz.

nigrocruciatus, Stål, Rio Jan. Hem., i, 1858, p. 57: Walk., Cat. Het., vi, p. 167.
Hab. Rio Janeiro.

nigroplagiatus, Stål, *l. c.*, p. 57: Walk., Cat. Het., vi, p. 167.
Hab. Rio Janeiro.

pallidirostris, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 323: Walk., *l. c. supra*, p. 166: Distant, Biol. Centr. Am. Rhyn., p. 285, t. 23, f. 14: Uhler, List, p. 19.
Hab. Mexico, Guatemala, San Geronimo, San Isidro.

pallidipes, Stål, Rio Jan. Hem., i, 1858, p. 57: Hem. Fabr. i, p. 85: Walk., *l. c. supra*, p. 167.
Hab. Rio Janeiro.

platensis, Berg, Hem. Arg. Add. Emend., 1884, p. 82.
Hab. Buenos Ayres.

purpurissatus, Berg, Hem. Arg., 1879, 131, 202.
Hab. Buenos Ayres.

ruficeps, Berg, *l. c.* p. 130, 189.
Hab.

semiluteus, Stål, Rio Jan. Hem., i, 1858, p. 57: Walk., Cat. Het., vi, p. 167.
Hab. Rio Janeiro.

splendens, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 284, t. 28, f. 1.
Hab. Panama, Bugaba.

venustus, Stål, Rio Jan. Hem., i, 1858, p. 58: Walk., Cat. Het., vi, p. 168.
Hab. Rio Janeiro.

vestitus, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 284, t. 28, f. 2.
Hab. Guatemala, Pantaleon.

Genus **PSEUDOBRYOCORIS.**

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 286.

bicolor, Distant, *l. c.*, p. 286, t. 28, f. 3.
Hab. Panama, Bugaba.

Genus **MONALOCORISCA.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 286.

granulata, Distant, *l. c.*, p. 286, t. 28, f. 4.
Hab. Guatemala, San Geronimo.

ravida, Distant, *l. c.*, p. 286, t. 28, f. 5.
Hab. Panama, Volcano de Chiriqui.

Genus **CARMELUS.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 287, 297.
Carnus, Distant, *l. c.*, p. 287.

formosus, Distant, *l. c.*, p. 287.
Hab. Panama, Volcano de Aittlan.

funebris, Distant, *l. c.*, p. 288.
Hab. Panama, Bugaba.

lunatus, Distant, *l. c.*, p. 287, t. 28, f. 6.
Hab. Panama, Volcano de Chiriqui.

parvus, Distant, *l. c.*, p. 287, t. 28, f. 7.
Hab. Guatemala, Las Mercedes.

Genus **PSEUDOCARNUS.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 288.

lineolatus, Distant, *l. c.*, p. 288, t. 28, f. 8.
Hab. Panama, Bugaba.

magnus, Distant, *l. c.*, p. 288, t. 28, f. 9.
Hab. Guatemala, Cerro Zunil.

Genus **PARACARNUS.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 289.

elongatus, Distant, *l. c.*, p. 289, t. 28, f. 25.
Hab. Panama, Bugaba.

Genus **NEOCARNUS.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 289.

vitreus, Distant, *l. c.*, p. 289, t. 29, f. 1.
Hab. Panama, Bugaba.

Genus **ANNONA.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 289, 297.
Aaia, Distant, *l. c.*, p. 289.

bimaculata, Distant, *l. c.*, p. 290, t. 27, f. 25.
Hab. Guatemala, San Geronimo, Panama, Volcano de Chiriqui.

decoloris, Distant, *l. c.*, p. 290; *Mala id.*, t. 26, f. 23.
Hab. Panama, Volcano de Chiriqui.

Genus **FUNDANIUS.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 290.

albomaculatus, Distant, *l. c.*, p. 291, t. 28, f. 12.
Hab. Guatemala, Panajachel.

maculatus, Distant, *l. c.*, p. 291, t. 28, f. 10.
Hab. Guatemala, Cerro Zunil.

marginatus, Distant, *l. c.*, p. 291.
Hab. Guatemala, Cerro Zunil.

pallescens, Distant, *l. c.*, p. 291, t. 28, f. 11.
Hab. Guatemala, Quiche range.

rubricosus, Distant, *l. c.*, p. 291.
Hab. Guatemala, Cerro Zunil.

Genus **NEOFURIUS**.

Distant, Biol Centr. Amer. Rhyn., 1884, p. 292.

affinis, Distant, *l. c.*, p. 294.
Hab. Panama, Volcano de Chiriqui.

amethystus, Distant, *l. c.*, p. 293, t. 28, f. 15.
Hab. Panama, Bugaba.

argentatus, Distant, *l. c.*, p. 293.
Hab. Guatemala, San Geronimo, Panama, Volcano de Chiriqui.

auratus, Distant, *l. c.*, p. 292, t. 28, f. 14.
Hab. Guatemala, San Isidro.

decoratus, Distant, *l. c.*, p. 294, t. 28, f. 17.
Hab. Guatemala, San Geronimo.

denigratus, Distant, *l. c.*, p. 294.
Hab. Guatemala, San Isidro, Cerro Zunil.

hieroglyphicus, Distant, *l. c.*, p. 294, t. 28, f. 19.
Hab. Guatemala, Sinanja.

infumatus, Distant, *l. c.*, p. 294, t. 28, f. 18.
Hab. Guatemala, Pantaleon.

linearis, Distant, *l. c.*, p. 295, t. 28, f. 22.
Hab Guatemala, San Geronimo, Marandilla.

ornandus, Distant, *l. c.*, p. 293.
Hab. Guatemala, La Tinta; Panama, Tolé.

pallidulus, Distant, *l. c.*, p. 295, t. 28, f. 20.
Hab. Guatemala, Panajachel.

pictus, Distant, *l. c.*, p. 293, t. 23, f. 24 (Var. *Furius pictus*).
Hab. Mexico; Guatemala, San Geronimo.

plagosus, Distant, *l. c.*, p. 295, t. 28, f. 21.
Hab. Panama, Volcano de Chiriqui.

scriptus, Distant, *l. c.*, p. 293, t. 28, f. 16.
Hab. Guatemala, Pantaleon.

variabilis, Distant, *l. c.*, p 292.
Hab. Guatemala, San Geronimo, Cerro Zunil; Panama, Bugaba.

villosus, Distant, *l. c.*, p. 292, t 28, f. 13.
Hab. Panama, Volcano de Chiriqui.

Genus **BIBACULUS**.

Distant, Biol. Centr. Amer., Rhyn , 1884, p. 295.

midestus, Distant, *l. c.*, p. 296, t. 28, f. 23, 24.
Hab. Guatemala, Senahu, Las Mercedes.

Genus **MALA**.

Distant, Biol. Centr. Amer., Rhyn., 1884, p. 296.
ornata, Distant, *l. c* , p. 296, t 26, f. 22.
Hab. Panama, Bugaba, Volcano de Chiriqui.

unicolor, Distant, *l. c.*, p. 296, t. 26, f. 21.
Hab. Guatemala, San Isidro.

Genus **NEOSILIA**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 296, 297.
Silia, Distant, *l. c.*, p. 296.

cineracea, Distant, *l. c* , p. 297, t. 27, f. 22 (*Silia id.*)
Hab. Panama, Volcano de Chiriqui.

sororia, Distant, *l. c.*, p. 297, t. 29, f. 2.
Hab. Guatemala, Cerro Zunil.

viduata, Distant, *l. c.*, p. 297, t. 27, f. 21 (*Silia id.*).
Hab. Panama, Bugaba.

Genus **CHIUS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 297.

maculatus, Distant, *l. c.*, p. 297, t. 27, f. 23.
Hab. Guatemala.

Genus **PARACHIUS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 298.

luteolus, Distant, *l. c* , p. 298, t. 27, f. 24.
Hab. Guatemala, Cerro Zunil.

Genus **FALCONIA**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 298.

caduca, Distant, *l. c* , p. 298, t. 29, f. 4.
Hab. Guatemala, Cerro Zunil.

poetica, Distant, *l. c.*, p. 298, t. 29, f. 3.
Hab. Guatemala, San Geronimo.

Genus **ANTIAS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 298.

aheneus, Distant, *l. c.*, p. 299, t. 29, f. 6.
Hab. Panama.

subaeratus, Distant, *l. c.*, p. 299, t. 29, f. 5.
Hab. Guatemala, San Geronimo.

Genus **FUSCUS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 299.

crinitus, Distant, *l. c.*, p. 299, t. 29, f. 7.
Hab. Guatemala, Cerro Zunil.

Genus **NEOLUCON**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 299.

horribilis, Distant, *l. c.*, p. 300, t. 26, f. 24.
Hab. Panama, Bugaba.

Genus **SPARTACUS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 300.

albatus, Distant, *l. c.*, p. 300, t. 26, f. 25.
Hab. Guatemala, Cerro Zunil.

Genus **TRYGO**.

Distant, Biol. Centr. Amer., Rhyn., 1884, p. 300.

imitationis, Distant, *l. c.*, p. 300, t. 29, f. 8.
Hab. Panama, Bugaba.

Genus **JORNANDES**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 301.

Championi, Distant, *l. c.*, p. 301, t. 29, f. 9.
Hab. Guatemala, Las Mercedes.

Genus **FLORUS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 301.

insolitus, Distant, *l. c.*, p. 301, t. 29, f. 10.
Hab. Panama.

Genus **PIRITHOUS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 302.

pallipes, Distant, *l. c.*, p. 302, t. 29, f. 11.
Hab. Guatemala, San Geronimo.

Genus **DACOTA**.

Uhler, Hayden Surv. Mont., 1872, p. 413.

hesperia, Uhler, *l. c.*, p. 414; Bull. Un. St. Surv., ii, 1876, p. 318.
Hab. Colorado, Dakota.

Genera of Doubtful Position.

Genus **DEMARATA**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 303.

villosa, Distant, *l. c.*, p. 303, t. 29, f. 14.
Hab. Guatemala.

Genus **AMBRACIUS**.

Stål, Rio Jan. Hem., i, 1858, p. 59.

Dufouri, Stål, *l. c.*, p. 59: Walk., Cat. Het., vi, p. 168.
Hab. Rio Janeiro.

phaleratus, Stål, *l. c.*, p. 59: Walk., *l. c. supra*, p. 169.
Hab. Rio Janeiro.

Genus **OLIGOBIELLA**.

Reuter, Ent. Mon. Mag., xxi, 1885, p. 201.

fuliginea (*Myrmedobia*), F. B. White, Proc. Zool. S. Lond., 1878, p. 466: Reuter, *l. c. supra*, p. 202.
Hab. St. Helena.

Div. V, **VALDASARIA**, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 242.

Genus **PIASUS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 242: Uhler, List, p. 17.

illuminatus, Distant, *l. c.*, p. 242, t. 24, f. 17: Uhler, List. p. 17.
Hab. Mexico; Panama, Volcano de Chiriqui.

Genus **VALDASUS**.

Stål, Rio Jan. Hem., i. 1858, p. 56: Walk. Cat. Het., vi, p. 47: Distant, Biol. Centr. Amer., p. 243.

cerbereus, Distant, Biol. Cent. Amer. Rhyn., 1883, p. 244.
Hab. Panama, Bugaba.

erebeus, Distant, *l. c.*, p. 244.
Hab. Panama, Bugaba.

famularis, Stal, Stettin. Ent. Zeit., xxiii, 1862, p. 321, ♀: Walk., Cat. Het., vi, p. 166: Distant, *l. c. supra*, p. 243, t. 24, f. 7: Uhler, List, p. 17.
Hab. Mexico.

funebris, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 244, t. 24, f. 8.
Hab Panama, Bugaba.

marginicollis, Distant, *l. c.*, p. 243.
Hab. Panama, Volcano de Chiriqui, Bugaba.

rugosus, Distant, *l. c.*, p. 245, t. 24, f. 10.
Hab. Guatemala, Senahu.

Schonherri, Stål, Rio Jan. Hem., i, 1858, p. 56: Walk., Cat. Het., vi, p. 166.
Hab. Rio Janeiro.

stellatus, Distant, Biol. Cent. Amer. Rhyn., 1883, p. 243.
Hab. Guatemala, San Juan in Vera Paz, Cubilguitz.

stygius, Distant, *l. c.*, p. 245, t. 24, f. 9.
Hab. Panama, Bugaba.

Genus **VANNIUS.**

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 245.

rubrovittatus, Distant, *l. c.*, p. 246, t. 24, f. 11.
Hab. Guatemala, Las Mercedes, Cerro Zunil; Panama, Volcano de Chiriqui.

Genus **EUCEROCORIS.**

Westwood, Trans. Ent. S. Lond., ii, 1835, p. 21, t. 2, f. 7.

basifer, Walker, Cat. Het., vi, 1873, p. 164.
Hab. Australia.

braconoides, Walker, *l. c.*, p. 164.
Hab. Australia.

guttulatus, Uhler, Ent. Am., iii, 1887, p. 150; List, p. 20.
Hab. N. America.

nigriceps, Westwood, Trans. Ent. S. Lond., ii, 1835, p. 22, t. 2, f. 7: Walk., Cat Het., vi, p. 163: Uhler, List, p. 20.
Hab. ? Brazil.

Westwoodii, White, Trans. Ent. S. Lond., iii, 1838, p. 94: Walk., Cat. Het., vi, p. 163.
Hab. Sierra Leone.

Genus **MONALONION.**

Herr. Schäff., Wanz. Ins., ix, 1853, p. 168: Sign., Ann. Soc. Ent. Fr. (3 s.), vi, 1858, p. 500: Walker, Cat. Het., vi, p. 47, 161; Distant, Biol. Centr. Amer. Rhyn., p. 246.

annulipes, Signoret, Ann. Soc. Ent. Fr. (3 s.), vi, 1858, p. 50: Walk., Cat. Het., vi, p. 162: Dist., *l. c. supra*, p. 246, t. 23, f. 25, Var.: Uhler, List, p. 17.
Hab. Mexico; Guatemala, San Geronimo; Panama, Bugaba.

atratum, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 247, t. 24, f. 14.
Hab. Panama, Bugaba.

braconoides, Walker, Cat. Het., vi, 1873, p. 162.
Hab. Amazons.

dissimulatum, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 247, t. 24, f. 15.
Hab. Guatemala, San Isidro.

hilaratum, Distant, *l. c.*, p. 247, t. 24, f. 13.
Hab. Guatemala, San Geronimo.

ichneumonides, Walker, Cat. Het., vi, 1873, p. 162.
Hab. Amazons.

parviventre, Herr. Schäff., Wanz., Ins., ix, 1853, p. 168, t. 312, f. 958: Walk., Cat. Het., vi, p. 161.
Hab. Brazil.

Schafferi, Stål, Rio Jan. Hem., i, 1858, p. 56: Walk., *l. c. supra*, p. 161.
Hab. Rio Janeiro.

versicolor, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 247, t. 24, f. 12.
Hab. Guatemala, Las Mercedes.

Genus **SINERVUS**.

Stål, Rio Jan. Hem., i, 1858, p. 56.

Barensprungi, Stål, *l. c.*, p. 56: Walk., Cat. Het., vi, p. 168.
Hab. Rio Janeiro.

Genus **DISPHINCTUS**.

Stål, Ofvers, K. V.-A., Förh., 1870, p. 668: Walk., Cat. Het., vi, p. 161.

divisus (*Monalonion*), Walker, Cat. Het., vi, 1873, p. 163.
Hab. Ternate.

Fallenii, Stål, Ofvers., K. V.-A., Förh., 1870, p. 668, t. 7, f. 6: Walk., Cat. Het., vi, p. 161.
Hab. Philippines.

Haglundii, Stål, *l. c.*, p. 668: Walk., *l. c. supra*, p. 161.
Hab. Philippines.

humeralis (*Monalonion*), Walker, Cat. Het., vi, 1873, p. 162.
Hab. Malacca, Sikkim (mihi).

politus (*Monalonion*), Walker, *l. c.*, p. 163.
Hab. Borneo, Sarawak.

Reuteri, Stål, Ofvers. K. V.-A., Förh., 1870, p. 668: Walk., Cat. Het., vi, p. 161.
Hab. Philippines.

Sahlbergii, Stål, *l. c.*, p. 668 : Walk., *l. c. supra*, p. 161.
Hab. Philippines.

Genus **PACHYPELTIS.**

Signoret, Ann : Soc. Ent. Fr. (3 s.), 1858, p. 501.

chinensis, Sign., *l. c.*, p. 501 : Walk., Cat. Het., vi, p. 164.
Hab. China.

Genus **HELOPELTIS.**

Signoret, Ann. Soc. Ent. Fr. (3 s.), 1858, p. 502 : Walk. Cat. Het., vi, p. 165.
Aspicelus, Costa, Ann. Mus. Zool. Nap., ii, 1863, p. 147.

Antonii, Signoret, *l. c.*, *supra*, p. 502, t. 12 (2), f. 2 : Walker, Cat. Het., vi, p. 165 : Waterhouse, Trans. Ent. S. Lond., 1886, p. 458, t. 11, f. 4 : Trimen, Nature, xxx, p. 364.
Hab. Ceylon.

braconiformis, Walker, Cat. Het., vi, 1873, p. 165 : Waterhouse, Trans. Ent. S. Lond., 1886, p. 459, t. 11, f. 5.
Dulichius? clavifer, Walker, Cat. Het., iv, 1871, p. 170.
Hab. Dorey.

Bradyi, Waterhouse, Trans. Ent. S. Lond., 1886, p. 458, t. 11, f. 1, 2.
Hab. Java.

collaris, Stål, Ofvers. Svenska V. A. Förh., 1870, p. 667 : Walk. Cat. Het., vi, p. 123
Hab. Philippines.

niger, Walker, Cat. Hem., vi, 1873, p. 165 : Waterh , *l. c. supra*, p. 459, t. 11, f. 6.
Hab. Waigiou.

pellucida, Stål, *l. c. supra*, p. 667 : Walk. Cat. Het., vi, p. 123 : Walk., Cat. Het., vi, p. 123.
Hab. Philippines.

podagricus, Costa, Ann. Mus. Zool. Nap., ii, 1863, p. 147, t. 2, f. 6 : Walker, Cat. Het., vi, p. 165.
Hab. ?

Romundei, Waterhouse, Trans. Ent S. Lond., 1888, p. 207.
Hab. Java.

theivora (Moore), Waterhouse *l. c*, 1886, p. 457, t. 11, f. 3.
Hab. Assam.

Genus **ORASUS.**

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 248.

robustus, Distant, *l. c.*, p. 248, t. 23, f. 13 : Uhler, List, p. 17.
Hab. Mexico.

Genus **SYSINAS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 248.

audens, Distant, *l. c.*, p. 249, t. 24, f. 25.
Hab. Panama, San Lorenzo.

centralis, Distant, *l. c.*, p. 249, t. 25, f. 7.
Hab. Guatemala, Cerro Zunil.

clarus, Distant, *l. c.*, p. 249.
Hab. Panama, Matachin.

floridulus, Distant, *l. c.*, p. 249, t. 24, f. 24.
Hab. Panama, Bugaba.

linearis, Distant, *l. c.*, p. 248, t. 23, f. 21: Uhler, List, p. 17.
Hab. Mexico.

Genus **ZOPYRUS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 249.

luteofasciatus, Distant, *l. c.*, p. 250, t. 25, f. 9.
Hab. Costa Rica, Cache.

rubromaculatus, Distant, *l. c.*, p. 250, t. 25, f. 8.
Hab. Guatemala, Quiche range, Totonicapam.

Genus **ADMETUS**.

Distant, Biol. Centr. Amer., Rhyn., 1883, p. 250.

fimbriatus, Distant, *l. c.*, p. 250, t. 25, f. 10.
Hab. Panama, Volcano de Chiriqui.

Genus **OFELLUS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 250.

praestans, Distant, *l. c.*, p. 251, t. 25, f. 11.
Hab. Guatemala, San Geronimo.

Div. VI, **CAPSARIA**, Reuter, Hem. Gymn. Eur., 1883, p. 566. Includes Div. *Miridaria*, *Loparia*, *Dioncaria*, *Phytocoraria* and *Capsaria*, Reuter *olim* (Bih. Svenska Handl. iii (i), 1875); also the genera *Pantilius*, Curtis (in *Miraria*, olim), *Odontoplatys*, Fieber, and *Epimecis*, Reuter.

Genus **PANTILIUS**.

Curtis, Ent. Mag., i, 1833, p. 197: Spinola, Ess., p. 188: Dougl. & Scott, Brit. Hem., p. 332: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 9; *id.*, Rev. Caps., p. 32.
Conometopus, Fieber, Crit. Gen., 1859, 20, t. 6, f. 1: Eur. Hem., p. 64, 249.

prasinus (*Conometopus*), Fieber, Verh. Zool.-Bot., Ges. Wien, xx, 1870, p. 258 ♂: Walk., Cat. Het., vi, p. 55.
Hab. S. Russia, Sarepta.

tunicatus (*Cimex.*), Fabr., Spec. Ins., ii, 1781, p. 396; Syst. Rhyng., p 233: Fallen, Mon., Cim., p. 79; *id.*, Hem. Suec., p. 85: Germar, Faun. Ins. Eur., v, p. 23: Curtis (*Pantilius*), Char. Gen. Spec., 1833, p. 197: Spinola, Ess., p. 189: Meyer (*Lopus*), Rhyn., Schw., p. 40: Kirschb. (*Lopus*), Rhyn., Wiesb., p. 197 sp. 13: Flor, Rhyn. Liv., i, p. 441: Fieber (*Conometopus*), Eur. Hem., p. 249: Dougl. & Scott, Brit. Hem., p. 333: Walk., Cat. Het., vi, p. 54: Saund., Syn., p. 262: Reuter, Rev. Caps., p. 33; *id.*, Rev. Syn. Het., p. 245.
gothicus, Geoffr. in Fourer, Ent. Par., 1785, p. 200 (nec Linn.).
Hab. Nearly all Europe. [*Atk.*, Yonne].

Genus **ALLORHINOCORIS.**

Reuter, Pet. Nouv. Ent., ii, no. 147, 1876, p. 33.

flavus, J. Sahlberg, Vet.-Aka. Handl., xvi (4), 1878, p. 24: Reuter, *l. c. supra*, p. 33.
Hab. S. Russia, Sarepta; Siberia.

Genus **LOPUS.**

Hahn, Wanz. Ins., i, 1831, p. 143, t. 1, f. 4, B-E: Dougl. & Scott, Brit. Hem., p. 474: Reuter, Rev. Caps, p. 34.
Horistus, Fieber, Eur. Hem., 1861, p. 66, 268.
Lopus, Fieber, *l. c.*, p. 66, 266.

australis, Walker, Cat. Het., vi, 1873, p. 57.
Hab. Australia.

bicolor, Fieber, Wien Ent. Monats., viii, 1864, p. 328: Walk., Cat. Het., vi, p. 56: Reut, Berlin. Ent. Zeits., xxix, 1885, p. 159.
sanguineus, Jakowleff, Bull. Mosc., lvi (4), 1882 p. 359.
Hab. Russia, Caucasus, Turkey.

bimaculatus, Jakowleff, Rev. Mens. d' Ent., 1884, p. 122.
Hab. Persia.

cingulatus, Fabr., Mant. Ins., 1787, p 307; *id*, Syst. Rhyng., p. 255: Stål, Hem. Fabr., i, p. 89: Walk., Cat. Het., vi, p. 53: Reuter, Rev. Syn. Het, p. 245.
albomarginatus, Hahn, Wanz. Ins., i, 1831, p. 140, t. 22, f. 72: Fieb., Eur. Hem., p. 267: Costa, Cim. Reg. Neap. Cent., iii, 1852, 33.
albostriatus (Klug), Burm., Handb., ii (i), 1835, p. 271: Meyer, Rhyn. Schw., p. 40: Kirschb., Rhyn. Wiesb., p. 198, sp. 15.
? *leucogrammus*, Gmelin, Syst. Nat., iv, 1788, p. 2165.
marginellus, Schrank, Fauna Boica, 1801, p. 94.
Hab. France, Spain, Italy, Germany [*Atk.* N. France].

fallax, Signoret, Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 570: Walk., Cat. Het., vi, p. 56.
Hab. Chili.

? fillicornis, Fabr., Syst. Rhyng., 1803, p. 245: Stål, Hem. Fabr., i, p. 89: Walk. Cat. Het., vi, p. 56.

Hab. S. America.

flavomarginatus (*Cimex*), Donovan, Brit. Ins., vii, 1798, p. 79, t. 245: Walk., Cat Het., vi, p. 54: Reuter, Rev. Syn. Het., p. 248.

mat, Saunders, Syn. Hem., 1875, p. 263 (*nec* Rossi).

miles, Dougl. & Scott, Brit. Hem., 1865, p. 476.

rubricosus, Garbiglietti, Bull. Soc. Ent. Ital., 1869, p. 184: Walk. Cat. Het. vi, p. 75.

Hab. Britain, France [*Atk.*, Valenciennes].

gothicus (*Cimex*), Linn., Syst. Nat., (*ed.* 10), 1758, p. 447: Fabr., Ent. Syst., iv, p. 180; *id.*, Syst. Rhyng., p. 244: Wolff, Ic. Cim., i, 1800, p. 33, t. 4, f. 33: Fallen, Mon. Cim., p. 98; *id.*, Hem. Suec., p. 117: Hahn, Wanz. Ins., i, 1831, p. 12, t. 2, f. 5: Burm., Handb. Ent., ii (i), p. 271: Spinola (*Lopus*), Ess., p. 188: Costa (*Phytocoris*), Cim. Regn. Neap. Cent., i, 1838, p. 49: Meyer, Rhyn. Schw., p. 41: Kolenati (*Lopus*), Mel. Ent., ii, p. 100: Kirschb. (*Lopus*), Rhyn. Wiesb., p. 197, sp. 14: Flor, Rhyn. Liv., i, p. 479: Fieber, Eur. Hem., p. 267: Dougl. & Scott, Brit. Hem., p. 475: Walk., Cat. Het., vi, p. 53: Sahlb., Syn., p. 263: Reuter, Rev. Caps., p. 34; Ent. Mon. Mag., xvi, p. 12; *id.*, Rev. Syn. Het., p. 246.

" *albomarginatus*, Preyssler, Beob. Böhmerwald, 1793, p. 219.

Lynchnitanus, Schrank, Fauna Boica, 1801, p. 94.

sanguineoguttatus, Goeze, Ent. Beytr., ii, 1787, p. 275.

var. *supercilicosus* (*Cimex*), Linn., Syst. Nat. (*ed.* 12), 1767, p. 728: Walk., Cat. Het., vi, p. 53: Reuter, Rev. Syn. Het., p. 247.

" *gothicus*, var. B., Fieber, Eur. Hem., 1861, p. 267.

" *albomarginatus*, Fabr., Syst. Rhyng., 1803, p. 244.

" *affinis*, Jakowleff, Bull. Mosc., li (3), 1876, p. 115.

Hab. All Europe [*Atk.*, N. France, Hungary].

Grasieri, Puton and Reut., Rev. d'Ent., vii, 1888, p. 201.

Hab. Amasia.

Hahni, Stål, Rio Jan. Hem., i, 1858, p. 45: Walk., Cat. Het., vi, p. 56.

Hab. Rio Janeiro.

infuscatus, Brullé, Exped. Morée, 1832, p. 77: Fieber, Eur. Hem., p. 269: Walk., Cat. Het., vi, p. 79; Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 174.

rubrostriatus, Fieber, Eur. Hem., 1861, p. 268 (*nec* Herr. Schäff.).

Hab. Greece, Turkey.

insignis, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 31.

Hab. Pyrenees.

lineolatus, Brullé, Exped. Morée, 1832, p. 76, t. 31, f. 6, 7: Fieb., Eur. Hem., p. 268: Walk., Cat. Het., vi, p. 54: Reut., Berlin. Ent. Zeits., xxv, 1881, p. 174.

consanguineus, Costa, Addit., 1860, p. 22-3, t. 3, f. 2.

rubrostriatus, Herr. Schäff., Wanz. Ins., iii, 1835, p. 45, t. 86, f. 260: Walk., Cat. Het., vi, p. 54.

Hab. S. France, Italy, Greece.

mat (*Cimex*), Rossi, Faun. Etrusc., ii, 1790, p. 250, t. 7, f. 6: Herr. Schäff., Nomen-

ncl. Ent., i, 1835, p. 51: Fieber, Eur. Hem., p. 267: Walk., Cat. Het., vi, p. 53: Reuter, Rev. Syn. Het., p. 248.

erythromelas, Hahn, Wanz. Ins., iii, 1835, p. 6, t. 75, f. 231: Costa, Cim. Regn. Neap., Cent., iii, p. 34.

rubricosus, Garbig., Bull., Soc. Ent. Ital., i, 1869, p. 184: Walk., Cat. Het., vi, p. 75.

Hab. Italy, Dalmatia, Turkey.

oculatus, Dahlbom, Ins. Gothl., Vet. Aka. Handl., 1850, p. 155.

Hab. Scandinavia.

? palliatus (*Lygaeus*), Fabr, Ent. Syst., iv, 1794, p. 181; Syst. Rhyng., p. 215: Reuter, Rev. Syn. Het., p. 248.

Hab. Morocco.

partilus (*? partitus*), Walker, Cat. Het., vi, 1873, p. 56.

Hab. New Guinea.

rufinasus, Stål, Rio Jan. Hem., i, 1858, p. 45; Walk., Cat. Het., vi, p. 56.

Hab. Rio Janeiro.

sordidus, Walker, Cat. Het., vi, 1873, p, 57.

Hab. Australia.

sulcaticornis, Stål, Rio Jan. Hem., i, 1858, p. 46: Walk., Cat. Het., vi, p. 56.

Hab. Rio Janeiro.

sulcatus, Fieber, Eur. Hem., 1861, p. 268: Walker, Cat. Het., vi, p. 54: Saund., Syn., p. 263.

Hab. Britain, France, Spain [*Atk.*, Yonne].

vittiventris, Puton, Rev. d' Ent., ii, 1883, p. 14.

var. *Leveillei*, Puton, Rev. d' Ent., vi, 1887, p. 101.

Hab. Algiers.

Genus **HORVATHIA**.

(*Horvathia*) Reuter, Berlin Ent. Zeit., xxv, 1881, p. 174; Zool. Jahr., Arthr., 1881, p. 274.

hieroglyphica (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon. 1852, p. 126; Puton, Bull. Soc, Ent. Fr., (6 s.) i, 1881, p. cxlvii.

vittatus (*Lopus*), Horvath, Pet. Nouv. Ent., ii, No. 42, 1876, p. 15.

Hab. Pyrenees, S. Hungary.

Genus **DIONCUS**.

Fieber, Crit. Gen., 1859, 34, t. 6, f. 9, 30; Eur. Hem., p. 67, 268: Rent. Bih. Vet.-Aka. Handl., iii (i), 1875, p. 10: Walk., Cat. Het., vi, p. 42, 79.

cruentatus (*Miris*), Brullé, Exp. Morée, 1832, p. 78, t. 31, f. 8: (*Lopus*) Fieb. Eur. Hem., p. 268: Walk., Cat. Het., vi, p. 54.

montivagus, Costa, Cim. Regn. Neap. Cent. Addit, 1860.

Hab. Greece, Italy [*Atk.*, Genoa].

neglectus (*Lygaeus*), Fabr., Ent. Syst. Supp., 1798, p. 542 : *id*., Syst. Rhyng. p. 241 : Latreille, Hist Nat., xii, p. 230 : Fieber (*Dioncus*), Eur. Hem., p. 269 : Walker, Cat. Het., vi, p. 97 : Reuter, Rev. Syn. Het., p. 248.
var. *flavescens*, Ferrari, Hem. Agr. Ligust., 1874, p. 67.
„ *lateralis*, Ferrari, *l. c.*, p. 67.
Hab. Dalmatia, Turkey.

Genus **MIRIDIUS.**

Fieber, Crit. Gen., 1859, g. 25 : Eur. Hem., p. 65, 257 : Walk., Cat. Het., vi, p 52 : Dougl. & Scott, Brit. Hem., p 299.

pallidus, Horvath, Rev. d' Ent., vi, 1887, p. 72.
Hab. Illyria.

quadrivirgatus (*Capsus*), Costa, Cim Regn. Neap. Cent., iii, 1852, p. 22, f. 3 : Dougl. & Scott, Brit. Hem., p. 300, t. 10, f. 5 : Saund., Syn., p. 266.
Hedenborgi (*Miris*), Stål, Ofvers Vet -Aka. Förh., xii, 1855, p. 187.
virgatus, Fieber, Eur. Hem., 1861, p. 258 : Walk., Cat. Het., vi, p. 52.
Hab. Britain, France, Spain, Italy, Rhodes, Syria [*Atk.*, S. France].

Genus **PALLACOCORIS.**

Reuter, Caps. Amer., 1875, p. 62 : Uhler, List, p. 17.

suavis, Reuter, *l. c. supra*, p. 62 : Uhler, List, p. 17.
Hab. Texas.

Genus **CLIVINEMA.**

Reuter, Caps. Amer , 1875, p. 63 : Uhler, List, p. 17.

villosa, Reuter, *l. c. supra*, p. 63 : Uhler, List, p. 17.
Hab. Texas.

Genus **RESTHENIA.**

Spinola, Ess., 1840, p. 184 : Am. & Serv., Hist. Nat. Ins. Hém., 1843, p. 280 : Walk. Cat. Het., vi, p. 105 : Distant, Biol. Centr. Amer. Rhyn., p. 251 : Reuter, Caps. Amer., p. 64 : Uhler, List, p. 17.
subg. *Callichila* and *Resthenia*, Reuter, *l, c.*

alternus, Walker, Cat. Het., vi, 1873, p. 111.
Hab. Rio Janeiro.

atrata, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 254.
Hab. Guatemala, San Geronimo.

atripennis, Reuter, Caps. Amer., 1875, p. 65 : Uhler, List, p. 17.
Hab. Texas.

atroluteus, Walker, Cat. Het., vi, 1873, p. 109.
Hab. Rio Janeiro.

basalis, Walker, *l. c.*, p. 108.
Hab. Rio Janeiro.

bicolor, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 256.
Hab. Guatemala, Zapote.

bivittata, Stål, Rio Jan. Hem., i, 1858, p. 47: Reut., Caps. Amer., p. 64: Walk., Cat. Het., vi, p. 107.
Hab. Rio Janeiro.

bivittis, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 318, ♀: Walker, Cat. Het., vi, p. 98: Distant, Biol. Centr. Amer. Rhyn., 1883, p. 256, t. 24, f. 21.
Hab. Mexico.

bracteata, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 254.
Hab. Panama, Bugaba.

chiriquina, Distant, *l. c.*, p. 253, t. 25, f. 3.
Hab. Panama, Volcano de Chiriqui.

cinctipes, Walker, Cat. Het., vi, 1873, p. 109.
Hab. Rio Janeiro.

cinnamomea, Berg, Hem. Arg., 1879, p. 125.
Hab. Argentine Republic, Missiones.

circumcincta, Say: Uhler, List, p. 17.
Hab. United States.

circummaculata (*Capsus*), Stål, Ofvers. K. V.-A., Förh., xi, 1854, p. 236; Freg. Eug. Resa, Hem. p. 257: Sign., Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 572: Walk., Cat. Het., vi, p. 107: Reut. Caps. Amer., p. 64: Berg, Hem. Arg., 1879, p. 126.
Hab. Chili, Buenos Ayres, Brazil.

concinna, Stål, Rio Jan. Hem., i, 1858, p. 47: Walk., Cat. Het., vi, p. 107: Reut., Caps. Amer., p. 64.
Hab. Rio Janeiro.

confraterna, Uhler, Hayden Mont. Surv., 1872, p. 411; Bull. Un. St. Surv., ii, 1876, p. 318; iii, 1877, p. 415; Proc. Bost. Soc. N. H., xix, 1878, p. 399; List, p. 17: Glover, Rep. Agric. Un. St. for 1875, 1876, p. 125, f. 31.
Hab. Colorado, Wisc., Ill., Maryland, &c.

correntina, Berg, Hem. Arg., 1879, p. 127.
Hab. Argentine Repub., Corrientes.

costalis, Stål, Rio Jan. Hem., i, 1858, p. 47: Walk., Cat. Het., vi, p. 107: Reut., Caps. Amer., p. 64.
Hab. Rio Janeiro.

crucifera, Berg, Hem. Arg., 1879, p. 124.
Hab. Buenos Ayres.

divisa (*Capsus*), Herr. Schäff., Wanz. Ins., ix, 1853, p. 167, t. 313, f. 960: Walk., Cat. Het. vi, p. 91, 98: Stål, Stettin. Ent. Zeit., xxiii, p. 317: Distant, Biol. Centr. Amer. Rhyn., p. 258.
tetrastigma, Herr. Schäff., Wanz. Ins., ix, 1853, p. 166, t. 313, f. 959: Walk., Cat. Hem., vi, p. 97: see *Phytocoris scrupeus*, Say.
Hab. Mexico.

erubescens, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 254.
Hab. Panama, Bugaba, Volcano de Chiriqui.

exornata, Distant, *l. c.*, p. 257, t. 22, f. 20.
Hab. Mexico.

flavicosta, Berg, Hem. Arg., Add. Emend., 1884, p. 189.
Hab. Buenos Ayres.

flavonigra, Stål, Rio Jan. Hem., i, 1858, p. 46: Walk., Cat. Het., vi, p. 107: Reut., Caps. Amer., p 64.
Hab. Rio Janeiro.

Gayi (*Capsus*), Spinola, Gay's Hist. Fis. Chili., vii, 1852, p., 184: Sign., Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 571.
? *melanochra*, Herr. Schäff., *q. v.*
Hab. Chili, Valdivia.

grandis, Blanchard; Reuter, Caps. Amer., p. 64.
dimidio-rufa, Stål, Ofvers. Vet.-Aka., Förh., xii, 1855, p. 186: Walker, Cat. Het., vi, p. 106.
Hab. Brazil.

guatemalana, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 255, t. 25, f. 5.
Hab. Guatemala, Aceituno.

Hogbergi, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 317, ♂: Walker, Cat. Het., vi, p. 98: Distant, Biol. Centr. Amer. Rhyn, p. 254, t. 24, f. 20.
Hab. Mexico.

incertus, Walker, Cat. Het., vi, 1873, p. 111.
Hab. Tejuca.

insignis (*Capsus*), Say, Hem. New Harm. Ind., 1831, 22, No. 12: Uhler., Bull. Un. St. Surv., ii, 1876, p. 318; List, p. 17.
Hab. Colorado, Atlantic region Un. States.

insitiva (*Capsus*), Say, Hem. New Harm. Ind., 1831, 21, 8: Uhler, Proc. Bost. Soc., xix, 1878, p. 399; List, p. 17.
xanthomelas, Walker, Cat. Het., 1873, p. 92.
Hab. S. United States.

interpuncta, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 257, t. 22, f. 15: Uhler List, p. 18.
Hab. Mexico.

latipennis, Stål, Stettin, Ent. Zeit., xxiii, 1862, p. 318: Walker, Cat. Het., vi, p. 98: Distant, Biol. Centr. Amer. Rhyn., p. 258, t. 22, f. 6, 7.
Hab. Mexico.

leprosus, Walker, Cat. Het., vi, 1873, p. 111.
Hab. Santarem.

luteiceps (*Capsus*), Stål, Freg. Eng. Resa, 1859, p. 257: Walk., Cat. Het., vi, p. 107 Reut., Caps. Amer., p. 64: Berg, Hem. Arg., 1879, p. 126.
Hab. Buenos Ayres.

luteigera, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 317, ♂ : Walker, Cat. Het., vi, p. 98 : Distant, Biol. Centr. Amer. Rhyn., p. 252, t. 24, f. 19 : Uhler, List, p. 17.
Hab. Mexico.

luteipes, Stål, Rio Jan. Hem., i, 1858, p. 46 : Walk., Cat. Het., vi, p. 107 : Reut. Caps. Amer., p. 64.
Hab. Rio Janeiro.

maculicollis, Reuter, Caps. Amer. Rhyn., 1875, p. 65 : Uhler, List, p. 17.
Hab. Texas.

marginanda, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 258, t. 22, f. 16 : Uhler, List, p. 18.
Hab. Mexico, Oaxaca.

melanochra (*Capsus*), Herr. Schäff., Wanz. Ins. viii, 1848, p. 17, t. 254, f. 793 : Walk., Cat. Het., vi, p. 97, 107 : Distant, Biol. Centr. Amer., Rhyn , p. 252, t. 22, f. 4.
? *Gayi*, Spinola, Gay's Hist. Fis. Chili, vii, 1852, p. 184, 1 : Sign., Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 571.
picturatus, Blanchard, Gay's Chili, *l. c.*, p. 143.
Hab. Mexico.

mimica, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 255.
Hab. Panama, Bugaba.

montana, Distant, *l. c.*, p. 252, t. 25, f. 1.
Hab. Panama, Volcano de Chiriqui.

montevidensis, Berg, Hem. Arg., Add. Emend., 1884, p. 71.
Hab. Montevideo.

montivaga, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 256.
Hab. Panama, Volcano de Chiriqui.

multifarior, Berg, Hem. Arg., 1879, p. 292.
Hab. Buenos Ayres.

nigricollis, Reuter, Caps. Amer., 1875, p. 65 : Uhler, List, p. 17.
Hab. New Jersey.

nigripennis, Stål, Rio Jan. Hem., i, 1858, p. 46 : Walk., Cat. Het., vi, p. 106 : Reut., Caps. Amer., p. 64.
Hab. Rio Janeiro.

nigritulus, Walker, Cat. Het., vi, 1873, p. 112.
Hab. Charles Island.

obscurans, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 254, t. 25, f. 4.
Hab. Panama, Bugaba.

obumbratus, Walker, Cat. Het., vi, 1873, p. 111.
Hab. S. America, Petropolis.

ornaticollis, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 317, ♂ : Walk., Cat. Het., vi, p. 98 : Reut., Caps. Amer., p. 64 : Distant, Biol. Centr. Amer. Rhyn., p. 253, t. 22, f. 5 : Uhler, List, p. 17.
Hab. Mexico.

pallida, Berg, Hem Arg., 1879, p. 291, 375: (? *Phytocoris*), Add. Emend., 1884, p. 70: Exped. Rio Negro, p. 82, t. 2, f. 4.
Hab. Buenos Ayres.

panamensis, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 253, t. 25, f. 6.
Hab. Panama, Matachin.

parva, Distant, *l. c.*, p. 258, t. 22, f. 18.
Hab. Mexico.

patruelis, Stål, Rio Jan. Hem., i, 1858, p. 47: Walk., Cat. Het., vi, p. 107: Reut., Caps. Amer., p. 64.
Hab. Rio Janeiro.

persignanda, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 257, t. 22, f. 21: Uhler, List, p. 18.
Hab. Mexico.

picticollis, Stål, Stettin. Ent. Zeit., xxiii, 1862, p 317, ♂: Walk., Cat. Het., vi, p. 98: Distant, Biol. Centr. Amer. Rhyn., p. 252, t. 22, f. 2: Uhler, List. p. 17.
Hab. Mexico.

plagigera, Stål, *l. c. supra*, p. 316 ♂: Walker, Cat. Het., vi, p. 98: Reut., Caps. Amer., p. 64: Distant, *l. c. supra*, p. 251, t. 24, f 18: Uhler, List, p. 17.
Hab. Mexico; Honduras; Guatemala, Panama, Smanja.

platensis, Berg, Hem. Arg., 1879, p. 128.
Hab. Buenos Ayres.

plena, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 255.
Hab. Mexico.

pullata (*Phytocoris*) Burm., Handb., ii (i), 1835, p. 271: Dist. *l. c. supra*, p. 252.
candens, Distant, t. 22, f. 3.
Hab. Mexico, Oaxaca; Guatemala, Zapote.

pyrrhomelaena, Stål, Rio Jan. Hem., i, 1858, p. 46: Walk., Cat. Het., vi, p. 106; Rent., Caps. Amer., p. 64.
Zetterstedti, Stål, *l. c. supra*, p. 46: Walk., Cat. Het., vi, p. 106.
Hab. Rio Janeiro.

pyrrhula (*Phytocoris*), Burm., Handb. Ent., ii (i), 1835, p. 271: Hahn, Wanz Ins., iii, 1835, p. 67, t. 94, f. 281: Stål, Rio Jan. Hem., i, p. 46: Walker, Cat. Het., vi, p. 106, 221: Reuter, Caps. Amer., p. 64: Berg, Hem. Arg., Add. Emend., 1884, p. 188.
Hab. Brazil, Buenos Ayres.

quadrinotatus, Walker, Cat. Het., 1873, p. 113.
Hab. James Island (Galapagos).

rubrovittata, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 318: Reuter, Caps. Amer., p. 64: Walker, Cat. Het., vi, p. 92: Uhler, List, p. 17.
Hab. N. America, Texas.

seminigra, Stål, Rio Jan. Hem., i, 1858, p. 46: Walk., Cat. Het., vi, p. 106: Reut., Caps. Amer., p. 64.
Hab. Rio Janeiro.

semivittata, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 253, t. 25, f. 2.
Hab. Guatemala.

spoliatus, Walker, Cat. Het., vi, 1873, p. 1[illegible]2.
Hab. Galapagos.

squalidus, Walker, *l. c.*, p. 110.
Hab. Rio Janeiro.

stigmosa, Berg, Hem. Arg., 1879, p. 123.
Hab. Buenos Ayres.

subannulata, Stål, Rio Jan. Hem., i, 1858, p. 47: Walk., Cat. Het., vi, p. 107: Reuter, Caps. Amer., p. 64.
Hab. Rio Janeiro.

sudata, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 256, t. 22, f. 17: Uhler, List, p. 17.
Hab. Mexico.

thoracica, Distant, *l. c.*, 1883, p. 257, t. 22, f. 14: Uhler, List, p. 18.
Hab. Mexico.

tibialis, Walker, Cat. Het., vi, 1873, p. 109.
Hab. Rio Janeiro.

univittata, Berg, Hem., Arg., 1879, p. 291: Exped. Rio. Negro., p. 83.
Hab. Buenos Ayres.

uruguayensis, Berg, *l. c.*, Add. Emend., 1884, p. 70.
Hab. Uruguay.

vitticeps, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 318, ♀: Walk., Cat. Het., vi, p. 98: Distant, *l. c. supra*, p. 256, t. 24, f. 22.
Hab. Mexico.

vittifrons, Stål, *l. c.*, p. 318, ♂: Walker, Cat. Het., vi, p. 98: Distant, Biol. Centr., Amer. Rhyn., p. 257, t. 24, f. 23.
Hab. Mexico.

xanthophilus, Walker, Cat. Het., 1873, p. 110.
Hab. Rio Janeiro.

Genus **ONCEROMETOPUS**.

Reuter, Caps. Amer., 1875, p. 65.

nigriclavus, Reuter, *l. c.*, p. 66: Uhler, List, p. 18.
Hab. Texas.

ruber, Reuter, *l. c.*, p. 66: Uhler, *l. c.*
Hab. Texas.

Genus **LOPIDEA**.

Uhler, Hayden Mont. Surv., 1872, p. 411; Proc. Bost. Soc. N. H., 1878, p. 405; List, p. 18: Reut., Caps. Amer., p. 66: Distant, Biol. Centr. Amer., p. 258.

bellula, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 259.
Hab. Guatemala, San Isidro.

? confluens (*Capsus*), Say, Hem. New Harm., 1831, 22; Compl. Writ., i, 1859, p. 342: Reut., Caps. Amer., p. 66: Uhler, List, p. 18.
Hab. Texas.

media (*Capsus*), Say, Het. New. Harm. Ind., 1831, 22 No. 11; Compl. Writ., i, 1859, p. 341: Uhler, Hayden Mont. Surv, p. 411; Wheeler Rep. Geogr. Expl. Un. St. V, Zool., 1875, p. 838; Bull. Un. St. Surv., ii, 1876, p. 317; iii, 1877, p. 414; Proc. Bost. Soc. N. H. xix, 1878, p. 406; List, p. 18: Reut., Caps. Amer, p. 66.
var. *robiniae*, Uhler, Proc. E. S. Phil., i, 1861, p. 24: Walk. Cat. Het., vi, p. 92.
Hab New Jersey [*Atk.*, United States].

scitula (*Capsus*), Walker, Cat. Het., vi, 1873, p. 99: Distant, Biol. Centr. Amer. Rhyn., p. 258, t. 23, f. 23: Uhler, List, p. 18.
Hab. Mexico, Oaxaca, Presidio; Guatemala, San Geronimo.

Genus **HADRONEMA**.

Uhler, Hayden Mont. Surv., 1872, p. 412: Dist., Biol. Centr. Amer., p. 259.

militaris, Uhler, Hayden, Mont. Surv., 1872, p. 412; *id*, Wheeler, Rep. Geogr. Explor., v, Zool., 1875, p. 838, t. 42, f. 12; Bull. Un. Surv., ii, 1876, p. 317; iii, 1877, p. 415: Distant, Biol. Centr, Amer. Rhyn., p. 259, t. 22, f. 23.
Hab. Colorado, Utah, California, Mexico.

Genus **LOMATOPLEURA**.

Reuter, Caps. Amer., 1875, p. 67.

Caesar, Reuter, *l. c.*, p. 67.
Hab. Pennsylvania.

Genus **PHYTOCORIS**.

Fallen, Hem. Succ., 1829, p. 83, pt.: Herr. Schäff., Wanz. Ins., iii, 1835, p. 36: Fieb. Eur. Hem., p. 65, 258: Dougl. & Scott, Brit. Hem., p. 301: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 10; *id.*, Rev. Caps., p. 35.

Abeillei, Puton, Rev. d' Ent., iii, 1884, p. 85.
Hab. S. France, Spain.

adspersus, Spinola, Gay's Chili, vii, 1852, p. 194, 8: Sign., Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 567: Walk., Cat. Het., vi, p. 61.
marmoratus, Blanchard, Gay's Hist. Fis. Chili, vii, 1852, p. 194, 17.
Hab. Chili.

albicans, Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 29.
Hab. Greece.

albinervis (Fitch), Walker, Cat. Het., vi, 1873, p. 92 (*ined.*).
Hab. New York.

albofasciatus, Fieber, Eur. Hem., 1861, p. 259 (*nec* Brullé): Walk., Cat. Het., vi, p. 58: Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 31.
Hab. Switzerland.

albofasciatus, Brullé, Expl. Scient. Alg., Zool., iii, 1849, Hem., p. 83, t. 3, f. 6.
Hab. Algeria.

Bergi, n. n.
pallidus, Berg, Hem. Arg., 1879, p. 291, 375; Add. Emend., 1884, p. 70 (*nec* Rambur).
Hab. Buenos Ayres.

bonaerensis, Berg, Hem. Arg., Add. Emend., 1884, p. 69.
Hab. Buenos Ayres.

brachymerus, Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 18.
Hab. Algeria.

breviusculus, Reuter, Caps. Amer., 1875, p. 68: Uhler, List, p. 18.
Hab. Texas.

Chardoni, Puton, Rev. d' Ent., vi, 1887, p. 305.
Hab. Algeria, Bona.

Chicotei, Bolivar, Anal. Soc. Esp. N. H., x, 1881, p. 362.
Hab. Spain.

citrinus, Bolivar, *l. c.*, p. 364.
Hab. Spain.

? coccineus, Spinola, Gay's Hist. Fis. Chili, vii, 1852, p. 185, t. 2. f. 10: Signoret Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 570: Walk., Cat. Het., vi p. 62.
Hab. Chili.

? colon (*Capsus*), Say: Uhler, List, p. 18.
Hab. United States.

delicatulus, Bolivar, Anal. Soc. Esp. N. H., x, 1881, p. 364.
Hab. Spain.

dimidiatus, Kirschbaum, Rhyn. Wiesb., 1855, p. 190, sp. 17; p. 282: Walk., Cat. Het., vi, p. 59: Reuter, Abo Hem., p. 167; *id.*, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 16; Ent. Mon. Mag., xiv, 1877, p. 32; Rev. Syn. Het., p. 249.
dubius, Dougl. & Scott., Brit. Hem., 1865, p. 305: Walk., Cat. Het., vi, p. 60.
? *inquinatus*, Fabr., Mant., Ins., 1787, p. 304; Syst. Rhyng., p. 236.
populi, Saund., Syn. 1875, p. 264, pt.
? *umbratilis*, Linn., Syst. Nat. (*ed.* 10), 1758, p. 448.
Hab. Nearly all Europe.

distinctus, Douglas & Scott, Brit. Hem., 1865, p. 302; Walk., Cat. Het., vi, p. 60; Reuter, Ann. Soc. Ent Fr., (5 s.), vii, 1877, p. 14, t. 2, f. 1: Saund., Syn. p. 264.
Hab. Britain, Scandinavia.

effictus, Stål, Rio Jan. Hem., i, 1858, p. 48: Walk., Cat. Het., vi, p. 61.
Hab. Rio Janeiro.

eximius, Reuter, Caps. Amer., 1875, p. 67: Uhler, List, p. 18.
Hab. Texas.

exoletus, Costa, Cim. Regn. Neap. Cent., iii, 1852, p. 35, f. 5.
Hab. S. France, Italy.

femoralis, Fieber, Eur. Hem., 1861, p. 260: Walk., Cat. Het., vi, p. 58: Reuter, Ann Soc. Ent. Fr., (5 s.), vii, 1877, p. 20, t. 2, f. 3.
irroratus, Fieber, Crit. Phyt., 1859, sp. 3.
Hab. Corsica, Algeria.

Fieberi, Bolivar, Anal. Soc. Esp. Nat. Hist., x, 1881, p. 360.
Hab. Spain.

flammula, Reuter, Notis. Skpts pro Faun. Fl. Fenn., xiv, 1875, p. 332; Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 25.
Hab. Corsica.

hirsutulus, Flor, Rhyn. Liv., ii, 1861, p. 597: Reuter, Ann. Soc Ent. Fr., (5 s.), vii, 1877, p. 32, t. 2, f. 6.
Hab. Russia.

incanus, Fieber, Wien Ent. Monats., viii, 1864, p. 326: Walk., Cat. Het., vi, p. 59: Reuter, Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 28.
Hab. S. Russia, Turkistan.

insignis, Reuter, Pet. Nouv. Ent., ii, no. 147, 1876, p. 33; *id.*, Ann. Soc. Ent. Fr., (5 s.), vii 1877, p. 26.
Hab. Caucasus.

intermedius, Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 14.
distinctus, Reuter, Rev. Caps., 1875, p. 37, (*nec* Dougl. & Scott).
Hab. Scandinavia.

intricatus, Flor, Rhyn. Liv., ii, 1861, p. 603: Reut., Caps. Syn., p. 5 *excl. syn.*; Rev. Caps., p. 41; Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 18.
Hab. N. & Middle Europe.

irroratus, Blanchard, Gay's Hist. Fis. Chili, vii, 1852, p. 193, 14: Sign. Ann. Soc. Ent. Fr., (4 s.), iii, p. 567: Walk., Cat. Het., vi, p. 62.
Hab. Chili.

Jakowleffi, Reuter, Pet. Nouv. Ent., ii, No. 147, 1876, p. 33; Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 24.
Hab. S. Russia, Saratov, Caucasus.

juniperi, Frey Gessner, MT. Schw. Ent. Ges., i, 1865, p. 302: Walk., Cat. Het., vi, p. 59: Reuter, Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 22, t. 2, f. 4.
Hab. France, Spain, Switzerland.

longipennis Flor, Rhyn. Liv., ii, 1861, p. 601: Reuter, Rev. Caps., p. 40; Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 16; Ent. Mon. Mag., xiv, 1877, p. 33: Thomson, Opusc. Ent. iv, 1874, p. 418: Saund., Syn. Brit. Hem., p. 264.
dimidiatus Fieber, Eur. Hem., 1861, p. 260 (*nec* Kirschb.): Dougl. & Scott, Brit. Hem., p. 307.
Hab. Scandinavia, Russia, Germany, Switzerland, France, Britain.

marmoratus (Fitch), Walker, Cat. Het., vi, 1873, p. 61: *incd.*?
Hab. New York.

minor, Kirschbaum, Rhyn. Wiesb., 1855, p. 200, sp. 22, p. 285: Walk., Cat. Het., vi, p. 59: Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 23, t. 2, f. 8.
Hab. Germany.

nesmia, Brullé, Ann. Soc. Ent. Fr., (2 s.) iv, 1846, p. 144: Explor. Scient. Alg., Zool., iii, p. 83.
Hab. Algeria.

? **miridioides**, Lethierry, Ann. Soc. Ent. Belg., xx, 1878, p. 38.
Hab. Spain.

Nowickyi, Fieber, Verh. Zool.-Bot. Ges. Wien, xx, 1870, p. 261: Walk., Cat. Het., vi, p. 60: Reuter, Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 23, t. 2, f. 5.
Hab. Galicia.

obliquus, Costa, Cim. Regn. Neap. Cent., iii, 1852, p. 35, f. 4: Reut., Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 21.
artemisiae, Ferrari, Ann. Mus. Civ. Gen., vi, 1874, p. 177.
Hab. S. France, Italy. [*Atk.* Stazzano].

obscurus, Reuter, Notis. Skpts pro Fann. Fl. Fenn., xiv, 1875, p. 331; Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 20.
Hab. S. France.

obscurellus, Blanchard, Gay's Hist. Fis. Chili, vii, 1852, p. 192, 12: Sign., Ann. Soc. Ent. Fr., (4 s.), iii, 1863, p. 569: Walk., Cat. Het., vi, p. 61.
Hab. Chili.

obsoletus, Blanchard, *l. c. supra*, p. 194, 16: Sign., *l. c. supra*, p. 569: Walk., Cat. Het., vi, p. 61.
Hab. Chili.

pallidicornis, Reuter, Caps. Amer., 1875, p. 69: Uhler, List, p. 18.
Hab. Wisconsin.

pallidulus, Blanchard, Gay's Hist. Fis. Chili, vii, 1852, p. 193, 15: Sign., Ann. Soc. Ent. Fr., (4 s.), iii, p. 568: Walker., Cat. Het., vi, p. 61.
Hab. Chili.

? **pallidus**, Rambur, Fann. Andal., 1842.
Hab. Spain.

parvulus, Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 14.
Hab. Greece.

pilifer, Reuter, *l. c.* p. 13.
Hab. Greece, Asia Minor.

pini, Kirschbaum, Rhynch. Wiesb., 1855, p. 200, sp 21, p. 283: Fieb. Eur. Hem., p. 261: Dougl. & Scott, Ent. Mon. Mag., xi, p. 144: Walk., Cat. Het., vi, p. 59: Saund., Syn., p 265: Reuter, Rev. Caps., p. 43; Ann. Soc. Ent. Fr., (5 s.). vii, 1877, p. 19; Ent. Mon. Mag., xiv, 1877, p. 33.
crassipes, Flor, Rhynch., Liv., ii, 1861, p. 606: ? Dougl. & Scott, Brit Hem. p. 369: Walk., Cat. Het., vi, p. 59: Reuter, Caps. Syn., p. 5.
? *minor*, Thomson, Opusc. Ent., iv, 1871, p. 418 (*nec* Kirschb.).
populi, Zetterstedt, Ins. Lapp., 1840, p. 273, excl. syn. (*nec* Linn.).
Hab. Scandinavia, Russia, Germany, Switzerland, France, Britain.

populi (*Cimex*), Linn., Syst. Nat., (*ed.* 10), 1758, p. 449: Fabr. Syst. Ent., 1775, p. 727; *id.*, Syst. Rhyng., p. 237: Fallen, Mon. Cim., p. 79; *id.*, Hem. Succ., p. 84: Burm. (*Phytocoris*), Handb. Ent., ii (i), p. 268: Westw., Intr. Mod. Class. Ins., ii, Syn., p. 122: F. Sahlb., Geoc. Fenn., p. 90: Kirschb., Rhyn. Wiesb., p. 198, sp. 16, p. 267: Flor, Rhyn. Liv., i, p. 413, ii, p. 594, pt: Fieber, Eur. Hem., p. 260: Walk., Cat. Het., vi, p. 59: Saund. Syn., p. 264: Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 15; *id.*, Rev. Caps., p. 36; Rev. Syn. Het., p. 249.

Hab. Scandinavia, Britain, Russia, France, Germany.

puella, Reuter, Caps. Amer., 1875, p. 69: Uhler, List, p. 18.

Hab. New York.

punctipes (Fitch), Walker, Cat. Het., vii, 1873, p. 92, (*ined.*).

Hab. New York.

punctum, Reuter, Ann. Soc. Ent. Fr. (5 s.), vii, 1877, p. 30.

var. *Reuterianus*, Fairm., Rev. d' Ent., v, 1886, p. 355, Morocco.

Hab. Greece, Tunis.

purgator, Fabr., Ent. Syst. Suppl., 1798, p. 537; Syst. Rhyng., p. 200: Reut. Rev. Syn. Het., p. 251.

Hab.

Reuterii, Saunders, Syn., in Trans. Ent. S. Lond., 1875, p. 265; Reuter, Ann. Soc. Ent. Fr., (5 s) vii, 1877, p. 17.

Hab. Britain.

rubrescens, Blanchard, Gay's Hist. Fis. Chil., vii, 1852, p. 191, 11: Sign., Ann. Soc. Ent. Fr., (4 s.), iii, 1863, p. 568: Walk., Cat. Het., vi, p. 61.

Hab. Chili.

rufulus, Blanchard, *l. c. supra*, p. 192, 13: Sign., *l. c. supra*, p. 568: Walk., Cat. Het., vi, p. 61.

Hab Chili.

salsolae, Puton, Pet. Nouv. Ent., i, no. 109, 1874, p. 436: Reuter, Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 27.

Hab. France, Spain, Algiers, Tunis.

scrupeus (*Capsus*), Say, Het. New Harm. Ind., 1831, 23, No. 13: Uhler, Bull., Un. St. Surv., ii, 1876, p. 317: Walker, Cat. Het., vi, p. 97: Uhler, List, p. 18: Distant, Biol. Centr. Amer., Rhyn., p. 271.

externus, Herr. Schäff., Wanz. Ins., viii, 1848, p. 16, t. 254, f. 791: Walk., Cat. Het., vi, p. 91.

? *tetrastigma*, Herr. Schäff., *l. c.* ix, 1852, p. 166, t. 313, f. 959: vide Dist. *l. c. supra*.

Hab. S. United States, Mexico.

Signoretii, Perris, Ann. Soc. Linn. Lyon, iv, 1857, p. 163: Fieber, Eur. Hem., p. 258: Walk., Cat. Het., vi, p. 58: Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 31, t. 2, f. 7.

? *meridionalis*, Herr. Schäff., Nomencl. Ent., 1835, p. 48.

Hab. France, Spain, Italy, Greece, Germany.

Stoliczkanus, Distant, Scien. Res. 2nd Yark. Miss., 1879, p. 10, f. 6; Trans. Ent. S. Lond., 1879, p. 124.
Hab. Murree.

subvittatus, Stål, Rio Jan. Hem., i, 1858, p. 47: Walk., Cat. Het., vi, p. 61.
Hab. Rio Janeiro.

tibialis, Reuter, Caps. Amer., 1875, p. 68; Uhler, List, p. 18.
Hab. Texas.

tiliae (*Cimex*), Fabr., Gen. Ins., 1776, p. 301; Syst. Rhyng., p. 237: Fallen, Mon. Cim., p. 79; *id.*, Hem. Suec., p., 85: F. Sahlb., Geoc. Fenn., p. 98: Kirschb., Rhyn. Wiesb., p. 199, sp. 18, p. 268: Fieber, Eur. Hem., p. 260: Dougl. & Scott, Brit. Hem., p. 303: Walk., Cat. Het., vi, p. 59: Saund., Syn., p. 265: Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 16; *id.*, Ent. Mon. Mag., xiv, 1877, p. 33; Rev. Caps., p. 38; Rev. Syn. Het., p. 250.
populi, Meyer, Rhyn. Schw., 1843, t. 7, f. 1 (*nec* Linn.).
var. *cretaceus*, Reuter, Rev. Caps., 1875, p. 39.
„ *signatus*, Reuter, *l. c.*, p. 39.
„ *typicus*, Reuter, *l. c.*, p. 39.
„ *marmoratus*, Dougl. & Scott, Ent. Mon. Mag., 1869, p. 261: Walk., Cat. Het., vi, p. 60: Reuter, Ann. Soc. Ent. Fr., (5 s.), vii, 1877, t. 2, f 2.
Hab. All Europe [*Atk.*, Lille].

trigonalis, Spinola, Gay's Hist. Fis. Chili, vii, 1852, p. 197, 20: Sign., Ann. Soc. Ent. Fr. (4 s.) iii, p. 569: Walk., Cat. Het., vi, p. 62.
Hab. Chili.

ulmi (*Cimex*), Linn., Syst. Nat., (*ed.* 10), 1758, p. 449: Fabr., Syst. Ent., 1775, p. 727; *id.*, Syst. Rhyng., p. 256: Fallen, Mon. Cim., p. 82; *id.*, (*Phytocoris*), Hem. Suec., p. 89: Walk., Cat. Het., vi, p. 58: Saund., Syn., p. 266: Reuter, Ann. Soc. Ent. Fr., (5 s.) vii, 1877, p. 24; Rev. Caps., p. 43; Ent. Mon. Mag., xiv, 1877, p. 33: Rev. Syn. Het., p. 250.
divergens, Meyer, Stettin. Ent. Zeit., ii, 1841, p. 87: *id.*, Rhyn. Schw., p. 44, t. 1, f. 1: Kirschb. Rhyn. Wiesb., p. 199, sp. 19, p. 268: Flor, Rhyn. Liv., i, p. 415; ii, p. 594: Fieber, Eur. Hem., p. 259: Dougl. & Scott, Brit. Hem., p. 311.
floralis, Fabr., Mant. Ins., 1787, p. 303: Stål, Hem. Fabr., i, p. 87: Walk., Cat. Het., vi, p. 58 (*flavalis*, sic.).
longicornis, Wolff, Ic. Cim., iv, 1804, p. 155, t. 15, f. 149: Burm., Handb. Ent., ii (i), p. 269.
vividus, Fabr., Syst. Rhyn., 1803, p. 237.
Hab. All Europe [*Atk.*, Lille].

undulatus, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 26.
Hab. Turkistan.

unicolor, Reuter, Ofvers. Finska. Soc. Förh., xxii, 1880, p. 15.
Hab. Greece.

ustulatus, Herr. Schäff., Nomencl. Ent., 1835, p. 47: Fieb., Eur. Hem., p. 258: Walk., Cat. Het., vi, p. 58: Reuter, Ann. Soc. Ent. Fr., (5 s.), vii, 1877, p. 29.
Hab. Bohemia, N. Italy.

varicornis, Erichson, Wiegmann Arch., viii (2), 1842, p. 280.
Hab. Tasmania.

varipes, Bohem., Ent. Ant. Sodra Sverige, Vet. Aka. Handl., 1852, p. 107: Thoms. Opusc. Ent. iv. p. 418: Reuter, Rev. Caps, p. 44: Saund., Syn. Brit. Hem., p. 265: Reuter, Ann. Soc. Ent. Fr., (5 s.), vii, 1877. p. 26.
irroratus, Perris, Ann. Soc. Linn. Lyon, iv, 1857, p. 16.
ulmi, Hahn, Wanz. Ins., iii, 1835, p. 9, t. 76, f. 234 (*nec* Linn.: Meyer, Rhyn. Schw., p. 43: Kirschb., Rhyn. Wiesb., p. 200, sp. 20: Flor, Rhyn. Livl. i, p. 416; ii, p. 593: Fieber, Eur. Hem., p. 259: Dougl. & Scott, Brit. Hem., p. 313.
Hab. Nearly all Europe [*Atk.* Dunkirk, Hungary].

Genus **COMPSOCEROCORIS**.

Reuter, Caps. Amer., 1875, 9, p. 70: Distant, Biol. Centr. Amer. Rhyn., p. 260: Uhler, List, p. 18.

annulicornis, Reuter, Caps. Amer., 1875, 9, p. 70: Distant, Biol. Centr. Amer. p. 261: Uhler, List, p. 18.
Hab. Texas, Guatemala, Panama.

dubitatus, Distant, Biol. Centr. Amer. Rhyn, 1883, p, 260, t. 25, f. 12.
Hab. Guatemala, Quiche range.

elegans, Distant, *l. c.*, p. 261, t. 25, f. 14.
Hab. Guatemala, San Geronimo.

exustus, Distant, *l. c.*, p. 260.
Hab. Guatemala, Quezaltenango.

mistus, Distant, *l. c.*, p. 262, t. 25, f. 15.
Hab. Guatemala, San Geronimo.

vilis, Distant, *l. c.*, p. 260, t. 25, f. 13.
Hab. Guatemala; Panama.

Genus **TAEDIA**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 262.

bimaculata, Distant, *l. c.*, p. 262, t. 25, f. 16.
Hab. Panama, Bugaba.

Genus **NEUROCOLPUS**.

Reuter, Caps. Amer., 1875, 9, p. 69; Dist., Biol. Centr. Amer. Rhyn., p. 262.

inops (*Phytocoris*), Uhler, Bull. Un. St. Surv., iii, 1877, p. 413; Proc. Bost. Soc. N. H., 1878, p. 402; List, p. 18.
Hab. Canada to Maryland.

mexicanus Distant, Biol. Centr. Amer. Rhyn., 1883, p. 262, t. 23, f. 5.
? var. *affinis*, Distant, *l. c.*, p. 263.
Hab. Mexico, Guatemala, Panama.

nubilus (*Capsus*), Say, Hem. Het. New Harm. Ind., 1831, 22 No. 10; Compl. Writ., i, p. 341, 10: Reuter, Caps. Amer., 1875, p. 70: Uhler, Bull. Un. St. Surv., ii, 1876, p. 317; iii, 1877, p. 413; Proc. Bost. Soc. N. H., xix, 1878, p. 403; List, p. 18.
Hab. New York, Canada, Atlantic States, Texas, Mexico [*Atk.*, Un. St.].

Genus **PARACALOCORIS**.

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 262: Uhler, List, p. 18.

annulatus, Distant, *l. c.*, p. 264.
Hab. Panama, Volcano de Chiriqui, Bugaba.

attenuatus, Distant, *l. c.*, p. 264.
Hab. Guatemala, San Geronimo; Panama, Bugaba.

balteatus, Distant, *l. c.*, p. 265, t. 25, f. 19.
Hab. Guatemala, San Geronimo.

fistulosus, Distant, *l. c*, p. 264, t. 22, f. 11: Uhler, List, p. 18.
Hab. Mexico.

jurgiosus (*Calocoris*), Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 320, ♀: Walk., Cat. Het., vi, p. 99: Distant, Biol. Centr. Amer. Rhyn,, p. 263, t. 25, f. 17: Uhler, List, p. 18.
Hab. Mexico; Guatemala, Cerro Zunil.

lunatus, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 265, t. 25, f. 20.
Hab. Guatemala, San Geronimo.

mastrucatus, Distant, *l. c.*, p. 265, t. 25, f. 21.
Hab. Panama, Bugaba.

molliculus, Distant, *l. c.*, p. 265, t. 25, f. 18.
Hab. Guatemala, San Geronimo.

Genus **PAPPUS**.

Distant, Biol. Centr., Amer. Rhyn., 1883, p. 266.

sordidus, Distant, *l. c.*, p. 266, t. 25, f. 22.
Hab. Guatemala, San Geronimo.

Genus **GARGANUS**.

Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 321: Distant, Biol. Centr. Amer. Rhyn., p. 266: Uhler, List, p. 20.

albidivittis, Stål, *l. c. supra*, p. 322, ♀: Walk., Cat. Het., vi, p. 66: Distant, *l. c. supra*, p. 266, t. 25, f. 3: Uhler, List, p 20.
Hab. Mexico, Guatemala, West. United States.

fusiformis (*Capsus*), Say, Compl. Writ., i, 1831, p. 344: Uhler, List, p. 20.
croceipes, Herr. Schäff., Wanz. Ins., viii, 1848, p. 16, t. 254, f. 792: Walker, Cat. Het., vi, p. 92.
Hab. Western United States, Pennsylvania.

Genus **ISCHNOCELICORIS**.

Reuter, Puton Explor. Scient. Tunis., 1886, p. 17.
Ischnoscelis, Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 15; Zool. Jahr., 1880, p. 140.

rubrinervis, Reuter, Puton, Explor. Scient. Tunis., 1886, p. 18.
Hab. Tunis, Algeria.

Genus **ALLOENOTUS**.

Fieber, Crit. Gen., 1859, 28, t. 6, f. 189; *id.*, Eur. Hem., p. 65,261: Walk., Cat. Het., vi, p. 60: Reuter, Bih. Vet.-Aka., Handl., iii (i), 1875, p. 10.

distinguendus, Herr. Schäff., Wanz. Ins., iv, 1839, p. 33, t. 121, f. 384: Fieb., Eur. Hem., p 262: Walk., Cat. Het., vi, p. 60.
var. *caspicus*, Horvath, Term. füz., viii, 1884, p. 316.
Hab. S. Russia, Transcaucasia.

egregius, pt., Fieber, Wien Ent. Monats., viii, 1864, p. 327: Walk., Cat. Het., vi, p. 60.
Hab. S. Russia, Dalmatia.

fulvipes (*Cimex*), Scopoli, Ent. Carn., 1763, p. 134: Reuter (*Globiceps*), Caps. Syn., p. 13; *id.* (*Alloenotus*), Ent. Mon. Mag., xvii, 1880, p. 14; Rev. Syn. Het., p. 252.
avellanae, Gmelin, Syst. Nat., iv, 1788, p. 2183.
distinguendus, Fieber, Crit. Phyt., 1859, 28; Eur. Hem., p. 262 (*nec* Her., Schäff.).
var. *separandus*, Horvath, Rev. d' Ent., vii, 1888, p. 179.
? „ *egregius*, Fieber, var. B, Wien. Ent. Monats., viii, 1864, p. 327.
Hab. Turkey, Asia Minor.

Genus **CALOCORIS**.

Fieber, Eur. Hem., 1861, p. 65, 251: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1857, p. 11; Rev. Caps., p. 45: Distant, Biol. Centr. Amer. Rhyn. p. 266: Walker, Cat. Het., vi, p. 71, 105.
subg. *Calocoris*, Fieber, Reuter, *l. c. supra.*
[*Calocoris*, Fieber; *Closterotomus*, Fieber., Eur. Hem., p. 65, 261].
subg. *Homodemus*, Fieber, Eur. Hem., p. 64, 249.
Deraeocoris, Douglas & Scott, Brit. Hem., 1865, p. 315.

albonotatus, Jakowleff., Bull. Mosc., lvi (i), 1881, p. 194.
Hab. Persia.

alpestris, Meyer, Rhyn. Schw., 1843, p. 49: Fieber, Eur. Hem., p. 253: Walk., Cat. Het., vi, p. 73: Saund., Syn., p. 270: Reuter, Bih. Vet.-Aka. Handl., iii (1), 1875, p. 13; Berlin, Ent. Zeits., xxix, 1885, p. 46.
pabulinus, var *major*, Schill. Hem. Het. Siles., 1829.
Hab. Nearly all Europe.

amoenus, Douglas & Scott, Ent. Mon. Mag., 1868, p. 115: Walk., Cat. Het., vi, p. 70, 76.
Hab. Syria.

angularis (*Homodemus*), Fieber, Wien Ent. Monats., viii, 1864, p. 325: Walk., Cat. Het., vi, p. 71: Reuter, Berlin. Ent. Zeits., 1881, p. 175.
var. *melanocephalus*, Reuter, *l. c.*, p. 30.
„ *biplagiatus*, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 30.
Hab. Hungary, Greece, Turkey, Syria, Caucasus.

annulicornis, F. Sahlb., Mon. Geoc. Fenn., 1848, p. 100: J. Sahlb., K. Vet.-Aka, Handl., xvi (4), 1878, p. 26: Walker, Cat. Het., vi, p. 76: Fieb., Eur. Hem., p. 390.
Hab. N. Europe, S. Siberia.

annulus, Brullé, Exped. Morée, iii (i), 1832: *teste*, Puton, Cat., p. 49.
Hab. Greece.

argentinus (*Phytocoris*), Berg, Hem. Arg., 1879, p. 122: *id.*, Add. Emend., 1884, p. 72.
Hab. Buenos Ayres.

Beckeri, Fieber, Verh. Zool.-Bot. Ges. Wien, xx, 1870, p. 259: Walk., Cat. Het., vi, p. 75.
Hab. Russia.

biclavatus (*Capsus*), Herr. Schäffer, Nomencl. Ent., 1835, p. 48: Reuter, Ent. Mon. Mag., xiv, 1878, p. 244; Rev. Syn. Het., p. 254.
bifasciatus, Herr. Schäff., Wanz. Ins., iii, 1835, p. 48, t. 87, f. 265 (*nec* Fabr.): Meyer, Rhyn. Schw., p. 97; F. Sahlb., Geoc. Fenn., p. 121: Kirschb., Rhyn. Wiesb., p. 208 sp. 35; p. 265: Flor, Rhyn. Liv., i, p. 488; Fieber (*Closterotomus*), Eur. Hem., p. 261.
? *quadriguttatus*, Goeze, Ent. Beytr., ii, 1778, p. 275.
variegatus, Reuter, Caps. Syn., 1875, p. 5; *id.*, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 12; Rev. Caps., p. 48 (*nec* Costa).
? var. *Schillingi*, Scholtz, Arb. u. Veränd. d. Schles-Ges., i, 1846, p. 108.
Hab. Nearly all Europe [*Atk.*, Geneva].

bimaculatus (*Capsus*), Fabr., Syst. Rhyng., 1803, p. 243: Stål, Hem. Fabr., i, p. 86: Walk., Cat. Het., vi, p. 105.
Hab. S. America.

bistriguttatus, Fabr., Ent. Syst., iv, 1794, p. 174: Reuter, Rev. Syn. Het., p. 263.
? = *biclavatus*, Herr. Schäff., q. v.
Hab. Germany.

capitatus, Jakowleff, Bull. Mosc., lii (2), 1877, p. 290.
Hab. S. Russia, Sarepta.

cinctipes (*Phytocoris*), Costa, Cim. Regn. Neap., Cent. iii, 1852, p. 41.
Hab. Italy, Dalmatia, Greece.

collaris, Fieber, Verh. Zool.-Bot. Ges. Wien, xx, 1870, p. 239: Walk, Cat. Het, vi, p. 75: Reuter, Berlin. Ent. Zeits, xxv, 1881, p. 175.
var. *fuliginosus*, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 29.
„ *fuscescens*, Reuter, *l. c.*, p 27.
Hab. Italy, Hungary, Dalmatia, Greece, Syria.

Costae, Reuter, Wien. Ent. Zeit., vii, 1888, p. 99, 100.
Hab. Armenia.

detritus, Fieber., Eur. Hem, 1861, p. 257: Walk. Cat. Het., vi, p. 74: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 12.
Hab. Hungary, France, Switzerland.

elegans, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 26.
Hab. Syria.

fasciativentris, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 320, ♀: Walker, Cat., vi, p. 99: Distant, Biol. Centr. Amer. Rhyn., p. 267, t. 25, f. 24: Uhler, List, p. 18.
Hab. Mexico, San Luis Potosi.

fasciatus, Jakowleff, Bull. Mosc., xlix (3), 1875, p. 167.
Hab. S. Russia.

Fedtschenkoi, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 199; Fedtsch. Turk., sep., 1887, p. 5; Wien Ent. Zeit., vii, 1881, p. 100.
Hab. Turkistan, Varsaminor.

Forsythi, Distant, Scien. resul. 2nd Yarkand Miss., 1879, p. 10, f. 8; Trans. Ent. S. Lond., 1879, p. 125.
Hab. Yarkand.

fulvomaculatus (*Cimex*), De Geer, Mém., iii, 1773, p. 294: Fallen, Mon. Cim., p. 81: *id*, Hem. Succ, p. 88: Zett., Faun. Lapp., p. 489: Herr. Schäff., Wanz. Ins., iii, p 50, t. 87, f. 267 ♂; *ib*, p. 81, t. 99, f. 302, ♀: Meyer, Rhyn. Schw., p. 96: Kolenati, Mel, Ent., ii, p. 109: F Sahlb, Geoc. Fenn., p. 109: Costa, Cim, Regn. Neap. Cent., iii, p. 41: Kirschb., Rhyn. Wiesb., p. 209, sp, 36: Flor, Rhyn. Liv., i, p. 505: Fieber, Eur. Hem., p. 253: Douglas & Scott, Brit. Hem., p. 316: Walk., Cat. Het., vi, p. 72: Saund., Syn., p. 267: Reuter, Rev. Caps., p. 49; *id*., Rev. Syn. Het., p. 255: Uhler, List, p. 18.
? *bimaculatus*, Linn., Syst. Nat. (*ed.* 10), 1758, p. 449.
distinguendus, Garbigl., Bull. Soc. Ent. Ital, 1869, p. 184: Walk, Cat. Het., vi, p. 75.
? *femoralis*, Lucas, Expl. Scient. Alg. iii, 1849, p. 82, t. 3, f. 4.
genistae, Schrank, Fauna Boica, 1801, p. 87 (*nec* Scop.).
isabellinus, Westh., Jahresb. Westfäl. Prov. Ver. Wiss. u. Kunst., ix, 1883, p. 80.
Rolandri (Retzius), De Geer, Gen. & Spec., 1783, p. 88 (*nec* Linn.).
saltatorius, Fabr., Syst. Rhyng., 1803, p. 239, *excl. syn.*
seticornis, Schrank, Fauna Boica, 1801, p. 89 (*nec* Fabr.).
Hab. Nearly all Europe: Canada [*Atk.*, Lillo].

fulvus, Jakowleff, Trudi. Ent. Ross., xiii, 1882, p. 170.
Hab. E. Siberia, Vladivostock.

Hedenborgi, Fieber, Verh. Zool.-Bot. Ges. Wien, xx, 1870, p. 258: Walk., Cat. Het., vi, p. 75; Reuter, Wien Ent. Zeit., vii, 1888, p. 100.
Hab. Bosphorus.

hispanicus, Gmelin, Syst. Nat., iv, 1788, p. 2174: Reuter, Rev. Syn. Het., p. 256.
Carcelii, Lep. & Serv., Enc. Méth., x, 1825, p. 325: Dufour, Rech., 1833, p. 178, t. 10, f. 325: Brullé, Hist. Ins., 1835, p. 409, t. 33, f. 4.
nemoralis, Burm., Handb. Ent., ii (i), 1835, p. 269: Blanchard, Hist. Ins., p. 136.

ruficollis, Fabr., Ent. Syst., iv, 1794, p. 138 (?); *id.*, Syst. Rhyng., p. 214.
sexpunctatus, Fabr., Mant. Ins., 1787, p. 300 (nec. *praec.*): Hahn, Wanz. Ins., ii, p. 131, t. 70, f. 213-216: Costa, Cim. Regn. Neap., i, 1838, p. 51: Fieber, Eur. Hem., p. 253: Stål, Hem. Fabr., i, p. 86: Walk., Cat. Het., vi, p. 73.

var. *coccineus*, Dufour, Recherch., 1833, p. 179.
" *cuneatus*, Puton, Rev. d' Ent., vi, 1887, p. 102.
" *nankineus*, Dufour, Recherch., 1833, p. 179.
" *nigridorsum*, Costa, Cim. Regn. Neap. Cent. Addit., 1860, p. 38.
" *nigrovittatus*, Costa, *l. c.* Cent., i, 1838, p. 51, f. 9.
" *piceus*, Cyrillo, Ent. Neap., 1787, t. 12, f. 5.?
" *aterrimus*, Garbigl., Bull. Soc. Ent. Ital., 1869, p. 185: Walk., Cat. Het., vi, p. 76.
" *rubromarginatus*, Lucas, Expl. Scient. Algerie, 1849, p. 81, t. 3, f. 3.
" *Zelleri*, Scott, Ent. Mon. Mag., xiii, 1876, p. 104. Palermo.
" *thoracicus*, Puton, Rev. d' Ent., iii, 1884, p. 148.
" *punicus*, Ferrari, Ann. Mus. Civ. Gen., (2 s.) i, 1884, p. 476.

Hab. S. Europe, Tunis.

histrio, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 27; Wien. Ent. Zeit., vii, 1888, p. 100.
Hab. Greece.

insularis, Horvath, Termes. Füz., iii, 1879, p. 147.
Hab. Japan, Nagasaki.

? **inustus**, Distant, Biol. Centr., Amer. Rhyn., 1883, p. 267, t. 23, f. 17: Uhler, List, p. 18.
Hab. Mexico.

Jakowleffi, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 28: Fedtschenko's Turkistan, rep., p. 6.
Hab. Turkistan.

Kolenatii, Fieber, Wien Ent. Monats., viii, 1864, p. 219: Walk., Cat. Het., vi, p. 75.
Hab. Germany.

Krueperii, Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 16; Wien. Ent. Zeit., vii., 1888, p. 100.
Hab. Greece.

lineolatus (*Cimex*), Goeze, Ent. Beytr., ii, 1778, p. 267: Reuter, Rev. Syn. Het., p. 262.
albinus, Geoffroy in Fourcr. Ent. Paris., 1785, p. 208.
binotatus, Hahn, Wanz. Ins., i, 1831, p. 202, t. 33, f. 103.
? *bipunctatus*, Burm., Handb. Ent., ii (i), 1835, p. 270: Costa, Cim. Regn. Neap. Cent., iii, p. 260.
? *brevicollis*, Meyer, Rhyn. Schw., 1843, p. 47, t. 1, f. 4.
chenopodii (*Lygaeus*), Fallen, Mon. Cim., 1807, p. 74; *id.*, Hem. Suec., p. 77: Meyer, Rhyn. Schw., p. 51: Kolenati, Mel. Ent., ii, p. 113: Sahlb. Geoc. Fenn., p. 100: Kirschb., Rhyn. Wiesb., p. 217, sp. 51: Flor, Rhyn. Liv., i, p. 501: Fieber, Eur. Hem., p. 255: Dougl. & Scott, Brit. Hem., p. 325: Walk., Cat. Het., vi, p. 74: Saund., Syn., p. 270: Reuter, Rev. Caps., p. 54, pt.; *id.* Fedtsch. Turk., p. 6.

J

laevigatus, Wolff, Ic. Cim., i, 1800, p. 36, t. 4, f. 36 (*nec* Linn.).
Hab. Nearly all Europe; Tunis, Turkistan [*Atk.*, Lille, Stazzano, Hungary].

Meyeri, Kolenati, Mel. Ent. ii, 1845, p. 105, t. 11, f. 26: Fieb., Eur. Hem., p. 250: Walk., Cat. Het., vi, p. 71.
Hab. Caucasus.

M-flavum (*Cimex*), Goeze, Ent. Beytr., ii, 1778, p. 279: Reut., Rev. Syn. Het., p. 263.
marginellus, Fabr., Spec. Ins., ii, 1781, p. 374; *id.*, Syst. Rhyng., p. 255: Burm., Handb. Ent., ii (i), p. 269: Meyer, Rhyn. Schw., p. 93: Kirschb., Rhyn. Wiesb., p. 210, sp. 38: Fieber, Eur. Hem., p. 250: Dougl. & Scott, Brit. Hem., p. 328: Walk., Cat. Het., vi, p. 71: Saund., Syn., p. 269.
scriptus, Fabr., Ent. Syst., iv, 1794, p. 182; *id.*, Syst. Rhyng., p. 247: Coq. Ill. Ic., p. 41, t. 10, f. 13: Lep. & Serv., Enc. Méth., x, p. 325: Hahn, Wanz. Ins., ii, p. 120, t. 66, f. 202.
striatus, Geoffr. in Fourcr., Ent., Par., 1785, p. 207 (*nec* Linn.).
Hab. Nearly all Europe [*Atk.*, Loire Inférieure].

nebulosus, Fieber, Wien Ent. Monats., viii, 1864, p. 326: Walk., Cat. Het., vi, p. 75.
Hab. Illyria.

nigricans, Distant, Biol. Centr. Amer., Rhyn., 1883, p. 267, t. 22, f. 22: Uhler, List, p. 18.
Hab. Mexico.

nigriceps, J. Sahlberg, K. Vet.-Aka. Handl., xvi (4), 1878, p. 25.
Hab. Siberia.

norvegicus (*Cimex*), Gmelin, Syst. Nat., iv, 1788, p. 2176: Reut., Rev. Syn. Het., p. 259.
? *biguttatus*, Schrank, Fauna Boica, 1801, p. 94.
bipunctatus, Fabr., Reise Norv., 1779, p. 346 (*nec* Linn.); *id.*, Syst. Rhyng., p. 235: Fallen, Mon. Cim., p. 75; *id.*, Hem. Suec., p. 78: Zett., Fauna Lapp., p. 486: Herr. Schäff., Wanz., Ins., iii, p. 79, t. 98, f. 298: Meyer, Rhyn. Schw., p. 51: Kirschb., Rhyn. Wiesb., p. 220, sp. 58: Flor, Rhyn. Liv., i, p. 498: Fieb., Eur. Hem., p. 254: Dougl. & Scott, Brit. Hem., p. 319: Walk., Cat. Het., vi, p. 73: Saund., Syn., p. 270: Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 400; List, p. 18: Reuter, Caps. Amer., p. 71; Abo Hem., p. 168; Rev. Caps., p. 53, pt; Berlin. Ent. Zeits., xxix, 1885, p. 46.
pabulinus, var. 1, 2, Scopoli, Ent. Carn., 1763, p. 132 (*nec* Linn.).
pabulinus, Rossi, Faun. Etrusc., ii, 1790, p. 251.
Hab. All Europe; Tunis; N. America, Texas [*Atk.*, Lille, Stazzano].

ochromelas (*Cimex*), Gmelin, Syst. Nat., iv, 1788, p. 2180: Reut., Rev. Syn. Het., p. 252.
cordiger, Schrank, Fauna Boica, 1801, p. 91 (*nec* Goeze).
luteus, Turton, Syst. Nat., ii, 1806, p. 682.
? *pulliço*, Harris, Exp. Engl. Ins., 1781, p. 89, t. 26, f. 4.
quadripunctatus, Vill., Ent. ancta, 1789, p. 535: Don., Br. Ins. iii, p. 77, t. 101, f. 1-3.
striatellus, Fabr., Ent. Syst., iv, 1794, p. 173; *id.*, Syst. Rhyng., p. 236:

Wolff, Ic. Cim., iv, 1804, p. 156, t. 15, f. 150: Panzer, Faun. Germ., 93, 1804, f. 17: Fallen, Mon. Cim., p. 78; *id*, Mem. Succ., p. 84: Zett., Fauna Lapp., p 488: Hahn, Wanz. Ins., ii, p. 133, t. 71, f. 218: Meyer, Rhyn. Schw., p. 94: F. Sahlb., Geoc. Fenn., p. 105: Costa, Cim. Regn. Neap., Cent. iii, p 263: Kirschb., Rhyn. Wiesb., p. 216, sp. 50: Flor, Rhyn. Liv., i, p. 492: Fieber, Eur. Hem., p. 251: Dougl. & Scott, Brit. Hem., p. 318; Walk., Cat. Het., vi, p. 71; Saund., Syn., p. 268: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 11; Rev. Caps., p. 46.

variegatus, Müller, Zool. Dan., 1776, p. 108 (*nom. praeoc*).

var. *fornicatus*, Fieber, Wien. Ent. Monats., viii, 1864, p. 218: Dougl. & Scott, Brit. Hem., p. 329: Walk., Cat. Het., vi, p. 75.

Hab. Nearly all Europe [*Atk.*, Lille, Hungary].

opacus, Walker, Cat. Het., vi, 1873, p. 100: Distant, Biol. Centr. Amer., Rhyn., p. 267, t. 22, f. 10: Uhler, List, p. 18.

Hab. Mexico.

Palmerii, Uhler, Hayden Mont. Surv., 1872, p. 410; Wheeler, Rep. Geogr. Expl. Un. St. Zool., 1875, p. 838, t. 42, f. 4; Bull. Un. St. Surv., ii, 1876, p. 318; Proc. Bost. Soc. N. H., xix, 1878, p. 40; List, p. 18.

Hab. West. Un. States, Arizona, S. Colorado.

pilicornis, Panzer, Faun. Germ., 1809, p. 99: Walker, Cat. Het., vi, p. 72: Kirschb., Rhyn. Wiesb., p. 222, sp. 61: Fieb., Eur. Hem., p. 252: Walk., Cat. Het., vi, p. 72: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 12.

anticus, Muls. & Rey, Ann. Soc. Linn. Lyon, 1852, p. 116.

Hab. France, Spain, Italy, Germany.

princeps, Reuter, Deutsche Ent. Zeits., 1880, p. 27: Ofvers. Finska Soc. Förh., 1880, p. 16.

Hab. Greece.

Putonii, Horvath, Rev. d' Ent., vii, 1888, p. 180.

Hab Syria, Caffa.

quadripunctatus (*Lygaeus*), Fabr., Ent. Syst., iv, 1794, p. 172: Fieber, Eur. Hem., p. 256: Walker, Cat. Het., vi, p. 74: Reuter, Bih. Vet.-Aka.. Handl., iii (i), 1875, p. 13; Rev. Syn. Het., p. 263.

Hab. Nearly all Europe [*Atk.*, Calais].

rapidus (*Capsus*), Say, Hem. Het. New Harm. Ind., 1831, p. 20, 4: Uhler, Hayden Mont. Surv., 1872, p. 410; *id*, Bull. Un. St. Surv, ii, 1876, p. 318: iii, 1877, p. 415; Proc. Bost. Soc. N. H., xix, 1878, p. 401; List, p. 18: Walk., Cat. Het., vi, p. 91: Forbes, Ill. Rep., xiii, p. 135, t. 14, f. 1, 2.

multicolor, Herr. Schäff, Wanz. Ins., viii, 1848, p. 19, t. 254, f. 795: Rent. Caps. Amer., 1875, p. 70.

Hab. Colorado, Arizona, Texas, California, Wisconsin, Canada [*Atk.*, E. Florida].

Reichelii, Fieber, Weit. Beitr., i, 1836, p. 103, t. 2, f. 2; Eur. Hem., p. 257: Walk., Cat. Het., vi, p. 74: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 12.

Hab. France, Italy, Germany [*Atk.*, Styria].

Reuterii, Horvath, Term. Füz., v, 1882, p. 223: var. in *l. c.*, vii, 1883, p. 29.

Hab. Caucasus, Broussa.

roscomaculatus (*Cimex*), De Geer, Mém., iii, 1773, p. 293: Baer., Cat., p. 14: Saund., Syn., p. 269: Reut., Rev. Caps., p. 52; Rev. Syn. Het. p. 260.

bistriatus, Goeze, Ent. Beytr., ii, 1778, p. 278.

campestris, Panzer, Schäff., Ic., 1804, p. 19.

cruentatus, Geoffr. in Fourcr., Ent. Par., 1785, p. 208.

digrammus, Gmelin, Syst. Nat., iv, 1788, p. 2181.

ferrugatus, Fabr., Ent. Syst., iv, 1794, p. 173; *id.*, Syst. Rhyng., p. 236: Fallen, Mon. Cim., p 79; *id.*, Hem. Suec., p. 86: Hahn, Wanz. Ins., i, p. 204, t. 33, f. 104: Burm., Handb. Ent., ii, p. 270: Meyer, Rhyn. Schwe. p. 52: Kolenati, Mel. Ent., ii, p. 111: F. Sahlb., Geoc. Fenn., p. 104: Costa, Cim. Regn. Neap., Cent. iii, p. 261: Kirschb., Rhyn. Wiesb., p. 217, sp. 53: Flor, Rhyn. Liv., i, p. 496: Fieb., Eur. Hem., p. 250: Dougl. & Scott, Brit. Hem., p. 327; Walk., Cat. Het., vi, p. 70.

? *pabulinus*, var. 3, Scop., Ent. Carn., 1763, p. 132.

rosetus, Schrank, Naturh. Bem., 1796, p. 213: Fauna Boica, ii, p. 90.

saucíatus, Gmelin, Syst. Nat, 1788, p. 2191.

succinctus, Turton, Syst. Nat., ii, 1806, p. 694.

Hab. Nearly all Europe [*Atk.*, Dunkirk].

rhaeticus [illegible] (*Capsus*), Meyer, Reuter, Rev. Mens. d' Ent., i, 1884, p. 213: Wien. Ent. Zeit., vii p. 99.

neolatus, Costa, Cim. Regn Neap. Cent. iii, 1852 (*nec* Goeze).

salmédi (*Pycnopterna*), Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 14; *id.*, Verh. Zool.-Bot Ges. Wien, xxv, 1876, p. 86.

Hab. France, Italy, Noric Alps, Hungary, Germany.

rubripes, Jakowleff, Bull. Mosc, li (3), 1876, p. 115.

Hab. E Siberia, Ussuri.

rubrinervis (*Capsus*), Herr. Schäff., Nomencl. Ent., i, 1835, p. 49: Reuter, Berlin. Ent. Zeits., xxix, 1885, p. 40.

instabilis, Fieber, Eur Hem., 1861, p. 255: Walk., Cat Het., vi, p. 74.

Hab. Spain, Tunis, Algeria, Syria.

salviae (*Phytocoris*), Hahn, Wanz. Ins., ii, 1834, p. 133, t. 71, f. 217: Meyer, Rhyn. Schw., p 95: Reuter, Rev. Syn. Het., p. 257.

affinis, Herr. Schäff, Nomencl Ent., 1835, p. 49: Kirschb., Rhyn, Wiesb., p. 210, sp. 39, p 269, 271: Fieber, Eur., Hem., p. 254: Walk, Cat. Het., vi, p 73.

pabulinus, Schrank, Verzeich. Ins. Ber., 1785, p 340 (*nec* Linn): Meyer, Rhyn. Schw, p. 48, t. 1, f. 5.

Hab. Europe [*Atk.*, Ardentes, Indre].

Samojedorum, J. Sahlberg, K. Vet.-Aka. Handl., xvi (4), 1878, p. 24.

Hab. N. W. Siberia.

Schmidtii, Fieber, Weit. Beit., i, 1836, p. 102, t. 2, f. 1.

bimaculatus, Herr. Schäff., Nomencl. Ent., 1835, p. 51; Wanz Ins., vi, p. 48, t. 196, f. 607: Reuter, Bih. Vet.-Aka. Handl, iii (i), 1875, p. 11: Glover, Rep Agric., Un. St. for 1875, p. 152, f. 32: Fieb., Eur. Hem. p. 252: Walk., Cat. Het., vi, p. 72.

tetraphlyctis, Garbigl., Bull. Soc. Ent. Ital., i, 1869, p. 184: Walk., Cat. Het., vi, p. 75.

Hab. France, Italy, Germany, Russia: N. America.

Sedillotii, Puton, Expl. Scient. Tunisie, 1886, p. 19.

Hab. Tunis.

semiopacus, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 267, t. 22, f. 9: Uhler, List, p. 18.

Hab. Mexico.

seticornis (*Cimex*), Fabr., Syst. Ent., 1775, p. 725; *id.*, Syst. Rhyng., p. 244.: Wolff, Ic. Cim., iv, 1804, p. 158, t. 16, f. 152: Burm., Handb. Ent., ii (i), p. 269: Costa, Cim. Regn. Neap. Cent. i, p. 52: Kolenati, Mel. Ent., ii, p. 114: Fieb., Eur. Hem., p. 257: Dougl. & Scott, Brit. Hem., p. 324: Walk., Cat. Het., vi, p. 74: Saund., Syn., p. 267: Reuter, Rev. Caps., p. 50; *id.*, Rev. Syn. Het., p. 258.

apicalis, Hahn, Wanz. Ins., i, 1831, p. 220, t. 35, f. 114.

bimaculatus, Sulzer, Kenntz. Ins., 1761, p. 28, t. 11, f. 76 (*nec.* Linn.).

exoletus, Gmelin, Syst. Nat., iv, 1788, p. 2165.

gothicus, var., Schrank, En. Ins. Austr., 1781, p. 205.

hirtus, Schrank, Fauna Boica, 1801, p. 81.

lateralis, Fallen, Hem. Suec., 1829, p. 88: Zett., Ins. Lapp., p. 273: Meyer, Rhyn. Schw., p. 95: F. Sahlb., Geoc. Fenn., p. 108: Kirschb., Rhyn. Wiesb., p. 218, sp. 54: Flor, Rhyn. Liv., i, p. 503.

tibialis, Wolff, Ic. Cim., iii, 1802, p. 117.

Hab. All Europe [*Atk.*, Lille, Hungary].

sexguttatus (*Cimex*), Fabr., Gen. Ins., 1776, p. 299: Fallen, Mon. Cim., p. 80; *id.*, Hem. Suec., p. 86: Herr. Schäff., Wanz. Ins., iii, p. 77, t. 97, f. 295: Meyer, Rhyn. Schw., p. 92; Kolenati, Mel. Ent., ii, p. 106: Flor, Rhyn. Liv., i, p. 494: Fieb., Eur. Hem., p. 252: Dougl. & Scott, Brit. Hem., p. 322: Walk., Cat. Het., vi, p. 72: Saund., Syn. p. 268: Reut., Rev. Caps., p. 47; Rev. Syn. Het., p. 253.

? *sexmaculatus*, Müller, Zool. Dan., 1776, p. 108.

? *termaculatus*, Goeze, Ent. Beytr., ii, 1778, p. 267.

? *ternatus*, Geoffr. in Fourcr., Ent. Par., 1785, p. 206.

Hab. All Europe [*Atk.*, France].

stigmosus (*Resthenia*), Berg, Hem. Arg., 1879, p. 123; Add. Emend., 1884, p. 72.

Hab. Buenos Ayres.

Stoliczkanus, Distant, Scient. Res. 2nd Yarkand Miss., 1879, p. 10, f. 7: Trans. Ent. S. Lond., 1879, p. 124.

Hab. Yarkand.

sulphureus, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 32.

Hab. Spain, Italy.

superbus, Uhler, Wheeler, Geog. Explor. Un. St. v, 1875, p. 838, t. 42, f. 3; Proc. Bost. Soc. N. H., 1878, p. 401; List, p. 18.

Hab. Arizona, California.

suturalis, Jakowleff, Trudi. Ent. Ross., xiii, 1882, p. 169.

Hab. Amuria.

tegularis, Puton, Rev. d' Ent., vii, 1888, p. 364.
Hab. Ghardaia, Laghouat, N. Africa.

tenebrosus, Reuter, Pet. Nouv. Ent., No. 136, 1875, p. 544.
Hab. Siberia.

ticinensis, Meyer, Rhyn. Schw., 1843, p. 100, t. 6, f. 1: Fieb., Eur. Hem., p. 256: Dougl. & Scott, Brit. Hem., p. 330; Saund., Syn., p. 269.
haemorrhous, Costa, Cim. Regn. Neap. Cent. iii, 1852.
Henkei, Jakowleff, Bull. Mosc. xlix (3), 1875, p. 165.
Hab. S. Europe, Astrakhan.

tinctus, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 367, t. 22, f. 8: Uhler, List, p. 18.
Hab. Mexico.

triannulatus, Stål, Stettin Ent. Zeit., xix, 1858, p. 183, ♀: Walk., Cat. Het., vi, p. 89.
Hab. Siberia, Irkutsk.

tricolor, Scott, Trans. Ent. S. Lond., 1880, p. 313.
Hab. Japan.

trivialis, Costa, Cim. Regn. Neap. Cent. iii, 1852: Fieber, Eur. Hem., p. 255: Walk., Cat. Het., vi, p. 73.
var. *limbicollis*, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 29.
Hab. Italy, Corsica, Greece, Turkey.

tucumanus, Berg, Hem. Arg. Add. Emend., 1884, p. 72.
Hab. Buenos Ayres.

vandalicus, Rossi, Faun. Etrusc., ii, 1790, p. 249: Fieb., Eur. Hem., p. 256: Walk. Cat. Het., vi, p. 74: Reut., Rev. Syn. Het., p. 257.
binotatus, var. *A.*, Blanch., Hist. Ins., 1840, p. 137.
bipunctatus Ab. a., Burm., Handb., ii (i), 1835, p. 270.
? *fraxini*, Fabr., Ent. Syst., iv, 1794, p. 172; Syst. Rhyng., p. 236: Herr. Schäff., Wanz. Ins., iii, p. 82, t. 99, f. 303: Kolenati, Mel. Ent., ii, p. 112.
taeniotoma, Costa, Cim. Regn. Neap. Cent., iii, 1852, p. 36, t. 7, f. 9.
var. *humuli*, Schummel in Scholtz Prodr. in Arb. u. Veränd. d. Schles. Ges., 1846, p. 126: Bäer., Cat., p. 14.
Hab. S. Europe [*Atk.*, Stazzano, Hungary].

ventralis, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 32.
Hab. France, Corsica, Italy, Germany [*Atk.*, Genoa].

venustus, Fieber, Eur. Hem., 1861, p. 254: Walker, Cat. Het., vi, p. 73.
Hab. Spain.

vicinus, Horvath, Pet. Nouv. Ent. ii, No. 142, 1876, p. 15: Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 175.
fulvomaculatus, var., Herr. Schäff., Wanz. Ins., vi, 1842, p. 35, t. 192, f. 593.
Hab. Hungary.

Genus **CALONDAS.**

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 268.

fasciatus, Distant, *l. c.*, p. 268, t. 26, f. 1.
Hab. Panama, Bugaba.

superbus, Distant, *l. c.*, p. 268, t. 23, f. 22.
Hab. Mexico, Guatemala, Cerro Zunil; Panama.

testaceus, Distant, *l. c.*, p. 269, t. 26, f. 2.
Hab. Costa Rica, Irazu.

Genus **PACHYPTERNA**.

Fieber, Crit. Gen. Phyt., 1859, 18; Eur. Hem., p. 63, 247; Walk., Cat. Het., vi, p. 68; Reut., Caps. Amer., p. 13; Bih. Vet.-Aka. Handl., iii (i), 1875, p. 13.

Fieberi (Schmidt), Fieb., Crit., 1859, sp. 1; Eur. Hem., p. 248.
Hab. Krainer Alps.

Genus **MEGACAELUM**.

Fieber, Crit. Gen., 1859, 21; Eur. Hem., 1861, p. 64, 249: Stål, Hem., Afric., iii, p. 18; Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 14; Rev. Caps., p. 56: Walk. Cat. Het., vi, p. 42.

apicale, Reuter, Ofvers. Finska Soc. Förh, xxv, 1884, p. 30.
Hab. Addah, W. Africa.

brevirostre, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 200; Fedtsch. Turk., p. 7.
Hab. Turkistan.

elegantulum, Jakowleff, Hor. Ent. Ross., xix, 1885, p. 124.
Hab. Turkistan, Achal Tekke.

elongatum, Lethierry, Ann. Mus. Civ. Gen., xvi, 1881, p. 293.
Hab. Abyssinia, Shoa.

filicorne (*Capsus*), Walker, Cat. Het., vi, 1873, p. 96; Uhler, List, p. 18.
Hab. E. Florida.

grossum, Uhler, Ent. Amer., iii, 1887, p. 70: List, p. 18.
Hab. N. America.

hottentotum (*Phytocoris*), Stål, Ofvers. Vet.-Aka. Förh., 1855, p. 36; Hem. Afric., iii, 1865, p. 18: Walk., Cat. Het., vi, p. 114.
Hab. Caffraria.

infusum (*Capsus*), Herr. Schäff., Wanz. Ins., iv, 1839, p. 30, t. 120, f. 381: Kirschbaum, Rhyn. Wiesb., p. 215, sp. 49: Thomson, Opusc. Ent., iv, 1871, p. 421: Fieber, Eur. Hem., p. 249: Dougl. & Scott, Brit. Hem., p. 331?: Walk., Cat. Het., vi, p. 70: Saund., Syn., p. 270: Reuter, Rev. Caps., p. 56; *id.*, Berlin. Ent. Zeits., xxv, 1881, p. 176.
Lethierryi, Fieber, Verh. Zool. Bot. Ges. Wien., xx, 1870, p. 260: Walk., Cat. Het., vi, p. 75.
rubidum, Garbigl., Bull. Soc. Ent. Ital., i, 1869, p. 185: Walker, Cat. Het., vi, p. 75.
validicorne, Bohem., Nya Svenska Hem., 1852, p. 14, sp. 19.

var. *ruficeps*, Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 17.
Hab. Middle & S. Europe [*Atk.*, Stazzano, Austria].

lustratum, F. B. White, Proc. Zool. S. Lond., 1878, p. 466.
Hab. St. Helena.

mundum, Uhler, Ent. Am., iii, 1887, p. 71.
Hab. N. America.

pellucens, Puton, MT. Schw. Ent. Ges., vi, 1881, p. 125.
Hab. Syria, Jaffa.

pulchricorne, Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 18.
Hab. Spain.

pusillum, Uhler, Ent. Am., iii, 1887, p. 71.
Hab. N. America.

? **signatum**, Distant, Biol. Centr. Amer. Rhyn., 1883, p. 269, t. 23, f. 11: Uhler, List, p. 18.
Hab. Mexico.

strigipes, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 31.
Hab. Greece.

Genus **VOLUMNUS.**

Stål, Hem. Afric., iii, 1865, p. 19.

obscuricornis (*Capsus*), Stål, Ofvers. K. V.-A., Förh., 1855, p. 36; Hem. Afric., iii, p. 19: Walk., Cat. Het., vi, p. 115.
Hab. Caffraria.

straminicolor (*Capsus*), Stål, Ofvers. K. V.-A., Förh., 1855, p. 36; Hem. Afric., iii, p. 19: Walk., Cat. Het., vi, p. 115.
Hab. Caffraria.

Genus **MELINNA.**

Uhler, Ent. Am., iii, 1887, p. 68.

fasciata (*Megacaelum*), Uhler, Bull. Un. St. Surv., iii, 1877, p. 421; List, p. 18; (*Melinna*) Ent. Am., iii, 1887, p. 68.
Hab. Texas, Missouri.

modesta, Uhler, Ent. Am., iii, 1887, p. 69.
Hab. N. America.

pumila, Uhler, *l. c.*, p. 69.
Hab. N. America.

Genus **PROBA.**

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 269.

gracilis, Distant, *l. c.*, p. 269, t. 26, f. 3, var. *b.*; t. 23, f. 25.
Hab. Guatemala, Cerro Zunil.

Genus **PARAPROBA.**

Distant, Biol. Centr. Amer. Rhyn., 1883, p. 270.

fasciata, Distant, *l. c.*, p. 270, t. 26, f. 4.
Hab. Guatemala, San Geronimo, Cerro Zunil.

pallescens, Distant, *l. c.*, p. 270, t. 26, f. 5.
Hab. Guatemala, Cerro Zunil.

Genus **NEOPROBA.**

Distant, Biol. Centr. Amer., Rhyn., 1883, p. 270.

rubescens, Distant, *l. c.*, p. 270, t. 26, f. 6.
Hab. Guatemala, Cerro Zunil.

varians, Distant, *l. c.*, p. 271, t. 26, f. 7.
Hab. Guatemala, San Geronimo.

Genus **PANDANUS.**

Distant, Biol. Centr. Amer., Rhyn , 1883, p. 271.

praeclara, Distant, *l. c.*, p. 271, t. 26, f. 8.
Hab. Guatemala, San Geronimo.

Genus **PYCNOPTERNA.**

Fieber, Crit. Gen., 1859, 30; Eur. Hem., p. 66, 262: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 13, pt.: Walk., Cat. Het., vi, 1873, p. 76.

amoena, Provancher, Faune Can. Hem., 1887, p. 114.
Hab. Canada.

blanda, Puton, MT. Schw. Ent. Ges., vi, 1881, p. 124.
Hab. Syria.

persica, Reuter, Pet. Nouv. Ent., ii, no. 140, 1876, p. 5.
Hab. Persia, Astrabad.

pulchra, Herr. Schäff., Wanz. Ins., iii, 1835, p. 75, t. 97, f. 293: Fieb., Eur. Hem., p. 263: Walk., Cat. Het., vi, p. 76.
Hab. Germany, France.

striata (*Cimex*), Linn., Syst. Nat., (*ed.* 10), 1758, p. 449: Scopoli, Ent. Carn., p. 133: De Geer, Mém., iii, p. 290, t. 15, f. 13-15: Schrank, Enum. Ins. Austr., p. 284; Fauna Boica, ii, p. 90: Fabr., Syst. Rhyng., p. 255: Panzer, Faun. Germ , 93, f. 22: Wolff, Ic. Cim., i, p. 37, t. 4, f. 37, *a*, *b*: Fallen, Mon. Cim., p 78; *id.*, Hem., Suec., p. 83: Zett., Faun. Lapp., p. 488: Hahn, Wanz. Ins., ii, p. 134, t. 71, f. 219: Burm., Handb. Ent., ii (i), p. 267: Zett., Ins. Lapp., p. 272: Meyer, Rhyn. Schw., p. 94: F. Sahlb., Mon. Geoc., p. 97: Kirschb., Rhyn. Wiesb., p. 209, sp. 37: Costa, Cim. Regn. Neap., Cent. iii, p. 40: Flor, Rhyn. Liv., i, p. 490: Kolenati, Mel. Ent., ii, p. 103: Fieber (*Pycnopterna*), Eur. Hem., p. 263: Dougl. & Scott, Brit. Hem. p. 320: Walk., Cat. Het., vi, p. 76: Saund., Syn., p. 268; Reuter, Rev. Caps., p. 55; *id.* Rev. Syn. Het., p. 264.

euonomyi, Gmelin, Syst. Nat., iv, 1788, p. 2183.
scriptus, Dvig., Pam. Faun. Mosq.: 1802, p. 126.
Hab. Nearly all Europe [*Atk.*, Finme, Hungary].

suturalis, Jakowleff, Rev. Mens. d' Ent., i, 1883, p. 110.
Hab. Caucasus.

Genus **PROBOSCIDOCORIS.**

Reuter, Ofvers. Finska Soc. Förh., xxv, 1884, p. 30.

fuliginosus, Reuter, *l. c.*, p. 36.
Hab. Addah, W. Africa.

Genus **ODONTOPLATYS.**

Fieber, Crit. Gen., 1859, 33; Eur. Hem., 1861, p. 76, 322, 395.

bidentulus, Herr. Schäff., Wanz. Ins., vi, 1842, p. 96, t. 212, f. 668: Fieb., Eur. Hem., p. 322: Walk., Cat. Het., vi, p. 143.
Hab. S. Europe [*Atk.*, Wallachia].

Genus **EPIMECIS.**

Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 30; Zool. Jahr., 1879, p. 508.

cylloco[illegible]ides, Reuter, *l. c.*, p. 31.
Hab. S. Russia, Tauria.

Genus **GRYPOCORIS.**

Douglas & Scott, Ent. Mon. Mag., v, 1868, p. 116: Walker, Cat. Het., vi, p. 70.

Fieberi, Douglas & Scott, *l. c. supra*, p. 117: Walk., *l. c. supra*.
Hab. Syria.

Genus **BRACHYCOLEUS.**

Fieber, Crit., 1859, 23, t. 6, f. 5; Eur. Hem., p. 56, 250: Rent., Bih. Vet.-Aka., Handl., iii (i), 1875, p. 15: Walk., Cat. Het., vi, p. 71.

bimaculatus, Rambur, Faun. Andal., 1842, p. 160: Fieb., Eur. Hem., p. 252: Walk. Cat. Het., vi, p. 71.
cruentatus, Perris, Ann. Soc. Linn. Lyon, iv, 1857, p. 167.
Hab. France, Spain, Italy [*Atk.*, Amiens, France].

lineellus, Jakowleff, Rev. Mens. d' Ent., 1884, p. 122.
Hab Persia, Ordubat.

scriptus (*Lygaeus*), Fabr., Syst. Rhyng., 1803, p. 234 (*nec* Ent. Syst., iv, p. 182): Herr. Schäff., Wanz. Ins., iii, p. 76, t. 97, f. 294: Fieber (*Brachycoleus*), Crit. 17; Eur. Hem., p. 251: Kirschb., Rhyn. Wiesb., p. 219, sp. 57, p. 343: Walk., Cat. Het., vi, p. 71: Reuter, Rev. Syn. Het., p. 266; Fedtsch. Turk., p. 7.
var. *decolor*, Reuter, Fedtsch. Turk., 1887, p. 7.
Hab. N. W. Siberia [*Atk.*, Hungary].

sexvittatus, Reuter, Deutsche Ent. Zeits., xxi, 1877, p. 32.
Hab. Spain, Italy, Algeria.

Steinii, Reuter, *l. c.* p. 32.
scriptus, Kolenati, Mel. Ent., ii, 1845, p. 115 (*nec* Fabr.).
Hab. Greece, Italy, Hungary, Russia.

Genus **ONCOGNATHUS**.

Fieber, Crit. Gen. Phyt., 1859, 15; Eur. Hem., p. 63, 246: Reuter, Rev. Caps. p. 56.
Stenotus, Jakowleff, Bull. Mosc., lii (2), 1877, p. 288.

binotatus (*Lygaeus*), Fabr., Ent. Syst., iv, 1794, p. 172; *id.*, Syst. Rhyng., p. 235: Fallen, Mon. Cim., p. 75; *id.*, Hem. Suec., p. 78: Herr. Schäff., Wanz. Ins., iii, p. 77, t. 98, f. 296: Meyer, Rhyn. Schw., p. 92: Costa, Cim. Regn. Neap., Cent., iii, p. 261: Kirschb., Rhyn. Wiesb., p 291, sp. 56: Flor, Rhyn. Liv., i, p. 499: Fieber, Crit., 1859, 15; *id.*, Eur. Hem., p. 247: Dougl. & Scott, Brit. Hem., p. 323: Thomson, Opusc. Ent., iv, p. 422: Walk., Cat. Het., vi, p. 68: Saund., Syn. p. 266: Jakowleff (*Stenotus*), Bull. Mosc., lii (2), 1877, p. 288, ♂: Lethierry, Ann. Mus. Civ. Gen., xviii, 1883, p. 749: Reuter, Rev. Caps., p. 55: Berlin. Ent. Zeits., xxix, 1885, p. 85; Rev. Syn. Het., p. 266: Uhler, List, p. 18.
Paykulli, Turton, Syst. Nat., ii, 1806, p. 609.
sareptanus, Jakowleff, Bull. Mosc., lii (2), 1877, p. 289, ♂.
Hab. All Europe; Abyssinia, Shoa, N. America [*Atk.*, Lille, Hungary].

Genus **EURYCYRTUS**.

Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 33; Zool. Jahr., 1879, p. 508.
Bellevoyei, Reuter, *l. c.*, p. 34.
Hab. Egypt.

Genus **DICHROOSCYTUS**.

Fieber, Crit. Gen., 1859, g. 36: Eur. Hem., p. 67, 269.
Dicrooscytus, Reuter, Bih. Vet.-Aka., Handl., iii (i), 1875, p. 15; Rev. Caps., p. 58.

intermedius, Reuter, C. R. Ent. Belg., 1885, p. xlii.
Hab. Germany, Roumania.

rufipennis (*Lygaeus*), Fallen, Mon. Cim. 1807, p. 84; *id.*, Hem. Suec., p. 92: Zett. Ins. Lapp., p. 274: Herr. Schäff. (*Capsus*), Wanz. Ins., vi, 1842, p. 50, t. 197, f. 610: F. Sahlb., Geoc. Fenn., p. 105; Kirschb., Rhyn. Wiesb., p. 215, sp. 48: Fieber (*Dichrooscytus*), Crit., 1859, 21; *id.*, Eur. Hem., p. 270: Flor, Rhyn. Liv., i, p. 489: Dougl. & Scott, Brit. Hem., p. 478: Walk., Cat. Het., vi, p. 80: Saund., Syn., p. 237: Thomson, Opusc. Ent., iv, p. 422: Reuter, Rev. Caps., p. 58; *id.*, Rev. Syn. Het., p. 267.
? *apparitor*, Vill., Ent. Auct., 1789, p. 535.
Hab. Nearly all Europe [*Atk.*, Vosges, France].

valesianus (Meyer), Fieber, Eur. Hem., 1861, p. 270: Walk., Cat. Het., vi, p. 80.
Hab. France, Germany, Greece, Tunis.

Genus **PLESIOCORIS**.

Fieber, Eur. Hem., 1861, p. 272: Walk., Cat. Het., vi, p. 81; Reuter, Bih. Vet.-Aka., Handl., iii (i), 1875, p. 15; *id.*, Rev. Caps., p. 59.

Tylonotus, Fieber, Crit. Phyt., 1859, 41; *id.*, Eur. Hem., p. 68.

rugicollis (*Phytocoris*), Fallen, Hem. Succ, 1829, p. 79: Herr. Schäff., Wanz. Ins., iii, p. 80, t. 98, f. 299: F. Sahlb., Geoc. Fenn., p. 102: Kirschb., Rhyn. Wiesb., p. 342, sp. 55a: Flor, Rhyn. Liv, i, p. 537: Thoms., Op. Ent., iv, p. 422: Fieber (*Plesiocoris*), Eur. Hem., p. 272: Walk., Cat. Het., vi, p. 81: Saund., Syn., p. 274; Reuter, Rev. Caps., p. 59.

marginatus, Zett., Ins. Lapp., 1840, p. 272.

Hab. Scandinavia, Germany, Switzerland.

Genus **LYGUS**.

Hahn, Wanz. Ins., i, 1831, p. 147: Fieber, Eur. Hem., p. 68, 272: Walker, Cat. Het., vi, p. 81: Reuter, Rev. Caps., p. 61.

Lygocoris, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 16; Rev. Caps., p. 61.

Orthops, Fieber, Wien. Ent. Monats., ii, 1858, p. 311; Eur. Hem., p. 68, 278: Dougl. & Scott, Brit. Hem., p. 451: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 18; Rev. Caps., p. 73.

adustus, Jakowleff, Bull. Mosc., li (3), 1876, p. 117.

Hab. Siberia, Ussuri.

apicalis, Fieber, Eur. Hem, 1861, p. 275: Walk., Cat. Het., vi, p. 83.

Putoni, Meyer Dur, MT. Schw. Ent. Ges, iii, 1870, p. 207: Walk., Cat. Het., vi, p. 84.

Hab. Spain, S. France.

annexus, Uhler, Hayden Mont. Surv., 1872, p. 413; Wheeler, Rep. Geogr. Expl. Un. St., V. Zool., 1875, p. 839, t. 42, f. 10; Bull. Un. St. Surv., ii, 1876, p. 318; *id.*, iii, 1877, p. 415; List, p. 18.

Hab. Colorado to Minnesota.

approximatus, Stål, Stettin Ent. Zeit., xix, 1858, p. 185, ♀: Walk., Cat. Het., vi, p. 89: Uhler, List, p. 18.

Hab. Sitka.

atomarius (*Capsus*), Meyer, Rhyn. Schw., 1843, p. 73, t. 4, f. 3: Fieber (*Hadrodema*), Eur. Hem., p. 277, 392: Walk., Cat. Het., vi, p. 82: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 16.

Hab. Spain, France, Switzerland.

aurantiacus, Snell. v. Voll., Ent. Tijds., xix, 1876, p. 104.

Hab. Holland.

basicornis (*Deraeocoris*), Stål, Rio. Jan. Hem., i, 1858, p. 52: Walk., Cat. Het., vi, p. 104.

Hab. Rio Janeiro.

Belfragii, Reuter, Caps. Amer., 1875, p. 71: Uhler, List, p. 18.

Hab. New York.

bengalicus, Reuter, Ent. Tidskr., v, 1884, p. 195.
Hab. Bengal.

bicinctus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 100: Uhler, List, p. 21.
Hab. Mexico, Oajaca.

Bolivarii, Chicote, Anal. Soc. Esp. N. H., 1881, p. 2.
Hab. Spain.

bonariensis (*Capsus*), Stål, Freg. Eug. Resa, 1859, p. 256: Walk., Cat. Het., vi, p. 105; Berg, Hem. Arg., 1879, p. 121; *id.*, Add. Emend., 1884, p. 75.
Hab. Buenos Ayres.

? **brachycnemis**, Reuter, C. R. Ent. Belg., 1885, p. xliii.
Hab. Algeria.

brunneus, Provancher, Nat. Can., iv, 1872, p. 104: Uhler, List, p. 18.
Hab. Canada.

caligatus (*Deraeocoris*), Stål, Rio. Jan. Hem., i, 1858, p. 50: Walk., Cat. Het., vi, p. 103.
Hab. Rio Janeiro.

cincticornis (*Deraeocoris*), Stål, *l. c.*, p. 52: Walk., Cat. Het., vi, p. 105.
Hab. Rio Janeiro.

clarus (*Deraeocoris*), Stål, *l. c.*, p. 53: Walk., *l. c.*, p. 105.
Hab. Rio Janeiro.

cribratus (*Deraeocoris*), Stål, *l. c.*, p. 50: Walk., *l. c.*, p. 104.
Hab. Rio Janeiro.

cribricollis (*Deraeocoris*), Stål, *l. c.*, p. 48: Walk., *l. c.*, p. 103.
Hab. Rio Janeiro.

cribrosus (*Deraeocoris*), Stål, *l. c.*, p. 51: Walk., *l. c.*, p. 104.
Hab. Rio Janeiro.

campestris (*Cimex*), Linn., Syst. Nat., (*ed.* 10), 1758, p. 448 (*nec.* Auct.): Geoffroy in Fourcr., Ent. Par., p. 205: Rossi, Faun. Etrusc., p. 247: Fabr., Ent. Syst., iv, p. 171, ?; *id.*, Syst. Rhyng. p. 234 (*nec* Fallen): Reuter, Rev. Syn. Het., p. 271.
lucidus, Kirschb., Rhyn. Wiesb., 1855, p. 228, sp. 71, p. 291.
pastinacae, Fallen, Mon. Cim., 1807, p. 86; *id.*, Hem. Succ., p. 94: F. Sahlb., Geoc. Fenn., p. 113: Flor, Rhyn. Liv., i, p. 523: Fieb., Eur. Hem., p. 279: Dougl. & Scott, Brit. Hem., p. 455: Walk., Cat. Het., vi, p. 85: Saund., Syn., p. 276.
transversalis, Fabr., Mant. Ins., 1787, p. 304: Reuter, Rev. Caps., p. 75.
transversus, Thomson, Opusc. Ent. iv, 1871, p. 427.
Hab. All Europe [*Atk.*, Lille].

Carolinae, Reuter, Caps. Amer., 1875, p. 71: Uhler, List, p. 18.
Hab. Carolina, S. United States.

caucasicus, Jakowleff, Trudi. Ent. Ross., xii, 1880, p. 125.
Hab. Caucasus.

cervinus (*Capsus*), Herr. Schäff., Wanz., Ins., vi, 1842, p. 57, t. 199, f. 617: Meyer, Rhyn., Schw. 1843, p. 103: Kirschb., Rhyn. Wiesb., p. 222, sp. 60: Fieber, Eur.

Hem., p. 279: Dougl. & Scott, Brit. Hem., p. 454: Saund., Syn., p. 277: Walk., Cat. Het., vi, p. 86: Reuter, Caps. Syn., p. 12; *id.*, Rev. Caps. p. 64.

lucorum, Bohem., Nya Svenska Hem., 1852, p. 67: Flor, Rhyn. Liv, i, p. 524 (*nec* Thoms.): Walk., Cat. Het., vi, p. 83.

Hab. Scandinavia, Britain, Middle Europe.

cetratus, Berg, Hem. Arg., Add. Emend., 1884, p. 74.

Hab. Uruguay.

Championii, Distant, Biol. Centr. Amer. Rhyn., 1884, p. 273.

Hab. Guatemala, Quezaltenango.

? chlorionis (*Capsus*), Say; Uhler, List, p. 18.

Hab. United States.

chloris, Fieber, Crit. Phyt., 1859, sp. 8; Eur. Hem., p. 276: Walk., Cat. Het. vi., p. 84.

Hab. Germany, Hungary, Russia.

conspurcatus, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 18: Reut. Ferr., Ann. Mus. Civ. Gen., (2 s.) i, 1884, p. 478, ♀.

Hab. Algeria, Biskra.

contaminatus (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 97: Zett., Ins. Lapp., p. 272: F. Sahlb., Geoc. Fenn., p. 102: Fieber (*Lygus*), Eur. Hem., p. 274: Walk., Cat. Het., vi, p. 83: Saund., Syn., p. 275: Reut., Caps. Syn., p. 9; Rev. Caps., p. 65: Uhler, List, p. 18.

viridis, Flor, Rhyn. Livl., i, 1860, p. 531, pt.

sulcifrons, Douglas & Scott, Brit. Hem., 1865, p. 459 (*nec* Kirschb., excl. syn.).

Hab. All Europe, N. America [*Atk.*, Lille].

convexicollis, Reuter, Caps. Amer., 1875, p. 72: Uhler, List, p. 18.

Hab. California.

cristatus, Distant, Biol. Centr. Amer. Rhyn., 1884, p. 274, t. 23, f. 10: Uhler, List, p. 18.

Hab. Mexico; Guatemala, San Geronimo; Panama.

Dahlbomii (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 52: Walk., Cat. Het., vi, p. 104.

Hab. Rio Janeiro.

dilatatus (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 52: Walk., Cat. Het., vi, p. 104.

Hab. Rio Janeiro.

dislocatus (*Capsus*), Say, Hem. Het., New Harm. Ind., 1831, 21, 6; Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 406.

lugubris, Say, Ms. ♀; *trifidus*, Say Ms. ♂.

Hab. E. United States, Canada.

distinguendus, Reuter, Pet. Nouv. Ent. No. 136, 1875, p. 541.

Hab. E. Siberia.

dorsalis, Provancher, Nat. Can., iv, 1872, p. 104: Uhler, List, p. 18.

Hab. Canada.

elegantulus, Jakowleff, Trudi. Ent. Ross. xii, 1880, p. 123.
Hab. Caucasus.

fasciatus, Reuter, Caps. Amer., 1875, p. 72: Uhler, List, p. 18.
Hab. S. Carolina.

fatuus, Lethierry, Ann. Mus. Civ. Gen., xviii, 1883, p. 749.
Hab. Abyssinia, Shoa.

flavovirens (Meyer), Fieber, Eur. Hem., 1861, p. 276: Reuter, Rev. Caps., p. 62, Walk., Cat. Het., vi, p. 84.
Hab. Scandinavia, Germany, Switzerland, France, Italy.

Forelii (Meyer), Fieber, Weit. Beitr., 1831, sp. 9; Eur. Hem., p. 279: Walker, Cat., Het., vi, p. 85.

fratruelis, Berg, Hem. Arg., 1879, p. 289.
Hab. Buenos Ayres.

fraudans (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 52: Walk., Cat. Het., vi, p. 104.
Hab. Rio Janeiro.

fraudulentus (*Deraeocoris*), Stål, *l. c.*, p. 49: Walker, Cat. Het., vi, p. 103: Berg Hem. Arg., 1879, p. 120; *id.*, Add. Emend., 1884, p. 73.
Hab. Buenos Ayres.

fuscomaculatus (*Deraeocoris*), Stål, *l. c. supra*, p. 49: Walk., Cat. Het., vi, p. 103.
Hab. Rio Janeiro.

fuscosus, Provancher, Nat. Can., iv, 1872, p. 105: Uhler, List, p. 18.
Hab. Canada.

innotatus, Reuter, Notis. Skpts Pro. F. Fl. Fenn., 1871, p. 322; *id.*, Bih. Vet.-Aka., Handl., iii (i), p. 17; *id.*, Rev. Caps., p. 65.
Hab. Siberia.

insignis (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 35: Walk., Cat. Het., vi, p. 105.
Hab. Rio Janeiro.

inspersus, Distant, Biol. Centr. Amer. Rhyn., 1884, p. 274, t. 23, f. 8: Uhler, List p. 18.
Hab. Mexico.

invitus (*Capsus*), Say, Het. New Harm., 1831 No. 21: Uhler, Proc. Bost. Soc., xix, 1878, p. 407; List, p. 18: Forbes, Rep. Ill., xxii, 1884, p. 110, t. 12, f. 1.
Hab. E. United States.

Kalmii (*Cimex*), Linn., Syst. Nat., (*ed.* 10), 1758, p. 448: Zett., Fauna Lapp., p. 491; *id.*, Ins. Lapp., p. 274: Meyer, Rhyn. Schw., p. 105: Kolenati, Mel. Ent, ii, p. 122: F. Sahlb., Geoc. Fenn., p. 112: Costa, Cim. Regn. Neap., Cent., iii, p. 38: Kirschb., Rhyn. Wiesb., p. 273, sp, 68: Flor, Rhyn. Liv., i, p. 521: Fieber, Eur. Hem., p. 280: Dougl. & Scott, Brit. Hem., p. 452: Walk., Cat. Het., vi, p. 86: Saund., Syn., p. 276: Reuter, Rev. Caps., p. 74; *id.*, Rev. Syn. Het., p. 272.
bifasciatus, Var. B. Schrank, En. Ins., Austr., 1781, p. 281.
? *Daldorfii*, Gmelin, Syst. Nat., iv, 1788, p. 2178.

? *gramineus*, Fabr., Ent. Syst. Supp., 1798, p. 542; *id.*, Syst. Rhyng., p. 243: Latreille, Hist. Nat., xii, 1804, p. 231.
pauperatus, Herr. Schäff., Wanz., Ins., iv, 1839, p. 31, t. 120, f. 382.
pratensis, var. 1, Scopoli, Ent. Carn., 1763, p. 135.
? *ribis*, Schrank, Fauna Boica, 1801, p. 91.
? *varius*, Fabr., Mant. Ins., 1787, p. 306: *id.*, Syst. Rhyng., p. 247.
var. *flavovarius*, Fabr., Ent. Syst., iv, 1794, p. 178; *id.*, Syst. Rhyng., p. 243: Latreille, Hist. Nat., xii, 1804, p. 230: Fallen, Mon. Cim., p. 86; *id.*, Hem. Suec., p. 93: Hahn, Wanz. Ins., i, p. 211, t. 34, f. 109: Burm., Handb. Ent., ii (i), p. 272: Fieb., Eur. Hem., p. 280: Stål, Hem. Fabr., i, p. 88: Walk., Cat. Het., vi, p. 86.
basalis, Costa, Cim. Regn. Neap., Cent. iii, 1852, p. 38.
Hab. All Europe, Turkistan [*Atk.*, Turin, Lille, Hungary].

lenticulosus (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 51: Walk., Cat. Het., vi, p. 104.
Hab. Rio Janeiro.

limbatus (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 92: Hahn (*Lygus*), Wanz. Ins., i, 1831, p. 152, t. 23, f. 77: Meyer (*Capsus*), Rhyn. Schw., p. 47: F. Sahlb., Geoc. Fenn., p. 106: Kirschb., Rhyn. Wiesb., p. 344, sp. 66*a*: Flor, Rhyn. Liv., i, p. 528, pt.; ii, p. 609?: Thomson, Opusc. Ent., iv, 1871, p. 424: Fieber, Eur. Hem., p. 274: Walker, Cat. Het., vi, p. 82: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 17; *id.*, Rev. Caps. p. 67.
Hab. Nearly all Europe.

lucorum (*Capsus*), Meyer, Rhyn. Schw., 1843, p. 46, t. 6, f. 2: Fieb., Eur. Hem., p. 275: Dougl. & Scott, Brit. Hem., p. 458: Walker, Cat. Het., vi, p. 83: Saund., Syn., p. 275: Reuter, Caps. Syn., p. 11, pt; *id*, Rev. Caps., p. 68: Uhler List, p. 18.
bipunctatus, Sahlb., *teste* Paton, Cat., 1886, p. 50.
contaminatus, Kirschb., Rhyn. Wiesb., 1855, p. 344, sp. 66: Flor, Rhyn. Liv., ii, p. 612: Thomson, Opusc. Ent., vi, p. 425 (*nec* Fallen).
? *declivis*, Scholtz. Arb. u. Veränd. d. Schles. Ges., 1846, p. 69.
pabulinus, F. Sahlb., Mon. Geoc., 1848, p. 101 (*nec* Linn.).
var. *nigronasutus*, Reuter, Rev. Caps., p. 69 (*nec* Stål).
Hab. N. & Middle Europe, N. America [*Atk.*, Lille].

luctuosus (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 50: Walk., Cat. Het., vi, p. 104.
Hab. Rio Janeiro.

monachus, Uhler, Can. Ent., xviii, 1886, p. 208: Bull. Un. St. Dep. Agric., xiii, 1887, p. 63.
Hab. Canada.

montanus, Schill., Arb. u. Veränd d. Schles. Ges. 1836: Scholtz *l. c.*, 1846, p. 33: Fieb., Eur. Hem., p. 279: Walk., Cat. Het., vi, p. 85: Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 176.
cervinus, Thoms., Op. Ent., iv, 1871, p. 426 (*nec* Herr. Schäff.).
fasciatus, Meyer, Stettin. Ent. Zeit., 1841, p. 86; Rhyn. Schw., p. 101, t. 5, f. 5: ? Herr. Schäff, Wanz. Ins., vi, 1842, p. 99, t. 212, f. 671.
Hab. Germany, Switzerland, France, Spain, Scandinavia.

mutans, Stål, Stettin. Ent. Zeit., xix, 1858, p. 186: J. Sahlb., Vet. Aka., Handl., xvi (4), 1878, p. 26: Walk., Cat. Het., vi, p. 89.
Hab. Siberia, Irkutsk.

nigronasutus, Stål, Stettin. Ent. Zeit, xix, 1858, p. 184, ♀: Walk., Cat. Het., vi, p. 84.
Hab. Siberia, Irkutsk.

nobilitatus (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 48: Walk., Cat. Het., vi, p. 103: Berg, Hem. Arg., 1879, p 122.
Hab. Rio Janeiro.

obtusus, Reuter, Ent. Tijds., v, 1884, p. 196.
Hab. Bengal.

pabulinus (*Cimex*), Linn., Faun. Suec., 1761, p. 253: Fabr., Gen. Ins., 1776, p. 301; *id.*, Syst. Rhyng., p. 254: Fallen, Mon. Cim., p. 75; *id*, Hem. Suec., p. 79: Zett., Faun. Lapp., p. 468; *id.*, Ins. Lapp., p. 272: Hahn, Wanz. Ins., i, p. 148, t. 23, f. 74: F. Sahlb., Geoc. Fenn., p. 101: Costa, Cim. Regn. Neap., Cent. iii, p. 260: Kirschb., Rhyn. Wiesb., p. 217, sp. 52: Flor, Rhyn. Liv., i, p. 507: Fieber, Eur. Hem., p. 276: Dougl. & Scott, Brit. Hem., p. 457: Walk., Cat. Het., vi, p. 83: Saund., Syn., p. 275: Reuter, Rev. Caps., p. 61; *id.*, Rev. Syn. Het., p. 267: Uhler, List, p. 18.
? aerugineus, Geoffr. in Fourcr., Ent. Par., 1785, p. 208, pt.
affinis, Meyer, Rhyn. Schw., 1843, p. 48, t. 1, f. 5 (*nec* Herr. Schäff.).
hortorum, Tigny, Hist. Nat. Ins., iv, 1813, p. 287.
nigrophthalmus, Retzius, De Geer, Gen. & Spec., 1783, p. 87.
Hab. All Europe: N. America [*Atk.*, Lille].

pachycnemis, Reuter, Ofvers. Finska Soc. Förh, xxi, 1879, p. 200: Fedtsch. Turk., p. 8.
Hab. Turkistan.

pellucidus, Fieber, Crit., 1859, 10; Eur. Hem., p. 279: Walk., Cat. Het., vi, p. 86: Reut., Rev. Caps., p. 75.
Hab. Switzerland, France, Scandinavia.

pilosulus (*Orthops*), Jakowleff, Trudi Russki Ent., x, 1876-77, p. 93.
Hab. N. Persia.

prasinus, Reuter, Caps. Amer., 1875, 9, p. 72: Uhler, List, p. 18.
Hab. Texas.

pratensis (*Cimex*), Linn, Syst. Nat, (*ed.* 10), 1758, p. 448: Fabr., Syst. Ent., 1775, p. 724: Geoffroy in Fourcr., Ent. Paris., p. 205: Rossi, Faun. Etrusc., ii, p. 246: Fallen, Mon. Cim., p. 83; *id.*, Hem. Suec., p. 90: Hahn, Wanz. Ins., i, p. 217, t. 35, f. 112: Zett., Faun. Lapp., p. 489; *id.*, Ins. Lapp., p. 273: Burm., Handb. Ent., ii (i), p. 272: Meyer, Rhyn. Schw., p. 99: Kolenati, Mel. Ent., ii, p. 119: F. Sahlb., Geoc. Fenn., p. 111: Kirschb., Rhyn. Wiesb., p. 224, sp. 64, p. 271: Flor, Rhyn. Liv., i, p. 517: Fieber, Eur. Hem., p. 273: Dougl. & Scott, Brit. Hem., p. 464: Walk., Cat. Het., vi, p. 82: Saund., Syn., p. 276: Reuter, Caps. Syn., p. 8; *id.*, Rev. Caps., p. 70-72, pt; Caps. Amer., p. 72; Rev. Syn. Het., p. 269: Distant, Biol. Centr. Amer. Rhyn., p. 272, t. 23, f. 4, 6, 7, 16: Uhler, List, p. 18.

artemisiae, Schill., Ber. Vat. Ges. Schles., 1836, p. 83.
diffusus, Uhler, Hayden Mont. Surv., 1872, p. 413.
lineolaris, Pal. Beauv., Ins. Afric. Amer., 1805-21, p. 187, t. 11, f. 7: Uhler, Hayden Surv. Mont., 1872, p. 413; Bull. Un. St. Surv., ii, 1876, p 318; iii, 1877, p. 415; Proc. Bost. Soc. N. H., xix, 1878, p. 407: Walker, Cat. Het., vi, p. 91, See also Forbes, Rep. Illin., xxii, p. 115, t. 11-13; *id.* xiv, *l. c.*, p. 77: Glover, Rep. Agric, Un. St. for 1875, p. 126, f. 34; Rep. Ent. Un. St. for 1884, p. 312, 391, t. 4, f. 3, 4 *a-d*.
oblineatus, Say, Het. New Harm. Ind., 1831, 21, 7: Walsh, Proc. Bost. Soc. N. H., ix, p. 313 [*Atk.* E. Florida].
redimitus, Uhler, Hayden, Mont. Surv., 1872, p. 413.
? *rubecula*, Göeze, Ent. Beytr, ii, 1778, p. 279.
umbellatarum, Scop., Ent. Carn., 1763, p. 133: Panzer, Faun. Germ., 93, 1805, f. 19.
? *viridulus*, Panzer, Schäff. Icones, 1804, p. 120.
var. *alpinus*, Kolenati, Mel. Ent., ii, 1845, p. 120.
var. *campestris*, Fallen, Mon. Cim., 1807, p. 83; *id.*, Hem. Succ., p. 91: Zett., Faun. Lapp., p. 489; *id.*, Ins. Lapp., p. 273: Hahn, Wanz. Ins., i, p. 218, t. 35, f. 113: Kolenati, Mel. Ent., ii, p. 118: F. Sahlb., Geoc. Fenn., p. 111: Kirschb., Rhyn. Wiesb., p. 225, sp. 65: Fieb., Eur. Hem., p. 273: Dougl. & Scott, Brit. Hem., p. 463: Reuter, Rev. Caps., p. 72, pt.
var. *gemellatus*, Herr. Schäff, Wanz. Ins., iii, 1835, p. 81, t. 99, f. 301: Kirschb., Rhyn. Wiesb., p. 224 sp. 63, p. 272: Reuter, Rev. Caps., p. 71.
adspersus, Schill. Ber. Vat. Ges. Schles., 1836, p. 83.
var. *punctatus*, Zett., Ins. Lapp, 1840, p. 273: F. Sahlb., Mon. Geoc., 1848, p. 110: Kolenati, Mel. Ent., ii, p. 118; Reuter, Rev. Caps., p. 71.
Hab. All Europe, Turkistan, N. Asia, Canada, United States, Mexico, Guatemala [*Atk.*, Genoa, Lille, Hungary, United States, E. Florida].

purgatus (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 51: Walk., Cat. Het., vi, p. 104.
Hab. Rio Janeiro.

rhamnicola, Reuter, Medd. Soc. Fenn., xi, 1885, p. 164.
limbatus, var. d, J. Sahlb.
Hab. Siberia, Finland.

rubricatus (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 100: Zett., Ins. Lapp., p. 275: Hahn (*Lygus*), Wanz. Ins., i, p. 156, t. 24, f. 80: F. Sahlb., Geoc. Fenn., p. 106: Kirschb., Rhyn. Wiesb., p. 342, sp. 55, p. 271: Flor, Rhyn. Liv., i, p. 526: Fieber, Eur. Hem., p. 274, 392: Dougl. & Scott., Brit. Hem., p. 462: Thomson, Opusc. Ent., iv, p. 21: Walk., Cat. Het., vi, p. 52: Saund., Syn., p. 277: Reuter, Caps. Syn., p. 8, pt.; *id.*, Rev. Caps., p. 63.
rubicundus, Meyer, Rhyn. Schw., 1843, p. 72 (*nec* Fallen).
Hab. N. & Middle Europe [*Atk.*, Vosges, France].

rufinervis, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 34.
Hab. S. France, Algeria.

rutilans, Horvath, Rev. d' Ent., vii, 1888, p. 181.
Hab. Tyrol.

Sallei, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 321, ♀ : Walk., Cat. Het., vi, p. 99 : Distant, Biol. Centr. Amer., Rhyn. p. 273, t. 23, f. 2, 3, var : Uhler, List, p. 18.
Hab. Mexico, S. United States.

sanguinolentus, Reuter, Ofvers. Finska Soc., Förh. xxi, 1879, p. 200 : Fedtsch. Turk., p. 10.
Hab. Turkistan.

scitulus, Walker, Cat. Het., vi, 1873, p. 99.
Hab. Mexico, Oajaca.

scutellatus, Uhler, Bull. Un. St. Surv., iii, 1877, p. 420 ; (*Orthops*) List, p. 19 : *nec* Distant, Biol. Centr. Amer., 1884, p. 274, t. 23, f. 9, & var. f. 18, which should be renamed *Distanti*. Hab. Mexico, Guatemala.
Hab. Colorado.

semilotus (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 50 : Walk., Cat. Het., vi, p. 103.
Hab. Rio Janeiro.

semiochraceus (*Deraeocoris*), Stål, *l. c. supra*, p. 49 : Walk., Cat. Het., vi, p. 103.
Hab. Rio Janeiro.

Spinolae, Meyer, Stettin. Ent. Zeit., ii, 1841, p. 86 ; *id.*, Rhyn. Schw., p. 45, t. 1, f. 2 : Fieber, Eur. Hem., p. 275 : Walk., Cat. Het., vi, p. 83 : Saund., Syn., p. 275 : Reuter, Rev. Caps., p. 69.
Hab. Scandinavia, Switzerland.

sticticollis (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 51 : Walker, Cat. Het., vi, p. 104.
Hab. Rio Janeiro.

sticticus (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 51 : Walk., Cat. Het., vi, p. 104.
Hab. Rio Janeiro.

sulcifrons (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 290 sp. 7, 343.
Hab. Germany.

tactus, Distant, Biol. Centr. Amer. Rhyn., 1884, p. 273, t. 26, f. 9.
Hab. Guatemala, Cerro Zunil.

tenellus, Uhler, List, 1886, p. 18 (*ined.?*).
Hab. S. United States.

testaceipes (*Deraeocoris*), Stål, Rio Jan. Hem., i, 1858, p. 50 : Walk., Cat. Het., vi, p. 103.
Hab. Rio Janeiro.

tribulis, Distant, Biol. Centr. Amer. Rhyn., 1884, p. 273, t. 26, f. 10.
Hab. Guatemala, Cerro Zunil.

unicolor, Provancher, Nat. Can., iv, 1872, p. 105 : Uhler, List, p 18.
Hab. Canada.

uruguayensis, Berg, Hem. Arg., 1879, p. 120 ; Add. Emend., 1884, p. 74.
Hab. Uruguay.

vinaceus, Distant, Biol Centr. Amer. Rhyn.., 1884, p. 273, t. 26, f. 11.
Hab. Guatemala.

viridicans (*Deracocoris*), Stål, Rio Jan. Hem., i, 1858, p. 49: Walk., Cat. Het., vi, p. 103.
Hab. Rio Janeiro.

viscicola, Puton, Rev. d' Ent., viii, 1888, p. 365.
Hab. France.

viridis (*Lygaeus*), Fallen, Mon. Cim., 1807, p. 85: *id.*, Hem. Suec., p. 93: F. Sahlb., Geoc. Fenn., p. 106: Flor, Rhyn. Liv., i, p. 532 pt: Saund., Syn., 654, 2*a*; Reuter, Caps. Syn., p. 10; Rev. Caps., p. 66; Rev. Syn. Het., p. 268.
commutatus, Fieb., Eur. Hem, 1861, p. 274; Walk., Cat. Het., vi, p. 83.
contaminatus, Dougl. & Scott, Brit. Hem., 1865, p. 461.
? *fuscomaculatus*, Goeze, Ent. Beytr., ii, 1778, p. 267.
? *obfuscatus*, Gmelin, Syst. Nat., iv, 1788, p. 2185.
sulcifrons, Thomson, Op. Ent., iv, 1871, p. 425 (*nec* Kirschb.).
? *viridescens*, Geoffr., Fourcr. Ent. Par., 1785, p. 207.
Hab. N. & Middle Europe.

vitreus (*Deracocoris*), Stål, Rio Jan. Hem., i, 1858, p. 52: Walk., Cat. Het., vi, p. 105.
Hab. Rio Janeiro.

vitticollis, Reuter, Caps. Amer., 1875, p. 71: Uhler, List, p. 18.
Hab. Texas.

vittiscutis (*Deracocoris*), Stål, Rio Jan. Hem., i, 1858, p. 48: Walk., Cat. Het., vi, p. 103; Berg, Hem. Arg., 1879, p. 121; Add. Emend., 1884, p. 74.
Hab. Rio Janeiro.

Wallengrenii (*Deracocoris*), Stål, *l. c.*, p. 48: Walk., Cat. Het., vi, p. 103.
Hab. Rio Janeiro.

Genus **ZYGIMUS**.

Fieber, Verh. Zool. Bot. Ges. Wien., xx, 1870, p. 249, t. 6: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 19: Walker, Cat. Het., vi, p. 85, 88.
Hadrodema, Fieber, Eur. Hem., p. 68, 277: Reut., Rev. Caps., p. 76.

nigriceps (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 104: Fieb., Verh. Zool. Bot. Ges. Wien, xx, 1870, p. 250, t. 6, f. 7: Walk., Cat. Het., vi, p. 88: Reuter, Caps. Syn., p. 12; Rev. Caps., p. 77.
Hab. Scandinavia.

parvulus, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 35.
Hab. Algeria.

pinastri (*Lygaeus*), Fallen, Mon. Cim., 1807, p. 95; *id.* (*Phytocoris*), Hem. Suec., p. 112: Zett., Faun. Lapp., p. 495, *id.*, Ins. Lapp., p. 277: Hahn, Wanz. Ins., ii, p 87, t. 57, f. 173: F. Sahlb., Geoc. Fenn., p. 118: Kirschb., Rhyn. Wiesb., p. 214, sp. 47: Flor, Rhyn. Liv., i, p. 536: (*Hadrodema*) Fieb., Eur. Hem., p. 278: Walker, Cat. Het., vi, p 85: Saund., Syn., p. 274: Reuter, Rev. Caps., p. 77; Ent. Mon. Mag., xvi, 1879, p. 12; *id.*, Rev. Syn. Het., p. 274.
? *aequalis*, Vill., Ent. auct., 1789, p. 329.

var. *maculicollis*, Muls. & Rey, Ann. Soc. Linn. Lyon, 1852, p. 140.
„ *melanaspis*, Muls. & Rey, *l. c.*, p. 144.
Hab. Nearly all Europe [*Atk.*, Lille].

Genus **LYGIDEA**.

Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 54; Zool. Jahr., 1879, p. 508.

illota, Stål, Stettin. Ent. Zeit., xix, 1858, p. 184, ♀: Walk., Cat. Het., vi, p. 89.
Hab. Siberia, Irkutsk.

Genus **CYPHODEMA**.

Fieber, Crit. Gen. Phyt., 1859, 40; Eur. Hem., p. 68, 272: Walk., Cat. Het., vi, p. 81: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 19; Rev. Caps, p. 78.
subg. *Cyphodema*, Fieb., *l. c. supra*: Reut. Bih., *l. c. supra*, p. 19.
„ *Agnocoris*, Reuter, *l. c.*, p. 19.

instabilis (*Phytocoris*), Lucas, Expl. Scient. Algerie, iii, 1849, p. 84, t. 3, f. 5.
Meyer-Duri, Fieber, Crit. sp. 5.; Eur. Hem., 1861, p. 272: Walk., Cat. Het., vi, p. 81.
tritaenia, Amyot, Mon. sp. 246: Costa, Cim. Regn. Neap. Cent., iii, 1852.
Hab. Corsica, Algeria, Tunis [*Atk.*, Genoa].

mendosa, Montandon, Rev. d' Ent., vi, 1887, p. 66.
Hab. Herzegovina.

Oberthuri, Puton, Bull. Soc. Ent. Fr., (5 s.) v, 1875, p. clvi.
Hab. Algeria.

rubicunda (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 92: Zett., Ins. Lapp., p. 273: Kolenati, Mel. Ent., ii, p. 124: F. Sahlb. (*Capsus*), Geoc. Fenn., p. 111: Kirschb., Rhyn. Wiesb., p. 228, sp. 72, p. 273: Flor, Rhyn, Liv., i, p. 534: Fieber (*Hadrodema*), Eur. Hem., p. 278: Walk., Cat. Het., vi, p. 85: Reuter (*Cyphodema*), Rev. Caps., p. 79.
rubricatus, Hahn, Wanz. Ins., i, 1831, p. 156, t. 24, f. 80: Meyer, Rhyn. Schw., p. 73, (*nec* Fallen).
Hab. All Europe [*Atk.*, S. France].

Genus **POECILOSCYTUS**.

Fieber, Crit. Gen., 1859, 9, 43; Eur. Hem., p. 68, 276: Walk., Cat. Het., vi, p. 84: Reuter, Bih. Vet.-Aka., Handl., iii (i), p. 19; Rev. Caps., p. 80.
subg. *Charagochilus*, Fieber, Crit. Gen. Phyt., 1859, 38; Eur. Hem., p. 67, 271: Reut., Bih Vet.-Aka Handl., iii (i), 1875, p 20; Rev. Caps., p. 80.
subg. *Systratiotus*, Dougl. & Scott, Brit. Hem., 1865, p. 442: Walker, Cat. Het., vi, p. 80: Reut., Bih. Vet.-Aka. Handl, iii (i), 1875, p. 20; Caps. Amer., p. 73; Rev. Caps., p. 81.
Polymerus, Hahn, Wanz. Ins. i, 1831, p 27: Fieber, Eur. Hem., p 67, 271.
subg. *Poeciloscytus*, Fieber, *l. c. supra*: Reuter, Bih. *l. c. supra*, p. 19; Rev. Caps., p. 82.

americanus, Reuter, Caps. Amer., 1875, p. 73: (*Systratiotus*) Uhler, List, p. 19.
Hab. Texas.

basalis, Reuter, *l. c.*, p. 73: Uhler, List, p. 19.
sericeus, Uhler, Bull. Un. St. Surv., iii, 1877, p. 422.
Hab. Quebec to Florida, Texas [*Atk.*, United States].

brevicornis, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 201: Fedtsch. Turk. p. 12.
Hab. Germany, Austria, Russia, Turkistan.

carpathicus, Horvath, Termes. Füzet., vi, 1882, p. 224.
nigritus, Fieber, Eur. Hem., 1861, p. 391, ♂ (nec Fallen).
Hab. N. Hungary.

cognatus, Fieber, Eur. Hem., 1861, p. 277: J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 27: Walker, Cat. Het., vi, p. 85.
Hab. S. Europe [*Atk.*, Hungary].

diffusus, Uhler, Hayden Mont. Surv., 1872, p. 415; Bull. Un. St. Surv., 1876, p. 318; List, p. 19.
Hab. W. United States, Utah, Idaho.

diversipes, Horvath, Rev. d' Ent., iv, 1885, p. 323.
Hab. Hungary.

eryngii, Berg, Hem. Arg., Add. Emend., 1884, p. 77.
Hab. Buenos Ayres.

? **geminus** (*Capsus*), Say: Uhler, List, p. 19.
Hab. United Sates.

Gyllenhalii (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 97: Zett., Ins. Lapp., p. 275: Herr. Schäff. (*Capsus*), Wanz. Ins., iii, p. 86, t. 101, f. 310: Meyer, Rhyn. Schw., p. 61: F. Sahlb., Geoc. Fenn., p. 116: Kirschb., Rhyn., Wiesb, p. 229, sp. 75: Flor, Rhyn. Liv., i, p. 546: Fieber (*Charagochilus*), Eur. Hem., p. 271: Dougl. & Scott, Brit. Hem., p. 446, t. 15, f. 1: Walk., Cat. Het., vi, p. 81: Saund., Syn., p. 273: Rev. Caps., p. 81; Fedtsch. Turk., p. 12.
Hab. All Europe, Turkistan [*Atk.*, Lille, Hungary, Genoa].

holosericeus (*Polymerus*), Hahn, Wanz. Ins., i, 1831, p. 27, t. 4, f. 17: Kirschb., Rhyn. Wiesb., p. 229, sp. 74, p. 274?: Fieb., Eur. Hem., p. 271: Walker, Cat. Het., vi, p. 81: Reut., Rev. Caps., p. 82.
Hab. France, Germany, Italy.

? **imbecillus** (*Capsus*), Say: Uhler, List, p. 19.
Hab. United States.

intermedius, Jakowleff, Trudi. Russki Ent., ix, 1876, p. 226.
Hab. S. Russia.

irroratus, Lethierry, Ann. Soc. Ent. Belg., xxv, 1881, p. 10.
Hab. Guadeloupe.

longicornis, Reuter, Ent. Tidjsk., v, 1884, p. 196.
Hab. Nicobar Islands.

nigritus (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 97: Zett., Ins. Lapp., p. 275: Herr. Schäff. (*Capsus*), Wanz. Ins., vi, p. 45, t. 195, f. 601: F. Sahlb., Geoc. Fenn., p. 116: Kirschb., Rhyn. Wiesb., p. 229, sp. 73, p. 273: Flor, Rhyn. Liv., i, p. 547:

Fieber (*Polymerus*), Eur. Hem., p. 391: Douglas & Scott (*Systratiotus*), Brit. Hem., p. 444, t. 14, f. 9: Walk., Cat. Het., vi, p. 81: Saund., Syn., p. 273: Reuter, Rev. Caps., p. 81.

Hab. N. & Middle Europe.

piceus (*Resthenia*), Berg, Hem. Arg., 1879, p. 125; Add. & Emend, 1884, p. 76.

Hab. Buenos Ayres.

unifasciatus (*Lygaeus*), Fabr., Ent. Syst., iv, 1794, p. 178; *id.*, Syst. Rhyng., p. 243: Meyer, Rhyn. Schw., p. 104: Kolenati, Mel. Ent., ii, p. 123: F. Sahlb., Geoc. Fenn., p. 108: Costa, Cim. Regn. Neap., Cent. iii, p. 40: Kirschb., Rhyn. Wiesb., p. 221, sp. 59,272: Flor, Rhyn. Liv., i, p. 544: Fieb., Eur. Hem., p. 276: Dougl. & Scott, Brit. Hem., p. 467: Stål, Hem. Fabr., i, p. 88: Walk., Cat. Het., vi, p. 84: Saund., Syn., p. 273: Reuter, Rev. Caps., p. 82; *id.*, Rev. Syn. Het., p. 274: Uhler, List, p. 19.

semiflavus, Wolff, Ic. Cim., 1804, p. 154, t. 15, f. 148: Fallen, Mon. Cim., p. 80; *id.*, Hem. Suec., p. 86: Hahn, Wanz. Ins., i, 1831, p. 208, t. 34, f. 107.

? *tomentosus*, Vill., Ent. anct., 1789, p. 528.

var. *asperulae*, Fieber, Eur. Hem., 1861, p. 276.

var. { *lateralis*, Hahn (as var. *Ph. semiflavus*), Wanz. Ins., ii, 1834, p. [illegible] p. 56 f. 169.
marginatus, Hahn, *l. c.*, f. 170.

Hab. All Europe, Turkistan, N. America [*Atk.*, Lille, Hungary].

venaticus (*Systratiotus*), Uhler, Hayden Mont. Surv., 1872, p. 414; Bull. Un. St. Surv., ii, 1876, p. 318; List, p. 19.

Hab. Colorado, Massachusetts.

vulneratus (*Lygaeus*), Wolff, Panzer Faun. Germ., 1801, 100: Fieber (*Poecilos-cytus*), Eur. Hem., p. 277: Walk., Cat. Het., vi, p. 84: Thoms., Opusc. Ent., iv, p. 428: Reuter, Rev. Caps., p. 83: Fedtsch. Turk., p. 12.

Dalmanni, Fallen, Hem. Suec., 1829, p. 87: Hahn, Wanz. Ins., i, 1831, p. 210, t. 34, f. 108: Herr. Schäff., Nomencl. Ent., p. 51: Kirschb., Rhyn. Wiesb., p. 223, sp. 62: Flor, Rhyn. Liv., i, p. 549.

Hab. Nearly all Europe, Turkistan [*Atk.* Monferrato, Dunkirk].

Genus **TROPIDOSTEPTES.**

Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 404; List, p. 19: Reuter, Zool. Jahr., 1879, p. 508.

cardinalis (*Say*), Uhler, *l. c. supra*, p. 404; List, p. 19.

Hab. United States, Massachusetts, Connecticut.

Genus **CAMPTOBROCHIS.**

Fieber, Eur. Hem., 1861, p. 248: Walk., Cat. Het., vi, p. 69: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 20; Rev. Caps., p. 84.

Camptobrochys, Fieb., Crit. Gen., 1859, g. 19, t. 6, f. 4, 35; Eur. Hem., p. 64.

grandis, Uhler, Ent. Am., ii, 1887, p. 230; List, p. 19.

Hab. N. America.

lutescens (*Phytocoris*), Schill., Verh. Schles. Ges., 1836: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 60; *id.*, Caps. Syn., 1875, p. 5: Saund., Syn., p. 277: P. Löw, Wien Ent. Zeit., ii, 1883, p. 59.

hyalinata, Costa, *teste* Puton, Cat., 1886, p. 51.

nitens, Stål, Ofvers. K. Vet.-Aka. Handl., 1855, p. 187.

punctulata, Meyer, Rhyn. Schw., 1843, p. 103, t. 4, f. 2: Fieb., Eur. Hem. p. 249 (*nec* Fallen): Dougl. & Scott, Brit. Hem., p. 448.

Hab. Nearly all Europe [*Atk.*, Lille, Stazzano].

nebulosus, Uhler, Hayden Mont. Surv., 1872, p. 417: Bull. Un. St. Surv., 1876, p. 319: Proc. Bost Soc. N. H., 1878, p. 408: List, p. 19.

Hab. Colorado, Dakota.

parvula, Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 158; Ent. Tidskr., v, 1884, p. 197, var.

Hab. Madeira.

pilipes, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 201: Fedtsch. Turk., p. 13.

Hab. Turkistan.

punctatus (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 95, ♀: F. Sahlb. (*Capsus*), (...)enn., p. 112: Kirschb., Rhyn. Wiesb., p. 227, sp. 70 (?): Flor, Rhyn. Liv., i, p. 532: Thomson, Opusc. Ent., iv, 1871, p. 427: Walk., Cat. Het., vi, p. 69: Reuter, Caps. Syn., 1875, p. 4; *id.*, Rev. Caps., p. 85; Fedtsch. Turk., p. 13.

Fallenii, Hahn, Wanz. Ins., ii, 1834, p. 89, t. 57, f. 175: Kirschb., Rhyn. Wiesb., p. 227, sp. 69?: Fieb., Eur. Hem., p. 248?: Walk., Cat. Het., vi, p. 69.

var. *serena*, Dougl. & Scott, Ent. Mon. Mag., v, 1868, p. 135: Walk., *l. c.*, *supra*, p. 69.

Hab. Nearly all Europe, Tunis, Syria, Persia [*Atk.*, Genoa, Switzerland].

Putonii, Montandon, Rev. d'Ent., iv, 1885, p. 280.

Hab. Dobrudscha.

Genus **POECILOCAPSUS.**

Reuter, Caps. Amer., 1875, p. 73: Distant, Biol. Centr. Amer. Rhyn., 1884, p. 274: Uhler, List, p. 19.

subg. *Metriorrhynchus*, Reuter, Caps. Amer., 1875, p. 74.

affinis (*Metriorrhynchus*), Reuter, Caps. Amer., 1875, p. 74: Uhler, List, p. 19.

Hab. New Jersey.

agrarius, Distant, Biol. Centr. Amer. Rhyn., 1884, p. 275.

Hab. Guatemala, Totonicapam.

alacer (*Brachycoleus*), Stål, Stettin. Ent. Zeit., xxxiii, 1862, p. 319, ♀: Walker, Cat. Het., vi, p. 99: Reut., Caps. Amer., p. 74: Distant, Biol. Centr. Amer. Rhyn., p. 275, t. 23, f. 1: Uhler, List, p. 19.

Hab. Mexico; Guatemala, Cerro Zunil.

frumentarius, Distant, Biol. Centr. Amer. Rhyn., 1884, p. 275, t. 26, f. 12.

Hab. Panama, Volcano de Chiriqui.

goniphorus (*Capsus*), Say, Compl. Writ., i, 1859, p. 241: Reut., Caps. Amer., p. 74, vars: Uhler, List, p. 19.

saxeus, Distant, *l. c.*, p. 276, t. 27, f. 5.
Hab. Panama, Volcano de Chiriqui.

scaber, Distant, *l. c.*, p. 276, t. 27, f. 6.
Hab. Guatemala, Cerro Zunil.

Genus **HEMICEROCORIS**.

Lethierry, Ann. Soc. Ent. Belg., xxv, 1881, p. 11 : Reuter, Zool. Jahr., Arthr., 1881, p. 74.

nigritarsis, Lethierry, *l. c.* p. 12.
Hab. Guadeloupe.

Genus **LIOCORIS**.

Fieber, Crit. Gen. Phyt., 1859, g. 37, t. 6, f. 15 : Eur. Hem., p. 67, 270 : Walker, Cat. Het., vi, p. 80 : Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 20 ; Rev. Caps. p. 85.

glabratus, Motsch., Bull. Mosc., xxxvi (3), 1863, p. 87.
Hab. Ceylon.

puncticollis, Motsch., *l. c.*, p. 88.
Hab. Antilles.

tripustulatus (*Cimex*), Fabr., Spec. Ins., ii, 1781, p. 370 ; *id.*, Syst, Rhyng., p. 239 : Schrank, Fauna Boica, ii, p. 88 : Zett., Ins. Lapp., p. 492 : Fallen, Hem. Suec., p. 96 : Hahn, Wanz. Ins., i, p. 215, t. 34, f. 111 : Burm., Handb. Ent., ii (i), p. 273 : Zett., Ins. Lapp., p. 257 : Meyer, Rhyn. Schw., p. 106 : Kolenati, M[illegible] p. 120 : F. Sahlb., Geoc. Fenn., p. 113 : Costa, Cim. Regn. N[illegible]eap., Kirschb., Rhyn. Wiesb., p. 224, sp. 65, p. 272 : Flor, Rhyn. Liv., (*Liocoris*), Crit. 21 : Eur. Hem., p. 271 : Dougl & Scott, Brit. Hem. Herr. Schäff. : p. 87 : Walk., Cat. Het., vi, p. 80 : Saund., Syn., p. Rev. Caps., p. 86 ; Rev. Syn. Het., p. 275.
? *bifasciatus*, Müller, Faun. Ins. Fridr., 1764, p. 29 ; Zool. Dan.
campestris, var. *a*, Geoffr., Fourcr. Ent. Par., 1785, p. 205.
var. *pastinacae*, Hahn, Wanz Ins., i, 1831, p. 213, t. 34, f. 110.
Hab. All Europe [*Atk.*, Lille, Genoa, Dalmatia].

Genus **DERAEOCORIS**.

Kirschbaum, Rhyn. Wiesb., 1855, p. 208 : Stål, Hem. Afric., iii, p. 20 : Reut. Caps. p. 87.
Capsus, Fabr., Syst. Rhyng., 1803, p. 241 : Fl[illegible] Crit. Gen., g. 32 ; Eur. Hem., p. 66, 264, pt : Puton, Cat., 1886.
Macrocapsus, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 55 ; Zool. Jahr., 1879, p. 509.

annulipes, Herr. Schäff., Wanz. Ins., vi, 1842, p. 97, t. [illegible]2, f. 669 : Walk., Cat Het., vi, p. 78 : J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 27 : Duda, Wien. Ent. Zeit., v, 1886, p. 85.
var. *flavolinea*, Costa, Cim. Regn. Neap. Cent., Addit., 1860.
Hab. Siberia, Germany, Switzerland, France.

melaxanthus, Herr. Schäff., Wanz. Ins, viii, 1848, p. 18, t. 254, f. 794; Walk., Cat. Het., vi, p. 91.

Hab. New York, Wisconsin [*Atk.*, United States].

lineatus (*Lygaeus*), Fabr., Ent. Syst. Sup., 1798, p. 541; *id.*, Syst. Rhyng., p. 234: Stål, Hem. Fabr., i, p. 86: Reuter, Caps. Amer., 1875, p. 74: Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 406; List, p. 19: Saunders, Ins. Inj. Fruit, 1883, p. 350, f. 364.

bellus, Emmons, Nat. Hist. New York Agric., v, 1854, t. 30, f. 1.

quadrivittatus, Say, Hem. Het., New Harm. Ind., 1831, p. 20, 5; Compl. Writ., i, 1859, p. 339: Fitch in Trans. New York Agric. Soc., xxix, 1869, p. 513: Walsh, Amer. Ent., i, 1869, p. 246: Le Baron, Rep. Ins. Illin., i, 1871, p. 61: Saunders, Rep. Ent. Soc. Ontario, 1871, p. 40: Glover, Rep. Agric. Un. St. for 1875, p. 125, f. 33: Lintner, Ins. New York, i, 1883, p. 271, f. 78.

Hab. N. America [*Atk.*, United States].

marginalis, Reuter, Caps. Amer., 1875, p. 75: Uhler, List, p. 19.

Hab. New York.

nigriger (*Brachycoleus*), Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 339, ♀: Walk., Cat. Het., vi, p. 99: Reut., Caps. Amer, p. 74: Distant, Biol. Centr. Amer. Rhyn., p. 275, t. 22, f. 12, 13 vars.

Hab. Mexico.

nobilellus, Berg, Hem. Arg., Add. Emend., 1884, p. 78.

nobilitatus, Berg, Hem. Arg., 1879, p. 122 (*nec* Stål).

Hab. Buenos Ayres.

[illegible]*coleus*), Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 319, ♂: Walk. [illegible] 1—4: [illegible] Amer., p. 74: Distant, Biol. Centr. Amer. Rhyn., [illegible]s, Walker, Cat. Het., vi, 1873, p. 100.

[illegible]ico, Orizaba; Guatemala, Zapote, Cerro Zunil.

Genus **CALLICAPSUS.**

[illegible]r., 1875, p. 75.

[illegible] p. 75: Uhler, List, p. 19.

[illegible] Texas.

Genus **DEROPHTHALMA.**

Berg, Hem. Arg., Add. Emend., 1884, p. 79.

Reuterii, Berg, *l. c.*, p. 80.

Hab. Argentine Republic, Uruguay.

Genus **NEOBORUS.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 276.

hirsutus, Distant, *l. c.*, p. 276, t. 27, f. 7.

Hab. Guatemala, P[illegible]on.

brachialis, Stål, Stettin. Ent. Zeit., xix, 1858, p. 185, t. 1, f. 1, ♂ : Walk., Cat. Het., vi, p. 89 ; (*Macrocapsus*) Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 55.
Hab. Siberia.

cardinalis, Fieber, Crit., 1859, sp. 4; Eur. Hem., p. 266: Walk., Cat. Het., vi, p. 78.
Hab. Austria.

cordiger, Hahn, Wanz. Ins., ii, 1834, p. 85, t. 56, f. 771 : Fieb., Eur. Hem., p. 264 : Walk., Cat. Het., vi, p. 77.
var. *apicalis*, Sign., Ann. Soc. Ent. Fr., (4 s.) v, 1865, p. 125 : Walk., *l. c.*, p. 90.
Hab. France, Germany [*Atk.*, N. France].

fratruelis, Berg, Hem. Arg., 1879, p. 289; Exped. Rio Negro, Zool., p. 82, t. 2, f. 3.
Hab. Buenos Ayres.

Freyii, Puton, Rev. d' Ent., vi, 1887, p. 102.
Hab. Sicily.

histricus, Stål, with var. *a*, *b*., Ofvers. Vet.-Aka. Förh., 1855, p. 37 ; Hem. Afric., iii, p. 21 : Walk., Cat. Het., vi, p. 114.
Hab. Caffraria.

incomparabilis, Stål, Ofvers. Vet.-Aka. Förh., 1855, p. 35 ; Hem. Afric., iii, p. 22 : Walk., Cat. Het., vi, p. 114.
Hab. Caffraria.

Martinii, Puton, Rev. d' Ent., 1887, p. 303.
Hab. Algeria.

olivaceus (*Cimex*), Fabr., Gen. Ins., 1776, p. 300 ; *id.*, Ent. Syst. iv, 1794, p. 179 ; Syst. Rhyng., p. 244 : Latreille, Hist. Nat., xii, p. 231 : Fieb., Eur. Hem., p. 266 : Walker, Cat. Het., vi, p. 78 : Reuter, Rev. Syn. Het., p. 278.
triangularis, Goeze, Ent. Beytr., ii, 1778, p. 278.
var. *erythrostomus*, Schrank, Fauna Boica, 1801, p. 86.
„ *fallax*, Horvath, Term. Füzetek, viii, 1884, p. 317.
„ *larvatus*, Horvath, *l. c.*, p. 317.
„ *medius*, Kirschbaum, Rhyn. Wiesb., 1855, p. 212, sp. 42 ; 288, sp. 6 : Baer., Cat., p. 14.
„ *rufipes*, Fabr., Syst. Rhyng., 1803, p. 211 ; Spinola, Ess., p. 190.
Hab. Germany, Austria, France.

ostentans, Stål, Ofvers. Vet.-Aka. Förh., 1855, p. 37 ; Hem. Afric., iii, p. 20 : Walk., Cat. Het., vi, p. 114.
histricus, var. *c d.*, Stål, Ofvers. *l. c. supra*, p. 37.
Hab. Caffraria, Cape of Good Hope.

punctum, Rambur, Faun. Andal., 1842, p. 164 : Fieb., Eur. Hem., p. 265 : Walk., Cat. Het., vi, p. 78 : Puton, Rev. d' Ent., iv, 1885, p. 137.
corruscus, Garbig., Bull. Soc. Ent. Ital., i, 1869, p. 186 : Walk., Cat. Het., vi, p. 79, 90.
episcopalis, Costa, Addit. Cim. Regn. Neap., 1860, p. 28, f. 7.
var. *minus*, Puton, Rev. d' Ent., vi, 1887, p. 103.
„ *nigerrimus*, Puton, Expl. Scient. Tunisie, 1886, p. 20.
Hab. Spain, Italy, Algeria, Tunis.

Genus **STETHOCONUS**.

Fieber, Wien. Ent. Monats., viii, 1864, p. 79, t. 2, 8: Walk., Cat. Het., vi, p. 69, 89: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 21.

Acropelta, Mella, Bull. Soc. Ent. Ital., i, 1869, p. 292: Walk., *l. c., supra*, p. 88.

mammillosus (*Capsus*), Flor, Rhyn. Liv., ii, 1861, p. 624: Walker, Cat. Het., vi, p. 69: Fieb., Wien. Ent. Monats, viii, 1864, p. 80: Rey, Ann. Soc. Linn. Lyon, xxix, 1883, p. 385: Walk., Cat. Het, vi, p. 69.

cyrtopeltis, Flor, Rhyn. Liv., i, 1860, p. 628.

pyri, Mella, Bull. Soc. Ent. Ital., i, 1869, p. 203, t. 4: Walk., Cat. Het., vi, p. 89.

Hab. Russia, Livonia, France, Hungary, Italy.

Genus **BOTHYNOTUS**.

Fieber, Wien Ent. Monats., viii, 1864, p. 76, t. 2, 7: Walk, Cat. Het., vi, p. 68: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 21; Rev. Caps. p. 90.

Trichymenus, Reuter, Caps. Syn., 1873, p. 7.

pilosus (*Phytocoris*), Bohem., Nya Svenska Hem., April, 1852, p. 68: Kirschb., Rhyn. Wiesb., p. 213, sp. 45: Thomson, Opusc. Ent., iv, p. 429: Saund., Syn., p. 272: Reuter (*Trichymenus*), Caps. Syn., p. 8; Rev. Caps., p. 91.

Fairmairei, Sign., Ann. Soc. Ent. Fr., (2 s.) x, Sept. 1852, p. 542, t. 16, f. 4.

horridus, Mulsant & Rey, Ann. Soc. Linn., Lyon. 1852, p. 151, ♀ (*formbrach.*).

Minkii, Fieber, Wien. Ent. Monats., viii, 1864, p. 77, t. 2, 7 *i*, *k*: Walk., Cat. Het., vi, p. 69.

Hab. Scandinavia, Germany, France, Italy, Hungary, Corfu.

Genus **SAUNDERSIA**.

Reuter, Pet. Nouv. Ent., ii, No. 147, 1876, p. 33.

moerens, Reuter, *l. c.*, p. 33.

Hab. Greece.

Genus **ALLOEOTOMUS**.

Fieber, Crit. Gen. Phyt. 1859, 17, t. 6, f. 23; Eur. Hem., p. 63, 247: Walk., Cat. Het., vi, p. 68: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 21; Rev. Caps., p. 92; Berlin. Ent. Zeits., xxv, 1881, p. 177.

gothicus (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 110: Fieb., Eur. Hem., p. 247: Walk., Cat. Het., vi, p. 68: Reuter, Rev. Caps., p. 92.

aetneus, Costa, Ann. Soc. Ent. Fr., x, 1841, p. 285.

marginepunctatus, Herr. Schäff., Wanz. Ins., iii, 1835, p. 69, t. 96, f. 284: Kirschb., Rhyn. Wiesb., p. 213, sp. 44: Walk., Cat. Het., vi, p. 68.

pilipes, Thomson, Op. Ent., iv, 1871, p. 429.

Hab. Scandinavia, N. and Middle Europe.

melinus, Harris, Exp. Engl. Ins., 1781, p. 90, t. 26, f. 11.
olivaceus, Schrank, Fauna Boica, 1801, p. 89 (*nec* Fabr.).
rubens, Harris, Exp. Engl. Ins., 1781, p. 90, t. 26, f. 10.
? *ruber*, Linn., Syst. Nat. (*ed.* 10), 1758, p. 446: Faun. Suec., p. 251.
rubro-acuminatus, Goeze, Ent. Beytr., ii, 1778, p. 268.
rufescens, Gmelin, Syst. Nat., iv, 1788, p. 2160.

var. *danicus*, Fabr., Ent. Syst., iv, 1794, p. 181; Syst. Rhyng., p. 245: Wolff, Ic. Cim., i, 1800, p. 34, t. 4, f. 34: Fallen, Mon. Cim., p. 93; *id.*, Hem. Suec., p. 109: Hahn, Wanz. Ins., i, p. 17, t. 2, f. 9.

var. *tricolor*, Fabr., Mant. Ins., 1787, p. 306; Syst. Rhyng., p. 245: Wolff, Ic. Cim., i, 1800, p. 35, t. 4, f. 35: Panzer, Faun. Germ., 93, 1804, f. 20: Spinola, Ess., p. 190: Dufour, Recherch., 1833, p. 176: Meyer, Rhyn. Schw., p. 108: Kirschb., Rhyn. Wiesb., p. 212, sp. 41: Flor, Rhyn. Liv., i, p. 509: Fieber, Crit., 1859, 19.

Hab. All Europe; United States, Brazil (Uhler) [*Atk.*, Lille, Genoa, Hungary].

trifasciatus (*Cimex*), Linn., Syst. Nat., (*ed.* 12), 1767, p. 725: Rossi, Fauna Etrusc., ii, p. 247: Fabr., Ent. Syst., iv, p. 176; *id.*, Syst. Rhyng. p. 244: Burm., Handb., ii, p. 274: Am. & Serv., Ins. Hem., p. 281: Meyer, Rhyn. Schw., p. 107: Costa, Cim. Regn. Neap., Cent. iii, p. 45: Kirschb., Rhyn. Wiesb., p. 213, sp. 43: Fieber, Eur. Hem., p. 265: Walker, Cat. Het., vi, p 78. Rent., Rev. Syn. Het., p. 277, 395.

elatior, Turton. Syst. Nat., ii, 1806, p. 671.
elatus, Fabr., Ent. Syst., iv, 1794, p. 176; Syst. Rhyng., p. 241: Wolff, Ic. Cim., i, t. 4, f. 31: Panzer, Faun. Germ., 73, 1801, f. 20: Spinola, Ess., p. 190: Fieb. Crit., 1859, 19.
fasciatus, Geoffroy, Fourcr., Ent. Paris., 1785, p. 200.
? var. *annulatus*, Germar, Reise Dalm., 1817, p. 285.
var. *bipartitus*, Horvath, Termes Füz., viii, 1884, p. 14.
„ *imitator*, Horvath, *l. c.*, vii, p 30.
„ *regalis*, Horvath, *l. c.*, viii, p. 13.
„ *ultramontana*, Gredler Verh. Zool. Bot. Ges. Wien, xxiv, 1874, p. 556: Horvath, *l. c. supra.*, vii, p. 30.

Hab. France, Germany, Italy, Syria.

Genus **MORNA**.

F. B. White, Ent. Mon. Mag., xv, 1878, p. 130.

capsoides, F. B. White, *l. c.*, p. 131.
Hab. New Zealand.

Genus **COCCOBAPHES**.

Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 401; List, p. 19; Reuter (*Caccobaphes*), Zool. Jahr., 1879, p. 507.

sanguinarius (Say), Uhler, *l. c. supra*, p. 401.
Hab. United States, Carolina, New Hampshire, Canada.

rutilus, Herr. Schäff., Wanz. Ins., iv, 1839, p. 34, t. 121, f. 385: Fieb., Eur. Hem., p. 265: Walk., Cat. Het., vi, p. 78.
var. *bellicosus*, Horvath, Rev. d' Ent., iv, 1885, p. 324.
Hab. Hungary, Turkey, S. Russia.

Schach (*Cimex*), Fabr., Spec. Ins., ii, 1781, p. 371: *id.*, Syst. Rhyng., p. 241: Latreille, Hist. Nat., xii, 1804, p. 230: Stål, Hem. Fabr., i, p. 87: Walk., Cat. Het., vi, p. 78: Reuter, Rev. Syn. Het., p. 276.
miniatus, Herr. Schäff., Wanz. Ins., iv, 1839, p. 34, t. 121, f. 386: Fieb., Eur. Hem., p. 265.
var. *cuneatis*, Reuter, Rev. d' Ent., vii, 1888, p. 227.
„ *Novaki*, Horvath, Rev. d' Ent., iv, 1885, p. 324.
Hab. France, Spain, Italy, Dalmatia, Greece [*Atk.*, Dalmatia].

scutellaris (*Lygaeus*), Fabr., Ent. Syst., iv, 1794, p. 180; *id.*, Syst. Rhyng., p. 245: Coqueb., Ill. Ic., ii, p. 83, t. 19, f. 8: Zett., Acta Holm., 1819, p. 74: Fallen, Hem. Suec., p. 109: Hahn, Wanz. Ins., i, 1831, p. 205, t. 33, f. 105: Burm., Handb. Ent., ii, p. 274: Rambur, Faun. Andal., p. 164: Flor, Rhyn. Liv., i, p. 510: Fieber, Eur. Hem., p. 266: Dougl. & Scott, Brit. Hem., p. 443: Walk., Cat. Het., vi, p. 79: Saund., Syn., p. 271: Reuter, Rev. Caps. p. 89: Rev. Syn. Het., p. 278.
var. *morio*, Bohem., Nya Svens. Hem., 1852, p. 68: Reuter, Caps. Syn., p. 6; Rev. Caps. p. 90.
Hab. Nearly all Europe [*Atk.*, Sarepta, S. Russia].

seguisinus (*Cimex*), Müller, Man. Ins. Taur., 1766, p. 191, ♂; Reuter, Rev. Syn. Het., p. 279.
adustus, Gmelin, Syst. Nat., iv, 1788, p. 2185.
biguttatus, Goeze, Ent. Beytr., ii, 1778, p. 278.
bimaculatus, Schrank, Fauna Boica, 1801, p. 88.
capillaris, Fabr., Syst. Ent., 1775, p. 725; Mant. Ins. ii. p., 305; Ent. Syst., iv, p. 180; Syst. Rhyng., p. 244: Burm., Handb., Ent., ii (i), p. 274: Am. & Serv., Hem., p. 281: Costa, Cim. Regn. Neap., Cent. iii, p. 44: Fieb., Eur. Hem., p. 266: Dougl. & Scott, Brit. Hem., p. 442: Stål, Hem. Fabr., i, p. 87: Walk., Cat. Het., vi, p. 79: Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 408; List, p. 19: Perrot, C. R. Soc. Ent. Belg., 1875, p. lxxxviii.
? *chrysocephalus*, Gmelin, Syst. Nat., iv, 1788, p. 2164.
cimbricus, Müller, Zool. Dan., 1776, p. 106: Goeze, Ent. Beytr, ii, p. 252.
croceus, Goeze, Ent. Beytr., ii, 1778, p. 265: Geoffr., Fourcr. Ent. Par. p. 200.
Daniae, Turton, Syst. Nat., ii, 1806, p. 674.
flammeus, Geoffr., Fourcr. Ent. Par., 1785, p. 210.
? *fuliginosus*, Gmelin, Syst. Nat., iv, 1788, p. 2164.
geniculus, Turton, Syst. Nat., ii, 1806, p. 687.
gothicus, *b*, Poda, Ins. Mus. Graec., 1761, p. 57.
gothicus, Scopoli, Ent. Carn., 1763, p. 131: Schrank, En. Ins. Austr., p. 283: Rossi, Faun. Etrusc., ii, p. 249 (*nec* Linn.).
haematocephalus, Gmelin, Syst. Nat., iv, 1788, p. 2166.
haematostictos, Gmelin, *l. c.*, p. 2181.
laniarius, Linn., Syst. Nat. (*ed.* 12), 1767, p. 726: Reut., Rev. Caps. p. 88: Saund., Syn., p. 271.
? *luteus*, Goeze, Ent. Beytr., ii, 1778, p. 278.

Genus **EUARMOSUS**.

Reuter, Caps. Amer., 1857, p. 76.

Sayii, Reuter, *l. c.*, p. 76; Uhler, List, p. 19.
Hab. Texas.

Genus **EUBATAS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 277.

chiriquinus, Distant, *l. c.*, p. 277, t. 27, f. 8.
Hab. Panama, Volcano de Chiriqui.

Genus **NEOCAPSUS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 277.

mexicanus, Distant, *l. c.*, p. 277, t. 22, f. 19; Uhler, List, p. 19.
Hab. Mexico.

Genus **HORCIAS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 277.

atratus, Distant, *l. c.*, p. 280.
Hab. Panama, Volcano de Chiriqui.

chiriquinus, Distant, *l. c.*, p. 278.
Hab. Panama, Volcano de Chiriqui.

decoratus, Distant, *l. c.*, p. 278, t. 27, f. 9.
Hab. Guatemala, Zapote.

notatus, Distant, *l. c.*, p. 278, t. 26, f. 14.
Hab. Guatemala, Pantaleon; Panama.

plagosus, Distant, *l. c.*, p. 279, t. 26, f. 16.
Hab. Panama, Volcano de Chiriqui.

plumatus, Distant, *l. c.*, p. 279, t. 27, f. 10.
Hab. Panama, Bugaba.

rutilus, Distant, *l. c.*, p. 279, t. 27, f. 11.
Hab. Panama, Volcano de Chiriqui.

scutellatus, Distant, *l. c.*, p. 278.
Hab. Guatemala, San Juan; Panama, Bugaba.

thoracicus, Distant, *l. c.*, p. 278, t. 26, f. 15.
Hab. Panama, Bugaba.

unicolor, Distant, *l. c.*, p. 279, t. 27, f. 12.
Hab. Panama, Volcano de Chiriqui.

variegatus, Distant, *l. c.*, p. 277, t. 26, f. 13.
Hab. Panama, David, Bugaba.

Genus **CALOCORISCA.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 280.

antennata, Distant, *l. c.*, p. 281, t. 27, f. 14.
Hab. Guatemala, Capetillo.

tenera, Distant, *l. c.*, p. 280, t. 26, f. 18.
Hab. Guatemala, Cerro Zunil.

thoracica, Distant, *l. c.*, p. 280, t. 27, f. 13.
Hab. Costa Rica, Irazu.

villosa, Distant, *l. c.*, p. 280, t. 26, f. 17.
Hab. Guatemala, Panama.

Genus **CIMATLAN.**

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 281.

delicatum, Distant, *l. c.*, p. 281, t. 27, f. 15.
Hab. Guatemala, Panajachel.

Genus **FULVIUS.**

Stål, Stettin. Ent. Zeit. xxxiii, 1862, p. 322: Distant, Biol. Centr. Amer. Rhyn., p. 281: Walk., Cat. Het., vi, p. 47: Uhler, List, p. 19.

albomaculatus, Dist., Biol. Centr. Amer. Rhyn., 1884, p. 282, t. 27, f. 16.
Hab. Panama, Volcano de Chiriqui.

anthocoroides, Stål, Stettin. [illegible] xxiii, 1862, p. 322: Walk., Cat. Het., vi, p. 160: Distant, *l. c., supra*, p. 281, t. 23, f. 15.
Hab. Mexico, Guatemala, Panama.

atratus, Distant, *l. c., supra*, p. 282, t. 27, f. 18.
Hab. Guatemala, San Geronimo.

fuscans, Distant, *l. c.*, p. 282, t. 27, f. 17.
Hab. Guatemala, Balhen.

Genus **PAMEROCORIS.**

Uhler, Bull. Un. St. Surv., iii, 1877, p. 424; Proc. Bost. Soc. N. H., xix, 1878, p. 412; List, p. 19.

anthocoroides, Uhler, Bull. Un. St. Surv., iii, 1877, p. 425: Bergroth, Ent. Nachr., iv, p. 108.
Hab. Colorado, E. United States, Canada.

Genus **HENICOCNEMIS.**

Stål, Rio Jan. Hem., i, 1858, p. 53: Dist., Biol. Centr. Amer. Rhyn., p. 282: Walker, Cat. Het., vi, p. 169: Uhler, List, p. 19.

albitarsis, Stål, Stettin. Ent. Zeit., xxiii, 1862, p. 320, ♀ : Walk., Cat. Het., vi, p. 169 : Distant, Biol. Centr. Amer. Rhyn., p. 283, t. 27, f. 19.
Hab. Mexico.

alboornata, Distant, *l. c., supra*, p. 283, t. 27, f. 20.
Hab. Panama, Bugaba

patellata, Stål, Rio Jan. Hem., i, 1858, p. 53 : Walk., Cat. Het., vi, p. 169.
Hab. Rio Janeiro.

Genus **CAPSUS**.

Stål, Hem. Fabr., i, p. 87 : Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 21 : Rev. Caps., p. 93.
Rhopalotomus, Fieber, Crit. Gen. Phyt., 1859, g. 31, t. 6, f. 38 : Eur. Hem., p. 66, 263 • Puton, Cat., 1886.

ater (*Cimex*), Linn. Syst. Nat., (*ed.* 10), 1758, p. 447 : Fabr., Syst. Ent., 1775, p. 725 ; *id.*, Syst. Rhyng., p. 241 : Fallen, Mon. Cim., p. 97 ; *id.*, Hem. Succ., p. 116 : Zett., Faun., Lapp., p. 497 ; *id.*, Ins., Lapp., p. 277 : Hahn, Wanz. Ins., i, p. 126, t. 20, f. 65 : Burm., Handb. Ent., ii, p. 275 : Westw., Intr. Mod. Class. Ins., p. 121 : Am. & Serv., Ins. Hém., p. 281 : Meyer, Rhyn. Schw., p. 108 : Kolenati, Mel. Ent., ii, p. 127 : F. Sahlb., Geoc. Fenn., p 121 : Kirschb., Rhyn. Wiesb., p. 214, sp. 46 : Costa, Cim. Regn. Neap. Cent. Addit. 30, xxxiii : Flor, Rhyn. Liv., i, p. 486 : Fieber, Eur. Hem., p. 264 : Dougl. & Scott., Brit. Hem., p. 440 : Stål, Hem. Fabr., i, p. 87 : Walk., Cat. Het., vi, p. 77 : Saund., Syn., p. 271 : Reuter, Rev. Caps., p. 94 : Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 411 : Reuter, Rev. Syn. Het., p 282.
nigricornis, Hahn, Icon. Cim., 1826, f. 20.
? *sordens*, Gmelin, Syst. Nat., iv, 1788, p. 2166.
var. *semiflavus*, Linn., Syst. Nat., (*ed.* 12), 1767, p. 725 : Gmelin, Syst. Nat., p. 2162.
var. *flavicollis*, Fabr., Syst. Ent., 1775, p. 725 : Rossi, Faun Etrusc., ii, p. 248 : Lap., Ess. Class. Syst., 1832, p. 39 : Guérin, Icones, iii, 1834, p. 348.
„ *testudineus*, Say, MS., *teste* Uhler, *l. c., supra*.
„ *tyrannus*, Fabr., Ent. Syst., iv, 1794, p. 177 : Wolff, Ic. Cim., iv, 1804, p. 152, t. 15, f. 146.
Hab. All Europe : N. America [*Atk.*, Lille].

brachycerus, Uhler, Hayden Surv. Mont., 1872, p. 416 ; Bull. Un. St. Surv., ii, 1876, p. 319 ; List, p. 19.
Hab. California, Colorado.

cinctus, Kolenati, Mel. Ent., ii, 1845, p. 128, t. 11, f. 29 : Fieb., Eur. Hem., p. 264 : Walk., Cat. Het., vi, p. 77 : Reuter, Fedtsch. Turk., p. 14.
Hab. Caucasus, Turkistan.

intermedius, Reuter, Ofvers. Finska Soc. Förh., xxvi, 1884, p. 25.
simulans, var., J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 27.
Hab. Siberia.

pacificus, Uhler, Hayden Surv. Mont., 1872, p. 415 ; Bull. Un. St. Surv., ii, 1876, p. 319 ; List, p. 19.
Hab. Montana, Idaho, California.

rubronotatus, Provancher, Nat. Can., iv, 1872, p. 105: Uhler, List, p. 19.
Hab. Canada.

simulans, Stål, Stettin. Ent. Zeit., xix, 1858, p. 186, ♂: J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 27: Walker, Cat. Het., vi, p. 89.
Hab. Siberia.

Genus **HYALOPEPLUS**.

Stål, Ofvers. Vet.-Aka. Förh., 1870, p. 670.

pellucidus (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 255: Walk., Cat. Het., vi, p. 127.
Hab. Honolulu.

vitripennis (*Capsus*), Stål, Ofvers. Vet.-Aka. Förh., 1855, p. 186; Freg. Eug. Resa, Hem., 1859, p. 255: Ofvers. Vet.-Aka. Förh., 1870, p. 671: Walk., Cat. Het., vi, p. 118.
Hab. Philippines, Java.

Genus **MACROLONIUS**.

Stål, Ofvers. K. Vet.-Aka. Förh., 1870, p. 670, note.

sobrinus (*Capsus*), Stål, Ofvers. K. Vet.-Aka. Förh., 1855, p. 186; Ofvers. *l. c.*, *supra*, p. 670, note: Walk., Cat. Het., vi, p. 124.
Hab. Philippines.

Genus **READA**.

F. B. White, Ent. Mon. Mag., xv, 1878, p. 132.

Mayrii, F. B. White, *l. c.*, p. 132.
Hab. New Zealand.

SPECIES OF DOUBTFUL POSITION.

albipes (*Capsus*), Motsch., Bull. Mosc., xxxvi (3), 1863, p. 82.
Hab. Ceylon.

albofasciatus (*Leptomerocoris*), Motsch., *l. c.*, p. 86.
Hab. Ceylon.

alboviridescens (*Leptomerocoris*), Motsch., *l. c.*, p. 85.
Hab. Ceylon.

angulifer (*Capsus*), Walker, Cat. Het., vi, 1873, p. 126.
Hab. Australia.

annulicornis (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 51.
Hab. Germany.

antennatus (*Phytocoris*), Blanchard, Gay's Hist Fisica Chili, Zool., vii, 1852, p. 188, 7: Signoret, Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 573: Walk., Cat. Het., vi, p. 108.
Hab. Chili.

antennatus (*Leptomerocoris*), Walker, Cat. Het., 1873, p. 145.
Hab. Australia.

anthracinus (*Ectopiocerus*), Uhler, List, 1886, p. 20.
Hab. United States.

apicifer (*Capsus*), Walker, Cat. Het., vi, 1873, p. 124.
Hab. Makian, Celebes.

aurulentus, Schill., Arb. u. Veränd. d. Schles. Ges., 1836.
Hab. Silesia.

bicinctus (*Capsus*), Walker, Cat. Het., 1873, p. 100: Uhler, List, p. 21.
Hab. Oajaca.

canescens (*Capsus*), Walker, Cat. Het., vi, 1873, p. 121.
Hab. Malacca.

capicola (*Capsus*), Stål, Freg. Eug., Hem., 1859, p. 256: Walk., Cat. Het., vi, p. 114.
Hab. Cape of Good Hope.

capitatus (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 50.
Hab. Germany.

chinensis (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 258: Walk., Cat. Het., vi, p. 118.
Hab. Hongkong.

coccineus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 93: Uhler, List, p. 21.
Hab. E. Florida.

coerulescens (*Capsus*), Scholtz, Arb. u. Veränd. d. Schles. Ges., 1846.
Hab. Germany.

conspersus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 116.
Hab. Cape of Good Hope.

contiguus (*Capsus*), Walker, *l. c.*, p. 95: Uhler, List, p. 21.
Hab. New York.

coxalis (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852.
Hab. S. France.

cuneatus (*Capsus*), Stål, Rio. Jan. Hem., i, 1858, p. 55: Walk., Cat. Het., vi, p. 144.
Hab. Rio Janeiro.

Dallasii (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 258.
Hab. Sydney.

desertus (*Capsus*), Becker, Bull. Mosc., xxxvii (i), 1865, p. 488: Walker, Cat. Het., vi, p. 90.
Hab. S. Russia, Sarepta.

dilutus (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 256.
Hab. Sydney.

dimidiatus (*Capsus*), Guérin, R. de Sagra's Hist. Fis. Cuba. vii, 1856, p. 168: Walk., Cat. Het., vi, p. 101.
Hab. Cuba.

discoidalis (*Capsus*), Walker, Cat. Het., vi, 1873, p. 122.
Hab. Singapur, Malacca.

elquiensis (*Capsus*), Blanchard, Gay's Hist. Fis. Chil., vii, 1852, p. 187, 3: Sign., Ann. Soc. Ent. Fr., (4 s.) iii, p. 572: Walker, Cat. Het., vi, p. 108.
Hab. Chili.

fasciatus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 122.
Hab. Singapur.

flavipes (*Capsus*), Provancher, Can. Nat., iv, 1872, p. 104: Uhler, List, p. 19.
Hab. Canada.

flavonotatus (*Capsus*), Provancher, *l. c.*, p. 103: Uhler, List, p. 19.
Hab. Canada.

floridanus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 97: Uhler, List, p. 21.
Hab. E. Florida.

Freyii (*Capsus*), Becker, Bull. Mosc., xxxvii (i), 1865, p. 481: Walk., Cat. Het., vi, p. 90.
Hab. S. Russia, Sarepta.

frontifer (*Capsus*), Walker, Cat. Het., vi, 1873, p. 94: Uhler, List, p. 21.
Hab. N. America.

gibbicollis (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 51.
Hab. Germany.

halimocnemis (*Capsus*), Becker, Bull. Mosc., xxxvii (i), 1865, p. 485: Walker, Cat. Het., vi, p. 89.
Hab. S. Russia, Sarepta.

hirsutulus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 95: Uhler, List, p. 21.
Hab. Lake Huron.

illepidus. Walker, *l. c.*, p. 115.
Hab. Cape of Good Hope.

incisuratus (*Capsus*), Walker, *l. c.*, p. 121.
Hab. Ceylon.

incisus (*Capsus*), Walker, *l. c.*, p. 92: Uhler, List, p. 21.
Hab. E. Florida.

innotatus (*Capsus*), Walker, *l. c.*, p. 119.
Hab. S. Africa.

invidus (*Cimex*), Rossi, Fauna Etrusc., 1790, p. 247.
Hab. Italy.

intaminatus (*Capsus*), Walker, Cat. Het. p. 127.
Hab. New Zealand.

Kinbergii (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 255.
Hab. Sydney.

laticinctus (*Capsus*), Walker, Cat. Het., 1873, p. 127.
Hab. New Zealand.

limbatellus (*Capsus*), Walker, *l. c.*, p. 93 : Uhler, List, p. 21.
Hab. New York.

limbatus (*Capsus*), Walker, *l. c.*, p. 117.
Hab. Cape of Good Hope.

lineifer (*Capsus*), Walker, *l. c.*, p. 122.
Hab. Malacca.

lucidus (*Capsus*), Walker, *l. c.*, p. 124.
Hab. Sarawak.

maculiceps (*Capsus*), Stål, Ofvers. Vet.-Aka. Förh., 1855, p. 186.
Hab. S. France.

marginatus (*Capsus*), Walker, Cat. Het., 1873, p. 96 : Uhler, List, p. 21.
Hab. New York.

maoricus (*Leptomerocoris*), Walker, Cat. Het., vi, 1873, p. 146.
Hab. New Zealand.

marginicollis (*Capsus*), Walker, *l. c.*, p. 128.
Hab. —— ?

miniatus (*Capsus*), Parfitt, Ent. Mon. Mag., ii, 1866, p. 130 : Walker, Cat. Het., vi, p. 89.
Hab. S. England.

modestus (*Capsus*), Blanchard, Gay's Hist. Fis. Chili, vii, 1852, p. 187, 5 : Sign. Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 572 : Walk., Cat. Het., vi, p. 108.
Hab. Chili.

obesulus (*Capsus* ?), Wollaston, Ann. Mag. N. H., (3 s.) i, 1858, p. 124.
Hab. Madeira.

obscurellus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 98 : Uhler, List, p. 21.
Hab. Hudson's Bay.

ocellatus (*Capsus*), Sign., Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 527 : Walker, Cat. Het., vi, p. 105, 108.
Hab. Chili.

ornata (*Closterocoris*), Uhler, List, 1886, p. 59.
Hab. United States.

pacificus (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 256 : Walk., Cat. Het., vi, p. 127.
Hab. Tahiti.

pallescens (*Capsus*), Walker, Cat. Het., vi, 1873, p. 94 : Uhler, List, p. 21.
Hab. Hudson's Bay.

pallescens (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 49.
Hab. Germany.

pallidulus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 116.
Hab. Cape of Good Hope.

partitus (*Capsus*), Walker, *l. c.*, p. 119.
Hab. N. India.

patulus (*Capsus*), Walker, *l. c.*, p. 120.
Hab. N. India.

peregrinus (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 49.
Hab. Germany.

piceoniger (*Deraeocoris*), Motsch., Bull. Mosc., xxxvi (3), 1863, p. 84.
Hab. Ceylon.

pictulifer (*Capsus*), Walker, Cat. Het., vi, 1873, p. 126.
Hab. Australia.

pistacinus (*Leptomerocoris*), Motsch., Bull. Mosc., xxxvi (3), 1863, p. 85.
Hab. Ceylon.

Proserpinae (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852.
Hab. France.

pulcher (*Oncodepsus*), Uhler, List, 1886, p. 17.
Hab. W. indies.

punctipes (*Capsus*), Mulsant & Rey, *l. c. supra.*
Hab. France.

punctum-album (*Cimex*), Rossi, Fauna Etrusc., 1790, p. 246, No. 1337.
Hab. Italy.

rubrovulneratus (*Deraeocoris*), Motsch., Bull. Mosc., xxxvi (3), 1863, p. 83.
Hab. Ceylon.

scutellaris (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 52.
Hab. Germany.

semiclusus (*Capsus*), Walker, Cat. Het., 1873, p. 118.
Hab. Ceylon.

sericeus (*Capsus*), Walker, Cat. Het., 1873, p. 117.
Hab. Sierra Leone.

sidnicus (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 258.
Hab. Sydney.

signatipes (*Capsus*), Herr. Schäff., Nomencl, Ent., 1835, p. 49.
Hab. Germany.

Signoretii (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 257: Walk., Cat. Het, vi, p. 105.
Hab. Rio Janeiro.

simplex (*Leptomerocoris*), Walker, Cat. Het., vi, 1873, p. 145.
Hab. Ceylon.

simulans (*Capsus*), Walker, *l. c.*, p. 125.
Hab. Singapur.

sinicus (*Capsus*), Walker, Cat. Het., *l. c.*, p. 120.
Hab. China.

sobrius (*Capsus*), Walker, *l. c.*, p. 115.
Hab. Sierra Leone.

solitus (*Capsus*), Walker, *l. c.*, p. 116.
Hab. Cape of Good Hope.

soror (*Macrocoleus*), Reuter, Pet. Nouv. Ent. No. 136, 1874, p. 541.
Hab. Siberia.

speciosus (*Capsus*), Signoret, Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 571: Walker, Cat. Het., vi, p. 105, 108.
Hab. Chili.

stramineus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 96: Uhler, List, p. 21.
Hab. Nova Scotia.

stramineus (*Capsus*), Walker, *l. c.*, p. 120 (*n. b. l.*).
Hab. N. Bengal.

strigulatus (*Capsus*), Walker, *l. c.*, p. 94: Uhler, List, p. 21.
Hab. Canada.

subirroratus (*Capsus*), Walker, *l. c.*, p. 119.
Hab. Ceylon.

suffusus (*Capsus*), Walker, *l. c.*, p. 117.
Hab. Cape of Good Hope.

tabescens (*Eurymerocoris*), Stål, Ofvers. Vet.-Aka. Förh., 1858, p. 317; Hem. Afric., iii, p. 22: Walk., Cat. Het., vi, p. 159.
Hab. S. Africa, Svakop river.

tagalicus (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 258: Walk., Cat. Het., vi, p. 123.
Hab. Manilla.

taiticus (*Capsus*), Stål, *l. c.*, p. 257: Walk., Cat. Het., vi, p. 127.
Hab. Tahiti.

thoracatus (*Capsus*), Stål, Ofvers. Vet.-Aka. Handl., 1855, p. 18[illegible]6.
Hab. Java.

tristis (*Capsus*), Walker, Cat. Het., vi, 1873, p. 125.
Hab. New Guinea.

tristis (*Phytocoris*), Blanchard, Gay's Hist. Fis. Chili, vii, 1852, p. 187, [illegible]6: Sign. Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 573: Walker, Cat. Het., vi, p. 108.
Hab. Chili.

ustulatus (*Capsus*), Walker, Cat. Het., vi, 1873, p. 128.
Hab. New Zealand.

vicarius (*Capsus*), Walker, *l. c.*, p. 121.
Hab. Siam.

vicinus (*Phytocoris*), Blanchard, Gay's Hist. Fis. Chili, vii, 1852, p. 186, 4: Sign., Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 573: Walker, Cat. Het., vi, p. 108.
Hab. Chili.

viridanus (*Deracocoris*), Motsch., Bull. Mosc., xxxvi (3), 1863, p. 83.
Hab. Ceylon.

viridipunctatus (*Eurymerocoris*), Stål, Ofvers. Vet.-Aka. Forh., 1858, p. 317; Hem. Afric., iii, p. 23: Walk., Cat. Het., vi, p. 159.
Hab. S. Africa, Svakop river.

volgensis (*Capsus*), Becker, Bull. Mosc., xxxvii (i), 1865, p. 488: Walker, Cat. Het., vi, p. 90.
Hab. S. Russia, Sarepta.

Waltlii (*Capsus*), Herr. Schäff., Nom. Ent., 1835, p. 52.
Hab. Germany.

Whitei (*Phytocoris?*), Wollaston, Ann. Mag. N. H., (3 s.) i, 1858, p. 124: Walker, Cat. Het., vi, p. 159.
Hab. Madeira.

Div. VII, **PILOPHORARIA**, Reuter, Hem. Gymn. Eur. iii, 1883, p. 566.

Genus **PILOPHORUS.**

Hahn, Ic. Mon. Cim., i, 1826, 23: Reut., Bih. Vet.-Aka. Handl., iii (i). p. 22; Rev. Caps., p. 100.
Camaronotus, Fieber, Crit. Gen., 1859, 79, t. 6, f. 28; Eur. Hem., p. 74, 313: Dougl. & Scott, Brit. Hem., p. 358.

amoenus, Uhler, Ent. Am., iii, 1887, p. 30.
Hab. N. America.

angustulus, Reuter, Rev. d' Ent., vii, 1888, p. 227.
Hab. Morea.

cinnamopterus (*Leptomerocoris*), Wiesenbaum, Rhyn. Wiesb., 1855, p. 232 sp. 81, p. 276, 259: Flor, Rhyn. Liv., i, p. 572; Fieber (*Camaronotus*), Crit. Phyt., 1859, p. 34; *id.*, Eur. Hem., p. 314: Dougl. & Scott, Brit. Hem., p. 359: Walker, Cat. Het., vi, p. 76, 87: Saund., Syn., p. 287, pt.: Reuter, Ent. Mon. Mag., xiv, 1878, p. 244; Rev. Syn. Het., p. 290.
bifasciatus, Fabr., Syst. Ent., 1775, p. 725 (*nom-praeoc*); Syst. Rhyn. p. 241: Latreille, Hist. Nat., xii, p 230: Zett., Fauna Lapp., p. 497; *id.*, Ins. Lapp., p. 277: Westwood (*Pilophorus*), Intr Mod. Class. Ins., ii. p. 121, ?: Reuter, Caps. Syn., p. 24; Rev. Caps., p. 101; Berlin. Ent. Zeits., xxv, 1881, p. 177, pt.: Puton, Bull. Soc. Ent Fr., (5 s.), vii, 1877 p. cxxx: Uhler, List, p. 20.
confusus, Thomson, Opusc. Ent., iv, 1871, p. 442, pt. (*nec* Kirschb.).
Hab. Nearly all Europe; N. America [*Atk.*, Switzerland].

clavatus (*Cimex*), Linn., Syst. Nat. (*ed.* 12), 1767, p. 729: Gmelin, Syst. Nat., iv, 1788, p. 2163, ?: Zett., Ins. Lapp., p. 278: Westwood, Introd. Mod. Class. Ins., ii, p. 121: Meyer, Rhyn. Schw., p. 87, pt: F. Sahlb., Geoc. Fenn., p. 91: Kirschb., Rhyn. Wiesb., p. 232, sp. 80, p. 297: Flor, Rhyn. Liv., i, p. 569: Fieber, Crit., Phyt., 1859, 34; *id.*, Eur. Hem., p. 314: Dougl. & Scott, Brit. Hem., p. 360, t. 12, f. 8: Ent. Mon. Mag., xii, p. 100: Walk., Cat. Het., vi, p. 86: Saund., Syn., p. 286: Reuter, Caps. Syn., p. 24; Rev. Caps., p. 102, pt; Ent. Mon. Mag., xiv, 1878, p. 245; Rev. Syn. Het., p. 290, 395.

bifasciatus, Schrank, Fauna Boica, 1801, p. 86 (*nec* Fabr.); Fallen, Mon. Cim., p. 99; *id.*, Faun. Suec., p. 118: Hahn, (*Pilophorus*), Icon. Cim., 1826, f. 22: Zett., Faun. Lapp., p. 498: Walk., Cat. Het., vi, p. 76.

? *trilineatus*, Müller, Zool. Dan., 1776, p. 106.

Hab. All Europe [*Atk.*, Dunkirk].

confusus, Kirschbaum, Rhyn. Wiesb., 1855, p. 232, sp. 79; p. 293, sp. 9: Flor, Rhyn. Liv., i, p. 573: Fieber (*Camaronotus*), Eur. Hem., p. 314: Walk., Cat. Het., vi, p. 87: J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 27: Duda, Wien Ent. Zeit., v, 1886, p. 113: Uhler, List, p. 20: Reuter, Rev. Caps., p. 102; Ent. Mon. Mag., xiv, 1878, p. 245; *id.*, Rev. Syn. Het., p. 291, note; Rev. d' Ent. v, 1886, p. 121.

clavatus, Herr. Schäff, Wanz. Ins., iii, 1835, p. 47, t. 87, f. 264 (*nec* Linn.).

var. *nitidicollis*, Puton, Rev. d' Ent. vi, 1887, p. 103.

Hab. Nearly all Europe, Turkistan, N. America [*Atk.*, Dunkirk].

fraternus, Uhler, Lintner, Rep. Ins. New York., 1885, p. 186.

Hab. New York.

perplexus, Scott, Ent. Mon. Mag., xii, 1875, p. 101: Reuter, Ent. Mon. Mag., xiv, 1878, p. 244; Rev. d' Ent., v, 1886, p. 121.

clavatus (*Phytocoris*), Burm., Handb. Ent., ii (i), 1835, p. 267 (*nec* Linn): Meyer, Rhyn. Schw, p. 87, pt: F. Sahlb., Geoc. Fenn., p. 91.

Hab. Nearly all Europe.

pusillus, Reuter, Ent. Mon. Mag., xiv, 1878, p. 245.

? *clavatus*, Costa, Cim. Regn. Neap., iii, 1852: (*nec* Linn.).

Hab. France, Germany, Spain, Italy, Greece.

sinuaticollis, Reuter, Ofvers. Finska Soc. Förh., xxii, 1879, p. 202; Fedtsch. Turk., p. 14.

Hab. Turkistan.

Walshii, Uhler, Ent. Am., iii, 1887, p. 30; List, p. 20.

Hab. N. America.

Genus **PAMILLIA.**

Uhler, Ent. Am., iii, 1887, p. 31.

Behrensii, Uhler, *l. c.*, p. 31.

Hab. N. America, San Francisco.

Genus **MIMOCORIS.**

Scott, Ent. Mon. Mag., viii, 1872, p. 195: Walk., Cat. Het., vi, p. 87: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 23.

coarctatus, Muls. & Rey, Ann Soc. Linn. Lyon, 1852.

camaranotoides, Dougl. & Scott, Ent. Mon. Mag., viii, 1872, p. 195: Walk. Cat. Het., vi, p. 87.

rugicollis, Costa, Cim. Regn. Neap. Cent., iii, 1852.

Hab. S. France, Italy, Algeria [*Atk.*, Pyrenees].

Scottii, Berg, Hem. Arg., Add. Emend., 1884, p. 86.
Hab. Buenos Ayres.

Genus **SERICOPHANES.**

Reuter, Caps. Amer., 1875, p. 79.

ocellatus, Reuter, *l. c.*, p. 79: Uhler, List, p. 19.
Hab. Texas.

Genus **MYRMECOMIMUS.**

Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 178; *id.*, Zool. Jahr., Arthr., 1881, p. 247.
Myrmicomimus, Reuter, *l. c. supra.*

paederoides, Costa, Atti Acad. Sc. Napoli, (2 s.) i, 1884, p. 64; *id.*, Bull. Soc. Ent. Ital., xvii, 1885, p. 251.
Hab. Sardinia.

variegatus (*Globiceps*), Costa, Cim. Regn. Neap., Cent. ii, 1847, p. 193, f. 10, in, Atti del Reale Inst. Napoli: Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 178.
Hab. Italy.

Genus **CREMNOCEPHALUS.**

Fieber, Eur. Hem., 1861, p. 63, 246: Walk., Cat. Het., vi, p. 52: Reuter, Rev. Caps., p. 124.
Cremnodes, Fieb., Crit. Gen. Phyt., 1859, 14, t. 6, f. 27.

albolineatus, Reuter, Verh. Zool. Bot. Ges. Wien, 1875, p. 87; Rev. Syn. Het., p. 292.
umbratilis, Fabr., Mant. Ins., 1787, p. 305 (*nec* Linn.); Syst. Rhyng., p. 243: Fallen, Mon. Cim., p. 101; *id.*, Hem. Suec., p 121: Herr. Schäff., Wanz. Ins., iii, 1835, p. 49, t 87, f. 266: Meyer, Rhyn. Schw., p. 58: F. Sahlb., Geoc. Fenn., p. 98: Fieber (*Cremnocephalus*), Eur. Hem., p. 246: Thoms., Opusc. Ent., iv, 1871, p. 442: Walk., Cat. Het., vi, p. 52: Reuter, Rev. Caps., p. 124.
Hab. Europe, especially W. Europe [*Atk.*, Hungary].

Genus **MYRMECOPEPLUS.**

Berg, Hem. Arg. Add. Emend., 1884, p. 84.

ornatus (*Monalonion*), Berg, Hem. Arg., 1879, p. 129; Add. Emend., 1884, p. 85.
Hab. Buenos Ayres.

Genus **MYRMECOZELOTES.**

Berg, Hem. Arg. Add. Emend., 1884, p. 87.

Lynchii, Berg, *l. c.*, p. 88.
Hab. Buenos Ayres.

Genus **SYSTELLONOTUS.**

Fieber, Crit. Gen. Phyt., 1859, 92, t. 6, f. 29; Eur. Hem., p. 77, 323: Rent., Bih Vet.-Aka. Handl., iii (i), 1875, p. 26; *id.*, Rev. Caps., p. 120.

? **albofasciatus** (*Phytocoris*), Lucas, Expl. Scient. Alg., iii, 1849, Hem., p. 83, t. 3, f. 6.
See also under *Phytocoris*.
Hab. Algeria, ? Tunis.

alpinus, Frey-Gessner, MT. Schw. Ent. Ges., iv, 1872, p. 21, t. 1, f. 3.
Hab. France, Spain, Switzerland.

Bruckii (*Fieber*), Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 181.
Hab. E. Algeria.

Miscelii, Ferrari, Ann. Mus. Civ Gen. (2 s.), i, 1884, p 482: Rev. d' Ent., v, 1886, p. 121.
albofasciatus, Ferrari, Ann. Mus. Civ. Gen., (2 s) i, 1884, p. 282 (*nec* Lucas).
Hab. Algeria, Tunis.

thymi, Signoret, Nouv. guide Amat. Ins., 1859, p. 49; Ann. Soc. Ent. Fr., (5 s.) v, 1865, p. 125: Walk., Cat. Het., vi, p. 66.
Hab. France.

triguttatus (*Cimex*), Linn., Syst. Nat., (*ed.* 12), 1767, p. 729: Latreille, Hist. Nat., xii, 1804, p. 227 (*nec* Fabr.): Fallen, Mon. Cim., p. 101; Hem. Suec., p. 121: Hahn, Wanz. Ins., ii, p. 99, t. 60, f. 183, Westw., Introd. Mod. Class. Ins., ii, p. 121: Meyer, Rhyn. Schw., p. 90: F. Sahlb., Geoc. Fenn., p. 92: Kirschb., Rhyn. Wiesb., p. 211, sp. 40, p. 270: Fieber (*Systellonotus*), Crit., 38; *id.*, Eur. Hem., p. 324: Flor, Rhyn. Liv., i, p. 480: Dougl. & Scott, Brit. Hem., p. 370, t. 12, f. 2, 2a: Thomson, Opusc. Ent., iv, 1871, p. 86: Walk., Cat. Het., vi, p. 65: Saund., Syn., p. 283: Reuter, Rev. Caps. p. 121: *id.*, Rev. Syn. Het., p. 291.
Hab. All Europe [*Atk.*, Stazzano].

unifasciatus (Fieber), Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 182.
Hab. Algeria.

venustissimus, Costa, Rend. Acc. Nap. (2 s.), i, 1887, p. 244.
Hab. Italy, Abruzzi.

Genus **CYRTOPELTOCORIS.**

Reuter, Caps. Amer., 1875, p. 81.

albofasciatus, Reuter, *l. c.*, p. 81: Uhler, List, p. 19.
Hab. Texas.

Genus **LAEMOCORIS.**

Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 183; Zool. Jahr., 1879, p. 509: Jakowleff, Bull. Mosc., lvi (4), 1882, p. 364.

Reuterii (Jakowleff), Reuter, *l. c.*, p. 184.
Reitteri, Jakowleff, Bull. Mosc., lvi (4), 1882, p. 365.
Hab. S. Russia.

Genus **PLAGIORHAMMA**.

Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1870, p. 250, t. 6: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 26.

pilosa, Reuter, Ofvers. Finska Soc. Förh., xxv, 1860, p. 31.
Hab. Addah, W. Africa.

suturalis, Herr. Schäff., Wanz. Ins., iv, 1839, p. 32, t. 120, f. 383 (*form brach.*), ♀: Fieber, Verh. Zool. Bot. Ges. Wien., xx, 1870, p. 251: Walker, Cat. Het., vi, p. 64: Ferrari, Ann. Mus. Civ. Gen., vi, 1874, p. 184, ♀.
saxicola, Costa, *teste* Puton, Rev. d' Ent., ii, p. 287.
Hab. Hungary, Italy.

Genus **EROTICORIS**.

Dougl. & Scott, Brit. Hem., 1865, p. 471: Walker, Cat. Het., vi, p. 60: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 27; Rev. Caps., p. 122.
Allodapus, Fieber, Eur. Hem., 1861, p. 262 (*nom-praeoc*).
Hallodapus, Fieber, *l. c.*, p. 66.
? *Omphalonotus*, Reuter, Pet. Nouv. Ent., ii, No. 145, 1876, p. 27.

albiceps, Lethierry, Ann. Soc. Ent. Belg., xxv, 1881, p. 12.
Hab. Guadeloupe.

quadriguttatus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 205, sp. 29; p. 286, sp. 5: Reuter, Pet. Nouv. Ent., ii, 1876, p. 27.
Hab. Germany.

rufescens (*Halticus*), Burm., Handb. Ent., ii (i), 1835, p. 278: Flor, Rhyn. Liv., i, p. 543: Scott, Ent. Ann., 1864, p. 161, t. 1, f. 4, ♂ (*form brach.*): Dougl. & Scott, Brit. Hem., p. 472, t. 14, f. 6, ♀ (*form brach.*): Saund., Syn., p. 281: Reuter, Pet. Nouv. Ent., 1876, p. 26; Rev. Caps., p. 123.
brachypterus (*Capsus*), Bohem., Vet.-Aka. Handl., 1849, p. 254: Kirschb., Rhyn. Wiesb., p. 231, sp. 78, p. 275.
coryzoides, Herr. Schäff., Wanz. Ins., iv, 1838, p. 35, t. 121, f. 387, ♀: Fieber (*Allodapus*), Eur. Hem., p. 262: Walk., Cat. Het., vi, p. 60.
Hab. Scandinavia, Russia, Germany, Switzerland, Britain.

Genus **TRICHIA**.

Reuter, Caps. Amer., 1875, p. 81.

punctulata, Reuter, *l. c.*, p. 82: Uhler, List, p. 20.
Hab. Texas.

Genus **ETHELASTIA**.

Reuter, Pet. Nouv., Ent., ii, No. 147, 1876, p. 34.

inconspicua (Jakowleff), Reuter, *l. c.*, p. 34.
Hab. S. Russia.

Div. VIII, **DIPLACARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 564.

Genus **DIPLACUS**.

Stål, Stettin. Ent. Zeit., xix, 1858, p. 183: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 25; *id.*, Rev. Caps., p. 116: Walker, Cat. Het., vi, p. 838.

Myrmecophyes, Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1870, p. 253, t. 6, f. 10.

alboornatus, Stål, Stettin. Ent. Zeit., xix, 1858, p. 183, t. 1, f. 3 (*form. macr.*): J. Sahlb., Notis. Skpts Faun. Fl. Fenn, xi, 1871, p. 465 (*form. brach.*): Walker, Cat. Het., vi, p. 138: Reuter, Caps. Syn., 1875, p. 4; Rev. Caps., p. 116: J. Sahlb., Vet.-Aka. Handl., xvi, (4), 1878, p. 28: Jakowleff, Rev. Mens. d' Ent., i, p. 111.

? *bimaculatus*, Motsch., see also under *Myrmecoris*, p. 31.

Oschanini, Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1870, p. 253, t. 6, f. 10, (*form brach.*): Walk., Cat. Het., vi, p. 138.

tricondyloides (*Myrmecophyes*), Osch., Bull. Mosc., xliii (i), 1870, p. 131 (*form. brach.*).

Hab. Siberia, Irkutsk, Russia.

limbatus, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 172; Fedtsch. Turk, p. 19.

Hab. Turkistan.

nigripes, Reuter, *l. c.*, p. 172; Fedtsch. Turk., p. 18.

Hab. Turkistan.

Div. IX, **LABOPARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 567.

Genus **HALTICUS**.

Hahn, Wanz. Ins., i, 1831, p. 112, t. 18, f. *a-d*: Burm., Handb. Ent., ii (i), 1835, p. 278: Fieb. Eur. Hem., p. 69, 281: Walker, Cat. Het., vi, p. 154: Reuter, Rev. Caps., p. 105.

Astemma, pt. Amyot & Serv., Hist. Nat. Ins. Hém., 1843, p. 284.

Halticocoris, Dougl. & Scott, Brit. Hem., 1865, p. 478.

apterus (*Cicada*), Linn., Faun Suec., 1761, p. 894: Brullé, Hist. Ins., 1835, p. 410, t. 33, f. 6: Am. & Serv., Ins. Hém., p. 284: Costa, Cim. Regn. Neap., Cent. iii, p. 53: Thomson, Opusc. Ent., iv, 1871, p. 441: Saund., Syn, p. 287: Reuter, Abo Hem., p. 170; Rev. Caps., p. 106; Fedtsch. Turk., p. 17; Rev. Syn. Het., p. 286.

pallicornis (*Acanthia*), Fabr., Ent. Syst., iv, 1794, p. 69; *id.*, (*Salda*), Syst. Rhyng., p. 115: Wolff, Ic. Cim., 1804, p. 128, t. 13, f. 122: Fallen (*Lygaeus*), Mon. Cim., p. 95; *id.*, Hem. Suec., p. 113: Hahn (*Halticus*), Wanz. Ins., i, p. 114, t. 18, f. 61: Burm., Handb. Ent. ii (i), 1835, p. 278: Am. & Serv. (*Astemma*), Ins. Hém., p. 284: Meyer (*Capsus*), Rhyn. Schw., p. 110: Kolenati (*Eurycephala*), Mel. Ent., ii, p. 130: F. Sahlb., Geoc. Fenn., p. 118: Kirschbaum (*Eurymerocoris*), Rhyn. Wiesb., p. 262, 280, sp. 151: Fieber, Crit. 24; *id.*, Eur. Hem., p. 282: Dougl. & Scott (*Halticocoris*), Brit. Hem., p. 479; Walk., Cat. Het., vi, p 129: Uhler, Proc. Bost. Soc. N. H., xix. 1878, p. 411.

pallidicornis, Herr. Schäff., Nomencl. Ent., i, 1835, p. 53: Flor, Rhyn. Liv., i, p. 583: Fieber, Wien. Ent. Monats., viii, 1864, p. 221.

Hab. All Europe; Turkistan, United States [*Atk.* Lille, Genoa, Hungary].

bicolor, Mulsant & Rey. Ann. Soc. Linn. Lyon, 1852: Puton, Cat., 1886, p. 53.

Hab. France, Spain.

bracteatus (*Capsus*), Say; Uhler, List, p. 20.
Hab. United States.

consimilis, Jakowleff, Trudi Russki Ent., x, 1876-77, p. 94.
Hab. N. Persia, S. Russia.

Henschii, Reuter, Rev. d' Ent., viii, 1888, p. 58.
Hab. Illyria.

luteicollis (*Lygaeus*), Panzer, Faun. Germ., 1805, 93, f. 18, Lepel. & Serv., Enc. Méth., x, p. 324: Lap. (*Miris*), Ess. Class. Syst., 1832, p. 40: Herr. Schäff., Nomencl. Ent., i, p. 53: Fieb., Eur. Hem., p. 281: Dougl. & Scott, Brit. Hem., p. 480, t. 21, f. 1; Saund., Syn., p. 287: Walk., Cat. Het., vi, p. 129: Reuter, Rev. Caps., p. 107; Rev. Syn. Het., p. 287.
bicolor, Germar, Faun. Ins. Eur., v, 1819, p. 22.
ochrocephalus, Fieb., Beitr., 1836, p. 105, f. 4: Crit. Gen. Phyt., 1859, g. 24.
var. *propinquus*, Herr. Schäff., Wanz. Ins., vi, 1842, p. 47, t. 196, f. 606: Costa, Cim. Regn. Neap., Cent. iii, 1852, p. 53: Kirschb., Rhyn. Wiesb., p. 260, sp. 147.
Hab. S. & Middle Europe [*Atk.*, Lille, Stazzano].

macrocephalus, Fieber, Crit. sp., 1859, 12; Eur. Hem., p. 282: Wien. Ent. Monats., viii, 1864, p. 221: Walk., Cat. Het., vi, p. 129.
Hab. Corsica.

minutus, Reuter, Ent. Tijds., v, 1884, p. 197.
Hab. Singapur.

puncticollis, Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1870. p. 261: Walk., Cat. Het., vi, p. 129.
Hab. Montenegro.

pusillus (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 53: Rent., Abo Hem., p. 170; Rev. Caps., p. 107.
arenarius, (*Attus*), Hahn, Wanz. Ins., iii, 1835, p. 34, t. 84, f. 255: Kirschb., Rhyn. Wiesb., p. 261, sp. 148, p. 280.
intricatus, Fieb., Wien. Ent. Monats., viii, 1864, p. 220: Walk., Cat. Het., vi, p. 130.
Hab. Scandinavia, Germany, Austria.

saltator (*Cimex*), Geoffr., Fourcr. Ent. Par., 1785, p. 218: Rossi, Mant. Ins., ii, 1794, p. 56: Reuter, Rev. Syn. Het., p. 287.
erythrocephalus, Herr. Schäff., Nomencl. Ent., i, 1835, p. 53: Kirschb., Rhyn. Wiesb., p. 262, sp. 152: Fieber, Eur. Hem., p. 281: Walk., Cat. Het., vi, p. 129: Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 179.
leucocephalus, Goeze, Ent. Beytr., ii, 1778 (*nec* Linn.), p. 205.
mercurialis (*Astemma*), Guérin, Icon. Regne Anim., Texte, iii, p. 348; Icon., ii, 1834, t. 56, f. 7.
Hab. France, Spain, Italy, Germany.

Spegazzinii, Berg, Hem. Arg. Add. Emend., 1884, p. 91.
Hab. Buenos Ayres.

Genus **CORIDROMIUS**.

Signoret, Bull. Soc. Ent. Fr. (4 s), ii, 1862, p. v.
Ocypus, Montrouzier, *l. c.*, Ann., i, 1861, p. 67 (*nom. praeoc.*).

variegatus (*Ocypus*), Montrouzier, *l. c.*, p. 67: Walk., Cat. Het., vi, p. 145.
Hab. New Caledonia.

Genus **STRONGYLOCORIS**.

Costa, Cim. Reg. Neap., iii, 1852, p. 263.
Stiphrosoma, Fieber, Crit. Gen. Phyt., 1859, g. 46, t. 6, f. 12: Dougl. & Scott, Brit. Hem., p. 481: Eur. Hem., p. 69, 280: Walk., Cat. Het., vi, p. 133: Reuter, Rev. Caps., p. 103.

amabilis, Dougl. & Scott, Ent. Mon. Mag., iv, 1868, p. 136: Walk., Cat. Het., vi, p. 134.
Hab. Syria.

cicadifrons, Costa, Cent. Cim. Regn. Neap., iii, 1852, p. 263: Reut., Rev. Syn. Het., p. 286.
? *leucocephalus*, Coq., Ill. Ic. Ins., ii, 1801, p. 83, t. 19, f. 9 (*nec* Linn.).
Hab. Italy, S. France, Spain.

erythroleptus, Costa, Cim. Regn. Neap. Cent., iii, 1852, p. 264.
Hab. S. France, Italy [*Atk.*, Genoa].

leucocephalus (*Cimex*), Linn., Syst. Nat. (*ed.* 10), 1758, p. 446: De Geer, Mém., iii, p. 290: Fabr., Syst. Ent., p. 724, ?; *id.*, Ent. Syst., iv, p. 175; Syst. Rhyng., p. 237: Coq. Ill. Ic., 1801, p. 83, t. 19, f. 9?: Wolff (*Lygaeus*), Ic. Cim., ii, p. 76, t. 13, f. 73: Panzer, Fauna Germ., 92, 1804, f. 12: Fallen, Mon. Cim., p. 94; *id.*, Hem. Suec., p. 111: Zett. (*Phytocoris*), Faun. Lapp., p. 495; *id.*, Ins. Lapp., p. 276: Hahn, Wanz. Ins., ii, p. 88, t. 57, f. 174: Burm. (*Attus*), Handb. Ent., ii (i), p. 276: Blanchard (*Strongylocoris*), Hist. Ins., 1840, p. 140: Meyer (*Capsus*), Rhyn. Schw., p. 109: F. Sahlb., Geoc. Fenn., p. 117: Costa, Cim. Regn. Neap., Cent. iii, p. 48: Kirschb., Rhyn. Wiesb., p. 246, sp. 114: Flor, Rhyn. Liv., i, p. 558: Fieber (*Stiphrosoma*), Crit., 24; *id.*, Eur. Hem., p. 281: Dougl. & Scott, Brit. Hem., p. 482, t. 21, f. 2: Stål, Hem. Fabr., i, p. 88: Thomson, Opusc. Ent., iv, p. 433: Walk., Cat. Het., vi, p. 133: Saund., Syn., p. 288: Reuter, Rev. Caps., p. 104; Ent. Mon. Mag., xvi, p. 12; *id.*, Rev. Syn. Het., p. 284.
decrepitus, Fabr., Ent. Syst., iv, 1794, p. 125; Syst. Rhyng., p. 254: Latreille, Turton.
var. *steganoides*, J. Sahlb., Notis Skpts pro Faun. Flor. Fenn., xiv, 1875, p. 306: Reuter, Rev. Caps., p. 104.
Hab. All Europe [*Atk.*, Austria].

luridus (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 112: Herr. Schäff., Wanz. Ins., iii, 1835, p. 87, t. 101, f. 312: Flor, Rhyn. Liv., i, p. 559: Thomson, Opusc. Ent, iv, p. 433: Fieber, Eur. Hem., p. 281: Walk., Cat. Het., vi, p. 134: Saund., Syn. p. 288: Reuter, Rev. Caps., p. 105.
Hab. Nearly all Europe.

niger (*Capsus*), Herr. Schäff., Nomencl. Ent., i, 1835, p. 53.

atrocaeruleus, Fieber, Wien. Ent. Monats., viii, 1864, p. 329: Walk., Cat. Het., vi, p. 134.
Hab. S. Europe.

nigerrimus (*Capsus*), Herr. Schäff., Wanz. Ins., iii, 1835, p. 87, t. 101, f. 311: Fieber, Eur. Hem., p. 392: Walk., Cat. Het., vi, p. 134.
Hab. Germany, France, Italy.

nigritarsis, Costa, Cim. Regn. Neap. Cent. iii, 1852.
Hab. Italy.

obesus (*Capsus*), Perris, Ann. Soc. Linn. Lyon, iv, 1857, p. 165.
lividus, Fieber, Crit. Phyt., 1859, sp. 11; Eur. Hem., p. 281: Walk., Cat. Het., vi, p. 134.
var.? *obscurus*, Rambur Faun. Andal., 1842.
Hab. Scandinavia, France, Germany, Russia.

stygicus (*Capsus*), Say: Uhler, List, p. 20.
Hab. United States.

Genus **TENTHECORIS**.

Scott, Ent. Mon. Mag., xxiii, 1886, p. 65.

bicolor, Scott, *l. c.*, p. 65.
Hab. Conservatories, ? W. Indies.

Genus **PIEZOCRANUM**.

Horvath Termes. Füz., 1877, p. 92.

simulans, Horvath, *l. c.*, p. 93.
Hab. Hungary.

Genus **PLATYPSALLUS**.

J. Sahlberg, Not. Skpts. pro Faun. Flor. Fenn. xiv, 1870, p. 308: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 24; Rev. Caps., p. 108.

acanthioides, J. Sahlb., *l. c.*, *supra*, p. 308: Vet.-Aka. Handl., xvi (4), 1878, p. 27: Reuter, Rev. Caps., p. 108, t. 1, f. 15, 15*a*.
Hab. Russian Lapland.

Genus **LABOPS**.

Burm., Handb. Ent., ii (i), 1835, p. 279: Walk. Cat. Het., vi, p. 137 pt: Fieber, Eur. Hem., p. 71, 294, pt: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 24, pt; Rev. Caps., p. 113, pt.

Anapus, Stål, Stettin. Ent. Zeit., xix, 1858, p. 188: Walk., *l. c.*, *supra*, p. 47, 160.

Merotrichaea, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 24.

Orthocephalus, Fieber, Crit. Gen. Phyt., 1859, 60, t. 6, f. 16; Eur. Hem., p. 71, 291: Dougl. & Scott, Brit. Hem., p. 129: Reuter, Rev. Caps., p. 109.

subg. *Euryopicoris*, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 24; Rev. Caps., p. 115.
" *Labops*, Burmeister, Handb. Ent., ii (i), 1835, p. 279: Walk., *l. c., supra*, p. 137: Reuter, *l. c., supra*, p. 24.
" *Ophthalmocoris*, Zett., Ins. Lap., 1840, p. 280.
" *Pachytoma*, Costa, Ann. Soc. Ent. Fr., 1841, x, p. 288: Walk., *l. c., supra* p. 135.

alutaceus, Puton, Ann. Soc. Ent. Fr., (5 s.) iv, 1874, p. 218.
Hab. Spain.

arenarius (*Pachytoma*), Horvath, Termes. Füz., viii, 1884, p. 14.
Hab. Hungary.

bilineatus, Jakowleff, Bull. Mosc., xlix (3), 1875, p. 169.
Hab. S. Russia.

bivittatus, Fieber, Wien. Ent. Monats., viii, 1864, p. 221: Walk., Cat. Het., vi, p. 137: Horvath, Term. Füz., v, p. 229 (*form macr.*).
Hab. Germany, France, Russia.

brevipennis, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 203; Fedtsch. Turk., p. 18.
Hab. Turkistan.

brevis (*Cimex*), Panzer, Fauna Germ., lix, 1798, f. 8: Fieber, Crit. Phyt., 1859, 28: Kirschb., Rhyn. Wiesb., p. 244, sp. 109: Flor, Rhyn. Liv., i, p. 563; Walk., Cat. Het., vi, p. 137: Reuter, Rev. Caps., p. 110; *id.*, Berlin. Ent. Zeits., xxv, 1881, p. 179; Rev. Syn. Het., p. 288.
? *cinereo-nigricans*, Goeze, Ent. Beytr., ii, 1778, p. 276.
confinis, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 35, ♂.
Panzeri, Fieber, Eur. Hem., 1861, p. 294.
Hab. Scandinavia, Russia, Germany, France, Tunis [*Atk.*, Wallachia].

Bolivarii, Reuter, Ofvers. Finska Soc. Förh., xxxii, 1880, p. 19.
Hab. Spain.

Burmeisterii, Stål, Stettin Ent. Zeit., xix, 1858, p. 189, ♀: J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 28: Walk., Cat. Het., vi, p. 137.
Hab. Siberia, Kamtschatka.

coracinus, Puton, Ann. Soc. Ent. Fr., (5 s.) iv, 1874, p. 217, f. 6, 7.
Hab. Basin of Mediterranean.

coriaceus (*Acanthia*), Fabr., Gen. Ins., 1776, p. 299: (*Salda*), Syst. Rhyng., p. 115: Stål, Hem. Fabr., i, p. 88: Thomson, Opusc. Ent., iv, p. 94: Walk., Cat. Het., vi, p. 137: Saund., Syn., p. 289: Reuter, Hem. Gymn., Scan. & Fenn., p. 110., *id.*, Rev. Syn. Het., p. 288.
grylloides, Goeze, Ent. Beytr., ii, 1778, p. 187.
mutabilis, Fallen, Mon. Cim., 1807, p. 98; *id.*, Hem. Suec., p. 118: Burm. Handb. Ent., ii (i), p. 277?: Kirschb., Rhyn. Wiesb., p. 243, sp. 107, p. 278: Fieber, Eur. Hem., p. 293: Dougl. & Scott, Brit. Hem., p. 430: Walk., Cat. Het., vi, p. 137.
pilosus, Hahn, Wanz. Ins., ii, 1831, p. 96, t. 59, f. 181: Herr. Schaff., Nome-

nel. Ent., i, p. 52: Meyer, Rhyn. Schw., p. 59: Flor, Rhyn. Liv., i, p. 564.

Hab. Nearly all Europe [*Atk.*, Lille].

debilis, Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 20.

Hab. Basin of Mediterranean.

Doriae, Ferrari & Reuter, Ann. Mus. Civ. Gen., (2 s.) i, 1884, p. 480.

Hab. Tunis.

flavomarginatus, Costa, Ann. Soc. Ent. Fr., x, 1841, p. 286, t. 6, f. 3*a*: Cim. Regn. Neap. Cent., iii, 1852, p. 278, t. 3, f. 3, 4: Reuter, Berl. Ent. Zeits., xxv, 1881, p. 180, pt.

Hab. Italy.

Freyii, Fieber, Wien. Ent. Monats., viii, 1864, p. 223: Walk., Cat. Het., vi, p. 137; Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 180.

Jakowleffi, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 36, (*form. macr*).

Hab. S. Russia.

funestus (*Orthocephalus*), Jakowleff, Bull. Mosc., lvi (i), 1881, p. 195.

Hab. Russia, Vladivostock.

hesperius, Uhler, Hayden Surv. Mont., 1872, p. 416; Bull. Un. St. Surv., ii, 1876, p. 319; iii, 1877, p. 417; List, p. 20.

Hab. British America, Colorado.

Kirschbaumii, Stål, Stettin. Ent. Zeit., xix, 1858, p. 180, t. 1, f. 2*a*, *b*: Walk., Cat. Het., vi, p. 160.

opacus, Jakowleff, Bull. Mosc., xlix (3), 1875, p. 170.

Hab. Astrakhan, Sarepta, Bogdo, Siberia.

longicornis (*Anapus*), Jakowleff, Bull. Mosc., lvi (4), 1882, p. 360.

Hab. Russia, Orenburg.

marginellus, Puton, Rev. d' Ent., vi, 1887, p. 306.

Hab. Algeria.

minor, Costa, Ann. Soc. Ent. Fr., X, 1841, p. 289, t. 6, f. 4*a*: Fieb., Eur. Hem., p. 294: Walk., Cat. Het., vi, p. 137.

minutus, Lucas, Expl. Scient. Algerie, iii, 1849, p. 85, t. 3, f. 8.

Passerinii, Costa, Ann. Soc. Ent. Fr., x, 1841, p. 288, ♂.

rugicollis, Lucas, *l. c. supra*, p. 85, t. 3, f. 7.

Hab. S. Europe, Tunis [*Atk.* Genoa].

nebulosus, Fieber, Eur. Hem., 1861, p. 393: Walk., Cat. Het., vi, p. 136.

Hab. Spain.

niger, Reuter, Ofvers. Finska Soc. Förh, xxi, 1879, p. 203; Fedtsch. Turk., p. 17.

Hab. Turkistan.

nigrita, Jakowleff, Bull. Mosc., lvi (4), 1882, p. 360.

Hab. Russia, Orenburg.

nitidus, Meyer, Rhyn. Schw., 1843, p. 113, t. 6, f. 4: Kolenati, Mel. Ent., ii, p. 130: Flor, Rhyn. Liv., i, p. 561: Fieber, Eur. Hem., p. 293: Walk., Cat. Het., vi, p. 136: Reuter (*Eurycoris*), Rev. Caps., p. 115; *id.*, Berlin. Ent. Zeits., xxv, 1881, p. 180: J. Sahlb. Vet.-Aka. Handl., xvi (4), 1878, p. 28.

albonotatus (*Halticus*), Costa, Cim. Regn. Neap., Cent. Addit., 1860, p. 32 t. 3, f. 9.

Hab. France, Switzerland, Hungary, Germany, S. Russia, Scandinavia.

pachymerus, Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 159.

Hab. Spain.

parallelus, Meyer, Rhyn. Schw., 1843, p. 57, t. 6, f. 3: P. N. E., no. 110, 1874, p. 446.

minor, Gredler, Nachlese Wanz. Tirols (*nec* Costa).

Hab. France, Switz., Germany, Spain [*Atk.* Vosges, France].

phoeniceus (*Orthocephalus*), Horvath, Termes. Füz., viii, 1884, p. 14.

Hab. Syria, Kaifa.

punctatipennis, Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 159.

Hab. Dalmatia.

punctigera, Horvath, Term. Füzetek., v, 1881, p. 42.

Hab. Syria.

Putonii, Reuter, Rev. d' Ent., i, 1882, p. 277.

Hab. France.

Reuterii, Jakowleff, Hem. Cauc., 1879, p. 132; *id.*, Bull. Mosc., lvi (4), 1882, p. 134.

Hab. Caucasus, Derbent.

rhyparopus, Fieber, Wien. Ent. Monats., viii, 1864, p. 222: Walk., Cat. Het., vi, p. 137.

Hab. S. Russia.

rugicollis, Jakowleff, Bull. Mosc., lii (2), 1877, p. 292: Reut., Berlin. Ent. Zeits., xxv, 1881, p. 159, note: Chicote, An. Soc. Esp. N. H., ix, 1880, p. 191.

Hab. S. Russia, Sarepta.

Sahlbergii (*Capsus*), Fallen, Hem. Suec., 1829, p. 116: Flor, Rhyn. Liv., i, p. 634: Zett. (*Ophthalmocoris*), Ins. Lapp., p. 280, ♀: F. Sahlb., Geoc. Fenn., p. 118: Thomson, Opusc. Ent., iv, p. 432: Fieb., Eur. Hem., p 294: Walk., Cat. Het., vi, p. 137: Reuter, Rev. Caps., p. 113.

diopsis, Burm., Handb. Ent., ii (i), 1835, p. 279: Herr. Schäff., Wanz. Ins., ix, p. 166, t. 313, f. 961-2.

Hab. Scandinavia, Russia, France.

saltator (*Capsus*), Hahn, Wanz. Ins., iii, 1835, p. 11, t. 76, f. 236: Meyer, Rhyn. Schw., p. 112: Kirschb., Rhyn. Wiesb, p. 243, sp. 108, p. 278: Thoms., Opusc. Ent., iv, p. 432: Fieber, (*Orthocephalus*), Eur. Hem., p. 293: Dougl. & Scott, Brit. Hem., p. 431, t. 14, f. 2 (*form. brach.*): Walk., Cat. Het., vi, p. 136: Saund., Syn., p. 289: Reuter (*Orthops*), Rev. Caps., p. 111; Pet. Nouv. Ent., ii, no. 147, 1876 p. 33.

hirtus, Curtis, Brit. Ent., xv, 1838, t. 693.

infuscatus (*Globiceps*), Garbigl., Bull. Soc. Ent. Ital., i, 1869, p. 190 Walk., Cat. Het., vi, p. 63.

major, Costa, Cim. Regn. Neap. Cent., iii, 1852.

mutabilis, Burm., Handb. Ent., ii (i), 1835, p. 277: Flor, Rhyn. Liv., i, p. 567.

mutabilis, var., Fallen, Hem. Suec., 1829, p. 118.

Hab. N. & Middle Europe [*Atk.*, Lille].

satyriscus, Scott, Stettin. Ent. Zeit., xxxii, 1870, p. 101 : Walk., Cat. Het., vi, p. 54.
Hab. Spain.

Schmidtii, Fieber, Crit., 1870, sp. 15 ; Eur. Hem., p. 292 : Walk., Cat. Het., vi, p. 136.
Hab. S. Germany.

sibiricus, Sahlberg, Vet.-Aka. Handl., xvi (4), 1878, p. 28.
Hab. Siberia.

signatus, Fieber, Eur. Hem., 1861, p. 292 : Walk., Cat. Het., vi, p. 136.
flavomarginatus, Leth. & Puton (*nec* Costa), *teste* Reuter, Berlin. Ent. Zeits., xxix, 1885, p. 47.
? *gracilis*, Rambur, Fauna Andal., 1842.
Hab. France, Spain, Algeria.

stygialis, Muls. & Rey, Ann. Soc. Linn. Lyon, 1852 : Putor, Cat., 1886.
Hab. S. France.

tauricus, (*Pachytoma*), Horvath, Term. Füz., iv, 1880, p. 185.
Hab. S. Russia, Krim.

tenuicornis, Muls. & Rey, Opusc. Ent., i, p. 152, in Ann. Soc. Linn. Lyon, 1852. Horvath, Term. Füz. v, p. 224.
Hab. France, Russia, Syria.

tristis, Fieber, Eur. Hem., 1861, p. 292 : Walk., Cat. Het., vi, p. 136.
Hab. Spain.

vittipennis (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 52 ; *id.*, Wanz. Ins., iii, p. 83, t. 100, f. 305 : Meyer, Rhyn. Schw., p. 56 : F. Sahlb., Geoc. Fenn., p. 120 : Flor, Rhyn. Liv., i, p. 566 : Fieber, Crit. sp. 28 ; *id.*, Eur. Hem., p. 293 : Thomson, Opusc. Ent., iv, 1871, p. 432 : Walk., Cat. Het., vi, p. 136 : Horvath, Termes. Füzet., v, p. 224 : Reuter, Rev. Caps., p. 112 ; *id.*, Rev. Syn. Het., p. 289.
? *hirtus*, Müller, Zool. Dan., 1776, p. 108.
Hab. Scandinavia Russia, Switzerland, Austria.

Genus **BOLTERIA**.

Uhler, Ent. Am., iii, 1887, p. 33.

amicta, Uhler, *l. c.*, p. 34.
Hab. New Mexico.

Genus **SEMIUM**.

Reuter, Caps. Amer., 1875, p. 20.

hirtum, Reuter, *l. c.*, p. 80 : Uhler, List, p. 19.
Hab. Texas.

Genus **LABOPIDEA**.

Uhler, Bull. Un. St. Surv., iii, 1877, p. 415.

chloriza, Uhler, *l. c.*, p. 416 : List, p. 20.
Hab. Utah.

Genus **IRBISIA**.

Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 57; Zool. Jahr., 1879, p. 509.

sericans (*Leptomerocoris*), Stål, Stettin. Ent. Zeit., xix, 1858, p. 188: Walk., Cat. Het., vi, p. 144: Reut., *l. c., supra*.
Hab. Siberia, Sitka.

Genus **DASOSCYTUS**.

Fieber, Wien. Ent. Monats., viii, 1864, p. 84, t. 2, 11.

sordidus, Fieber, *l. c.*, p. 85: Walk., Cat. Het., vi, p. 157.
Hab. Spain.

Genus **PLAGIOTYLUS**.

(Fieber) Scott, Ent. Mon. Mag., x, 1874, p. 272.

maculatus, Scott, *l. c.*, p. 273: Puton, Bull. Soc. Ent. Fr., (5 s.), ix, 1879, p. cx.
Hab. Britain, France.

Genus **HYOIDEA**.

Reuter, Pet. Nouv. Ent., ii, No. 147, 1876, p. 34.

notaticeps, Reuter, *l. c.*, p. 34.
Hab. Russia, Hungary.

EXAERATARIA, Reuter, Hem. Gymn. Eur., iii, 1883, p. 566.

Genus **EXAERETUS**.

Fieber, Wien. Ent. Monats., viii, 1864, p. 81, t. 2, 9: Walk., Cat. Het., vi, p. 70: Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 39: Walk., Cat. Het., vi, p. 69.

Meyeri (*Camptotylus*), Frey Gessner, MT. Schw. Ent. Ges., 1863, p. 119: Fieb., *l. c., supra*, p. 81: Walk., Cat. Het., vi, p. 157.
Hab. S. Russia, Sarepta [*Atk.*, Sarepta, S. Russia].

Genus **CAMPTOTYLUS**.

Fieber, Eur. Hem., 1861, p. 70, 286: Walk., Cat. Het., vi, p. 157: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 32, pt.

Reuterii, Jakowleff, Bull. Mosc., lvi (i), 1881, p. 196.
Hab. S. Russia, Astrakhan, Sarepta.

Yersinii, Muls. & Rey, Ann. Soc. Linn. Lyon, vii, 1856, p. 129: Fieb., Eur. Hem., p. 287: Walk., Cat. Het., vi, p. 157.
Hab. S. France, Spain.

Genus **MEGALOBASIS**.

Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 205; Zool. Jahr., 1879, p. 509; Fedtsch. Turk., p. 23.

bipunctatus, Reuter, Ofvers., *l. c.*, p 205; Fedtsch. Turk., p. 24.
Hab. Turkistan.

Linae, Puton, Bull. Soc. Ent. Fr., (6 s.) i, 1881, p. lxv.
aphidioides, Jakowleff, Bull. Mosc., lvi (i), 1881, p. 190: *teste* Reut., Berlin. Ent. Zeits., xxix, 1885, p. 159.
bipunctatus, var., Puton, MT. Schw. Ent. Ges. vi, 1881, p. 126, *nec* Reuter).
Hab. S. Russia, Caucasus.

Div. XI, **CREMNORRHINARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 567.

Genus **CREMNORRHINUS**.

Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 18: Zool. Jahr., 1880, p. 140.

basalis, Reuter, *l. c.*, p. 19.
Hab. Greece.

Div. XII, **BOOPIDOCORARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 567.

Genus **BOOPIDOCORIS**.

Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 202; Zool. Jahr., 1879, p. 509; Fedtsch. Turk., p. 15.

vitticollis, Reuter, *l. c.*, p. 202; Fedtsch. Turk., p. 16.
Hab. Turkistan.

Div. XIII, **DICYPHARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 408, 566.

Genus **MACROLOPHUS**.

Fieber, Crit. Phyt. Gen., 1859, g. 89, t. 6, f. 25, 32; *id.*, Eur. Hem., p. 76, 321: Reuter, Rev. Caps., p. 125; Hem. Gymn. Eur., iii, p. 435, 559, t. 1, f. 18.

costalis, Fieber, Crit. Phyt., 1859, sp. 41; *id.*, Eur. Hem., p. 322: Walk., Cat. Het., vi, p. 143: Reuter, Hem. Gymn. Eur., iii, p. 436, 563, t. 4, f. 2.
? *melanotoma*, Costa, Cim. Regn. Neap., Cent., iii, 1852, p. 269; Reuter, *l. c.*, *supra*, p. 438, 563.
Hab. Spain, Corsica, Italy, Switzerland, Greece.

glaucescens, Fieber, Crit., 1859, sp. 39; *id.*, Eur. Hem., p. 321: Walk., Cat. Het., vi, p. 143: Reuter, Hem. Gymn. Eur., iii, p. 438, 563.
Hab. Hungary.

nubilus (*Capsus*), Herr. Schäff., in Panzer Fauna Germ., 135, t. 9: Meyer., Rhyn. Schw., p. 89: Fieber (*Macrolophus*), Eur. Hem., p. 322: Dougl. & Scott, Brit. Hem., p. 382, t. 12, f. 6: Walk., Cat. Het., vi, p. 143: Saund., Syn., p. 286: Reuter, Rev. Caps., p. 126; Hem. Gymn. Eur., iii, p. 437, 477, 563, t. 1, f. 18; t. 4, f. 3.
? *pygmaeus*, Rambur, Faun. Andal., 1842, p. 163.
Hab. Scandinavia, N. Europe, Britain, France, Spain, Switzerland, Germany, Austria, Italy [*Atk.*, Genoa].

Genus **CYRTOPELTIS**.

Fieber, Eur. Hem., 1861, p. 76, 323: Reuter, Hem. Gymn. Eur., iii, p. 434, 559, t. 1, f. 17.

chlorogaster (*Capsus*), Berg, Hem. Arg., 1879, p. 290; Add. Emend., 1884, p. 92.
Hab. Uruguay.

geniculata, Fieber, Eur. Hem., 1861, p. 323: Walk., Cat. Het., vi, p. 144: Reuter, Hem. Gymn. Eur., iii, p. 435, t. 4, f. 1.
Hab. Spain, France, Italy, Switzerland, Austria, Tyrol [*Atk.*, Stazzano].

Genus **DICYPHUS**.

Fieber, Crit. Phyt., 1859, 94; *id.*, Eur. Hem., p. 77, 325: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 27; Caps. Amer., p. 82; *id.*, Rev. Caps., p. 126; Hem. Gymn. Eur., iii, p. 411, 599, t. 1, f. 16.
Brachyceraea, Fieber, Crit. Phyt., 1859, g. 93: *id.*, Eur. Hem., p. 77, 324.
Idolocoris, Douglas & Scott, Brit. Hem., 1865, p. 380.

agilis (*Idolocoris*), Uhler, Bull. Un. St. Surv., iii, 1878, p. 425; List, p. 20.
Hab. E. United States, Canada, Colorado.

annulatus (*Gerris*), Wolff, Ic. Cim., iv, 1804, p. 162, t. 16, f. 156: Herr. Schäff. (*Capsus*), Wanz. Ins., iii, p. 52, t. 88, f. 270: Meyer, Rhyn. Schw., p. 80: Kirschb., Rhyn. Wiesb., p. 207, sp. 33, 247: Fieber (*Brachyceraea*), Crit., 39; Eur. Hem., p. 325; Dougl. & Scott (*Idolocoris*), Brit. Hem., p. 376: Walk., Cat. Het., vi, p. 64: Saund. (*Dicyphus*), Syn., p. 284: Reuter, Hem. Gymn. Eur., iii, p. 432, 563, t. 2, f. 7; Rev. Syn. Het., p. 293.
Hab. Nearly all Middle & S. Europe [*Atk.*, Dunkirk].

californicus (*Capsus*), Stål, Freg. Eug. Resa, Hem., 1859, p. 259: Walk., Cat. Het., vi, p. 66: Reuter, Caps. Amer., 1875, p. 82: Uhler, List, p. 21.
Hab. California.

constrictus (*Capsus*), Bohem., Ofvers. Vet.-Aka. Förh., 1852, p. 74: Reuter, Ent. Mon. Mag., xx, 1883, p. 51; Hem. Gymn. Eur., iii, p. 413, 560.
? *collaris*, Zett., Ins. Lapp., 1840, p. 279 (*nec* Fallen).
pallidus, Thomson, Opusc. Ent., iv, 1871, p. 435; Reuter, Rev. Caps., p. 128; *id.*, Ent. Mon. Mag., xx, p. 51.
Hab. Scandinavia, Scotland.

epilobii, Reuter, Ent. Mon. Mag., xx, 1883, p. 52; *id.*, Hem. Gymn. Eur., iii, p. 415, 561.
pallidus (*Idolocoris*), Dougl. & Scott, Brit. Hem., 1865, p. 380 (*nec* Herr. Schäff.)
Hab. Britain, France, Germany, N. Italy [*Atk.*, Lille].

errans (*Gerris*), Wolff, Ic. Cim., iv, 1804, p. 161, t. 16, f. 155: Fieber (*Dicyphus*), Eur. Hem., p. 326: Thomson, Opusc. Ent., iv, 1871, p. 435: Walk., Cat. Het., vi, p. 65: Saund. Syn., p. 285: Reuter, Ent. Mon. Mag., xx, p. 52: Rev. Caps., p. 127; Hem. Gymn. Eur., iii, p. 417, 561, t. 3, f. 4; Rev. Syn. Het., p. 293.
collaris, Fallen, Mon. Cim., 1807, p. 103; *id.*, Hem. Succ. p. 125: Hahn, Wanz. Ins., ii, p. 121, f. 203: Meyer, Rhyn. Schw., p. 83: Kolenati

(*Blepharidopterus*), Mel. Ent., ii, p. 107: Costa, Cim. Regn. Neap., Cent., iii, p. 44: Kirschb., Rhyn. Wiesb., p. 202, sp. 24: Fieber (*Dicyphus*), Crit., 1858, 39: Dougl. & Scott, (*Idolocoris*), Brit. Hem., p. 379, t. 12, f. 4.

Hab. Nearly all Europe, Britain, Algeria [*Atk.*, Lille].

famelicus (*Idolocoris*), Uhler, Proc. Bost. Soc. N. H., xix, 1878, p. 413; List, p. 20.

Hab. United States, New Hampshire.

geniculatus (*Brachyceraea*), Fieber, Eur. Hem., 1861, p. 325: Walk., Cat. Het., vi, p. 65: Reuter, Hem. Gymn. Eur., iii, p. 429, 562, t. 2, f. 8.

Hab. Corsica [*Atk.*, Genoa].

globulifer (*Capsus*), Fallen, Hem. Succ., 1829, p. 124: Flor, Rhyn. Liv., i, p. 512: Fieber (*Brachyceraea*), Eur. Hem., p. 325: Dougl. & Scott (*Idolocoris*), Brit. Hem., p. 377: Thomson (*Orthotylus*), Opusc. Ent., iv, p. 435: Walk., Cat. Het., vi, p. 65: Saund. (*Dicyphus*), Sgn., p. 284: Reuter, Rev. Caps., p. 127; Hem. Gymn. Eur., iii, p. 430, 563, t. 2, f. 9.

alienus (*Capsus*), Herr. Schäff., Wanz. Ins., iii, 1835, p. 53, t. 88, f. 271: Meyer, Rhyn. Schw., p. 80: Kirschb., Rhyn. Wiesb., p. 208, sp. 34.

cyllocoroides (*Capsus*), Scholtz., Arb. u. Veränd. d. Schles. Ges., 1846, 133, sp. 64.

scabricollis, Costa, Cim. Regn. Neap. Cent. Addit. 1860.

Hab. Scandinavia, N. & Middle Europe, Caucasus [*Atk.*, Lille].

hyalinipennis (*Phytocoris*), Klug in Burm. Handb. Ent. ii, 183, p. 268: Fieber (*Brachyceraea*), Eur. Hem., p. 325: Walk., Cat. Het., vi, p. 64: Reuter, Ent. Mon. Mag. xx, 1883, p. 52; Hem. Gymn. Eur., iii, p. 419, 561, t. 3, f. 5.

Hab. Spain, Portugal, S. France, S. Austria, Greece, Asia Minor, Tunis.

Montandoni, Reuter, Rev. d' Ent., 1888, p. 62, ♂.

Hab. Roumania.

nigricollis (*Phylus*), Garbiglietti, Bull. Soc. Ent. Ital., i, 1869, p. 193; Puton, Ann. Soc. Ent. Fr. (5 s.), iv, 1874, p. 223: Reuter, Hem. Gymn. Eur., iii, p. 433, 563.

Hab. N. Italy.

orientalis, Reuter, Ofvers. Finska Vet. Soc., Förh., xxi, 1879, p. 203; Hem. Gymn. Eur., iii, 1883, p. 428, 562: Fedtsch. Turk., p. 20.

Hab. Turkistan.

pallidicornis (Fieber), Reuter, Hem. Gymn. Eur., iii, p. 423, 561, t. 3, f. 6.

pallicornis (*Brachyceraea*), Fieber, Eur. Hem., 1861, p. 324: Dougl. & Scott (*Idolocoris*), Brit. Hem., p. 375, t. 12, f. 5: Walk., Cat. Het., vi, p. 64: Saund. (*Dicyphus*), Syn., p. 285: Reuter, Ent. Mon. Mag., xx, 1883, p. 53.

Hab. Britain, France, Spain, Germany, Austria.

pallidus (*Capsus*), Herr. Schäff., Wanz. Ins., iii, 1835, p. 51, t. 88, f. 269: Meyer, Rhyn. Schw., p. 84: Kirschb., Rhyn. Wiesb., p. 202, sp. 25: Fieber (*Dicyphus*), Eur. Hem., p. 326: Walk., Cat. Het., vi, p. 65: Saund., Syn., p. 285, Reuter, Ent. Mon. Mag. xx, 1883, p 51; *id.*, Rev. Caps., p. 128; Hem. Gymn. Eur., iii, p. 412, 560, t. 3, f. 3.

Hab. France, Belgium, Switzerland, Germany, Austria, Caucasus [*Atk.*, Lille].

Sedillotii, Puton, Expl. Scient. Tunisie, 1886, p. 20.
Hab. Tunis.

stachydis, Reuter, Ent. Mon. Mag., xx, 1883, p. 58; *id.*, Hem. Gymn. Eur., ii., p. 421, 561: J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 29.
collaris, Flor, Rhyn. Liv., i, 1860, p. 483 (*f. brach.*), pt.
errans, Reuter, Rev. Caps., p. 128 (*f. brach.*) (*nec* Wolff).
Hab. Scandinavia, Siberia, Britain, France, Switzerland, Austria.

tamaricis, Puton, Expl. Scient. Tunisie, 1886, p. 19.
Hab. Tunis.

testaceus, Reuter, Ofvers. Finska Vet. Soc., Förh., xxi, 1879, p. 204; *id.*, Hem Gymn. Eur., iii, p. 425, 562; Fedtsch. Turk., p. 20.
Hab. Turkistan.

thoracicus, Reuter, Ofvers., *l. c.*, *supra*, p. 204; *id.*, Fedtsch. Turk., p. 21; Hem., *l. c. supra*, p. 427, 562.
Hab. Turkistan.

Genus **CAMPYLONEURA**.

Fieber, Crit. Gen., 1859, 35; Eur. Hem., p. 67, 269: Reut., Hem. Gymn. Eur., iii, p. 409, 559, t. 1. f. 15.

virgula (*Capsus*), Herr. Schäff., Nomencl. Ent., 1835, p. 48, 188; *id.*, Wanz. Ins., iii, 1835, p. 51, t. 88, f. 268: Meyer, Rhyn. Schw., p. 85: Fieber (*Campyloneura*), Eur. Hem., p. 269; Dougl. & Scott, Brit. Hem., p. 373, t. 12, f. 10: Walk., Cat. Het., vi, p. 80: Saund., Syn., p. 281: Reuter, Rev. Caps., p. 130; Hem. Gymn. Eur., iii, p. 410.
pulchellus, Guérin, Régne Anim., Texte, iii, p. 348; Ic., ii, t. 56, f. 7.
Hab. Scandinavia, Britain, France, Belgium, Holland, Switzerland, S. Austria [*Atk.*, Lille].

Genus **ENGYTATUS**.

Reuter, Caps. Amer., 1875, p. 82.

geniculatus, Reuter, *l. c.*, p. 83: Uhler, List, p. 20.
Hab. Texas.

Genus **HYALIODES**.

Reuter, Caps. Amer., 1875, p. 83.

vitripennis (*Capsus*), Say, Compl. Writ., i, 1859, p. 345: Reut., *l. c.*, supra. p. 84: Uhler, List, p. 20: Riley, 3 Rep. Ins. Mo., 1870, p. 137, f. 58, 59: Glover, Rep. Dep. Agric. Un. St. for 1875, p. 125, f. 30.
Hab. United States, New York.

Genus **STHENAROPS**.

Uhler, Bull. Un. St. Surv., iii, 1877, p. 418.

chloris, Uhler, *l. c.*, p. 419; List, p. 20.
Hab. Colorado.

malina, Uhler, *l. c.*, p. 419; List, p. 20.
Hab. Massachusetts to Texas, Russian America.

Div. XIV, CYLLOCORARIA, Reuter, Hem. Gymn. Eur., iii, p. 319, 567.

Genus CYLLOCORIS.

Hahn, Wanz. Ins., ii, 183, p. 97, t. 60 B-E: Reuter, Ent. Mon. Mag., xv, 1878, p. 115; Hem. Gymn. Eur., iii, p. 401, 546.
Camarocyphus, Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 21; Zool. Jahr., 1880, p. 140.
Cyllocoris, pt., Hahn, Fieber, Eur. Hem., 1861, p. 69, 282.
Dryophilocoris, Subg. of *Globiceps*, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 30; Rev. Caps., p. 137.
Globiceps, pt, Latreille, Fieber, Eur. Hem., 1861, p. 69, 282.
Perideris, Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1870, p. 249.

Amyotii, Stål, Rio. Jan. Hem., i, 1858, p. 55: Walk., Cat. Het., vi, p. 67.
Hab. Rio Janeiro.

bis-bistillatus, Stål, *l. c. supra*, p. 54: Walk., Cat. Het., vi, p. 67.
Hab. Rio Janeiro.

Costae, Stål, Rio Jan. Hem., i, 1858, p. 54; Walk., Cat. Het., vi, p. 67.
Hab. Rio Janeiro.

cucurbitaceus (*Phytocoris*), Spinola, Gay's Hist. Fis. Chili, vii, 1852, p. 196, 19: Sign., Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 571: Walk., Cat. Het., vi, p. 67.
Hab. Chili.

equestris (*Cyllecoris*), Stål, Stettin. Ent. Zeit., xix, 1858, p. 182, ♀: Walk., Cat. Het., vi, p. 62: Reuter, Hem. Gymn. Eur., iii, p. 407, 558.
Hab. E. Siberia, Irkutsk.

flavoquadrimaculatus (*Cimex*), De Geer, Mém., iii, 1773, p. 295: Reuter, Caps. Syn., p. 12; *id.*, Ent. Mon. Mag., xv, 1878, p. 115; Hem. Gymn. Eur., iii, p. 404, 557, t. 5, f. 26; Rev. Syn. Het., p. 300.
flavomaculatus (*Lygaeus*), Wolff, Ic. Cim., iii, 1802, p. 114, t. 11, f. 108 (*nom. praeoc.*): Latreille, Hist. Nat, xii, 1804, p. 233: Panzer, Fauna Germ., 92, 1805, f. 16: Burm., Handb. Ent., ii (i), p. 267: Hahn (*Cyllocoris*), Wanz. Ins., iii, p. 10, t. 76, f. 235: Spinola, Ess., p. 188: Herr Schäff., Wanz. Ins., ix, index, p. 35.
flavonotatus, Bohem., Nya Svenska Hem., 1852, p. 71: Kirschb., Rhyn. Wiesb., p. 207, sp. 32, p. 269: Fieber, Crit., 24; *id.*, Eur. Hem., p. 283: Flor, Rhyn. Liv., i, p. 467: Dougl. & Scott, Brit. Hem., p. 366: Thomson, Opusc. Ent., iv, p. 436: Walk., Cat. Het., vi, p. 63: Saund., Syn., p. 279: Reuter, (*Dryophilocoris*) Rev. Caps., p. 137; Ent. Mon. Mag. xv, 1878, p. 113.
ochromelas, Gmelin, Syst. Nat., iv, 1788, p. 2165.
quadrimaculatus, Schrank, Fauna Boica., ii, 1801, p. 92.
tricoloratus, Turton, Syst. Nat., ii, 1806, p. 676.
tricolor, Gmelin, Syst. Nat., iv, 1788, p. 2165.
Hab. All Europe to S. Scandinavia [*Atk.*, Lille].

gracilentus, Stål, Rio Jan. Hem., i, 1858, p. 53: Walk., Cat. Het., vi, p. 66.
Hab. Rio Janeiro.

histrionicus (*Cimex*), Linn., Syst. Nat., (*ed.* 12), 1767, p. 728: Herr. Schäff. (*Capsus*), Nomencl. Ent., i, p. 48: Burm., Handb. Ent., ii (i), p. 267: Blanchard, Hist. Ins., 1840, p. 138: Meyer, Rhyn. Schw., p. 90: Kolenati (*Kelidocoris*), Mel. Ent., ii, p. 103: F. Sahlb., Geoc. Fenn., p. 96: Herr. Schäff., Wanz. Ins., ix, index, p. 36: Kirschb., Rhyn. Wiesb., p. 203, sp. 26: Flor, Rhyn. Liv., i, p. 475: Fieber, Crit., 24; *id.*, Eur. Hem., p. 282: Dougl. & Scott, Brit. Hem., p. 368: Thomson, Opusc. Ent., iv, p. 436: Walk., Cat. Het., vi, p. 62: Saund., Syn., p. 280: Reuter, Rev. Caps., p. 131; *id.*, Hem. Gymn. Eur., iii, p. 406, 558, t. 1, f. 14, *a*, *b*; t. 5, f. 25; *id.*, Rev. Syn. Het., p. 299.

agilis, Fabr., Spec. Ins., 1781, p. 374; *id.*, Syst. Rhyng., p. 247: Wolff, Ic. Cim., iv, p. 153, t. 15, f. 147: Latreille, Hist. Nat., xii, p. 233: Fallen, Mon. Cim., p. 100; *id.*, Hem. Suec., p. 120: Hahn, Wanz. Ins., ii, p. 98, t. 60, f. 182: Costa, Cim. Regn. Neap., Cent. i, 1838, p. 50: Westwood (*Cyllecoris*), Intr. Mod. Class. Ins., ii, p. 122.

cantharinus, Müller, Zool. Dan., 1776, p. 108.

cordatus, Geoffroy, Fourcr. Ent. Par., 1785, p. 206.

cordiger, Goeze, Ent. Beytr., ii, 1778, p. 266.

fulvipes, Schrank, Fauna Boica, ii, 1801, p. 93.

leucozonias, Gmelin, Syst. Nat., iv, 1788, p. 2164.

vittatus, Gmelin, *l. c.*, p. 2166: Donovan, Brit. Ins., vii, p. 252?

Hab. All Europe to S. Scandinavia, Caucasus, Derbent [*Atk.*, Lille, Hungary].

[illegible] (*Phytocoris*), Spinola, Gay's Hist. Fis. Chili, vii, 1852, p 195, 18: Signoret, Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 571: Walk., Cat. Het., vi, p. 67.
Hab Chili.

luteus (*Capsus*), Herr. Schäff., Wanz. Ins., iii, 1835, p. 78, t. 98, f. 297: Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 181; Hem. Gymn. Eur., iii, p. 402, 557, t. 1, f. 13; t. 5, f. 24.

nigrogularis (*Camarocyphus*), Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 22.

Hab. Austria, Greece.

marginatus (*Perideris*), Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1870, p 249, t. 5, f. 6: Walk., Cat. Het., vi, p. 61: Reuter, Hem. Gymn. Eur., iii, p. 405, 558, t. 1, f. 14; t. 3, f. 2; t. 5, f. 27.
Hab. Greece.

petiolatus, Stål, Rio Jan. Hem., i, 1858, p. 55: Walker, Cat. Het., vi, p. 67.
Hab. Rio Janeiro.

quadristillatus, Stål, Rio Jan. Hem., i, 1858, p. 54: Walker, *l. c.*, *supra*, p. 67.
Hab. Rio Janeiro.

sanguiniceps, Stål, *l. c. supra*, p. 54: Walker, *l. c. supra*, p. 67.
Hab. Rio Janeiro.

scutellatus, Spinola, Gay's Hist Fis. Chili, vii, 1852, p. 190, 9: Walker, Cat. Het., vi, p. 67.

jucundus, Sign., Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 570, t. 11, f. 5: id., p. 586.
Hab. Chili.

stillatipennis, Stål, Rio Jan. Hem., i, 1858, p. 54: Walker, Cat. Het., vi, p. 67.
Hab. Rio Janeiro.

Genus **AETORRHINUS.**

Fieber, Eur. Hem., 1861, p. 70, 285: Reuter, Rev. Caps., p. 138; Hem. Gymn. Eur., iii, p. 399, 546, t. 1, f. 12; Walk., Cat. Het., vi, p. 164.
Blepharidopterus, Kolenati, Mel. Ent., ii, 1845, p. 108.
Haetorhinus, Fieber, Crit. Gen. Phyt., 1859, 52, t. 6, f. 8, 31.

angulatus (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 81: Zett., Ins. Lapp., p. 272: Herr. Schäff. (*Capsus*), Wanz. Ins., iii, p. 75, t. 97, f. 292: Meyer, Rhyn. Schw., p. 89: F. Sahlb., Geoc. Fenn., p. 97: Kirschb., Rhyn. Wiesb., p. 203, sp. 27: Flor, Rhyn. Liv., i, p. 477: Kolenati (*Polymerus* subg. *Blepharidopterus*), Mel. Ent., ii, p. 108: Fieber (*Aetorhinus*), Eur. Hem., p. 285: Thomson, Opusc. Ent., iv, p. 437: Dougl. & Scott, Brit. Hem., p. 347, t. 11, f. 4: Walk., Cat. Het., vi, p. 64: Saund., Syn., p. 281: Reuter, Rev. Caps., p. 138; Hem. Gymn. Eur., iii, p. 400, 557.
Hab. All Europe, Caucasus [*Atk.*, Pyrenees].

Genus **GLOBICEPS.**

(Latreille), Am. & Serv. Ins. Hém., 1843, p. 282: Walk., C[illegible] p. 6[illegible]
Bih. Vet.-Aka. Handl., iii (i), 1875, p. 28; Ent. Mon. Mag., xv, 1878, p. 115; Hem. Gymn. Eur., iii, p. 386, 545, t. 5, f. 19-23, 30.
subg. *Globiceps*, Latreille, Reuter, Bih. *l. c. supra.*
„ *Kelidocoris* (subg. of *Polymerus*), Kolenati, Mel. Ent., ii, 1845, p. 102: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 28; *id.*, Rev. Caps., p. 133.

albipennis, Jakowleff, Bull. Mosc., lii (2), 1877, p. 294, ♀: Reuter, Hem. Gymn. Eur., iii, p 390, 556.
Hab. Astrakhan, Charkov.

ater, Douglas & Scott, Ent. Mon. Mag., ii, 1866, p. 248: Walk., Cat. Het., vi, p. 63: Saund., Syn., p. 280: Reuter, Hem. Gymn. Eur., iii, p. 398.
Hab. England.

cruciatus, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 36; Hem. Gymn. Eur., iii, p. 393, 556, t. 5, f. 20 (*vide* Puton, Cat., 1886, p. 55).
flavomaculatus, Kolenati, Mel. Ent., ii, 1845, p. 103?; Fieber, Eur. Hem., p. 284 (*nec* Fabr.): Dougl. & Scott, Brit. Hem., p. 364: Reuter, Ent. Mon. Mag., xvii, 1880, p. 13.
fulvipes, Saund., Syn., 1875, p. 279 (*nec* Reuter).
suturalis, Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 37.
Hab. N. & Middle Europe, Britain, Greece, Russia, Transcaucasia.

dispar (*Cyllecoris*), Bohem., Nya Svenska Hem., 1852, p. 72: Flor, Rhyn. Liv., i, p. 472: Fieber (*Globiceps*), Eur. Hem., p. 283: Dougl. & Scott, Ent. Mon. Mag., ii, p. 249; iv, p. 48, t. 1, f. 4: Walk., Cat. Het., vi, p. 63: Saund., Syn., p. 280:

Reuter Bih. Vet.-Aka. Handl., iii (i), p. 29; (*Kelidocoris*), Rev. Caps., p. 136; *id.*, Hem. Gymn. Eur., p. 397, 557, t. 3, f. 1, ♂.

Hab. Scandinavia, Livonia, Germany, France, Britain.

fasciolaris (*Phytocoris*), Blanchard, Gay's Hist. Fis. Chil., vii, 1852, p. 191, 10; Signoret, Ann. Soc. Ent. Fr., (4 s.) iii, 1863, p. 573: Walk., Cat. Het., vi, p. 68.

Hab. Chili.

flavomaculatus (*Lygaeus*), Fabr., Ent. Syst. iv, 1794, p. 182; *id.*, (*Capsus*), Syst. Rhyng., p. 246: Fallen, Mon. Cim., p. 100; *id.*, Hem. Suec., p. 120: Costa, Cim. Regn. Neap., i, 1838, p. 50, var. *a*, ♀: Zett., Ins. Lapp., p. 278: Meyer, Rhyn. Schw., p. 91? : Kolenati, Mel. Ent., ii, p. 103: F. Sahlb., Geoc. Fenn., p. 96: Kirschb., Rhyn. Wiesb., p. 206, sp. 31: Flor, Rhyn. Liv., i, p. 469: Thomson, Opusc. Ent., iv, p. 436: Walk., Cat. Het., vi, p. 63: Saund., Syn., p. 279: Reuter, Rev. Caps., p. 133; *id.*, Hem. Gymn. Eur., iii, p. 395, 557, t. 5, f. 19; *id.*, Rev. Syn. Het., p. 298.

distinguendus, Voll., Hem. Neerl., 1878, p. 116 (*nec* Herr. Schäff.).

selectus, Fieber, Crit. Gen. Phyt., 1859, sp. 13; Eur. Hem., p. 284; Dougl. & Scott, Brit. Hem., p. 364: Walk., Cat. Het., vi, p. 63: Reuter, Ent. Mon. Mag., xvii, 1880, p. 13.

Hab. Scandinavia, Britain, France, Germany, Austria, Russia. [*Atk.*, Lille, Dunkirk, Genoa].

fulvicollis, Jakowleff, Bull. Mosc., lii (2), 1877, p. 293: Reuter, Hem. Gymn. Eur., iii, p. 388, 555: Horvath, Rev. d' Ent., vii, 1888, p. 181, ♂.

Hab. S. Russia, Sarepta, E. Caucasus.

Pictetii, Fieber, Eur. Hem., 1861, p. 283: Walk., Cat. Het., vi, p. 63: Reuter, Hem. Gymn. Eur., iii, p. 389, 556, t. 2, f. 8; t. 5, f, 22.

Hab. Spain.

salicicola, Reuter, Abo Hem., 1880, p. 171; Ent. Mon. Mag., xvii, 1880, p. 13; Hem. Gymn. Eur., iii, p. 392, 556, t. 5, f. 21.

fulvipes, Reuter, Caps. Syn., 1875, p. 13; Bih. Vet. Aka. Handl., iii (i), p. 28; *id.*, Rev. Caps., p. 134 (*nec* Scop.); Ent. Mon. Mag., xv, p. 66; xvii, p. 13.

flavomaculatus, var. 1. F. Sahlb., Geoc. Fenn., 1848, p. 97.

Hab. Scandinavia.

sordidus, Reuter, Pet. Nouv. Ent., ii, no. 144, 1876, p. 21; *id.*, Hem. Gymn. Eur., iii, p. 390, 556, t. 5, f. 23.

Hab. France, Austria.

sphaegiformis (*Cimex*), Rossi, Fauna Etrusc., ii, 1790, p. 250: Kolenati, Mel. Ent., ii, p. 110: Fieber (*Globiceps*), Eur. Hem., p. 283: Walk., Cat. Het., vi, p. 62: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 28; Hem. Gymn. Eur., iii, p. 387, 555, t. 5, f. 30; *id.*, Rev. Syn. Het., p. 298.

bifasciatus, Herr. Schäff., Nomencl. Ent., i, 1836, p. 48; Hahn, Wanz. Ins., iii, p. 48, t. 87, f. 265 (*nec* Fabr.), ♂.

capito (*Globiceps*), Lep. & Serv., Enc. Méth., x, 1825, p. 326: Am. & Serv., Ins. Hém., p. 282: Costa, Cim. Regn. Neap., Cent. iii. p. 46: Fieber, Crit., 24.

decoratus, Meyer, Rhyn. Schw., 1843, p. 88: Kirschb., Rhyn. Wiesb., p. 206, sp. 30 ?: Flor, Rhyn. Liv., i, p. 474.

Hab. Middle & S. Europe, S. Russia, Caucasus [*Atk.*, Genoa].

Genus **MECOMMA.**

Fieber, Crit. Gen. Phyt., 1859, 50, t. 6, f. 17; Eur. Hem., p. 69, 284: Walker, Cat. Het., vi, p. 130: Reuter, Hem. Gymn. Eur., iii, p. 383, 545, t. 1, f. 11.

Chlamydatus, pt, Curtis: *Sphyracephalus*, pt, Dougl. & Scott, Brit. Hem., 1865, p. 349 (*nom. praeoc.*): *Sphyrops*, Dougl. & Scott, Ent. Mon. Mag., iii, 1866, p. 16.

ambulans (*Capsus*), Fallen, Hem. Succ., 1829, p. 126 (excl. var γ): Herr. Schäff., Wanz. Ins., iii, p. 109, t. 108, f. 335, ♂; f. 336-7, ♀: Meyer, Rhyn. Schw., p. 86: Zett., Ins. Lapp., p. 279: F. Sahlb., Geoc. Fenn., p. 94: Kirschb., Rhyn. Wiesb., p. 236, sp. 88, p. 277, ♂: Flor, Rhyn. Liv., i, p. 577: Thomson (*Orthotylus*), Opusc. Ent., iv, p 437: Fieber (*Mecomma*), Eur. Hem., p. 284: Dougl. & Scott (*Sphyracephalus*), Brit. Hem., p. 349, t. 11, f. 5: Walk., Cat. Het., vi, p. 130: Saund., Syn., p. 282: Reuter, Caps. Syn., p. 13; *id.*, Rev. Caps., p. 140; Hem. Gymn. Eur., iii, p. 384, 555, t. 1, f. 11; t. 2, f. 1, 2: Uhler, List, p. 20.

dubius, Zett., Ins. Lapp., 1840, p. 279, ♀.

nigritulus, Zett., *l. c.*, p. 279, ♂, ♀ (*form macr.*).

ochripes, Curtis, Brit. Ent. xv, 1838, 693.

Hab. N. Europe, Austria, Russia N. America [*Atk.*, Lille].

gilvipes (*Leptomerocoris*), Stål, Stettin. Ent. Zeit., 1858, p. 187, ♀: Walk., Cat. Het., vi, p. 144: Reuter, Ofvers. Finska Vet. Soc. Förh., xxi, p. 57; Hem. Gymn. Eur., iii, p. 386, 555, t. 2, f. 6.

Hab. Sitkha.

Genus **CYRTORRHINUS.**

Fieber, Crit. Gen., 1859, 51; Eur. Hem., p. 69, 284: Reuter, Hem. Gymn. Eur., iii, p. 379, 545, t. 1, f. 10.

Chlamydatus, pt, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 30.

Sphyracephalus, pt, Douglas & Scott, Brit. Hem., 1865, p. 349.

Tytthus, Fieber, Wien. Ent. Monats., viii, 1864, p. 82, t. 2, 10.

caricis (*Capsus*), Fallen, Hem. Succ., 1829, p. 123: F. Sahlb., Geoc. Fenn., p. 92, ♂: Kirschb., Rhyn. Wiesb., p. 236, sp. 87, p. 277 (*excl. syn.*): J. Sahlb. (*Cyrtorrhinus*), Notis. Skpts pro Fauna. Fl. Fenn., ix, p. 176: Thomson (*Orthotylus*), Opusc. Ent., iv, p. 437: Saund. (*Chlamydatus*), Syn., p. 282: Reuter, Caps. Syn., p. 14; *id.*, Rev. Caps., p. 144; Hem. Gymn. Eur., iii, p. 383, 555, t. 1, f. 10; t. 2, f. 3, ♀; Fedtsch. Turk., p. 21.

chloropterus, Herr. Schäff., Wanz. Ins., ix, index, p. 34 (*nec* Kirschb.).

elegantulus, Meyer, Rhyn. Schw., 1843, p. 69, t. 5, f. 2 (*nec* Guérin): Bohem. Nya Svenska Hem., p. 22: Fieber (*Cyrtorhinus*), Eur. Hem., p. 285: Dougl. & Scott (*Sphyracephalus*), Brit. Hem., p. 351: Walk., Cat. Het., vi, p. 130.

Hab. N. Europe, Britain, Caucasus, Turkistan.

flaveolus (*Tytthus*), Reuter, Notis. Skpts pro Fauna Fl. Fenn., xi, 1871, p. 323, t. 1, f. 6; (*Chlamydatus*) Abo Hem., p. 75; Hem. Gymn. Eur., iii, p. 380, 554.

insignis (*Chlamydatus*), Reuter, Rev. Caps., 1876, p. 142 (*nec* Dougl. & Scott); Ent. Mon. Mag., xiv, 1877, p. 131: Walk., Cat. Het., vi, p. 131.

Hab. Scandinavia.

geminus (*Capsus*), Flor, Rhyn. Liv., i, 1860, p. 606: Fieber, Wien. Ent. Monats, viii, 1864, p. 84: Walk., Cat. Het., vi, p. 131: Reuter, Rev. Caps., p. 142; *id.*, Hem. Gymn. Eur., iii, p. 382, 554, t. 2, f. 5, ♀.

Hab. Finland, Livonia.

lividipennis, Reuter, Ent. Tijds., v, 1884, p. 199.

Hab. Great Nicobars.

pygmaeus (*Capsus*), Zetterstedt, Ins. Lapp., 1840, p. 279: Flor, Rhyn. Liv., i, p. 605: Fieber (*Tytthus*), Wien. Ent. Monats., viii, 1864, p. 83: Thomson (*Orthotylus*), Opusc. Ent., iv, p. 437: Walk., Cat. Het., vi, p. 131: Reuter (*Chlamydatus*), Caps. Syn., p. 16; *id.*, Rev. Caps., p. 143; Hem. Gymn. Eur., iii, p. 381, 554, t. 2, f. 4, ♀.

pellucens, Bohem., Nya Svenska Hem., 1852, p. 76.

var. *insignis* (*Tytthus*), Douglas & Scott, Ent. Mon. Mag., ii, 1866, p. 247, fig.: Saund., Syn., p. 282.

Hab. Scandinavia, N. France, Britain.

Genus **MICROTECHNITES.**

Berg, Hem. Arg. Add. Emend., 1884, p. 89.

pygmaeus (*Deraeocoris*), Berg, Hem. Arg., 1879, p. 290; Add. Emend., p. 90.

Hab. Buenos Ayres.

Genus **AMIXIA.**

Reuter, Hem. Gymn. Eur., iii, 1883, p. 377, 545.

bicolor, Reuter, Hem. Gymn. Eur., iii, 1883, p. 378, 554, t. 1, f. 9 *d-f*.

Hab. Greece.

longiceps, Reut., *l. c.*, p. 378, 554, t. 1, f. 9*a-c*.

Hab. Greece, Naxos.

Genus **PARTHENICUS.**

Reuter, Caps. Amer., 1875, p. 84.

psalliodes, Reuter, *l. c.*, p. 85: Uhler, List, p. 20.

Hab. Texas.

Genus **ORTHOTYLUS.**

Fieber, Crit. Gen., 1859, 57; Eur. Hem., p. 71, 288: Reuter, Hem. Gymn. Eur., iii, p. 342, 545, t. 1, f. 7.

Allocotus (Fieb.), Puton, Ann. Soc. Ent. Fr. (5 s.), iv, 1874, p. 218, t. 7, f. 2: Sign. Ann. Mus. Civ. Gen., xv, 1880, p. 531: Reut., Bih. Vet.-Aka. Handl., iii (i), p. 36.

Halocapsus, Puton, Bull. Soc. Ent. Fr., (5 s.), viii, 1878, p. xxxiii.
Litocoris, Fieber, Eur. Hem., 1861, p. 70, 287.
Litosoma, Dougl. & Scott, Brit. Hem., 1865, p. 334.
Melanotrichus, Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 35.
Pachylops, pt, Fieb., Eur. Hem., 1861, p. 70, 285.
Tichorhinus, Fieb., Crit. Gen., 1859, 55, t. 6, f. 24.

Adenocarpi (*Capsus*), Perris, Ann. Soc. Linn. Lyon, iv, 1857, p. 167: Reuter, Ent. Mon. Mag., xiv, 1877, p. 129; Hem. Gymn. Eur., iii, p. 367, 553.
Douglasii, Saunders, Syn. Brit. Hem., 1875, p. 293.
Hab. Britain, France, Spain.

alaiensis, Reuter, Hem. Gymn. Eur. iii, 1883, p. 361, 552; Fedtsch. Turk., p. 22.
Hab. Turkistan.

artemisiae, J. Sahlberg, Vet.-Aka Handl., xvi (4), 1878, p. 29: Reuter, Hem. Gymn. Eur., iii, p. 368, 552.
Hab. Siberia.

bilineatus (*Capsus*), Fallen, Hem. Suec., 1829, p. 122: F. Sahlb., Geoc. Fenn., p. 94: Thomson, Opusc. Ent., iv, p. 432: Saund., Syn., p. 290: Reuter, Caps. Syn., p. 16; *id.*, Rev. Caps, p. 146; Hem. Gymn. Eur., iii, p. 346, 549
Kirschbaumii (*Capsus*), Flor, Rhyn. Liv, i, 1860, p. 614: Fieber (*Aetorhinus*), Erört. Zur. Nom. d. Rhyn. Liv., p. 6.
Hab. Scandinavia, Russia, France, Britain.

boreellus (*Capsus*), Zetterstedt, Ins. Lapp., 1840, p. 278; J. Sahlb., Notis. Skpts Fauna Fl. Fenn., ix, 1867, p. 227: Thomson, Opusc. Ent., iv, p. 438: Reuter, Caps. Syn., p. 16; *id.*, Rev. Caps., p. 146; Hem. Gymn. Eur., iii, p. 345, 549, t. 5, f. 6.
Hab. Lapland, N. Sweden.

chloropterus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p 249, sp. 121, p. 316 (*nec* Herr. Schäff.; *nec* Fieber): Reuter, Ent. Mon. Mag., xiv, 1877, p. 128; *id.*, Hem. Gymn. Scan. & Fenn., p. 152, pt: Puton, Cat., 1886, p. 56.
concolor, pt, Dougl. & Scott, Brit. Hem., p. 340 (*nec* Kirschb.): Walk., Cat. Het., vi, p. 132: Saund., Syn., p. 293.
virescens, Dougl. & Scott, *l. c.*, p. 339: Walk., Cat. Het., vi, p. 158: Reuter, Hem. Gymn. Eur., iii, p. 364, 552.
Hab. Nearly all Europe, Britain [*Atk.*, Lille, Genoa].

concolor (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 249, sp. 119, p. 315: Fieber, Eur. Hem., p. 289: Dougl. & Scott, Brit. Hem., p. 340, pt: Reuter, Ent. Mon. Mag., xiv, 1877, p. 128: Hem. Gymn. Eur., iii, p. 366, 553.
Hab. Scandinavia, Britain, France, Spain, Switzerland, Germany [*Atk.*, Vosges, France].

cupressi, Reuter, Rev. d' Ent., ii, 1883, p. 253; Hem. Gymn. Eur., iii, p. 349, 477, 550.
Hab. S. France.

diaphanus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 238, sp. 97, p. 305: Flor, Rhyn. Liv., i, p. 613: Fieber, Eur. Hem., p. 290: Dougl. & Scott, Ent. Mon. Mag., iv, p. 47: Walk., Cat. Het., vi, p. 132: Saund., Syn., p. 291: Reuter, Ent. Mon. Mag., xiv, 1877, p. 62; xvii, 1880, p. 12; Hem. Gymn. Eur., iii, p. 358, 551.

viridinervis, Thomson, Opusc. Ent., iv, 1871, p. 438.
Hab. N. Europe, Germany, Austria, Astrakhan [*Atk.*, Dunkirk].

discolor, J. Sahlberg, Vet.-Aka Handl., xvi (4), 1878, p. 29: Reut., Hem. Gymn. Eur., iii, p. 369, 551.
Hab. Siberia, Yenisei.

eleagni, Jakowleff, Bull. Mosc., lvi (i), 1881, p. 200: Reut., Hem. Gymn. Eur., iii, p. 357, 551.
Hab. Caucasus.

ericetorum (*Lygaeus*), Fallen, Mon. Cim., 1807, p. 91: *id.* (*Phytocoris*), Hem. Suec., p. 105: F. Sahlb. (*Capsus*), Geoc. Fenn., p. 104: Kirschb., Rhyn. Wiesb., p. 250, sp. 122: Flor, Rhyn. Liv., i, p. 587: Fieber (*Litocoris*), Eur. Hem., p. 287: Dougl. & Scott (*Litosoma*), Brit. Hem., p. 343: Walk., Cat. Het., vi, p 158: Saund., (*Orthotylus*), Syn., p. 294: Thomson, Opusc. Ent., iv, p. 440: Reuter, Rev. Caps., p. 154; *id.*, Hem. Gymn. Eur., iii, p 376, 554, t. 1, f. 7*c*.
limbatus, Perris, Ann Soc. Linn. Lyon, 1857, p. 165.
? *prasinus*, Hahn, Wanz. Ins., iii, 1835, p. 8, t. 75, f. 233.
Hab. N. & Middle Europe, Austria, Russia [*Atk.*, Lille].

Fieberii, Frey Gessner, MT. Schw. Ent. Ges., 1864, p. 260: Walk., Cat. Het., vi, p. 133: Reuter, Hem. Gymn. Eur., iii, p. 360, 552.
Hab. S. Russia, Sarepta.

flavinervis (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 239, sp. 99, p. 278, 307: Fieber (*Orthotylus*), Eur. Hem., p. 289: Dougl. & Scott (*Litosoma*), Brit. Hem., p. 338: Walk., Cat. Het., vi, p. 132: Saund., Syn., p. 292: Reuter, Abo. Hem., p. 176; Hem. Gymn. Eur., iii, p. 348, 549, t. 5, f. 8.
? *icterocephalus*, Hahn, Wanz. Ins., i, 1831, p. 149, t. 23, f. 75.
Hab. Scandinavia, Britain, France, Germany, Switzerland, S. Austria.

flavosparsus (*Phytocoris*), C. Sahlberg, Acta Soc. Scien. Fenn., i, p. 411: Bohem., Ofvers. Vet.-Akad. Förh., 1852, p. 65: F. Sahlb. (*Capsus*), Geoc. Fenn., p. 103: Kirschb., Rhyn. Wiesb., p. 249, sp. 120: Flor, Rhyn. Liv., i, p. 582: Fieber (*Orthotylus*), Eur. Hem., p. 283: Dougl. & Scott (*Litosoma*), Brit. Hem., p. 341: Walk., Cat. Het., vi, p. 131: Saund., Syn., p. 292: Reuter, Caps. Syn., p. 18; *id.*, Ent. Mon. Mag., xiv, 1877, p. 128; Rev. Caps., p. 151; Hem. Gymn. Eur., iii, p. 360, 552; Fedtsch. Turk., p. 23.
prasinus (*Hypsitelus*), Dougl. & Scott, Brit. Hem., 1865, p. 344 (*nec* Fieber).
viridipennis, Dahlbom, Konig. Vet.-Aka. Handl., 1850, p. 212.
Hab. Lapland, Italy, Tunis, Turkistan [*Atk.*, Dunkirk].

fuscescens (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 237, sp. 92, p. 299: Reuter, Pet. Nouv. Ent., i, 1875, p. 551: Hem. Gymn. Eur., iii, p. 344, 477, 549, t. 4, f. 5; t. 5, f. 5.
luridus, Reuter, Hem. Gymn. Scan. & Fenn., 1875, p. 153.
obsoletus, Reuter, Ofvers. Vet.-Aka. Förh., 1874, p. 48 (*nec* Dougl. & Scott).
pinitellus (*Brachyarthrum*), Fieber, Eur. Hem., 1861, p. 301.
Hab. Scandinavia, Britain, Germany, France, Switzerland, Greece.

Lethierryi, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 37; Hem. Gymn. Eur., iii, p. 375, 554.
Hab. Algeria, Biskra.

marginalis, Reuter, Hem. Gymn. Eur., iii, 1883, p. 350, 550, t. 1, f. 7 *a-b*; t. 5, f. 9
nassatus (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 80 (*nec* Fabr.): Zett., Ins. Lapp., p. 272: Kolenati, Mel. Ent., ii, p. 177: Meyer, Rhyn. Schw., p. 50: F. Sahlb. Geoc. Fenn., p. 102: Kirschb., Rhyn. Wiesb., p. 238, sp. 98: Flor, Rhyn. Liv., i, p. 618: Fieber (*Orthotylus*), Eur. Hem., p. 289: Dougl. & Scott (*Litosoma*), Brit. Hem., p. 337, t. 11, f. 3: Thomson, Opusc. Ent., iv, p. 439: Walk., Cat. Het., vi, p. 132: Saund., Syn., p. 292: Reuter, Hem. Gymn. Scan. & Fenn., p. 148.
Hab. Lapland, Britain, Spain, Greece, Siberia [*Atk.*, Lille].

Martinii, Puton, Rev. d' Ent., vi, 1887, p. 307.
Hab. Algeria, Biskra.

Mayrii, Signoret, Ann. Mus. Civ. Gen., xv, 1880, p. 532.
Hab. New Guinea.

minutus, Jakowleff, Bull Mosc., lii (2), 1877, p. 296: Reuter, Hem. Gymn. Eur., iii, p. 371, 553; Fedtsch. Turk., p. 23.
Hab. Greece, S. Russia, Caucasus, Turkistan.

mutabilis, F. B. White, Proc. Zool. S. Lond., 1878, p. 467.
Hab. St. Helena.

nassatus (*Cimex*), Fabr., Mant. Ins., ii, 1787, p. 304; *id.*, Syst. Rhyng., p. 236: Reuter, Hem. Gymn. Eur., iii, p. 352, 550, t. 5, f. 10; *id.*, Rev. Syn. Het., p. 297.
flavicornis, Latreille, Hist. Nat., xii, 1804, p. 224.
striicornis, Kirschb., Rhyn. Wiesb., 1855, p. 238, sp. 96, p. [illegible] Flor (*Capsus*), Rhyn. Liv., i, p. 615: Fieber (*Orthotylus*), Eur. Hem., p. 289: Dougl. & Scott (*Litosoma*), Brit. Hem., p. 336: Walk., Cat. Het., vi, p. 132: Saund., Syn., p. 291: Reuter, Ent. Mon. Mag., xvii, 1880, p. 11; Rev. Caps., p. 150.
Hab. Nearly all Europe [*Atk.*, Loire Inférieure].

obscurus, Reuter, Pet. Nouv. Ent., i, no. 138, 1875, p. 551; Hem. Gymn. Eur., iii, p. 343, 549: Puton, Cat., 1886, p. 56.
? *mutabilis*, Hahn, Wanz. Ins., ii, p. 137, t. 72, f. 223 (*nec* Fallen).
fuscescens, Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 33 (*nec* Kirschb.).
Hab. France, Austria.

obsoletus, Fieber, Eur. Hem. 1861, p. 289: Walk., Cat. Het., vi, p. 132: Reuter, Hem. Gymn. Eur., iii, p. 365, 553, t. 5, f. 18.
Hab. Spain.

ochrotrichus, Douglas & Scott, Brit. Hem., 1865, p. 342: Fieber, Wien. Ent. Monats., viii, 1864, p. 330: Walk., Cat. Het., vi, p. 133, 158, Reuter, Hem. Gymn. Eur., iii, p. 359, 554.
Hab. Britain.

Oschanini, Reuter, Hem. Gymn. Eur. iii, 1883, p. 363, 553.
Hab. Turkistan.

palustris, Reuter, Rev. d' Ent., vii, 1888, p. 59.
Hab. Illyria.

parvulus, Reuter, Ofvers. Finska Vet. Soc. Förh., xxi, 1879, p. 38: Jak., Bull. Mosc. lv (i), 1880, p. 142: Reuter, Hem. Gymn. Eur., iii, p. 374, 554, t. 5, f. 16.
Hab. S. Russia, Astrakhan.

Paulinoi, Reuter, C. R. Soc. Ent. Belg., 1885, p. xliv, fig.
Hab. Portugal.

prasinus (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 81: Flor, Rhyn. Liv., i, p. 616: Thomson, Opusc. Ent., iv, 1871, p. 439 ?: Reuter, Caps. Syn., p. 13, pt; *id.*, Rev. Caps., p. 149; Ent. Mon. Mag., xiv, 1877, p. 62; xvii, 1880, p. 12; Hem. Gymn. Eur., iii, p. 354, 551, t. 5, f. 13.
Hab. Scandinavia, Livonia, Britain, Belgium, France, Spain, S. Austria.

propinquus, Reuter, Hem. Gymn. Eur., iii, p. 356, 551, t. 5, f. 17.
Hab. Spain.

pusillus, Reuter, *l. c.*, p. 373, 554.
Hab. Tunis.

quercicola, Reuter, C. R. Soc. Ent. Belg., 1885, p. xliii, fig.
Hab. Lower Austria.

rubidus (Fieber), *Allocotus*, Puton, Ann. Soc. Ent. Fr., (5 s.) iv, 1874, p. 219, t. 7, f. 2: Dougl. & Scott, Ent. Mon. Mag., xi, p. 146: Saund., Syn., p. 294: Reuter, Caps. Syn., p. 37; Hem. Gymn. Eur., iii, p. 372, 477, 554, t. 1, f. 7 *c*, *d*.
var. { *curvipennis*, Rent., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 36 (*forma brach*), ♀.
{ *rubidus*, var. *Moncreaffi*, Dougl. & Scott, Ent. Mon. Mag., xi, 1874, p. 147.
rubricatus, Jakowleff, Bull. Mosc., xlix (2), 1875, p. 171.
var. *salsolae*, Reuter, Bih. Vet. Akad. Handl., iii (i), 1875, p. 37.
Hab. Nearly all Europe, Britain, Tunis, Georgia.

Schoberiae, Reuter, Pet. Nouv. Ent., ii, no. 147, 1876, p. 34; Hem. Gymn. Eur., iii, p. 370, 553.
Hab. Hungary, S. Russia, Astrakhan.

Scottii, Reuter, Ent. Mon. Mag., xiv, 1877, p. 62; xvii, 1880, p. 12; Hem. Gymn. Eur., iii, p. 355, 551, t. 5, f. 14.
prasinus, Saund., Syn., Brit. Hem., 1875, p. 291 (*nec* Fallen).
viridinervis (*Litosoma*), Douglas & Scott, Brit. Hem., 1865, p. 335 (*nec* Kirschb.).
Hab. Britain, Germany, S. Austria.

? striola, Kirschbaum, Rhyn. Wiesb., 1855, p. 236, sp. 94, ?, p. 301.
Hab. Austria.

tenellus (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 103: Thomson (*Orthotylus*), Opusc. Ent., iv, 1871, p. 439: Saund., Syn., p. 392: Reuter, Caps. Syn., pt, p. 18; *id.*, Rev. Caps., p. 149; Hem. Gymn. Eur., iii, p. 351, 550, t. 5, f. 11.
angustus (Herr. Schäff.), Meyer, Rhyn. Schw., p. 56, t. 2, f. 3: Kirschb., Rhyn. Wiesb., p. 237, sp. 93: Fieber (*Orthotylus*), Eur. Hem., p. 288: Dougl. & Scott (*Litosoma*), Brit. Hem., p. 343: Walk., Cat. Het., vi, p. 131.
Hab. Scandinavia, Britain, Switzerland, Germany, Austria, Italy, Spain.

turanicus, Reuter, Hem. Gymn. Eur., iii, 1883, p. 362, 552; Fedtsch. Turk., p. 22.
Hab. Turkistan, Alai Range.

virens (*Capsus*), Fallen, Hem. Succ., 1829, p. 122, ♂: F. Sahlb., Geoc. Fenn., p. 95: Kirschb., Rhyn. Wiesb., p. 236, sp. 89, ♂: Flor, Rhyn. Liv., i, p. 617: Thomson, Opusc. Ent., iv, 1871, p. 438: Fieber (*Orthotylus*), Wien. Ent. Monats., viii, 1864, p. 342: Reuter, Caps. Syn., p. 17; *id.*, Rev. Caps., p. 147; Hem., Gymn. Eur., iii, p. 347, 550, t. 5, f. 7.
Hab. Scandinavia, Germany, Hungary.

viridinervis (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 238, sp. 95, p 277, 302: Walk., Cat. Het., vi, p. 132: Reuter, Ent. Mon. Mag., xiv, p. 61, 76; xvii, p. 11; Hem. Gymn. Eur., iii, p. 353, 477, 550, t. 5, f. 12.
Hab. Scandinavia, Britain, France, Germany, Switzerland, Austria, Greece.

Genus **HYPSITYLUS.**

Fieber, Eur. Hem., 1861, p. 286: Reut., Hem. Gymn. Eur., iii, p. 340, 544, t. 1, f. 6.
Litosoma, pt, Dougl. & Scott, Brit. Hem., 1865, p. 345.
Orthotylus, pt, Saunders, Syn., 1875, p. 294.
Pachylops, pt, Fieber, Eur. Hem. 1861, p. 70, 286.

bicolor, Douglas & Scott, Ent. Mon. Mag., iv, 1868, p. 267, t. 2, f. 3: Walk., Cat. Het., vi, p. 158: Reuter, Ent. Mon. Mag., xiv, 1877, p. 129, 131: *id.*, Hem. Gymn. Eur., iii, p. 342, 549.
? *chloropterus*, Fieber (*Pachylops*), Eur. Hem., p. 285 (*nec* Kirschb., *nec* Herr. Schäff): Dougl. & Scott, Brit. Hem., p. 345 (*nec* Kirschb.): Saund., Syn., p. 294.
Hab. Britain, France, Germany.

prasinus (Meyer), Fieber, Eur. Hem., 1861, p. 286: Walk., Cat. Het., vi, p. 157: Reut., Hem. Gymn. Eur., iii, p. 341, 549, t. 1. f. 6.
Hab. Spain, Portugal, S. France, Italy.

Genus **LITOXENUS.**

Reuter, C. R. Soc. Ent. Belg., 1885, p. xlv.

tenellus, Reuter, *l. c.*, p. xlv, fig.
Hab. Hungary.

Genus **ILNACORA.**

Reuter, Caps. Amer., 1875, p. 85.

divisa, Reuter, *l. c.*, p. 86: Uhler, List, p. 20.
Hab. Texas.

Stalii, Reuter, *l. c.*, p. 86: Uhler, List, p. 20.
Hab. New York, Texas.

Genus **CERATOCAPSUS.**

Reuter, Caps. Amer., 1875, p. 87.

lutescens, Reuter, *l. c.*, p. 87: Uhler, List, p. 20.
Hab. Texas.

punctulatus, Reuter, *l. c.*, p. 87: Uhler, List, p. 20.
Hab. Cuba.

Genus **DIOMMATUS**.

Uhler, Ent. Amer., 1887, p. 32.

congrex, Uhler, *l. c.*, p. 33.
Hab. N. America.

Genus **LOXOPS**.

Fieber, Crit., 1859, 64, t. 6, f. 21; *id.*, Eur. Hem., p. 70, 287: Reuter, Hem. Gymn. Eur., iii, p. 338, 545, t. 1, f. 8.

coccinea (*Capsus*), Meyer, Rhyn. Schw., 1843, p. 75, t. 4, f. 5: Fieber, Eur. Hem., p. 287: Dougl. & Scott, Ent. Mon. Mag., x, p. 64: Walk., Cat. Het., vi, p. 158: Saund., Syn., p. 289: Reuter, Hem. Gymn. Eur., iii, p. 339, 447, 548.
Hab. S. Britain, Holland, Switzerland, Germany, Austria.

Genus **HETEROTOMA**.

Latreille, Fam. Nat., 1829, p. 422: Am. & Serv., Hist. Ins. Hém., p. 236: Fieb. Eur. Hem., p. 71, 290: Reut., Hem. Gymn. Eur., iii, p. 336, 544, t. 1, f. 19.

acinaciformis, E. G. Costa, Mon. Ins. Uliv., ii, p. 20, t. 2, f. 4: Reuter, Hem. Gymn. Eur., iii, p. 338, 548.
Hab. Calabria.

diversipes, Puton, Bull. Soc. Ent. Fr., (5 s.) vi, 1876, p. xxxix: Reuter, Hem. Gymn. Eur., iii, p. 337, 548, t. 5, f. 29.
Hab. Corsica, Algeria.

merioptera (*Cimex*), Scopoli, Ent. Carn., 1763, p. 131: Fieber (*Heterotoma*), Eur. Hem., p. 290: Dougl. & Scott, Brit. Hem., p. 438, t. 14, f. 5: Walk., Cat. Het., vi, p. 134: Saund., Syn., p. 295: Reuter, Hem. Gymn. Eur., iii, p. 336, 548, t. 5, f. 28; *id.*, Rev. Syn. Het., p. 296.

ater, Geoffroy, Fourcroy, Ent. Paris., 1785, p. 211.

planicornis, Pallas, Spicil. Zool., ix, 1772, p. 23, t. 1, f. 13.

spissicornis, Fabr., Gen. Ins., 1776, p. 147: Panzer, Fauna Germ., ii, f. 15: Donovan, Brit. Ins., iv, p. 71, t. 135: Schrank, Fauna Boica, ii, p. 88?: Fabr., Syst. Rhyng., p. 246: Latreille, Hist. Nat., xii, p. 233; *id.*, (*Heterotoma*), Fam. Nat. Règn. Anim., p. 422: Herr. Schäff., Nomencl. Ent., i, p. 52: Burm., Handb. Ent., ii (i), p. 276: Costa, Cim. Regn. Neap., i, 1838, p. 54, f. 11: Westwood, Mod. Class. Ins., ii, p. 121: Am. & Serv., Hist. Ins., p. 283: Meyer, Rhyn. Schw., p. 64: Fieber, Crit., 27.

? var. *crassicornis*, Fabr., Syst. Ent., iv, 1794, p. 70: Reuter, Rev. Syn. Het., p. 297.

,, *crassipennis*, Turton, Syst. Nat., 1806, p. 609.

Hab. Nearly all Europe, Britain [*Atk.*, Lille, Liguria].

Genus **PLATYTOMATOCORIS**.

Reuter, Hem. Gymn. Eur., iii, 1883, p. 334, 544.
Excentricus, pt, Reuter, Hem. Gymn. Eur., iii, p. 335.

planicornis (*Capsus*), Herr. Schäff., Wanz. Ins., iii, 1835, p. 84, t. 100, f. 306: Walk., Cat. Het., vi, p. 135: Reuter (*Excentricus*), Hem. Gymn. Eur., i, p. 90, t. 1, f. 16 *d*; iii, p. 335, 477, 548.
Hab. France, Spain, Germany, Austria, Caucasus.

Genus **STHENARIDEA**.

Reuter, Ent. Tijdskr., v, 1884, p. 197.

pusilla, Reuter, *l. c.*, p. 198.
Hab. Bengal.

Genus **HETEROCORDYLUS**.

Fieber, Crit. Gen., 1859, 59, t. 6, f. 6; *id.*, Eur. Hem., p. 71, 290: Reuter, Rev. Caps., p. 97; Hem. Gymn. Eur., iii, p. 327, 544, t. 1, f. 5.
Bothrocranum, Reuter, Pet. Nouv. Ent., ii, no. 152, 1876, p. 54.

erythrophthalmus (*Phytocoris*), Hahn, Wanz. Ins., i, 1831, p. 207, t. 33, f. 106; Reuter, Hem. Gymn. Eur., iii, p. 333, 548, t. 5, f. 3: Berlin. Ent. Zeits., xxv, 1881, p. 178.
Freyii (*Bothrocranum*), Reuter, Pet. Nouv. Ent., ii, no. 152, [illegible] 54.
Hab. France, Germany, Switzerland, Austria.

farinosus, Horvath, Rev. d' Ent., vi, 1887, p. 73, f. 5.
Hab. Illyria.

genistae (*Cimex*), Scopoli, Ent. Carn., 1763, p. 134: Reuter, Hem. Gymn. Eur., iii, p. 330, 477, 588, t. 4, f. 8, ♀; *id.* Rev. Syn. Het., p. 295.
ater, Schrank, Fauna Boica, 1801, p. 86, pt, ♀.
leptocerus, Dougl. & Scott, Brit. Hem., p. 433, t. 14, f. 3, ♀ (*nec* Kirschb.).
pulverulentus (Klug), Burm. Handb. Ent., ii (i), 1835, p. 276 (*nec* Kolenati): Meyer, Rhyn. Schw., p. 63: Fieber (*Heterocordylus*), Crit., 1859, 28; Costa, Cim. Regn. Neap. Cent. Addit., 1860, p. 31.
unicolor (*Capsus*), Hahn, Wanz. Ins., ii, 1834, p. 94, t. 69, f. 179 *a*, *b*: Kirschb., Rhyn. Wiesb., p. 245, sp. 111: Fieb., Eur. Hem., p 291: Dougl. & Scott, Brit. Hem., p. 432: Walk., Cat. Het., vi, p. 135: Saund., Syn., p. 288.
Hab. Nearly all Europe, Britain [*Atk.*, Lille, Genoa].

leptocerus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 245, sp. 112, p. 278, 309: Fieber, Eur. Hem., p 291: Thomson, Opusc. Ent., iv, p. 440: Walk., Cat. Het., vi, p. 135: Reut., Hem. Gymn. Eur., iii, p. 331, 477, 548, t. 4, f. 7 ♀.
mutabilis, Hahn, Wanz. Ins., ii, 1834, p 95, t. 69, f. 180 (*nec* Fallen).
Spartii, Eohem., Ent. Ant. Sverge, p. 180.
tibialis, Reuter, Rev. Caps., 1875, p. 99 (*nec* Hahn).
Hab. Scandinavia, Germany, Hungary, Italy, S. Russia.

oblongus (*Heterotoma*), Kolenati, Mel. Ent., ii, 1845, p. 135, t. 9, f. 28: Walk., Cat. Het., vi, p. 135: Reuter, Hem. Gymn. Eur., iii, p. 329, 548.
Hab. Tashkent.

parvulus, Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 158; Hem. Gymn. Eur., iii, p. 331, 477, 548, t. 5, f. 2.
Hab. France, Portugal [*Atk.*, N. France].

tibialis (*Capsus*), Hahn, Wanz. Ins., i, 1831, p. 128, t. 20, f. 66: Kirschb., Rhyn. Wiesb., p. 245, sp. 113: Fieber, Eur. Hem., p. 291: Dougl. & Scott, Brit. Hem., p. 434: Saund., Syn., p. 288: Reuter, Hem. Gymn. Eur., iii, p. 332, 477, 548, t. 4, f. 6, ♂.
Hab. Denmark, France, Belgium, Britain, Spain, Germany, Austria, Syria [*Atk.*, N. France].

tumidicornis (*Capsus*), Herr. Schäff., Nomencl. Ent., i, 1835, p. 52; *id.*, Wanz. Ins., iii, p. 84, t. 100, f. 307 *et* a: Meyer, Rhyn. Schw., p. 59: Kirschb., Rhyn. Wiesb., p. 244, sp. 110: Fieber (*Heterocordylus*), Crit., 28: Costa, Cim. Regn. Neap. Cent. Add., 1860, p. 31, 34: Fieber, Eur. Hem., p. 291: Walk., Cat. Het., vi, p 135: Reuter, Rev. Caps., p. 89; Hem. Gymn. Eur., iii, p. 328, 547, t. 4, f. 9; t. 5, f. 1; *id.*, Rev. Syn. Het., p. 295.
Mali (*Capsus*), Bohem. Ofvers. Vet.-Aka. Förh., 1852, p. 72 (*nec* Meyer).
? *nigrita*, Schrank, Fauna Boica, 1801, p. 88.
pulverulentus, Kolenati, Mel. Ent. ii, 1845, p. 126 (*nec* Klug).
unicolor, Thomson, Opusc. Ent., iv, 1871, p. 440 (*nec* Herr. Schäff.)
Hab. Scandinavia, Central Europe, Russia, Caucasus.

Genus **MALACOCORIS.**

Fieber, Crit. Gen., 1859, 91, t. 6, f. 53; Eur. Hem., p. 76, 322: Reuter, Hem. Gymn. Scan. & Fenn., p. 139; Hem. Gymn. Eur., iii, p. 325, 544, t. 1, f. 4.

chlorizans (*Lygaeus*), (Block), Panzer, Fauna Germ., 1794, 18, f. 21: Fallen, Mon. Cim., p. 77; *id.*, Hem. Suec., p. 82: Meyer, Rhyn. Schw., p. 67: F. Sahlb., Geoc. Fenn., p. 98: Kirschb., Rhyn. Wiesb., p. 233, sp. 83, p. 277: Fieber (*Malacocoris*), Crit., 38; *id.*, Eur. Hem., p. 323: Flor, Rhyn. Liv., i, p. 551: Dougl. & Scott, Brit. Hem., p. 383, t. 12, f. 7: Thomson, Opusc. Ent. iv, p. 440: Walk., Cat. Het., vi, p. 144: Saund., Syn., p. 286: Reuter, Rev. Caps., p. 139; Hem. Gymn. Eur., iii, p. 327, 547; *id.*, Rev. Syn. Het., p. 294.
smaragdinus, Fieb., Crit. Phyt., 1859, sp. 42; Eur. Hem., p. 323: Walk., Cat. Het., vi, p. 144.
sulphuripennis, Westhoff, Jahrb. Westf. Prov.-Ver, Wiss. u. Kunst., ix, 1880, p. 79.
Hab. All middle Europe, S. Scandinavia, Italy.

irroratus (*Capsus*), Say: Uhler, List, p. 20.
Hab. United States.

Provancherii, Burque, Fauna Can. Hem., 1887, p. 144.
Hab. Canada.

Genus **REUTERIA**.

Puton, Pet. Nouv. Ent. i, no. 130, 1875, p. 519: Reut., Hem. Gymn. Eur., iii, p. 324, 544, t. 1, f. 3d.

Marquetii, Puton, *l. c., supra*, p. 519: Wien. Ent. Zeit., ii, 1883, p. 60: Reuter, *l. c., supra*, p. 325.

Hab. S. France, S. Austria, Greece [*Atk.*, Toulouse].

Genus **BRACHYNOTOCORIS**.

Reuter, Ofvers. Finska Soc. Förh., xxii, 1880, p. 22; Zool. Jahr., 1880, p. 141; Hem. Gymn. Eur., iii, p. 322, 543, t. 1, f. 3 *a-c*.

puncticornis, Reuter, Ofvers. *l. c. supra*, p. 22; Hem. Gymn. Eur., iii, p. 323, 547 t. 1, f. 1 *a-c*.

Hab. Spain.

Genus **PLATYCRANUS**.

Fieber, Verh. Zool.-Bot. Ges. Wien, xx, 1870, p. 252: Reuter, Hem. Gymn. Eur, iii, p. 320, 476, 543, t. 1, f. 2.

Erberii, Fieber, *l. c. supra*, p. 252, t. 6, f. 9: Walk., Cat. Het., vi, p. 157: Reut. Hem. Gymn. Eur., iii, p. 321, 547, t. 1, f. 2.

Hab. Algeria, Portugal, S. France, Italy, Tyrol, Montenegro, Greece [*Atk.* Stazzano].

metriorrhynchus, Reuter Rev. d' Ent., ii, 1883, p. 252; *id.*, Hem. Gymn. Eur., iii, 1883, p. 476, 547.

Hab. France.

Putonii, Reuter, Ofvers. Finska Vet. Soc. Förh., xxi, 1879, p. 38; *id.*, Hem. Gymn. Eur., iii, p. 322, 476, 547.

Hab. S. Algeria.

Div. XV, **NASOCORARIA**, Reuter, Hem. Gymn. Eur., iii, 1883, p. 317, 568.

Genus **NASOCORIS**.

Reuter, Ofvers. Finska Soc. Förh., xxi, 1879, p. 206; Hem. Gymn. Eur., iii, p. 371, t. 1, f. 1; Fedtsch. Turk., p. 32.

argyrotrichus, Reuter, Ofvers. Finska Vet. Soc. Förh., xxi, 1879, p. 206; Hem. Gymn. Eur., iii, p. 318, t. 1, f. 1; Fedtsch. Turk., p. 23.

Hab. S. Russia, Turkistan.

Div. XVI, **ONCOTYLARIA**, Reuter, Hem. Gymn. Eur., ii, p. 193; iii, p. 568.

Genus **ATOMOPHORA**.

Reuter, Hem. Gymn. Eur., ii, 1880, p. 287, 307, t. 1, f. 14; iii, p. 529; *id.*, Fedtsch. Turk., p. 29.

alba, Reuter, Hem. Gymn. Eur., ii, p. 290, t. 1, f. 14 *e*; iii, p. 542; *id.*, Fedtsch.-Turk., p. 31.
Hab. Turkistan.

eximia, Reuter, *l. c.*, ii, p. 288; iii, p. 542; *id.*, Fedtsch. Turk., p. 30.
Hab. Turkistan.

fuscomaculata, Reuter, Hem. Gymn. Eur., ii, p. 291, iii, p. 542.
Hab. Caspian Region.

pantherina, Reuter, *l. c.*, ii, p. 289, t. 1, f. 14 *a-d*; iii, p. 542; *id.*, Fedtsch. Turk., p. 31.
Hab. Turkistan.

Genus **ONYCHUMENUS**.

Reuter, Hem. Gymn. Eur., ii, p. 286, t. 1, f. 21; iii, p. 529.

decolor (*Capsus*), Fallen, Hem. Suec., 1829, p. 123: Meyer, Rhyn. Schw., p. 86: F. Sahlb., Geoc. Fenn., p. 95: Kirschb., Rhyn. Wiesb., p. 237, sp. 91: Flor, Rhyn. Liv., i, p. 555: Thomson (*Phylus*), Opusc. Ent., iv, p. 452: Fieber (*Oncotylus*), Eur. Hem., p. 298: Dougl. & Scott, Brit. Hem., p. 393, t. 13, f. 2: Walk., Cat. Het., vi, p. 139: Saund., Syn., p. 299: Reuter, Rev. Caps., p. 168; *id.*, Hem. Gymn. Eur., ii, p. 287; iii, p. 475, 542: Uhler (*Oncotylus*), List, p. 20.
chrysanthemi (*Lopus*), Hahn, Wanz. Ins., i, 1831, p. 10, t. 1, f. 4.
palliatus, Perris, Ann. Soc. Linn. Lyon, 1857, p. 166.
Hab. Middle Europe, Sesia, S. Scandinavia, Britain, United States [*Atk.*, Lillooet].

Genus **EURYCOLPUS**.

Reuter, Hem. Gymn. Eur., ii, 1880, p. 284, t. 1, f. 20; iii, p. 531.
Oncotylus, pt, Fieber, Eur. Hem., 1861, p. 298.

flaveolus (*Eurymerocoris*), Stål, Stettin. Ent. Zeit., 1858, p. 189: Walk., Cat. Het., vi, p. 158: Reuter, Ofvers. Finska Soc. Förh., xxi, p. 48; Hem. Gymn. Eur., ii, p. 285, t. 5, f. 7 ♂, f. 8 ♀; iii, p. 475, 542.
fenestratus, Fieber, Crit. Phyt., 1859, sp. 19; *id.*, Eur. Hem., p. 298: Walk., Cat. Het., vi, p. 139: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 41.
Hab. France, Austria, E. Siberia, Irkutsk [*Atk.*, Pyrenees].

Genus **ONCOTYLUS**.

Fieber, Crit. Phyt., 1859, 66, t. 6, f. 7; *id.*, Eur. Hem., p. 72, 298, 393: Reuter, Hem. Gymn. Eur., ii, p. 273, t. 1, f. 19; iii, p. 531.
Anoterops, Fieber, Crit. Gen., 1859, g. 65; Eur. Hem., p. 72, 297, 892: Reut., Bih. Vet.-Aka. Handl., iii (i), p. 42: Dougl. & Scott, Brit. Hem., p. 385.
Cylindromelus, Fieber, Eur. Hem., 1861, p. 393: Reut. Bih. *l. c. supra*, p. 42.

affinis, Jakowleff, Bull. Mosc., lvi (4), 1882, p. 23: Reut., Hem. Gymn. Eur., iii, p. 475, 542.
Hab. Krasnovodsk.

caspicus, Reuter, Hem. Gymn. Eur., ii, 1879, p. 282; iii, p. 542.
Hab. Astrakhan.

desertorum, Reuter, Fedtsch. Turk., p. 25 *t. c. supra*, ii, p. 277; iii, p. 541.
Hab. Turkistan.

nigricornis, Saunders, Ent. Mon. Mag., xii, 1876, p. 222: Reut., Hem. Gymn. Eur., ii, p. 278; iii, p. 541.
Hab. Spain, S. France.

pennicornis, Jakowleff, Trudi Russk., xi, 1880, p. 216: Reut., Hem. Gymn. Eur., iii, p. 473.
Hab. S. Russia, Sarepta.

persicus, Reuter, Hem. Gymn. Eur., ii, 1879, p. 281; iii, p. 542.
Hab. N. Persia, Shahrud.

plumicornis, Jakowleff, Bull. Mosc., lvi (4), 1882, p. 25: Reut., *l. c., supra*, iii, p. 474, 541.
Hab. S. Russia, Sarepta.

pulchellus, Reuter, Ofvers. Vet. Aka. Förh., 1874, p. 48; Bih. Vet. Aka. Handl., iii (i), p. 41; Rev. Caps., p. 159; Hem. Gymn. Eur., ii, p. 281; iii, p. 542.
Hab. Sweden.

punctipes, Reuter, Bih. Vet. Aka. Handl., iii (i), 1875, p. 42; Rev. Caps., p 160; Hem. Gymn. Eur., ii, p. 279, t. 5, f. 4; iii, p. 473, 541: Ent. Mon. Mag., x, 1873; p. 91, 119, 165.
tanaceti, Herr. Schäff., Wanz. Ins., iii, 1835, p. 35, t. 101, f. 309 (*nec* Fallen): Kirschb., Rhyn. Wiesb., p. 242, sp. 102: (*Oncotylus*), Fieber, Eur. Hem., p. 299.
Hab. Scandinavia, N. France, Germany, N. Austria, Russia [*Atk.*, Bohemia].

pyrethri (*Capsus*), Becker, Bull. Mosc., xxxvii (2), 1864 p. 487: Walk., Cat. Het. vi, p. 90: Reuter, Bih. Vet. Aka. Handl., iii (i), p. 42; Hem. Gymn. Eur., ii, p. 280, t. 5, f. 5, ♂; 6, ♀; iii, p. 541.
Hab. S. Russia, Sarepta, Astrakhan.

Reuterii (Oschanin), Reuter, Hem. Gymn. Eur., ii, 1880, p. 283; iii, p. 541.
Hab. S. Russia, Astrakhan.

setulosus (*Capsus*), Herr. Schäff., Wanz. Ins., iv, 1839, p. 30, t. 120, f. 380: (*Cylindromelus*) Fieber, Eur. Hem., p. 393: Walk., Cat. Het., vi, p 139: Reuter, Hem. Gymn. Eur., ii, p. 274, t. 5, f. 3; t. 1, f. 19 *a-e*; iii, p, 473, 540; Fedtsch. Turk., p 24.
Hab. Turkistan, S. Russia, Greece, Hungary.

viridiflavus (*Cimex*), Goeze, Ent. Beytr., ii, 1778, p. 267: Reuter, Hem. Gymn. Eur., iii, p. 473, 541; Rev. Syn. Het., p. 303.
chloris, Gmelin, Syst. Nat., iv, 1788, p. 2185.
nigropunctatus, Geoffroy, in Fourcr. Ent. Par., 1785, p. 207.
setulosus, Meyer, Rhyn. Schw., 1843, p. 53, t. 2, f. 1 (*nec* Herr. Schäff): Fieber, Eur. Hem., p. 298: Dougl. & Scott, (*Anoterops*), Brit. Hem., p. 385, t. 12, f. 8: Walk., Cat. Het., vi p. 138: Saund., Syn., p. 295.
tanaceti, Schrank, Fauna Boica, ii, 1801, p. 92.

trisignatus, Assman, Vers. Schles. Hem., 185 , p. 41 : Reut., Hem. Gymn. Eur., ii, p. 275, 305, t. 5, f. 1 ; iii, p. 473.

Hab. Britain, France, Switzerland, Austria, Russia, Derbent [*Atk.*, Lille].

vitticeps, Reuter, Hem. Gymn. Eur., ii, 1879, p. 276 ; iii, p. 473, 541 ; Fedtsch. Turk., p 25.

Hab. Turkistan, Tauria.

Genus **ENDERON**.

Puton, Rev. d' Ent., vii, 1888, p. 106.

Martinii, Puton, *l. c.*, p. 107.

Hab. Algeria, Biskra.

Genus **ACROTELUS**.

Reuter, C. R. Soc. Ent. Belg., 1885, p. xlvi.

Loewii, Reuter, *l. c.*, p. xlvi, fig.

Hab. Lower Austria.

Genus **PASTOCORIS**.

Reuter, Hem. Gymn. Eur. ii, 1879, p. 271, t. 1, f. 18 ; iii, p. 530.

Putonii, Reuter, Bih. Vet. Ak. Handl., iii (i), 1875, p. 41 ; Hem. Gymn. Eur., ii, p. 272 ; iii, p. 540.

Hab. S. France, Greece, Tunis.

Genus **STENOPARIA**.

Fieber, Verh. Zool.-Bot. Ges. Wien, xx, 1870, p. 255, t. 6 : Reuter, Hem. Gymn. Eur., ii, p. 269, t. 1, f. 17 ; iii, p. 530.

Putonii, Fieber, Verh. Zool. Bot. Ges., Wien, xx, 1870, p. 256, t. 6, f. 12 : Walk., Cat. Het , vi, p. 133 : Reut., Hem. Gymn. Eur., ii, p. 270, 305, t. 1, f. 17 *a-c* ; t. 4, f 9 ; iii, p. 540.

var. *punctata*, Reuter, *l. c.*, *supra*, ii, p. 306.

Hab. Spain, Sardinia, Greece.

Genus **CONOSTETHUS**.

Fieber, Crit. Gen., 1859, 67 : Eur. Hem., p. 72, 299 : Dougl. & Scott, Brit. Hem., p. 397 : Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 40 ; Hem. Gymn. Eur., ii, p. 264, t. 1, f. 16 ; iii, p. 530.

Xenocoris, Fieber, Crit. Gen., 1859, 56 ; Eur. Hem., p. 71, 288 : Reut., Bih. *l. c. supra*, p. 40.

brevis, Reuter, Ent. Mon. Mag., xiv, 1877, p. 77 ; *id.*, Hem Gymn. Eur., ii, p. 266 ; iii, p. 473, 540.

Hab. Scotland.

pamparum, Berg, Hem. Arg., Add. Emend., 1884, p. 92.
Hab. Buenos Ayres.

roseus (*Capsus*), Fallen, Hem. Succ., 1829, p. 124: (*Lopus*) Herr. Schäff., Nomencl. Ent., i, p. 47: (*Conostethus*), Fieber, Eur. Hem., p. 229, 394: Dougl. & Scott, Brit. Hem., p. 398, t, 13, f. 4: Walk., Cat. Het., vi, p. 140: Saund., Syn., p. 298: Reuter, Rev. Caps. p. 157; *id.*, Hem. Gymn. Eur., ii, p. 266, t. 4, f. 7, ♂; f. 8, ♀; iii, p. 473, 540.
aridellus, Flor, Rhyn. Liv., i, 1860, p. 556; Thomson, Opusc. Ent., iv, p. 452.
subpatellatus, Vollenhoven, Tijdskr. Ent., xviii, p. 172.
Hab. Scandinavia, Livonia, Germany, France, Switzerland.

salinus, J. Sahlberg, Notis. Skpts Fauna Fl. Fenn., xi, 1871, p. 296, t. 1, f. 3, 4: Reuter, Caps. Syn., p. 19; *id.*, Rev. Caps. p. 157; Hem. Gymn. Eur., ii, p. 265; iii, p. 473, 540: Saund., Syn., p. 298.
griseus, Douglas & Scott, Ent. Mon. Mag., 1870, p. 242
Hab. Finland, Britain, Hungary, S. France [*Atk.*, Hungary].

venustus, Fieber, Crit., 1859, sp. 14; *id.*, Eur. Hem., p. 288: Walk., Cat. Het., vi, p. 131: Reuter, Hem. Gymn. Eur., ii, p. 268, 305, t. 1, f. 16 *a-c*; iii, p. 473, 540.
Hab. Spain, S. France, Corsica, Italy, Greece, Algeria, Syria.

Genus **HADROPHYES**.

(Fieber), Puton, Ann. Soc. Ent. Fr., (5 s.) iv, 1874, p. 220; Reuter, Hem. Gymn. Eur., ii, p. 262, 305, t. 1, f. 15; iii, p. 531.

sulphurella (Fieber), Puton. *l. c.*, p. 220, t. 7, f. 4: Reut., *l. c.*, *supra*, ii, p. 263; iii, p. 540.
Hab. France, Corsica, Algeria.

Genus **LEUCOPTERUM**.

Reuter, Hem. Gymn. Eur., ii, 1879, p. 259, t. 1, f. 13; iii, p. 530: Fedtsch. Turk., p. 29.

candidatum, Reuter, *l. c.*, ii, p. 260; iii, p. 472, 539.
Hab. S. Russia, Georgia.

fasciatum, Reuter, *l. c.*, ii, p. 261, t. 1, f. 13; t. 5, f. 2; iii, p. 539.
Hab. S. Russia, Bogdo.

longicolle, Reuter, *l. c.*, ii, p. 260; iii, p. 539; Fedtsch. Turk., p. 29.
Hab. Turkistan, Karak.

? pallens, Reuter, *l. c.*, ii, p. 262; iii, p. 540.
Hab. S. Russia, Bogdo.

transversum, Jakowleff, Trudi Russk. Ent., xiii, 1882, p. 127: Reut., Hem. Gymn. Eur., iii, p. 472, 540.
Hab. Georgia, Derbent.

Genus **SOLENOXYPHUS**.

Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 38; Hem. Gymn. Eur., ii, p. 255, t. 1, f. 12; iii, p. 531.

Agalliastes, pt, Fieber, Eur. Hem. 1861: *Macrocoleus*, pt, Fieber, *l. c.*: *Psallus*, pt, Fieber, *l. c.*

crassiceps, Reuter, *l. c.*, p. 257, t. 1, f. 12 *a*; t. 4, f. 6; iii, p. 472, 539.

fuscovenosus, Fieber, Wien. Ent. Monats., viii, 1864, p. 330; Walk., Cat. Het., vi, p. 153.

Hab. Spain, Hungary, S. Russia, Sarepta, Turkistan.

♀ kirgisicus (*Agalliastes*), Frey Gessner, MT. Schw. Ent. Ges., 1864, p. 261: Walk., Cat. Het., vi, p. 156: Reuter, Hem. Gymn. Eur., ii, p. 258, 305, t. 1, f. 12 *d*, *e*; iii, p. 472, 539.

Hab. S. Russia, Sarepta, Astrakhan, Greece, Caucasus.

lepidus (Fieber), Puton, Ann. Soc. Ent. Fr., (5 s.) iv, 1874, p. 222, t. 7, f. 3; Reut., Hem. Gymn. Eur., ii, p. 256, t. 1, f. 12 *b*, *c*; iii, p. 471, 539.

Hab. S. France, Spain, S. Russia, Turan, Mangishlak [*Atk.*, Sarepta, S. Russia].

Genus **MALTHACOSOMA**.

Reuter, Fedtsch. Turk., p. 28; Hem. Gymn. Eur., ii, 1879, p. 253, t. 1, f. 11; iii, p. 531.

punctipenne, Reuter, Hem. Gymn. Eur., ii, p. 254; iii, p. 539; Fedtsch. Turk., p. 28.

Hab. Turkistan, Karakatsuk.

Genus **VORUCHIA**.

Reuter, Hem. Gymn. Eur., ii, 1879, p. 251, t. 1, f. 10; iii, p. 531; Fedtsch. Turk., p. 27.

vittigera, Reuter, Fedtsch. Turk., p. 27; Hem. *l. c.*, *supra*, ii, p. 251; iii, p. 539.

Hab. Turkistan, Voruch.

Genus **PLACOCHILUS**.

Fieber, Crit. Gen. Phyt., 1859, 85; *id.*, Eur. Hem. p. 75, 317: Reuter, Rev. Caps., p. 156; Hem. Gymn. Eur., ii, p. 250, t. 1, f. 9; iii, p. 532.

Hoplomachus subg. *Placochilus*, Reuter, Bih. Vet.-Aka., iii (i), 1875, p. 39; Rev. Caps., p. 156.

♀ sareptanus, Frey Gesner, MT. Schw. Ent. Ges., 1864, p. 261: Walk., Cat. Het., vi, p. 141: Reuter, Hem. Gymn. Eur., ii, p. 293.

Hab. S. Russia, Sarepta.

seladonicus (*Lygaeus*), Fallen, Mon. Cim., 1807, p. 77; *id.* (*Phytocoris*), Hem. Suec., p. 82: (*Capsus*) Herr. Schäff, Nomencl. Ent., i, p. 49: Kirschb., Rhyn. Wiesb., p. 241, sp. 103: Thomson, Opusc. Ent., iv, p. 450: (*Placochilus*) Fieber, Crit., 36; *id.*, Eur. Hem., p 317: Walk., Cat. Het., vi, p. 141: Reuter, Rev. Caps., p. 156; Hem. Gymn. Eur., ii, p. 251; iii, p. 470, 539; *id.*, Rev. Syn. Het., p. 302.

? *viror*, Harris, Exp. Engl. Ins., 1781, p. 91, t. 26, f. 13.

Hab. Nearly all Europe.

Genus **PRONOTOTROPIS**.

Reuter, Hem. Gymn. Eur., ii, 1880, p. 248, t. 1, f. 8; iii, p. 529: Fedtsch. Turk., p. 26.

Oncotylus, pt, Fieber, Eur. Hem., 1861, p. 72, 298.

punctipennis (*Oncotylus*), Fieber, Wien. Ent. Monats., viii, 1864, p. 225: Walk., Cat. Het., vi, p. 140: Reuter, Hem. Gymn. Eur., ii, p. 249, t. 2, f. 8, ♂: 9 ♀; iii p. 539; id., Fedtsch. Turk., p. 26.

Hab. S. Russia, Turkistan, Tashkent.

Genus **PHOENICOCAPSUS**.

Reuter, Pet. Nouv. Ent., ii, No. 152, 1876, p. 54; Hem. Gymn. Eur., ii, 1880, p. 246: iii, p. 530.

regina, Reuter, Pet. Nouv. Ent., ii, No. 152, 1876, p. 54; Hem. Gymn. Eur., ii, p. 247; iii, p. 538.

Hab. Spain.

Genus **PACHYXYPHUS**.

Fieber, Crit., 1859, 84; Eur. Hem., p. 75, 316: Reuter, Hem. Gymn. Eur., ii, p. 242: iii, p. 532.

Pachyxiphus, Fieber, *l. c. supra.*

caesareus, Reuter, *l. c.*, ii, p. 243, t. 1, f. 7 *a*; iii, p. 538.

Hab. Spain, Portugal.

lineellus (*Capsus*), Muls. & Rey, Ann. Soc. Linn. Lyon, 1852, p. 113: Fieber (*Pachyxiphus*), Eur. Hem., p. 317: Walk., Cat. Het., vi, p. 141: Reuter, Hem. Gymn. Eur., ii, p. 245; iii, p. 471, 538.

coroniceps, Costa, Cim. Regn. Neap., Cent., iii, 1852, p. 41, f. 7.

Hab. S. France, Corsica, S. Italy, Spain, Dalmatia, Greece, Asia Minor.

Genus **ROUDAIREA**.

Puton & Reuter, Expl. Scient. Tunisie, 1886, p. 21.

crassicornis, Puton & Reuter, *l. c.* p. 22.

Hab. Tunis.

Genus **THERMOCORIS**.

Puton, Pet. Nouv. Ent., i, No. 130, 1875, p. 519: Reuter, Hem. Gymn. Eur., ii, p. 240, t. 1, f. 6; iii, p. 532.

Munierii, Puton, *l. c., supra*, p. 519: Reut., Hem. Gymn. Eur., ii, p. 241; iii, p. 471, 538.

Hab. Greece, Algeria, Broussa.

Genus **HOPLOMACHUS**.

Fieber, Crit. Gen. Phyt., 1859, 83; *id.*, Eur. Hem. p. 75, 316: Dougl. & Scott, Brit. Hem., p. 395: Reuter, Hem. Gymn. Eur., ii, p. 238, t. 1, f. 5; iii, p. 532.

Thunbergii (*Lygaeus*), Fallen, Mon. Cim., 1807, p. 91; *id.*, (*Phytocoris*), Hem. Succ., p. 105: (*Miris*), Germar, Faun. Ins. Eur., xiii, t. 14: (*Capsus*), Meyer, Rhyn. Schw., p. 81: F. Sahlb., Geoc. Fenn., p 110: Kirschb., Rhyn. Wiesb., p. 242, sp. 106: Flor, Rhyn. Liv., i, p. 608: (*Phylus*), Thomson, Opusc. Ent., iv, p. 451: Fieber (*Hoplomachus*), Eur. Hem., p. 316: Dougl. & Scott, Brit. Hem., p. 396, t. 13, f. 1: Walk., Cat. Het., vi, p. 140: Saund., Syn., p. 295: Reuter, Caps. Syn., p. 24; Rev. Caps., p. 155; Hem. Gymn. Eur., ii, p. 239; iii, p. 538.

Hieracii (*Lopus*), Hahn, Wanz. Ins., i, 1831, p. 144, t. 22, f. 73.

Hab. Nearly all Europe [*Atk.*, Lille].

Genus **TINICEPHALUS**.

Fieber, Crit. Gen. Phyt., 1859, g. 68, t. 6, f. 11; *id.*, Eur. Hem., p. 73, 299: Reuter, Hem. Gymn. Eur., ii, p. 232, t. 1, f. 4; iii, p. 532.

discrepans, Fieber, Crit., 1859, sp. 20; *id.*, Eur. Hem., p. 300: Walk., Cat. Het., vi, p. 148: Reuter, Hem. Gymn. Eur., ii, p. 235, t. 4, f. 4, ♂; f. 5, ♀; iii, p. 538.

Hab. S. France, Corsica.

flavopilosus, Reuter, Hem. Gymn. Eur., ii, 1880, p. 234; iii, p. 538.

Hab. Corsica.

hortulanus (*Capsus*), Meyer, Rhyn. Schw., p. 77, t. 7, f. 3: (*Phytocoris*), Kolenati Mel. Ent., ii, p. 125?: Kirschb., Rhyn. Wiesb., p. 249, sp. 118: (*Tinicephalus*), Fieber, Eur. Hem., p. 300: Walk., Cat. Het., vi, p. 148: Saund., Syn., p. 296: Reuter, Ent. Mon. Mag., xv, 1878, p. 66; Hem. Gymn. Eur., ii, p. 236; iii, p. 471, 538.

punctipes, Dougl. & Scott, Cat. Brit. Hem., p. 38 (*nec* Reuter).

sordidus, Dougl. & Scott, Ent. Mon. Mag., iv, p. 49 (*nec* Kirschb.).

tanaceti, Dougl. & Scott, Brit. Hem., 1865, p. 394 (*nec* Fallen, *nec* Herr. Schäff).

Hab. Britain, France, Switzerland, Germany, Austria, ? Transcaucasia.

rubiginosus, Fieber, Eur. Hem., 1861, p. 300: Walk., Cat. Het., vi, p. 148: Reut., Hem. Gymn. Eur., ii, p. 233, t. 4, f. 3; iii, p. 538.

Hab. Spain, N. Italy, Tangiers.

simplex, Uhler, Hayden Surv. Mont., 1872, p. 417; Bull. Un. St. Surv., ii, 1876, p. 319; iii, 1877, p. 418.

Hab. Colorado.

Genus **MACROCOLEUS**.

Fieber, Crit. Gen. Phyt., 1859, 88; *id.*, Eur. Hem., p 76, 319: Dougl. & Scott, Brit. Hem., p. 386: Reuter, Rev. Caps., p. 161; Hem. Gymn. Eur., ii, p. 216, t. 1, f. 3; iii, p. 531.

Amblytylus, pt, Fieber, Eur. Hem., 1861, p. 318.

aurantiacus, Fieber, Crit. Phyt., 1859, sp. 38; *id.*, Eur. Hem., p. 320: Walk., Cat. Het., vi, p. 142: Reuter, Hem. Gymn. Eur., ii, p. 218, 305, t. 1, f. 3*a*; t. 3, f. 8, ♀; iii, p. 536.

Hab. Corsica, S. France, Algeria, Greece, Asia Minor.

Bolivarii, Reuter, Hem. Gymn. Eur., ii, 1880, p. 220, t. 1, f. 3*d*; iii, p. 537.
Hab. Spain.

chrysotrichus, Fieber, Wien. Ent. Monats., viii, 1864, p. 332: Walk., Cat. Het., vi, p. 143: Reuter, Hem. Gymn. Eur., ii, p. 225, 305, t. 3, f. 6; iii, p. 536.
Hab. S. Russia, Sarepta.

coagulatus, Uhler, Bull. Un. St. Surv., iii, 1877, p. 417; List, p. 20.
Hab. Colorado.

dissimilis, Reuter, Pet. Nouv. Ent., ii, No. 144, 1876, p. 21; Hem. Gymn. Eur., ii, p. 227; iii, p. 471, 537.
Hab. Italy, Hungary.

exsanguis (*Capsus*), Herr. Schäff., Nomencl. Ent., i, 1835, p. 21: Kirschb., Rhyn. Wiesb., p. 239, sp. 100: Fieber (*Macrocoleus*), Eur. Hem., p. 320: Walk., Cat. Het., vi, p. 142: Reuter, Hem. Gymn. Eur., ii, p. 229, t. 4, f. 1; iii, p. 536.
Hab. Germany.

femoralis, Reuter, Hem. Gymn. Eur., ii, 1880, p. 230; iii, p. 537.
Hab. Alsace.

Krueperii, Reuter, *l. c.*, ii, p. 231; iii, p. 537.
Hab. Algeria.

longirostris (*Amblytylus*), Fieber, Eur. Hem., 1861, p. 319: Walk., Cat. Het., vi, p. 55: Reuter, Hem. Gymn. Eur., ii, p. 222, 305, t. 3, f. 9 ♀; iii, p. 537.
Hab. Spain, Portugal, S. France, Greece.

Mellae, Reuter, Pet. Nouv. Ent., ii, No. 152, 1876, p. 54; Hem. Gymn. Eur., ii, 1879, p. 224; iii, p. 471, 536.
Hab. Italy.

molliculus (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 82: Herr. Schäff., Wanz. Ins., vi, p. 32, t. 191, f. 589: Meyer, Rhyn. Schw., p. 78: F. Sahlb., Geoc. Fenn., p. 103: Kirschb., Rhyn. Wiesb., p. 240, sp. 101: Flor, Rhyn. Liv., i, p. 611: Thomson, Opusc. Ent., iv, p. 451: Fieber (*Macrocoleus*), Eur. Hem., p. 321: Dougl. & Scott, Brit. Hem., p. 387, t. 12, f. 9; Walk., Cat. Het., vi, p. 143: Saund., Syn., p. 297: Reuter, Rev. Caps., p. 161; Eur. Hem., ii, p. 226, 305; iii, p. 537.
Hardyi, Bold, Trans. N. Durham Soc., iv, 1872, p. 358.
Hab. Nearly all Europe, Britain [*Atk.*, Lille].

naso, Reuter, Hem. Gymn. Eur., ii, 1879, p. 221, t. 1, f. 3 *b. c.*; iii, p. 471, 537.
Hab. Corsica.

ochroleucus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 248, sp. 117, p. 313: Reut. Hem. Gymn. Eur., ii, p. 223; iii, p. 471, 537.
Hab. Germany, Hungary.

pilosus (*Cimex*), Schrank, Fauna Boica, ii, 1801, p. 87: Reuter, Rev. Syn. Het., p. 302.
? *aureolus*, Fieber, Crit., 1859, sp. 37; *id.*, Eur. Hem., p. 320: Walk., Cat. Het., vi, p. 142.
sordidus, Kirschbaum, Rhyn. Wiesb., 1855, p. 247, sp. 116, p. 310: Fieber, Eur., Hem., p. 320; Walk., Cat. Het., vi, p. 142.

tanaceti, Fallen, Hem. Suec., 1829, p. 83: Flor, Rhyn. Liv., i, p. 610 Thomson, Opusc. Ent., iv, p. 450: Walk., Cat. Het., vi, p. 139: Saund., Syn., p. 296: Reuter, Ent. Mon. Mag., xv, 1878, p. 66; Hem. Gymn. Eur., ii, p. 223, 305, t. 3, f. 7; iii, p. 471, 536.

Hab. Scandinavia, Livonia, Hungary, Germany, Russia, N. France, Britain, [*Atk.*, Lille].

Signoretii, Reuter, Ann. Soc. Esp. H. N., ix, 1880, p. 194: Hem. Gymn, Eur., ii, 1880, p. 219.

Hab. S. France.

? **tibialis**, Jakowleff, Trudi Russki Ent., xi, 1880, p. 217: Reut., Hem. Gymn. Eur., iii, p. 471, 537.

Hab. S. Russia, Sarepta.

Genus **ALLOETOMUS**.

Reuter, C. R. Soc. Ent. Belg., 1885, p. xlvii.

vitellinus, Reuter, *l. c.*, p. xlvii, fig.

Hab. Portugal.

Genus **AMBLYTYLUS**.

Fieber, Crit. Gen. Phyt., 1859, 87, t. 6, f. 22; Eur. Hem., p. 76, 318: Dougl. & Scott, Brit. Hem., p. 388: Reuter, Rev. Caps., p. 163; Hem. Gymn. Eur., ii, p. 208; iii, p. 530.

Miris, pt, Hahn, Wanz. Ins., i, 1831: *Lopus*, pt, Kirschbaum, 1855: *Capsus* pt., Flor, 1860.

affinis, Fieber, Wien. Ent. Monats., viii, 1864, p. 332: Dougl. & Scott, Brit. Hem., p. 389: Walk., Cat. Het., vi, p. 56: Saund., Syn., p. 298: Reut., Hem. Gymn. Eur. ii, p. 213, t. 3, f. 2; iii, p. 470, 535.

Hab. N. Germany, Belgium, France, Italy, Britain [*Atk.*, Lille].

albidus (*Miris*), Hahn, Wanz. Ins., ii, 1834, p. 77, t. 53, f. 162: Kirschb. (*Lopus*), Rhyn. Wiesb., p. 195, sp. 9: Thomson (*Phylus*), Opusc. Ent., iv, p. 452: Fieber (*Amblytylus*), Eur. Hem., p. 318: Walk., Cat. Het., vi, p. 55: Reuter, Rev. Caps., p. 163; *id.*, Hem. Gymn. Eur., ii, p. 209; iii, p. 470, 535.

frontalis, Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 127.

Hab. S. Sweden, Denmark, Germany, S. France.

brevicollis, Fieber, Crit. Caps., 1859, sp. 35: Eur. Hem., p. 318: Walk., Cat. Het., vi, p. 55: Reuter, Hem. Gymn. Eur., ii, p. 214, t. 3, f. 3; iii, p. 535.

Hab. Corsica, S. France.

concolor, Jakowleff, Bull. Mosc., lii (2), 1877, p. 297: Reuter, Hem. Gymn. Eur. ii, p. 214; iii, p. 470, 535.

Hab. S. Russia, Astrakhan, Hungary, Turkistan.

delicatulus, Perris, Ann. Soc. Linn. Lyon, iv, 1857, p. 167: Reuter, Hem. Gymn. Eur., ii, p. 210; iii, p. 469, 535; Berl. Ent. Zeits, xxv, 1881, p. 160, ♀.

Hab. S. France.

? Jani, Fieber, Eur. Hem., 1861, p. 319: Walk., Cat. Het., vi, p. 55: Reuter, Hem. Gymn. Eur., ii, p. 292, t. 3, f. 5.
Hab. Italy.

? longiceps, Flor, Rhyn. Liv., i, 1860, p. 554: Walk., Cat. Het., vi, p. 55: Reuter, Hem. Gymn. Eur., ii, p. 293, t. 3, f. 4.
Hab. Livonia.

? lunula, Fieber, Eur. Hem., 1861, p. 318: Walk., Cat. Het., vi, p. 55: Reuter, Hem. Gymn. Eur., ii, p. 292, t. 5, f. 9.
Hab. Spain.

nasutus (*Lopus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 195, sp. 10, p. 281: Flor, Rhyn. Liv., i, p. 552: Fieb., Eur. Hem., p. 319: Reuter, Rev. Caps., p. 164: *id.*, Hem. Gymn. Eur., ii, p. 211, t. 3, f. 1; iii, p. 470, 535.
Hab. S. Sweden, Denmark, Germany, Hungary, Italy, Corfu.

? ornatulus, Jakowleff, Trudi Russk. Ent., xii, 1882, p. 140: Reuter, Hem. Gymn. Eur., iii, p. 470.
Hab. Caucasus, Derbent.

testaceus, Reuter, Hem. Gymn. Eur., ii, 1880, p. 215; iii, p. 536.
Hab. Hungary.

Genus **MACROTYLUS**.

Fieber, Crit. Gen. Phyt., 1859, 86; *id.*, Eur. Hem., p. 76, 317: Reuter, Hem. Gymn. Eur., ii, p. 194, t. 1, f. 1; iii, p. 529.
Lopus, pt, F. Sahlb, Geoc. Fenn., 1848; *macrocoleus*, pt, *Hoplomachus*, pt, Fieber, Eur. Hem. 1861; *Uncotylus*, pt. Dougl. & Scott, 1865: *Mermimerus*, J. Sahlb., Notis. Skpts pro Faun. Fl. Fenn., xi, 1871, p. 293; Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 43.

atricapillus (*Litosoma*), Scott, Ent. Mon. Mag., viii, 1872, p. 194: Walk., Cat. Het., vi, p. 131: Reuter, Hem. Gymn. Eur., ii, p. 206; iii, p. 468, 534.
gracilis, Puton, Ann. Soc. Ent. Fr., (5 s.) iv, 1874, p. 221.
Hab. S. France, Spain, Corsica, Greece.

attenuatus, Jakowleff, Trudi Russki., xiii, 1882, p. 172: Reuter, Hem. Gymn. Eur., iii, p. 468, 535.
Hab. S. Russia, Sarepta.

bicolor (*Macrocoleus*), Fieber, Eur. Hem., 1861, p. 319: Walk., Cat. Het., vi, p. 142: Reuter, Hem. Gymn. Eur., ii, p. 204, t. 2, f. 6; iii, p. 533.
Hab. Spain.

bipunctatus, Reuter, Hem. Gymn. Eur., ii, 1879, p. 207; iii, p. 535.
Hab. France.

colon, Reuter, An. Soc. Esp. N. H., ix, 1880, p. 194: Ofvers. Finska Soc. Förh., xxii, p. 23: Hem. Gymn. Eur., iii, p. 467, 534.
Hab. Spain.

cruciatus (*Lopus*), F. Sahlberg, Mon. Geoc. Fenn., 1848, p. 89: (*Mermimerus*) J. Sahlb., Not. Fauna Fl. Fenn., xi, p. 294: Reuter, Rev. Caps., p. 162; Ofvers. Finska

Soc. Förh., xxi, p. 56; Walk., Cat. Het., vi, p. 58: Reuter, Hem. Gymn. Eur., ii, p. 198; iii, p. 467, 535.

prolixus, Stål, Stettin. Ent. Zeit., xix, 1858, p. 187, ♀: Walk., Cat. Het. vi, p. 144.

Hab. Finland, Karelia, Siberia.

elevatus, Fieber, Crit. Phyt., 1859, sp. 37; Eur. Hem., p. 321: Walk., Cat. Het., vi, p. 143: Reuter, Hem. Gymn. Eur., ii, p. 199, t. 2, f. 5, ♀, iii, p. 535.

Hab. S. France, Corsica, Hungary.

fulvicornis, Jakowleff, Bull. Mosc., lvi (4), 1882, p. 364: Reuter, Hem. Gymn. Eur., iii, p. 469, 535.

Hab. S. Russia.

Herrichii, Reuter, Not. Skpts. Faun. Flor. Fenn., xiv, 1871, p. 24; Hem. Gymn. Eur., ii, p. 200; iii, p. 534.

bilineatus, Herr. Schäff, Wanz. Ins., iii, p. 70, t. 96, f. 285 (*nec* Fallen): Kirschb., Rhyn. Wiesb., p. 242, sp. 105: Fieber, Eur. Hem., p. 316: Walk., Cat. Het., vi, p. 141.

Hab. France, Germany, Austria, Hungary.

Horvathii (*Amblytylus*), Reuter, Pet. Nouv. Ent., ii, No. 144, 1876, p. 21; Hem. Gymn. Eur., ii, p. 203, 305; iii, p. 467, 534.

Hab. Hungary, S. France, Greece.

lutescens, Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1870, p. 262: Walk., Cat. Het., vi, p. 141: Reuter, Hem. Gymn. Eur., ii, p. 197, t. 2, f. 4; iii, p. 535.

Hab. Spain, Portugal, Italy.

mundulus (*Leptomerocoris*), Stål, Stettin. Ent. Zeit., xix, 1858, p. 188, ♂: Walk., Cat. Het., vi, p. 144: Reuter, Ofvers. Finska Soc. Förh., xxi, p. 56: Hem. Gymn. Eur., ii, 1879, p. 208, 305, t. 2, f. 7 ♂; iii, p. 534.

Hab. E. Siberia, Irkutsk.

nigricornis, Fieber, Wien. Ent. Monats., viii, 1864, p. 331, ♀: Walk., Cat. Het., vi, p. 141: Reuter, Hem. Gymn. Eur., ii, p. 195, t. 2, f. 2, 3; iii, p. 535: Ferrari., Ann. Mus. Civ. Gen., (2 s.), i, 1884, p. 486.

var. *melanocerus*, Puton, Ann. Soc. Ent. Fr., (5 s.) ix, 1876, p. 282, ♂.

Hab. Greece, Algeria, Tunis.

Paykullii (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 106: Fieber (*Macrocoleus*), Eur. Hem., p. 319: Dougl. & Scott, Brit. Hem., p. 388: Saund. Syn., p. 297: Reuter (*Mermimerus*), Hem. Gymn. Scan. & Fenn., p. 162: Thomson (*Phylus*), Opusc. Ent., iv, p. 451: Walk., Cat. Het., vi, p. 142: Reuter (*Macrotylus*), Hem. Gymn. Eur., ii, p. 204; iii, p. 468, 534.

elegans (*Poecilosoma*), Curtis.

maculipennis, Herr. Schäff., Nomencl. Ent., i, 1835, p. 50: Meyer, Rhyn. Schw., p. 81, t. 5, f. 1: Kirschb., Rhyn. Wiesb., p. 241, sp. 104.

var. *nigripes* (*Macrocoleus*), Puton, Ann. Soc. Ent. Fr., (5 s.) iv, 1874, p. 221.

Hab. S. & Middle Europe to S. Sweden; Tunis [*Atk.*, Dunkirk, Stazzano].

quadrilineatus (*Cimex*), Schrank, Verz. Ins. Bercht., 1785, p. 339: Reut., Hem. Gymn. Eur., iii, p. 467, 533; *id.*, Rev. Syn. Het., p. 301.

albopunctatus, Garbig., Bull. Soc. Ent. Ital., i, 1869, p. 194: Walk., Cat. Het., vi, p. 144.

luniger (*Macrotylus*), Fieber, Crit., ii, 1859, 34; Eur. Hem., p. 318: Walk., Cat. Het., vi, p. 141: Reuter, Hem. Gymn. Eur., ii, p. 195, t. 2, f. 1.
Hab. Austria, Switzerland, Italy.

solitarius (*Capsus*), Meyer, Rhyn. Schw., 1843, p. 83, t. 5, f. 4: Fieb. Eur. Hem., p. 321: Dougl. & Scott, Ent. Mon. Mag., iv, 227, t. 2, f. 4: Walk., Cat. Het., vi, p. 142: Saund., Syn., p. 297: Reut., Hem. Gymn. Eur., ii, p. 202, 305; iii, p. 467, 534.

var. *pilosus* (*Oncotylus*), Douglas & Scott, Brit. Hem., 1865, p. 395; Ent. Mon. Mag., x, p. 165, 277: Walk., Cat. Het., vi, p. 139.
seladonicus, Kirschbaum, Rhyn. Wiesb., 1855, p. 241, sp. 103 (*nec* Fallen).
Hab. Austria, Switzerland, France, Britain [*Atk.*, Bohemia].

Div. XVII, **PLAGIOGNATHARIA**, Reuter, Hem. Gymn. Eur., i, 1879, p. 15; iii, 1883, p. 568.

Genus **HARPOCERA**.

Curtis, Brit. Ent., xv, 1838, p. 36: Fieber, Eur. Hem., p 72, 296: Dougl. & Scott, Brit. Hem., p. 468: Reuter, Rev Caps., p. 165; *id.*, Hem. Gymn., Eur., i, p. 168 iii, p. 504.

hellenica, Reuter, Pet. Nouv. Ent., ii, No. 144, 1876, p. 21; Hem. Gymn. Eur., i, p. 170; iii, p. 466, 528.
Hab. Greece.

thoracica (*Lygaeus*), Fallen, Mon. Cim., 1807, p. 81; *id.*, Hem. Succ., p. 111: Herr. Schäff., Nomencl. Ent., p. 52: Meyer, Rhyn. Schw., p. 102, t. 6, f. 5, ♀: Kirschb., Rhyn. Wiesb., p. 233, sp. 82, p. 277: Fieber (*Harpocera*), Crit., 28; *id.*, Eur. Hem., p. 297: Dougl. & Scott, Brit. Hem., p. 469, t. 15, f. 3: Thomson, Opusc. Ent., iv, p. 443: Walk., Cat. Het., vi, p. 138: Saund., Syn., p. 299: Reuter, Rev. Caps, p. 165; *id.*, Hem Gymn. Eur., i, p. 169, t. 8, f. 6, ♂; f. 7, ♀; iii, p. 466, 527; Rev. Syn. Het., p. 312.

antennatus, Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 129, ♂.
Burmeisteri (*Harpocera*), Curtis, Brit. Ent., xv, 1838, p. 709, f. 709, ♂.
circumflexa, Costa, Cim. Regn. Neap. Cent., iii, 1852, p. 36, t. 7, f. 6.
curvipes, Meyer, Rhyn. Schw., 1843, p 98, t. 5, f. 3, ♂.
dispar, Stephens, *teste*, Signoret, Bull. Soc. Ent. Fr., 1853, p. liv,
picticornis, Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 149, ♀.
? *prothyris*, Vill., Ent. Anct., 1789, p. 529.
Hab. Middle & S. Europe [*Atk.*, Lille].

Genus **BYRSOPTERA**.

Spinola, Ess., 1837, p. 191: Dougl. & Scott, Brit. Hem., p. 351: Reuter, Rev. Caps. p. 166; Hem. Gymn. Eur., i, p. 165, 181; iii, p. 501.
Bryocoris, pt, F. Sahlberg, Mon. Geoc. Fenn., 1848.
Capsus, pt, Fallen, Mon. Cim., 1807.
Cyllecoris, pt, Hahn, Wanz. Ins.
Halticus, pt, Burm., Handb. Ent., ii (i), 1835.
Malthacus, Fieber, Crit. Gen. Phyt., 1859, g. 77; Eur. Hem., p. 74, 312.

cylindricollis (*Halticus*), Costa, Cim. Regn. Neap., Cent. iii, 1852, p. 280: Reuter, Hem. Gymn. Eur., iii, p. 465, 527: Horvath, Rev. d' Ent., vii, 1888, p. 182, ♂.
Hab. France, Italy, Hungary, Greece.

fuscicornis, Reuter, Hem. Gymn. Eur., i, 1879, p. 168; iii, p. 527: Fedtsch. Turk., p. 33.
Hab. Turkistan.

pontica, Horvath, Rev. d' Ent., vii, 1888, p. 182.
Hab. Tauria.

rossica, Reuter, Hem. Gymn. Eur., i, 1879, p. 167; iii, p. 527.
Hab. S. Russia.

ruffrons (*Capsus*), Fallen, Mon. Cim., 1807, p. 105: Herr. Schäff., Wanz. Ins., iii, p. 110, t. 108, f. 328, ♀: Burm. (*Halticus*), Handb. Ent., ii (i), p. 278: Westwood (*Astemma*), Mod. Class. Ins., ii, p. 121: Meyer (*Capsus*), Rhyn. Schw., p. 112: Kolenati (*Eurycephala*), Mel. Ent., ii, p. 131: F. Sahlb. (*Bryocoris*), Geoc. Fenn., p. 124: Kirschb., Rhyn. Wiesb., p. 235, sp. 77; p. 274: Flor, Rhyn. Liv., i, p. 622: Thomson, Opusc. Ent., iv, p. 445: Walk., Cat. Het., vi, p. 130: Saund., Syn., p. 283: Reuter, Caps. Syn., p. 23; *id.*, Rev. Caps., p. 167; Hem. Gymn. Eur., i, p. 166; iii, p. 465, 527; Rev. Syn. Het., p. 308.
ambulans, ♀, var. β, Fallen, Hem. Suec., 1829, p. 126.
caricis, Fieber, Crit., 1859, 34; *id.* (*Malthacus*), Eur. Hem., p. 313 (*nec* Fallen): Dougl. & Scott, Brit. Hem., p. 352, t. 11, f. 6.
erythrocephala (*Byrsoptera*), Spinola, Ess., 1837, p. 191.
? *leucocephalus*, Schrank, Fauna Boica, 1801, p. 78 (*nec* Linn.).
Hab. Nearly all Europe, Asia Minor [*Atk.*, Hungary].

syriaca, Puton, MT. Schw. Ent. Ges., vi (3), 1881, p. 127: Reuter, Hem. Gymn. Eur., iii, p. 465, 527.
Hab. Syria, Kaiffa.

Genus **BRACHYARTHRUM.**

Fieber, Crit. Gen., 1859, 70; Eur. Hem., p. 73, 301: Reuter, Rev. Caps., p. 170; *id.* Hem. Gymn. Eur., i, p. 164, t. 1, f. 19 *d*; iii, p. 501.

limitatum, Fieber, Eur. Hem., 1861, p. 301, ♀: Walk., Cat. Het., vi, p. 148: Reuter, Rev. Caps., p. 170; *id.*, Hem. Gymn. Eur., i, p. 164, t. 8, f. 5, ♀; iii, p. 465, 526.
nigriceps, Bohem., Nya Svenska Hem., 1852, p. 67 (*nec* Fallen) ♀: Reuter, Caps. Syn., 1875, p. 19.
pinetellum, Thomson, Opusc. Ent., iv, 1871, p. 244 (*nec* Zett.).
Hab. Sweden, S. Finland, Bohemia.

Genus **PHYLUS.**

Hahn, Wanz. Ins., i, 1831, p. 26: Reuter, Bih. Vet.-Akn. Handl., iii (i), p. 44, pt; Rev. Caps., p. 168; *id.*, Hem. Gymn. Eur., i, p. 159, t. 1, f. 19 *a-c*; iii, p. 501.
Gnostus, Fieber, Crit. Gen. Phyt., 1859, g. 82; Eur. Hem., p. 75.
Teratoscopus, Fieber, Eur. Hem., p. 315.

coryli (*Cimex*), Linn., Syst. Nat., (*ed.* 10), 1758, p. 451: Fabr., Syst. Ent., 1775, p. 724; *id.*, Syst. Rhyng., p. 234: Schrank, Fauna Boica, ii, p. 84?: Fallen, Mon. Cim., p. 83; *id.*, Hem. Suec., p. 90: Herr. Schäff., Nomencl. Ent., i, p. 52: Burm. Handb. Ent., ii (i), p. 268: Westwood, Mod. Class. Ins., ii, p. 122: Meyer, Rhyn. Schw., p. 54: F. Sahlb., Geoc. Fenn., p. 99: Kirschb., Rhyn. Wiesb., p. 234 sp. 85: Flor, Rhyn. Liv., i, p. 620: Fieber, Crit., 35; *id.*, Eur. Hem., p. 315: Dougl. & Scott, Brit. Hem., p. 356: Thomson, Opusc. Ent., iv, p. 444: Walk., Cat. Het., vi, p. 88: Saund., Syn., p. 300: Reuter, Rev. Caps., p. 168; *id.*, Hem. Gymn. Eur., i, p. 161; iii, p. 526; *id.*, Rev. Syn. Het., p. 310, 396.

? flavipes, Scopoli, Ent. Carn., 1763, p. 134.

? mutabilis, Linn., Syst. Nat. (*ed.* 10), 1758, p. 449; Faun. Suec., p. 256.

pallipes (*Phylus*), Hahn, Wanz. Ins., i, 1831, p. 26, t. 4, f. 16: Costa, Cim. Regn. Neap., Cent., i (1838) p. 50.

? rufiventris, Fallen, Hem. Suec., 1829, p. 100: Puton, Cat., 1886, p. 60.

var. *avellanae* (*Capsus*), Meyer, Stettin. Ent. Zeit., ii, 1841, p. 83; *id.*, Rhyn. Schw., p. 54, t. 2, f. 2: Herr. Schäff., Wanz. Ins., vi, p. 98, t. 212, f. 670: Kirschb., Rhyn. Wiesb., p. 235, sp. 86, p. 277; Fieber, Crit., 35; *id.*, Eur. Hem., p. 315: Dougl. & Scott, Brit. Hem., p. 357: Walk., Cat. Het., vi, p. 88: Saund., Syn., p. 300: Reuter, Hem. Gymn. Eur., i, p. 161, t. 8, f. 2; iii, p. 465, 526.

Hab. Nearly all Europe [*Atk.*, Liguria, Hungary].

lituratus, Fieber, Eur. Hem., 1861, p. 315: Walk., Cat. Het., vi, p. 87: Reuter, Hem. Gymn. Eur. i, p. 162, t. 8, f. 3; iii, p. 526.

Hab. Ural Mountains.

melanocephalus (*Cimex*), Linn., Syst. Nat., (*ed.* 12), 1767, p. 728: Hahn (*Lygus*), Wanz. Ins., i, p. 155, f. 79: Burm., Handb. Ent., ii (i), p. 268: Meyer, Rhyn. Schw., p. 55: F. Sahlb., Geoc. Fenn., p. 99: Costa, Cim. Regn. Neap., Cent, iii, p. 40: Kirschb., Rhyn. Wiesb., p. 234 sp. 84: Flor, Rhyn. Liv., i, p. 621: Fieber, (*Phylus*), Crit., 1859, 35; *id.*, Eur. Hem., p. 315: Dougl. & Scott, Brit. Hem., p. 355: Stål, Hem. Fabr., i, p. 89; Thomson, Opusc. Ent., iv, p. 444: Walk., Cat. Het., vi, p. 87: Saund., Syn., p. 300: Reuter, Rev. Caps., p. 169; *id.*, Hem. Gymn. Eur, i, p. 160; ii, p. 304; iii, p. 526; *id.*, Rev. Syn. Het., p. 309.

diaphanus, Vill., Ent. Auct., 1789, p. 535.

leucopus, Gmelin, Syst. Nat. iv, 1788, p. 2167.

nigripes, Muls. & Rey, Ann. Soc. Linn. Lyon, 1852, p. 137.

ochropterus, Gmelin, Syst. Nat., iv, 1788, p. 2167.

pallens, Fabr., Mant. Ins., 1787, p. 306; *id.*, Syst. Rhyng., p. 254: Latreille, Hist Nat., xii, p. 228.

pallidus, Gmelin, Syst. Nat., iv, 1788, p. 2190.

vestitus, Fallen, Mon. Cim., 1807, p. 82; *id.*, Hem. Suec., p. 89.

Hab. Nearly all Europe [*Atk.*, Lille].

palliceps, Fieber, Eur. Hem., 1861, p 315: Dougl. & Scott, Brit. Hem., p. 355: Walk., Cat. Het., vi, p. 87: Saund., Syn., p. 300: Reuter, Hem. Gymn. Eur., i, p. 160; iii, p. 464, 526.

aurantiacus, Vollenhoven, Inl. Hem., in Tijdschr. Ent., xix, p. 104.

Hab. Britain, Holland, France, Spain, Austria [*Atk.*, Hungary].

plagiatus (*Capsus*), Herr. Schäff., Nomencl. Ent., i, 1835, p. 50; *id.*, Panzer, Faun. Germ., 135, t. 10, ♀: Herr. Schäff., Wanz. Ins., vi, p. 80, t. 191, f. 587, ♂: Fieber, Crit. Phyt., p. 35; *id.*, Eur. Hem., p. 316: Walk., Cat. Het., vi, p. 140: Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 160, Var.; *id.*, Hem. Gymn. Eur., i, p. 163, t. 8, f. 4; iii, p. 465.

insticatus, Fieber, Weit. Beytr., j, 1836, p. 104, t. 2, f. 3.

Hab. France, Switzerland, Austria.

Genus **ICODEMA**.

Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 45; Hem. Gymn. Eur., i, p. 157; iii, p. 501.

Plagionathus, pt, Fieber: *Orthotylus*, pt, Frey Gessner.

infuscatum (*Plagiognathus*), Fieber, Eur. Hem., 1861, p. 303: Walk., Cat. Het., vi, p. 149: Reut., Hem. Gymn. Eur., i, p. 158, t. 8, f. 6; ii, p. 304; iii, p. 464, 526.

pallidus, Meyer, MT. Schwe. Ent. Ges., iii, 1870, p. 209; Puton, *ib.*, p. 421: Walk., Cat. Het., vi, p. 133.

Hab. S. Finland, France, Spain, Austria.

Genus **PLESIODEMA**.

Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 45; Rev. Caps., p. 171; Hem. Gymn. Eur., i, p. 155; iii, p. 500.

Capsus, pt, Zetterstedt, Ent. Lap., 1840, p. 276: (*Capsus*) Kirschbaum, Rhyn. Wiesb., p. 236, sp. 90, p. 277, ♂: Flor, Rhyn. Liv., i, p. 586: Walk., Cat. Het., vi, p. 148: Reuter, (*Plesiodema*), Rev. Caps., p. 171; Ent. Mon. Mag. xiii, p. 85; Caps. Syn., p. 23; Hem. Gymn. Eur., i, p. 156, 179; ii, p. 304; iii, p. 464, 526: Saund., Syn., p. 654.

lugubris, Fieber, Eur. Hem., 1861, p. 312: Walk., Cat. Het., vi, p. 155.

pallidipennis, J. Sahlb., Notis Skpts Fauna Fl. Fenn., ix, 1867, p. 178, ♀.

var. { *impurum*, Reuter, Caps. Syn., 1875, p. 22 (*nec* Bohem.).
{ *pallidipennis*, var. β, Reuter, Hem. Gymn. Eur., i, p. 115.

Hab. N. & Middle Europe, N. Italy, Scotland [*Atk.*, Lille].

Genus **EUROTAS**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 302.

nodosus, Distant, *l. c.*, p. 303, t. 29, f. 12.

Hab. Panama, Bugaba.

Genus **LAMPETHUSA**.

Distant, Biol. Centr. Amer. Rhyn., 1884, p. 303.

anatina, Distant, *l. c.*, p. 303, t. 29, f. 13.

Hab. Guatemala, Zapote.

Genus **PSALLUS**.

Fieber, pt, Crit. Gen., 1859, g. 74; *id.*, Eur. Hem., p. 74, 305: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 47; Rev. Caps., p. 174; *id.*, Hem. Gymn. Eur., i, p. 101, t. 1, f. 18; iii, p. 503.

Agalliastes, pt, Fieber, Eur. Hem., 1861, p. 74, 310.

Apocremnus, Fieber, Crit. Phyt., 1859, g. 73; Eur. Hem., p. 74, 304: Reuter, Bih. *l. c. supra*, p. 47.

Atractotomus, pt, Fieber, Eur. Hem., 1861, p. 71, 294.

Liops, pt, Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1880, p. 254, t. 6; Reuter, Bih. *l. c. supra*, p. 49.

absinthii, Scott, Stettin. Ent. Zeit., xxxi, 1860, p. 100: Walk., Cat. Het., vi, p. 156: Reuter, Hem. Gymn. Eur., i, p. 150; iii, p. 525.

aethiops (*Phytocoris*), Zetterstedt, Ins. Lapp., 1840, p. 274 ♀: Thomson (*Phylus*), Opusc. Ent., iv, p. 446: J. Sahlb., Vet.-Aka. Handl., xvi, (4), 1878, p. 30: Reuter, Caps. Syn., p. 21; Abo Hem., p. 179; *id.*, Rev. Caps., p. 177; Hem. Gymn. Eur., i, p. 109, 176; iii, p. 517, 519.

intermedius, F. Sahlb., Geoc. Fenn., 1848, p. 116: Reuter, Caps. Syn., p. 21; Rev. Caps., p. 175; Hem. Gymn. Eur., i, p. 107, 176.

Hab. S. Finland, Lapland, Siberia [*Atk.*, Finland].

albicinctus (*Capsus*), Kirschb., Rhyn. Wiesb., 1855, p. 256, sp. 138, p. 332: Fieber (*Psallus*), Eur. Hem., p. 307: Walk., Cat. Het., vi, p. 152 [illegible] p. 190; *id.*, Hem. Gymn. Eur., i, p. 148, t. 6, f. 3; iii, p. 463 [illegible]

Hab. Denmark, Germany, S. Austria, Switzerla[illegible] Lille].

albipes (*Apocremnus*) [illegible] Mosc., lii (2), 1877, p. 298: Reuter, Hem. Gymn. Eur., i, p. 114; iii, p. 520.

Hab. S. Russia.

alnicola, Douglas & Scott, Ent. Mon. Mag., viii, p. 62: Saund. Syn., p. 305: Reuter, Rev. Caps., p. 183; Abo Hem., p. 182; Hem. Gymn. Eur., i, p. 126; iii, p. 522.

alni, Douglas & Scott, Brit. Hem., 1865, p. 414

Hab. Britain, Scandinavia.

ambiguus (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 99: Zett., Ins. Lapp., p. 274: Herr. Schäff. (*Capsus*), Wanz. Ins., vi, 1842, p. 43, t. 95, f. 602, ♀: Meyer, Stettin. Ent. Zeit., ii, 1841, p. 85 ?; Rhyn. Schw., p. 60: F. Sahlb., Geoc. Fenn., p. 114: Kirschb., Rhyn. Wiesb., p. 254, sp. 132, p. 279: Flor, Rhyn. Liv., i, p. 627: Thomson, Opusc. Ent., iv, p. 346: Fieber (*Apocremnus*), Eur. Hem., p. 305, pt; Walk., Cat. Het., vi, p. 150: Reuter, Caps. Syn., p. 20, pt; Abo Hem., p. 179; *id.*, Rev. Caps., p. 178; Hem. Gymn. Eur., i, p. 105, t. 7, f. 8; ii, p. 302; iii, p. 460, 517, 519: Saund., Syn., p. 302.

betuleti, Zetterstedt, Ins. Lapp., 1840, p. 274.

mutabilis, Fallen, Hem. Suec., 1829, p. 98, ♀ p. 252, sp. 128.

obscurus, Kirschbaum, Rhyn. Wiesb., 1855, ♂, ♀: Douglas & Scott, Brit. Hem., p. 406.

Hab. Nearly all Europe.

ancorifer, Fieber, Crit. Phyt., 1859, sp. 24, *id.*, Eur. Hem., p. 304: Walk., Cat. Het., vi, p. 150: Reuter, Hem. Gymn. Eur., i, p. 104, t. 7, f. 7; iii, p. 459, 460, 517, 518.

nigripes, Fieber, Eur. Hem., 1861, p. 295, ♂.
var. *fuscinervis*, Reuter, Bih. Vet.-Aka. Handl., iv (i), 1875, p. 56, ♂; Hem. Gymn. Eur., i, p. 103, 176, t. 1, f. 18 *f-h*; ii, p. 303; iii, p. 459.
„ *minor*, Reuter, Hem. Gymn. Eur., iii, 1883, p. 459, 460: Ferrari, Ann. Mus. Civ. Gen., 1884, p. 486.
Hab. S. Europe, Greece, Tunis, Asia Minor [*Atk.*, Catalonia, Genoa].

anticus (*Apocremnus*), Reuter, Pet. Nouv. Ent., ii, No. 144, 1876, p. 22; Hem. Gymn. Eur., i, p. 118; iii, p. 520.
Hab. S. Russia, Greece.

argyrotrichus, Fieber, Eur. Hem., 1861, p. 308: Walk., Cat. Het., vi, p. 152: Reut., Hem. Gymn. Eur., i, p. 153; iii, p. 526.
Hab. Spain, Aachen.

atomosus, Reuter, Hem. Gymn. Eur., i, 1879, p. 150; ii, p. 303; iii, p. 464, 525.
? = *absinthii*, Scott, *q. v.*
Hab. France, S. Russia, Sarepta.

aurora (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 133; Reut., *l. c.*, *supra*, p. 146; iii, p. 523.
Hab. S. France, Spain, Algeria.

betuleti (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 97: Zett., Ins., Lapp., p. 274: F. Sahlb., Geoc. Fenn., p. 114: Thomson, Opusc. Ent., iv, p. 445: Reuter, Caps. Syn., p. 20; Abo Hem., p. 180; *id.*, Rev. Caps., p. 176; Hem. Gymn. Eur., i, p. 110, 178; ii, p. 302; iii, p. 469, 518, 519; Rev. Syn. Het., p. 306: Saund., Syn.,

? *ambiguus*, pt, Flor, Rhyn. Liv., i, 1860, p. 627, ?: Fieber, Eur. Hem., p. 305, pt: Dougl. & Scott, Brit. Hem., p. 404, *excl. syn.*
betulae, Kirschb., Rhyn. Wiesb., 1855, p. 254, sp. 133, p. 327, ♀.
? *cruentus*, Müller, Zool. Dan., 1776, p. 108 (*nom. praeoc.*).
? *leucostictus*, Gmelin, Syst. Nat. iv, 1788, p. 2180.
? *Müllori*, Turton, Syst. Nat., ii, 1806, p. 671.
? *obscurus*, Kirschb., Rhyn. Wiesb., 1855, p. 252, sp. 128, p. 279, 322: *teste* Puton, Cat. 1886.
ruber, Herr. Schäff., Nomen. Ent., i, 1835, p. 50, ?.
Hab. Nearly all Europe, S. Finland.

bicolor, Jakowleff, Trudi Russki Ent., ix, 1880, p. 219: Reuter, Hem. Gymn. Eur., iii, p. 460, 520.
Hab. S. Russia, Sarepta.

bivitreus (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 146: Reuter, Hem. Gymn. Eur., p. 152.
? = *variabilis*, Hahn, Wanz. Ins., ii, 1835, p. 137, t. 72, f. 224.
Hab. S. France.

carduellus, Horvath, Rev. d' Ent., vii, 1888, p. 183.
Hab. Dalmatia, Herzegovina.

callunae, Reuter, Hem. Gymn. Eur., i, 1879, p. 122; iii, p. 521.
Hab. S. France.

chrysopsilus, Reuter, *l. c.*, p. 112, 179; iii, p. 518, 519.
Hab. N. Hungary.

cognatus, Jakowleff, Bull. Mosc., lii (2), 1877, p. 298; Reuter, Hem. Gymn. Eur., i, p. 122, 179; iii, p. 521.
Hab. S. Russia, Sarepta.

? convexus, Reuter, Pet. Nouv. Ent., i, 1875, p. 540.
Hab. Corsica.

corsicus, Puton, Pet. Nouv. Ent., i, No. 131, 1875, p. 522: Reuter, Hem. Gymn. Eur., i, p. 130; iii, p. 522.
Hab. Corsica.

criocoroides, Reuter, Ofvers. Finska Vet. Soc. Förh., xxi, 1879, p. 39; *id.*, Hem. Gymn. Eur., ii, p. 302; iii, p. 520.
Hab. S. France.

Crotchii, Scott, Stettin. Ent. Zeit., xxxi, 1860, p. 91; Walk., Cat. Het., vi, p. 153: Reut., Hem. Gymn. Eur., i, p. 149; iii, p. 464, 525.
Hab. Spain, S. France, Corsica.

cruentatus (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 131: Reuter, Hem. Gymn. Eur., i, p. 153.
Hab. France.

delicatus, Uhler, Ent. Amer., iii, 1887, p. 34; List, p. 20.
Hab. N. America.

dilutus (Meyer), Fieber, Crit. Phyt., 1859, sp. 28; Eur. Hem., p. 308: W[illiams]. Cat. Het., vi, p. 152: Reut., Hem. Gymn. Eur., i, p. 136; iii, p. 525.
Hab. Switzerland.

diminutus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 256 sp. 137, p. 330: Fieber (*Psallus*), Eur. Hem., p. 309: Walk., Cat. Het., vi, p. 153: Saund., Syn., p. 665: Reuter, Caps. Syn., p. 21, pt; Abo Hem., p. 182; *id.*, Rev. Caps., p. 190; Ent. Mon. Mag., xxii, p. 86; Hem. Gymn. Eur., i, p. 140, t. 6, f. 4; iii, p. 462, 523.
Hab. S. Scandinavia, Germany, S. Austria, Switzerland, France, Britain [*Atk.*, Lille].

Fallenii, Reuter, Hem. Gymn. Eur., iii, 1883, p. 462, 522.
roseus, Fabr., Syst. Rhyng., 1803, p. 238 (*nec* Gen. Ins., 1766, p. 300)?: Reuter, Hem. Gymn. Scan. & Fenn., p. 186, pt; Hem. Gymn. Eur., i, p. 131: Fallen, pt, Hem. Suec., p. 101: Zett., Ins. Lapp., p. 275: F. Sahlb., Geoc. Fenn., p. 107: Flor, Rhyn. Liv., i, p. 591: Thomson, Opusc. Ent., p. 447: Walk., Cat. Het., vi, p. 152: Saund., Syn., p. 305: Reuter, Rev. Caps., p. 186.
salicis, Fieber, Eur. Hem., 1861, p. 307: Dougl. & Scott, pt, Brit. Hem., p. 414: Walk., Cat. Het., vi, p. 152: Reuter, Hem. Gymn. Eur., t. 6, f. 7.
Hab. Nearly all Europe.

flavosparsus, F. B. White, Proc. Zool. S. Lond., 1878, p. 468.
Hab. St. Helena.

graminicola (*Phytocoris*), Zetterstedt, Ins. Lapp., 1840, p. 275 ; F. Sahlb., Geoc. Fenn., p. 115 : Thomson, Opusc. Ent., iv, p. 416 : Reuter, Caps. Syn., p. 21 ; Abo Hem., p. 180 ; *id.*, Rev. Caps., p. 179 ; Hem. Gymn. Eur., i, p. 108, 176 ; iii, p. 518, 519.

Hab. Lapland, S. Finland.

guttulosus, Reuter, Caps. Amer., 1875, p. 89 : Uhler, List, p. 20.

Hab. Texas.

Henschii, Reuter, Rev. d' Ent., viii, 1888, p. 59.

Hab. Illyria.

Kirschbaumii, Fieber, Eur. Hem., 1861, p. 308 : Walk., Cat. Het., vi, p. 452 : Reuter, Hem. Gymn. Eur., i, p. 154.

roseus, Kirschbaum, Rhyn. Wiesb., 1855.

Hab. Germany.

Kolenatii (*Capsus*), Flor, Rhyn. Liv., i, 1860, p. 585 : Fieber, Wien. Ent. Monats., viii, 1864, p. 230 : Walk., Cat. Het., vi, p. 156 : Reuter, Abo Hem , p. 178 ; Hem. Gymn. Eur., i, p. 102, 176 ; iii, p. 517.

debilicornis (*Atractotomus*), Reuter, Rev. Caps., 1875, p. 174.

Hab. S. Scandinavia, Livonia, Hungary, Switzerland.

lapponicus, Reuter, Ofvers. Vet.-Aka. Förh., 1874, p. 47 ; *id.*, Rev. Caps , p. 188 ; Hem. Gymn. Eur., i, p. 134 ; iii, p. 524.

quercus, Gredler, Nachlese Wanz. Tirols., p. 557.

varians, pt, Meyer, Rhyn. Schw., 1843, p. 69.

Hab. Lapland, Switzerland, France, Tyrol, Hungary.

laricis, Reuter, Bih. Vet.-Akad. Handl., iii (i), 1875, p. 48 ; *id.*, Hem. Gymn. Eur., i, p. 113, t. 7, f. 6 ; iii, p. 460, 519.

roseri, var. *decolor*, Gredler, Nachlese Wanz. Tyrol, p. 557.

Hab. Switzerland, Tyrol, Hungary [*Atk.*, Canton Valais].

laticeps, Reuter, Hem. Gymn. Eur., i, 1879, p. 180 ; iii, p. 524.

Hab. Siberia, Yenisei.

lepidus, Fieber, Crit. Phyt., 1859, sp. 25 ; *id.*, Eur. Hem., p. 307 : Douglas & Scott, Brit. Hem., p. 416 : Walk., Cat. Het., vi, p. 152 : Saund., Syn., p. 304 : Reuter, Abo Hem., p. 178 ; *id.*, Rev. Caps., p. 184 ; Hem. Gymn. Eur., i, p. 127, t. 6, f. 8 ; iii, p. 460, 522.

roseus, Herr. Schäff., Nomencl. Ent., i, 1835, p. 49 ; *id.*, Wanz. Ins., iii, p. 7, t. 96, f. 287 ? ; *ib.*, vi, p. 46, t. 195, f. 604 : Meyer, Rhyn. Schw., p. 67, ? : Costa, Cim. Regn. Neap., Cent., iii, p. 268, ? .

salicis, Reuter, Hem. Gymn. Eur., i, p. 129 ; iii, p. 461 (*nec* Kirschb.).

Hab. S. Scandinavia, Britain, France, Switzerland, Austria, Moldavia, Caucasus [*Atk.*, France].

luridus, Reuter, Hem. Gymn. Eur., i, 1878, p. 133, t. 1, f. 18 *d* ; ii, p. 303 ; iii, p. 524.

Rotermundi, Gredler, Nachlese Wanz. Tirols, *l. c. supra*.

Hab. France, Tyrol, Hungary.

luteicornis, Vuillefroy, Ent. Auct., 1789, p. 535 : Reuter, Rev. Syn. Het., p. 308.

Hab. France.

lutosus, F. B. White, Proc. Zool. S. Lond., 1878, p. 468.
Hab. St. Helena.

mollis (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon., 1852, p. 141: Reut., Hem. Gymn. Eur., i, p. 139, iii, p. 462, 523.
convexus, Reut., Pet. Nouv. Ent., i, 1875, p. 540.
Hab. S. France, Corsica, Greece [*Atk.*, Genoa].

nebulosus, Reuter, Hem. Gymn. Eur., i, p. 142, t. 1, f. 18 *l*; iii, p. 524; Fedtsch. Turk., p. 34.
Hab. Turkistan.

obscurellus (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 108: Zett., Ins. Lapp., p. 276: Thomson (*Phylus*), Opusc. Ent., iv, p. 446: Saund., Syn., p. 302: Reuter, Abo Hem., p. 180; *id.*, Caps. Syn., p. 22; Rev. Caps., p. 180; Hem. Gymn. Eur., i, p. 115, 179, t. 7, f. 2; iii, p. 518, 519.
? Meyeri, Fieber, Wien Ent. Monats., viii, 1864, p. 231: Walk., Cat. Het., vi, p. 156.
pini, Douglas & Scott, Brit. Hem., 1865, p. 436: Fieb., Wien. Ent. Monats., 1864, p. 224; Walk., Cat. Het., vi, p. 148.
pityophilus, Flor, Rhyn. Liv., i, 1860, p. 597.
Hab. Nearly all Europe, Britain [*Atk.*, Lille].

pallidus, Reuter, Ofvers. Finska Vet. Soc. Förh., xxii, 1880, p. 24; *id.*, Hem. Gymn. Eur., iii, p. 462, 523.
Hab. Pyrenees.

piceae, Reuter, Hem. Gymn. Eur., i, 1879, p. 135; iii, p. 524.
? varians, Meyer, pt, Stettin. Ent. Zeits., ii, 1841, p. 84; *id.*, Rhyn. Schw., p. 69: Herr. Schäff., Wanz. Ins., vi, p. 25, f. 603.
Hab. Switzerland.

pinicola, Reuter, Bih. Vet. Aka. Handl., iii (i), 1875, p. 51; *id.*, Hem. Gymn. Eur., i, p. 132, 179; iii, p. 462, 524.
roseus, Fieber, Eur. Hem., 1861, p. 308 (*nec* Fabr., Fall.).
Hab. France, Switzerland, Hungary [*Atk.*, Vosges, France].

puberulus, Montandon, Rev. d' Ent., vi, 1887, p. 68.
Hab. Herzegovina.

pumilus (*Agalliastes*), Jakowleff, Bull. Mosc., li (3), 1876, p. 121; Reut., Hem. Gymn. Eur., i, p. 151; iii, p. 464, 525.
Hab. Spain, Hungary, S. Russia, Sarepta, Astrakhan, Caucasus.

punctipollis (*Liops*), Fieber, Verh. Zool. Bot. Ges. Wien, xx, 1870, p. 254, t. 6, f. 5: Walk., Cat. Het., vi, p. 149: Reut., Hem. Gymn. Eur., i, p. 124; iii, p. 460, 520.
Hab. Spain.

punctulatus (Fieber), Puton, Ann. Soc. Ent. Fr., (5 s.) iv, 1874, p. 220, t. 7, f. 4: Reuter, Hem. Gymn. Eur., i, p. 144; iii, p. 463, 523.
Hab. France, Austria, Greece.

quercus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 253, sp. 130, p. 323, Fieb., Eur. Hem., p. 305: Dougl. & Scott, Brit Hem., p. 409; Walk., Cat. Het., vi,

p. 150 : Saund., Syn., p. 303 : Reuter, Rev. Caps., p. 182 ; Hem. Gymn. Eur., i, p. 120, t. 7, f. 3 ; ii, p. 303 ; iii, p. 460, 521.

Hab. Britain, France, Spain, Italy, Germany, S. Austria, Sweden [*Atk.*, Lille, Genoa].

roseus (*Cimex*), Fabr., Gen. Ins., 1766, p. 300 ; *id.*, Spec. Ins., 1781, p. 370 : Mant. Ins., 1787, p. 304 ; Ent. Syst. Supp., 1798, p. 542 ? : Reuter, Hem. Gymn. Eur., iii, p. 463, 525 ; *id.*, Rev. Syn. Het., p. 307.

? *conspersus*, Gmelin, Syst. Nat., iv (i), 1788, p. 2167.

dilutus, Dougl. & Scott, Brit. Hem., 1865, p. 417.

? *haematodes*, Gmelin, Syst. Nat., iv (i), 1788, p. 2169.

haematopus, Turton, Syst. Nat., ii, 1806, p. 671.

? *pallescens*, Gmelin, Syst. Nat , iv (i), 1788, p. 2165.

? *rubellus*, Müller, Zool. Dan., 1776, p. 108.

sanguineus, Fabr. Ent. Sys., iv, 1794, p. 175 ; Syst. Rhyng., p. 306 : Latr., Hist. Nat., xii, p. 226 : Fallen, Mon. Cim., p. 89 ; *id.*, Hem. Suec., p. 102 : Meyer, Rhyn. Schw., p. 75 : F. Sahlb., Geoc. Fenn., p. 107 : Kirschb., Rhyn. Wiesb., p. 257, sp. 140 : Fieber, Crit., 33 ; *id.*, Eur. Hem., p. 306 : Flor, Rhyn. Liv., i, p. 588 : Dougl. & Scott, Brit. Hem , p. 413 : Walk., Cat. Het., vi, p. 151 : Saund., Syn., p. 304 : Reuter, Rev. Caps., p. 191.

var. *alni*, Fabr., Ent. Syst., iv, 1794, p. 175 ; Syst. Rhyng , p. 238 : Stål, Hem. Fabr., i, p. 88 : Thomson, Opusc. Ent., iv, p. 447 : Walk., Cat. Het., vi, p. 151 : Reuter, Hem. Gymn. Eur., i, p. 144 ; iii, p. 463.

quercetí, Fallen, Mon. Cim. Supp., 1826, p. 15 ; *id.*, Hem. Suec., p. 49 : Herr. Schäff., Nomencl. Ent., i, p. 50 : Fieber, Eur. Hem., p. 306 : Dougl. & Scott, Brit. Hem., p. 412 : Walk., Cat. Het., vi, p. 151.

Hab. Nearly all Europe [*Atk.*, Lille].

salicis (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 257, sp. 139, p. 280, 334 (nec Fieb. Reut.) : Reut., Hem. Gymn. Eur., iii, p. 461, 526.

Hab. Germany.

salicellus (*Capsus*), Meyer, Rhyn. Schw., 1843, p. 74 : Herr. Schäff., Wanz. Ins. vi, 1842, p. 47, f. 605 : Flor, Rhyn. Liv., i, p. 590 : Fieb., Eur. Hem., p. 305 : Dougl. & Scott, Brit. Hem., p. 411 : Walk., Cat. Het., vi, p. 151 : Saund., Syn., p. 304 : Reuter, Hem. Gymn. Eur., i, p. 146 ; iii, p. 525.

irroratus, Mulsant & Rey, Ann. Soc. Linn, Lyon, 1852.

Hab. S. & Mid. Europe, Livonia.

Scholtzii (Meyer), Fieber, Eur. Hem., 1861, p. 306 : Walk., Cat. Het., vi, p. 151 : Reuter, Abo Hem., p. 177, 181 ; *id.*, Rev. Caps., p. 185 ; *id.*, Hem. Gymn. Eur., i, p. 125, t. 6, f. 9 ; iii, p. 522.

alnicola, pt, Reuter, Rev. Caps., p. 184, ♂.

? *signatipes*, Herr. Schäff., Nomencl. Ent., i, 1835, p. 49 : Puton, Cat., p. 60 : Reuter, Hem. Gymn. Eur., i, p. 125, 127.

Hab. Scandinavia, Germany, Switzerland, France.

siculus, Reuter, Pet. Nouv. Ent., i, No. 135, 1875, p. 539 ; *id.*, Hem. Gymn. Eur., i, p. 113 ; iii, p. 518.

Hab. Sicily.

simillimus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 253, sp. 131, p. 325 : Fieber, Eur. Hem., p. 305 : Walk., Cat. Het., vi, p. 151 : Saund., Syn., p. 303 :

Reuter, Abo Hem., p. 181; *id.*, Rev. Caps., p. 182; *id.*, Hem. Gymn. Eur., i, p. 119, 179, t. 8, f. 4; iii, p. 460, 521.

Hab. Middle & S. Europe.

variabilis (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 98: Hahn, Wanz. Ins., ii, p. 137, t. 72, f. 224, ♂, ♀: Zett., Ins. Lapp., p. 275: Costa, Cim. Regn. Neap., Cent., iii, p. 268: Meyer (*Capsus*), Rhyn. Schw., p. 68, t. 3, f. 4, ♀: F. Sahlb., Geoc. Fenn., p. 115: Kirschb., Rhyn. Wiesb., p. 253, sp. 129, p. 279: Flor, Rhyn. Liv., i, p. 592: Thomson, Opusc. Ent., iv, p. 447: Fieber (*Apocremnus*), Eur. Hem., p. 305: Dougl. & Scott, Brit. Hem., p. 408: Walk., Cat. Het., vi, p. 151: Saund. (*Psallus*), Syn., p. 302: Reuter, Abo Hem., p. 180; *id.*, Rev. Caps., p. 181; *id.*, Hem. Gymn. Eur., i, p. 116, t. 7, f. 5; ii, p. 303; iii, p. 520.

Perrisii, Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 139.

salicis, Douglas & Scott, pt, Brit. Hem., 1865, p. 414.

var. *simillimus*, Douglas & Scott, *l. c.*, p. 166.

Whitei, Douglas & Scott, Ent. Mon. Mag., v, 1869, p. 263: Walk., Cat. Het., vi, p. 153.

Hab. Nearly all Europe [*Atk.*, Lille, Genoa].

varians (*Capsus*), Herr. Schäff., Wanz. Ins., vi, 1842, p. 45, t. 195, f. 603 ♂: Meyer, Stettin. Ent. Zeit., ii, 1841, p. 84 ?; Rhyn. Schw., p. 39, pt: Kirschb., Rhyn. Wiesb., p. 256 sp. 136: Fieber (*Psallus*), Eur. Hem., p. 309: Dougl. & Scott, Brit. Hem., p. 418, t. 13, f. 7: Walk., Cat. Het., vi, p. 153: Saund., Syn., p. 305: Reuter, Caps. Syn., p. 21; Abo Hem., p. 182; *id.*, Rev. Caps., p. 189; Hem. Gymn. Eur., i, p. 138, t. 1, f. 18 *a-c*, *e*; iii, p. 462, 523.

mutabilis, Thomson, Opusc. Ent., iv, 1871, p. 447 (nec Fallen).

rubricatus, Fallen, Hem. Suec., 1829, p. 100.

rufescens, Hahn, Wanz. Ins., i, 1831, p. 28, t. 4, f. 18.

var. *decoloratus*, Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 143: Reuter, Hem. Gymn. Eur., iii, p. 525.

„ *distinctus*, Fieber, Crit. Phyt., 1859, sp. 26; Eur. Hem., p. 309: Douglas & Scott, Brit. Hem., p. 419: Walk., Cat. Het., vi, p. 153.

„ *insignis*, Fieber, Crit. Phyt., 1859, 9, 27; Eur. Hem., p. 309.

„ *nigrescens*, Fieber, *l. c.* p. 309.

„ *ochraceus*, Fieber, *l. c.* p. 309.

Hab. Nearly all Europe [*Atk.*, Hyères].

vinaceus, F. B. White, Proc. Zool. S. Lond., 1878, p. 469.

Hab. St. Helena.

vitellinus (*Capsus*), Scholtz, Arb. u. Veränd. d. Schles. Ges., 1846, p. 26: Flor, Rhyn. Liv., i, p. 624: Fieb., Eur. Hem., p. 307: Walk., Cat. Het., vi, p. 152: Reuter, Hem. Gymn. Eur., i, p. 137, t. 1, f. 18 *k*; t. 7, f. 1; iii, p. 462, 525.

Hab. Denmark, Germany, Switzerland, Tyrol, France.

Wollastonii, Reuter, Ent. Mon. Mag., xiii, 1876, p. 154: Hem. Gymn. Eur., i, p. 141; iii, p. 524.

Hab. Madeira.

Genus **EPISCOPUS**.

Reuter, Caps. Amer., 1875, p. 90.

ornatus, Reuter, *l. c.*, p. 90: Uhler, List, p. 20.
Hab. Texas.

Genus **EURYSTYLUS**.

Stål, Ofvers. K. Vet.-Aka. Förh., 1870, p. 67.

costalis, Stål, *l. c.*, p. 671: Walk., Cat. Het., vi, p. 124.
Hab. Philippines.

Genus **ATRACTOTOMUS**.

Fieber, Crit. Gen., 1859, 62, t. 6, f. 39; Eur. Hem., p. 71, 294, pt: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 46; Hem. Gymn. Eur., i, 1879, p. 92, t. 1, f. 17; ii, p. 302; iii, p. 503.

albipennis, Reuter, Pet. Nouv. Ent., ii, No. 144, 1876, p. 21; *id.*, Hem. Gymn. Eur., i, 1879, p. 94, t. 5, f. 4; iii, p. 514.
Hab. S. Russia, Sarepta.

egregius, Berg, Hem. Arg., Add. Emend., 1884, p. 95.
Hab. Buenos Ayres.

femoralis, Fieber, Eur. Hem., 1861, p. 295: Walk., Cat. Het., vi, p. 147: Reut., Hem. Gymn. Eur., i, 1879, p. 95, t. 5, f. 6; iii, p. 516.
Hab. Bohemia.

forticornis (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 148: Reut., Hem. Gymn. Eur., i, 1879, p. 97, t. 1, f. 17 *k*; iii, p. 516.
Hab. France.

magnicornis (*Capsus*), Fallen, Hem. Suec., 1828, p. 119; Zett., Ins. Lapp., p. 278: F. Sahlb., Geoc. Fenn., p. 122: Flor, Rhyn. Liv., i, p. 575: Fieb., Eur. Hem., p. 296: Walk., Cat. Het., vi, p. 147: Reut., Hem. Gymn. Scan. & Fenn. p. 173; *id.*, Hem. Gymn. Eur., i, 1879, p. 100, t. 6, f. 2; *id.*, ii, p. 302; iii, p. 459, 516.
crinicornis (Klug), Burm. Handb. Ent., ii (i), 1835, p. 257.
? *planicornis*, Kolenati, Mel. Ent., ii, 1845, p. 126.
Hab. Nearly all Europe, England, Russia [*Atk.*, Pyrenees].

mali (*Capsus*), Meyer, Rhyn. Schw., 1843, p. 63, t. 2, f. 5: Kirschb., Rhyn. Wiesb., p. 279, 345: Fieber, Eur. Hem., p. 296: Walk., Cat. Het., vi, p. 147: Saund., Syn., p. 300: Reuter, Hem. Gymn. Eur., i, p. 98, t. 1, f. 17 *b*, *m*; t. 5, f. 9; iii, p. 458, 515, 516.
magnicornis, Douglas & Scott, Brit. Hem., 1865, p. 435, t. 14, f. 4: Walk., Cat. Het., vi, p. 147, pt.
pyri, Meyer, Stettin. Ent. Zeit., ii, 1841, p. 87.
Hab. Scandinavia, Britain, Middle & S. Europe.

morio, J. Sahlberg, Medd. Soc. pro. Faun. Fl. Fenn., ix, 1883, p. 94, 154: Reuter, Hem. Gymn. Eur., iii, p. 458, 515; Ofvers. Finska Soc. Förh, xxvi, 1884, p. 26. ♀.
Hab. E. Finland.

nigritarsis, Jakowleff, Bull. Mosc., lvi (4), 1882, p. 370: Reut., Hem. Gymn. Eur., iii, p. 459, 516.
Hab. Russia, Orenburg.

oculatus (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 250 sp. 123, p. 318: Fieb., Eur. Hem., p. 296: Walk., Cat. Het., vi, p. 147: Reuter, Hem. Gymn. Eur., i, 1879, p. 99, t. 6, f. 1; iii, p. 516.

albipes, Fieber, Crit. Phyt., 1859, sp. 18.

Hab. Germany, Switzerland, France [*Atk.*, Valenciennes].

parvulus, Reuter, Hem. Gymn. Eur., i, 1879, p. 95; iii, p. 458 ♂, 515, 516.

Hab. France.

Putonii, Reuter, Hem. Gymn. Eur., i, 1879, p. 175; iii, p. 459, 515; Berlin. Ent. Zeits., xxv, 1881, p. 183.

Hab. S. France.

Rhodani (Meyer), Fieber, Eur. Hem., 1861, p. 296: Walk., Cat. Het., vi, p. 147: Reuter, Hem. Gymn. Eur., i, p. 98, t. 1, f. 17 *a*; t. 5, f. 8; iii, p. 515.

Hab. Switzerland, France.

rufus, Fieber, Crit. Phyt., 1859, sp. 17; *id.*, Eur. Hem., p. 296: Walk., Cat. Het, vi, p 147: Reuter, Hem. Gymn. Eur., i, p. 96, t. 5, f. 7; iii, p. 515.

Hab. Bohemia, France.

? spissicornis (*Cimex*), Schrank, Fauna Boica, 1801, p. 88: Reuter, Rev. Syn. Het., p. 306.

Hab. Germany.

tigripes (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 148: Fieber (*Atractotomus*), Eur. Hem., p. 295: Walk., Cat. Het., vi, p. 147: Reuter, Hem. Gymn. Eur., i, p. 94, t. 1, f. 17, *g*, *h*; t. 5, f. 5; *id.*, ii, p. 302; *id.*, iii, p. 457, 515.

magnicornis, Hahn, Wanz. Ins., i, p. 130, t. 20, f. 67 (*nec* Fallen) ?: Meyer, Rhyn. Schw., p. 29, t. 2, f. 4: Kirschb., Rhyn. Wiesb., p. 251 sp. 126, p. 278 ?.

Hab. France, Spain, Switzerland, Germany, Austria, Greece, S. Russia.

validicornis, Reuter, Pet. Nouv. Ent., ii, No. 144, 1876, p. 21; *id.*, Hem. Gymn. Eur., i, p. 96, t. 1, f. 17 *i*; iii, p. 516.

Hab. France.

vinaceus, F. B. White, Proc. Zool. S. Lond., 1878, p. 467.

Hab. St. Helena.

Genus **EXCENTRICUS**.

Reuter, Hem. Gymn. Eur., i, 1879, p. 89, t. 1, f. 16; iii, p. 504.

Atractotomus, pt, Fieber, Eur. Hem., 1861, p. 71, 294.

oophorus, Horvath, Rev. d' Ent., vii, 1888, p. 184, t. 1, f. 10.

Hab. Asia Minor, Broussa.

punctipes (*Atractotomus*), Fieber, Wien. Ent. Monats., viii, 1864, p. 224: Walk., Cat. Het., vi, p. 147: Reuter, Hem. Gymn. Eur., i, p. 91, 175, t. 1, f. 16 *a-c*; *t.* 5, f. 2; *id.*, iii, p. 457, 514.

var. *pictipes*, Reuter, *l. c. supra*, i, p. 91.

Hab. S. Russia, Tauria, Sarepta, Asia Minor.

singularis, Horvath, Rev. d' Ent., vii, 1888, p. 148, t. 1, f. 8.

Hab. Tauria.

Genus **RHINACLOA**.

Reuter, Caps. Amer., 1875, p. 88.

citri, Ashmead, Ent. Amer., iii, 1887, p. 155.
Hab. N. America, Florida.

forticornis, Reuter, Caps. Amer., 1875, p. 89: Uhler, List, p. 20.
Hab. Texas.

Genus **STRONGYLOTES**.

Reuter, Caps. Amer., 1875, p 88.

saliens, Reuter, *l. c.*, p. 88: Uhler, List. p. 20.
Hab. Texas.

Genus **CRIOCORIS**.

Fieber, Crit. Gen. Phyt., 1859, 71; *id.*, Eur. Hem., p. 73, 301: Reuter (*Plagiognathus*, subg. *Criocoris*) Bih. Vet.-Aka. Handl, iii (i), 1875, p. 55; Rev. Caps., p. 193; Hem. Gymn. Eur., i, p 84, t. 1, f. 15; iii, p. 503.
Colpochilus, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 60.

apicalis (*Atractotomus*), Reuter, Bih. *l. c.*, *supra*, p. 46; Verh. Zool. Bot. Ges. Wien, 1876, p. 87, ♂; Hem. Gymn. Eur., i, p. 87, t. 1, f. 15 *b*; iii, p. 513.
Hab. Austria.

ater, Jakowleff, Trudi Rusk. Ent., xiii, 1882, p. 174, ♀: Reuter, Hem. Gymn. Eur., iii, p. 457, 514.
Hab. S. Russ., Sarepta.

crassicornis (*Phytocoris*), Hahn, Wanz. Ins., ii, 1834, p. 90, t. 57, f. 176, ♂: Herr. Schäff., *l. c.*, iii, p. 85, t. 101, f. 308, ♀: Kirschb., Rhyn. Wiesb., p. 251, sp. 124, p. 345 ?: Meyer, Rhyn. Schw., p. 66: Flor, Rhyn. Liv., i, p. 579: Fieber, Eur. Hem., p. 302: Walk., Cat. Het., vi, p. 149: Reuter, Hem. Gymn. Eur., i, p. 88; iii, p. 513, 514.
tenuicornis (*Colpochilus*), Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 60.
terminalis, Herr. Schäff., Nomencl. Ent., i, 1835, p. 87.
Hab. France, Germany, Italy, S. Russia, Livonia.

fuscipennis, Jakowleff, Trudi, Rusk. Ent., xiii, 1882, p. 173: Reuter, Hem. Gymn. Eur., iii, p. 456, 514.
Hab. S. Russia, Sarepta.

longicornis, Reuter, Hem. Gymn. Eur., iii, 1883, p. 455, 513.
Hab. Hungary.

nigripes, Fieber, Eur. Hem., 1861, p. 304: Walk., Cat. Het., vi, p. 147, 149: Reuter, Hem. Gymn. Eur., i, p. 85, t. 4, f. 9; iii, pp. 455, 513.
? = *tarsalis*, Reuter, ♂, *q. v.*
Hab. Hungary, Galicia, Alsace.

quadrimaculatus (*Capsus*), Fallen, Hem. Suec., 1828, p. 119: F. Sahlb., Geoc. Fenn. p. 122: Flor, Rhyn., Liv., i, p. 580: Reuter, Rev. Caps., p. 193: *id.*, Hem. Gymn. Eur., i, p. 87; ii, p. 301; iii, p. 456, 513, 514.
Hab. N. France, Scandinavia, Siberia, S. Russia, Livonia, Karelia.

sulcicornis (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 251, sp. 125, p. 320, 345: ? Fieb. Eur. Hem., p. 293: Walk., Cat. Het., vi, p. 146: Reuter Hem. Gymn. Eur., ii, p. 301, 302, iii, p. 514.

moestus, Reut., Pet. Nouv. Ent., ii, No. 144, 1876, p. 22; *id.*, Hem. Gymn. Eur., i, p. 89 ♀; ii, p. 301.

sulcicornis (*Actratotomus*), Reuter, *l. c.*, p. 93, t. 1, f. 17*e*, *f*; t. 5, f. 3 *deletur*: vide, *ib.*, p. 302.

Hab. France, Hungary.

tarsalis, Reuter, Hem. Gymn. Eur., i, 1879, p. 85, 175; iii, pp. 455, 513, 514.

? = *nigripes*, Fieber, ♀, *q. v.*: Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 183.

Hab. Vienna, Styria.

tibialis, Fieber, Wien Ent. Monats., viii, 1864, p. 227: Walk., Cat. Het., vi, p. 149 Reuter, Hem. Gymn. Eur., i, p. 86, t. 5, f. 1; iii, p. 514.

Hab. S. France.

Genus **PLAGIOGNATHUS**.

Fieber, Crit. Gen. Phyt., 1859, g. 72; Eur. Hem., p. 73, 302: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 54; Hem. Gymn. Scan. & Fenn., p. 192, pt; Hem. Gymn. Eur., i, p. 71, 175, t. 1, f. 14; iii, p. 503.

albipennis (*Phytocoris*), Fallen, Hem. Suec., 1829, p. 107: Hahn, Wanz. Ins., ii p. 91, t. 57, f. 177: Meyer, Rhyn. Schw., p. 79: Kirschb., Rhyn. Wiesb., p. 252, sp. 127: Flor, Rhyn. Liv., i, p. 598: Fieber (*Agalliastes*), Eur., Hem., p. 311: Walk., Cat. Het., vi, p. 154: Ferrari, Ann. Mus. Civ. Gen., vi, 1874, p. 187, ♀: Saund., Syn., p. 306 ?: Reuter, Rev. Caps., p. 198: *id.*, Hem. Gymn. Eur., i, p. 80, 175, t. 4, f. 8, var; iii, p. 454, 512.

artemiscae, Becker, Bull. Mosc., xxxvii (i), 1864, p. 487: Reut., Hem. Gymn. Eur., i, p. 173; iii, p. 466.

lanuginosus, Jak., Bull. Mosc., xlix (2), 1876, p. 28.

pallidulus, Dahlb., Svenska Vet.-Aka. Handl., 1850, p. 211.

tibialis, Fieber, Wien Ent. Monats., viii, 1864, p. 228: Walk., Cat. Het., vi, p. 156.

Hab. Nearly all Europe, Siberia, S. Russia, Caucasus [*Atk.*, Calais, Hungary].

alpinus, Reuter, Bih. Vet.-Aka Handl., iii (i), 1875, p. 56; *id.*, Verh. Zool. Bot. Ges. Wien, 1876, p. 88; Hem. Gymn. Eur., i, p. 72: ii, p. 300; iii, p. 450, 511.

viridulus, Gredler, Rhynch. Tirol., p. 98.

Hab. France, Alsace, Austria, Greece, Turkistan.

amurensis, Reuter, Hem. Gymn. Eur., iii, 1883, p. 454, 513: Ferr., Ann. Mus. Civ., Gen., (2 s.) i, 1884, p. 454.

Hab. America.

? annulicornis, Reuter, Hem. Gymn. Eur., ii, 1880, p. 298; iii, p. 511; Fedtsch. Turk., p. 34.

Hab. Turkistan, Kizilkum.

arbustorum (*Lygaeus*), Fabr., Ent. Syst., iv, 1794, p. 175; *id.*, Syst. Rhyng., p. 238: Latreille, Hist. Nat., xii, p. 225: Fallen, Mon. Cim., p. 90; *id.*, Hem. Suec., p. 104: Zett., Fauna Lapp., p. 493; *id.*, Ins. Lapp., p. 275: Herr. Schäff., No-

menel. Ent., i, p. 53; Wanz. Ins., iii, p. 80, t. 99, f. 300: Meyer, Rhyn. Schw., p. 64: Kolenati, Mel. Ent., ii, p. 86; F. Sahlb., Geoc. Fenn., p. 115: Kirschb., Rhyn. Wiesb., p. 259 sp. 145: Fieber (*Plagiognathus*), Crit., 1859, 32; *id.*, Eur. Hem., p. 302: Flor, Rhyn. Liv., i, p. 602: Dougl & Scott, Brit. Hem., p. 402, t. 13, f. 5: Thomson, Opusc. Ent., p. 448: Walk., Cat. Het., vi, p. 149: Saund., Syn., p. 307: Reuter, Caps. Syn., p. 19; *id.*, Rev. Caps., p. 197; Hem. Gymn. Eur., i, p. 78; iii, p. 452, 512; Rev. Syn. Het., p. 305, 396.

? *betuleti*, Hahn, Wanz. Ins., ii, 1834, p. 138, t. 72, f. 222.

? *chloromelas*, Gmelin, Syst. Nat., iv, 1788, p. 2185.

fulvipennis, Reuter, Hem. Gymn. Scan. & Fenn., p. 197 (*nec* Kirschb.).

? *pes variegatus*, Goeze, Ent. Beytr., ii, 1778, p. 268.

? *plessaeus*, Geoffroy in Fourcroy. Ent. Paris., 1785, p. 211.

var. *brunnipennis*, Meyer, Rhyn. Schw., 1843, p. 66, t. 3, f. 3: Costa, Cim. Regn. Neap., Cent. iii, p. 42: Kirschb. Rhyn. Wiesb., p. 259, sp. 144.

„ *hortensis*, Meyer, *l. c. supra*, p. 65, t. 3, f. 2: Costa, *l. c. supra*, p. 42: Kirschb., Rhyn. Wiesb., p. 260, sp. 146.

„ *lugubris*, Hahn, Wanz. Ins., ii, 1834, p. 138, t. 72, f. 225.

Hab. All Europe [*Atk.*, Lille].

bipunctatus (Jakowleff), Reuter, Hem. Gymn. Eur., iii, 1883, p. 451, 511.

Hab. Austria, Hungary, Caucasus.

? breviceps, Reuter, Hem. Gymn. Eur., i, 1879, p. 82; iii, p. 513; Fedtsch. Turk., p. 34.

Hab. Turkistán, Alai.

chrysanthemi (*Lygaeus*), Wolff, Ic. Cim., iv, 1804, p. 157, t. 15, f. 151: Reuter, Hem. Gymn. Eur., iii, p. 452, 511; *id.*, Rev. Syn. Het., p. 303.

? *femoralis*, Geoffroy in Fourcroy, Ent. Paris., 1785, p. 204.

? *femorepunctatus*, Goeze, Ent. Beytr., ii, 1778, p. 266.

? *viridescens*, Gmelin, Syst. Nat., iv, 1788, p. 2184.

viridulus (*Lygaeus*), Fallen, Mon. Cim., p. 90; *id.*, Hem. Suec., p. 105: Herr. Schäff., Nomencl. Ent., i, p. 50: Meyer, Rhyn. Schw., p. 77: Kolenati, Mel. Ent., ii, p. 124: F. Sahlb., Geoc. Fenn., p. 103: Costa, Cim. Regn. Neap. Cent., iii, p. 43: Kirschb., Rhyn. Wiesb., p. 258 sp. 142: Fieber (*Plagiognathus*), Crit., 32; *id.*, Eur. Hem., p. 303: Flor, Rhyn. Liv., i, p. 595: Dougl. & Scott, Brit. Hem., p. 401: Thomson, Opusc. Ent., p. 448: Walk., Cat. Het., vi, p. 150: Saund., Syn., p. 307: Reuter, Rev. Caps. p. 196; *id.*, Hem. Gymn. Eur., i, p. 74, 175, t. 4, f. 5, 6.

Hab. All Europe [*Atk.*, Lille].

cunctator, Horvath, Rev. d' Ent., vi, 1887, p. 73.

Hab. Illyria.

flavipes, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 57; *id.*, Hem. Gymn. Eur., i, p. 79; ii, p. 300; iii, p. 454, 512.

Hab. Corsica, Sardinia, Greece.

fulvipennis (*Capsus*), Kirschbaum, Rhyn. Wiesb., 1855, p. 259, sp. 144, p. 336: Fieb., Eur. Hem., p. 303; Walk., Cat. Het., vi, p. 150: Reuter, Hem. Gymn. Eur., i, p. 76, t. 4, f. 7; ii, p. 300; iii, p. 452, 512.

Hab. France, Spain, Italy, Switzerland, Germany, Hungary, Greece, Caucasus.

fusciloris, Reuter, Hem. Gymn. Eur., i, 1879, p. 73; ii, p. 300; iii, p. 450, 512.
Hab. France, Spain, Hungary.

grandis, Reuter, Caps. Amer., 1875, p. 91: Uhler, List, p. 21.
Hab. Texas.

obscuriceps, Stål, Stettin. Ent. Zeit., xix, 1858, p. 190, ♀: Walk., Cat. Het., vi, p. 159: Reut., Hem. Gymn. Eur., i, p. 76; iii, p. 512.
Hab. Siberia, Irkutsk.

obscurus, Uhler, Hayden Surv. Mont., 1872, p. 418; Bull. Un. St. Surv., iii, 1877, p. 422; Proc. Bost. Soc. N. H., 1878, p. 409; *id.*, List, p. 21.
Hab. United States, Canada, British Columbia [*Atk.*, Florida].

olivaceus, Reuter, Ofvers. Finska Vet. Soc. Förh., xxii, 1880, p. 23; *id.*, Anal. Soc. Esp. Hist. Nat., ix, p. 193; *id.*, Hem. Gymn. Eur., iii, p. 453, 512.
Hab. Spain.

pictus (*Macrocoleus*), Fieber, Wien. Ent. Monats., viii, 1864, p. 333: Walk., Cat. Het., vi, p. 143: Reut., Hem. Gymn. Eur., ii, p. 299; iii, p. 450, 511.
punctiveps, Reuter, Pet. Nouv. Ent., ii, No. 144, 1876, p. 22.
Hab. S. Europe, Hungary, S. Russia.

plagiatus, Reuter, Pet. Nouv. Ent., ii, No. 152, 1876, p. 54; *id*, Hem. Gymn. Eur., i, p. 77; ii, p. 300; iii, p. 512.
Hab. N. Italy, Caucasus.

Retowskii, Reuter, C. R. Ent. Belg., 1885, p. xlviii.
Hab. Tauria.

rubricans, Provancher, Faune Can. Hem, 1887, p. 154.
Hab. Canada.

rufinervis, Jakowleff, Trudi Rusk. Ent., xi, 1880, p. 218: Reut., Hem. Gymn. Eur., iii, p. 452, 513.
Hab. S. Russia, Sarepta.

spilotus, Fieber, Crit. Phyt., 1859, sp. 23; *id.*, Eur. Hem., p. 304: Walk., Cat. Het., vi, p. 150: Reut., Hem. Gymn. Eur., i, p. 71, t. 4, f. 4; iii, p. 450, 511.
Hab. S. France, Corsica, Algeria.

Genus **AGRAMETRA**.

F. B. White, Proc. Zool. S. London, 1878, p. 467.

aethiops, White, *l. c.*, p. 468, t. 31, f. 2.
Hab. St. Helena.

Genus **UTOPNIA**.

Reuter, Berlin. Ent. Zeits., xxv, 1881, p. 185: Zool. Jahr., Arthr., 1881, p. 274; Hem. Gymn. Eur., iii, 1883, p. 449, 502.

torquata (*Macrotylus*), Puton, MT. Schw. Ent. Ges., vi, 1881, p. 126: Reuter, Berlin. Ent. Zeits, xxv, 1881, p. 184; *id.*, Hem. Gymn. Eur., iii, p. 450, 511.
Hab. Syria, Broussa.

Genus **MALACOTES.**

Reuter, Hem. Gymn. Eur., i, 1879, p. 69, t. 1, f. 13; iii, p. 502.

Mulsantii, Reuter, Hem. Gymn. Eur., i, p. 70, 175, t. 1, f. 13; iii, p. 448, 510: Rev. d' Ent., i, 1882, p. 136, ♂.
Hab. S. France.

Genus **ATOMOSCELIS.**

Reuter, Hem. Gymn. Eur., i, 1879, p. 67, t. 1, f. 12; ii, p. 298; iii, p. 502.
Agalliastes, pt, Fieber, Eur. Hem., 1861, p. 310.
Atomoscelis, pt, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 57.

brevicornis, Reuter, Ofvers. Finska, Vet. Soc. Förh., xxi, 1879, p. 39; *id.*, Hem. Gymn. Eur., ii, 1880, p. 298; iii, p. 510.
Hab. S. Russia, Astrakhan.

onustus (*Agalliastes*), Fieber, Eur. Hem., 1861, p. 312: Walk., Cat. Het., vi, p. 155: Reut., Hem. Gymn. Eur., i, p. 68, 175, t. 4, f. 3; iii, p. 448, 510; Fedtsch. Turk., p. 35.
Hab. Spain, S. France, Austria, S. Russia, Greece, Caucasus, Tunis [*Atk.*, Spain].

? punctatus (*Agalliastes*), Fieber, Eur. Hem., 1861, p. 311; Walk, Cat. Het., vi, p. 155: Reut, Hem. Gymn. Eur., i, p. 171, t. 8, f. 8; Puton, Cat., 1886, p. 62.
Hab. Spain.

seriatus, Reuter, Caps. Amer. 1875, p. 91: Uhler, List, p. 21.
Hab. Texas.

Genus **SPANAGONICUS.**

Berg, Hem. Arg. Add. Emend., 1884, p. 94.

provincialis, Berg, *l. c.*, p. 95.
Hab. Buenos Ayres.

Genus **CHLAMYDATUS.**

Curtis, Brit. Hem., xv, 1838, p. 693: Reuter, Rev. d' Ent., v, 1886, p. 122.
Agalliastes, pt, Fieber, Crit. Gen., 1859, 76; Eur. Hem., p. 74, 310: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 59; Rev. Caps., p. 202; Hem. Gymn. Eur., i, p. 60; iii, p. 501.
Astemma, pt, Am. & Serville, Ins. Hém., 1843, p. 284.

argentinus, Berg, Hem. Arg., Add. Emend., 1884, p. 93.
Hab. Buenos Ayres.

associatus, Uhler, Hayden, Mont. Surv., 1872, p. 419; *id.*, Bull. Un. St. Surv., ii, 1876, p. 319.
Hab. Utah.

evanescens (*Pachystoma*), Bohem., Ofvers. Vet.-Aka. Förh., ix, 1852, p. 70: Kirschb., Rhyn. Wiesb., p. 263 sp. 154: Fieber, Eur. Hem., p. 310; *id.*, Wien. Ent.

Monats., viii, 1864, p. 229: Walk., Cat. Het., vi, p. 154: Reuter., Rev. Caps., p. 206; Hem. Gymn. Eur., i, p. 66, 175, t. 3, f. 9; ii, p. 298; iii, p. 510.

Hab. Nearly all Europe to S. Scandinavia [*Atk.*, Dunkirk].

luctuosus, Provancher, Faune Can. Hem., 1887, p. 137.

Hab. Canada.

pulicarius (*Phytocoris*), Fallen, Mon. Cim., 1807, p. 95; *id.*, Hem. Succ., p. 113: Hahn (*Attus*), Wanz. Ins., i, p. 117, t. 18, f. 62: Burm., Handb. Ent., ii (i), p. 227: Meyer (*Capsus*), Rhyn. Schw., p. 110: F. Sahlb., Geoc. Fenn., p. 119: Kirschb., Rhyn. Wiesb., p. 261 sp. 149: Flor, Rhyn. Liv., i, p. 600: Fieber (*Agalliastes*), Eur. Hem., p. 312, 427; *id.*, Wien. Ent. Monats., viii, 1864, p. 229: Dougl. & Scott, Brit. Hem., p. 427, t. 14, f, 1: Walk., Cat. Het., vi, p. 155: Saund., Syn., p. 308: Reuter, Rev. Caps., p. 202; Hem. Gymn. Eur., i, p. 60, t. 3, f. 8; iii, p. 510.

? *pallipes*, Jakowleff, Horae Soc. Ent. Ross., iv, 1867, p. 158: Walk., Cat. Het., vi, p. 156.

saliens, Wolff, Ic. Cim., 1811, p. 200, t. 20, f. 194.

Hab. All Europe.

pullus, Reuter, Not. Skpts Faun. Fl. Fenn., Förh., xi, 1871, p. 224: *id.*, Rev. Caps., p. 202; Hem. Gymn. Eur., i, p. 61; ii, p. 297; iii, p. 448, 510; Fedtsch. Turk., p. 37.

Hab. S. Scandinavia, Lapland, Carinthia, N. France, S. Russia, Turkistan, Siberia [*Atk.*, Dunkirk].

saltitans (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 114: Burm. (*Halticus*), Handb. Ent., ii, p. 298: Am. & Serv. (*Astemma*), Ins. Hém., p, 284: F. Sahlb., Geoc. Fenn., p. 119: Kirschb., Rhyn., Wiesb., p. 263 sp. 153: Flor, Rhyn. Liv., i, 603: Fieb., Eur. Hem., p. 311: Dougl. & Scott, Brit. Hem., p. 428: Walk. Cat. Het., vi, p. 154: Saund., Syn., p. 308: Reuter, Rev. Caps., p. 204; Hem. Gymn. Eur., i, p. 64; iii, p. 510.

marginatus, Curtis, Brit. Hem., xv, 1838, p. 693.

Hab. Nearly all Europe [*Atk.*, France].

signatus, J. Sahlberg, Not. Skpts pro Faun. Fl. Fenn., Förh., ix, 1867, p. 228: Reuter, Caps. Syn., p. 23; *id.*, Rev. Caps., p. 203; Hem. Gymn. Eur., i, p. 62; iii, p. 510.

opacus (*Capsus*), Zett., Ins. Lapp., 1840, p. 279, ♀: Thomson, Opusc. Ent., iv, 1871, p. 450.

Hab. Lapland.

suavis, Reuter, Caps. Amer., 1872, p. 92: Uhler, List, p 21.

Hab. Texas.

? vittatus (*Agalliastes*), Fieber, Eur. Hem., 1861, p. 312; Walk., Cat. Het., vi, p. 155: Reut., Hem. Gymn. Eur., i, p. 172, t. 8, f. 9.

Hab. Lower Austria.

Wilkinsonii (*Agalliastes*), Douglas & Scott, Ent. Mon. Mag., ii, 1866, p. 273 (*form brach.*): Walk., Cat. Het., vi, p. 155: Saund., Syn., p. 309: Reuter, Ent. Mon. Mag., xiii, 1876, p. 87 (*form macr.*); *id.*, Rev. Caps., p. 205; Hem. Gymn. Eur., i, p. 65, 175, t. 4, f. 1, 2; ii, p. 298; iii, p. 448, 510: J. Sahlb., Vet.-Aka. Handl., xvi (4), 1878, p. 30.

Hab. Britain, Lapland, France.

Genus **ORECTODERUS**.

Uhler, Bull. Un. St. Surv., iii, 1877, p. 426; *id.*, List, p. 20.

amoenus, Uhler, *l. c.*, iii, 1877, p. 426: *id.*, List, p. 20.
Hab. Colorado, New Mexico, Texas, Illinois.

obliquus, Uhler, *l. c. supra*, ii, 1876, p. 320; List, p. 20.
Hab. New Mexico, Texas.

Genus **NEOCORIS**.

Douglas & Scott, Brit. Hem., 1865, p. 424: Reuter, (*Plagiognathus* subg. *Neocoris*), Rev. Caps., p. 200; *id.*, Hem. Gymn. Eur., i, p. 55, t. 1, f. 10; iii, p. 502.
Agalliastes, pt, Fieber, Eur. Hem., 1861, p. 74, 310.
Microsynamma, Fieber, Wien Ent. Monats, viii, 1864, p. 74, t. 1, f. 6.
Monosynamma, Scott, Ent. Ann., 1864, p. 160.
Plagiognathus, pt, Fieber, *l. c.*, p. 302.

basalis, Reuter, Hem. Gymn. Eur., i, 1879, p. 59; iii, p. 509; Fedtsch. Turk., p. 36.
Hab. Turkistan.

Bohemanii (*Phytocoris*), Fallen, Hem. Succ., 1829, p. 106: Zett., Ins. Lapp., p. 276: Flor, Rhyn. Liv., i, p. 625: Fieber (*Plagiognathus*), Eur. Hem., p. 303: Dougl. & Scott (*Neocoris*), Brit. Hem., p. 424, t. 13, f. 9: Walk., Cat Het., vi, p. 150: Saund., Syn., p. 307: Reuter, Rev. Caps., p. 200: Hem. Gymn. Eur., i, p. 57; ii, p. 303; iii, p. 509.
furcatus, Herr. Schäff., Wanz. Ins., iv, 1839, p. 79, t. 132, f. 408, 409 (♂ ♀): Meyer, Rhyn. Schw., p. 70: Kirschb., Rhyn. Wiesb., p. 255, sp. 134.
var. *rubronotatus*, Jak., Bull. Mosc., li, 1876, p. 119; Reuter, Hem. Gymn. Eur., i, p. 154; ii, p. 303.
„ *ruficollis*, Fallen, Hem. Succ., 1829, p. 107, ♀.
Hab. Nearly all Europe, S. Russia, Siberia [*Atk.*, Lille].

nigritulus (*Phytocoris*), Zetterstedt. Ins. Lapp., 1840, p. 276, 31: Flor, Rhyn. Liv., i, p. 599: Fieber (*Agalliastes*), Wien. Ent. Monats., viii, 1864, p. 230: Walk., Cat. Het., vi, p. 156: Reuter, Rev. Caps., p. 201; *id.*, Hem. Gymn. Eur., i, p. 56, t. 3, f. 7; iii, p. 509: Saund., Syn., p. 308.
pulicarius, var. 1, F. Sahlberg, Geoc. Fenn., 1848, p. 119.
var. *Putonii*, Reuter, Bih. Vet.-Aka. Handl., 1875, p. 59 (*nec* Fieb.).
„ *Scottii* (*Microsynamma*), Fieber, Wien Ent. Monats., viii, 1864, p. 75, t. 1, f. 6: (*Monosynamma*) Scott, Ent. Ann., 1864, p. 160, f. 5: Dougl. & Scott, (*Neocoris*), Brit. Hem., p. 425: Walk., Cat. Het., vi, p. 133.
Hab. Scandinavia, Livonia, France, Britain [*Atk.*, Dunkirk].

Genus **CAMPYLOMMA**.

Reuter, Hem. Gymn. Eur., i, 1879, p. 52, t. 1, f. 9; iii, p. 501.
Agalliastes, pt, Fieber, Eur. Hem., 1861, p. 74, 310.
Atomoscelis, pt, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 57.

annulicornis (*Litocoris* ?), Signoret, Ann. Soc. Ent. Fr., (4 s.) v, 1865, p. 126: Reuter, Berlin. Ent. Zeits., xxv, p. 184; Hem. Gymn. Eur., iii, p. 447, 509.

lucida, Jakowleff, Trudi Russki Ent., ix (3), 1876, p. 228, ♀; Reuter, Hem. Gymn. Eur., i, p. 54; ii, p. 296.

viridula, Jakowleff, Bull. Mosc., lv (i), 1880, p. 143.

Hab. France, S. Russia, Caucasus, Turkistan.

diversicornis, Reuter, Hem. Gymn. Eur., i, 1879, p. 55; iii, p. 509, Fedtsch. Turk., p. 37.

Hab. Turkistan.

livida, Reuter, Ent. Tijds, v, 1884, p. 199.

Hab. Bengal.

Nicolasii, Puton & Reut., Rev. d' Ent., ii, 1883, p. 251: Reut., Hem. Gymn. Eur., iii, p. 446, 509.

Hab. S. France.

nigronasuta, Reuter, Hem. Gymn. Eur., i, p. 53; iii, p. 509; Fedtsch. Turk., p. 36.

Hab. Turkistan.

Oertzenii, Reuter, Rev. d' Ent., viii, 1888, p. 228.

Hab. Greece, Attica.

simillima, Jakowleff, Trudi Russk. Ent., xiii (2), 1882, p. 129: Reut., Hem. Gymn. Eur., iii, p. 447, 509.

Hab. Caucasus, Petrovsk.

verbasci (*Capsus*), Meyer, Rhyn. Schw., 1843, p. 70, t. 4, f. 1: Kirschb., Rhyn. Wiesb., p. 258, sp. 141: Fieber (*Agalliastes*), Eur. Hem., p. 311: Walk., Cat. Het., vi, p. 155: Uhler, List, p. 21: Reuter, Hem. Gymn. Eur., i, p. 53, 175, t. 3, f. 6; ii, p. 296; iii, p. 477, 509; Fedtsch. Turk., p. 37.

pellucidus, Garbigl., Bull. Soc. Ent. Ital., 1869, p. 190.

? *punctipes*, Herr. Schäff., Nomencl. Ent., i, 1835, p. 50.

Hab. S. & Middle Europe: Turkistan: E. United States [*Atk.*, Hungary].

zizyphi, Puton & Reut., Expl. Scient. Tunisie, 1886, p. 20.

Hab. Tunis.

Genus **STHENARUS**.

Fieber, Crit. Gen. Phyt., 1859, 75; *id*, Eur. Hem., p. 74, 309: Reuter (*Plagiognathus* subg. *Sthenarus*), Rev. Caps., p. 194; Hem. Gymn. Eur., i, p. 42, t. 1, f. 8; iii, p. 502.

Agalliastes, pt. Fieber, Eur. Hem., 1861, p. 74, 310.

Criocoris, pt, Reuter, Rev. Caps., p. 191.

Phoenicocoris, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 55; Rev. Caps., p. 195.

carbonarius, Horvath, Rev. d' Ent., vii, 1888, p. 185.

Hab. Roumania.

dissimilis, Reuter, Hem. Gymn. Eur., i, 1879, p. 174; iii, p. 445, 508.

Hab. France, Hungary.

maculipes, Reuter, *l. c.*, i, p. 46; iii, p. 446, 508.
Hab. France, Austria, Vienna, Greece.

modestus (*Capsus*), Meyer, Rhyn. Schw., 1843, p. 40, t. 3, f. 5: Walk., Cat. Het. vi, p. 154: Fieber, Eur. Hem., p. 312: Reuter (*Phoenicocoris*), Hem. Gymn. Scan. & Fenn., p. 195, pt.; *id.*, Hem. Gymn. Eur., i, p. 43; iii, p. 445, 508.
atropurpureus, Kirschb., Rhyn. Wiesb., 1855, p. 262 sp. 150, p. 338.
gracilicornis, Scholtz, Arb. u. Verand. d. Schles. Ges., 1846, p. 106.
Hab. Scandinavia, Russia, Herzegovina, Germany, Switzerland, France.

nigripilis, Reuter, Rev. d' Ent., viii, 1888, p. 228, ♀.
Hab. Greece.

ochraceus (*Agalliastes*), Scott, Ent. Mon. Mag., viii, 1872, p. 243 ♀: Reuter, Hem. Gymn. Eur., i, p. 49, t. 2. f. 9; iii, p. 446, 508.
fulvus, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 54, ♂.
Hab. S. France, Corsica, Spain.

ocularis, Mulsant & Rey, Ann. Soc. Linn. Lyon., 1852, p. 144: Reut., Hem. Gymn. Eur., i, p. 45; iii, p. 446, 508.
major, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 55.
Hab. W. & S. France, Spain.

pubescens (*Phoenicocoris*), Reuter, Caps. Amer., 1875, p. 90: Uhler, List, p. 21.
Hab. Texas.

pusillus, Reuter, Hem. Gymn. Eur., i, 1879, p. 44; iii, p. 508.
Hab. Naples.

Roseri (*Capsus*), Herr. Schäff., Wanz. Ins., iv, 1839, p. 78, t. 132, f. 407, ♀: Meyer, Rhyn. Schw., p. 105: Kirschb., Rhyn. Wiesb., p. 247 sp. 115 (♂, ♀): Flor, Rhyn. Liv., i, p. 560: Thomson, Opusc. Ent., iv, p. 449: Fieber (*Sthenarus*), Eur. Hem., p. 309: Walk., Cat. Het., vi, p. 154: Saund., Syn., p. 307: Reuter, Rev. Caps. p. 194; *id.*, Hem. Gymn. Eur., i, p. 47; iii, p. 446, 508.
geniculatus, Stål, Ofvers. Vet.-Aka. Förh., xv, 1858, p. 355 ♂.
var. *saliceticola*, Stål, *l. c.*, p. 355, ♀.
„ *vittatus*, Fieber, Eur. Hem. 1861, p. 310: Walk., Cat. Het., vi, p. 154.
Hab. Scandinavia, Germany, Austria, Tyrol, Switzerland, France, Greece, S. Russia [*Ark.*, Lille].

Rotermundii (*Capsus*), Scholtz, Arb. u. Veränd. d. Schles. Ges., 1846, p. 131, sp. 42: Flor, Rhyn. Liv., i, p. 594: Fieber (*Sthenarus*), Eur. Hem., p. 310: Dougl. & Scott, Brit. Hem., p. 422: Walk., Cat. Het., vi, p. 154: Saund., Syn., p. 303: Reuter, Hem. Gymn. Eur., i, p. 50, t. 3, f. 1; iii, p. 446, 508.
Hab. Russia, Corfu, Germany, Hungary, Switzerland, Tyrol, Italy, Spain, France, Belgium, Britain.

syriacus, Reuter, Hem. Gymn. Eur., iii, 1883, p. 445: Ferrari, Ann. Mus. Civ. Gen. (2 s.), i, p. 445, 508.
Hab. Syria.

visci, Puton, Rev. d' Ent., vii, 1888, p. 366.
Hab. France.

Genus **AUCHENOCREPIS.**

Fieber, Crit., 1859, 78; Eur. Hem., p. 74, 313: Reuter, Hem. Gymn. Eur., i, p. 39, t. 1, f. 7; iii, p. 499.

alboscutellata, Puton, Pet. Nouv. Ent., i, No. 110, 1874, p. 440; *id.*, Ann. Soc. Ent. Fr., (5 s.) vi, 1876, p. 37: Reuter, Hem. Gymn. Eur., i, p. 42; iii, p. 507.
Hab. Egypt, Algeria.

minutissima (*Phytocoris*), Rambur, Faun. Andal., 1842: Reuter, Hem. Gymn. Eur., i, p. 40, t. 2, f. 8; iii, p. 507.
dorsalis, Fieber, Crit., 1859, sp. 32.
Forelii, Muls. & Rey, Ann. Soc. Linn. Lyon, vii, 1856, p. 130: Costa, Cim. Regn. Neap. Cent. Add., 1860, p. 25, t. 3, f. 3: Fieber, Eur. Hem., p. 313: Walk., Cat. Het., vi, p. 140.
Schiödtei, Stål, Ofvers. Vet.-Aka. Förh., xi, 1854, p. 236.
Hab. S. France, Spain, Italy.

Reuteri, Jakowleff, Bull. Mosc., (3), 1876, p. 120: Reuter, Hem. Gymn. Eur., i, p. 41, 174; ii, p. 296; iii, p. 445, 507; *id.*, Fedtsch. Turk., p. 37.
Hab. Greece, S. Russia, Caucasus, Turkistan, Asia Minor, Persia.

Genus **TRAGISCOCORIS.**

Fieber, Eur. Hem., 1861, p. 300: Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 55; *id.*, Hem. Gymn. Eur., i, p. 37, t. 1, f. 6; iii, p. 500.
Tragiscus, Fieber, Crit., 1859, g. 69; Eur. Hem., p. 73.

Fieberii (*Tragiscus*), Meyer, Fieber, Crit., 1859, sp. 21; (*Tragiscocoris*), *id.*, Eur. Hem., p. 301: Walk., Cat. Het., vi, p. 148: Reuter, Hem. Gymn. Eur., i, p. 38, t. 3, f. 4, 5; iii, p. 445, 507: Ferrari, Ann. Mus. Civ. Gen., (2 s.) i, 1884, p. 486.
Hab. Corsica, Algeria, Tunis.

Genus **PAREDROCORIS.**

Reuter, Hem. Gymn. Eur., i, 1879, p. 36, t. 1, f. 5; iii, p. 500.

pectoralis, Reuter, *l. c.*, i, p. 37; iii, p. 445, 507: Horvath, Rev. d' Ent., vii, 1881, p. 186, ♀.
Hab. Hungary; S. Russia, Sarepta.

Genus **DAMIOSCEA.**

Reuter, Hem. Gymn. Eur., iii, 1883, p. 443, 500.

Komaroffii (*Oncotylus*), Jakowleff, Reuter, Hem. Gymn. Eur., iii, p. 444, 507.
Hab. Georgia, Derbent.

Genus **ASCIODEMA.**

Reuter, Hem. Gymn. Eur., i, 1879, p. 33, t. 1, f. 4; iii, p. 500.
Psallus, pt, Fieber, Eur. Hem., 1861, p. 305.
Tinicephalus, pt, Fieber, *l. c.*, p. 299.

obsoletum (*Tinicephalus*), Douglas & Scott, Brit. Hem., 1865, p. 391: Walk., Cat. Het., vi, p. 148: Saund., Syn., p. 295: Fieb., Wien. Ent. Monats., viii, 1864, p. 226: Reuter, Ofvers. Vet.-Aka. Förh., 1874, p. 48; Hem. Gymn. Eur., i, p. 34, 176, t. 3, f. 2; iii, p. 507.

Reiberii, Reuter, Pet. Nouv. Ent., No. 135, 1875, p. 540.

Saundersii, Reuter, Rev. Caps., 1875, p. 153; Ent. Mon. Mag., xiv, 1877, p. 129: Saund., Syn., p. 293.

Hab. Britain, France, Spain [*Atk.*, Valenciennes].

Fieberii (*Psallus*), Douglas & Scott, Brit. Hem., 1865, p. 420: Fieber, Wien. Ent. Monats., viii, 1864, p. 227: Walk., Cat. Het., vi, p. 153: Saund., Syn., p. 303: Reuter, Hem. Gymn. Eur., i, p. 35, t. 3, f. 3; iii, p. 507.

Genus **MEGALODACTYLUS**.

Fieber, Crit., 1859, 64; Eur. Hem., p. 72, 297: Reuter, Hem. Gymn. Eur., i, p. 32, t. 1, f. 3; iii, p. 499.

macula-rubra (*Capsus*), Mulsant & Rey, Ann. Soc. Linn. Lyon, 1852, p. 138: Fieber, Eur. Hem., p. 297: Walk., Cat. Het., vi, p. 138: Reuter, Hem. Gymn. Eur., i, p. 33, t. 2, f. 7; iii, p. 507.

Hab. S. Europe.

? **mixticolor** (*Capsus*), Costa, Cent. Cim. Neap., Add., 1860, p. 26, t. 3, f. 6: Reut., Hem. Gymn. Eur., i, p. 172.

Hab. S. Italy.

Genus **MAURODACTYLUS**.

Reuter, Hem. Gymn. Eur., i, 1879, p. 27, t. 1, f. 2; iii, p. 500.

Agalliastes, pt, Fieber, Eur. Hem., 1861, p. 310.

alutaceus (*Agalliastes*), Fieber, Verh.-Zool. Bot. Ges. Wien, xx, 1870, p. 262: Walk., Cat. Het., vi, p. 156: Reut., Hem. Gymn. Eur., i, p. 30, t. 2, f. 5; iii, p. 506.

Hab. Spain.

instabilis, Reuter, Hem. Gymn. Eur., i, 1879, p. 28; iii, p. 506: Fedtsch. Turk., p. 37.

Hab. Turkistan.

nigricornis, Reuter, Hem. Gymn. Eur., i, 1879, p. 29, t. 2, f. 4; iii, p. 443, 506; Fedtsch. Turk., p. 38.

bicolor (Fieb.), Reuter, *l. c.*, i, p. 31, t. 2, f. 6, ♂; Fedtsch. Turk., p. 38.

Hab. Spain, S. Russia, Caucasus, Turkistan.

Genus **TUPONIA**.

Reuter, (*Megalodactylus*, subg., *Tuponia*), Bih. Vet.-Aka. Handl., iii (i), 1875, p. 53: (*Tuponia*), Hem. Gymn. Eur., i, 1879, p. 16, t. 1, f. 1; iii, p. 499.

Agalliastes, pt, Fieber, Eur. Hem., 1861, p. 310.

Oncotylus, pt, Fieber, *l. c.*, p. 298.

Psallus, pt, Fieber, *l. c.*, p. 305.

arcuifera, Reuter, Ofvers. Finska Vet. Soc. Förh., xxi, 1879, p. 38: *id.*, Hem. Gymn. Eur., ii, p. 295; iii, p. 505.
Hab. S. Russia, Astrakhan.

brevirostris, Reuter, Hem. Gymn. Eur., iii, 1883, p. 440, 505.
Hab. France.

concinna (*Atomoscelis*), Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 57; *id.*, Hem. Gymn. Eur., i, p. 24, ii, p. 296; iii, p. 442, 506: Leth. & Put., Ann. Soc. Ent. Fr. (5 s.), vi, 1876, p. 37.
Hab. Algeria, S. Russia.

hippophaes (*Oncotylus*), Fieber, Eur. Hem., 1861, p. 299: Walk., Cat. Het., vi, p. 139: Reuter, Hem. Gymn. Eur., i, p. 21, t. 2, f. 1; iii, p. 440, 506.
Hab. Spain, France, Italy, Switzerland [*Atk.*, Switzerland].

Lethierryi (*Megalodactylus*), Reut., Bih. Vet.-Aka. Handl., iii (i), 1875, p. 53; *id.*, Hem. Gymn. Eur, i, p. 20, 174; iii, p. 505: Leth. & Puton, Ann. Soc. Ent. Fr. (5 s.), vi, 1876, p. 37.
Hab. Algeria, Egypt.

pallida, Reuter, Hem. Gymn. Eur., i, 1879, p. 17, 174, t. 1, f. 1 *a-c*; iii, p. 505; Fedtsch. Turk., p. 38.
Hab. Turkistan, Sardara, Kisilkum.

prasina (*Agalliastes*), Fieber, Wien Ent. Monats., viii, 1864, p. 228; Walk., Cat. Het., vi, p. 156: Reut. Hem. Gymn. Eur., i, p. 23, t. 2, f. 2; ii, p. 296; iii, p. 441, 506; Fedtsch. Turk., p. 39.
affinis, Reuter, Hem. Gymn. Eur., i, 1879, p. 22.
Hab. Transylvania, S. Russia, Turkistan [*Atk.*, Wallachia].

punctipes, Reuter, Hem. Gymn. Eur., iii, 1883, p. 441.
prasina, var. *punctipes*, Reut., *l. c.*, ii, p. 296.
Hab. Turkistan.

roscipennis, Reuter, Hem. Gymn. Eur., i, 1879, p. 21, 174; iii, p. 505; Fedtsch. Turk., p. 39.
Hab. Turkistan.

tamaricis, Perris, Ann. Soc. Linn. Lyon, iv, 1857, p. 187: Reuter (*tamaricis*), Hem. Gymn. Eur., i, p. 19; ii, p. 295, 296; iii, p. 439, 505.
notata, Fieber, Crit. Phyt., 1859, sp. 30: Eur. Hem., p. 307: Walk., Cat. Het., vi, p. 152.
var. *elegans*, Jak., Horae Soc. Ent. Ross., iv, 1867, p. 158: Walk., Cat. Het., vi, p. 153: Reut., Hem. Gymn. Eur., i, p. 18, 174; iii, p. 439; Fedtsch. Turk., p. 38.
Hab. Spain, France, Italy, Switzerland, S. Russia, Transcaucasus, Turkistan [*Atk.*, S. Russia].

unicolor (*Agalliastes*), Scott, Ent. Mon. Mag., viii, 1872, p. 243; Reuter, Hem. Gymn. Eur., i, p. 26, t. 2, f. 3; ii, p. 296; iii, p. 443, 506.
Hab. Corsica.

Div. XVIII, ISOMETOPARIA, Reuter, Bih. Vet.-Aka. Handl., iii (i), 1875, p. 60.
Isometopidae, [Fieber, Wien. Ent. Monats., iv, 1860, p. 259; Eur. Hem., p. 237.

Genus ISOMETOPUS.

Fieber, Wien Ent. Monats., iv, 1860, p. 259, t. 6A; Eur. Hem., p. 61, 237: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 61.

intrusus (*Acanthia*), Herr. Schäff., Nomencl. Ent., i. 1835, p. 61: Wanz., Ins., vi, p. 48, t. 196, f. 608: Fieber, Wien Ent. Monats., iv, 1860, p. 259, t. 6A, f. 15, 16; Eur. Hem., p. 237: Puton, Ann. Soc. Ent. Fr., (5 s.), iii, 1873, t. 1, f. 5.

alienus, Fieber, Wien. Ent. Monats., iv, 1860, p. 259, t. 6A, f. 17-19; Eur. Hem., p. 237: Puton, *l. c. supra*, t. 1, f. 4; Bull. Soc. Ent. Fr., (5 s.) vii, 1877, p. cxxx.

Hab. France, Switzerland, Austria.

mirificus, Mulsant & Rey, Ann. Soc. Linn. Lyon, xxv, 1878, p. 323: Rev. d' Ent., i, 1882, p. 278.

Hab. France.

Genus MYIOMMA.

Puton, Pet. Nouv. Ent., i, No. 44, 1872, p. 177; Ann. Soc. Ent. Fr., (5 s.) iii, 1873, p. 21, note: Reuter, Bih. Vet.-Aka. Handl., iii (i), p. 60.

Fieberii, Puton, *l. c. supra*, 1872, p. 177; Ann. Soc. Ent. Fr., (5 s.) iii, 1873, p. 20, t. 1, f. 3, ♂.

Hab. S. France, Italy.

ADDITIONS.

p. 42. ECCRITOTARSUS.

exitiosus, Distant, Ent. Mon. Mag., xxv, 1889, p. 202.
Hab. Trinidad.

incusus, Distant, C. R. Soc. Ent. Belg., xxxii, 1888, p. lxxxi.
Hab. Brazil.

magnificus, Distant, *l. c.*, p. lxxxii.
Hab. Brazil.

p. 44. NEOCARNUS.

glabratus, Distant, C. R. Soc. Ent. Belg., xxxii, 1888, p. lxxxii.
Hab. Brazil.

p. 44. FUNDANIUS.

bicolor, Distant, *l. c.*, p. lxxxii.
Hab. Brazil.

p. 51. HELOPELTIS.

febriculosa, Bergroth, Ent. Mon. Mag., xxv, 1889, p. 271.
Hab. Sikkim [*Ind. Mus.*, Mungphu].

p. 56. RESTHENIA.

designata, Distant, C. R. Soc. Ent. Belg, xxxii, 1888, p. lxxxi.
Hab Brazil.

majuscula, Distant, *l. c.*, p. lxxxi.
Hab. Brazil.

p. 93, near CYPHODEMA.

Genus CHILOCRATES.

Horvath, Termes füzet., xii, 1889, p. 39.

Lenzii, Horvath, *l. c. supra*, p. 39.

Hab. Kashmir.

p. 93. **POECILOSCYTUS.**

aterrimus (*Systratiotus*), Jakowleff, Hor. Soc. Ent. Ross., xxiii, 1889, p. 69.

Hab. Siberia.

p. 105. **CAPSUS.**

niger (*Rhopalotomus*), Jakowleff, Hor. Soc. Ent. Ross., xxiii, 1889, p. 69.

Hab. Siberia.

p. 154. **MACROTYLUS.**

dimidiatus, Jakowleff, Hor. Soc. Ent. Ross., xxiii, 1889, p. 69.

Hab. Siberia.

CORRECTIONS.

p. 31, omit *Myrmecoris* **bimaculata**, Motsch.: see p. 117.

p. 33, transfer *Miris* **dolobratus**, Linn. to Genus **Leptopterna**, p. 39.

p. 39, **Xenetus**, Dist., is the same as **Eccritotarsus**, Westw., p. 49.

p. 46, for '**midestus**,' Dist., read '**modestus**.'

p. 54, line 21 from above, for '*Lynchnitidis*,' read '*Lychnitidis*.'

p. 55, line 5 from above, omit *rubricosus* Garbig., and references.

p. 65, omit '?' before **miridioides**, Leth.

p. 71, line 18 from above, for '*bifasciatus*, Herr. Schäff. and references,' read '*bifasciatus*, Hahn, Wanz. Ins., iii, 1835, p. 7, t. 75, f. 232.'

p. 84, omit '*aurantiacus*, Voll.,' and reference: see p. 158.

p. 85, omit '?' before **brachycnemis**, Rent.

p. 87, omit '**fratruelis**, Berg,' and reference: see p. 99.

p. 107, omit '**bicinctus**, Walker' and reference: see p. 85.

p. 110, omit '**signatipes**, Herr. Schäff,' and references, see p. 165.

p. 119, for '**crythroleptus**,' read '**erythroleptus**.'

p. 149, line 12 from below, for '*Placochilus*,' read '*Placochilus*.'

p. 153, for '**ALLOETOMUS**,' read '**ALLOETARSUS**.'

p. 162, omit '? **convexus**, Rent.' and reference: see p. 164.

INDEX GENERUM.

Acetropis, 32.
Acropelta, 102.
Acrotelus, 147.
Actinocoris, 38.
Actitocoris, 38.
Admetus, 52.
Aetorrhinus, 132.
Agalliastes, 149, 159, 160, 173.
Agnocoris, 93.
Agrametra, 172.
Allodapus, 116.
Alloenotus, 70.
Alloetarsus, 153.
Alloetomus, 102.
Allocotus, 135.
Allorhinocoris, 53.
Amblytylus, 151, 153.
Ambracius, 48.
Amixia, 135.
Anapus, 120.
Ania, 44.
Annona, 44.
Anoterops, 145.
Antias, 47.
Aphanosoma, 31.
Apocremnus, 160.
Asciodema, 178.
Aspicelus, 51.
Astemma, 117, 173.
Atomophora, 144.
Atomoscelis, 173.
Atractotomus, 160, 167.
Auchenocrepis, 178.

Bibaculus, 46.
Blepharidopterus, 132.
Boopidocoris, 126.
Bolteria, 124.
Bothrocranum, 142.
Bothynotus, 102.
Brachyarthrum, 157.
Brachycerwa, 127.
Brachycoleus, 82.
Brachynotocoris, 144.
Brachytropis, 33.
Bryocoris, 41, 156.
Byrsoptera, 156.

Callicapsus, 97.
Callichila, 56.
Callimiris, 38.
Calocoris, 70.
Calocorisca, 104.
Calondas, 78.
Camarocyphus, 130.
Camaronotus, 112.
Camelocapsus, 30.
Camponotidea, 31.
Camptobrochis, 95.
Camptobrochys, 95.
Camptotylus, 125.
Campylomma, 175.
Campyloneura, 129.
Capsus, Stal, 105.
Capsus, Fall. 98, 156, 159.
Carmelus, 44.
Carnus, 44.
Ceratocapsus, 140.
Charagochilus, 93.
Chilocrates, 182.
Chius, 46.
Chlamydatus, 173.
Cimatlan, 104.
Clivinema, 56.
Closterocoris, 110.
Closterotomus, 70.
Coccobaphes, 101.
Collaria, 32.
Colpochilus, 169.
Compsocerocoris, 68.
Conometopus, 52.
Conostethus, 147.
Coridromius, 119.
Cremnocephalus, 114.
Cremnodes, 114.
Cremnorrhinus, 126.
Creontiades, 37.
Criocoris, 169.
Cylindromelus, 145.
Cyllocoris, 130, 156.
Cyphodema, 93.
Cyrtocapsus, 41.
Cyrtopeltis, 127.
Cyrtopeltocoris, 115.
Cyrtorrhinus, 134.

Dacota, 48.
Damiosca, 178.
Dasoscytus, 125.
Demarata, 48.
Deracocoris, Kb., 98.
Derophthalma, 97.
Dichrooscytus, 83.
Dicrooscytus, 83.
Dicyphus, 127.
Diommatus, 141.
Dioncus, 55.
Diplacus, 117.
Disphinctus, 50.
Dolichomiris, 37.
Dryophilocoris, 130.

Ecritotarsus, 42, 181.
Ectopiocerus, 108.
Enderon, 147.
Engytatus, 129.
Epimecis, 82.
Episcopus, 166.
Eroticoris, 116.
Ethelastia, 116.
Euarmosus, 103.
Eubatas, 103.

Eucerocoris, 49.
Eurotas, 159.
Eurycolpus, 145.
Eurycyrtus, 83.
Eurymerocoris, 113.
Eurypicoris, 122.
Eurystylus, 167.
Exaeretus, 125.
Excentricus, 142, 168.

—

Falconia, 46.
Florus, 47.
Fulvius, 104.
Fundanius, 44, 181.
Fuscus, 47.

—

Garganus, 69.
Globiceps, 130, 132.
Gnostus, 157.
Gryllocoris, 31.
Grypocoris, 82.

—

Hadrodema, 92.
Haetorhinus, 132.
Hadronema, 62.
Hadrophyes, 148.
Hallodapus, 116.
Halocapsus, 136.
Halticus, 117, 156.
Halticocoris, 117.
Harpocera, 156.
Helopeltis, 51, 181.
Hemicerocoris, 98.
Henicocnemis, 104.
Herdonius, 31.
Heterocordylus, 142.
Heterocoris, 41.
Heterotoma, 141.
Homodemus, 70.
Hoplomachus, 149, 150, 154.
Horcias, 103.
Horistus, 53.
Horvathia, 55.
Hyaliodes, 129.
Hyalopeplus, 106.
Hyoidea, 125.
Hypsitylus, 140

—

Icodema, 159.
Idolocoris, 127.
Unacora, 140.
Irbisia, 125.
Ischioscelicoris, 70.
Ischnoscelis, 70.
Isometopus, 181.

—

Jornandes, 47.

—

Kelidocoris, 132.

—

Laboparia, 117.
Labopidea, 124.
Labops, 120.
Lacmocoris, 115.
Lampethusa, 159.
Laurinia, 32.
Leptomerocoris, 108.
Leptopterna, 39.
Leucopternum, 148.
Liocoris, 98.
Liops, 160.
Litocoris, 136.
Litosoma, 136, 140.
Litoxenus, 140.
Lobostethus, 33.
Lomatoplenra, 62.
Lopomorphus, 39.
Lopidea, 61.
Lopus, 53, 153, 154.
Loxops, 141.
Lygdus, 40.
Lygidea, 93.
Lygocoris, 84.
Lygus, 84.

—

Macrocapsus, 98.
Macrocoleus, 149, 151, 154.
Macrolonius, 106.
Macrolophus, 126.
Macrotylus, 154.
Mala, 46.
Malacocoris, 143
Malacotes, 173.
Malthacosoma, 149.
Malthacus, 156.
Maurodactylus, 179.
Mecomma, 134.
Megacaelum, 79.
Megalobasis, 125.
Megalocerasa, 35.
Megalodactylus, 179.
Melanotrichus, 136.
Melinna, 80.
Mermimerus, 154.
Merotrichaa, 120.
Metriorrhynchus, 96.
Microsynamma, 175.
Microtechnites, 135.
Mimocoris, 113.
Minytus, 37.
Miridius, 56.
Miris, 32, 153.
Monalocoris, 40.
Monalocorisca, 43.
Monalonion, 49.
Monosynamma, 175.
Morna, 101.
Myiomma, 181.
Myrmecomimus, 114.
Myrmecopeplus, 114.
Myrmecophyes, 117.
Myrmecoris, 31.
Myrmecozelotes, 114.

—

Nabidea, 32.
Nasocoris, 144.
Neoborus, 97.
Neocapsus, 103.
Neocarnus, 44, 181.
Neocoris, 175.
Neofurius, 45.
Neoleucon, 47.
Neoproba, 81.
Neosilia, 46.
Neurocolpus, 68.
Notostira, 35.

—

Ocypus, 119.
Odontoplatys, 82.
Ofellus, 52.
Oligobiella, 48.
Omphalonotus, 116.
Oncerometopus, 61.
Oncodepsus, 111.
Oncognathus, 83.
Oncotylus, 145, 150, 154.
Onychumenus, 145.

Ophthalmocoris, 121.
Ophthalmomiris, 38.
Orasus, 51.
Orectoderus, 170.
Orthocephalus, 120.
Orthops, 84.
Orthotylus, 135, 140, 159.

Pachylops, 136, 140.
Pachypeltis, 51.
Pachypterna, 79.
Pachytoma, 121.
Pachyxyphus, 150.
Pallacocoris, 56.
Pamerocoris, 104.
Pamillia, 113.
Pandanus, 81.
Pantilius, 52.
Pappus, 69.
Paracalocoris, 69.
Paracarnus, 44.
Parachius, 46.
Paraproba, 81.
Paredrocoris, 178.
Parthenicus, 135.
Pastocoris, 147.
Perideris, 130.
Phoenicocapsus, 150.
Phylus, 157.
Phytocoris, 62.
Piasus, 48.
Piezocranum, 120.
Pilophorus, 112.
Pirithous, 47.
Pithanus, 30.
Plachochilus, 149.
Plagiognathus, 159, 170.
Plagiorrhamma, 116.
Plagiotylus, 125.
Platycranus, 144.
Platypsallus, 120.
Platytomatocoris, 142.
Plesiocoris, 83.
Plesiodema, 159.
Poecilocapsus, 96.
Poecilocytus, 93, 182.
Polymerus, 93.
Porpomiris, 39.
Proba, 80.
Proboscidocoris, 82.
Pronototropis, 150.
Psallus, 149, 160, 179.
Pseudobryocoris, 43.
Pseudocarnus, 44.
Psilorhamphus, 41.
Pycnoderes, 41.
Pycnopterna, 81.

Reada, 106.
Resthenia, 56, 181.
Renteria, 144.
Rhinaclon, 169.
Rhopalotomus, 105.
Roudairea, 150.

Saundersia, 102.
Semium, 124.
Sericophanes, 114.
Silia, 46.
Sinervus, 50.
Sixconotus, 41.
Solenoxyphus, 149.
Spanagonicus, 173.
Spartacus, 47.
Sphinctothorax, 31.
Sphyracephalus, 134.
Sphyrops, 134.
Stenodema, 33.
Stenoparia, 147.
Stenotus, 83.
Stethoconus, 102.
Sthenaridea, 142.
Sthenarops, 129.
Sthenarus, 176.
Stiphrosoma, 119.
Strongylocoris, 119.
Strongylotes, 169.
Sysinas, 52.
Systellonotus, 115.
Systratiotus, 93.

Tacdia, 68.
Tenthecoris, 120.
Teratodella, 30.
Teratocoris, 37.
Teratoscopus, 157.
Thermocoris, 150.
Tichorhinus, 136.
Tinicephalus, 151, 178.
Trachelomiris, 39.
Tragiscocoris, 178.
Tragiscus, 178.
Trichia, 116.
Trichymenus, 102.
Trigonotylus, 35.
Tropidosteptes, 95.
Trygo, 47.
Tuponia, 179.
Tylonotus, 84.
Tytthus, 134.

Utopnia, 172.

Valdasus, 48.
Vannius, 49.
Volumnus, 80.
Voruchia, 149.

Xenetus, 39.
Xenocoris, 147.

Zacorus, 40.
Zacynthus, 40.
Zopyrus, 52.
Zosippus, 40.
Zygimus, 92.

INDEX SPECIERUM.

[The changes in the genera have been so great that it is necessary to give an index to the species described. Those names that have become synonyms are given in italics, and when several authors have given the same specific name to different species, the authors are quoted and the following contractions have been employed:—

Beck. = Becker.
Blanc., Blanchard.
Brul., Brullé.
Chic., Chicote.
Cost, Costa.
Dahl., Dahlbohm.
Dist., Distant.
De G., De Geer.
D. & S. Douglas & Scott.
Duf, Dufour.
Fab., Fabricius.
Fal., Fallen.
Fb., Fieber.
Ferr., Ferrari.
Garb., Garbiglietti.
Geof., Geoffroy.
Germ., Germar.
Gmel., Gmelin.
Goez., = Goeze.
Gredl., Gredler.
H. S., Herrich Schäffer.
Hhn., Hahn.
Horv., Horvath.
Jak., Jakowleff.
Kb., Kirschbaum.
Kol., Kolenati.
Leth., Lethierry.
Lin., Linnæus.
Luc., Lucas.
Mey., Meyer.
Mots., Motschulsky.
Mül., Müller.
Muls., Mulsant.
Per., Perris.
Put., Puton.
Preys., Preyssler.
Prov., = Provancher.
Rt., Reuter.
Saun., Saunders.
Schol., Scholtz.
Shlb, Sahlberg.
Schk, Schrank.
Schill., Schilling.
Scop., Scopoli.
Sign., Signoret.
Spin., Spinola.
Sulz., Sulzer.
Uhl., Uhler.
Vill., Villers.
Voll, Vollenhoven.
Wlk, Walker.
Wlf., Wolff.

E. T. A.].

Abeillei, 62.
abbreviatus, 34.
absinthii, 160, 161.
acanthioides, 120.
acinaciformis, 141.
adenocarpi, 136.
adspersus, *Spin.*, 62.
adspersus, *Schil.*, 90.
adustus, *Jak.*, 84.
adustus, *Gmel.*, 100.
aequalis, 92.
aerugineus, 89.
aethiops, *Zet.*, 160.
——— *White.*, 172.
aetneus, 102.
affinis, *Fb.*, 153.
——— *Jak.*, 145.
——— *Dist.*, 45.
——— *Rt.*, 33, 96.
affinis, *Rt.*, 180.
——— *Jak.*, 54.
——— *Dist*, 68.
——— *Mey.*, 89.
——— *H. S.*, 76.
agilis, *Uhl.*, 127.
agilis, *Fab.*, 131.
agrarius, 96.
aheneus, 47.
alacer, 96.
alaiensis, 136.
alba, 145.
albatus, 47.
albicans, 62.
albiceps, 116.
albicinctus, 160.
albidivittis, 69.
albidus, 153.
albinervis, 62.
albinus, 73.
albipennis, *Rt.*, 167.
———, *Fal*, 170.
———, *Jak.*, 132.
albipes, *Mots.*, 106.
——— *Jak.*, 160.
albipes, *Fb.*, 168.
albitarsis, 105.
albofasciatus, *Mots.*, 106.
——— *Luc.*, 63, 115.
——— *Rt.*, 115.
——— *Fb.*, 63.
albofasciatus, *Fer.*, 115.
albolineatus, Rt., 114.
albolineatus, *Goez*, 34.
albomaculatus, *Stal*, 41.
albomaculatus, *Dist.*, 45, 104.
albomarginatus, *Hhn.*, 53.
——— *Fab.*, 54.
——— *Preys.*, 54.
albonotatus, 70.
albonotatus Cost, 123.
alboornata, *Dist.*, 105.
alboornatus, 117.
albopilosus, 33.
albopunctatus, 155.
albosctellata, 178.
albostriatus, 53.
alboviridescens, 106.
alienus, *Fb.*, 181.
——— *H. S.*, 128.
alni, *D. S.*, 160.
——— *Fab.*, 165.
alnicola, *D. S.*, 160.
alnicola, *Rt.*, 165.
alpestris, 70.
alpinus, *Frey.* 115.
———. *Rt*, 170.
alpinus, *Kol*, 90.
alternus, 56.
alutaceus, *Put.*, 121.
———. *Fb.*, 179.

amabilis, 119.
ambiguus, *Fal.*, 160.
———. *Dist.*, 39.
ambiguus, Flor. 161.
ambulans, *Fal.*, 134, 157.
americanus, 93.
amethystus, 45.
amicta, 124.
amoena, *Uhl.*, 39.
———. *Prov.*, 81.
amoenus, *Uhl.*, 112, 175.
——— *D. S.*, 70.
amplificatus, 37.
amurensis, 170.
Amyotii, 130.
anatina, 159.
ancorifer, 160.
angularis, 71.
angulatus, 132.
angulifer, 106.
angusticollis, 32.
angustulus, 112.
angustus, 139.
annexus, 84.
annulatus, *Dist.*, 69.
———. *Wlf.*, 127.
annulatus, Germ., 101.
annulicornis, *Shlb.*, 71.
——— *H. S.*, 106.
——— *Rt.*, 68, 170.
——— *Sign.*, 176.
annulipes, *H. S.*, 98.
——— *Sign.*, 50.
annulus, 71.
antennata, *Dist.*, 104.
antennatus, *Boh.*, 37.
——— *Wlk.*, 107.
——— *Blanc.*, 106.
antennatus, Muls., 156.
——— *Flor.*, 38.
antennirectus, 34.
anthocoroides, *Rt.*, 31.
——— *Stal*, 104.
——— *Uhl.*, 104.
anthracinus, 107.
anticus, *Rt.*, 161.
anticus, Mul., 75.
Antonii, 51.
aphidioides, 126.
apicale, *Rt.*, 79.
apicalis, *Fb.*, 84.
——— *Rt.*, 169.
apicalis, Sign., 99.
——— *Hhn.*, 77.
apicifer, 107.
apparitor, 83.
approximatus, 84.
apterus, 117.
arbustorum, 170.
arcufera 180.
arenarius, *Horv.* 121.
arenarius, Hahn., 118.
argentatus, 45.
argentinus, 71, 173.
argillaceus, 37.
argyrotrichus, *Put.*, 161.
——— *Rt.*, 144.
aridellus, 148.
armatus, 31.
artemisiae, *Shlb.*, 136.
artemisiae, Schill., 90.
——— *Beck.*, 170.
——— *Fer.*, 65.
asperulae, 95.
associatus, 173.
ater, *Lin.*, 105.
—— *Jak.*, 169.
—— *D. S.*, 132.
ater, Geof., 141.
—— *Schk.*, 142.
aterrimus, *Jak.*, 181.
aterrimus, Garb., 73.
atomarius, 84.
atomosus, 161.
atrata, 56.
atratum, 50.
atratus, *Dist.*, 42, 103, 104.
atricapillus, 154.
atripennis, 56.
atrocoeruleus, 120.
atrolutens, 56.
atropurpureus, 177.
attennatus, *Dist.*, 69.
——— *Jak.*, 154.
audens, 52.
aurantiacus, *Fb.*, 151.
aurantiacus, Rt., 34.
——— *Voll.*, 158.
auratus, 45.
aureolus, 152.
aurora, 161.
aurulentus, 107.
australis, *Wall.*, 33.
——— *Wlk.*, 53.
avellanae, Gmel., 70.
——— *Mey.*, 158.

balteatus, 69.
Bärensprungii, 50.
basalis, *Rt*, 94, 126, 175.
——— *Wlk*, 57.
basalis, Costa, 88.
basicornis, 84.
basifer, 49.
Beckerii, 71.
Behrensii, 113.
Belangerii, 33.
Belfragii, 84.
Bellevoyei, 83.
bellicosus, 190.
bellula, 62.
bellus, 97.
bengalicus, 85.
Bergii, 63.
betulae, 161.
betuleti, *Fal.*, 161.
betuleti, Zet., 160.
——— *Hahn.*, 171.
bicinctus, 85.
biclavatus, 71.
bicolor, *Dist.*, 43, 57, 181.
——— *Mul.*, 117.
——— *D. S.*, 140.
——— *Fb.*, 53, 154.
——— *Rt.* 135.
——— *Jak.*, 161.
——— *Scot.*, 120.
bicolor, Germ., 118.
——— *Rt.*, 179.
bidentulus, 82.
bifasciatus, H. S., 133.
——— *Schk.*, 87, 113.
——— *Mül.*, 98.
——— *Hahn.*, 71.
——— *Fabr.*, 112.
biguttatus, Schk., 74.
——— *Goez.*, 100.
bilineatus, *Fal.*, 136.
——— *Jak.*, 121.
bilineatus, H. S., 155.
bimaculata, 44, 68.
bimaculatus, *Fab.*, 71.
——— *Ramb.*, 82.
——— *Jak.*, 53.
bimaculatus Schk., 100.
——— *Mots.*, 117.
——— *H. S.*, 76.
——— *Lin.*, 72.
——— *Sulz.*, 77.
binotatus, *Fab.*, 83.
binotatus, Hahn., 73.
——— *Blanc.*, 78.
bipartitus, 101.
biplagiatus, 71.
bipunctatus, *Rt.*, 126, 154, 171.
bipunctatus, Shlb, 88.
——— *Fab.*, 74.
——— *Put.*, 126.
——— *Burm.*, 73, 78.
bipunctipennis, 40.
bisbistillatus, 130.
bistriatus, 76.
bistriguttatus, 71.
bivittata, 57.
bivittatus, 121.
bivitreus, 161.
bivittis, 57.
blanda, 81.
Bohemanii, *Fal.*, 175.
Bolivarii, *Chic.*, 85.
——— *Rt.*, 121, 152.
bonaerensis, 63.

bonariensis, 85.
borealis, 136.
brachialis, 99.
brachycerus, 105.
brachycnemis, 85.
brachymerus, 63.
brachypterus, 116.
braconiformis, 51.
braconoides, 49, 50.
bracteata, 57.
bracteatus, *Dist*, 39.
——— —— *Say*., 118.
Bradyi, 51.
breviceps, 171.
brevicollis, *Fb*., 153.
brevicollis, *Mey*., 73.
brevicornis, 94, 173.
brevipennis, 121.
brevipes, 36.
brevirostre, 79.
brevirostris, 180.
brevis, *Panz*., 121.
——— *Rt*., 147.
breviusculus, 63.
Bruckii, 115.
brunneus, 85.
brunnipennis, 171.
Burmeisterii, *Stål*, 121.
Burmeisterii, *Curt*., 156.

caduca, 46.
Caesar, 62.
caesareus, 150.
calcaratus, 33.
californicus, 127.
caligatus, 85.
caligineus, 41.
callunae, 161.
camaronotoides, 113.
campestris, *Lin*., 85.
campestris, *Fal*., 90.
——— ——— *var. Geoff*., 98.
——— ——— *Panz*., 76.
candens, 60.
candidatum, 148.
canescens, 107.
cantharinus, 131.
capicola, 107.
capillaris, 100.
capitatus, *Jak*., 71.
——— *H. S*., 107.
Capito, 133.
capsoides, 101.
carbonarius, 176.
Carcelii, 72.
cardinalis, *Uhl*., 95.
——— ——— *Fb*., 99.
carduellus, 161.
caricis, *Fal*., 134.
caricis, *Fb*., 157.
carinata, *H. S*., 32.
carinatus, *D. S*., 34.
Carolinae, 85.
carpathicus, 94.
caspicus, *Rt*., 146.
caspicus, *Horv*., 70.
caucasica, 36.
caucasicus, 85.
centralis, 52.
cerbereus, 48.
cervinus, *H. S*, 85.
cervinus, *Thom*., 88.
cetratus, 86.
Championii, 47, 86.
Chardonii, 63.
chenopodii, 73.
Chicotei, 63.
chinensis, *Sign*., 51.
——— *Stal*., 107.
chiriquina, 57.
chiriquinus, 103.
chlorionis, 86.
chloris, *Fb*., 86.
——— *Uhl*., 129.
chloris, *Gmel*., 146.
chloriza, 124.
chlorizans, 143.
chlorogaster, 127.
chloromelas, 171.
chloropterus, *Kb*., 136.
chloropterus, *H. S*., 134.
——— ——— *Fb*., 140.
chrysanthemi, *Wlf*., 171.
chrysanthemi, *Hhn*., 145.
chryselectrus, 40.
chrysocephalus, 100.
chrysospilus, 162.
chrysotrichus, 152.
cicadifrons, 119.
cimbricus, 100.
cincticornis, 85.
cinctipes, *Wlk*., 57.
——— ——— *Cost*., 71.
cinctus, 105.
cineracea, 46.
cinereo-nigricans, 121.
cingulatus, 53.
cinnamomea, 57.
cinnamopterus, 112.
circumcincta, 57.
circumflexa, 156.
circummaculata, 57.
citri, 169.
citrinus, 63.
clarus, 52, 85.
clavatus, *Lin*., 112.
clavatus, *H. S*., 113.
——— ——— *Burm*., 113.
——— ——— *Cost*., 113.
coagulatus, 152.
coarctatus, 113.
coccinea, 141.
coccineus, *Spin*., 63.
——— ——— *Wlk*., 107.
coccineus, *Duf*., 73.
coerulescens, 107.
cognatus, *Fb*., 94.
——— ——— *Jak*., 162.
collaris *Fb*., 71.
——— *Stal*, 51.
collaris, *Fal*., 127.
——— ——— *Flor*., 129.
——— ——— *Zet*., 127.
colon, *Rt*., 154.
——— *Say*., 63.
commutatus, 92.
concinna, *Rt*., 180.
——— ——— *Stal*, 57.
concolor, *Kb*., 136.
——— ——— *Jak*., 153.
concolor, *D. S*., 136.
confinis, 121.
confluens, 62.
confraterna, 57.
confusus, *Kb*., 113.
confusus, *Thom*., 112.
congrex, 141.
consanguineus, 54.
consimilis, 118.
conspersus, *Stal*, 41.
——— ——— *Wlk*., 107.
conspersus, *Gmel*., 165.
conspurcatus, 86.
consputus, 41.
constrictus, 127.
contaminatus, *Fal*., 86.
contaminatus, *Kb*., 88.
——— ——— *D. S*., 92.
contiguus, 107.
convexicollis, 86.
convexus, 164.
coracina, 32.
coracinus, 121.
cordatus, 131.
cordiger, *Hahn*., 99.
cordiger, *Goez*., 131.
——— ——— *Schk*., 74.
coriaceus, 121.
coroniceps, 150.
correntina, 57.
corruscus, 99.
corsicus, 162.
coryli, 158.
coryzoides, 116.
Costae, *Rt*., 71.
——— *Stal*, 130.
costalis, *Fb*., 126.
——— *Stal*, 57, 167.
costicollis, 36.
coxalis, 107.
crassiceps, 149.
crassicornis, *Put*, 150.
——— ——— *Hhn*, 169.

crassicornis, 141.
crassipennis, 141.
crassipes, 65.
cretaceus, 67.
cribratus, 85.
cribricollis, 85.
cribrosus, 85.
crinicornis, 167.
crinitus, 47.
criocoroides, 162.
cristatus, 86.
croceus, 100.
croceipes, 69.
Crotchii, 162.
cruciatus, *Rt.*, 132.
——— *Shlb.*, 154.
crucifera, 57.
cruentatus, *Muls.*, 162.
——— *Brul.*, 55.
cruentatus, *Per.*, 82.
——— *Geof.*, 76.
cruentus, 161.
cruxnigra, 42.
cucurbitaceus, 130.
cunctator, 171.
cunealis, 100.
cuneatus, *Stal*, 107.
cuneatus, *Put.*, 73.
cupressi, 136.
curticollis, 33.
curvicornis, 40.
curvipennis, 139.
curvipes, 156.
cylindrocollis, 157.
cyllocoroides, *Rt.*, 82.
cyllocoroides, *Schol*, 129.
cyrtopeltis, 102.

Dahlbomii, 86.
Daldorfii, 87.
Dalmannii, 95.
Dallasii, 107.
daniae, 100.
danicus, 101.
debilicornis, 163.
debilis, *Uhl.*, 36.
——— *Rt.*, 122.
declivis, 88.
decolor, *Fal.*, 145.
decolor, *Rt.*, 82.
——— *Gredl*, 163.
decoloratus, 166.
decoloris, 44.
decoratus, *Dist.*, 45, 103.
decoratus, *Mey.*, 134.
——— *Wlk.*, 97.
decrepitus, 119.
delicatulus, *Bol.*, 63.
——— *Per.*, 153.
delicatum, 104.
delicatus, 162.
denigratus, 45.
denotatus, 33.
desertorum, 146.
deserticus, 107.
deses, 34.
designata, 181.
detritus, 72.
diaphanus, *Kb.*, 136.
diaphanus, *Vill.*, 158.
diffusus, *Uhl.*, 94.
diffusus, *Uhl.*, 90.
digrammus, 76.
dilatatus, *Guer.*, 41.
——— *Stal*, 86.
dilutus, *Stal*, 107.
——— *Fb.*, 162.
dilutus, *D. S.*, 165.
dimidiatus, *Kb.*, 63.
——— *Jak.*, 182.
——— *Guér*, 107.
——— *Stal*, 42.
dimidiatus, *Fb.*, 64.
dimidiorufa, 58.
diminutus, 162.
diopsis, 123.
discifer, 42.
discipennis, 42.
discoidalis, 108.
discolor, *Uhl.*, 38.
——— *Shlb.*, 137.
discors, 39.
discrepans, 151.
dislocatus, 86.
dispar, *Boh.*, 132.
dispar, *Steph.*, 156.
dissimilis, 152, 176.
dissimulatum, 50.
Distantii, 91.
distinctus, *D. S.*, 63.
distinctus, *Rt.*, 64.
——— *Fb*, 166.
distinguendus, *Rt.*, 86.
——— *H. S.*, 70.
distinguendus, *Voll.*, 133.
——— *Garb*, 72.
——— *Fb.*, 70.
divergens, 67.
diversicornis, 176.
diversipes, *Horv.*, 94.
——— *Put.*, 141.
divisa, *Rt.*, 140.
——— *H. S.*, 57.
divisus, 50.
Dohrnii, 33.
dolabratus, 33.
Doriae, 122.
dorsalis, *Prov.*, 86.
——— *Say*, 34.
dorsalis, *Fb.*, 178.
——— *D. S.*, 37.
Douglasii, 136.
Dufourii, 48.
dubitatus, 68.
dubius Zett., 134.
——— *D. S.*, 63.

effictus, 63.
egregius, *Fb.*, 70.
——— *Berg*, 167.
egregius, *Fb.*, 70.
elatior, 101.
elatus, 101.
elegni, 137.
elegans, *Dist*, 68.
——— *Rt.*, 72.
——— *Uhl.*, 42.
elegans, *Jak.*, 180.
——— *Curt.*, 155.
elegantulum, *Jak.*, 79.
elegantulus, *Jak.*, 87.
elegantulus, *Mey.*, 134.
elevatus, 155.
elongatum, *Leth.*, 79.
elongatus, *Dist.*, 44.
elongatus, *Geof.*, 36.
elquiensis, 108.
epilobii, 127.
episcopalis, 99.
equestris, 130.
Erberi, 144.
erebeus, 48.
ericetorum, 137.
errans, *Wlf.*, 127.
errans, *Rt.*, 129.
erratica, 36.
erubescens, 58.
eryngii, 94.
erythrocephala, *Spin*, 157.
erythrocephalus, *H. S.*, 118.
erythroleptus, 119.
erythromelas, 55.
erythronotus, 42.
erythrophthalmus, 142.
erythrostomus, 99.
eucosmus, 42.
euonomyi, 82.
evanescens, 173.
eximia, 145.
eximius, 63.
exitiosus, 181.
exoletus, *Cost.*, 64.
exoletus, *Gmel.*, 77.
exornata, 58.
explicata, 32.
exsanguis, 152.
externus, 66.
exustus, 68.

Fairmairei, *Stal*, 42.
Fairmairei, *Sign.*, 102.
fallax, *Sign.*, 53.
fallax, *Horv.*, 99.

Fallenii, *Rt.*, 162.
——— *Stal*, 50.
Fallenii, Hhn., 96.
famelicus, 129.
famularis, 49.
farinosus, 142.
fasciata, *Dist.*, 81.
———·— *Uhl.*, 80.
fasciativentris, 72.
fasciatum, 148.
fasciatus, *Dist.*, 79.
——— *Jak.*, 72.
——— *Rt.*, 87.
——— *Wlk.*, 108.
fasciatus, Mey., 88.
fasciolaris, 133.
fatuus, 87.
febriculosa, 181.
Fedtschenkoii, 72.
femoralis, *Fb.*, 64, 167.
———·— *Rt.*, 152.
femoralis, Geof., 171.
——— *Luc.*, 72.
femorepunctatus, 171.
fenestratus, 145.
ferrugata, *Fab.*, 39.
ferrugatus, Fab., 76.
Fieberii, *D. S.*, 82, 179.
———·— *Schm.*, 79.
———·— *Bol.*, 64.
———·— *Frey*, 137.
———·— *Put.*, 181.
———·— *Mey.*, 178.
Fieberii, Rt., 31.
filicis, 40.
filicorne, 79.
filicornis, 54.
fimbriatus. 52.
fistulosus, 69.
flammeus, 100.
flammula, 64.
flaveolus, *Stal*, 145.
——— *Rt.*, 135.
flavescens, 56.
flavicollis, 105.
flavicornis, 138.
flavicosta, 58.
flavinervis, 137.
flavipes, *Prov.*, 108.
——— *Rt.*, 171.
flavipes, Scop., 158.
flavolimbatus, 30.
flavolinea, 98.
flavomaculatus, *Fab.*, 133.
flavomaculatus, Shlb., 133.
——————— *Kol.*, 132.
——————— *Wlf.*, 130.
flavomarginatus, *Cost.*, 122.
———·— *Don.*, 54.
flavomarginatus, Leth., 124.
flavonigra, 58.
flavonotatus, *Prov.*, 108.
flavonotatus, Boh., 130.
flavopilosus, 151.
flavoquadrimaculatus, 130.
flavosparsus, *Shlb.*, 137.
———·— *Whit.*, 162.
flavovarius, 88.
flavovirens, 87.
flavus, 53.
floralis, 67.
Florii, 38.
floridanus, 108.
floridulus, 52.
Forelii *Fb.*, 87.
Forelii, Mul, 178.
fornicatus, 75.
formosus, 44.
Forsythii, 72.
forticornis, *Mul.*, 167.
———·— *Rt.*, 169.
fraternus, 113.
fratruelis *Berg.*, 99.
fraudans, 87.
fraudulentus, 87.
fraxini, 78.
Freyii, *Put.*, 99.
——— *Beck.*, 108.
——— *Fb.*, 122.
Freyii, Rt., 142.
frontalis, 153.
frontifer, 108.
frumentarius, *Dist.*, 96.
frumentarius, Poda, 34, 35.
fugax, 32.
fuliginea, 48.
fuliginosus, *Rt.*, 82.
fuliginosus, Gmel., 100.
———·— *Rt*, 71.
fulvicollis, *Jak.*, 133.
———· *Fab.*, 42.
fulvicornis, 155.
fulvipennis, *Kb.*, 171.
fulvipennis, Rt., 171.
fulvipes, *Scop.*, 70.
fulvipes, Saun., 132.
———· *Schk.*, 131.
———·— *Rt.*, 133.
fulvomaculatus, *Deg.*, 72.
fulvomaculatus, H. S. 78.
fulvus, *Jak.*, 72.
fulvus, Fb., 35.
—·—·— *Rt.*, 177.
funebris, 44, 49.
funestus, 122.
furcatus, 175.
fuscans, 104.
fuscescens, *Kb.*, 137.
fuscescens, Rt., 71, 138.
fuscicornis, *Brul.*, 34.
——— *Rt.*, 157.
fusciloris, 172.
fuscinervis, 161.
fuscipennis, 169.
fuscofasciatus, 36.
fuscomaculata, 145.
fuscomaculatus, *Stal*, 87.
fuscomaculatus, Goez., 92.
fuscosus, 87.
fuscovenosus, 149.
fuscus, 31.
fusiformis, 69.

Gayii, 58, 59.
gemellatus, 90.
geminus, *Say*, 94.
———·— *Flor*, 135.
generosus, 42.
genetivns, 42.
geniculata, *Fb.*, 127.
geniculatus, *Fb.*, 128.
———·— *Rt.*, 129.
geniculatus, Stal, 177.
geniculus, 100.
genistæ, *Scop.*, 142.
genistæ, Schk., 72.
gibbicollis, 108.
gibbus, 42.
gilvipes, 134.
Gimmerthalii, 32.
glabratus, *Mots.*, 98.
———·— *Dist*, 181.
glaucescens, 126.
globulifer, 129.
goniphorus, 96.
gothicus, *Lin.*, 54.
——— *Ful.*, 102.
gothicus, Scop., 100.
———·— *Schk*, 77.
———·— *Fb.*, 54.
———·— *Poda*, 100.
———·— *Geof.*, 53.
gracilentus, 131.
gracilis, *Shlb.*, 31.
———·— *Dist.*, 80.
gracilis, Ramb., 124.
gracilicornis, 177.
graminens, 88.
graminicola, 163.
grandis, *Uhl.*, 95.
———·— *Rt.*, 172.
———·— *Blanc.*, 58.
granulata, 43.
Grasierii, 54.
griscescens, 33.
griseus, 148.
grossum, 79.
grylloides, 121.
guatemalana, 58.
guatemalanus, 34.
guttulatus, 49.
guttulosus, 163.
Gyllenhalii, 94.

haematocephalus, 100.
haematodes, 165.
haematopus, 165.
haematosticus, 100.
haemorrhous, 78.
Haglundii, 50.
Hahnii, 54.
halimocnemis, 108.
Hardyi, 152.
Hedenborgii, *Fb.*, 72.
Hedenborgii, *Stal*, 56.
hellenica, 156.
Henkei, 78.
Henschii, 118, 163.
Herrichii, 155.
hesperia, Uhl., 48.
hesperina, 122.
Hieracii, 151.
hieroglyphica, *Mul.*, 55.
hieroglyphicus, *Dist.*, 45.
hilaratum, 50.
hippophaes, 180.
hirsutus, 97.
hirsulutus, *Flor*, 64.
——·—— *Wlk.*, 108.
hirtum, 124.
hirtus, *Curt.*, 123.
——· *Mül.*, 124.
—·— *Schk.*, 77.
hispanicus, 72.
histricus, 99.
histricus, var., 99.
histrio, 73, 97.
histrionicus, 131.
Hogbergii, 58.
Holmbergii, 42.
holosericeus, 94.
holsatus, 34.
holsaticus, 34.
horribilis, 47.
horridus, 102.
hortensis, 171.
hortorum, *Wlf.*, 36.
——— *Tign.*, 89.
hortulanus, 151.
Horvathii, 155.
hottentotum, 79.
humeralis, 50.
humuli, 78.
hyalinata, 96.
hyalinipennis, 128.
hyalinus, 42.
hyperboreus, 38.

—

ichneumonides, 50.
icterocephalus, 137.
illepidus, 108.
illota, 93.
illuminatus, 48.
imbecillus, 94.
imitationis, 47.
imitator, 101.
impurum, 159.
incanus, 64.
incertus, 58.
incisuratus, 108.
incisus, 108.
incomparabilis, 99.
inconspicua, 116.
incurvus, 42.
incusus, 181.
infumatus, 45.
infuscata, *Uhl.*, 32.
infuscatum, *Fb.*, 159.
infuscatus, *Brul.*, 54.
infuscatus, *Garb.*, 123.
infusum, 79.
inhonestus, 40.
innotatus, *Rt.*, 87.
———· *Wlk.*, 108.
inops, 68.
inquinatus, 63.
insignis, *Stal*, 87.
—·——— *Rt.*, 41, 54, 64.
insignis, *Rt.*, 135.
———· *D. S.*, 135.
———·— *Fb.*, 166.
———— *Say*, 58.
insitiva, 58.
insolitus, 47.
inspersus, 87.
instabilis, *Luc.*, 93.
———— *Rt.*, 179.
instabilis, *Uhl.*, 33.
——— *Fb.*, 76.
insuavis, 34.
insularis, 73.
insulicatus, 159.
intaminatus, 108.
intermedius, *Rt.*, 64, 83, 105.
———·—— *Jak.*, 94.
intermedius, *Shlb.*, 160.
interpuncta, 58.
intricatus, *Flor*, 64.
intricatus, *Fb.*, 118.
intrusus, 181.
inustus, 73.
invidus, 108.
invitus, 87.
irroratus, *Blanc.*, 64.
——— *Say*, 143.
——— *Leth.*, 94.
irroratus, *Mul.*, 165.
——— *Fb.*, 64.
——— *Per.*, 68.
isabellinus, 72.
italicus, 32.

—

Jakowleffi, 64, 73.
Jakowleffi, 122.
jamaicensis, 41.
Jani, 154.
jucundus, 132.
juniperi, 64.
jurgiosus; 69.

—

Kalmii, 87.
Kinbergii, 108.
kirgisicus, 149.
Kirschbaumii, *Stal*, 122.
———·——— *Fb.*, 163.
Kirschbaumii, *Flor*, 136.
Kolenatii, *Fb.*, 73.
———· *Flor*, 163.
Komaroffii, 178.
Kruperii, 73, 152.

—

lacteus, 131.
laevigatus, *Lin.*, 34.
laevigatus, *Wlf.*, 74.
———· *Deg.*, 34.
———·— *Zet.*, 35.
laniarius, 100.
lanuginosus, *Dist.*, 40.
lanuginosus, *Jak.*, 170.
lapponicus, 163.
laricis, 163.
larvatus, 99.
lateralis, *Wlf.*, 34.
———·· *Hhn.*, 95.
———·· *Fal*, 77.
———·· *Fab.*, 34.
———·· *Shlb.*, 35.
———·· *Fer*, 56.
———·· *Geof.*, 35.
laticeps, 163.
laticinctus, 108.
latipennis, 58.
lenticulosus, 88.
Lenzii, 181.
lepidus, *Put.*, 149.
———· *Fb.*, 163.
leprosus, 58.
leptocerus, *Kb.*, 142.
leptocerus, *D. S.*, 142.
Lethierryi, *Rt*, 137, 180.
Lethierryi, *Fb.*, 79.
leucocephalus, *Linn.*, 119.
leucocephalus, *Schk.*, 157.
———·——— *Coq.*, 119.
———·——— *Goez.*, 118.
leucogrammus, 53.
leucophaeus, 31.
leucopus, *Stal*, 42.
leucopus, *Gmel.*, 151.
leucostictus, 161.
leucozonias, 131.
Leveillei, 55.
limbatellus, 109.
limbatus, *Fal.*, 88.
——— *Wlk.*, 109.
——— *Rt.*, 117.
limbatus, *Per.*, 137.

limbatus, var. *Shlb.*, 90.
limbicollis, 78.
limitatum, 157.
Linae, 127.
linearis, *Rt.*, 37.
——— *Dist.*, 45, 52.
linearis, *Faes.*, 36.
lineatus, 97.
lineellus, *Mul.*, 150.
——— *Jak.*, 82.
lineifer, 109.
lineolaris, 90.
lineolatus, *Goez.*, 73.
——— *Brul.*, 54.
——— *Dist.*, 44.
lineolatus, *Costa*, 76.
lithuanicus, 31.
lituratus, 158.
livida, 170.
lividipennis, 135.
lividus, 120.
longiceps, *Rt*, 135.
——— *Flor*, 154.
longicolle, 148.
longicornis, *Rt*, 94, 169.
——— *Jak.*, 122.
longicornis, *Fal.*, 36.
——— *Shlb.*, 38.
——— *Wlf.*, 67.
longipennis, 64.
longirostris, *Put.*, 32.
——— *Fb.*, 152.
longulus, 42.
Löwii, 147.
lucida, 176.
lucidus, *Wlk.*, 109.
lucidus, *Kb.*, 85.
lucorum, *Mey.*, 88.
lucorum, *Boh.*, 86.
luctuosus, *Prov*, 174.
——— *Stal*, 88.
lugubris, *Hhn.*, 171.
——— *Fb.*, 159.
——— *Say.*, 86.
lunatus, 44, 69.
luniger, 156.
lunula, 154.
luridus, *Fal.*, 119.
——— *Rt.*, 163.
luridus, *Rt.*, 137.
lustratum, 80.
luteiceps, 58.
luteicollis, 118.
luteicornis, 163.
luteigera, 59.
luteipes, 59.
luteofasciatus, 52.
luteolus, 46.
lutescens, *Schil.*, 96.
——— *Rt.*, 141.
——— *Stal*, 42.
lutescens, *Fb.*, 155.
luteus, *H. S.*, 131.
luteus, *Turt.*, 74.
——— *Goez.*, 100.
lutosus, 164.
Lychnitidis, 54.
Lynchii, 114.

macrocephalus, 118.
macularubra, 179.
maculatus, *Scot.*, 125.
——— *Dist.*, 45, 46.
maculiceps, 109.
maculicollis, *Rt.*, 59.
maculicollis, *Mul.*, 93.
maculipennis, 155.
maculipes, 177.
Maerkelii, 30.
magnicornis, *Fal.*, 167.
magnicornis, *D. S.*, 167.
——— *Hhn.*, 168.
magnificus, 181.
magnus, 44.
major, *Schill.*, 70.
——— *Rt.*, 177.
——— *Costa*, 123.
majuscula, 181.
mali, *Mey.*, 167.
mali, *Boh.*, 143.
malina, 130.
mammillosus, 102.
maoricus, 109.
marginalis, 97, 138.
marginanda, 59.
marginata, 32.
marginatus, *Fb.*, 131.
——— *Wlk.*, 109.
——— *Dist.*, 45.
marginatus, *Curt.*, 174.
——— *Zet.*, 84.
——— *Hhn.*, 95.
marginellus, *Put.*, 122.
marginellus, *Schk.*, 53.
——— *Fab.*, 74.
marginepunctatus, 102.
marginicollis, *Wlk.*, 109.
——— *Dist.*, 49.
marmoratus, *Wlk.*, 64.
marmoratus, *D. S.*, 67.
——— *Blanc.*, 62.
Marquetii, 144.
Marshallii, 30.
Martinii, 99, 138, 147.
mastrucatus, 69.
mat, *Rossi*, 54.
mat, *Saun*, 54.
Mayrii, *White*, 106.
——— *Sign.*, 138.
media, 62.
medius, 99.
megatoma, 36.
Meilleurii, 32.
melanaspis, 93.
melanocephalus, *Lin.*, 158.
melanocephalus, *Rt.*, 71.
melanocerus, 155.
melanochra, 58, 59.
melanotoma, 126.
melaxanthus, 97.
melinus, 101.
Mellae, 152.
mendosa, 93.
mercurialis, 118.
meridionalis, 66.
merioptera, 141.
metriorrhynchus, 144.
M-flavum, 74.
Meyerii, *Kol.*, 74.
——— *Frey.*, 125.
Meyerii, *Fb.*, 164.
Meyer-Durii, 93.
mexicanus, 68, 103.
miles, 54.
militaris, 62.
mimica, 59.
mimus, 99.
miniatus, *H. S.*, 100.
——— *Prof.*, 109.
Minkii, 102.
minor, *Kb.*, 65.
——— *Cost.*, 122.
minor, *Rt.*, 161.
——— *Thom*, 65.
——— *Gredl.*, 123.
minutissima, 178.
minutus, *Rt*, 118.
——— *Jack.*, 138.
minutus, *Luc.*, 122.
miraria, 38.
miridioides, 65.
mirificus, 181.
Miscelii, 115.
mistus, 68.
mixticolor, 179.
modesta, *Uhl.*, 80.
modestus, *Mey.*, 177.
——— *Blanc.*, 109.
——— *Dist.*, 46.
moerens, 102.
moestus, 170.
molliculus, *Fal.*, 152.
——— *Dist.*, 69.
mollis, 164.
monachus, 88.
Moncreaffi, 139.
montana, 59.
Montandoni, 128.
montanus, 88.
montevidensis, 59.
montivaga, *Dist.*, 59.
montivagus, *Cost.*, 55.
morio, *Shlb.*, 167.

morio, Boh., 100.
Müllerii, 161.
Mulsantii, 173.
multicolor, 75.
multifarior, 59.
mundulus, 43, 155.
mundum, 80.
Municrii, 150.
mutabilis, *Whit.*, 138.
mutabilis, Hbn., 138, 142.
——·—— *Fal.*, 121, 123, 160.
——·—— *Lin.*, 158.
——·—— *Burm*, 123.
——·—— *Thom.*, 166.
mutans, 89.

nankinensis, 73.
nassatus, *Fab.*, 138.
nassatus, Fal., 138.
naso, 152.
nasutus, 154.
nebulosus, *Fb.*, 74, 122.
——·—— *Uhl.*, 96.
——·—— *Rt.*, 164.
neglectus, 56.
nemoralis, 72.
nesmia, 65.
Nicolasii, 176.
niger, *Rt.*, 122.
——·—— *Jak.*, 182.
——·—— *H. S.*, 119.
——·—— *Stal*, 43.
——·—— *Wlk.*, 51.
nigerrimus, *H. S*, 120.
nigerrimus, Put., 99.
nigrescens, 166.
nigricans, 74.
nigriceps, *Shlb.*, 74.
——·—— *Fal.*, 92.
——·—— *West.*, 49.
nigriceps, Boh., 157.
nigriclavus, 61.
nigricollis, *Rt.*, 59.
——·—— *Garb.*, 128.
nigricornis, *Fb.*, 155.
——·—— *Rt.*, 179.
——·—— *Saun.*, 146.
nigricornis, Hbn., 105,
nigridorsum, 73.
nigriger, 97.
nigripennis, 59.
nigripes, *Fb.*, 169.
——·—— *Rt.*, 117.
——·—— *Dist.*, 43.
nigripes, Fb., 161.
——·—— *Put.*, 155.
——·—— *Mul.*, 158.
nigripilis, 177.
nigrita, *Jak.*, 122.
nigrita, Schk, 143.
nigritarsis, *Leth.*, 98.
nigritarsis, *Jak.*, 167.
——·—— *Cost.*, 120.
nigritulus, *Wlk.*, 59.
——·—— *Zet.*, 175.
nigritulus, Zet., 134.
nigritus, *Fal.*, 94.
nigritus, Fb., 94.
nigrocruciatus, 43.
nigrogularis, 131.
nigronasuta, *Rt.*, 176.
nigronasutus, Stal, 89.
nigronasutus, Rt., 88.
nigrophthalmus, 89.
nigroplagiatus, 43.
nigropunctatus, 146.
nigrovittatus, 73.
nitens, 96.
nitidicollis, 113.
nitidus, 122.
nobilitatus, *Stal*, 89.
nobilitatus, Berg., 97.
nobilellus, 97.
nodosus, 159.
norvegicus, 74.
notaticeps, 125.
notata, Fb., 180.
notatus, *Dist.*, 103.
notatus, Bacr., 38.
Novakii, 100.
Nowickyi, 65.
nubilus, *H. S.*, 126.
——·—— *Say.*, 69.

Oberthurii, 93.
obesulus, 109.
obesus, 120.
obfuscatus, 92.
obtineatus, 90.
obliquus, *Uhl.*, 175.
——·—— *Cost.*, 65.
oblongus, 143.
obscurans, 59.
obscurellus, *Blanc.*, 65.
——·—— *Fal.*, 164.
——·—— *Wlk.*, 109.
obscuriceps, 172.
obscuricornis, 80.
obscurus, *Rt.*, 65, 188.
——·—— *Uhl.*, 172.
obscurus, Ramb., 120.
——·—— *Kb.*, 160, 161.
obsoletum, 179.
obsoletus, *Fb.*, 138.
——·—— *Blan.*, 65.
obsoletus, 137.
obtusus, 89.
obumbratus, 59.
ocellatus, *Sign.*, 109.
——·—— *Rt.*, 114.
ochraceus, *Scot.*, 177.
ochraceus, Fb., 36, 166.
ochripes, 134.
ochrocephalus, 118.
ochroleucus, 152.
ochromelas, 74.
ochromelas, 130.
ochropterus, 158.
ochrotrichus, 138.
ocularis, 177.
oculatus, *Dahl.*, 55.
——·—— *Rt.*, 39.
——·—— *Kb.*, 168.
Oertzenii, 176.
oleosus, 39.
olivaceus, *Fb.*, 99.
——·—— *Rt.*, 172.
olivaceus, Schk., 101.
onustus, 173.
oophorus, 168.
opacus, *Wlk.*, 75.
opacus, Zet, 174.
——·—— *Jak.*, 122.
orientalis, 128.
ornandus, 45.
ornata, *Uhl.*, 109.
——·—— *Dist.*, 46.
ornaticollis, 59.
ornatulus, *Stal*, 97.
——·—— *Jak.*, 154.
ornatus, *Berg.*, 114.
——·—— *Rt.*, 167.
Oschaninii, *Rt.*, 138.
Oschaninii, Fb., 117.
ostentans, 99.
oxycarenoides, 30.

pabulinus, *Lin.*, 89.
pabulinus, Schk., 76.
——·—— *Shlb.*, 88.
——·—— *Rossi*, 74.
——·—— *Scop*, 74, 76.
pachycnemis, 89.
pachymerus, 123.
pacificus, *Stal*, 109.
——·—— *Uhl.*, 105.
paederoides, 114.
pallens, *Rt.*, 148.
pallens, Fab., 158.
pallescens, *Dist.*, 45, 81.
——·—— *Wlk.*, 109.
——·—— *H. S.*, 109.
pallescens, Gmel., 165.
——·—— *Don.*, 35.
palliatus, *Fb.*, 55.
palliatus, Perr., 145.
palliceps, 158.
pallicornis, 117, 128.
pallida, *Berg.*, 60.
——·—— *Rt.*, 180.
pallidicornis, *Rt.*, 65, 128.
pallidicornis, H. S., 117.
pallidipennis, Shlb., 159.

pallidipennis, Rt., 159.
pallidipes, 43.
pallidirostris, 43.
pallidulus, *Wlk.*, 109.
———·— *Dist.*, 45.
— ——— *Blanc.*, 65.
pallidulus, Dahl., 170.
pallidus, *H. S.*, 129.
———·· *Rt.*, 164.
———·· *Ransb.*, 65.
———·· *Horv.*, 56.
pallidus, D. S., 127.
——— *Berg.*, 63.
——— *Thoms*, 127.
——— *Gmel.*, 158.
———– *Mey.*, 159.
——— *Har.*, 35.
pallipes, *Dist.*, 48.
pallipes, Hhn., 158.
———·— *Jak.*, 174.
palmeni, 76.
palmerii, 75.
paludum, 38.
palustris, 138.
pamparum, 148.
panamensis, 60.
pantherina, 145.
Panzerii, 121.
parallelus, 123.
partilus, 55.
partitus, 55, 109.
parva, 60.
parviventre, 50.
parvula, 96.
parvulus, Rt., 65, 92, 139, 143, 168.
——— *Brul.*, 35.
parvus, 44.
passerinii, 122.
pastinacae, Fal., 85.
———· *Hhn.*, 98.
pătellata, 105.
patruelis, 60.
patulus, 110.
Paulinoi, 139.
pauperatus, 88.
Paykullii, *Fal.*, 155.
Paykullii, Turt., 83.
pectoralis, 178.
pellucens, *Pal.*, 80.
pellucens, Boh., 135.
pellucida, 51.
pellucidus, *Fb.*, 89.
———·— *Steph.*, 106.
pellucidus, Garb., 176.
pennicornis, 146.
peregrinus, 110.
perplexus, 113.
Perrisii, 166.
persica, 81.
persicus, 146.
persignanda, 60.
pervariegatus, 171.
petiolatus, 131.
phaleratus, 48.
phoeniceus, 123.
piceae, 164.
piceus, 95.
piceus, Cyr., 73.
piceoniger, 110.
Pictetii, 133.
picticollis, 60.
picticornis, 156.
pictipes, 168.
pictulifer, 110.
picturatus, *Berg.*, 39.
picturatus, Blanc., 59.
pictus, *Fb.*, 172.
——— *Dist.*, 45.
pilicornis, 75.
pilifer, 65.
pilipes, *Rt.*, 96.
pilipes, Thoms., 102.
pilosa, *Rt.*, 39, 116.
pilosulus, 89.
pilosus, *Schk.*, 152.
——— *Boh.*, 102.
pilosus, D. S., 156.
——— *Hhn.*, 121.
pinastri, 92.
pini, *Kb.*, 65.
pini, D. S., 164.
pinicola, 164.
pinetellum, *Zet.*, 159.
pinetellum, Thoms., 157.
pinitellus, 137.
pistacinus, 110.
pityophilus, 164.
plagiatus, *H. S.*, 159.
———·— *Rt.*, 172.
plagigera, 60.
plagosus, 45, 103.
planicornis, *H. S.*, 142.
planicornis, Pall., 141.
——— *Kol.*, 167.
platensis, 43, 60.
plena, 60.
plessaeus, 171.
plumatus, 103.
plumicornis, 146.
podagricus, 51.
poetica, 47.
politus, 50.
pontica, 157.
populi, *Lin.*, 66.
populi, Mey., 67.
——·· *Saund.*, 63.
——·· *Zett.*, 65.
porrectus, 34.
praeclara, 81.
praestans, 52.
prasina, *Fb.*, 180.
prasinus, *Fal.*, 139.
——— *Fb.*, 53, 140.
——— *Rt.*, 89.
——— *Mey.*, 140.
prasinus, Hhn., 137.
——— *D. S.*, 137.
——— *Saund.*, 139
pratensis, *Lin.*, 89.
pratensis, Scop., 88.
princeps, 75.
prolixus, 155.
propinquus, *Rt.*, 139.
propinquus, H. S., 118.
Proserpinae, 110.
prothyris, 156.
Provancherii, 143.
provincialis, 173.
psalliodes, 135.
psammaecolor, 37.
pteridis, 41.
puberulus, 164.
pubescens, 177.
pubicornis, 36.
puella, 66.
pulchellus, *Rt.*, 146.
pulchellus, Guer, 129.
———·— *Hhn.*, 36.
pulcher, *Rt.*, 36.
———·— *Uhl.*, 110.
———·— *Shlb.*, 41.
pulchra, 81.
pudchricorne, 80.
pulicarius, *Fal.*, 174.
pulicarius, Shlb., 175.
pullata, 60.
pulligo, 74.
pullus, 174.
pulverulentus, Burm., 142.
——— *Kol.*, 143.
pumila, 80.
pumilus, 164.
punctata, 147.
punctatipennis, 123.
punctatus, *Fb.*, 173.
punctatus, Zet., 90.
puncticeps, 172.
punctic̣ollis, *Mots.*, 98.
———·— *Fb.*, 118, 164
puncticornis, 144.
punctigera, 123.
punctipenne, 149.
punctipennis, 150.
punctipes, *Rt*, 146, 180.
———·— *Fb.*, 168.
———·— *Muls.*, 110.
———·— *Wlk.*, 66.
punctipes, H. S., 176.
———·— *D. S.*, 151.
punctulata, *Rt.*, 116.
punctulata, Mey, 96.
punctulatus, *Rt.*, 141.

punctulatus, *Fal.*, 96.
———·— *Put.*, 164.
punctum, *Ramb.*, 99.
——— *Rt*, 66.
punctum-album, 110.
punicus, 73.
purgator, 66.
purgatus, 90.
purpurissatus, 43.
pusilla, 142.
pusillum, 80.
pusillus, *Rt.*, 113, 139, 177.
—·—·— *H. S.*, 118.
Putonii, *Rt.*, 123, 144, 147, 168.
—·—·— *Fb.*, 147.
—·——— *Mont.*, 96.
———·— *Horv.*, 75.
Putonii, *Rt.*, 175.
———·— *Mey.*, 84.
pygmaeus, *Berg.*, 135.
———·—·— *Zet.*, 135.
pygmaeus, *Ramb.*, 126.
pyrethri, 146.
pyri, *Mey.*, 167.
—— *Mella*, 102.
pyrrhomelaena, 60.
pyrrhula, 60.

quadriguttatus, *Kb.*, 116.
quadriguttatus, *Goez.*, 71.
quadrilineatus, 155.
quadrilineatus, 36.
quadrimaculatus, *Fal.*, 169.
———·— *Guer.*, 41.
quadrimaculatus, *Schk.*, 130.
quadrinotatus, 60.
quadripunctatus, *Fab.*, 75.
quadripunctatus, *Vill.*, 74.
quadristillatus, 131.
quadrivirgatus, 56.
quadrivittatus, 97.
querceti, 165.
quercicola, 139.
quercus, *Kb.*, 164.
quercus, *Gredl.*, 163.

rapidus, 75.
ravida, 44.
recticornis, *Geof.*, 36.
recticornis, *Gmel.*, 34.
redimitus, 90.
regalis, 101.
regina, 150.
Reiberii, 179.
Reichelii, 75.
Reitterii, 115.
Retowskii, 172.
Reuterii, *Jak.*, 115, 123, 125, 178.
—·—·— *Berg.*, 97.
Reuterii, *Hon.*, 75.
—·—·— *Saun.*, 66.
—·—·— *Oysch.*, 146.
—·—·— *Berg.*, 39.
—·—·— *Stål*, 50.
Reuteriana, 36
Reuteriana, 66.
revestitus, 158.
rhaeticus, 76.
rhamnicola, 90.
rhyparopus, 123.
Rhodani, 168.
ribis, 88.
riparius, 34.
robiniae, 62.
robustus, 51.
Rolandrii, 72.
Romundei, 51.
rosatus, 76.
roscipennis, 180.
roscomaculatus, 76.
Roseri, *H. S.*, 177.
Roseri, *Gredl.*, 163.
roseus, *Fab.*, 163.
——— *Fal.*, 148.
——— *Dist.*, 35.
roseus, *Fab.*, 162.
——— *H. S.*, 163.
——— *Fb.*, 164.
——— *Kb.*, 163.
rossica, 157.
Rotermundii, *Schl.*, 177.
Rotermundii, *Gredl.*, 163.
rubecula, 90.
rubellus, 165.
rubens, 101.
ruber, *Rt.*, 61.
ruber, *Lin.*, 101.
—·— *H. S.*, 161.
rubescens, 81
rubicunda, *Fal*, 93.
———·— *Uhl.*, 36.
rubicundus, *Mey.*, 90.
rubidum, 79.
rubidus, 139.
rubiginosus, 151.
rubrescens, 66.
rubricans, 172.
rubricatus, *Jak.*, 31.
———·—·— *Fal.*, 90.
rubricatus, *Hbn.*, 93.
———·—·— *Fal.*, 166.
———·—·— *Jak.*, 139.
rubricosus, *Dist.*, 45.
rubricosus, *Sarb.*, 54.
rubrinervis, *Stål*, 37.
———·—·— *Rt.*, 70.
———·—·— *H. S.*, 76.
rubripes, 76.
rubroacuminatus, 101.
rubromaculatus, 52.
rubromarginatus, 73.
rubronotatus, *Prov.*, 106.
rubronotatus, *Jak.*, 175.
rubrostriatus, *H. S.*, 54.
———·—·— *Fb.*, 54.
rubrovittata, 60.
rubrovittatus, 49.
rubrovulneratus, 110.
rufescens, *Burm.*, 116.
rufescens, *Smel.*, 101.
——— *Hbn.*, 166.
ruficeps, *Berg.*, 43.
ruficeps, *Rt.*, 80.
ruficollis, *Fab.*, 73.
——— *Fal.*, 175.
ruficornis, *Geof.*, 37.
ruficornis, *Hbn.*, 35.
rufifrons, 157.
rufinasus, 55.
rufinervis, *Rt.*, 90.
——— *Jak.*, 172.
rufipennis, 83.
rufiventris, 158.
rufipes, 99.
rufulus, 66.
rufus, 168.
rufusculus, 31.
rugicollis, *Fal.*, 84.
———·— *Jak.*, 123.
rugicollis, *Luc.*, 122.
———·— *Cost.*, 113.
rugosus, 49.
rutilans, 90.
rutilus, *Dist.*, 103.
——— *H. S.*, 100.

Sahlbergii, *Fal.*, 123.
———·— *Stål*, 156.
salicellus, 165.
saliceticola, 177.
salicicola, 133.
salicis, *Kb.*, 165.
salicis, *Fb.*, 162.
——— *Rt.*, 163.
——— *D. S.*, 166.
saliens, *Rt.*, 169.
saliens, *Wlf.*, 174.
salinus, 148.
Sallei, 91.
salsolae, *Put.*, 66.
salsolae, *Rt.*, 139.
saltator, *Geof.*, 118.
—·—·— *Hbn.*, 123.
saltatorius, 72.
saltitans, 174.
salviae, 76.
samojedorum, 76.
sanguinarius, 101.
sanguineoguttatus, 54.
sanguineus, *Fab.*, 165.
———·— *Jak.*, 53.

sanguiniceps, 131.
sanguinolentus, 91.
sareptanus, *Frey.*, 149.
sareptanus, Jak., 83.
satyriscus, 124.
sauciatus, 76.
Saundersii, Put., 31.
——— *D. S.*, 38.
Saundersii, 179.
saxeus, 98.
saxicola, 116.
Sayii, 103.
scaber, 98.
scabricollis, 128.
scenicus, 39.
Schach, 100.
Schäfferii, 50.
Schillingii, 71.
Schiodtei, 178.
Schmidtii, 76, 124.
Schoberiae, 139.
Scholtzii, 165.
Schönherrii, 49.
scitula, 62.
scitulus, 91.
Scottii, *Rt.*, 139.
——— *Berg.*, 114.
Scottii, Fb., 175.
scriptus, *Fab.*, 82.
——— *Dist.*, 45.
scriptus, Deig., 82.
—·—·— *Kol.*, 83.
—·—·— *Fah.*, 74, 82.
scrupeus, 66.
scutellaris, *Fab.*, 100.
——— *H. S.*, 110.
scutellatus, *Spin.*, 131.
——— *Uhl.*, 91.
scutellatus, Dist., 103.
Sedillotii, 77, 129.
seguisinus, 100.
seladonicus, *Fal.*, 149.
seladonicus, Kb., 156.
selectus, 133.
semiclusus, 110.
semiflavus, Lin., 105.
—·—·—·— *Wlf.*, 95.
semilotus, 91.
semilutens, 43.
seminigra, 60.
semiochraceus, 91.
semiopacus, 77.
semivittata, 61.
separandus, 70.
serena, 96.
seriatus, 173.
sericans, *Stål*, 125.
sericeus, *Fb.*, 35.
—·—·— *Wlk.*, 110.
sericeus, Uhl., 94.
seticornis, 77.
seticornis, 72.
seticulosa, Fb., 32.
setulosus, *H. S.*, 146.
setulosus, Mcy., 146.
sexguttatus, 77.
sexmaculatus, 77.
sexpunctatus, 73.
sexvittatus, 83.
sibiricus, 124.
siculus, 165.
sidnicus, 110.
signatipes, 165.
signatum, *Dist.*, 80.
signatus, *Fb.*, 124.
——— *Shlb.*, 174.
——— *Rt.*, 38.
signatus, Rt., 67.
Signoretii, *Stål*, 110.
—·—·— *Rt.*, 153.
—·—·—·— *Per.*, 66.
simillima, *Jak.*, 176.
simillimus, *Kb.*, 165.
simillimus, D. S., 166.
simplex, *Wlk.*, 110.
—·— *Uhl.*, 151.
simulans, *Wlk.*, 110.
——— *Dist.*, 140.
——— *Horv.*, 120.
——— *Stål*, 106.
simulans, Shlb., 105.
singularis, 168.
sinicus, 110.
sinuaticollis, 113.
smaragdinus, 143.
sobrinus, 106.
sobrius, 110.
solitarius, 156.
solitus, 111.
sordeus, 105.
sordidus, *Fb.*, 125.
——— *Wlk.*, 55.
——— *Rt.*, 133.
—·— *Dist.*, 69.
sordidus, D. S., 151.
——— *Kb.*, 152.
soror, 111.
sororia, 46.
Spartii, 142.
speciosus, 111.
Spegazzinii, 118.
sphaegiformis, 133.
spilotus, 172.
Spinolae, 91.
spissicornis, *Schk.*, 168.
spissicornis, Fab., 141.
splendens, 43.
spoliatus, 61.
spurius, 35.
squalidus, 61.
stachydis, 129.
Stalii, 140.
staphyliniformis, 40.
steganoides, 119.
Steinii, 83.
stellatus, 49.
sticticollis, 91.
sticticus, 91.
stigmosa, 61.
stigmosus, 77.
stillatipennis, 132.
Stoliczkanus, 67, 77.
straminens, 111.
straminicolor, 80.
striata, *Lin.*, 81.
striatus, Geof., 74.
striatellus, 74.
strigipes, 80.
strigulatus, 111.
striicornis, 138.
striola, 139.
stygialis, 124.
stygicus, 120.
stygius, 49.
suavis, 56, 174.
subaeratus, 47.
subannulata, 61.
subirroratus, 111.
subpatellatus, 148.
subvittatus, 67.
succinctus, 76.
sudata, 61.
suffusus, 111.
sulcaticornis, 55.
sulcatus, 55.
sulcicornis, 170.
sulcifrons, *Kb.*, 91.
sulcifrons, D. S., 86.
———·— *Thoms.*, 92.
sulphurella, 148.
sulphureus, 77.
sulphuripennis, 143.
superbus, *Dist.*, 79.
——— *Uhl.*, 77.
superciliosus, 54.
suturalis, *H. S.*, 116.
——— *Jak.*, 77, 82.
suturalis, Rt., 132.
syriaca, *Put.*, 157.
syriacus, *Rt.*, 177.
——
tabescens, 111.
tactus, 91.
taeniotoma, 78.
tagalicus, 111.
taiticus, 111.
tamaricis, *Put.*, 129.
———·— *Per.*, 180.
tanaceti, H. S., 146.
———·— *Schk.*, 146.
—·—— *D. S.*, 151.
———·— *Fal.*, 153.
tarsalis, 38, 170.

taurica, 124.
tegularis, 78.
tenebrosus, 78.
tenellus, *Uhl.*, 91.
——— *Fal.*, 139.
——— *Rt.*, 140.
tenera, 104.
tenuicornis, *Muls.*, 124.
tenuicornis, Rt., 169.
termaculatus, 77.
terminalis, 169.
ternatus, 77.
testaceipes, 91.
testaceus, *Rt.*, 129, 154.
——— *Dist.*, 79.
testaceus, Scop., 35.
testudineus, 105.
tetragrammus, 35.
tetraphlyctis, 77.
tetrastigma, 57, 66.
theivora, 51.
thoracatus, 111.
thoracica, *Dist.*, 61, 104.
——— *Fal.*, 156.
thoracicus, *Dist.*, 103.
——— *Rt.*, 129.
thoracicus, Put., 73.
Thunbergii, 151.
thymi, 115.
tibialis, *Fb.*, 170.
——— *Jak.*, 153.
——— *Hhn.*, 143.
——— *Wlk.*, 61.
——— *Rt.*, 67.
tibialis, Jak., 153.
——— *Fb.*, 170.
——— *Rt.*, 142.
——— *Wlf.*, 77.
ticinensis, 78.
tigripes, 168.
tiliae, 67.
tinctus, 78.
tomentosus, 95.
torquata, *Put.*, 172.
transversalis, 85.
transversum, 148.
transversus, 85.
triangularis, 99.
triannulatus, 78.
tribalis, 91.
tricolor, *Scott.*, 78.
tricolor, Gmel., 130.
——— *Fabr.*, 101.
tricoloratus, 130.
tricondyloides, 117.
tricostatus, 36.
trifasciatus, 101.
trifidus, 86.
trigonalis, 67.
triguttatus, 115.
trilineatus, 113.
tripustulatus, 98.
trisignatus, 147.
tristis, *Wlk.*, 111.
———— *Blanc.*, 111.
——— *Fb.*, 124.
tritaenia, 93.
tritici, 36.
trivialis, 78.
tucumanus, 78.
tumidicornis, 143.
tunicatus, 53.
turanicus, 140.
typicus, 67.
tyrannus, 105.

Uhleri, 38.
ulmi, *Lin.*, 67.
ulmi, Hahn., 68.
ultramontana, 101.
umbellatarum, 90.
umbratilis, Lin., 63.
——— *Fab.*, 114.
undulatus, 67.
unicolor, *Prov.*, 91.
——— *Dist.*, 46, 67, 103.
——— *Scot.*, 180.
unicolor, Hhn., 142.
——— *Thoms*, 143.
unifasciatus, *Fab.*, 95.
——— *Rt.*, 115.
univittata, 61.
uruguayensis, 61, 91.
ustulatus, *Wlk.*, 111.
——— *H. S.*, 67.

valesianus, 83.
validicorne, 79.
validicornis, 168.
vandalicus, 78.
variabilis, *Fal.*, 166.
——— *Dist.*, 46.
variabilis, Hhn., 161.
varians, *H. S.*, 166.
——— *Dist.*, 81.
varians, Mey., 163, 164.
varicornis, 68.
variegatus, *Dist.*, 103.
——— *Cost.*, 114.
Montr., 119.
variegatus, Geof., 101.
——— *Mül*, 75.
——— *Rt.*, 71.
varipes, 68.
varius, 88.
venaticus, 95.
ventralis, 78.
venustissimus, 115.
venustus, *Stål*, 43.
——— *Fb.*, 78, 148.
verbasci, 176.
versicolor, 50.
vestitus, 43.
v-flavum, 34.
vicarius, 111.
vicinus, *Prov.*, 35.
——— *Blanc.*, 111.
——— *Horv.*, 78.
viduata, 46.
vilis, 68.
villosa, *Dist.*, 48, 104.
——— *Rt.*, 56.
villosus, *Dist.*, 46.
vinaceus, *Dist.*, 92.
——— *Whit.*, 166, 168.
virens, *Lin.*, 35.
——— *Fal.*, 140.
virens, Hhn., 35.
——— *Ros.*, 36.
virescens, D. S., 136.
——— *Fb.*, 33, 35.
——— *Fal.*, 35.
virgatus, 56.
virgula, 129.
viridanus, 111.
viridescens, Geof., 92.
——— *Gmel.*, 171.
viridicans, 92.
viridiflavus, 146.
viridinervis, *Kb.*, 140.
viridinervis, D. S., 139.
——— *Thom.*, 137.
viridipennis, 137.
viridipunctatus, 112.
viridis, *Fal.*, 92.
——— *D. S.*, 38.
——— *Prov.*, 35.
viridis, Flor, 86.
viridiusculus, 36.
viridula, Jak., 176.
viridulus, Panz., 90.
——— *Fal.*, 171.
viror, 149.
visci, 177.
viscicola, 92.
vitellinus, *Schl.*, 166.
——— *Rt.*, 153.
vitreus, *Stål*, 92.
——— *Dist.*, 44.
vitripennis, *Stål*, 106.
——— *Say.*, 129.
vittatus, *Fb.*, 174.
vittatus, Gmel., 131.
——— *Fb.*, 177.
——— *Horv.*, 55.
——— *Dahlb.*, 30.
vitticeps, *Rt.*, 61.
——— *Rt.*, 147.
vitticollis, 92, 126.
vittifrons, 61.
vittigera, 149.
vittipennis, 124.
vittiscutis, 92.

vittiventris, 55.
viridus, 67.
volgensis, 112.
vulneratus, 95.

Wallengrenii, 92.
Walshii, 113.
Waltlii, 112.
Westwoodii, 49.
Whitei, *Wol.*, 112.
whitei, *D. S.*, 166.
Wilkinsonii, 174.
Wollastonii, 166.

xanthomelas, 58.
xanthophilus, 61.

Yersinii, 125.

Zellerii, 73.
Zetterstedtii, 60.
zizyphi, 176.

Note. The following additions and corrections should be made in the 'Catalogue of the *Cicindelidæ*':—

p. 4. analis, Fabr., add to references, MacLeay, Annul. Javan., p. 11.
p. 5. bramani, Dokhtouroff, locality, India.
p. 8. omit flammulata, Quedenfeldt: it is an African species.
„ funerea, MacLeay, read in reference, Annul. Javan., 1825, p. 12.'
„ add, formosana, Bates, Proc. Zool. S. Lond., 1866, p. 341. Formosa.
p. 9. add, lobipennis, Bates, *l. c.*, 1888, p. 380. Kiukiang on Yangtse.
p. 11. quadrilineata, Fabr., add 'MacLeay, Annul. Javan., 1825, p. 11.'
„ omit 'scrobiculata, Wied.,' see *Dromicidia*, p. 14.
p. 12. line 18 from top, *for* 't. 2,' *read* 't. 1.'
add :—

Genus **EURYTARSA**.

Dokhtouroff, Rev. d' Ent., i, 1882, p. 113, 276.
bigranifera, Dokhtouroff, *l. c.*, p. 114.
Hab. Philippines, Mindoro.
p. 17. Mellyi, Chaudoir, add 'xxxiv (4), 1861, p. 359.'
p. 18. add, collyris aureofusca, Bates, Proc. Zool. S. Lond., 1889, p. 216.
Hab. Ichang, Yangtse Valley.

TABLES

OF

METRIC WEIGHTS AND MEASURES

PREPARED FOR THE USE OF

THE PHOTOGRAPHIC AND LITHOGRAPHIC OFFICES, SURVEY OF INDIA,

BY

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SURVEY OF INDIA.

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TABLES

OF

METRIC WEIGHTS AND MEASURES

PREPARED FOR THE USE OF

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Metric Tables.

The metric system of weights and measures having been adopted in the Photographic Office for convenience in keeping the store accounts, the following tables for the conversion of these measures to British and *vice versâ* will be found useful.

They have been based on the relative equivalents of the metric and British systems given in Schedule III of the Weights and Measures Act of 1878, and have been compiled from De la Rue's Tables and other sources.

As the metric system is now ordinarily used in scientific publications, the scope of the tables has been extended so as to meet, as far as possible, the ordinary requirements of general and scientific reference.

Use of the Tables.

The number required to be converted, whether British or metric, may either be multiplied directly by the decimal fraction representing the equivalent value of one unit of the required denomination, as found in the tables of equivalents or multipliers, according to the accuracy required; or, it may be broken up into a series of constituent parts in thousands, hundreds, tens, units and fractions, and the equivalents of the several amounts, as found from the tables of multipliers, added together. In the latter case care must be taken to change the position of the decimal point as required for multiples or fractions of the unit.

This will be best illustrated by examples.

Supposing it be desired to find the equivalent of 645·15 litres in pints.

By the first method 645·15 is multiplied by the equivalent of 1 litre in pints = 1·76077, giving a product of 1135·961.

By the second method the total number of litres may be broken up as follows :—

600·00 litres	=	1056·462 pints.
40·00 „	=	70·431 „
5·00 „	=	8·804 „
0·10 „	=	0·176 „
0·05 „	=	0·088 „
645·15		1135·961

Adding together the equivalents of the constituent parts in pints the same total is obtained.

Conversely :—Supposing it be desired to find the equivalent of 3 cwt. 25lb 14½ ounces in kilogrammes, the whole sum may be reduced to ounces and multiplied by ·02835, the equivalent of 1 ounce in kilogrammes, thus :—

5790·5oz × ·02835 = 164·161 kilos.

But in this case the result will be more accurately and simply obtained by finding the metric equivalents of the separate items of British measure from the tables, and adding them together, thus :—

3 cwt.	=	152·407 kilos.
20 lb	=	9·072 „
5 lb	=	2·268 „
10 oz.	=	0·283 „
4 oz.	=	0·113 „
0·5 oz.	=	0·014 „
TOTAL		164·157 „

In some cases the first method will be the simplest and in others the second. The tables of multipliers show only 3 places of decimals, and therefore, if greater accuracy be required, especially in the first method, a longer fraction of at least 5 places of decimals should be taken from the tables of equivalents.

NOTE.—The value of the metre given in the Table 1 = 39·37079 inches, *in vacuo*, at Sea-level, was determined by Captain Kater in 1818, the temperature of the standard yard being 62° F. and of the metre 32° F. It has since then been recognised as the authoritative legal equivalent of the metre in British measure and still remains so.

In the course of his comparison of the standards of length of various countries, made at the Ordnance Survey Office, Southampton, in 1865, Captain A. R. Clarke, R.E., determined the true length of the legal equivalent of the metre under the above conditions of temperature to be 1·09362311 yards = 3·28083933 feet = 39·37043196 inches (see "Comparison of the Standards of Length," p. 280).

By this valuation the corresponding equivalents of British Measures of Length in Metric Measures are —

1 inch	=	2·5399772 centimetres.
1 foot	=	30·4797264 „
1 yard	=	91·4391792 „
1 mile	=	1·6093196 kilometr

(as given in the Survey of India '*Auxiliary Tables*').

Captain Clarke further determined the correct British equivalent of the *Scientific* metre or the length of the ideal theoretical metre, being the 10-millionth part of the quadrant of the Meridian passing through Paris, to be 39·377786 inches, or, reduced to the same standard of temperature as the legal metre, 39·376229 inches.

As stated above, in fixing the equivalent of the legal metre, the lengths of the standards were compared at their normal temperature, *viz.*, 32° for the metre and 62° F. for the standard yard. The Standards Commissioners recommended in 1871 that, for *commercial* purposes, it was desirable that the comparison of the two standards should be made at the same ordinary temperature of the air at 62° F. According to this valuation the length of a brass metre would be 39·380203 inches.

Table II is based on the determination by Prof. W. H. Miller, in 1844, of the weight of the French *Kilogramme des Archives, in vacuo*, to be equal to 15432·34874 imperial grains, or 2·20462125 standard platinum pounds (avoirdupois).

The Troy pound has now almost become obsolete. Under the Weights and Measures Act of 1878, avoirdupois weight is to be used exclusively for all articles sold by weight, except for bullion and precious stones, which may be sold by the Troy ounce or by decimal parts of it, and for drugs which may be sold by retail by apothecaries' weight. In the latest editions of the British Pharmacopœia the only weights used are the grain, avoirdupois ounce (437·5 grains) and pound (7000 grains). Photographic and chemical formulæ are commonly prepared according to Apothecaries or Troy grains, drachms and ounces, but the use of Avoirdupois and Metric Weights for this purpose is fast extending.

The tables have been carefully revised in the Trigonometrical Branch office by Mr. W. H. Cole, M.A., Deputy Superintendent of Survey.

Metric to

The fundamental unit of Metric Length and Weight is the METRE, *assumed to be the 10-millionth part of the standard metre at its normal temperature of 32° F. is 39·37079*

		Inches.	Feet.	Yards.
Millimetre	= $\frac{1}{1000}$ metre	= 0·03937	0·00328	0·00109
Centimetre	= $\frac{1}{100}$ "	= 0·39371	0·03281	0·01094
Decimetre	= $\frac{1}{10}$ "	= 3·93708	0·32809	0·10936
METRE	= unit	= 39·37079	3·28090	1·09363
Decametre	= 10 metres	= 393·70790	32·80899	10·93633
Hectometre	= 100 "	= 3,937·07900	328·08992	109·36331
Kilometre	= 1,000 "	= 39,370·79000	3,280·89917	1,093·63306
Myriametre	= 10,000 "	= 393,707·90000	32,808·99167	10,936·33056

One *Micron* (μ.)(*micra*), = one thousandth of a millimetre = ·001 millimetre = ·000039 inch.

MULTI

	Metres.	Millimetres to Inches.	Feet.	Metres.	Centimetres to Inches.	Feet.
1	0·001	0·03937	0·00328	0·01	0·3937	0·0328
2	0·002	0·07874	0·00656	0·02	0·7874	0·0656
3	0·003	0·11811	0·00984	0·03	1·1811	0·0984
4	0·004	0·15748	0·01312	0·04	1·5748	0·1312
5	0·005	0·19685	0·01640	0·05	1·9685	0·1640
6	0·006	0·23622	0·01969	0·06	2·3622	0·1969
7	0·007	0·27560	0·02297	0·07	2·7560	0·2297
8	0·008	0·31497	0·02625	0·08	3·1497	0·2625
9	0·009	0·35434	0·02953	0·09	3·5434	0·2953
10	0·010	0·39371	0·03281	0·10	3·9371	0·3281

British to

			Millimetres.	Centimetres.
		1 inch	= 25·39954	2·53995
12	Inches	= 1 foot	= 304·79449	30·47945
3	feet	= 1 yard	= 914·38348	91·43835
2	yards	= 1 fathom	= 1,828·76696	182·87670
5½	"	= 1 pole or perch	= 5,029·10914	502·91091
40	poles	= 1 furlong	= 201,164·36576	20,116·43658
8	furlongs	= 1 mile	= 1,609,314·92612	160,931·49261

1 chain = 20·11644 Metres. 1 Geographical mile = 1·1527 Statute miles = 1,855·053 metres. 1 degree = 1 mil = $\frac{1}{1000}$ inch = ·0254 m.m.

MULTI

	Millimetres.	Inches to Centimetres.	Decimetres.	Centimetres.	Feet to Decimetres.	Metres.
1	25·3995	2·54	0·254	30·479	3·048	0·305
2	50·7991	5·08	0·608	60·957	6·096	0·610
3	76·1986	7·62	0·762	91·438	9·144	0·914
4	101·5982	10·16	1·016	121·918	12·192	1·219
5	126·9977	12·70	1·270	152·397	15·240	1·524
6	152·3972	15·24	1·524	182·876	18·288	1·829
7	177·7968	17·78	1·778	213·356	21·336	2·134
8	203·1963	20·32	2·032	243·835	24·384	2·438
9	228·5959	22·86	2·286	274·315	27·432	2·743
10	253·9954	25·40	2·540	304·794	30·479	3·048

1 inch = 25,399·54 micra. $\frac{1}{100}$ inch = 253·995 micra.

Fractions of an Inch to Millimetres.

$\frac{1}{2}$	= 12·6998	$\frac{1}{8}$	= 3·1750	$\frac{1}{32}$	= 0·7937	$\frac{1}{64}$	= 0·3969
$\frac{3}{4}$	= 8·4665	$\frac{3}{16}$	= 4·7625	$\frac{3}{32}$	= 2·3812	$\frac{3}{64}$	= 1·1906
$\frac{5}{8}$	= 15·9330	$\frac{5}{16}$	= 7·9375	$\frac{5}{32}$	= 3·9687	$\frac{5}{64}$	= 1·9843
$\frac{7}{8}$	= 6·3499	$\frac{7}{16}$	= 11·1125	$\frac{7}{32}$	= 5·5562	$\frac{7}{64}$	= 2·7781
$\frac{1}{16}$	= 19·0497	$\frac{9}{16}$	= 14·2874	$\frac{9}{32}$	= 7·1437	$\frac{9}{64}$	= 3·5718
		$\frac{1}{4}$	= 6·3499	$\frac{1}{16}$	= 1·5875	$\frac{1}{32}$	= 0·7937
		$\frac{3}{8}$	= 9·5249	$\frac{3}{16}$	= 4·7625	$\frac{3}{32}$	= 2·3812
		$\frac{5}{8}$	= 12·6998	$\frac{5}{16}$	= 7·9375	$\frac{5}{32}$	= 3·9687
		$\frac{7}{8}$	= 15·8748	$\frac{7}{16}$	= 11·1125	$\frac{7}{32}$	= 5·5562
		$\frac{1}{2}$	= 12·6998	$\frac{1}{8}$	= 3·1750	$\frac{1}{16}$	= 1·5875
		$\frac{5}{8}$	= 15·8748	$\frac{5}{16}$	= 7·9375	$\frac{5}{32}$	= 3·9687
		$\frac{3}{4}$	= 19·0497	$\frac{3}{8}$	= 9·5249	$\frac{3}{16}$	= 4·7625
		$\frac{7}{8}$	= 22·2247	$\frac{7}{16}$	= 11·1125	$\frac{7}{32}$	= 5·5562
		$\frac{1}{2}$	= 25·3997	$\frac{1}{8}$	= 6·3499	$\frac{1}{16}$	= 3·1750
		$\frac{5}{8}$	= 28·5747	$\frac{5}{16}$	= 7·9375	$\frac{5}{32}$	= 3·9687
		$\frac{3}{4}$	= 31·7496	$\frac{3}{8}$	= 9·5249	$\frac{3}{16}$	= 4·7625
		$\frac{7}{8}$	= 34·9246	$\frac{7}{16}$	= 11·1125	$\frac{7}{32}$	= 5·5562
		$\frac{1}{2}$	= 38·0996	$\frac{1}{8}$	= 12·6998	$\frac{1}{16}$	= 6·3499
		$\frac{5}{8}$	= 41·2745	$\frac{5}{16}$	= 15·8748	$\frac{5}{32}$	= 7·9375
		$\frac{3}{4}$	= 44·4495	$\frac{3}{8}$	= 19·0497	$\frac{3}{16}$	= 9·5249
		$\frac{7}{8}$	= 47·6244	$\frac{7}{16}$	= 22·2247	$\frac{7}{32}$	= 11·1125
		$\frac{1}{2}$	= 50·7994	$\frac{1}{8}$	= 25·3997	$\frac{1}{16}$	= 12·6998
		$\frac{5}{8}$	= 53·9743	$\frac{5}{16}$	= 28·5747	$\frac{5}{32}$	= 14·2874
		$\frac{3}{4}$	= 57·1493	$\frac{3}{8}$	= 31·7496	$\frac{3}{16}$	= 15·8748
		$\frac{7}{8}$	= 60·3242	$\frac{7}{16}$	= 34·9246	$\frac{7}{32}$	= 17·4623
		$\frac{1}{2}$	= 63·4992	$\frac{1}{8}$	= 38·0996	$\frac{1}{16}$	= 19·0497
		$\frac{5}{8}$	= 66·6741	$\frac{5}{16}$	= 41·2745	$\frac{5}{32}$	= 20·6372
		$\frac{3}{4}$	= 69·8491	$\frac{3}{8}$	= 44·4495	$\frac{3}{16}$	= 22·2247
		$\frac{7}{8}$	= 73·0240	$\frac{7}{16}$	= 47·6244	$\frac{7}{32}$	= 23·8122
		$\frac{1}{2}$	= 76·1990	$\frac{1}{8}$	= 50·7994	$\frac{1}{16}$	= 25·3997
		$\frac{5}{8}$	= 79·3739	$\frac{5}{16}$	= 53·9743	$\frac{5}{32}$	= 26·9872
		$\frac{3}{4}$	= 82·5489	$\frac{3}{8}$	= 57·1493	$\frac{3}{16}$	= 28·5747
		$\frac{7}{8}$	= 85·7238	$\frac{7}{16}$	= 60·3242	$\frac{7}{32}$	= 30·1621
		$\frac{1}{2}$	= 88·8988	$\frac{1}{8}$	= 63·4992	$\frac{1}{16}$	= 31·7496
		$\frac{5}{8}$	= 92·0737	$\frac{5}{16}$	= 66·6741	$\frac{5}{32}$	= 33·3371
		$\frac{3}{4}$	= 95·2487	$\frac{3}{8}$	= 69·8491	$\frac{3}{16}$	= 34·9246
		$\frac{7}{8}$	= 98·4236	$\frac{7}{16}$	= 73·0240	$\frac{7}{32}$	= 36·5121
		$\frac{1}{2}$	= 101·5986	$\frac{1}{8}$	= 76·1990	$\frac{1}{16}$	= 38·0996
		$\frac{5}{8}$	= 104·7735	$\frac{5}{16}$	= 79·3739	$\frac{5}{32}$	= 39·6870
		$\frac{3}{4}$	= 107·9485	$\frac{3}{8}$	= 82·5489	$\frac{3}{16}$	= 41·2745
		$\frac{7}{8}$	= 111·1234	$\frac{7}{16}$	= 85·7238	$\frac{7}{32}$	= 42·8620
		$\frac{1}{2}$	= 114·2984	$\frac{1}{8}$	= 88·8988	$\frac{1}{16}$	= 44·4495
		$\frac{5}{8}$	= 117·4733	$\frac{5}{16}$	= 92·0737	$\frac{5}{32}$	= 46·0370
		$\frac{3}{4}$	= 120·6483	$\frac{3}{8}$	= 95·2487	$\frac{3}{16}$	= 47·6244
		$\frac{7}{8}$	= 123·8232	$\frac{7}{16}$	= 98·4236	$\frac{7}{32}$	= 49·2119
		$\frac{1}{2}$	= 126·9982	$\frac{1}{8}$	= 101·5986	$\frac{1}{16}$	= 50·7994
		$\frac{5}{8}$	= 130·1731	$\frac{5}{16}$	= 104·7735	$\frac{5}{32}$	= 52·3869
		$\frac{3}{4}$	= 133·3481	$\frac{3}{8}$	= 107·9485	$\frac{3}{16}$	= 53·9743
		$\frac{7}{8}$	= 136·5230	$\frac{7}{16}$	= 111·1234	$\frac{7}{32}$	= 55·5618
		$\frac{1}{2}$	= 139·6980	$\frac{1}{8}$	= 114·2984	$\frac{1}{16}$	= 57·1493
		$\frac{5}{8}$	= 142·8729	$\frac{5}{16}$	= 117·4733	$\frac{5}{32}$	= 58·7368
		$\frac{3}{4}$	= 146·0479	$\frac{3}{8}$	= 120·6483	$\frac{3}{16}$	= 60·3242
		$\frac{7}{8}$	= 149·2228	$\frac{7}{16}$	= 123·8232	$\frac{7}{32}$	= 61·9117
		$\frac{1}{2}$	= 152·3978	$\frac{1}{8}$	= 126·9982	$\frac{1}{16}$	= 63·4992
		$\frac{5}{8}$	= 155·5727	$\frac{5}{16}$	= 130·1731	$\frac{5}{32}$	= 65·0867
		$\frac{3}{4}$	= 158·7477	$\frac{3}{8}$	= 133·3481	$\frac{3}{16}$	= 66·6741
		$\frac{7}{8}$	= 161·9226	$\frac{7}{16}$	= 136·5230	$\frac{7}{32}$	= 68·2616
		$\frac{1}{2}$	= 165·0976	$\frac{1}{8}$	= 139·6980	$\frac{1}{16}$	= 69·8491
		$\frac{5}{8}$	= 168·2725	$\frac{5}{16}$	= 142·8729	$\frac{5}{32}$	= 71·4366
		$\frac{3}{4}$	= 171·4475	$\frac{3}{8}$	= 146·0479	$\frac{3}{16}$	= 73·0240
		$\frac{7}{8}$	= 174·6224	$\frac{7}{16}$	= 149·2228	$\frac{7}{32}$	= 74·6115
		$\frac{1}{2}$	= 177·7974	$\frac{1}{8}$	= 152·3978	$\frac{1}{16}$	= 76·1990
		$\frac{5}{8}$	= 180·9723	$\frac{5}{16}$	= 155·5727	$\frac{5}{32}$	= 77·7865
		$\frac{3}{4}$	= 184·1473	$\frac{3}{8}$	= 158·7477	$\frac{3}{16}$	= 79·3739
		$\frac{7}{8}$	= 187·3222	$\frac{7}{16}$	= 161·9226	$\frac{7}{32}$	= 80·9614
		$\frac{1}{2}$	= 190·4972	$\frac{1}{8}$	= 165·0976	$\frac{1}{16}$	= 82·5489
		$\frac{5}{8}$	= 193·6721	$\frac{5}{16}$	= 168·2725	$\frac{5}{32}$	= 84·1364
		$\frac{3}{4}$	= 196·8471	$\frac{3}{8}$	= 171·4475	$\frac{3}{16}$	= 85·7238
		$\frac{7}{8}$	= 200·0220	$\frac{7}{16}$	= 174·6224	$\frac{7}{32}$	= 87·3113
		$\frac{1}{2}$	= 203·1970	$\frac{1}{8}$	= 177·7974	$\frac{1}{16}$	= 88·8988
		$\frac{5}{8}$	= 206·3719	$\frac{5}{16}$	= 180·9723	$\frac{5}{32}$	= 90·4863
		$\frac{3}{4}$	= 209·5469	$\frac{3}{8}$	= 184·1473	$\frac{3}{16}$	= 92·0737
		$\frac{7}{8}$	= 212·7218	$\frac{7}{16}$	= 187·3222	$\frac{7}{32}$	= 93·6612
		$\frac{1}{2}$	= 215·8968	$\frac{1}{8}$	= 190·4972	$\frac{1}{16}$	= 95·2487
		$\frac{5}{8}$	= 219·0717	$\frac{5}{16}$	= 193·6721	$\frac{5}{32}$	= 96·8362
		$\frac{3}{4}$	= 222·2467	$\frac{3}{8}$	= 196·8471	$\frac{3}{16}$	= 98·4236
		$\frac{7}{8}$	= 225·4216	$\frac{7}{16}$	= 200·0220	$\frac{7}{32}$	= 100·0111
		$\frac{1}{2}$	= 228·5966	$\frac{1}{8}$	= 203·1970	$\frac{1}{16}$	= 101·5986
		$\frac{5}{8}$	= 231·7715	$\frac{5}{16}$	= 206·3719	$\frac{5}{32}$	= 103·1861
		$\frac{3}{4}$	= 234·9465	$\frac{3}{8}$	= 209·5469	$\frac{3}{16}$	= 104·7735
		$\frac{7}{8}$	= 238·1214	$\frac{7}{16}$	= 212·7218	$\frac{7}{32}$	= 106·3610
		$\frac{1}{2}$	= 241·2964	$\frac{1}{8}$	= 215·8968	$\frac{1}{16}$	= 107·9485
		$\frac{5}{8}$	= 244·4713	$\frac{5}{16}$	= 219·0717	$\frac{5}{32}$	= 109·5360
		$\frac{3}{4}$	= 247·6463	$\frac{3}{8}$	= 222·2467	$\frac{3}{16}$	= 111·1234
		$\frac{7}{8}$	= 250·8212	$\frac{7}{16}$	= 225·4216	$\frac{7}{32}$	= 112·7109
		$\frac{1}{2}$	= 253·9962	$\frac{1}{8}$	= 228·5966	$\frac{1}{16}$	= 114·2984
		$\frac{5}{8}$	= 257·1711	$\frac{5}{16}$	= 231·7715	$\frac{5}{32}$	= 115·8859
		$\frac{3}{4}$	= 260·3461	$\frac{3}{8}$	= 234·9465	$\frac{3}{16}$	= 117·4733
		$\frac{7}{8}$	= 263·5210	$\frac{7}{16}$	= 238·1214	$\frac{7}{32}$	= 119·0608
		$\frac{1}{2}$	= 266·6960	$\frac{1}{8}$	= 241·2964	$\frac{1}{16}$	= 120·6483
		$\frac{5}{8}$	= 269·8709	$\frac{5}{16}$	= 244·4713	$\frac{5}{32}$	= 122·2358
		$\frac{3}{4}$	= 273·0459	$\frac{3}{8}$	= 247·6463	$\frac{3}{16}$	= 123·8232
		$\frac{7}{8}$	= 276·2208	$\frac{7}{16}$	= 250·8212	$\frac{7}{32}$	= 125·4107
		$\frac{1}{2}$	= 279·3958	$\frac{1}{8}$	= 253·9962	$\frac{1}{16}$	= 126·9982
		$\frac{5}{8}$	= 282·5707	$\frac{5}{16}$	= 257·1711	$\frac{5}{32}$	= 128·5857
		$\frac{3}{4}$	= 285·7457	$\frac{3}{8}$	= 260·3461	$\frac{3}{16}$	= 130·1731
		$\frac{7}{8}$	= 288·9206	$\frac{7}{16}$	= 263·5210	$\frac{7}{32}$	= 131·7606
		$\frac{1}{2}$	= 292·0956	$\frac{1}{8}$	= 266·6960	$\frac{1}{16}$	= 133·3481
		$\frac{5}{8}$	= 295·2705	$\frac{5}{16}$	= 269·8709	$\frac{5}{32}$	= 134·9356
		$\frac{3}{4}$	= 298·4455	$\frac{3}{8}$	= 273·0459	$\frac{3}{16}$	= 136·5230
		$\frac{7}{8}$	= 301·6204	$\frac{7}{16}$	= 276·2208	$\frac{7}{32}$	= 138·1105
		$\frac{1}{2}$	= 304·7954	$\frac{1}{8}$	= 279·3958	$\frac{1}{16}$	= 139·6980
		$\frac{5}{8}$	= 307·9703	$\frac{5}{16}$	= 282·5707	$\frac{5}{32}$	= 141·2855
		$\frac{3}{4}$	= 311·1453	$\frac{3}{8}$	= 285·7457	$\frac{3}{16}$	= 142·8729
		$\frac{7}{8}$	= 314·3202	$\frac{7}{16}$	= 288·9206	$\frac{7}{32}$	= 144·4604
		$\frac{1}{2}$	= 317·4952	$\frac{1}{8}$	= 292·0956	$\frac{1}{16}$	= 146·0479
		$\frac{5}{8}$	= 320·6701	$\frac{5}{16}$	= 295·2705	$\frac{5}{32}$	= 147·6354
		$\frac{3}{4}$	= 323·8451	$\frac{3}{8}$	= 298·4455	$\frac{3}{16}$	= 149·2228
		$\frac{7}{8}$	= 327·0200	$\frac{7}{16}$	= 301·6204	$\frac{7}{32}$	= 150·8103
		$\frac{1}{2}$	= 330·1950	$\frac{1}{8}$	= 304·7954	$\frac{1}{16}$	= 152·3978
		$\frac{5}{8}$	= 333·3699	$\frac{5}{16}$	= 307·9703	$\frac{5}{32}$	= 153·9853
		$\frac{3}{4}$	= 336·5449	$\frac{3}{8}$	= 311·1453	$\frac{3}{16}$	= 155·5727
		$\frac{7}{8}$	= 339·7198	$\frac{7}{16}$	= 314·3202	$\frac{7}{32}$	= 157·1602
		$\frac{1}{2}$	= 342·8948	$\frac{1}{8}$	= 317·4952	$\frac{1}{16}$	= 158·7477
		$\frac{5}{8}$	= 346·0697	$\frac{5}{16}$	= 320·6701	$\frac{5}{32}$	= 160·3352
		$\frac{3}{4}$	= 349·2447	$\frac{3}{8}$	= 323·8451	$\frac{3}{16}$	= 161·9226
		$\frac{7}{8}$	= 352·4196	$\frac{7}{16}$	= 327·0200	$\frac{7}{32}$	= 163·5101
		$\frac{1}{2}$	= 355·5946	$\frac{1}{8}$	= 330·1950	$\frac{1}{16}$	= 165·0976
		$\frac{5}{8}$	= 358·7695	$\frac{5}{16}$	= 333·3699	$\frac{5}{32}$	= 166·6851
		$\frac{3}{4}$	= 361·9445	$\frac{3}{8}$	= 336·5449	$\frac{3}{16}$	= 168·2725
		$\frac{7}{8}$	= 365·1194	$\frac{7}{16}$	= 339·7198	$\frac{7}{32}$	= 169·8600
		$\frac{1}{2}$	= 368·2944	$\frac{1}{8}$	= 342·8948	$\frac{1}{16}$	= 171·4475
		$\frac{5}{8}$	= 371·4693	$\frac{5}{16}$	= 346·0697	$\frac{5}{32}$	= 173·0350
		$\frac{3}{4}$	= 374·6443	$\frac{3}{8}$	= 349·2447	$\frac{3}{16}$	= 174·6224
		$\frac{7}{8}$	= 377·8192	$\frac{7}{16}$	= 352·4196	$\frac{7}{32}$	= 176·2099
		$\frac{1}{2}$	= 380·9942	$\frac{1}{8}$	= 355·5946	$\frac{1}{16}$	= 177·7974
		$\frac{5}{8}$	= 384·1691	$\frac{5}{16}$	= 358·7695	$\frac{5}{32}$	= 179·3849
		$\frac{3}{4}$	= 387·3441	$\frac{3}{8}$	= 361·9445	$\frac{3}{16}$	= 180·9723
		$\frac{7}{8}$	= 390·5190	$\frac{7}{16}$	= 365·1194	$\frac{7}{32}$	= 182·5598
		$\frac{1}{2}$	= 393·6940	$\frac{1}{8}$	= 368·2944	$\frac{1}{16}$	= 184·1473
		$\frac{5}{8}$	= 396·8689	$\frac{5}{16}$	= 371·4693	$\frac{5}{32}$	= 185·7348
		$\frac{3}{4}$	= 400·0439	$\frac{3}{8}$	= 374·6443	$\frac{3}{16}$	= 187·3222
		$\frac{7}{8}$	= 403·2188	$\frac{7}{16}$	= 377·8192	$\frac{7}{32}$	= 188·9097
		$\frac{1}{2}$	= 406·3938	$\frac{1}{8}$	= 380·9942	$\frac{1}{16}$	= 190·4972
		$\frac{5}{8}$	= 409·5687	$\frac{5}{16}$	= 384·1691	$\frac{5}{32}$	= 192·0847
		$\frac{3}{4}$	= 412·7437	$\frac{3}{8}$	= 387·3441	$\frac{3}{16}$	= 193·6721
		$\frac{7}{8}$	= 415·9186	$\frac{7}{16}$	= 390·5190	$\frac{7}{32}$	= 195·2596
		$\frac{1}{2}$	= 419·0936	$\frac{1}{8}$	= 393·6940	$\frac{1}{16}$	= 196·8471
		$\frac{5}{8}$	= 422·2685	$\frac{5}{16}$	= 396·8689	$\frac{5}{32}$	= 198·4346
		$\frac{3}{4}$	= 425·4435	$\frac{3}{8}$	= 400·0439	$\frac{3}{16}$	= 200·0220
		$\frac{7}{8}$	= 428·6184	$\frac{7}{16}$	= 403·2188	$\frac{7}{32}$	= 201·6095
		$\frac{1}{2}$	= 431·7934	$\frac{1}{8}$	= 406·3938	$\frac{1}{16}$	= 203·1970
		$\frac{5}{8}$	= 434·9683	$\frac{5}{16}$	= 409·5687	$\frac{5}{32}$	= 204·7845
		$\frac{3}{4}$	= 438·1433	$\frac{3}{8}$	= 412·7437	$\frac{3}{16}$	= 206·3719
		$\frac{7}{8}$	= 441·3182	$\frac{7}{16}$	= 415·9186	$\frac{7}{32}$	= 207·9594
		$\frac{1}{2}$	= 444·4932	$\frac{1}{8}$	= 419·0936	$\frac{1}{16}$	= 209·5469
		$\frac{5}{8}$	= 447·6681	$\frac{5}{16}$	= 422·2685	$\frac{5}{32}$	= 211·1344
		$\frac{3}{4}$	= 450·8431	$\frac{3}{8}$	= 425·4435	$\frac{3}{16}$	= 212·7218
		$\frac{7}{8}$	= 454·0180	$\frac{7}{16}$	= 428·6184	$\frac{7}{32}$	= 214·3093
		$\frac{1}{2}$	= 457·1930	$\frac{1}{8}$	= 431·7934	$\frac{1}{16}$	= 215·8968
		$\frac{5}{8}$	= 460·3679	$\frac{5}{16}$	= 434·9683	$\frac{5}{32}$	= 217·4843
		$\frac{3}{4}$	= 463·5429	$\frac{3}{8}$	= 438·1433	$\frac{3}{16}$	= 219·0717
		$\frac{7}{8}$	= 466·7178	$\frac{7}{16}$	= 441·3182	$\frac{7}{32}$	= 220·6592
		$\frac{1}{2}$	= 469·8928	$\frac{1}{8}$	= 444·4932	$\frac{1}{16}$	= 222·2467
		$\frac{5}{8}$	= 473·0677	$\frac{5}{16}$	= 447·6681	$\frac{5}{32}$	= 223·8342
		$\frac{3}{4}$	= 476·2427	$\frac{3}{8}$	= 450·8431	$\frac{3}{16}$	= 225·4216
		$\frac{7}{8}$	= 479·4176	$\frac{7}{16}$	= 454·0180	$\frac{7}{32}$	= 227·0091
		$\frac{1}{2}$	= 482·5926	$\frac{1}{8}$	= 457·1930	$\frac{1}{16}$	= 228·5966
		$\frac{5}{8}$	= 485·7675	$\frac{5}{16}$	= 460·3679	$\frac{5}{32}$	= 230·1841
		$\frac{3}{4}$	= 488·9425	$\frac{3}{8}$	= 463·5429	$\frac{3}{16}$	= 231·7715
		$\frac{7}{8}$	= 492·1174	$\frac{7}{16}$	= 466·7178	$\frac{7}{32}$	= 233·3590
		$\frac{1}{2}$	= 495·2924	$\frac{1}{8}$	= 469·8928	$\frac{1}{16}$	= 234·9465
		$\frac{5}{8}$	= 498·4673	$\frac{5}{16}$	= 473·0677	$\frac{5}{32}$	= 236·5340
		$\frac{3}{4}$	= 501·6423	$\frac{3}{8}$	= 476·2427	$\frac{3}{16}$	= 238·1214
		$\frac{7}{8}$	= 504·8172	$\frac{7}{16}$	= 479·4176	$\frac{7}{32}$	= 239·7089
		$\frac{1}{2}$	= 507·9922	$\frac{1}{8}$	= 482·5926	$\frac{1}{16}$	= 241·2964
		$\frac{5}{8}$	= 511·1671	$\frac{5}{16}$	= 485·7675	$\frac{5}{32}$	= 242·8839
		$\frac{3}{4}$	= 514·3421	$\frac{3}{8}$	= 488·9425	$\frac{3}{16}$	= 244·4713
		$\frac{7}{8}$	= 517·5170	$\frac{7}{16}$	= 492·1174	$\frac{7}{32}$	= 246·0588
		$\frac{1}{2}$	= 520·6920	$\frac{1}{8}$	= 495·2924	$\frac{1}{16}$	= 247·6463
		$\frac{5}{8}$	= 523·8669	$\frac{5}{16}$	= 498·4673	$\frac{5}{32}$	= 249·2338
		$\frac{3}{4}$	= 527·0419	$\frac{3}{8}$	= 501·6423	$\frac{3}{16}$	= 250·8212
		$\frac{7}{8}$	= 530·2168	$\frac{7}{16}$	= 504·8172	$\frac{7}{32}$	= 252·4087
		$\frac{1}{2}$	= 533·3918	$\frac{1}{8}$	= 507·9922	$\frac{1}{16}$	= 253·9962
		$\frac{5}{8}$	= 536·5667	$\frac{5}{16}$	= 511·1671	$\frac{5}{32}$	= 255·5837
		$\frac{3}{4}$	= 539·7417	$\frac{3}{8}$	= 514·3421	$\frac{3}{16}$	= 257·1711
		$\frac{7}{8}$	= 542·9166	$\frac{7}{16}$	= 517·5170	$\frac{7}{32}$	= 258·7586
		$\frac{1}{2}$	= 546·0916	$\frac{1}{8}$	= 520·6920	$\frac{1}{16}$	= 260·3461
		$\frac{5}{8}$	= 549·2665	$\frac{5}{16}$	= 523·8669	$\frac{5}{32}$	= 261·9336
		$\frac{3}{4}$	= 552·4415	$\frac{3}{8}$	= 527·0419	$\frac{3}{16}$	= 263·5210
		$\frac{7}{8}$	= 555·6164	$\frac{7}{16}$	= 530·2168	$\frac{7}{32}$	= 265·1085
		$\frac{1}{2}$	= 558·7914	$\frac{1}{8}$	= 533·3918	$\frac{1}{16}$	= 266·6960
		$\frac{5}{8}$	= 561·9663	$\frac{5}{16}$	= 536·5667	$\frac{5}{32}$	= 268·2835
		$\frac{3}{4}$	= 565·1413	$\frac{3}{8}$	= 539·7417	$\frac{3}{16}$	= 269·8709
		$\frac{7}{8}$	= 568·3162	$\frac{7}{16}$	= 542·9166	$\frac{7}{32}$	= 271·4584
		$\frac{1}{2}$	= 571·4912	$\frac{1}{8}$	= 546·0916	$\frac{1}{16}$	= 273·0459
		$\frac{5}{8}$	= 574·6661	$\frac{5}{16}$	= 549·2665	$\frac{5}{32}$	= 274·6334
		$\frac{3}{4}$	= 577·8411	$\frac{3}{8}$	= 552·4415	$\frac{3}{16}$	= 276·2208
		$\frac{7}{8}$	= 581·0160	$\frac{7}{16}$	= 555·6164	$\frac{7}{32}$	= 277·8083
		$\frac{1}{2}$	= 584·1910	$\frac{1}{8}$	= 558·7914	$\frac{1}{16}$	= 279·3958
		$\frac{5}{8}$	= 587·3659	$\frac{5}{16}$	= 561·9663	$\frac{5}{32}$	= 280·9833
		$\frac{3}{4}$	= 590·5409	$\frac{3}{8}$	= 565·1413	$\frac{3}{16}$	= 282·5707
		$\frac{7}{8}$	= 593·7158	$\frac{7}{16}$	= 568·3162	$\frac{7}{32}$	= 284·1582
		$\frac{1}{2}$	= 596·8908	$\frac{1}{8}$	= 571·4912	$\frac{1}{16}$	= 285·7457
		$\frac{5}{8}$	= 600·0657	$\frac{5}{16}$	= 574·6661	$\frac{5}{32}$	= 287·3332
		$\frac{3}{4}$	= 603·2407	$\frac{3}{8}$	= 577·8411	$\frac{3}{16}$	= 288·9206
		$\frac{7}{8}$	= 606·4156	$\frac{7}{16}$	= 581·0160	$\frac{7}{32}$	= 290·5081
		$\frac{1}{2}$	= 609·5906	$\frac{1}{8}$	= 584·1910	$\frac{1}{16}$	= 292·0956
		$\frac{5}{8}$	= 612·7655	$\frac{5}{16}$	= 587·3659	$\frac{5}{32}$	= 293·6831
		$\frac{3}{4}$	= 615·9405	$\frac{3}{8}$	= 590·5409	$\frac{3}{16}$	= 295·2705
		$\frac{7}{8}$	= 619·1154	$\frac{7}{16}$	= 593·7158	$\frac{7}{32}$	= 296·8580
		$\frac{1}{2}$	= 622·2904	$\frac{1}{8}$	= 596·8908	$\frac{1}{16}$	= 298·4455
		$\frac{5}{8}$	= 625·4653	$\frac{5}{16}$	= 600·0657	$\frac{5}{32}$	= 300·0330
		$\frac{3}{4}$	= 628·6403	$\frac{3}{8}$	= 603·2407	$\frac{3}{16}$	= 301·6204
		$\frac{7}{8}$	= 631·8152	$\frac{7}{16}$	= 606·4156	$\frac{7}{32}$	= 303·2079
		$\frac{1}{2}$	= 634·9902	$\frac{1}{8}$	= 609·5906	$\frac{1}{16}$	= 304·7954
		$\frac{5}{8}$	= 638·1651	$\frac{5}{16}$	= 612·7655	$\frac{5}{32}$	= 306·3829
		$\frac{3}{4}$	= 641·3401	$\frac{3}{8}$

# of Length.

British.

millionth part of the quarter of the earth's meridian. The legal British equivalent of the inches, of the British standard yard at the temperature of 62° F.

Furlongs.	Miles.	Miles.	Furlongs.	Yards.	Feet.	Inches.
...	...	= 0	0	0	0	about $\frac{1}{16}$
0·00005	...	= 0	0	0	0	" $\frac{3}{4}$
0·00050	0·00006	= 0	0	0	0	" $3\frac{1}{16}$
0·00197	0·00052	= 0	0	1	0	" $3\frac{1}{16}$
0·04071	0·00521	= 0	0	10	2	" $9\frac{1}{16}$
0·40711	0·06214	= 0	0	109	1	" $1\frac{3}{4}$
4·97106	0·62138	= 0	4	213	1	" $10\frac{1}{2}$
49·71059	6·21382	= 6	1	156	0	" $11\frac{5}{8}$

One *micro-millimetre* ($\mu\mu$) = one-millionth of a millimetre or about 0·00000004 of an inch.

PLIERS.

Inches.	Metres to Feet.	Yards.	Feet.	Kilometres to Yards.	Miles.	
39·371	3·281	1·094	3,280·899	1,093·633	0·621	1
78·742	6·562	2·187	6,561·798	2,187·266	1·243	2
118·113	9·843	3·281	9,842·697	3,280·899	1·864	3
157·483	13·124	4·375	13,123·597	4,374·532	2·486	4
196·854	16·404	5·468	16,404·496	5,468·165	3·107	5
236·225	19·685	6·562	19,685·395	6,561·798	3·728	6
275·596	22·966	7·655	22,966·294	7,655·431	4·350	7
314·966	26·247	8·749	26,247·193	8,749·064	4·971	8
354·337	29·528	9·843	29,528·092	9,842·697	5·592	9
393·708	32·809	10·936	32,808·992	10,936·331	6·214	10

Metric.

Decimetres.	Metres.	Hectometres.	Kilometres.
0·25400	0·02540	0·00254	0·00003
3·04794	0·30479	0·00305	0·00030
9·14383	0·91438	0·00914	0·00091
18·28767	1·82877	0·01829	0·00183
50·29103	5·02911	0·05029	0·00503
2,011·64366	201·16437	2·01164	0·20116
16,093·14926	1,609·31493	16·09315	1·60931

111·303 kilometres. The length of 1′ of latitude at 45° = 6,076 feet = 1·1508 Statute mile = 1852 metres, nearly.
1 line = $\frac{1}{12}$ inch = 2·1166 mm.

PLIERS.

Decimetres.	Yards to Metres.	Kilometres.	Metres.	Miles to Hectometres.	Kilometres.	
9·1438	0·914	0·0009	1,609·315	16·093	1·609	1
18·2877	1·829	0·0018	3,218·630	32·186	3·219	2
27·4315	2·743	0·0027	4,827·945	48·279	4·828	3
36·5753	3·658	0·0037	6,437·260	64·373	6·437	4
45·7192	4·572	0·0046	8,046·575	80·466	8·047	5
54·8630	5·486	0·0055	9,655·890	96·559	9·656	6
64·0068	6·401	0·0064	11,265·204	112·652	11·265	7
73·1507	7·315	0·0073	12,874·519	128·745	12·875	8
82·2945	8·229	0·0082	14,483·834	144·838	14·484	9
91·4383	9·144	0·0091	16,093·149	160·931	16·093	10

Approximate Values.

1 kilometre = about 5 furlongs (·029 less)
1 metre = " 39⅓ inches (·029" less)
To convert metres to yards add $\frac{1}{10}$.
1 Decimetre = 4 inches (3·94 exactly)
1 Centimetre = ⅖ inch
1 Millimetre = $\frac{1}{25}$ "

1 mile = nearly 1⅝ kilometre (1% less).
1 yard = " ⅞ metre. 11 Metres = 12 yards.
1 foot = " 30½ centimetres.
1 inch = " 2½ "
1 " = " 25½ millimetres

II.—Measures

Metric to British Avoir

The standard unit of Metric Weight is the KILOGRAMME, *which is the weight of a*

		Grammes.		Grains.	Troy Ounces. (480 grains.)	Avoirdupois Ounces. (437·5 grains.)
Milligramme	=	$\frac{1}{1000}$	=	0·01543	0·00003	0·00003
Centigramme	=	$\frac{1}{100}$	=	0·15432	0·00032	0·00035
Decigramme	=	$\frac{1}{10}$	=	1·54323	0·00322	0·00353
GRAMME	=	1	=	15·43235	0·03215	0·03527
Decagramme	=	10	=	154·32349	0·32151	0·35274
Hectogramme	=	100	=	1,543·23487	3·21507	3·52739
KILOGRAMME	=	1,000	=	15,432·34874	32·15073	35·27394
Myriagramme	=	10,000	=	154,323·48740	321·50727	352·73940
Quintal			=	100 Kilogrammes	196841 Cwt.	0·09842 Tons
Millier or Tonne			=	1000 ,,	19·68412 ,,	0·98421 ,,

MULTI

	Milligrammes to Grains.	Centigrammes to Grains.	Decigrammes to Grains.	Grammes to Grains.	Ap. Drachms.	Troy oz.	Avoir. oz.
1	0·0154	0·154	1·543	15·432	0·2572	0·032	0·035
2	0·0309	0·309	3·086	30·865	0·5144	0·064	0·071
3	0·0463	0·463	4·630	46·297	0·7716	0·096	0·106
4	0·0617	0·617	6·173	61·729	1·0288	0·129	0·141
5	0·0772	0·772	7·716	77·162	1·2860	0·161	0·176
6	0·0926	0·926	9·259	92·594	1·5432	0·193	0·212
7	0·1080	1·080	10·803	108·026	1·8004	0·225	0·247
8	0·1235	1·235	12·346	123·459	2·0576	0·257	0·281
9	0·1389	1·389	13·889	138·891	2·3149	0·289	0·318
10	0·1543	1·543	15·432	154·323	2·5721	0·322	0·353

British Troy and

				Milligrammes.	Centigrammes.	Decigrammes.
Grain			=	64·79895	6·47990	0·64799
Scruple (℈)	=	20 Grains	=	1,295·97901	129·59790	12·95979
Pennyweight (dwt)	=	24 ,,	=	1,555·17481	155·51748	15·55175
Drachm (ʒ)	=	60 ,,	=	3,887·93702	388·79370	38·87937
Ounce	=	480 ,,	=	31,103·49617	3,110·34962	311·03496
Pound	=	5,760 ,,	=	373,241·95410	37,324·19541	3,732·41954

In the new British Pharmacopœia the Avoirdupois Ounce and

Avoirdupois

				Milligrammes.	Centigrammes.	Decigrammes.
Dram	=	27·34 Grains	=	1,771·84630	177·18463	17·71846
Ounce	=	437·5 ,,	=	28,349·54058	2,834·95408	283·49541
Pound	=	7,000 ,,	=	453,592·65255	45,359·26525	4,535·92653
Stone	=	14 lb	=	...	...	...
Hundredweight	=	112 ,,	=	...	...	...
Ton	=	2,240 ,,	=	...	...	...

MULTI

	Grains to Milligrms.	Grains to Centigrms.	Grains to Grms.	Apothecaries' Drachms to Decigrms.	Apothecaries' Drachms to Grms.	Apothecaries' Drachms to Decagrms.	Troy Ounces to Grms.	Troy Ounces to Hectogrms.	Troy Ounces to Kilogrms.
1	64·799	6·480	0·065	38·879	3·888	0·389	31·103	0·311	0·031
2	129·598	12·960	0·130	77·752	7·776	0·778	62·207	0·622	0·062
3	194·397	19·440	0·194	116·638	11·664	1·166	93·310	0·933	0·093
4	259·196	25·920	0·259	155·517	15·552	1·555	124·414	1·244	0·124
5	323·995	32·399	0·324	194·397	19·440	1·944	155·517	1·555	0·156
6	388·794	38·879	0·389	233·276	23·328	2·333	186·621	1·866	0·187
7	453·593	45·359	0·454	272·156	27·216	2·722	217·724	2·177	0·218
8	518·392	51·839	0·518	311·035	31·103	3·110	248·828	2·488	0·249
9	583·190	58·319	0·583	349·914	34·991	3·499	279·931	2·799	0·280
10	647·990	64·799	0·648	388·794	38·879	3·888	311·035	3·110	0·311

Fractions of a Grain to Milligrammes.

$\frac{1}{2}$	= 32·4	$\frac{5}{8}$	= 12·96	$\frac{1}{50}$	= 0·26	$\frac{1}{16}$	= 45·36
$\frac{1}{3}$	= 21·6	$\frac{2}{3}$	= 25·92	$\frac{1}{60}$	= 8·10	$\frac{1}{18}$	= 58·32
$\frac{1}{4}$	= 43·2	$\frac{3}{4}$	= 38·88	$\frac{1}{90}$	= 7·20	$\frac{1}{20}$	= 3·24
$\frac{1}{5}$	= 16·2	$\frac{4}{5}$	= 51·84	$\frac{1}{100}$	= 0·48	$\frac{1}{50}$	= 1·30
$\frac{1}{6}$	= 48·6	$\frac{5}{6}$	= 10·80	$\frac{1}{10}$	= 19·44	$\frac{1}{100}$	= 0·65

# of Weight.

dupois and Troy.

cubic decimetre, or 61·027 cubic inches, of pure water in vacuo, at 4° C. (39·2° F.).

Avoirdupois Pounds. (7000 grains.)	Hundredweights. (112 lbs. Avr.)
...	...
0·00002	...
0·00032	...
0·00220	0·00002
0·02205	0·00020
0·22046	0·00197
2·20462	0·01968
22·04621	0·19684

Avoirdupois. lbs.	oz.	grs.
= 0	0	$\frac{1}{10}$ nearly.
= 0	0	$\frac{3}{10}$
= 0	0	$1\frac{1}{10}$
= 0	0	15
= 0	0	$154\frac{3}{10}$
= 0	3	230
= 2	3	$110\frac{1}{10}$
= 22	0	$323\frac{1}{2}$

Troy and Apothecaries. lbs.	oz.	dr.	grs.
0	0	0	$\frac{1}{10}$
0	0	0	$\frac{3}{10}$
0	0	0	$1\frac{1}{10}$
0	0	0	$15\frac{3}{10}$
0	0	2	$31\frac{1}{2}$
0	3	1	$43\frac{1}{2}$
2	8	1	$12\frac{1}{2}$
26	9	4	31

= weight of 1 cubic metre of water.

PLIERS.

Hectogrammes to Troy oz.	Avoir. oz.	Avoir. lbs.
3·215	3·527	0·220
6·430	7·055	0·441
9·645	10·582	0·661
12·860	14·110	0·882
16·075	17·637	1·102
19·290	21·164	1·323
22·506	24·692	1·543
25·721	28·219	1·764
28·936	31·747	1·984
32·151	35·274	2·205

Kilogrammes to Troy oz.	Avoir. oz.	Avoir. lbs.
32·151	35·274	2·205
64·301	70·548	4·409
96·452	105·822	6·614
128·603	141·096	8·818
160·754	17	11·023
192·904	211·64	13·228
225·055	246·918	15·432
257·206	282·192	17·637
289·357	317·465	19·842
321·507	352·739	22·046

Quintals to Hundredweights.	Milliers to Tons.
1·968	0·984
3·937	1·968
5·905	2·953
7·874	3·937
9·842	4·921
11·810	5·905
13·779	6·889
15·747	7·874
17·716	8·858
19·684	9·842

Apothecaries Weight to Metric.

Grammes.	Decagrammes.	Hectogrammes.	Kilogrammes.
0·06480	0·00648	0·00065	0·00006
1·29538	0·12960	0·01296	0·00130
1·55517	0·15552	0·01555	0·00156
3·88794	0·38879	0·03888	0·00389
31·10359	3·11035	0·31103	0·03110
373·24195	37·32420	3·73242	0·37324

Pound and the ordinary Grain are the only weights adopted.

to Metric.

Grammes.	Decagrammes.	Hectogrammes.	Kilogrammes.
1·77185	0·17718	0·01772	0·00177
28·34954	2·83495	0·28350	0·02835
453·59267	45·35927	4·53593	0·45359
6,350·20714	635·02971	63·50297	6·35030
50,802·37703	5,080·23771	508·02377	50·80238
1,016,047·54170	101,604·75417	1,0160·47542	1,016·04754

PLIERS.

Avoirdupois Ounces to Grms.	Hectogrms.	Kilogrms.
28·310	0·283	0·028
56·699	0·567	0·057
85·049	0·850	0·085
113·398	1·134	0·113
141·748	1·417	0·142
170·097	1·701	0·170
198·447	1·984	0·198
226·796	2·268	0·227
255·146	2·551	0·255
283·495	2·835	0·283

Avoirdupois Pounds to Grms.	Hectogrms.	Kilogrms.
453·593	4·536	0·454
907·185	9·072	0·907
1360·778	13·608	1·361
1814·371	18·144	1·814
2267·963	22·680	2·268
2721·556	27·216	2·722
3175·149	31·751	3·175
3628·741	36·287	3·629
4082·334	40·823	4·082
4535·927	45·359	4·536

Hundredweights to Quintals.	Tons to Milliers.
0·508	1·016
1·016	2·032
1·524	3·048
2·032	4·064
2·540	5·080
3·048	6·096
3·556	7·112
4·064	8·128
4·572	9·144
5·080	10·160

Approximate Equivalents.

1,000 Kilogrammes or Metric Tonne is nearly 1 English Ton (about 1½% less).
1 Kilogramme equals weight of cubic decimetre or litre of water,
" is nearly 2¼lb. Avoirdupois (about ¼% more); 5 Kilos. = 11lb. nearly.
1 Hectogramme is about 3½ ounces Avoirdupois.
1 Decagramme is about ⅓ ounce.
1 Gramme is about 15½ grains.
05 Milligrammes are about 1 grain.
1 Hundredweight is nearly 51 Kilos. (about ¾ % less).
1 ounce Troy = 31·½ grammes } The ounce, is commonly and conveniently taken as 30 grammes in making up
1 ounce Avoirdupois = 28·½ grammes } photographic formulæ.
1 Drachm = 4 grammes nearly (about 1½ grains less).

III.—Measures of

Metric

The Unit of Metric Measures of Capacity is the LITRE, *or Cubic Decimetre, equal to the*

		Litres.	Cubic Inches.	Cubic Feet.	Fluid, Oz. 1·73296 Cub. Ins.
Millilitre or cubic centimetre	=	$\frac{1}{1000}$	0·06103	0·00004	0·03522
Centilitre = 10 cubic cents	=	$\frac{1}{100}$	0·61027	0·00035	0·35215
Decilitre = 100 ,, ,,	=	$\frac{1}{10}$	6·10271	0·00353	3·52155
LITRE or cubic Decimetre	=	1	61·02705	0·03532	35·21547
Decalitre	=	10	610·27052	0·35317	352·15468
Hectolitre	=	100	6,102·70515	3·53166	3,521·54683
Kilolitre (cubic metre)	=	1,000	61,027·05152	35·31658	35,215·46828
Myrialitre	=	10,000	610,270·51519	353·16581	352,154·68280

N.B.—The above Table is based upon the value of the Litre as given in the Weights and Measures Act of 1878 = 0·2202443 Imperial gallons. Under this valuation the Litre = 35·23909 fluid ounces

MULTI

	Millilitres to Minims.	Millilitres to Fl. Drachms.	Millilitres to Fl. Oz.	Centilitres to Fl. Drachms.	Centilitres to Fl. Ounces.	Decilitres to Fl. Ounces	Decilitres to Pints.
1	16·903	0·282	0·035	2·817	0·352	3·522	0·176
2	33·807	0·563	0·070	5·634	0·704	7·043	0·352
3	50·710	0·845	0·106	8·452	1·056	10·565	0·528
4	67·614	1·127	0·141	11·269	1·409	14·086	0·704
5	84·517	1·409	0·176	14·086	1·761	17·608	0·880
6	101·421	1·690	0·211	16·903	2·113	21·129	1·056
7	118·324	1·972	0·247	19·721	2·465	24·651	1·233
8	135·227	2·254	0·282	22·538	2·817	28·172	1·409
9	152·131	2·536	0·317	25·355	3·169	31·694	1·585
10	169·034	2·817	0·352	28·172	3·522	35·215	1·761

British

		Millilitres or cubic centimetres.	Centilitres.
Minim		0·05916	0·00592
Drachm	= 60 minims	3·54958	0·35496
Fluid ounce	= 8 Fl. drachms	28·39661	2·83966
Pint	= 20 Fl. ounces	567·93225	56·79322
Quart	= 40 ,, ,,	1,135·86449	113·58665
Gallon	= 160 ,, ,,	4,543·45797	454·31580

According to the corrected value of the Litre, as above, 1 pint = ·56755

MULTI

	Minims to Millilitres.		Fl. Drachms to Millilitres.	Millilitres.	Fluid Ounces to Decilitres.	Litres.
1 =	0·059	15 = 0·887	1 = 3·550	28·397	0·284	0·028
2 =	0·118	20 = 1·183	2 = 7·099	56·793	0·568	0·057
3 =	0·177	25 = 1·479	3 = 10·649	85·190	0·852	0·085
4 =	0·237	30 = 1·775	4 = 14·198	113·586	1·136	0·114
5 =	0·296	35 = 2·071	5 = 17·748	141·983	1·420	0·142
6 =	0·355	40 = 2·366	6 = 21·297	170·380	1·704	0·170
7 =	0·414	45 = 2·662	7 = 24·847	198·776	1·988	0·199
8 =	0·473	50 = 2·958	8 = 28·397	227·173	2·272	0·227
9 =	0·532	55 = 3·254	9 = 31·946	255·570	2·556	0·255
10 =	0·592	60 = 3·550	10 = 35·496	283·966	2·840	0·284

Useful Data.

1 Minim is the measure of 0·91146 grains of water.
1 Fluid drachm = 54·6875 ,, ,,
1 Fluid ounce = 437·5 ,, ,, = 1 ounce avoirdupois.
1 Pint = 1·25 lb or 8750 ,, ,, = 34·64993 cubic inches.
1 Gallon = 10 lb or 70,000 ,, ,, = 277·27384 ,, ,,
Cubic feet × 6·2321 = gallons.
Gallons × ·16046 = cubic feet.
Litres × ·03532 = ,, ,, Litres × ·220 = gallons.
1 Cubic inch of distilled water at 62° F., Bar. 30 ins, = 252·458 grains = ·0361 lb = 16·385,176 cubic cent.
1 Cubic foot of water = 62·321 lb = 6·2321 gallons = 28·315312 litres.
1 Ton of water = 35·9 cubic feet.

Capacity (Fluid).

to British.

weight of 1,000 grammes of pure water, at a temperature of 4° C. (39·2° F.).

Pints. 34·65923 Cub. Ins.	Gallons. 277·27384 Cub. Ins.		Gallons.	Pints.	Fl. Oz.	Fl. Drachms.	Minims.
= 0·00176	0·00022	=	0	0	0	0	16·0034
= 0·01761	0·00220	=	0	0	0	2	49·03
= 0·17608	0·02201	=	0	0	3	4	10·34
= 1·76077	0·22010	=	0	1	15	1	43·43
= 17·60773	2·20097	=	2	1	12	1	13·44
= 176·07734	22·00967	=	22	0	1	4	22·47
= 1,760·77341	220·09668	=	220	0	15	3	44·56
= 17,607·73414	2,200·96677	=	2,200	7	14	5	28·94

1·76077 pints or 0·22009668 gallon. More accurate determination shows that the correct equivalent is 1·761954 pints, or the Millilitre = ·281913 fluid drachms = 16·91476 minims. The practical difference is trifling.

PLIERS.

Fl. Ounces.	Litres to Pints.	Gallons.	Decalitres to Quarts.	Gallons.	Kilolitres to Gallons.	
35·215	1·761	0·220	8·804	2·201	220·097	1
70·431	3·522	0·440	17·608	4·402	440·193	2
105·646	5·283	0·660	26·412	6·603	660·290	3
140·862	7·043	0·880	35·215	8·804	880·387	4
176·077	8·804	1·100	44·019	11·005	1,100·483	5
211·293	10·565	1·321	52·823	13·206	1,320·580	6
246·508	12·325	1·541	61·627	15·407	1,540·677	7
281·724	14·086	1·761	70·431	17·608	1,760·773	8
316·939	15·847	1·981	79·235	19·809	1,980·870	9
352·155	17·608	2·201	88·039	22·010	2,200·967	10

to Metric.

Decilitres.	Litres.	Decalitres.	Kilolitres.
0·00059	0·00006	0·00001	...
0·03550	0·00355	0·00035	...
0·28397	0·02840	0·00284	0·000028
5·67932	0·56703	0·05679	0·000568
11·35864	1·13386	0·11359	0·001136
45·43458	4·54346	0·45435	0·004543

Litre. 1 fluid ounce = 28·377 C. C. 1 fluid drachm = 3·547 C. C. 1 minim = 0·5911 C. C.

PLIERS.

Millilitres.	Pints to Decilitres.	Litres.	Quarts to Litres.	Gallons to Litres.	
567·932	5·679	0·568	1·136	4·543	1
1,135·864	11·359	1·136	2·272	9·087	2
1,703·797	17·038	1·701	3·408	13·630	3
2,271·729	22·717	2·272	4·543	18·174	4
2,839·661	28·397	2·840	5·679	22·717	5
3,407·593	34·076	3·408	6·815	27·261	6
3,975·526	39·755	3·976	7·951	31·804	7
4,543·458	45·435	4·543	9·087	36·348	8
5,111·390	51·114	5·111	10·223	40·891	9
5,679·322	56·793	5·679	11·359	45·435	10

Approximate values.

1 Millilitre or cubic centimetre is 17 minims nearly.
1 Centilitre is about 2 drachms 49 minims.
1 Decilitre is about 3½ ounces.
1 Litre is about 35¼ fluid ounces, or rather more than 1¾ pint.
1 Kilolitre or cubic metre holds nearly one ton of water 62° F.
1 Fluid drachm is rather more than 3½ cubic centimetres (1¾ % more).
1 Fluid ounce is about 28½ cubic centimetres.
1 Pint is about 568 cubic centimetres.
1 Quart is rather more than 1¼ litres.
Gallon is about 4½ litres (1 % more).

IV.—Cubic

The unit of Metric Measurement is the STERE, *or* CUBIC METRE, *weighing*

Metric to

		Cubic Metre.
Cubic Millimetre		= 0·0000001
Cubic Centimetre	= 1,000 Cubic millim.	= 0·0001
Millistere (cubic decim.)	= 1,000 ,, centim.	= 0·001
Centistere	= 10 ,, decim.	= 0·01
Decistere	= 100 ,, ,,	= 0·1
STERE (cubic metre)	= 1,000 ,, ,,	= 1
Decastere	10 ,, metres.	= 10
Hectostère	100 ,, ,,	= 100

NOTE.—The Stere is more generally used for measuring timber, wood-work, or firewood.

MULTI

	Cubic Centimetres to Cubic Inches.	Cubic Decimetres to Cubic Inches.	Cubic Decimetres to Cubic Feet.
1	0·061	61·027	0·035
2	0·122	122·054	0·071
3	0·183	183·081	0·106
4	0·244	244·108	0·141
5	0·305	305·135	0·177
6	0·366	366·162	0·212
7	0·427	427·189	0·247
8	0·488	488·216	0·283
9	0·549	549·243	0.318
10	0·610	610·271	0.353

British to

	Cubic Inches.	Cubic Feet.	Cubic Yards.
Cubic Inch	= 1	= 0·0005787	0·000021143
Cubic foot	= 1,728	= 1·00	0·03704
Cubic yard	= 46,656	= 27·00	1·00

MULTI

	Cubic Inches to Cubic Centimetres.	Cubic Feet to Cubic Decimetres.	Cubic Feet to Cubic Metres.
1	16·386	28·315	0·028
2	32·772	56·631	0·057
3	49·159	84·946	0·085
4	65·545	113·261	0·113
5	81·931	141·577	0·142
6	98·317	169·892	0·170
7	114·703	198·207	0·198
8	131·089	226·522	0·227
9	147·476	254·838	0·255
10	163·862	283·153	0·283

Approximate

1 cubic metre is nearly 1¼ cubic yard (1¾ % less).
1 ,, ,, is nearly 35¼ cubic feet (·05 % less).
10 cubic metres equal 13 cubic yards.
1 cubic yard is about ¾ cubic metre (2 % more).
1 cubic foot is about 28¼ cubic decimetres (·018 less).

NOTE.—To reduce cubic metres to cubic decimetres or cubic centimetres, which are all multiples of 1,000, the decimal to convert cubic metres into *cubic* decametres or *cubic* hectometres the decimal-point is removed 3 places at a time to the

Measures.

1 Millier, or 1,000 Kilogrammes, of pure water, at 4° C. (39·2° F.).

British.

Cubic Inches.	Cubic Feet.	Cubic Yards.
0·000051	0·0000003	.....
0·061027	0·000353	0·000001
61·027052	0·035317	0·001308
610·270515	0·353169	0·013080
6102·705152	3·531658	0·130802
61027·051519	35·316581	1·308022
610270·515194	353·165807	13·080215
.....	3531·658074	130·802151

The Centistere, Decistere, Decastere, and Hectostere are not *cubic* measures but only measures of volume.

PLIERS.

Cubic Feet.	Cubic Metres to Cubic Yards.	
35·317	1·308	1
70·633	2·616	2
105·950	3·924	3
141·266	5·232	4
176.583	6·540	5
211·899	7·848	6
247·216	9·156	7
282·533	10·464	8
317·849	11·772	9
353·166	13·080	10

Metric.

Cubic Centimetres.	Cubic Decimetres.	Cubic Metres.
= 16·386176	0·016386	0·000016
= 28315·311931	28·315312	0·028315
= 764513·421237	764·513422	0·764513

PLIERS.

Cubic Decimetres.	Cubic Yards to Cubic Metres.	
764·513	0·765	1
1529·027	1·529	2
2293·540	2·294	3
3058·054	3·058	4
3822·567	3·823	5
4587·080	4·587	6
5351·594	5·352	7
6116·107	6·116	8
6880·621	6·881	9
7645·134	7·645	10

Values.

1 cubic inch is about 16½ cubic centimetres (·014 less).
1 cubic metre is the cube of nearly 39½ inches (1399 cubic inches less).
1 cubic decimetre is the cube of nearly 4 inches (3 cubic inches less).
1 cubic centimetre is the cube of nearly ¼ inch (·00397 cubic inches less).
1 cubic millimetre is the cube of nearly $\frac{1}{25}$ inch (·000003 cubic inches less).

point must be removed 3 places at a time to the right, instead of one, as the denomination would seem to imply. Similarly left.

V.—Square

Metric to

The Unit of Metric Measurement for Land Measure

			Sq. Inches.	Sq. Feet.
Square Millimetre	= 1/1000000 Sq: Metre.	= 1/100 Sq. centim.	= 0·00155	0·00001
Square Centimetre	= 1/10000 „ „	= 1/100 „ decim.	= 0·15501	0·00108
Square Decimetre	= 1/100 „ „		= 15·50059	0·10764
Square Metre, or Centiare	= 1 „ „		= 1,550·05911	10·76430
Are	= 100 Sq. Metres.		= 155,005·91052	1,076·42993
Hectare	= 10,000 „ „		= ...	107,643·99341

Multi

	Square Millims. to Sq. Inches.	Square Centimetres to Sq. Inches.	Sq. Feet.	Square Decimetres to Sq. Inches.	Sq. Feet.	Sq. Yards
1	0·002	0·155	0·001	15·501	0·108	0·012
2	0·003	0·310	0·002	31·001	0·215	0·024
3	0·005	0·465	0·003	46·502	0·323	0·036
4	0·006	0·620	0·004	62·002	0·431	0·048
5	0·008	0·775	0·005	77·503	0·538	0·060
6	0·009	0·930	0·006	93·004	0·646	0·072
7	0·011	1·085	0·008	108·504	0·753	0·084
8	0·012	1·240	0·009	124·005	0·861	0·096
9	0·014	1·395	0·010	139·505	0·969	0·108
10	0·016	1·550	0·011	155·006	1·076	0·120

British

		Square Millimetres.	Square Centimetres.
Square Inch	= ...	= 645·14869	6·45137
„ Foot	= 144 square inches.	= ...	928·99683
„ Yard	= 9 „ feet.	= ...	8,360·97150
„ Perch	= 30·25 „ yards.	= ...	...
Rood	= 40 „ perches.	= ...	...
Acre	= 4 roods.	= ...	...
Square Mile	= 640 acres.	= ...	...

Multi

	Square Inches to Sq. Millims.	Sq. Centims.	Square Feet to Sq. Centims.	Sq. Decims.	Sq. Metres.	Square Yards to Sq. Decims.	Sq. Metres.
1	645·137	6·451	928·997	9·2909	0·092	83·619	0·8361
2	1290·273	12·903	1,857·994	18·5799	0·186	167·219	1·6722
3	1935·410	19·354	2,786·990	27·8699	0·279	250·829	2·5083
4	2580·547	25·805	3,715·987	37·1599	0·372	334·439	3·3444
5	3225·683	32·257	4,644·984	46·4498	0·464	418·049	4·1805
6	3870·820	38·708	5,573·981	55·7398	0·557	501·658	5·0166
7	4515·957	45·160	6,502·978	65·0298	0·650	585·268	5·8527
8	5161·094	51·611	7,431·975	74·3197	0·743	668·878	6·6888
9	5806·230	58·062	8,360·971	83·6097	0·836	752·487	7·5249
10	6451·367	64·514	9,289·968	92·8997	0·929	836·097	8·3610

Approximate

One square millimetre is nearly 1/12 of a square inch, or the square of 1/3 of an inch.
One square centimetre is nearly $\frac{1}{6\cdot25}$ of a square inch, or the square of $\frac{1}{2\cdot5}$ of an inch.
One square metre contains rather more than 10¾ square feet, or nearly 1⅕ square yards.
One are is about ¼ of an acre.
One hectare contains nearly 2½ acres.

Measure.

British.

is the ARE = *100 square Metres or a square Decametre.*

Sq. Yards.	Sq. Perches.	Roods.	A
...	...	...	...
0·00912	...	...	...
0·01196	0·00040	0·00001	...
1·19603	0·03954	0·00099	0·00025
119·60333	3·95383	0·09885	0·02471
11,960·33200	395·38290	9·88457	2·47114

PLIERS.

Sq. Metres to Sq. Feet.	Sq. Yds.	Ares to Sq. Yds.	Perches.	Roods.	Acres.	Hectares to Roods.	Acres.	
10·764	1·196	119·603	3·954	0·999	0·025	9·885	2·471	1
21·529	2·392	239·207	7·908	0·198	0·049	19·769	4·942	2
32·293	3·588	358·810	11·861	0·297	0·074	29·654	7·413	3
43·057	4·784	478·413	15·815	0·395	0·099	39·538	9·885	4
53·821	5·980	598·017	19·769	0·494	0·124	49·423	12·356	5
64·586	7·176	717·620	23·723	0·593	0·148	59·307	14·827	6
75·350	8·372	837·223	27·677	0·692	0·173	69·192	17·298	7
86·114	9·568	956·827	31·631	0·791	0·198	79·077	19·769	8
96·879	10·764	1,076·430	35·584	0·890	0·222	88·961	22·240	9
107·643	11·960	1,196·033	39·538	0·988	0·247	98·846	24·711	10

to Metric.

Sq. Decimetres.	Sq. Metres.	Ares.	Hectares.
0·06451	0·00065	0·00001	...
9·28997	0·09290	0·00093	0·00001
83·60971	0·83610	0·00836	0·00008
2,529·19388	25·29194	0·25293	0·00253
...	1,011·67755	10·11678	0·10117
...	4,046·71021	40·46710	0·40467
...	...	25,898·94531	258·98945

PLIERS.

Sq. Perches to Sq. Metres.	Ares.	Rood to Ares.	Acres to Ares.	Hectares.	Square Miles to Hectares.	
25·293	0·253	10·117	40·467	0·405	258·989	1
50·584	0·506	20·234	80·934	0·809	517·979	2
75·876	0·759	30·350	121·401	1·214	776·968	3
101·168	1·012	40·467	161·868	1·619	1,035·958	4
126·460	1·265	50·584	202·336	2·023	1,294·947	5
151·752	1·518	60·701	242·803	2·428	1,553·937	6
177·044	1·770	70·817	283·270	2·833	1,812·926	7
202·336	2·023	80·934	323·737	3·237	2,071·916	8
227·627	2·276	91·051	364·204	3·642	2,330·905	9
252·919	2·529	101·168	404·671	4·047	2,589·895	10

Values.

One square inch contains about 645 square millimetres or 6½ square centimetres.
One square foot contains nearly 9½ square decimetres or $\frac{1}{11}$ of a square metre.
One square yard is nearly $\frac{4}{5}$ or $\frac{5}{6}$ of a square metre.
1 Acre is nearly 40½ ares or $\frac{2}{5}$ of a hectare.
1 Square mile is very nearly 259 hectares.

VI.—Conversion of British

British Indian

The unit of British Indian Weight

				Milligrammes.	Centigrammes.
Dhan	= $\frac{1}{11}$ Tola	= $\frac{1}{2}$ Grain	=	30·37451	3·03745
Rati	= $\frac{1}{8}$ „	= $1\frac{1}{2}$ Grains	=	121·49803	12·14980
Masha	= $\frac{1}{12}$ „	= 15 „	=	971·98426	97·19843
Tola	= 1 „	= 180 „	=	11663·81107	1166·38111
Chhatak	= 5 Tolas	= 900 „	=	58319·05533	5831·90553
Ser (Seer	= 80 „	= 2lbs 400 Grains avoir.	=	93310·48852	9331·04885
Man (Maund)	= 3,200 „	= 82⅔ lbs Avoir. 100lbs. Troy =		3732419·54095	

Under Bengal Regulation VII of 1833, the only legalised British Indian weights are the *Tola*, of 180 grains Troy; the and their values vary considerably in different parts of India; those stated in the table are given by Prinsep (*Useful Tables*).

MULTI

	Dhans to Milligrammes.	Ratis to Milligrammes.	Mashas to Milligrammes.	Mashas to Grammes.	Tolas to Grammes.	Tolas to Decagrammes.	Tolas to Kilogrammes.
1	= 30·375	121·498	971·984	0·972	11·664	1·166	0·012
2	= 60·749	242·996	1943·969	1·944	23·328	2·333	0·023
3	= 91·124	364·494	2915·953	2·916	34·991	3·499	0·035
4	= 121·498	485·992	3887·937	3·888	46·655	4·666	0·047
5	= 151·873	607·490	4859·921	4·860	58·319	5·832	0·058
6	= 182·247	728·988	5831·906	5·832	69·983	6·998	0·070
7	= 212·622	850·486	6803·890	6·804	81·647	8·165	0·082
8	= 242·996	971·984	7775·874	7·776	93·310	9·331	0·093
9	= 273·371	1093·482	8747·858	8·748	104·974	10·497	0·105
10	= 303·745	1214·980	9719·843	9·720	116·638	11·664	0·117

Metric to

		Dhans.	Ratis.	Mashas.
Milligramme	=	0·032902	0·00823	0·00103
Centigramme	=	0·32922	0·08231	0·01029
Decigramme	=	3·29223	0·82306	0·10288
Gramme	=	32·92234	8·23059	1·02882
Decagramme	=	329·22341	82·30586	10·28823
Hectogramme	=	3292·23440	823·05860	102·88232
Kilogramme	=	32922·34396	8230·58599	1028·82325
Myriagramme	=	.....	.....	10288·23249
Quintal	=	.....	.....	102882·32493
Millier or Tonne	=	.....	.....	.....

MULTI

	Grammes to Dhans.	Ratis.	Mashas.	Tolas.	Chhataks.	Sers.
1	32·922	8·231	1·029	0·086	0·017	0·0011
2	65·845	16·461	2·058	0·171	0·034	0·0021
3	98·767	24·692	3·086	0·257	0·051	0·0032
4	131·689	32·922	4·115	0·343	0·069	0·0043
5	164·612	41·153	5·144	0·429	0·086	0·0054
6	197·534	49·384	6·173	0·514	0·103	0·0064
7	230·456	57·614	7·202	0·600	0·120	0·0075
8	263·379	65·845	8·231	0·686	0·137	0·0086
9	296·301	74·075	9·260	0·772	0·154	0·0096
10	329·223	82·306	10·288	0·857	0·171	0·0107

Approximate Equivalents.

1 Rati is nearly 1½ decigrammes (about ·035 less).
1 Masha is nearly 1 gramme (about ·028 less).
1 Tola is nearly 11½ grammes (about ·003 less).
1 Ser is nearly 1 kilogramme (about ·907 less).
1 Man is nearly 3½ myriagrammes (about ·018 less).
„ „ 37½ kilogrammes (about ·009 less).
1 Decigramme is nearly $\frac{1}{10}$ of a tola, or 3½ dhans (about ·04 less).
1 Gramme is nearly 1 masha or $\frac{1}{10}$ of a tola (about ·029 more).
1 Decagramme is about $\frac{1}{12}$ of a tola (about ·007 more).
1 Hectogramme is about 8½ tolas (about ·074 more) of nearly 1½ chhataks (about ·035 less).
1 Kilogramme is nearly 85½ tolas (about ·015 less) or about 1 ser (about ·072 more).
1 Quintal is about 2½ mans (about ·0125 more).
1 Millier or Tonne is nearly 26½ mans (about ·008 less).

Indian and Metric Weights.

to Metric.

is the TOLA, *equal to 180 Grains.*

Decigrammes.	Grammes.	Decagrammes.	Hectogrammes.	Kilogrammes.	Myriagrammes.
0·32375	0·03037	0·00304	0·00030	0·00003	.....
1·23408	0·12150	0·01215	0·00121	0·00012	0·00001
9·71984	0·97168	0·09720	0·00972	0·00097	0·00010
116·63811	11·66381	1·16638	0·11664	0·01166	0·00117
583·19055	58·31906	5·83191	0·58319	0·05833	0·00583
933·10489	93·31049	9·33105	0·93310	0·09331	0·00933
37324·19541	3732·41954	373·24195	37·32420	3·73242	

Ser equal to 80 Tolas and the *Man* equal to 40 Sers. Mashas, Ratis and Dhans are used by native goldsmiths and jewellers, p. 96). There is also a weight called Panseri equal to 5 sers.

PLIERS.

Chhataks to Grammes.	Chhataks to Kilogrammes.	Sers to Grammes.	Sers to Kilogrammes.	Mans to Kilogrammes.	
58·319	0·058	933·105	0·933	37·324	1
116·638	0·117	1866·210	1·866	74·648	2
174·957	0·175	2799·315	2·799	111·973	3
233·276	0·233	3732·420	3·732	149·297	4
291·595	0·292	4665·524	4·665	186·621	5
349·914	0·350	5598·629	5·599	223·945	6
408·233	0·408	6531·734	6·532	261·269	7
466·552	0·467	7464·839	7·465	298·594	8
524·871	0·525	8397·944	8·398	335·918	9
583·191	0·583	9331·049	9·331	373·242	10

British Indian.

Tolas.	Chhataks.	Sers.	Mans.
0·00009	0·00002	.....	.....
0·00086	0·00017	0·00081	.....
0·00857	0·00171	0·00011	.....
0·08574	0·01715	0·00107	0·00003
0·85735	0·17147	0·01072	0·00027
8·57353	1·71471	0·10717	0·00268
85·73527	17·14705	1·07169	0·02679
857·35271	171·47054	10·71691	0·26792
8573·52708	1714·70542	107·16909	2·67923
85735·27078	17147·05416	1071·65088	26·79227

PLIERS.

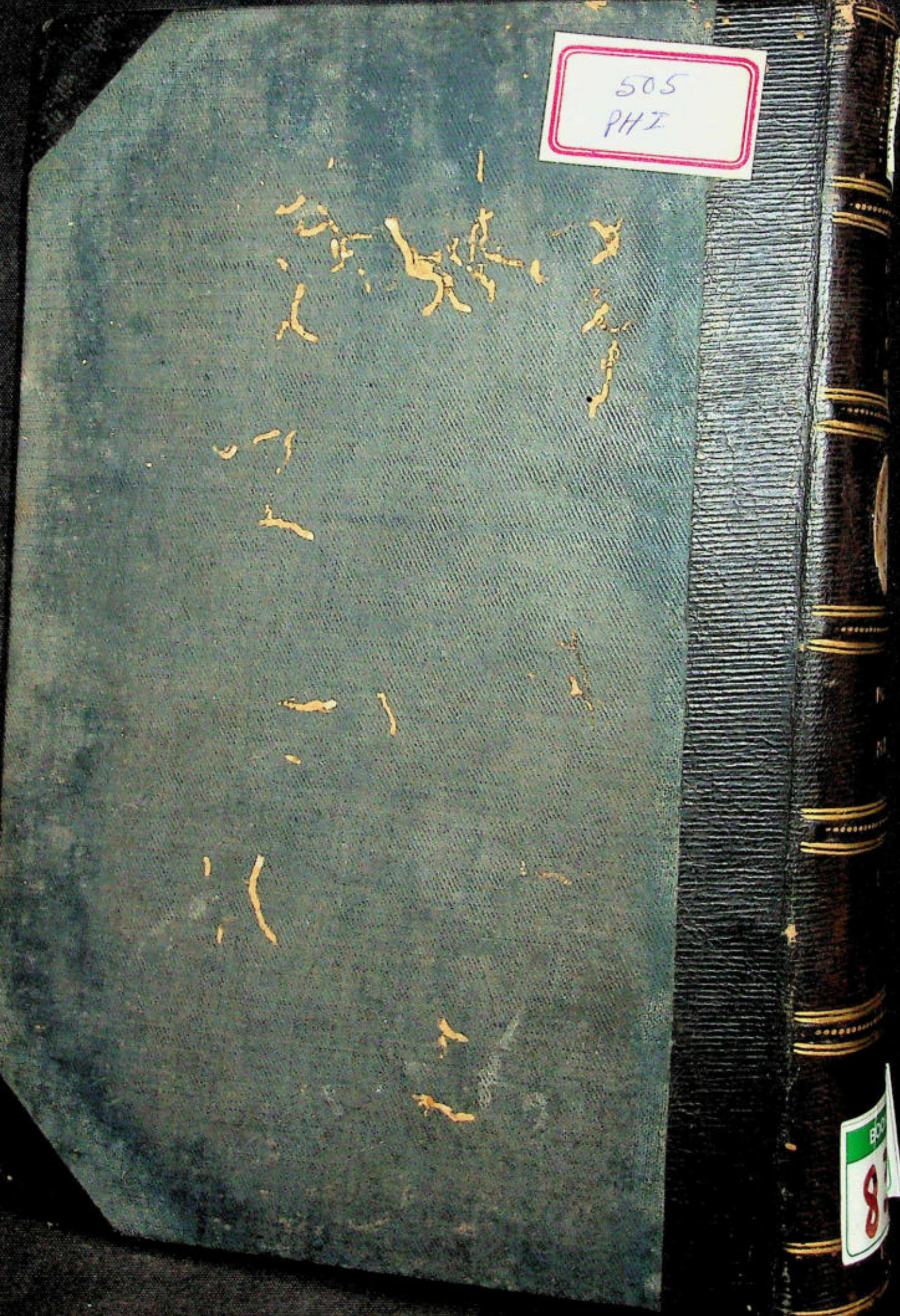
Kilogrammes to Tolas.	Chhataks.	Sers.	Mans.	Quintals to Mans.	
85·735	17·147	1·0717	0·0268	2·6792	1
171·471	34·294	2·1434	0·0536	5·3585	2
257·206	51·441	3·2151	0·0804	8·0377	3
342·941	68·588	4·2868	0·1072	10·7169	4
428·676	85·735	5·3585	0·1340	13·3961	5
514·412	102·882	6·4301	0·1608	16·0753	6
600·147	120·029	7·5018	0·1875	18·7546	7
685·882	137·176	8·5735	0·2143	21·4338	8
771·617	154·323	9·6452	0·2411	24·1130	9
857·353	171·471	10·7169	0·2679	26·7923	10

Fractions of a Tola to Milligrammes.

$\frac{1}{16}$ = 728·688	$\frac{1}{2}$ = 4373·929
$\frac{1}{8}$ = 1457·376	$\frac{5}{8}$ = 5831·906
$\frac{1}{4}$ = 2915·953	$\frac{3}{4}$ = 7775·874
$\frac{1}{3}$ = 3887·937	$\frac{7}{8}$ = 8747·858

Useful Data.

1 Man is equal to 100 lb Troy.
35 Sers are equal to 72 lb Avoirdupois.
1 Pound Troy is equal to 32 Tolas.
1 Ounce Troy is equal to 2·67 Tolas.
½ Ounce Avoirdupois (the unit for English letter postage) = 1·215 Tolas.
15 Grammes (the unit for foreign letter postage) = 1·286 Tolas or about 1¼ Tolas.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