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EDITORIAL NOTE.

We had hoped to have the collections made on the Abor Expedition worked out completely, and to have published a final summary with figures of characteristic animals. The war, however, interrupted the progress of the work, which has continued for 10 years. As there seems little prospect of completing it now and as the delay is causing serious bibliographical inconvenience owing to the lack of an index to the volume, we have decided to bring it to a close. At some future date it may be utilised in a general study of the Himalayan fauna.

N. ANNANDALE,
Director,
Zoological Survey of India.

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CONTENTS.

PART I. *Published October*, 1912.

		Page
Introduction	.. ..	1
I.	Batrachia	7
II.	Reptilia	37
III.	Lepidoptera	61
IV.	Porifera	67
V	Scolopendridae	69
VI.	Hymenoptera Anthophila	75

PART II. *Published March*, 1913.

VII.	Mammals	85
VIII.	Coleoptera, I–III: Rhysodidae, Nitidulidae, Colydiidae, Cucujidae, Passandridae, Discolomidae, .. Crytophagidae, Mycetophagidae and Dryopidae..	99
IX.	Arachnida, I: Chelifera, Pedipalpi and Scorpiones	127
X.	Dermaptera	135
XI.	Diptera	149

PART III. *Published September*, 1913.

XII.	Coleoptera, IV–VI: Lamellicornia, Anthribidae and Une nouvelle espèce de Malacodermes des Indes..	191
XIII.	Thysanoptera	201
XIV.	Arachnida, II: Opiliones	203
XV.	Mollusca, I: Rathouisiidae	209
XVI.	Temnocephalidae	229
XVII.	Hymenoptera, II, III: Ants (Formicidae) and Tenthredinidae	233
XVIII.	Fish	243
XIX.	Birds	259
XX.	Crustacea Decapoda	289
XXI	Orthoptera, I: Tetriginae (Acridiinae).. ..	311
XXII	Freshwater Planaria	317

PART IV. *Published March*, 1914

XXIII.	Hymenoptera, IV: Ichneumonidae	323
XXIV.	Orthoptera, II: Gryllacridae and Stenopelmatidae	329
XXV.	Odonata	335
XXVI.	Neuropteroid Insects	351
XXVII.	Reptilia (Supplement)	357
XXVIII.	Mollusca, II: Zonitidae and Helicidae (in part) ..	359
XXIX.	Oligochaeta	365

PART V. *Published July*, 1914.

XXX.	Coleoptera, VII: Ipidae and Platypodidae ..	411
XXXI.	Orthoptera, III: Mantidae and Phasmidae ..	415

		Page
XXXII.	Termitidae	425
XXXIII.	Lepidoptera, II: Moths	437
XXXIV.	Hymenoptera, V: Fossores, Diploptera and Chrysididae	443
XXXV.	Crustacea Amphipoda	449

PART VI. *Published December*, 1914.

XXXVI.	Land Planarians	455
XXXVII.	Terrestrial Isopoda	465
XXXVIII.	Onychophora	471

PART VII. *Published August*, 1915.

XXXIX.	Mollusca, III: Cyclophoridae (in part) ..	493
XL.	Mollusca, IV: Helicidae	505
XLI.	Coleoptera, VIII: Passalidae and Lucanidae ..	515

PART VIII. *Published November*, 1915.

XLII.	Coleoptera, IX: Tenebrionidae	519
XLIII.	Mollusca, V	537

PART IX. *Published August*, 1916.

XLIV.	Terrestrial Isopoda, II	543
XLV.	Mollusca, VI	547

PART X. *Published April*, 1917.

XLVI.	Collembola	561
XLVII.	Mollusca, VII: Cyclophoridae (in part) ..	569

PART XI. *Published February*, 1918.

XLVIII.	Mollusca, VIII: Macrochlamyinae (in part) ..	581

PART XII. *Published November*, 1918.

XLIX.	Mollusca, IX	601

PART XIII. *Published May*, 1922.

L.	Coleoptera, X: Hydrophilidae	623

LIST OF PLATES.

	Follow Page
Plate I (Map)	6
Plates II–IV (Batrachia)	36
Plate V (Reptilia)	60
Plate VI (Diptera)	190
Plates VII–IX (Fish)	258
Plates X–XIII (Mollusca)	228
Plate XIV (Temnocephalidae)	232
Plate XV (Orthoptera)	316
Plate XVI (Odonata)	350
Plates XVII–XXI (Crustacea Decapoda)	310
Plate XXII (Freshwater Planaria)	322
Plates XXIII–XXIV (Mollusca)	364
Plate XXV (Neuropteroid insects)	356
Plates XXVI–XXVII (Oligochaeta)	410
Plate XXVIII (Crustacea Amphipoda)	454
Plates XXIX–XXX (Land Planarians)	464
Plates XXXI–XXXIII (Terrestrial Isopoda)	470
Plates XXXIV–XXXVII (Onychophora)	492
Plates XXXVIII–XL (Mollusca)	504
Plates XLI–XLII (Mollusca)	514
Plates XLIII–XLIV (Tenebrionidae)	536
Plates XLV–XLVIII (Mollusca)	560
Plates XLIX–L (Terrestrial Isopoda)	546
Plates LI–LIV (Mollusca)	600
Plates LV–LVII (Collembola)	568

LIST OF AUTHORS.

Page

Annandale, N., *D.Sc.*, *F.A S.B.*
- Batrachia 7
- Reptilia 37
- Porifera 67
- Reptilia (Supplement) .. 357

Arrow, G. J., *F.E.S.*
- Coleoptera, IV : Lamellicornia 191

Bagnall, Richard S., *F.L.S.*
- Thysanoptera .. 201

Baker, E. C. Stuart.
- Birds 259

Banks, Nathan.
- Neuropteroid Insects .. 351

Bickhardt, H.
- Coleoptera, III : Histeridae 121

Brunetti, E.
- Diptera 149

Burr, Malcolm, *D.Sc.*, *F L.S.*, etc.
- Dermaptera .. 135

Carpenter, G. H., *M.Sc.*, *M.R.I.A.*
- Collembola 561

Chaudhuri, B. L., *B.A.*, *B Sc.*
- Fish 243

Collinge, Walter E., *M.Sc.*, *F L.S.*
- Terrestrial Isopoda .. 465
- ,, ,, II .. 543

d'Orchymont, A.
- Coleoptera, X: Hydrophilidae 623

Elligsen, E.
- Arachnida, I: Chelifera.. 127

Evans, W. H., Capt., *R.E.*
- Lepidoptera .. 61

Ghosh, Ekendranath, *B.Sc.*, *L.M.S.*
- Mollusca, I : Rathouisiidae 209

Godwin-Austen, H. H., *F.R.S.*
- Mollusca, II: Zonitidae and Helicidae (in part) 359
- Mollusca, III: Cyclophoridae (in part) .. 493

Page

- Mollusca, VI : Zonitidae 547
- Mollusca, VII: Cyclophoridae (in part) .. 569
- Mollusca, VIII : Macrochlamyinae (in part) .. 581
- Mollusca, IX: Zonitidae and Helicidae .. 601

Gravely, F. H., *M.Sc.*
- Scolopendridae .. 69
- Arachnida, I : Pedipalpi 127
- Temnocephalidae .. 229
- Coleoptera, VIII : Passalidae and Lucanidae .. 515
- Coleoptera, IX : Tenebrionidae 519

Griffini, A.
- Orthoptera, II : Gryllacridae and Stenopelmatidae 329

Grouvelle, A.
- Coleoptera, I: Rhysodidae, Nitidulidae, Colydiidae, Cucujidae, Passandridae, Discolomidae, Crytophagidae, Mycetophagidae, Dryopidae 99

Gude, G. K.
- Mollusca, IV : Helicidae. 505

Hancock, J. L., *F.E.S.*
- Orthoptera, I: Tetriginae (Acridiinae) .. 311

Henderson, J. R., *M.B.*, *C.M.*, *F.L.S.*
- Arachnida, I: Scorpiones 128

Jordan, K.
- Coleoptera, V : Anthribidae 197

Kemp, S., *B.A.*
- Crustacea Decapoda .. 289
- Onychophora .. 471

Laidlaw, F. F.
- Odonata 335

Morley, Claude, *F.Z.S.*, *E.E.S.*
- Hymenoptera, IV : Ichneumonidae .. 32

	Page
Olivier, Ernest.	
Coleoptera, II : Malacodermidae	119
Paiva, C. A.	
Hymenoptera Anthophila	75
Pic, Maurice.	
Coleoptera, VI : Une nouvelle espèce de Malacodermes des Indes	199
Preston, H. B., *F.Z.S.*	
Mollusca, V	537
Robinson, Herbert C., *C.M.Z.S.*	
Mammals	85
Roewer, C. Fr.	
Arachnida, II : Opiliones	203
Rohwer, S. A.	
Hymenoptera, III : Tenthredinidae	239
Stephenson, J , *D.Sc., Major, I.M.S.*	
Oligochaeta	365
Wheeler, William Morton.	
Hymenoptera, II : Ants (Formicidae)	233
Whitehouse, Richard H., *M.Sc.*	
Freshwater Planaria	317
Land Planarians	455

INDEX.

[*N.B.*—An asterisk (*) preceding a line denotes a new subspecies or variety; a dagger (†), a new species; a double (‡), a new genus or subgenus; synonyms are printed in italics.]

A

	Page
Ablabes frenatus ..	37, 47, 53
†pavo ..	37, 47, 53
porphyraceus ..	37, 47, 53
Ablyomma testudinarium ..	98
‡Aborichthys	244
†kempi ..	243, 245
Abrornis albigularis ..	271
supercilliaris	271
Acalyptrata ..	173, 191
Acanthocephala	98
Acantholipes pansalis ..	438
Acanthopterygii	256
Acanthosaura minor	37, 41, 52
Acantholelphusa	301
Acanthothrips sanguineus ..	201
Accipitres	286
Aceraius	516
grandis ..	515, 516
grandis hirsutus ..	516
himalayensis ..	515, 516
Achorutes	561
Aciagrion borneensis ..	344
pallidum	344
Acidia fossata	185
Acisoma panorpoides ..	337
Acorynus carinifrons ..	197
Actinodura egertoni egertoni ..	265
Acridiinae	311
Acromantis	417
japonica ..	415, 417
Adiathetus	144
glaucopterus	144
Adoretus	191
Aegus labilis	518
Aetheriidae	491
Aethopyga andersoni	259, 281
saturata	281
seheriae seheriae	259, 281
Aeschnidae	339
Aeschninae	339
Agamidae	40
Agonosoma	157
Agriocnemis	347
†aborense	347
incisa	349
lacteola	347
lunulata	347
minima	348
†nana	348
†obscura	346
pygmaea	348
rubeola	347
Agrion	343
Agrioninae ..	339, 341
Agrotis flavirena	438
Alaopone	234
conradi	234
curtisi	234
oberthurii	234
orientalis fusca ..	234
orientalis longicornis ..	234
vishnui	234
Alcippe nepalensis ..	263
Alectoropodes	287
Allactoneura cincta ..	149
Allocamptus sinuatus ..	324
Allodahlia	145
coriacea	146
scabriuscula	145
Allodape	83
Allograpta	163
Alphitobius (Diachina) quadri-maculatus	526
Alucurus striatus	268
Alycaei ..	502, 503
Alycaeus	494, 502, 569, 570
aborensis	503
brahma	503
chanjukensis	503
distinctus	503
duoculmen	503
graphicus dihingensis ..	503
lohitensis	503
luyorensis	503
oakesi	503
oglei	503
panggiana	503
sibbumensis	503
vesica	503
yamneyensis	503
Alycaeus (Cycloryx) costatus ..	503
granum	503
Alycaeus (Dioryx) globulosus ..	503
globulosus	503
urceolus	503
Alycaeus (Raptomphalus) magnificus	503
Alyceinae ..	494, 569
Amalopis glabripennis ..	153
Amarygmus pilipes	532
Ambassis ranga ..	244, 256
Amblycephalidae	50
Amblycephalus monticola	37, 50, 54
mangois ..	243, 244, 252
Ammophila atripes ..	445
Amorphoscelis	415
annulicornis	415

Page

Amphidromus 360
Amphiops gibbus .. 628, 629
mirabilis .. 623, 628, 629
mirabilis variolosus .. 628
pedestris .. 628, 629
*pedestris varians .. 629
Amphipoda .. 449, 453
Amphithemis vacillans .. 336
Ampittia maro 65
Ampulex 443
†aborensis 445
Amyna selenampha .. 438
†Amystrops montana .. 103
Anatidae 288
Anax guttatus 339
Ancaria fuscinervis 327
Andrena mollis 75
Anchurinae 145
Aneleus minimus 236
pygmaeus 236
sarasinorum 236
similis 236
Angitia 325
Anguidae 42
Anisodactyli 284
Anisolabis 137
annulipes 138
gaudens 138
pervicina 137
Anisoptera 354
Ankylopteryx octopunctata .. 354
Anomala 191
Anomalon ? binghami .. 325
decorum 325
Anomoea 185
Anseres 288
Anthomyidae 173
Anthomyinae 171
Anthophora subcaerulea .. 78
zonata 78
Anthracias fairmairei 529, 530
†punctipennis 529
tenuis 530
Anthribidae 197
Anthribus macrocerus .. 198
Anthus trivialis 281
trivialis maculatus 280, 281
richardi richardi .. 281
Anurida 562
Apachyidae 140
Apachyus 140
feae 140
Aphodiinae 195
Aphodius chinensis .. 195
elegans 195
urostigma 193
Apis dorsata 80
latipes 79
testacea 80
zonata 78, 80
Apobletes macilentus .. 122
planidorsum 122
tener 122
Apodes 255
Apogonia 192
Apophua carinata 323
Appias lalage 63

Page

‡Aproaspidops 45, 54
†antecursorum .. 37, 46, 53
Apterygota 567
Arachnida 97, 98, 127, 203, 466
Arachnothera magna .. 281
Arachnotherinae 281
Arboricola rufigularis intermedia 287
rufigularis rufigularis .. 287
Archibasis oscillans .. 343
Archisometrus mucronatus .. 128
scutilus 129
Argynnis hyperbius .. 63
Arhopala silhetensis .. 65
Artaminae 273
Artamus fuscus 273
Artemisia 171
Asarkina aegrotus 164
salviae 164
Asilidae 157
Asilinae 157
Asilus 157
†Assamia aborensis .. 204
sexdentata 204
Assamiidae 204
Atopos 227
†(Podangia) kempii .. 209
sanguiolenta .. 216, 220
Atteva niveigutta 441
subaurata 441
Atyidae .. 305, 491
Austenia 360, 548, 549, 550, 554, 556
†aborense 548
†alba 549
gigas 361
resplendens .. 360, 361
rotunda 551
†rotungensis 360
†siyomensis 550
tigris 548

B

Baccha flavopunctata .. 165
gratiosa 165
Bacillus artemis .. 419, 420
Bacillus (Baculum) artemis 419, 420
Bacteria baucis 422
Badis badis .. 244, 256
Bactis 354
‡Bapuia 589
†rengingensis 589
Barbus chagunio .. 250, 251
chola .. 243, 244, 249
hexagonolepis .. 243, 244, 249
hexastichus .. 243, 244, 249
kunta 250
sarana .. 244, 250
sophore .. 243, 244, 250
spilopholus .. 244, 250
ticto .. 244, 251
tor .. 244, 251
Barytelphusa 302
Basitropis hamata .. 198
Bathia 593
madagascariensis .. 593
praetumida 593
Batrachia .. 7, 29, 35, 36, 37, 54, 55

	Page
Belone cancila ..	244, 256
Bensonia	596
†aborensis ..	596, 600, 621
Berotha insolita	354
Bibio obscuripennis ..	150
Bibionidae	150
Bipalium	455
ceres	462
delicatum ..	458, 459
diana	462
†dihangense ..	455, 457
†giganteum ..	456, 457
proserpina	462
robiginosum ..	459, 460
†rotungense	459
smithi	457
†sordidum ..	459, 460
†Bithynia dibrugarhensis	540, 541
pulchella	540
Bithynis (*Parapalaemon*) *hendersoni*	303
Blattoidea	3
Blennocampa	239
†gracilicornis	239
tenuicornis	239
Blythia	45, 54
reticulata ..	37, 45, 46, 53
Boarmia ochrifasciata ..	440
Bombus buccinatoris ..	80
haemorrhoidalis ..	80
orientalis	80
simulus	80
Barborinae	173
Brachydiplax sobrina ..	337
Brachylabinae	139
Brachypodinae	267
Brachypteryginae	264
Brachypteryx	278
Brachythemis contaminata ..	338
Brackenridgia cavernarum ..	467
Bringa remifer	270
Bufo	34
himalayanus ..	17, 19, 29, 34, 35
melanostictus ..	7, 19, 20, 34, 35
melanostictus himalayanus	19
penangensis	32
Bufonidae	19
‡Burmoniscus ..	465, 466, 467
†moulmeinus	466
Buteo desertorum	286
Byrsax excisicollis	522
†tuberculatus	522

C

	Page
Caecilius ceylonicus ..	351
Callophis macclellandi	37, 50, 54, 357
Calobata	186
†trifascipennis ..	186
Calopsilia florella	64
Calopteryginae ..	335, 340
Calotes jerdoni ..	37, 42, 52
versicolor ..	37, 41, 51
Calvisia	423
fusco-alata ..	415, 423
Calyptopogon albitarsis	150
Calyptrata	170
Camponotinae	237
Camponotus nicobarensis ..	237
taylori albosparsus ..	237
Campoplex tyrannus ..	325
Camptolynx fuscipennis ..	327
striatus	327
†Camptoprosopella notatifrons	181
Capitonidae	283
Capo-peripatus	483
Capricornis sumatrensis jamrachi	91
sumatraensis milne-edwardsi	92
sumatraensis thar ..	92
Capritermes incola	435
†laetus ..	434, 435
nemorosi	435
Caracolla	537
Cardanus	518
Caridina 289, 290, 305, 306, 308,	310
acutirostris	308
†excavata 289, 290, 306, 308,	310
grandirostris	310
†hodgarti 289, 290, 308, 309,	310
nilotica	307
weberi 231, 289, 290, 305, 306,	308
weberi sumatrensis	305, 306
‡Caridinicola ..	231, 232, 290
indica	231
Carpophaginae	286
Carpophilus dimidiatus ..	100
dimidiatus contingens ..	100
obsoletus	100
Castalius elna	64
rosimon	64
Catapiestus indicus	528
Catharsius molossus ..	194
Catochrysops strabo ..	64
Celyphinae	184
Celyphus ? lucidus	184
scutatus	184
Centropus bengalensis ..	286
sinensis	285
Ceratina flavopicta	76
hieroglyphica	76
Ceriagrion cerinorubellum ..	346
coromandelianum	345, 346
erubescens	346
glabrum	346
melanurum	346
†olivaceum ..	345, 346
Ceropalidae	444
Ceropria induta	525
laticollis	525
subocellata	525
Certhia discolor	270
Certhiidae	270
Cervulus muntjac	92
Cethosia biblis	63
cyane	63
Cetoniinae	191
Chaerilus tricostatus ..	131
Chaetospania feae	142
Chaptia aenea	269
Charadriidae	287
Chelifer	127
javanus	127
superbus	127
Chelisoches	143
morio	143

	Page
†Chelisoches tigris	143
Chelisochidae	143
Chelonia	37, 38, 54
Cheritra freja	65
Chibia hottentotta	269
Chilioperipatus	484, 488, 489
Chimarrhornis leucocephalus	276
Chirixalus	33, 34
doriae	7, 18, 34
Chironomidae	150
Chironomus	151
Chirotonetes	354
Chloritis gabata merguiensis	537
Chloroclystes admixtaria	440
Chlorogomphinae	335
Choloroperla (Isoteryx)	353
†Chlorops maculipleura	188
Chloropsis hardwickii	267
Chrysididae	443, 447
Chrysis durga	447
Chrysoconops	152
Chrysopa alcestris	355
virgestes	355
Chrysophlegma flavinucha	282
Chrysopidae	354
Chrysops? designata	157
Chrysoloxum sexfasciatum	169
Cichlidae	491
Cidaria catenaria	440
Cirrhina reba	244, 249
Cirrhochroa aoris	63
Cissa chinensis	260
Cittocincla macrura macrura	278
Cladoctonus eggersi	414
Clarias assamensis	244, 252
Clausilia	360, 601
†aborensis	618, 619
annandalei	618, 619
insignis	614, 618
ios	618
†shimangensis	619
Clausilia (Oospira) philippiana	539
†Clausilia (Phaedusa) annandalei	538
insignis	538
Clausiliidae	538
Cleon	354
Clitumnus	417, 420
ablutus	415, 417
†aboricus	415, 417
artemis	420
operculatus	415
porrectus	420
†Cnemocryptus epistomatus	326
Coeliccia	339
†bimaculata	341
Coelostoma horni	625
orbiculare	625
stultum	625
Coenosia	173
Coleoptera	16, 99, 119, 121, 191, 197, 199, 411, 515, 519, 615, 623
Colias edusina	64
fieldii	64
Collembola	561, 567, 563
Coluber taeniurus	37, 48, 58
Colubridae	45, 286
Colubrinae	45
Columbae	286
Colydiidae	99, 104
Conosia irrorata	153
Copera vittata	343
Copera (Psilocnemis) annulata	342
*Copera (Psilocnemis) annulata stevensi	341
*Copera (Psilocnemis) vittata assamensis	342, 343
vittata atomaria	343
imbricata	343
serapica	343
vittata	343
Coprinae	193
Copris magicus	194
Coptotettix	313
indicus	311, 313
inflatus	313
†nullipennis	311, 313, 314
parvulus	311, 313, 314
†tumidus	311, 313
Corbitidinae	244
Cordulegasterinae	335
Corduliinae	339
Cordax	147
forcipatus	147
Corrodentia	351
Corvidae	260
Corvinae	260
Cotile riparia	280
sinensis	280
†Cotyloplana pilleata	463
Crabro	446
Crateropodidae	262
Crateropodinae	262
Cremastocephalus	564, 565
Cremastogaster biroi aitkeni	236
rogenhoferi	236
Criniger	268
flaveolus burmanicus	267
flaveolus flaveolus	267
Criotettix	311, 312
extremus	311
grandis	312
†maximus	311
†orientalis	311, 312
tricarinatus	312
Crocidura fuliginosa	87
rubricosa	87
Crocisa decora	77
elegans	77
emarginata	77
Crocodilus palustris	38
Crocothemus servilia	337
Crustacea	4
Crustacea Amphipoda	449
Crustacea Decapoda	289
Cryptaustenia	360, 548
†bicolor	548
Cryptogirasia	558, 559
rubra	559
Cryptogirasiae	558
Cryptolopha affinis	270
jerdoni	259
xanthoschista jerdoni	270, 271
xanthoschista xanthoschista	270
Cryptoperla	354

	Page
†Cryptoperla divergens	353
Cryptophagidae	99, 112
Cryptopinae	69
Cryptops	69
doriae	69
Cryptus	328
filicornis	328
himalayensis	328
Cubaris	465, 543
†caeruleus	467
†fragilis	468
†marmoratus	545
†robusta	468
Cucujidae	99, 107
Cucujus	107
†kempi	107
Cuculidae	285
Culcicapa ceylonensis	274
Culicidae	152
Cuniculina	418, 420
†perfida	415, 419, 420
†rotungina	415, 418
detrectans	419
Curvella	615
sikkimensis	615
suicata	615
Cutia nepalensis	266
Cyaniris dilecta	64
limbata placida	64
transpecta	64
Cyanops	259
asiatica asiatica	283
asiatica rubescens	284
franklini franklini	284
franklini ramsayi	284
Cyclophoridae	493, 540, 569
Cyclophorinae	493, 569, 570
Cyclophorus	493, 569, 577, 585
†aborensis	494
†oakesi	502
†Cyclophorus (Glossostylus) koboensis	495
†(Glossostylus) bapuensis	494
†(Glossostylus) sidiensis	494, 495
Cyclopodia horsfieldii	97, 190
Cycloryx	494, 503, 569
Cyclostomacea	575, 578
Cynthia erota	63
Cyornis hyperythrus	274
Cyphoderini	363, 566
‡Cyphoderopsis	566
†kempi	566, 567
Cyphoderus	561, 566
simulans	563, 566
Cyprinidae	32, 244, 250
Cyprininae	247
Cyrestis thyodamas	62

D

	Page
Dactylosternum hydrophiliodes	625
Danais aglea melanoides	61
melaneus	61
plexippus	61
Danio aequipinnatus	243, 244, 252
Dasypogoninae	157
Decapoda	290
Delias aglaia	63
Dendrocitta frontalis	261
Dendrocopus macii atrotus	283
macii macii	283
Dendrophis gorei	37, 48, 53
pictus	48
Dercas virhueli doubledayi	63
Dermaptera	3, 35
Derosphaerus (?) Encyalesthus impresus	528
†Derosphaerus rugosus	528
Desmogaster	366, 367
Diaparsis	326
caudata	326
†Diaphanes simulator	119
Diastrammena unicolor	329
Dichraeosis bacillus	521
capucinus	520
Dicronomyia marmoripennis	152
saltans	152
Dicruridae	269
†Dictysus filicornis	532, 533, 534
†latifrons	534
†nodicornis	533, 534
‡Dihangia	552
†koboensis	552, 553
Dilemera arctata	437
Dioctes apostata	325
Diopsinae	184
Diopsis indica	184
Dioryx	494, 503, 569, 570
†Diphyllus molestus	114
†odiosus	112
Diplacodes nebulosa	337
trivialis	337
Diplatyinae	135
Diplatys	135
Diplommatina	494, 569
†acutulus	576, 577
exilis	577
†miriensis	576, 577
†mucronatus	576
†perobesa	537, 540, 541, 576
Diplommatininae	494, 569, 576
Diploptera	443, 446
Dipsadomorphinae	49
Dipsadomorphus gokool	37, 49, 51
Dipsas gokool	49
Diptera	149
Diptera Pupipara	97
Discognathus	247
lamta	32, 243, 247
lamta nasutus	247
Discolomidae	99, 111
Dolichoderinae	237
Dolichopidae	157
Dorylinae	233
Dorylus (Alaopone) orientalis	233, 234
†(Alaopone) vishnui	233
Draco	41, 54
blanfordii	41
maculatus	37, 40, 41, 52
norvillii	41
Drawida	365, 366, 367
†decourcyi	368, 373
grandis	375
†kempi	366, 368, 376

Page

Drawida pellucida 366, 368, 369, 372, 373
pellucida bournei .. 369
*pellucida stewarti 368, 369, 372
†rotungana .. 368, 372
Dremomys 90
lokriah 90, 96
pernyi .. 85, 90, 96
†Drepanephora multimaculata 180
Drosophila 190
Drymochares 278
Dryonastes ruficollis .. 262
Dryophis prasinus 37, 50, 54
†Dryopidius montanus .. 116
Dryopidae 99, 115
†Dryops monticola .. 115
Ducula insignis griseicapilla .. 287
insignis insignis .. 286
Durgella .. 360, 555
†aborense 555
assamica 555
christianae 555
dekhanensis 555
levicula 556
rogersi 555
Durgellinae .. 360, 555, 559
Dynastinae 192
Dysantes elongatus .. 523
Dytiscidae 4

E

Ecacanthothripidae .. 201
Ecacanthothrips 201
sanguineus 201
Echinorhynchus gigas .. 98
Echinosoma 136
sumatranum 136
Echinosomatinae 136
Elapinae 50
Elaunon 146
bipartitus 146
Elis annulata 444
iris 444
Empriinae 239
Emydosauria 37, 38
Encyalesthus exularis 527, 528
†stevensi 527
Endomychidae 3
Endoplon 512
Entomobryidae .. 561, 563
Entomobryinae 563
Entomobryini .. 563, 566
Entozoa 98
Eoperipatus 471, 475, 476, 477, 478, 479, 482, 483, 484, 485, 486, 487, 489, 490, 491, 492
horsti 478
weldoni 484
Eparchus 146
insignis 146
Epedaninae 206
Ephemera 354
Ephemeridae .. 351, 354
Ephestia cantella 440
Epierus 124
abrogatus 124
amandus 124

Page

Epierus crenulatus 124
foederatus 124
monticola .. 124, 125
nemoralis 124
planiceps 124
punctulipennis 124
purus 124
rufescens 124
rusticus 124
simplex 124
sylvanus 124
Epimys rattus 90, 96
†Epiphragma kempi .. 155
†Epipsocus conspersus .. 351
costalis 352
Epirhyssa flavobalteata .. 323
Eristalis 169
Ethmostigmus 72
pygomegas 72
Euborellia 137
†aborensis 137
Eucorymus crassicornis .. 198
Eucyrtus splendens .. 532
Eudermaptera 140
Eulota .. 602, 613
Eulotella similaris 602
Eumelia rosalia 440
Eumenes arcuata 446
Eumenidae 446
Euparatettix 315
parvus .. 311, 315
tenuis .. 311, 315
Eupatorus hardwickei cantori .. 192
Euploea diocletianus .. 61
‡Eupomatias .. 569, 579
†oakesi .. 579, 580
†sibbumensis 579
Euponera (Brachyponera) nigrita 233
Eurypus 592
caseus 592
similis 592
Eurytrachelus 517
Eutermes ceylonicus .. 431
fletcheri 431
†moratus 431
†roboratus 430
Eutochia lateralis 526
Eutyphoeus .. 365, 366
†aborianus .. 368, 406
†kempi .. 368, 401
†koboensis 368, 404, 406, 407
magnus .. 368, 408
Exostoma davidi .. 243, 244, 252
labiatum .. 243, 244, 252

F

Falconidae 286
Falconinae 286
Fenenias albomaculatus .. 327
erythropus 327
Ferussacidae 539
Forcipula 139
pugnax 139
Forficulidae 145
Forficulinae 146
†Formicaleon bivittatum .. 355

Page

Formicidae 233
Fossores 443
Fringillidae 279
Fringillinae 279
Friona curvicarinata .. 327
†didymata 328
rufipes 328
variipes 328
Fruticola 606

G

Gagrella feae 203
feae-humeralis 203
lepida 203
Gagrellinae 203
Gallinae 287
Gallus ferrugineus 287
‡Galongia 553
†kempi 553
Gammaridea 453
Garrulax leucolophus belangeri 262
leucolophus leucolophus .. 262
moniliger 262
Gastropoda 537
Gavialis gangeticus .. 37, 38, 51
Gecarcinucinae .. 291, 302
Gecinulus grantia 282
Gecinus chlorolophus .. 282
Geckonidae 39
Gelsana 543
Geoemyda 54
Geoplanidae 462
Geotelphusa .. 230, 290, 298, 301
Geranomyia notatipennis .. 152
Girasia 360, 550, 551, 554, 556, 557, 558
cacharica .. 551, 552
†gladstonei 552
hookeri .. 551, 553, 558
†maculosa 551
rubra 558
rubrum 558
Girasia (Ibycus) sikimensis .. 552
Glessula .. 359, 360, 585 601
†aborensis 618
botellus .. 539, 616, 617, 618
†oakesi .. 615, 616, 617
ochracea .. 616, 617
orophila 616
Globitelphusa 291
†Globitermes audax .. 432, 433
sulphureus 434
Glossostylus 569
Glycyphana minima 191
nepalensis 191
Glyphodes unionalis 441
Glyptosternum 32
Gnapholoryx velutinus .. 518
Gomphinae .. 335, 340
Gonocephalum depressum .. 520
pubeus 520
ruficornis 520
subspinosum 520
Gonypeta irina 416
Goryphus fuscinervis .. 327
maculiceps 327
Grammatoptila striata .. 262

Page

Grammatoptila striata austeni 262, 263
Grandala 278
Graptomyza brevirostris .. 167
ventralis 167
*ventralis nigripes .. 167
Graucalus layardi 272
macii macii 272
Gryllacridae 329
Gryllacris genuali 330
†gravelyi 329
Gymnodactylus himalayicus .. 36
khasiensis .. 37, 39, 51
Gymnopleurus assamensis .. 193
sinuatus 193
Gynacantha 340
hyalina 340
khasiaca .. 339, 340
khasiaca nigripes .. 340

H

Habropoda fulvipes 78
Haemaphysalis 98
bispinosa 98
gigas 98
koeningsberneri .. 97
Haematospiza indica .. 279
Halictus 75, 83
funebris 75
pulchriventris 75
rufo-zonatus 75
Hamaxas 144
dohertyi 145
feae 145
†kempi 144
nigrorufa 145
semiluteus 145
Hapalus .. 601, 615
Haptoncus ocularis 100
tetragonus 100
Harpactes 260
erythrocephalus .. 285
Hebomoia glaucippe .. 64
Hectarthrum trigeminum .. 111
Hedycryptus filicornis .. 328
Helicarion gigas 558
helenae 592
idae 592
Helecarioninae .. 360, 548, 558
Helicidae 359, 360, 493, 505, 537, 569, 602, 604
Helix 537, 613
catostoma .. 601, 612, 613, 614
dámsangensis .. 610, 614
huttoni 603, 604, 605, 606, 608, 613
huttoni vadleyi 609
merguiensis 537
orbicula .. 605, 606
(Plectotropis) huttoni .. 607
Helochares 627
Helochares (Hydrobaticus) lentus 626
†kempi 626
minutissimus .. 627, 628
Hemerobiidae 354
Hemicordulia asiatica .. 339
Hemidactylus bowringii 37, 39, 51
brookii .. 37, 39, 40

Page

Hemidactylus frenatus 37, 39, 51, 57
gleadovii 39
nepalensis 40
†platyceps 56
platyurus .. 37, 40, 52
reticulatus 57
subtriedroides 40
Hemiplecta auriettae .. 582
textrina 582
theodori 582
Hemiptera 82
Hemipus capitalis 271
Hemixus 268
flavala flavala 267
maclellandi maclellandi .. 268
Henicurus leschenaulti .. 276
schistaceus 276
Hestina nama 62
Heterolocha falconaria .. 439
Heteromera 3
Heteroneurinae 175
Hierodula 416
crassa .. 415, 416
Hinulia 43
Hirudinidae 280
Hister (Atholus) philippinensis 123
Histeridae 121
Holkeion anceps 537
Hololepta aequata 121
batchiana 121
elongata 121
indica 121
laevigata 121
procera 121
†Holophygus rugosus .. 111
Hoplia 192
Hoplosternus 192
nepalensis 192
Hormurus australasiae .. 133
Humbertiella 416
Hyalomma syriacum .. 97
†Hyberis similis 106
Hydraena bihamata .. 624
cirrata 624
†dimorpha .. 623, 624
indica 624
maculicollis 624
Hydrochus annamita .. 624
binodosus 624
lacustris 624
latitans 624
opacus 624
violaceomicans 624
Hydrophilidae 623
Hydrophilus gibbus .. 623
Hydropsyche 356
asiatica 356
Hydropsychidae 355
Hydropsychodes 356
Hydrophila 539
Hylorana granulosa .. 9
Hymenoptera 75, 81, 82, 83, 170, 233, 239, 323, 443, 444
Hymenoptera Anthophila .. 75
Hypena occata 439
Hyperythra lutea 439
Hypoctonus .. 127, 128

Page

Hypoctonus dawnae .. 128
wood-masoni 128
Hypolimnas bolina .. 62
Hypolycaena erylus .. 65
Hypothymis azurea .. 275

I

Ianthia hyperythra .. 277
rufilata 277
Icaria artifex 447
ornaticeps 447
variegata 447
Ichneumonidae 83, 323
†Idgia arbori 199
foveifrons 199
Ilerda epicles 65
Ipidae 411
Ipidia variolosa 100
Irdex 141
nitidipennis 141
Iridopteryx 416
irina .. 415, 416
Ischnura rufostigma .. 344
Ixalus 33, 34
annandalei .. 7, 16, 33, 34
†argus .. 7, 16, 33
asper .. 7, 16, 27, 33, 34
assamensis 35
horridus 25
tuberculatus 7, 16, 17, 27, 29, 33
Ixodes acutitarsis 98
angustus 97
gigas 98
Ixodidae 97, 98
Ixulus flavicollis 266
occipitalis 266

J

Japalura 54, 55
andersoniana .. 52, 58, 357
†bengalensis 57, 58
planidorsata 55, 58
variegata 55, 58
yunnanensis 57
Junonia iphita 62

K

Kachuga 38
intermedia 38
tectum .. 37, 38, 51
Kallima inachus 62
Kalocrania 135
picta 136
siamensis 135
Khasiella .. 359, 593
†dinoensis .. 590, 593
Kolbea punctata 352
Kosmetor 146
brahma 146

L

Labeo angra 244, 249
dyochilus 244, 249
gonius 244

	Page
Labia	142
curvicauda	142
mucronata	142
Labiduridae	137
Labidurinae	139
Labiidae	140
Labiinae	142
Labus humbertianus	446
Lacertidae	42
Lacertilia	37, 39
Lachesis gramineus	51
monticola	50
Lachnosterna	192
serricollis	192
sikkimensis	192
Laemophloeus proximus	110
†semilaetaneus	108
†subturcicus	109
Lagocheilus	494, 569
†daflaensis	574, 575
†oakesi	574
†sikhimensis	574, 575
tomotrema	575
Lamellicornia	191
Lampides bochus	64
elpis	64
pura	65
Lampito	389
Lamprophorus	143
kervillei	143
Landouria	604, 611
†aborensis	605, 611, 614
†damsangensis	605, 607, 609, 611, 614
dawnaensis	614
†hengdanensis	605, 608, 609, 610, 611, 614
huttoni	605, 606, 614
radleyi	605, 609, 610, 614
Laniatores	204
Laniidae	271
Lanius tephronotus	271
Lariscus	90
Lauxania	176
†flavicornis	179
Lea arcuata	149
Lepidocephalichthys guntea	243, 247
Lepidocyrtus	563
†caudatus	563
imperialis	563
maximus	563
pictus	563
Lepidoptera	61, 437
Leptaulax	517
bicolor	515, 517
cyclotaenius	517
cyclotaenius himalayae	515, 517
dentatus	515, 517
roepstorfi	515, 517
Leptocircus curius	63
Leptogenys (Lobopetta) assamensis	233
Leptogomphus	340
Leptoscopha	516
lignicola	531
†pulchra	530, 531
spissicornis	530, 531

	Page
Lepus	90
peguensis	91
ruficaudatus	90
Lethe chandica	61
Leuctra indica	353
Libellulidae	336
Libellulinae	336
Libnotes fuscinervis	153
punctipennis	153
Limicolae	287
Liminites procris	62
Limnaea (Limnaea) acuminata	539
Limnaeidae	539
Limnebius	626
†Limnophila claripennis	153
†quartarius	154
†Limnophora kempi	172
†Limnosina magna	173, 174
subtinctipennis	174
Lioptila annecteus	265
pulchella	265
Liopygus famelicus	122
Liothrix lutea	266
Liotrichinae	266
Liris aurata	444
ducalis	445
Lispa ? pallitarsis	172, 173
Litargus	115
Lithurgus dentipes	76
Litocerus khasianus	197
paviei	197
Lonchaea	179
aenea	179
†montana	178, 179
Lopaphus baucis	422
Loxura atymnus	65
Lucanidae	515, 517
Lucilia	171
Lumbricidae	367
Luxiaria contigaria	439
Lycaenesthes emolus	64
†Lychas gravelyi	129, 130
mucronatus	128
rugosus	130
scutilus	129
Lygosoma albopunctatum	52
†courcyanum	37, 43, 52
indicum	37, 43, 52
zebratum	43
Lygosoma (Hinulia) cacharense	43
Lyprops curticollis	531
Lyriothemis acigastra	336

M

Mabuia macularia	37, 43, 51
Macaca assamensis	85
rhesus	85
Macaria emersaria	439
†Macrobunus aborensis	206
†longipes	205
singularis	205, 206
Macrochlamyinae	359, 581, 588
Macrochlamys	359, 363, 547, 581, 584, 585, 586, 588, 590, 592
†albulus	587
†bapuensis	583, 584

	Page
Macrochlamys beata	590
†burkilli	586
causia	582
chaos	582
consepta	581
†hardwickei	582, 583
hardwickei politulus	582
hippocastaneum	584
hypoleuca	582
indica	582, 583
†luyorensis	587
†murdochi	587
nebulosa	582
notha	582
noxia	582
†psittacinus	584
†rotungensis	584, 586, 589
rotungensis var.	585
salweenensis	582
†shimangensis	584
Macrolinus	516
sikkimensis	515, 516
Macromeris	444
honesta	444
Macrones affinis	253
†merianiensis	244, 253
†montanus dibrugarensis	244, 254
tengara	244, 255
vittatus	244, 255
Macronota nigricollis	191
Macropeza	150
gibbosa	150
javanensis	150
Macrura	4
Malacodermidae	119
Mantidae	415
Mantis aridifolia	416
chloreude a	416
Mantis (Mantis) maculata	416
servillei	416
Mazarredia aptera	314
Mecocerus allectus maculatus	197
Medaura austeni	422
Megalaema	259, 260
marshallorum marshallorum	283
Megalophrys 16, 20, 21, 27, 28, 29, 30, 34	
hasseltii	29
heteropus	20, 29
†kempi	7, 20, 29, 34
major	7, 16, 29, 34
montana	28, 29, 30
parva	29, 31, 32
Megascolecidae	367
Megascolides	365, 366, 367
†oneilli	368, 377
Megauchenia angustata	100
quadricollis	100
Melanitis leda ismene	62
phedima bela	62
Melanochlora sultanea	267
Melanopa atrata	203
varians	203
Melanostoma mellinum	164
orientalis	164
scalare	164
univittatum	164
Melcha maculiceps	327
Melittophagus swinhoei	284
Melolontha argus	191
flabellata	192
guttifera	192
indica	192
Melolonthinae	192
†Menephilus aborensis	529
†medius	529
Menexenus	421
†rotunginus	415, 421
semiarmatus	422
Meranophus bicolor	237
Merganser castor	288
Merginae	288
Meromyza	188
Meropes	284
Meropidae	284
Merula atrogularis	278, 279
ruficollis	278, 279
Mesarmadillo	543, 544
Mesogramma	163
Mesoperipatus	486, 489, 496, 492
Mesostenoideus albomaculatus	527
erythropus	527
Metapodontus impressus	517
‡Metathyreotus	206
†aborensis	206, 207
†kempi	207
Metisolabis	139
caudelli	139
Metopius rufus	324
Micrixalus	11, 33, 34, 54
†borealis	7, 10, 12, 29, 33
†Microchrysa albitarsis	156
Microcichla scouleri	276
Microgaster luteus	323
Micropezinae	186
Microserica	193
†viridicollis	192
‡Mikiria	611
†diyungensis	611, 612, 614
Miltochrista perpallida	437
undulosa	438
‡Minyongia	556, 559
†kempi	556, 559
†Mixogaster vespiformis	169
Mollusca 209, 359, 493, 505, 537, 547, 569, 581, 601	
Molpastes haemorrhous bengalensis	268
haemorrhous burmanicus	268
Moniligaster	410
grandis	410
Moniligastridae	366, 367
Monticola	279
†Moringua hodgarti	244, 255
Moringuidae	255
Motacilla alba	280
alba ocularis	280
Motacillidae	280
Muridae	93, 94, 96
Mus rattus	90
Musca domestica	171
Muscicapidae	274
Muscicapula maculata	87
Muscidae	170
Muscidae verae	170

	Page
Muscinae	170
Mustela flavigula flavigula ..	86
flavigula typica	86
Mutilla	443
blanda	443
cassiope	443
Mutillidae	443
Mycalesis meda	62
perseoides khasia ..	62
visala	62
Mycetophagidae	99, 115
Mycetophilidae	149
Myiophoneus temminckii eugenii	278
temminckii temminckii ..	278
Myophoneus	259
Myopopone castanea maculata	233
Myrmemorpha	188
Myrmicinae	234
Myronides	422
baucis ..	415, 422, 423
†dawnanus ..	.. 415, 422
Myxostoma ..	493, 569

N

Nacaduba bhutea	64
nora	64
noreia	64
Nala	139
nepalensis	139
Nandidae	256
Nandus nandus ..	244, 259
Nannophya pygmaea ..	337
Naxa textilis	440
Neanias jacobsoni	333
†kempi	332
pupulum	333
Neanura ..	561, 562
muscorum	563
pudibunda	562
Neanurinae	561
Nectariniidae	281
Nectariniinae	281
Nemachilichthys	245
Nemachilus	245
rupicola	31, 32
Nemorhaedus bubalinus ..	91, 92
Nemoura	353
Neoperla	354
Neopithecops zalmora ..	64
Neptis hordonia ..	62
hylas varmona ..	62
soma	62
Nerius annulipes	184
†obscurus	183
tibialis	184
Neurobasis sinensis	340
Neuroptera	4, 354
Neurothemis	338
fulvia	338
intermedia ..	337, 338
intermedia degener ..	337
tullia	337
Nicoria tricarinata	51, 54
Niltava macgrigoriae ..	274
sundara	274
Nitidulidae	99, 100
Nodaria externalis	439
innocens	439
Nomia aurifrons	76
terminata	76
Nomioides	83
Notodela	278
Notogonia	444
Notoscolex ..	365, 366, 367
†stewarti ..	366, 368, 382
striata	383
striatus ..	365, 368, 380
Nuria danrica ..	244, 251
Nyctemera coleta	437
varians	437
Nycticejus ornatus	87

O

Odonata ..	4, 335, 336
Odontomachus monticola ..	233
Odontotermes	428
assamensis	428
feae .	428, 430
†gravelyi ..	428, 429
microdens	428
Odynerus fragilis	446
icaroides	446
Oecophylla smaragdina ..	237
†Oedematopsis aborensis ..	324
apollos	324
ops	324
Oegista	613
Oligochaeta ..	365, 410
Oligodon erythrorachis	37, 48, 53
Oncopodidae	207
Oniticellus vertagus ..	194
Onitis philemon	194
Onthophagus	195
luzonicus	195
taraudus	194
†triceratops	195
Onychargia vittigera ..	343
Onychophora 471, 473, 487, 488, 490	483, 488
Ooperipatus ..	360, 615
Opeas	37, 44
Ophidia	256
Ophiocephalidae	244, 256
Ophiocephalus gachua	37, 42, 52, 357
gracilis	172
Ophyra anthrax	171
caerula	203
Opiliones	146
Opisthocosmiinae	484
Opisthopatus	484, 488
blainvillei ..	488
cinctipes	451, 452
Orchestia ..	449, 451, 453
parvispinosa ..	451
Orchestoidea	244, 247
†Oreinus molesworthi	243, 244, 247
plagiostomus ..	243, 244, 247
richardsoni ..	243, 244, 247
sinuatus	273
Oriolidae	273
Oriolus melanocephalus ..	273
trailii	201
Oromothrips sanguineus ..	

	Page
Orthetrum glaucum	336
pruniosum neglectum	336
sabina	336
triangulare	337
Orthoptera	311
Orthotomus sutorius	270
Oscinella	190
Oscininae	188
Oscinis	190
obscuripes	190
Osphromenidae	257
Osphromenus nobilis	244, 257
olfax	257
Ostariophysi	244
Otocompsa emeria emeria	268
flaviventris	269
Otostigminae	69
Otostigmus	69
†burn-murdochi	69
insularis	70
rugulosus	71
scaber	71
Oxytes	547
†aborensis	595, 597
blanfordi	595
cycloplax	594
†oglei	594
oglei *var.*	594
oslei	359
oxytes	359, 594
pollux	595
shanensis	595
†siyomensis	595

P

	Page
Pachycondyla (Ectomomyrmex) astuta	233
javana materna	233
Pachylophus	189
rufescens	188, 189
Palaemon	4, 303
dayanus	304
hendersoni	289, 290, 303, 304, 305
Palaemon (Parapalaemon ?) hendersoni	303
Palaemonidae	303
Palaeornis fasciatus	286
Palpatores	203
Palpopleura sexmaculata	337
Paludestrinidae	540
Paludina	540
Paludomus	537
†rotungensis	537, 539, 540
Pandanus	4
Pandarus odoratissimus	102, 104
Pangshura cochinchinensis	38
Pantoporia zeroca	62
Papilio helenus	63
mennon agenor	63
paris	63
philoxenus polyeuctes	63
polytes romulus	63
protenor euprotenor	63
Paradoxornithinae	261
Paragus rufiventris	157
serratus	158
Paraliris faceta	445
Paraperipatus	486, 488, 489
†Paraphytus hindu	193, 194
ritsemae	194
Paratelphusa	302
Paratelphusa (Barytelphusa) feae	301
harpax	289, 302
Paratenodera	416
‡Parepierus	124
amandus	124, 125
†corticicola	124, 125
Pareronia avator	64
Parinae	261
Parmarion ? rubrum	557, 558
Paromalus pardali	125
tcibodae	125
vermiculatus	125
Paronela	561
Paronella	563, 564
borneri	566
†crassicornis	564
dahlii	566
†elongata	565
†flava	565
Paronellini	563, 564, 565, 566
Parorchestia	451
Parus	261
major	261
major atriceps	261
major cinereus	261
Passalidae	3, 515
Passandridae	99, 111
Passer rutilans	280
rutilans cinnamomea	280
debilis	280
Passeres	260
Pectinibranchia	539
Pedipalpi	127, 128
†Pelitnus aborensis	207
annulipes	207
Pellorneum mandellii	263
mandellii minus	263
Pelmatoplana aurantia	462
sondaica	463
Pelobatidae	4, 20, 28
Percesoces	256
Perciformes	256
Pericrocotus fraterculus	272
solaris	272
speciosus	271, 272
Perionyx	365, 366, 389, 398
†aborensis	368, 392
†annulatus	368, 372, 386
arboricola	365
†depressus	365, 368, 377, 394
excavatus	368, 386, 399
†foveatus	368, 396
†kempi	368, 389, 399
†koboensis	368, 389, 391, 396, 399
sansibaricus	392
Peripatidae	472
Peripatoides	483, 486, 488, 489, 490, 491, 492
novae zealandiae	478, 487
Peripatopsis	484, 489
cinctipes	483

Page

Peripatus 471, 472, 473, 474, 476, 478, 481, 483, 486, 488, 489, 490, 491, 492
ceramensis 488
edwardsii 483
sedgwicki 483
Perlidae 353
Petaurista magnificus .. 88
Petrophila .. 259, 279
erythrogaster 279
solitarius pandoo .. 279
Phalangidae 203
Phalangodidae 206
Phasianidae 287
Phasmidae .. 415, 417
†Pheidologeton (Aneleus) aborensis .. 234, 236
Pheretima .. 365, 366, 367
anomala 366
heterochaeta .. 366, 368, 399
lignicola .. 366, 368, 399
Philaematomyia insignis .. 171
Philopotamus 355
Philoscia .. 455, 466
coeca 465
Phlocopemon acuticorne .. 198
Phoenicophainae 285
Phricotelphusa 291
Phrynoderma 34
asperum 18
†moloch 7, 18, 21, 25, 29, 34
Phyllium 417
celebicum .. 415, 417
Phymatocerinae 240
Pici 282
Picidae 282
Picinae 282
Picumninae 283
Pieris canidia 63
Piletocera aegimiusalis .. 440
Pipistrellus abramus .. 87
Pitta 259
nepalensis nepalensis .. 282
Pittidae 282
Placocephalus superbus 460, 462
Plagiolepis longipes .. 237
Plagiopholis 45, 54
Planaria .. 317, 319
†aborensis 317
†kempi .. 319, 320
subtentaculata 317
venusta .. 318
vitta 318
Planispira 360
delibrata fasciata .. 360
Planorbis exustus 539
(Gyraulus) himalayanus .. 539
Platanista gangetica .. 38
Platycnemis 341
†Platydema alticornis .. 524
annamitum 524
†auremaculata .. 523, 524
subfascia 524
Platylister 123
Platypodidae 413
Platyptilia taprobanes .. 441
Platypus 414
†cupulifer 413

Page

Platysoma confucii .. 123
†crassum 123
silvestre 123
(Platylister) cambodjensis 122
dissimile 122
†kempi 123
marseuli 122
odiosum 122
Pleciomyia melanaspis .. 150
Plecoptesa 353
Plectopylis 360, 493, 505, 508, 512
brachyplecta 512
brahma .. 509, 511
emigrans 513
fruhstorferi 513
hirasei 513
macromphalus 507
muspratti 508
oglei .. 511
pinacis .. 506, 508
plectostoma .. 507, 509
pulvinaris 513
sowerbyi .. 507, 509
vulvivaga 602
†(Chersaecia) bedfordi .. 510
†williamsoni .. 509
†(Endoplon) aborensis 511
†(Endothyra) gregorsoni .. 506
†miriensis .. 507, 508
†oakesi 505
†(Sinicola) babbagei 512, 513
Plectotropis 360, 601, 602, 606, 613
akoutongensis 602
austeni .. 537, 538, 614
catostoma 602
clarus 602
emensus 602
grumulus .. 601, 602
huttoni 602
huttoni savadiensis .. 602
mitanensis 602
oldhami 602
orbicula 602
pudica 601
radleyi 602
rotatoria 602
sumatrana .. 602, 612
tapeina 185
Plilona dunlopi 279
Ploceidae 438
Plusia orichalcea .. 365, 366, 367
Plutellus .. 368 384
†aborensis 561
Poduridae 447
Polistes hebraeus 446
Polybia indica 446
orientalis .. 37, 46, 53
Polydontophis collaris .. 65
Polyommatus boeticus .. 9
Polypedates afghana .. 237
Polyrhachis dives 237
halidayi 237
laevissima 237
mayri 237
striatorugosa 237
tibialis .. 494, 569, 580
Pomatias ..

	Page
Pomatiasinae ..	494, 569, 577
Pomatorhinus ferruginosus ..	263
Pompilidae	444
Pompilus	444
Ponera confinis	233
confinis wroughtoni ..	233
Ponerinae	233
Porcellionides pruninosus ..	465
Porifera	67
Poritia hewitsoni tavoyana ..	65
Potamiscus	230, 289, 290, 291, 296
Potamon	229, 230, 290, 291, 297
adiatretum	229
andersonianum ..	229
annandalei ..	291, 294
manii	229
pealinum	293
sikkimense	291, 292, 294, 295, 296, 297
superciliosum	229
tumidum	291
(Acanthotelphusa) feae	289, 301, 302
(Geotelphusa) adiatretum	289, 298, 299, 300, 301
**var.* lophocarpus	289, 299, 301
†superciliosum	289, 300, 301
†(Potamiscus) aborense	289, 292, 294, 295, 296, 297
annandalei.. ..	293
†decourcyi	289, 291, 292, 293, 294
†obliteratum	289, 292, 294, 295, 296, 297
Potamonidae ..	290, 291
Potamoninae ..	290, 291
Pratincola maura	276
torquata przewalskii ..	276
Presbytes	85
entellus	85
schistaceus	85
†Pria diluticollis	102
†mirmidon	101
†Prisma aborense ..	209, 222
Pristomyrmex brevispinosus ..	237
Prodenia littoralis	438
Prosobranchia	493
Prosopis	83
Protaetia fusca	191
inanis	191
inanis cuprea	191
Protanura ..	561, 562
citronella	562
kraepelini	562
spinifera	562
Protodermaptera	135
Psalinae	137
Psalis	138
dhorni	138
femoralis	138
Psammodynastes pulverulentus	37, 50, 54
Psenulus	446
pulcherrimus	446
Pseudagenia	444
tincta	444
Pseudagrion	344
Pseudaustenia ater	592
Pseudecheneis	32
sulcatus ..	243, 244, 255
Pseudergolis wedah.. ..	63
Pseudeutropius atherinoides	244, 245
garua ..	244, 255
Pseudoblaps javana ..	520
†Pseudokaliella annandalei ..	596
nevilli	597
†sadiyaensis	597
Pseudomantis haanii ..	416
maculata	416
Pseudominea castaneiceps ..	264
Pseudopomatias ..	569, 577, 579
grandis	578
himalayae	578
†luyorensis	578
pleurophorus	578
†siyomensis	578
Pseudoxenodon	54
macrops ..	37, 49, 53
Psila kempi	187
Psilinae	187
Psilopus	157
Psittaci	286
Psittacidae	286
Psocidae	351
†Psocus nirvanus	352
†Psychoda notatipennis ..	151
Psychodidae	151
Pterocyclos	494, 499, 502, 569, 570
†aborensis	498
†brahmakundensis ..	499
magnus	500
†miriensis ..	498, 500
†spiramentum ..	498, 500
Pteromys magnificus ..	88
Pteropus giganteus leucocephalus	81, 97
leucocephalus	87
medius	87, 90
Pterutheus melanotis ..	267
Ptyctolaemus	41, 54
gularis ..	37, 39, 41, 52
Pulmonata	537
Pupina	573
Pupipara	190
Pygidicranidae	135
Pygidicraninae	135
Pygoplus trifasciatus ..	205
Pyrellia violacea	170
Pyrocoelia lampyroides ..	119
Pyrrhopicus pyrrhotes ..	283

R

Rahula ..	599, 603
†aborensis ..	597, 598, 599
†burrailensis	598
†dihingensis ..	597, 598
†koboensis ..	598, 599, 600, 621
munipurensis	599
Rana ..	11, 24, 31, 32
afghana	7, 9, 21, 24, 31, 32, 33
alticola	7, 8, 9, 21, 22, 33, 35
blanfordii	8
cyanophlyctis ..	7, 32, 35

Page

Rana erythraea 9
†gerbillus .. 7, 10, 33
granulosa .. 7, 9, 33, 35
jerboa 10
latopalmata 9
liebigii 7, 8, 21, 28, 31, 32
limnocharis .. 7, 8, 29, 33
tenasserimensis .. 10, 11
tigrina .. 7, 8, 32, 35
tytleri 9
Ranidae .. 4, 7, 21, 32
Rapala schistacea 65
Raparna digramma .. 438
Raphaulus .. 494, 569, 570
†aborensis .. 571, 572, 573
assamicus 541
assamica .. 570, 571
blanfordi .. 573, 574
†oakesi 572
†shimangensis .. 572, 573
†yamneyensis 571
Raptomphalus .. 502, 503, 569
Rasbora daniconia 252
rasbora 252
*rasbora kobonensis 244, 251
Rathouisiidae 209
Ratufa gigantea 88, 93
macruroides 88
melanopepla 88
Reptilia .. 5, 37, 357
Rhacophorus .. 16, 27, 33
bimaculatus .. 7, 12, 33
leucomystax 14, 24
maculatus .. 14, 21, 24, 25
maculatus himalayensis 7, 14, 24, 33
maculatus leucomystax .. 14
maximus .. 7, 12, 33
†microdiscus .. 7, 13, 33
†naso .. 7, 12, 16, 27, 33
reinwardtii 24
tuberculatus .. 7, 14, 33
Rhamphidia 153
Rhaphedophora brunneri .. 329
Rhingia binotata 166
sexmaculata 166
Rhinocypha quadrimaculata .. 341
Rhinia limbipennis 170
Rhinopalpa polynice birmana .. 62
Rhinosciurus 90
Rhipidura albicollis .. 260
albicollis albicollis .. 276
*albicollis kempi 275, 276
Rhopalocampta benjaminii .. 65
Rhopodytes .. 260, 283
tristis 285
Rhyacornis fuliginosus .. 277
Rhynchium argentatum .. 446
Rhynchomyia 170
Rhynchophora 3
Rhynchota 16
Rhyothemis 383
curiosa .. 338, 339
fulgens 339
obsolescens 339
plutonia 338
pygmaea 339

Page

Rhyothemis variegata .. 338
Rhysida 71
cuprea 72
immarginata 71
nuda 71
petersi 72
stuhlmanni 72
†Rhysodes alticola 99
intrusus 100
longiceps 100
Rhysodidae 99
Rioxa 185
‡Rotungia .. 590, 591
†williamsoni 590
‡Rotungus 543
†pictus 544
Rutelinae 591
Ruticilla aurorea leucoptera .. 277
frontalis 277

S

Saccobranchus fossilis 244, 255
Saedjahus 543
Salea 34, 54
austeniana 52
Salius praestabilis 444
Sapromyza 176
histrio 176
Sapromyzinae 178
Saprosites marchionalis .. 196
Sarama .. 359, 363
kala .. 362, 363
†kempi .. 359, 362, 581, 591
Sarcophaga 170
Sarika 582
concepta .. 614, 618
consepta 537
Sasia ochracea 283
Saturnia pyretorum .. 437
Sauris abortivata 440
lineosa 440
Scaeorhynchus ruficeps ruficeps 261
Scelimena .. 311, 312
india 311
Sceliphron madraspatanam .. 445
†Schedorhinotermes magnificus 425, 426
malaccensis 426
Schizopygopsis stoliczkae .. 249
Sciara 149
orientalis 149
Scincidae 43
Sciomyza 176
†ocellata 176
quinquevittata 176
†septemlineata .. 178
strigata .. 176, 178
trypetoptera 176
Sciomyzinae 176
Sciuridae .. 93, 94, 96
Sciuropterus alboniger .. 88
Sciurus 90
atrodorsalis 89
bicolor 88
castaneoventris .. 88
castaneoventris griseopectus .. 89
erythraeus 88

	Page
Sciurus erythraeus erythrogaster	88
erythraeus intermedius	89, 93, 94, 97
erythrogaster	88
giganteus	88
gordoni intermedia	89
griseopectus	89
locria	90
lokriah	90
macclellandi barbei	89
macclellandi manipurensis	89
macclellandi novemlineatus	89
macclellandi typicus	89
pernyi	90
stevensi	85, 89, 95
Scleron ferrugineum	520
Scolia	443
floridula	443
kirbyi	443
sikkimensis	443
Scoliidae	443
Scolopendra	72
†mazleii	72
morsitans	73
Scolopendridae	69
Scolopendrinae	72
Scombresocidae	256
Scorpiops binghami	133
longimanus	132, 133
montanus	133
Selandriinae	241
Seopsis	353
Sepsinae	185
Sepsis bicolor	185
coprophila	185
indica	185
viduata	185
Serica	193
Sericomyia	169
†eristalioides	167
Serranidae	256
†Sesara globosa	598, 599
Setenis	527
crenatostriata	526
dentipes	527
indosinica	526
†kempi	526
laevis	526
Sibia picaoides	264, 265
Sibiinae	264
Silsila fulvipes	327
Siluridae	252
Silvanus lateritius	111
Sima rufonigra	234
Simotes albocinctus	37, 48, 53
juglandifer	48
Simplicia niphona	439
Simuliidae	150
Simulium	150
indicum	150
Sinicola	505, 573
Siphia	274
albicilla	274
parva	274
Sirella	359
Sitta cinnamoneoventris	259, 269
neglecta	259, 269
Sittidae	269
Siva cyanuroptera	266
Sivella	360, 585
castra	603, 604
*castra kobonensis	604
Solenosoma	145
birmanum	145
Sorex fuliginosus	87
Speculitermes cyclops	431
Sphaerophoria scutellaris	164
Sphecodes	75
Sphegidae	444
†Sphegina tristriata	165
Spheniscomyia sexmaculata	185
Sphex umbrosus	445
Spilogaster	173
Spiraculum 359, 494, 499, 500, 501, 502, 569, 570, 581	
andersoni	501
†kempi	496, 467, 501
†luyorensis	500, 502
†minimum	501, 502, 581
nevilli	497, 501
†oakesi	496
†planum	497
†putaoensis	500, 501, 502, 581
Spongilla crassissima	67
decipiens calcuttana	67
Spongilla (Eunapius) crassissima crassior	67
Spongilla (Euspongilla) proliferens	67
Spongophorinae	140
Spongovostox	140
†aborum	140
kristenseni	141
luteus	140, 141
Stachyris chrysaea	264
nigriceps	264
Staphylinidae	3
Statilia	416
haanii	415, 416
maculata	416
Stenopelmatidae	329
Stenopsyche griseipennis	355
Stenopterina aenea	183
eques	183
†flavofemorata	182
Sternolophus (Neosternolophus) tenebricosus	628
Stibocheona nicea	62
Stictolissonota foveata	323
Stegmus niger	446
Stoparola melanops	274
Stratiomyidae	156
Streptaulus	569, 570, 573
blanfordi	570
†luyorensis	573
†miriensis	573, 574
Streptostele (Elma) nevilli dubia	593
Stromboceros	241
Stromboceros (Neostromboceros) congener	241
*congener tarsalis	241
Strongylium cultellatum	535
†curvicomis	535
sobrinum	534, 535

	Page
Strongylium †stevensi ..	534
westermanni ..	535, 536
Sturnidae	273
Sturnopaster	260
Sturnopasta contra	273
contra superciliaris ..	273
Sufetula sunidesalis	441
Sumniva	543
Sus cristatus	92, 98
jubatus	92
Sylviidae	270
Symbrenthia hippoclus khasiana	62
Sympetrum orientale ..	338
Syngamia floridalis	441
Sypna quadrisignata ..	438
Syrphidae ..	157, 164
Syrphus ..	163, 164
†aeneiirons ..	159, 160
balteatus	159
cinctellus	163
cinctus	163
†fulvifacies	161
†maculipleura	162
ribesii	162
†transversus	160
vitripennis	162

T

Tabanidae	157
Tachininae	170
Tachydromus sexlineatus	37, 42, 52
Tachysphex	444
‡Tadunia	588
†muspratti	588
†oakesi ..	588, 589
Taeniocerus	515
bicuspis	515
Taenioglossa	539
Talitridae ..	451, 452
Talitrus	451
Talorchestia ..	451, 452
†kempi .. 449, 451,	452, 453
martensii	452
novaehollandiae ..	452
parvispinosa ..	452, 453
Talpa leucura	86
micrura	86
Tamiops macclellandi ..	89, 95
Taphrospira	359
Tapinoma melanocephalum ..	237
†Tarphiosoma kempi ..	104
Tearchus annulipes ..	532
Technomyrmex albipes ..	237
Temnocephala .. 229, 230,	231, 232
chiliensis	232
fasciata	231
madagascareensis ..	231
semperi .. 229, 230,	231, 290
Temnocephalidae ..	229, 230
Temnocephaloidea	232
Tenebrionidae ..	519, 526
Tenebrioninae	530
Tenodera	416
aridifolia ..	415, 416
Tenthredinidae	239
Terias hecabe	64
silhetana	64
†Termes annandalei ..	427
malaccensis	428
Termitidae	425
Tetriginae	311
Teucholabis biannulata ..	153
Themara maculipennis ..	185
†Themus aborensis ..	119, 120
Theopompa	416
servillei ..	415, 416
Thermesia rubricans ..	438
Tholymis tillarga	339
Tho adonta	312
spiculoba ..	311, 312
Thraulus	354
Thymaris clotho	326
Thyreotus	206
bimaculatus	206
Thysanoptera	201
Tiara (Melanoides) variabilis ..	539
Tiara (Tarebia) lineata ..	539
Tiaridae	539
Tiberioides	516
austeni ..	515, 516
Timeliinae	263
Timomenus	147
aeris	147
Tinda indica	157
Tinnunculus alaudarius alaudarius	286
Tiphia intrudens	443
Tipulidae	152
Tomostethus	240
†assamensis	241
barda	240
formosanus	241
†hirticornis	240
Tonkinius sculptilis ..	527
striatipennis	527
Totaninae	287
Totanus ochropus	287
Toxicum	530
assameuse	529
Toxorhynchites	152
Trachia delibrata	615
delibrata fasciata ..	614
Trachischium monticola	37, 45, 53, 357
Trachypholis decorata ..	107
hispida	107
signata	107
Tribalus colombius	125
pluristriatus	125
Trichogaster fasciatus	244, 257
Trichomma	325
decorum	325
Trichoptera	355
Trichopteryx sikkima ..	440
Trichorypha	564
Trigonometopus frontalis ..	176
†trilineatus	175
Trigonophorus nepalensis ..	191
Trimeresurus gramineus	37, 51, 54
monticola ..	37, 50, 51, 54
Trirhinopholis	45, 54
Trithemis aurora	338
festiva	338

	Page
Trithemis pallidinervis ..	338
Trochomorphoides acris ..	615
Trogones	285
Trogonidae	285
Tropidonotus khasiensis	37, 49, 53
piscator ..	37, 49, 53
platyceps ..	37, 49, 53
†assamensis	58
berdmorei	59
cochinensis	58
yunnanensis	59
Trypeticus nemorivagus ..	121
Trypetinae	185
Trypoxylon	445
Tubulifera	201
Tupaia belangeri	86, 97
chinensis	86
ferruginea	86
Turdidae ..	276, 278
‡Typhloperipatus	479, 483, 484, 486, 487, 489, 490, 491
†williamsoni ..	472, 476
Typhlopidae	44
Typhlops beddomii	44
braminus	44, 52
diardi ..	37, 44, 53
†diversiceps ..	37, 44, 53
tephrosoma ..	37, 44, 53

U

Uleiota atratula	108
Uloma javana	525
orientalis	525
orientalis minor ..	525
Ulominae	530
Upupa epops indica	284
Upupae	284
Upupidae	284
Uroloncha acuticauda ..	279
Uroproctus	127
assamensis ..	127, 128
Ursus torquatus	86

V

Vanessa indica	62
Varanidae	42
Varanus bengalensis ..	37, 42
Vespa basalis	447
bicolor	447
cincta	447
dorylloides	447
Vespa ducalis	447
magnifica	447
Vesperugo abramus	87
Vespidae	446
Vestalis amoena ..	340
gracilis	340
Videna bicolor	604
conicoides	604
trilineatus	604
Viduinae	279
Vipera russeli	51
Viperidae	50
Viverra zibetha	85
Vivipara (Idiopoma) heliciformis	540
Viviparidae	540

X

Xanthogramma	163
Xanthopimpla nursei ..	323
punctata	323
Xenocerus khasianus ..	198
rectilineatus	198
Xiphocaridina	491
curvirostris ..	290, 491
Xuthia parallela	104
Xyleborus ..	411, 413
†aplanatus	412
capucinus	413
†gravelyi	411
perforans	413
Xylinades annulipes ..	198
plagiatus	198
Xylocopa	82
collaris	79
dejeanii	79
latipes	79

Y

Ypthima affectata	61
baldus	61
philomela indecora ..	61

Z

Zaleptus sulphureus ..	204
Zamenis mucosus ..	37, 48, 53
Zeltus etolus	65
Zemeros confucius	63
flegyas	63
Zonitidae ..	359, 537, 548, 559, 569, 603, 604

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ZOOLOGICAL RESULTS OF THE ABOR EXPEDITION, 1911—1912.

Introduction.

In accordance with a resolution passed at the Conference on Museums and Archaeology held at Simla in July, 1911, it was arranged by the Trustees in consultation with the Military and Education Departments of the Government of India that I should accompany the Abor Expeditionary Force as Zoologist and Anthropologist, and that Mr. R. Hodgart, Zoological Collector in the Indian Museum, should go with me as assistant.

The present volume is devoted to the zoological results and parts will be issued from time to time as reports become available for publication. The issue of the usual annual volume of the "Records" will continue as heretofore.

In addition to results obtained with the Abor Expeditionary Force, in several groups the determinations of animals obtained by Mr. F. H. Gravely in November and December, 1911, between Moulmein and the Siamese frontier will be included. The fauna of this area, at least of the Thaungyin Valley, is not very dissimilar from that of the Abor country, and notice of specimens from this area will be of interest from a comparative point of view.

Mr. Hodgart and I left Calcutta on November 13th and arrived back on April 3rd after having spent about four months in the Abor country.

On the outward journey we were detained for about a fortnight before we could proceed to Kobo, the base camp of the expedition, and this period was spent in making observations on the fauna at Dibrugarh on the left bank of the Brahmaputra and at Sadiya which lies on the right bank at the foot of the Mishmi country.

We reached Kobo on November 29th and remained until December 13th; on the 14th we left by boat-convoy up the Dihang River and arrived at Pasighat and Janakmukh on the evening of the 16th, and leaving the latter camp on the 19th we marched to Renging and Rotung, arriving on December 21st.

I was unfortunate in being unable to join the party which left Yembung, the head-quarter camp, on December 27th to explore the course of the Dihang river and survey the country to the north: shortage of transport compelled Major-General Bower to refuse my application. My main object when I joined the expedition was to explore the practically unknown Himalayan fauna

of the N.-E. Frontier, but it now became evident that this idea would have to be abandoned. As events turned out this was not so disadvantageous as was feared, for the fauna of the foot-hills yielded material of very considerable interest and in investigating this region it was not necessary to make any drastic reduction in the apparatus required to carry on the work. But the country visited must be regarded purely as the foot-hill region of the north-east Himalayas and this fact must not be lost sight of in any comparisons which may be drawn between the Abor fauna and that of the ranges further to the west.

We remained at Rotung until January 12th, when we proceeded to the head-quarter camp at Yembung, and a week later I received permission to join a small party with an Indian surveyor under Capt. A. L. M. Molesworth which was going up the right bank of the Dihang to explore the courses of the Siyom and Shimang rivers, two large tributaries of the Dihang. I left with Capt. Molesworth on January 23rd. We reached Parong, a village two marches below Riga, and Damda which is some ten miles up the Siyom river, and returned to Yembung, sooner than was anticipated, on February 3rd. Triangulation did not form part of the survey work on this occasion; there were consequently no halts of any considerable length and the greater part of the time was occupied in hard marching which afforded but little facility for zoological work. Subsequently I proceeded to the Komsing camp, close to the Abor village of that name, and remained there until March 3rd, but the work accomplished during this period was almost entirely anthropological.

On my return to Yembung I proceeded as soon as possible to Rotung, where I purposed staying a few days to make further observations on the zoology of the district. But Capt. Sir George Duff Dunbar, who was then in command of Rotung post, suggested that I should make a short expedition to the west beyond Kalek and the Sireng valley towards Misshing, offering to provide an escort and Abor cooly transport for the purpose. I accepted this offer gladly, and in company with Mr. J. Coggin Brown of the Geological Survey and Dr. Falkiner of the Assam Valley Light Horse, who was then attached to the Lakhimpore Military Police, I left Rotung on March 15th, marching two days towards the west, halting the third day and returning on the evening of the 19th. This expedition gave me an opportunity of visiting fresh country with high tree-jungle of a type not elsewhere seen, a change which was of course accompanied by a corresponding change in the fauna. My thanks are due to Sir George Dunbar for suggesting this expedition and for making every arrangement necessary for its success.

On the morning of March 20th we left Rotung and marched beyond Renging to the camp of the 32nd Pioneers in the Sirpo valley and after a day's halt proceeded to Pasighat, from which place we reached Balek, where three days were spent in anthropological work. Returning to Pasighat we proceeded on March

27th by boat-convoy to Kobo, and leaving there a few days later arrived in Calcutta on the evening of April 3rd.

The Abor country lies in the N. E. corner of the Indian Empire and is bounded on the east by Mishmi country, on the north by Tibet, on the west by the land inhabited by the Miris and on the south by the Brahmaputra River. Plate I, which is reproduced by permission from the maps made during the expedition by officers of the Survey of India under Capt. O. H. B. Trenchard, R.E., shows the routes which I traversed and the principal places at which collections were made.

In a north and south direction the Abor country extends for about 80 miles.[1] Between the base camp at Kobo and Janakmukh and Bafek it consists of an alluvial plain situated at a height of 400 to 600 feet above sea-level and clad with dense jungle interspersed with open patches of long grass or *chapris*. In some places the jungle has at one time or another been cleared for cultivation, but the older clearings are for the most part so thickly grown with scrub and creepers as to be almost impenetrable. To the north of this the country is a maze of hills, often precipitous, and intersected by the boulder-strewn courses of the numberless small streams that drain into the Dihang river. All the hills were originally clothed from foot to summit with tree-jungle, but frequently, more particularly in the vicinity of the Abor villages, large tracts of country have been cleared. Many such areas have, after a period of years, been discarded for cultivation purposes and soon develop thick scrub-jungle.

The majority of the specimens obtained were found at comparatively low altitudes between 400 and 2,500 ft., but some were taken at greater heights up to about 5,000 ft. and part of a small collection of insects, made for me by Mr. J. Coggin Brown of the Geological Survey, was obtained on Geku hill at a height of about 10,000 ft. Bapu, the highest of the foot-hills proper, reaches an altitude of 6,390 ft.

As regards invertebrates, the best results were obtained by searching under bark and in rotten wood and large collections were made by this means alone. In particular some dead and partially decayed jack-fruit trees, which were being cut by the 32nd Sikh Pioneers in the vicinity of Rotung, afforded admirable material; many of the branches were hollow and bored and when split open were found to be literally filled with a varied assortment of Carabidae, Staphylinidae, Passalidae, Endomychidae, Heteromera, Rhynchophora, Dermaptera and Blattoidea along with representatives of many other groups. Considerable collections were also made under stones and numerous interesting species were found in this situation.

[1] Only the southern portion of the Abor country is shown on the map (Pl. I); the great ranges further to the north were not visited.

In the Abor country the cold weather season is also the driest season of the year and numbers of invertebrates, to which an abundance of moisture is a necessity, take refuge during this period in plantain trees, living behind the great ensheathing leaf-stems. Water is invariably found in the leaf-base and the atmosphere in the almost completely closed chamber behind the leaf-stems is probably always at or near saturation point. A considerable amount of rain fell during February and March, and in the latter month it was noticed that the numbers of animals found in such situations had greatly diminished.

Small Dytiscidae, Odonata larvae and Oligochaete worms were found in the tops of plantains and screw-pines (*Pandanus*), living in a collection of water at the leaf-base at from 20 to 40 ft. above the surface of the ground.

No lakes or pools of standing water were met with in the country and practically all the aquatic animals obtained were taken in small streams and rivers draining into the Dihang or its larger tributaries: in the Dihang itself, which in the rains appears to rise in some places at least sixty feet above its winter level, practically nothing could be found. The smaller rivers and streams of the hills teem with the larvae of Neuroptera and Odonata and in the warm weather the perfect insects must occur in very great numbers. Brachyurous Crustacea were not uncommon, but Macrura appeared to be represented only by a single species of *Palaemon*. Fish were plentiful and some, along with tadpoles belonging to the families Ranidae and Pelobatidae, show interesting adaptations to life in hill-streams subject to sudden spate.

The different groups of animals are unfortunately very unevenly represented in the collection, but this was to a large extent unavoidable. The cold weather season is not the best time of year for zoological work and the poverty of the collection in several respects, notably in some sections of the Insecta, must be attributed to this fact. Other groups, again, should have received far more attention than I was able to give them, for only by the devotion of a specialist's whole time to the subject could satisfactory results have been obtained among the birds and mammals.

My activities and opportunities for work were, as was only to be expected, somewhat limited by the restrictions necessary in the case of a military expedition carried out in a hostile country, but it was only in a few instances that these restrictions were severely felt. Work with an escort must of necessity have some drawbacks, though in many cases, more especially with Gurkhas, the escort was keenly interested and showed itself adept in the capture of the more elusive species.

To express my gratitude for all the help I received in the course of the expedition is a difficult task. I have in the first place to thank Major-General Bower, C.B., General Officer commanding the Force, for the interest which he took in my work and for the facilities extended to me.

To the 32nd Sikh Pioneers I am under very great obligation for the large collections of Reptilia and other animals which they made on my behalf. During the winter season most of the reptiles were in hiding beneath the ground or in roots of trees, and in these situations they were found by the Pioneers when cutting roads along the hill-sides. The extent of the help they gave me may be judged from the fact that while snakes are now represented by twenty-six species, three hitherto unknown and one belonging to an undescribed genus, my own individual efforts only resulted in the acquisition of three common forms. Through the instrumentality of the British officers of the regiment and in particular of Capt. the Hon. M. de Courcy each non-commissioned officer on works was provided with a large section of bamboo fitted with a plug and every day a valuable collection of snakes, lizards, frogs, centipedes, scorpions, etc., was obtained.

Numerous specimens were also contributed by Col. (now Brigadier-General) D. C. F. Macintyre, Capt. A. L. M. Molesworth, by Capt. J. S. O'Neill, Capt. F. H. Stewart and Capt. R. S. Kennedy of the Indian Medical Service, by Capt. H. W. Price and Mr. G. F. T. Oakes. We are indebted to Major Sweet, Capt. B. R. Nicholl, Capt. J. Masters and Mr. I. Burn Murdoch for the loan of various mammals and to Dr. J. Falkiner for the loan of a collection of birds.

Opportunity will I hope be found of making fuller individual acknowledgments in the course of publication of the different reports, though it will still be impossible for me to express my thanks in an adequate manner for all the kindness and hospitality I received from officers of different services attached to the expedition.

I was fortunate in having Mr. R. Hodgart with me as my assistant. Throughout the period during which we were attached to the expedition his energy was unremitting and he spared no efforts to render the work a success.

STANLEY KEMP,

June 1st, 1912. *Offg. Superintendent, Indian Museum.*



Map of the southern part of the Abor country.

Reg. No. 1792 E., 12-H-400

I. BATRACHIA.

(Plates ii—iv.)

By N. ANNANDALE, *D.Sc., F.A.S.B., Superintendent, Indian Museum.*

Mr. Kemp's collection of Batrachia from the Abor country and the frontiers of Assam comprises 57 specimens of frogs and toads and a considerable number of tadpoles. With those obtained on the Expedition of 1911—1912 I have included two interesting specimens taken by Mr. Kemp on a previous visit to the frontier of eastern Bhutan. In all at least 25 species are represented, of which about one-third are new to science, while several have only been recorded hitherto from Burma or from Assam south of the Brahmaputra. The collection, therefore, affords the opportunity of making important additions to the fauna of the Himalayas, the animals of the extreme eastern region of which have up to the present been almost unknown.

PART I.—SYSTEMATIC.

List of species represented in Mr. Kemp's collection:—

1. *Rana cyanophlyctis.*
2. *R. liebigii.*
3. *R. tigrina.*
4. *R. limnocharis.*
5. *R. alticola.*
6. *R. granulosa.*
7. *R. afghana.*
8. *R. gerbillus*, nov.
9. *Microxalus borealis*, nov.
10. *Rhacophorus maximus.*
11. *Rh. bimaculatus.*
12. *Rh. naso*, nov.
13. *Rh. microdiscus*, nov.
14. *Rhacophorus maculatus himalayensis*, nov.
15. *Rh. tuberculatus.*
16. *Ixalus asper.*
17. *I. annandalei.*
18. *I. argus*, nov.
19. *I. tuberculatus.*
20. *Chirixalus doriae.*
21. *Phrynoderma moloch*, nov.
22. *Bufo melanostictus.*
23. *B. himalayanus.*
24. *Megalophrys (?) major.*
25. *M. kempii*, nov.

(*a*) ADULTS.

Fam. RANIDAE.

1. Rana cyanophlyctis, Schneid.

Boulenger, *Fauna*, p. 442.

This frog occurs all over the plains of India and ascends the Himalayas to altitudes of at least 5,000 ft. In Kumaon in the

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Western Himalayas it is the common frog at 4,500 ft., but at 6,000 ft. is entirely replaced by *R. blanfordii*. It is very largely aquatic in habits and is not as a rule found in dense jungle.

Mr. Kemp obtained a single specimen at Dibrugarh.

2. Rana liebigii, Günth.

Boulenger, *Fauna*, p. 445.

R. liebigii is very common in the Darjiling Himalayas at altitudes between 4,000 and 10,000 feet; it also occurs, though rarely, in the Western Himalayas (Simla and Kashmir), while to the south-east its range extends to northern Tenasserim. It is essentially a jungle frog and is usually found among dense undergrowth or at the edge of streams.

No adults of this species were obtained on the expedition, but two tadpoles were taken in a small stream near Yembung (alt. 1,100 ft.) on the east side of the Dihang River.

3. Rana tigrina, Daud.

Boulenger, *Fauna*, p. 449.

Although it is apparently rare in the Himalayas, *R. tigrina* occurs all over the plains of India. In different parts of India, however, its habits differ considerably and certain structural differences also seem to occur, so that it is probable that several different races will ultimately have to be recognized as distinct. In Bengal *R. tigrina* is essentially a "tank" frog, inhabiting moderately large masses of water.

Two specimens were obtained by Mr. Kemp at Sadiya under a log at the edge of the Dikrang River.

4. Rana limnocharis, Wiegm.

Boulenger, *Fauna*, p. 450.

Being much more adaptable in its habits than *R. tigrina*, *R. limnocharis* has an even wider range than that species. It is equally at home in flooded rice-fields and at the edge of rocky streamlets in the densest jungle. Both in the Himalayas and in the mountains of Burma it ascends to an altitude of at least 6,000 ft.

Mr. Kemp obtained specimens at Sadiya, Kobo and Rotung and in the Siyom valley below Damda.

5. Rana alticola, Boulgr.

Boulenger, *Cat. Batr. Sal. Brit. Mus.* (2nd ed.), p. 63, fig. (1882).

The range of this frog is considerable both in longitude and latitude and also in altitude. Colonel Alcock obtained specimens of

the characteristic tadpole at an altitude of 8,500 ft. in the Hundur Yarm Valley in northern Kashmir, while Capt. R. B. Seymour Sewell has recently taken precisely similar larvae a few feet above sea-level and a few yards from the shore, in a small stream running into Heinze Basin on the coast of Tavoy. I have also examined larvae from other parts of Tenasserim and Assam and from Little Andaman I., and adults from Tenasserim and Assam, Bengal and Orissa. I have not, however, seen specimens from any place in the plains west of Calcutta. In Lower Burma and Orissa the frog is usually found amongst dense vegetation at the edge of ponds and lakes. On the shores of the Sar Lake near Puri it is abundant on the leaves of plants that grow out of the water and also on ledges in the sides of old wells.

The back of the young frog is brown, often mottled with black, but in the adult it becomes of a bright leaf-green. I have redescribed the tadpole below (p. 22). *R. alticola* is of much more slender habit and usually of smaller size than *R. erythraea*, which resembles it in habits, but apparently is not found west of the Bay of Bengal.

Mr. Kemp took a small specimen of *R. alticola* on the Assam-Bhutan frontier in the north-east of the Mangaldai division of the Darrang district in January, 1911.

6. Rana granulosa (Anderson).

Hylorana granulosa, Anderson, *J.A.S.B.*, (2), xl, p. 23 (1871).
? *Rana tytleri*, Boulenger, *Fauna*, p. 458 (*partim*).
Rana granulosa, *id.*, *Ann. Mus. Genova* (2nd ser.), xiii, p. 333, pl. viii, fig. 2 (1893).

This frog is known from the Karin Hills and Pegu in Burma, from Yunnan and from north-eastern Assam (Sibsagar). It is apparently arboreal in habits.

A specimen was taken on a tree-trunk near Dibrugarh.

7. Rana afghana (Günth.).

Polypedates afghana, Günther, *Rept. Brit. Ind.*, p. 432.
Rana latopalmata, Boulenger, *Fauna*, p. 462.
Rana afghana, *id.*, *Ann. Mus. Genova* (2nd ser.), v, p. 420 (1888).

It is very unfortunate that this frog should have to bear the inappropriate specific name "*afghana*," for there can be little doubt that its range does not extend west of Nepal. It is not uncommon in the Darjiling Himalayas at moderate altitudes and has also been found in Assam and Burma.

An adult was taken by Mr. Kemp at Yembung (alt. 1,100 ft.), and also two tadpoles, which are noticed below (p. 24).

8. Rana gerbillus, sp. nov.

(Plate ii, fig. 1.)

Allied to *R. jerboa* (Günther), from which it differs in its much smaller tympanum and in other particulars.

Habit slender. Length from snout to vent 33 mm.

Head broad, triangular; snout bluntly pointed, somewhat depressed at the tip, a trifle longer than the diameter of the orbit; nostril a little nearer the tip of the snout than the eye, which is large and prominent; interorbital space flat, as wide as the upper eyelid; canthus rostralis bluntly angular; loreal region concave; tympanum not very distinct, small, about $\frac{1}{3}$ as wide as eye.

Mouth.—A distinct tooth at the tip of the lower jaw; no free papilla on the tongue; vomerine teeth ill-developed, in two small roundish patches situated close together in the middle of the palate between the choanae.

Limbs slender. Fingers slender, with well-developed disks; that on the third rather larger than the tympanum; that on the first small; a rudiment of a web between the third and fourth fingers; others quite free; first finger shorter than second. Hind limbs very long, the tarso-tibial articulation reaching far beyond the edge of the snout. Toes almost completely webbed; their disks subequal, smaller than the tympanum; subarticular tubercles large but not prominent, oval; a low oval inner metatarsal tubercle; no outer one; no tarsal fold.

Skin.—A distinct glandular latero-dorsal fold and another, less distinct, extending from the eye above the tympanum almost to the shoulder. Dorsal surface of the head minutely pitted, of the back obscurely granular with large compressed longitudinal tubercles scattered more especially on the sides. Ventral surface and limbs smooth.

Colouration.—Dorsal surface very dark grey obscurely mottled with a paler shade; lips with pale vertical stripes; sides pale, spotted with dark grey; limbs, especially the thighs, conspicuously barred; ventral surface dull greenish yellow with large round or oval brown spots on the chin, throat and chest.

Habitat.—Yembung, Abor foot-hills at an altitude of 1,100 ft. A single specimen was found at the edge of a small stream in February.

Type.—No. 16925 of Indian Museum register of Reptiles and Batrachia.

Rana jerboa (Günther), to which this new species is most closely allied, is found in Burma, the Malay Peninsula, Java, Borneo, etc.

9. Micrixalus borealis, sp. nov.

(Plate ii, fig. 2.)

Closely allied to *Rana tenasserimensis*,[1] Sclater, from which it may be distinguished by the small size of the disks on its

[1] *P. Z. S.*, 1892, p. 345, pl. xxiv, fig. 4, and *List Batrachia Ind. Mus.*, p. 8 (1892).

fingers, its hidden tympanum and its almost completely webbed toes.

Habit stout. Length from snout to vent 25 mm.

Head short, broad, triangular, by no means depressed; snout bluntly pointed, convex at the tip, a little shorter than the orbit; canthus rostralis rounded; loreal region not concave, sloping outwards and downwards; eye large, not very prominent; interorbital region slightly convex, a little broader than the upper eyelid; tympanum concealed; a prominent fold running backwards and downwards from the eye to a point a little behind the gape.

Mouth.—A prominent tooth at the apex of the lower jaw; no trace of vomerine teeth; the choanae situated far forward; no papilla on the tongue. An internal vocal pouch in the male.

Skin.—No dorso-lateral fold. Dorsal surface minutely warty; ventral surface almost smooth but with a rather indistinct reticulation of grooves; a transverse fold running across the posterior end of the throat in the male.

Limbs stout. Fore limbs short; fingers short; the first a little shorter than the second; disks very small but distinct; a rudiment of a web between all the fingers; subarticular tubercles inconspicuous but of fairly large size. Tibio-tarsal articulation reaching the eye; toes moderately slender, with very small disks; web almost complete but not quite reaching or barely reaching the disks of the first and fifth toes; subarticular tubercles inconspicuous; an elongate but not very prominent internal metatarsal tubercle followed by a fold of skin on the tarsus; another fold on the external margin of the foot; no outer metatarsal tubercle.

Colouration.—Back dark brown mottled with purplish black; a dark interorbital cross-bar usually present; limbs obscurely barred and digits more conspicuously so; ventral surface yellowish, powdered on the throat and chin with purple-brown, as a rule so densely that the skin appears almost black to the naked eye; ventral surface of hands, feet and thighs powdered in a similar manner but not so densely; belly sometimes spotted.

Localities.—Rotung (alt. 1,300 ft.) and about 3 miles S. of Yembung.

Type.—No. 16932 in Indian Museum register of Reptiles and Batrachia.

I think I am right in referring this species, of which I have examined eleven specimens, to Boulenger's genus *Micrixalus* rather than to *Rana*; for I can find no trace of vomerine teeth, while the small size of the frog and its general facies are features in which it resembles the south Indian species included in the former genus. Sclater's *Rana tenasserimensis*, of which three type-specimens are now in our collection, has apparently vomerine teeth in some individuals and none in others, but these teeth are never well developed. It should also, in my opinion, rank as *Micrixalus*.[1]

[1] See Boulenger, *P.Z.S.*, 1883, p. 205, and *Fauna*, p. 464; also W. L. Sclater, *P.Z.S.*, 1892, p. 345, pl. xxiv, fig. 4, 4a, and Boulenger, *Ann. Mus. Genova* (2nd ser.), xiii, p. 331.

Ten specimens of *M. borealis* were taken under stones in a stream at Rotung and one a few miles S. of Yembung.

10. Rhacophorus maximus, Günth.

Boulenger, *Fauna*, p. 472.

A common species on the lower slopes of the Darjiling Himalayas and the Khasi Hills. Colonel Godwin-Austen obtained specimens in the Dafla country.

Mr. Kemp obtained a half-grown specimen at Upper Rotung at an altitude of about 2,000 ft.

11. Rhacophorus bimaculatus, Boulgr.

Boulenger, *Fauna*, p. 472.

Not uncommon in the Khasi Hills. Mr. Kemp's only specimen, which was taken at Rotung (alt. 1,300 ft.) in January, has the web of the feet of a bright scarlet colour and lacks the dark spots on the sides usually so characteristic of the species. In the former particular it agrees with other specimens in our collection.

12. Rhacophorus naso, sp. nov.

(Plate ii, fig. 3.)

This peculiar species can be distinguished from any other of the genus that occurs in Assam or Burma by the dermal appendage on its snout.

Habit moderately stout. Length from snout to vent 43 mm.

Head rather broad, triangular, with convex sides; snout much longer than orbit, pointed, convex above, nostril much nearer tip of snout than eye; canthus rostralis indistinct; loreal region concave, almost horizontal. Diameter of tympanum, which is distinct, about $\frac{2}{3}$ that of eye.

Mouth.—No prominent tooth at apex of lower jaw; no papilla on the tongue; vomerine teeth forming two small, almost circular patches, one close to the inner margin of each choana; choanae small.

Skin of dorsal surface rugose with many prominent and irregular tubercles; a small subquadrangular dermal projection on the snout; rounded tubercles scattered on the basal part of the thighs; ventral surface coarsely granular, more so on the chest and throat than on the belly. A fairly distinct dorso-lateral fold and a more prominent one running from the eye above the tympanum to the shoulder; serrated cutaneous fringes on the outer edges of the forearm and the shin.

Limbs stout, not very long. Fingers with a rudimentary web; their disks well developed, transversely oval; that on the third finger almost as large as the tympanum; subarticular tubercles well developed. The tibio-tarsal articulation reaches the eye; toes almost completely webbed; their disks like those of the fingers;

subarticular tubercles well developed; a somewhat elongate but not very prominent inner metatarsal tubercle; no corresponding outer tubercle.

Colouration.—Dorsal surface purplish-brown irregularly marked with dark slate-colour; irregular paler markings on the sides; limbs irregularly marked; fingers and toes barred with alternate brown and grey stripes. Ventral surface dirty white, shaded posteriorly with dark grey; dark grey spots on throat and an irregular reticulation of the same shade on the chest. Ventral surface of hands and feet grey, with the tubercles white; a white spot on the soles in the place where an external metatarsal tubercle would be.

Habitat.—Egar stream between Renging and Rotung (9-i-12).

Type (a unique specimen). No. 16929 in the Indian Museum register of Reptiles and Batrachia.

13. **Rhacophorus microdiscus**, sp. nov.

(Plate ii, fig. 4.)

This species is easily recognized by the small size of its digital disks.

Habit slender. Length from snout to vent 29 mm.

Head large, flat, broadly ovoid; snout rounded in front, by no means prominent, rather shorter than the orbit; nostril much nearer tip of snout than eye; canthus rostralis indistinct; loreal region concave, oblique; tympanum distinct, close to eye; its diameter about $\frac{1}{3}$ of that of eye; interorbital space about as wide as upper eye-lid, flat.

Mouth.—No tooth at apex of lower jaw; no papilla on the tongue; choanae large; vomerine teeth in two short, ridge-like series running obliquely backwards and inwards from a point near the anterior inner margin of the choanae but widely separated from one another.

Limbs slender but short. Fingers with a slight rudiment of a web; their disks very small, that on the third being much less than $\frac{1}{2}$ as wide as the tympanum; subarticular tubercles well developed; a large rounded inner metacarpal tubercle. Tibio-tarsal articulation barely reaching the eye; disks of toes like those of fingers; feet less than half webbed; subarticular tubercles well developed; an elongate but by no means prominent inner metatarsal tubercle.

Skin of dorsal surface, throat and chest smooth; that of belly separated into polygonal areas by a very distinct network of grooves; on the posterior part these areas gradually take the form of low conical tubercles; isolated rounded tubercles on basal part of thighs. No dorso-lateral fold; an indistinct fold running from above tympanum to shoulder.

Colouration.—Dorsal surface pale slate-grey irregularly marked with darker grey and powdered with black; dorsal surface of limbs indistinctly barred; outer margin of thigh reddish; ventral surface dirty white.

Habitat.—Kobo, at base of Abor foot-hills (alt. 400 ft.): 29–30-iii-12.

Type (a unique specimen). No. 16924 in Indian Museum register of Reptiles and Batrachia.

14. Rhacophorus maculatus (Günther).

Rhacophorus maculatus and *R. leucomystax*, Boulenger, *Fauna*, pp. 474, 475.

I have little doubt that what may be called the "Common Tree-frog" of Peninsular India, the Himalayas and the Malay Peninsula really represents three local races of a single species. These three races or subspecies may be distinguished as follows:—

1. *Rhacophorus maculatus* (Günther) (*forma typica*). No parieto-squamosal arch; dorsal surface of skull smooth; skin of dorsal surface of head free. *Distribution.*—Peninsular India and Ceylon.

2. *Rhacophorus maculatus himalayensis*, subsp. nov. A well-developed parieto-squamosal arch; dorsal surface of skull smooth; skin of dorsal surface of head free. *Distribution.*—The Eastern Himalayas, Assam, western China.

3. *Rhacophorus maculatus leucomystax* (Gravenhagen). A well-developed parieto-squamosal arch; dorsal surface of skull rugose; skin of dorsal surface of head adhering to the skull. *Distribution.*—Lower Burma, the Malay Peninsula and many of the Malay islands.

Mr. Kemp's specimens belong to the second race. The larvae of the three races are discussed below (p. 24).

Two small specimens were taken at Kobo and a very large one on the east side of the Dihang R. at an altitude of 1,100 feet.

15. Rhacophorus tuberculatus, Anderson.

(Plate ii, fig. 5.)

Anderson, *J.A.S.B.*, (2), xl, p. 26; Boulenger, *Fauna*, p. 474.

The specimens in Mr. Kemp's collection agree well as regards structure and dimensions with the late Dr. Anderson's description and with his type specimens, which are in the same condition as they were when the species was described. The colours of the latter specimens had, however, already faded at that date and the fresh ones now before me are particularly interesting in this respect. No two of the four brought back from the Abor country and taken together in circumstances which I will describe immediately, are precisely identical in colouration; but in all the colours are so blended that those commonly found on the stems of bamboos

growing in thickets in damp jungle are accurately reproduced. The back and the dorsal surface of the head and limbs are in all dull clay-colour sparingly powdered with black and suffused more or less definitely with yellow, the canthus rostralis is outlined in black, the ventral surface is pale yellow and the inner surface of the thighs wholly or partly scarlet. In one individual there is a narrow black, white-edged line running backwards along each side from the eye to the base of the hind limb, while the back of the head and the back are ornamented with two large irregular marks outlined by similar lines. In this specimen, which appears to be an adult male, there are also dark longitudinal lines on the limbs and on the inner margin of the fifth toe and the web that intervenes between that toe and the fourth. In the second individual, a female, the sides of the back are so strongly suffused with yellow that they may be described as ochraceous, the webs of the feet are almost black and the red colour of the inner surface of the thigh extends down that of the shin. In another male, rather smaller than the first, there are small black spots on the back and a dark-edge white line running transversely on the dorsal surface above the vent. The fourth specimen, probably a young male, has no very definite markings. The colouration of the dorsal surface in all the specimens bears a close resemblance to that of a bamboo-stem overgrown with minute fungi and lichens such as are usually found on bamboo-stems in a very damp atmosphere. The scarlet of the thighs would be completely concealed in the attitude of rest.

It is interesting to have the opportunity of comparing Anderson's types with fresh specimens of the species, but it is still more interesting to be able to put on record the peculiar circumstances in which these specimens were taken. They were found in an internode of bamboo which was intact as regards both its sides and its two nodes, except that there was in one side a small hole apparently made by some insect, less than a quarter of an inch in diameter. When the bamboo was split open in preparation for bridge-making the four frogs were seen seated on the inner surface near one end (the upper at the time), while two earthworms and a land planarian occupied the other. There can be little doubt, therefore, that they had entered the bamboo as small frogs and had been supplied with food by the intrusion of worms and other small animals through the hole by which they had originally entered, and from which their increase in bulk rendered it impossible for them to emerge. In spite of the fact that they must have lived for some considerable time practically in the dark they had preserved their colouration, which was of a distinctly protective type.

Four specimens from Upper Rotung (alt. *ca.* 2,000 ft.): 22nd January 1912, collected by Capt. the Hon. M. de Courcy. Anderson's specimens were from Sibsagar in N.-E. Assam. This place is situated on the northern bank of one of the smaller tributaries of the Brahmaputra.

16. Ixalus asper, Boulgr.

Boulenger, *P.Z.S.*, 1886, p. 415, pl. xxxix, and *Ann. Mus. Genova* (2nd ser.), xiii, p. 340, 1893; Sclater, *P.Z.S.*, 1892, p. 347; Robinson, *Journ. F.M.S. Mus.*, i, p. 24.

This species appears to be the most widely distributed of the Indian *Ixali*. It was originally described from the mountains of Perak in the Malay Peninsula and was found by the late Signor Fea in the Karin Hills and by one of our collectors in the hills between Burma and Siam. The Indian Museum possesses a specimen labelled as being from Kolasi in the Purnea district of Bihar, but this specimen very possibly came actually from the foot-hills of eastern Nepal.

The irregular white or greyish-white markings on the posterior part of the body of *I asper* give it exactly the appearance of being overgrown with a mould or fungus. Whether this is of any protective advantage to the frog may perhaps be doubted, but I have noticed a similar phenomenon in the case of several Malayan insects belonging to the orders Coleoptera and Rhynchota and it is well known that in tropical jungles insects are frequently attacked by fungi which produce a white mycelium and finally, having killed them, fasten their dead bodies by means of this mycelium to tree-trunks or other inanimate objects.

A specimen of *Ixalus asper* was taken on a tree-trunk at the edge of Egar stream between Renging and Rotung on 9th January, 1912. With it were taken the type specimen of *Rhacophorus naso*, a specimen of *Ixalus tuberculatus* and also tadpoles of two species, a *Megalophrys* (*M.? major*) and a Ranid which cannot be identified.

17. Ixalus annandalei, Boulgr.

(Plate iii, fig. 2.)

Boulenger, *J.A.S.B.*, 1906 (2), p. 385.

This species was not taken on the Abor Expedition, but a single specimen was obtained by Mr. Kemp in December, 1910, on the Bhutan frontier of Assam in the Mangaldai division of the Darrang district. It is common in the Darjiling district between 4,000 and 5,000 ft. and occurs both among dead leaves and low herbage in the jungle and on tea-bushes.

18. Ixalus argus, sp. nov.

(Plate iii, fig 3.)

Habit moderately-slender, *Khacophorus*-like. Length from snout to vent 27 mm.

Head short and broad, triangular; snout blunt, somewhat depressed at tip, obliquely truncate vertically, projecting, a little longer than the orbit; nostril nearer tip of snout than eye; canthus rostralis fairly distinct; loreal region vertical, concave; tympanum distinct, small, about $\frac{1}{3}$ as broad as eye, interorbital space broader than upper eyelid.

Mouth.—A small tooth at apex of lower jaw; no papilla on the tongue; choanae small, widely separated, situated far forwards.

Skin.—No latero-dorsal or supratympanic folds. Skin of head and neck smooth, of back beset with small scattered tubercles; ventral surface smooth.

Limbs slender. Fingers slender, free, with large disks; that on third finger as large as tympanum; first finger a little shorter than second; subarticular tubercles large, rounded, a little prominent; no metacarpal tubercles. Tibio-tarsal articulation reaching nostril; toes fully webbed; disks a little smaller than those on fingers; subarticular tubercles distinct but by no means prominent; a very distinct inner, but no outer, metatarsal tubercle; no tarsal fold.

Colouration.—Dorsal surface dark slate-grey with a paler reticulation on the back that gives it the appearance of being faintly ocellated; limbs and fingers conspicuously barred with dark grey and white; ventral surface dirty white faintly spotted on the throat and chest with grey; soles of feet and palms of hands dark grey.

Habitat.—Upper Renging, alt. 2,150 feet.

Type (a unique specimen). No. 16950 in the Indian Museum register of Reptiles and Batrachia.

19. **Ixalus tuberculatus**, Anderson.

(Plate iii, fig. 1.)

Anderson, *Anat. Zool. Res. Yunnan Exp.*, p. 855, pl. lxxviii, fig. 7 (1878).

I think I am right in identifying a series of specimens in Mr. Kemp's collection with this species, but Anderson's figure is poor and his specimens are not forthcoming for comparison. It is evidently variable in several characters, notably in stoutness of habit, in colouration, in roughness of skin and in the relative size of the disks of the fingers and toes. In some of the Abor specimens the skin of the dorsal surface is smooth except for small scattered tubercles, in others the tubercles are so much larger and closer together that it is quite rough; in some the finger-disks are much smaller than the toe-disks, but in others they are of almost exactly the same size, while some individuals are much stouter than others. In all the ground-colour of the dorsal surface is very dark slate-grey rather than olive, but this may be due to the fact that the specimens had been hardened in formalin before being preserved in spirit. A pale cross-bar between the eyes can usually be detected and there is always a pale patch on the sides near the groin marked diversely with black; the corresponding surface of the outer margin of the thighs is similarly marked; in some individuals there is a large dark x-shaped mark on the back.

Specimens were taken at Janakmukh (600 ft.), in Egar stream between Renging and Rotung, at Rotung (1,300 ft.) and at Kalek (3,800 ft.). At the two last-named localities several individuals were found between the 24th and 29th of December hiding under

the leaf-stems of banana-trees. Probably they were hibernating. In all seven specimens were found.

20. **Chirixalus doriae**, Boulgr.

Boulenger, *Ann. Mus. Genova* (2nd ser.), xiii, p. 341, pl. x, fig. 5 (1893).

A single male taken under a log at Kobo (alt. 400 ft.) agrees well with Mr. Boulenger's figure and description. *Ch. doriae*, which is the only known species of the genus, was originally found by the late Signor Fea in the Karin Hills.

21. **Phrynoderma moloch**, sp. nov.

(Plate iii, fig. 4.)

This species differs from *Phrynoderma asperum*, Boulenger,[1] the only one hitherto known, in several important characters, notably in the much more pronounced nature of the asperities on its back.

Habit slender. Length from snout to vent 41 mm.

Head short, broad, triangular, depressed; snout about as long as orbit, sinuously truncate transversely, obliquely truncate vertically; nostril close to tip of snout, very prominent; eye large, prominent; canthus rostralis indistinct; loreal region almost vertical, slightly concave; inter-orbital region slightly concave, broader than upper eye-lid; tympanum fairly distinct, about $\frac{2}{3}$ as wide as eye.

Skin.—No supratympanic or dorso-lateral folds; back bearing very prominent ridge-like, more or less serrated, warts which run longitudinally and obliquely; these warts larger on neck and across shoulders, on which they form Λ-shaped figures; shorter warts on head and dorsal surface of limbs; throat and ventral surface of limbs smooth; belly and sides coarsely granular.

Limbs slender but rather short. Fingers free, slender, flattened; disks very large, that on the 3rd finger nearly equalling the tympanum; subarticular tubercles small; external and internal subcarpal tubercles indistinct. Tibio-tarsal articulation reaching tympanum; toes $\frac{3}{4}$ webbed, the web reaching the disks of all but the 4th, up which it extends as a narrow fringe almost to the disk; subarticular tubercles small and by no means prominent; a very small and indistinct internal metatarsal tubercle; no external metatarsal tubercle; a narrow serrated fringe on the 5th toe and a less distinct serrated ridge running along middle of ventral surface of shin.

Colouration.—Back grey with black spots; the larger warts buff; the tympanum black; a large black and white diversified patch on each side between the two fore and hind limbs and a white patch in the axilla; external surface of thigh irregularly banded and marbled with black, white and grey; ventral surface

[1] *Ann. Mus. Genova* (2nd ser.), xiii, p. 342, pl. xi, fig. 1.

black with a faint vermicular reticulation running all over the body and onto the ventral surface of the thighs.

Habitat.—Upper Renging (alt. 2,150 ft.): 5-10-ii-12.

Types (two adults). Nos. 16951 and 16952: presented by Capt. the Hon. M. de Courcy.

The circumstances in which these frogs and their tadpoles were found are of considerable interest. Capt. de Courcy writes about them as follows:—

"[The frogs were taken] between Upper Renging and the Yernu Kotal . . . . . It was a few yards this side of Prospect Col that some of my men found the new Phrynoderma frogs—3 of them, under a log—and kept them, trying to make me see them among some lumps of earth—almost an impossibility. One escaped a few minutes after I had taken them over, and while I was standing there, the men cut off a big bit of the same log, the usual old felled tree on a *jhoom* [clearing], and rolled it down on to the road. Some water gushed out of a hole and I saw the tadpoles wriggling about on the ground and collected all I could."

The tadpoles, which are described below (p. 25), evidently belong to the same species as the adult frogs, for one of them has progressed far in its metamorphosis and has begun to develop the characteristic ridge-like warts on the back.

Fam. BUFONIDAE.

22. **Bufo melanostictus**, Schneid.

A typical specimen of this toad was taken by Mr. Kemp at Dibrugarh in the middle of November and on the same date he found a number of tadpoles in which the hind limbs were not developed.

23. **Bufo himalayanus**, Günth.

Bufo melanostictus var. *himalayanus*, Günther, *Rept. Brit. Ind.*, p. 442.

Bufo himalayanus, Boulenger, *Fauna*, p. 505.

I am inclined to agree with Dr. Günther in regarding this form merely as an Alpine race of *B. melanostictus*. The greatest difficulty is often experienced in separating specimens and quite typical individuals of *B. melanostictus* are often found at considerable altitudes in the Himalayas. Almost every gradation between the two forms can be found. Tadpoles (plate iv, fig. 7), however, from above 4,000 ft. in the E. Himalayas can, so far as my experience goes, be distinguished from those found in the plains of India by the fact that the eyes are not prominent but rather sunken. Tadpoles from the plains agree well with one from the Malay Peninsula figured by Flower (*P.Z.S.*, 1896, p. 911, pl. xliv, fig. 3), and I have found similar specimens at an altitude of over 7,000 ft. in the W. Himalayas near Naini Tal.

Mr. Kemp obtained four toads at Kobo in November and December, which I assign to Günther's "variety" with some

doubt. Their tympana are smaller than is usually the case in *B. melanostictus* and in two of them are also somewhat obscured. The parietal ridges are absent in one specimen and in the others, although they are present, they are very indistinct.

Fam. PELOBATIDAE.

The genus *Megalophrys* is represented in the collection by tadpoles which seem to belong to at least two species and also by a single small frog, which I have accepted as the type of a new species. The tadpoles are discussed below (p. 28).

25. **Megalophrys kempii**, sp. nov.

(Plate iii, fig. 5.)

Although the only specimen obtained is very small, I am inclined to think from its general appearance that it is at least sub-adult. The species is clearly related to *M. heteropus* (Boulenger),[1] but the snout is rather longer, the tympanum larger and the hind legs longer.

Habit slender. Length (of type) from snout to vent 15 mm.

Head moderate, little depressed; snout longer than eye, sloping forwards above, rounded at the tip, truncate vertically, projecting very little beyond lower jaw; nostril much nearer tip of snout than eye; canthus rostralis distinct; loreal region concave, nearly vertical; interorbital distance much greater than width of upper eye-lid; tympanum fully exposed, nearly as large as eye, close to which it is situated.

Mouth.—No vomerine teeth; tongue slightly cleft behind.

Skin of back, limbs, throat and chest smooth, of belly obscurely granular; some irregular tubercles on the base of the thighs. No dorso-lateral or supratympanic folds.

Limbs slender. Fingers short, free, bearing (except the first, which is merely blunt) very small but distinct disks; first finger shorter than second; lower surface of hand smooth; subarticular tubercles poorly developed; no metacarpal tubercles. Hind limb long; the tibio-metatarsal articulation reaches the tip of the snout; toes slender, the fourth very long, with small disks and the rudiments of a web; subarticular tubercles poorly developed; no metatarsal tubercles; no tarsal fold.

Colouration.—Dorsal surface dark olive with more or less symmetrically arranged greyish-green marks; upper surface of snout of latter shade; hind limbs obscurely banded with dark olive; ventral surface yellowish, suffused with dark olive; throat densely powdered with that shade but ornamented with clear yellowish spots.

Habitat.—Upper Rotung (2,000 ft.): 1-i-12.

Type.—No. 17013 in Indian Museum register of Reptiles and Batrachia.

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1 *Ann. Mag. Nat. Hist.*, (7), vi, p. 186 (1900), and *P.Z.S.*, 1908 (1), p. 422, fig. 2.

(*b*) TADPOLES.

The tadpoles here discussed are those of:—

A. *Rana liebigii*,
B. *Rana alticola*,
C. *Rana afghana*,
D. *Rhacophorus maculatus*,
E. *Phrynoderma moloch*,
F. An unidentified Ranid,
G. and H. *Megalophrys*, spp.

Fam. RANIDÆ.

A. Larva of RANA LIEBIGII, Günth. (Plate iv, fig. 2.)

Annandale, *J.A.S.B.*, 1906 (2), p. 290.

The tadpole of this species is very abundant in small jungle streams in the neighbourhood of Kurseong (4,000—5,000 ft.), E. Himalayas, both in April and May and in July, August and September. Mr. Kemp obtained two specimens in a small stream on the east side of the Dihang R. near Yembung between the 13th and the 17th of January. Their hind legs were just beginning to appear.

The larva of *R. liebigii* may be redescribed as follows:—

Head and body feebly arched above but not quite flat, sloping slightly from behind forwards, convex on ventral surface, broadly ovoid as seen from above; the tip of the snout rounded.

Mouth ventral; lips broad but not excessively so, directed inwards and enclosing a considerable cavity; posterior lip directed backwards, anterior lip forwards and inwards, thus forming a vestibule to the mouth; lower lip with a complete double row of rather elongate tubercles; upper lip fringed with a single row of rather smaller tubercles which is widely interrupted in the middle; dental formula usually 2: 5+5 | 1+1: 2,[1] sometimes three uninterrupted rows of teeth present on the upper lip; neither upper nor lower beak divided; both horseshoe-shaped and minutely serrated; upper lip very narrow.

Nostril and eye small, by no means prominent; the former situated midway between the eye and the tip of the snout; eye directed obliquely upwards, situated at the junction of the dorsal and the ventral surfaces, much nearer the tip of the snout than the base of the tail.

Glands.—None apparent.

Spiracle sinistral, pointing backwards and slightly upwards, small, circular, not markedly tubular.

Vent dextral.

Tail gradually pointed, tapering, twice as long as head and body; its greatest depth $\frac{1}{6}$ of total maximum length; fin-mem-

[1] For convenience in printing this and other dental formulae in this paper are printed in a somewhat novel form. The figures to the right of the central dark vertical line represent the tooth-rows of the upper, those to the left of this line the tooth-rows of the lower lip. The colons merely separate the number of undivided from that of divided rows.

branes well developed for its whole length both above and below the muscular portion; the greatest depth twice that of the muscular portion.

Colouration somewhat variable; dorsal surface brownish, marked in some individuals with yellow; fin-membrane pale, with large dark pigment-cells which in some individuals tend to be arranged in vertical bars; a dull yellowish mid-dorsal streak sometimes present at base of tail; spiracle surrounded by a white ring.

Dimensions of an individual in which the hind legs are beginning to appear.

Total length	..	..	44 mm.
Length of head and body	..	..	15 ,,
Length of tail	..	..	29 ,,
Maximum breadth of body	..	..	12 ,,
Maximum depth of body	..	..	10 ,,
Maximum depth of tail	..	..	12 ,,

Full-grown tadpoles measure about 56 mm. in length.

B. Larva of RANA ALTICOLA, Boulgr. (Plate iv, fig. 1.)

Boulenger, *Cat. Batr. Sal. Brit. Mus.*, p. 62, fig.; Annandale *P.Z.S.*, 1905 (1), p. 58, pl. vi.

The tadpoles figured and described by Mr. Boulenger were evidently badly preserved and faded. I have, therefore, redescribed this larva from well-preserved and recently captured specimens.

Head and body flattened both above and also on the anterior part of the ventral surface, oval, truncate anteriorly.

Mouth ventral; lips well developed, the posterior lip directed backwards, not excessively broad, with a single row of rather small tubercles running all along its margin; anterior lip directed forwards and inwards, fringed for rather less than a third of its length on either side and bearing on its ventral surface in the same region numerous small tubercles, bare in the middle. Dental formula 2 : 5+5 | 1+1 : 8, the outer row of teeth on the posterior lip feebly developed; beak in two parts, an upper and a lower; both parts roughened on the surface but not serrated at the margin; upper part crescentic, projecting slightly in the middle; lower part broadly V-shaped.

Nostril and eye small, by no means prominent; the former in well-preserved specimens rather nearer the eye than the tip of the snout; eye directed obliquely upwards, situated near the dorsal surface, much nearer the snout than the base of the tail.

Spiracle sinistral, tubular, directed outwards and a little upwards

Vent dextral.

Glands.—A large and prominent oval parotoid gland [1] present on each side and a small and less conspicuous single gland (in large tadpoles) on the dorsum at the base of the tail.

Tail bluntly pointed, about $1\frac{1}{3}$ times as long as head and body, very shallow at its base owing to poor development of both fin-membranes; these become deep shortly afterwards and then diminish again somewhat abruptly, so that the outline of the tail is strongly sinuous.

Colouration.—In the young tadpole the head and body are boldly diversified with dark and pale markings not of a symmetrical nature, while the muscular part of the tail bears numerous large and small ocelli, which are replaced on the fin-membranes by small black spots. As the tadpole grows and the limbs begin to develop the colours darken and the caudal ocelli become indistinct or disappear, with the exception, as a rule, of one large ocellus on each side at the base of the tail. Sometimes a second smaller and more distal ocellus also persists and occasionally there is a row of ocelli all along the tail of even full-grown larvae, gradually diminishing in size from in front backwards. The central spot of each ocellus is black, the outer ring yellow. The number of ocelli is not always the same on both sides of the body.

Dimensions.—The tadpole reaches a length of at least 57 mm. The following are the measurements of two specimens in one of which (A) the hind limbs appear as minute buds, while in the other (B) the toes can just be detected :—

	A (tail injured).	B.
Total length	— mm.	42 mm.
Length of head and body ..	27 ,,	18 ,,
Length of tail	— ,,	24 ,,
Maximum breadth of body ..	16 ,,	10 ,,
Maximum depth of body ..	14 ,,	9 ,,
Maximum depth of tail ..	16 ,,	9 ,,

I was at first inclined to adopt the opinion that the large series of ocellate Ranid larvae in our collection represented two distinct species, one with a distinct supra-caudal gland, prominent parotoids and not more than two ocelli on each side of the tail, the other with no supra-caudal gland, much less prominent parotoids, the head and body spotted and mottled, and numerous caudal ocelli. Specimens, however, recently obtained by Mr. F. H. Gravely and Capt. R. B. Seymour Sewell, I.M.S., in Lower Burma, show that there is a complete gradation between the two forms, the latter being merely a younger stage of the former. Mr. Gravely's specimens, in none of which were the hind limbs developed, were taken in a small pond near Kawkareik in

[1] This gland is not nearly so conspicuous in fresh specimens as it is in old and faded ones.

November and Capt. Sewell's, which were in a slightly more advanced stage of development, on the coast of Tavoy in spring. A young frog which had already assumed the green back of the adult was taken with Mr. Gravely's tadpoles.

C. Larva of RANA AFGHANA (Gunth.). (Plate iv, fig. 3.)

? *Rhacophorus reinwardtii* (larva), Boulenger, *Cat. Batr. Sal. Brit. Mus.*, p. 89, fig.

Rana afghana, id., Ann. Mus. Genova (2nd ser.), v, p. 420 (1883), and *P.Z.S.*, 1893, pp. 526, 527.

Mr. Boulenger has given an excellent description of this larva in the "Annali" of the Genoa Museum and has also published a key whereby those tadpoles of the genus *Rana* which are provided with large ventral suckers may be distinguished from one another. This key is in the *P.Z.S.* for 1893.

Mr. Kemp obtained two tadpoles that agree well with Mr. Boulenger's description in a small stream running into the Dihang R. near Yembung in January. Their hind limbs have not yet appeared. An adult *R. afghana* was taken at the same place in the same month.

D. Larva of RHACOPHORUS MACULATUS (Gray).

(Plate iv, figs. 4, 5.)

Rhacophorus leucomystax, Flower, *P.Z.S.*, 1896, p. 906, pl. xliv, fig. 2, and 1899, p. 898, pl. lix, figs. 3, 3*a*, Butler, *Journ. Bombay Nat. Hist. Soc.*, xv, p. 202.

Rh. maculatus, Ferguson, *ibid.*, p. 504, pl. B, fig. 4.

Captain Flower, in the first of the two papers cited after his name, describes and figures the tadpoles of the Malay race (*leucomystax*) of this species, his specimens being from Singapore. In his second paper he does the same for tadpoles from Bangkok, which seem to differ in more than one particular from those of the Malay race. I propose here to describe those of the Himalayan and the Peninsular races—the latter from specimens taken in September in Orissa, the former from tadpoles caught in the neighbourhood of Darjiling and identified after breeding out several individuals from the same lot in Calcutta. In both cases the tadpoles were taken in pools of rain-water.

1. Tadpoles of Himalayan race (*himalayensis*).

Head and body moderately flat above, ovoid, rounded in front, convex on ventral surface.

Mouth nearly terminal, comparatively small; lips relatively narrow, both directed forwards; upper lip smooth except at the corners, which bear numerous rounded papillae; lower lip with a fringe interrupted in the middle, and consisting of similar papillae about three deep; dental formula 1: 3+3 | 1+1: 2 or 1: 3+3 | 3; beak in two parts; the upper beak not hooked, the lower crescentic; both parts massive, both serrated.

Eye and nostril.—Eye lateral, directed outwards; nostril nearer tip of snout than eye.

Glands.—There is a large gland in front of and slightly below each eye.

Spiracle sinistral, pointing backwards and a little upwards, flap-like, large.

Anus dextral.

Tail long and slender, about twice as long as head and body, sharply pointed; its outline not strongly sinuous; fin-membranes deep throughout its length.

Colouration.—Mottled with dark brown on dorsal surface and sides; fin-membranes minutely spotted; ventral surface white.

Dimensions.—The following are the measurements of a tadpole with well developed hind legs (A) and of one in which the hind legs are just about to appear (B):—

	A.	B.
Length	62 mm.	33 mm.
Length of head and body	20 ,,	12 ,,
Length of tail	42 ,,	21 ,,
Maximum width of body	13 ,,	8 ,,
Maximum depth of body	10 ,,	7 ,,
Maximum depth of tail	14 ,,	8 ,,

2. Tadpole of Peninsular Indian race (*maculatus*).

The larvae of this race differ from those of the Himalayan race in the following points:—

i. The head and body are flatter above.
ii. The lips are even narrower.
iii. The habit is more slender and the dimensions less.
iv. The colour is very pale brown or green with scattered pigment-cells of a darker shade on the back and sides.

Both races apparently differ from the Malay one in having the outline of the tail less strongly sinuous and in colouration. In all essential structural characters, however, they are identical. Ferguson's Travancore tadpoles differed slightly in colouration from my Orissa ones. The breeding season in Travancore lasts, according to that author, from June to November; both in the E. Himalayas and the plains of Lower Bengal, it is in progress in July, August and September. I have never seen the tadpoles of either race in running water. The eggs in their frothy covering are usually laid at the edge of small pools.

E. Larva of PHRYNODERMA MOLOCH, sp. nov. (Plate iv, fig. 6.)

The tadpoles are very like those of *Ixalus horridus*, Blgr.[1], but have a longer and more pointed tail, and when full-grown

[1] Report on the Reptiles in Annandale and Robinson's *Fasciculi Malayenses*, i. p. 139, pl. vi, figs. 2*a*, 2*b* (1902).

develop the characteristic dorsal rugosities of the adult before the fore-legs break through.

The head and body are flattened and broadly oval, being only a little longer than broad. The tail as a whole tapers gradually and is nearly twice as long as the head and body. The colour is an almost uniform black or dark grey, except that the margins of the lips are white and the lower surface slightly paler than the dorsal. At the time at which the hind limbs begin to sprout out the skin is still quite smooth, but as they develop ridge-like warts appear on the dorsal surface. There are numerous little sensory pits arranged in lines on the head and body.

Mouth subterminal, small; its lips by no means strongly developed. The margin of the upper lip for the most part smooth but with a few conical tubercles where it joins the lower lip, the margin of which is completely fringed with a double row of similar tubercles. The dental formula is $1 : 3+3 \mid 3$, the first interrupted row of teeth being much longer than the other two. The beak consists of an upper and a lower part each of which is undivided; both are rather narrow; the anterior is narrowly crescentic in form, while the posterior is deeply excavated in the middle; neither has a concavity on the exposed surface and both are minutely serrated.

Nostril and eye small, dorsal, directed upwards, by no means prominent. The internasal space is about $\frac{2}{3}$ the interorbital and $\frac{1}{2}$ that between the nostril and the eye; the nostril is equidistant from the tip of the snout and the eye.

Sensory pits.—On the dorsal surface of the head and body four longitudinal lines of minute white pits can be distinguished, two on either side of the middle line. Two on each side start close together on the snout and after diverging in a sinuous manner so as to include between them a nostril and an eye meet together behind the latter. On the ventral surface there are three backwardly concave transverse lines, one just behind the mouth and two, the corner of which is somewhat sinuous, posterior to it. There is also a lateral line of pits along the muscular portion of the tail and a row of larger, isolated ones along the upper fin-membrane.

Spiracle sinistral, large and patent, directed backwards and situated somewhat low down on the side.

Vent in the middle line.

Tail.—The muscular portion is slender and tapers to a fine point. In the middle part of the tail the membrane equals it in depth both above and below, but at the base the membrane is shallow on both sides.

Dimensions of an individual with well-developed hind limbs (A) and of one (B) in which they have just begun to sprout :—

	A.	B.
Total length	58 mm.	55 mm.
Length of head and body ..	20 ,,	17 ,,
Length of tail	38 ,,	38 ,,

	A.	B.
Maximum breadth of body	.. 16 mm.	13 mm.
Maximum depth of body	.. 11 ,,	9 ,,
Maximum depth of tail	.. 10 ,,	12 ,,

Habitat, etc.—Four tadpoles were taken by Capt. de Courcy near Upper Renging between the 5th and the 10th of January, 1912. They were in a small pool of rain-water inside a log of rotten wood and were accompanied by two adults, the types of the species. There can be no doubt as to their identity, for the largest tadpole has already begun to develop the characteristic features of the adult. It has the hind limbs well developed.

F. UNDETERMINED RANID LARVA. (Plate iv, fig. 11).

A number of large Ranid larvae were taken on the 9th and 16th of January in the Egar stream between Renging and Rotung by Mr. Kemp and Capt. de Courcy. Specimens of *Rhacophorus naso*, *Ixalus asper* and *I. tuberculatus* were taken with one of them, and also several *Megalophrys* tadpoles. Mr. Kemp suggests that they may be the larvae of one of the adults captured on the same occasion and they may well be that of a *Rhacophorus*. There is, however, no direct evidence as to their parentage and none of them have reached a stage in their metamorphosis that would render it possible to throw any definite light on the subject. It may be as well to describe them, however, as they present certain features of biological interest. There can be no doubt that they are specifically identical.

Head and body convex above, flattened on the ventral surface, ovoid, snout bluntly rounded, projecting.

Mouth ventral, very large with both lips highly developed and the lower lip directed backwards and of unusual size; upper lip not fringed except at the corners; lower lip extending backwards for some distance behind the last row of teeth and covered in this region with relatively large rounded tubercles, also completely fringed with smaller and more elongate tubercles; dental formula $2+2:1:5+5 \parallel 1+1:2$; the outermost row of teeth on each side of the upper lip curving upwards and inwards to the margin of the lip which it reaches near the middle without meeting its fellow of the opposite side; beak stout, in two parts; the upper part having a flattened, nearly triangular area in the middle of the free margin; this area separated from the rest of the upper beak by a minutely serrated ridge which is in continuity with the edge of the beak on either side; the lower beak broadly V-shaped, minutely serrated on the margin.

Nostril and eye by no means prominent, of moderate size; eyes lateral but near the dorsal surface, directed outwards and upwards; nostril nearer eye than tip of snout.

Glands, etc.—No very definite glands can be detected but there are numerous little pits arranged along the upper lip, in a

line extending from near the tip of the snout upwards outside each nostril to the eye, round the eye and in two patches behind it.

Spiracle sinistral, large and tubular, pointing directly backwards.

Tail rather more than twice the length of the head and body, stout, with both fin-membranes well developed throughout its length.

Dimensions of tadpoles without hind limbs.

Total length	76 mm.
Length of head and body	25 ,,
Length of tail	51 ,,
Maximum width of body	16 ,,
Maximum depth of body	15 ,,
Maximum depth of tail	18 ,,

Colour an almost uniform dark brown; fin-membranes and ventral surface a little paler.

There can be no doubt that the lips form in this species a powerful sucker, as they do even in such tadpoles as that of *Rana liebigii*. It is the largest Indian tadpole with which I am acquainted.

Fam. PELOBATIDAE.

G. H. Larvae of MEGALOPHRYS spp. (Plate iv, figs. 8, 9, 10).

Weber, *Ann. Jard. Bot. Buitenzorg*, xv, suppl. ii, p. 5, 1898; Laidlaw, *P.Z.S.*, 1900, p. 889; Gadow, *Camb. Nat. Hist., Amphib. and Rept.*, p. 60, fig. 11; Boulenger, "Report on the Reptiles," *Fascic. Malay., Zool.*, i, p. 131; Annandale, *ibid.*, p. 275, fig. 1; van Kampen, *Natuurk. Tijd. v. Ned.-Ind.*, lxix (1), p. 27; Boulenger, *P.Z.S.*, 1908 (1), pp. 413, 426.

It has been pointed out by Mr. Boulenger and other authors that the larvae of the Oriental genus *Megalophrys* fall into two groups one of which resembles the larvae of European Pelobatidae and is in no way remarkable, while the other is distinguished from all other known tadpoles by the peculiar structure of the mouth. It is with the latter group that I am at present concerned.

The first representative of this group to be described was *M. montana* (Kuhl), a species not uncommon in hilly districts of Java and the Malay Peninsula but not known to occur in the Indian Empire. This larva has frequently been described and I need only refer to its colouration. The whole of the body and tail are dark brown with paler markings along the sides. At altitudes of from 2,000 to 5,000 ft. in the E. Himalayas a tadpole of precisely similar structure is abundant in small jungle streams, but it differs in colouration in two particulars, firstly in that the ventral surface is much paler than the sides and secondly that there are dark instead of pale markings on the latter. These markings take the

form of irregular spots and veinings. I have found every stage in the metamorphosis of this tadpole into *M. parva*, Boulenger.

A second tadpole of identical structure but slightly different colouration, larger size and more slender form also occurs in the E. Himalayas and was taken in considerable numbers in the Abor foot-hills. It differs from that of *M. parva* in lacking the dark markings on the sides or at any rate in having them much less conspicuous and consisting only of minute spots. I believe that this larva, which I have seen from the N. Shan States, is that of *M. major*, Boulenger, but have only circumstantial evidence in support of this belief.

A fourth *Megalophrys* tadpole was taken by Mr. Kemp in the Abor foot-hills. It differs from the one I have assigned provisionally to *M. major* in being of an almost uniform dark brown colour both above and below. There is no evidence that this is the tadpole of *M. kempii*, but it may be stated that a very similar larva was taken by Mr. F. H. Gravely on the Siamese frontier of Tenasserim near the Dawna Hills in company with a young frog that apparently represents *M. heteropus* (Boulenger), a species hitherto known from the hills of the Malay Peninsula.

It is a remarkable fact that whereas the tadpoles of *M. hasseltii* (Tshudi), a Malayan species, are of typical Pelobatid structure, those of other members of the genus from the same region are not only extremely different from that form but also extremely close to one another in structure. Were it not proved that the common Darjiling tadpole is the larva of *M. parva*, it would be difficult to believe that it was specifically distinct from that of *M. montana*, although there is no difficulty in distinguishing the adults. Seeing that these two larvae belong to different species, it is evident that the larva of other species must only be identified with great caution.

PART II.—BIOLOGICAL.

Of all the frogs and toads taken in the Abor foot-hills only two (*Rana limnocharis* and *Bufo himalayanus*) entirely lack adhesive digital disks, and we may take it that the majority of the other species are normally arboreal in habits. Some few of them, however, seem rather to be rupicolous and to live among stones at the edge of streams. It is probable that *Micrixalus borealis* belongs to the latter category, but *Ixalus tuberculatus*, although individuals were actually found at the edge of a stream, is known also to frequent tree-trunks. *Phrynoderma moloch* apparently affects dead tree-trunks and lays its eggs in or near small masses of water that accumulate in them. In the dense jungles of the Malayo-Himalayan tract most of the Batrachia are as a rule arboreal and Mr. Kemp's collection in this respect is no exception. It may be noted, further, that the great majority of his specimens are protectively coloured and resemble either the lichen-clad bark of jungle trees or the green leaves of their foliage.

A very interesting set of biological phenomena is illustrated by the tadpoles of the Abor foot-hills, which agree precisely in this respect with those of the Darjiling district and of hilly districts in the Malay Peninsula. In the great majority of cases their structure is adapted for life in rapid-running mountain streams subject to sudden floods, and they are provided with special apparatus with which to contend against the dangers incidental to such a life. In other words, they possess special structural facilities either for clinging to fixed objects or else for floating away lightly on the surface of the flood.

There has been considerable dispute as to the function of the lozenge-shaped structure surrounding the mouth of the tadpole of *Megalophrys montana* and similar species. Dr. Gadow suggests that the peculiar teeth on the inner surface may be used for scraping the leaves of water-plants and Dr. van Kampen has observed the tadpoles rasping algae from the sides of a glass aquarium with them; but observations made in the Malay Peninsula, Burma and the Himalayas confirm me in the opinion, which was originally



Fig. 1.—Tadpoles of *Megalophrys montana*.

advanced by Prof. Max Weber, that the chief function of the whole structure is to act as a float whereby the tadpole can be carried along on the surface, and also convince me that this function is correlated with the fact that floods are one of the chief dangers which tadpoles living in mountain streamlets have to fear. I reproduce above a photograph of two living tadpoles of *M. montana* taken some years ago in the Malay Peninsula. One of these tadpoles is lying at the bottom of the basin of water in which they were photographed and has the float folded, the other has it expanded on the surface. The water was too shallow for this tadpole's tail to hang vertically downwards as it usually does. Dr. Gadow's figure in the *Cambridge Natural History* is therefore more correct in this respect.

Although to act as a float is the main function of the oral apparatus of these *Megalophrys* tadpoles, and although the teeth on this apparatus are used for scraping off algae from stones (and, I think from an examination of the contents of their stomachs, also fungi from rotting wood), the apparatus has at least two other uses. In the first place it facilitates breathing when the tadpole

is lying among vegetable débris in the corner of little pools, and in the second it assists it to crawl over wet rocks and thus, perhaps, to reach a fresh pool if the one in which it is confined dries up during a period of drought. The first of these secondary functions only comes into play when the funnel is folded. As is shown in my figure in *Fasciculi Malayenses*, the mouth is well protected by the manner in which the lower part of the apparatus folds upwards over the upper part, but the lateral parts do not completely close together. Each margin bends inwards towards the other in such a way that on each side a narrow tube is formed down which water free from all but very minute fragments of débris is drawn to the mouth by the respiratory movements.

I have often observed the larvae of *M. parva* adhering to rocks at the edge of small streams in the E. Himalayas and even making their way up the faces of rocks in this position until at least the anterior part of the body was out of water. Adhesion was brought about very largely by the application of the outer surface of the lower part of the apparatus, which only bears teeth on the inner surface, to the face of the rock; but the ventral surface of the body was applied in the same manner, while the movements of the powerful tail thrust the animal upwards. A small fish (*Nemachilus rupicola*) common in the same little streams actually, as I have myself observed, makes its way over rocks from pool to pool in a very similar manner, adhering partly by means of the smooth skin of its belly and partly by means of its lips.

Other tadpoles which frequent the streams of the Himalayas, instead of allowing themselves to be borne away lightly on the surface of the flood, adhere to rocks at the bottom or sides of the stream and have been found firmly fixed even in the immediate vicinity of waterfalls. The majority of the species both of the Darjiling district and of the Abor foot-hills adhere mainly by means of their lips, the inner, tooth-bearing surface of which is applied to the rocks. It is for this reason that in these species the position of the mouth is much more nearly horizontal than it is in many other tadpoles and the lips themselves are more or less enlarged. In such forms as the larva of *Rana liebigii* the lips, although they are distinctly broader than in the typical *Rana* tadpole and are directed forwards and backwards respectively instead of both forwards, are not monstrously developed; but in other forms, such as the large unidentified Ranid larva described above, they attain enormous dimensions and form together a powerful sucker possibly rendered necessary by the large size and heavy build of their possessor, for even the lips of the tadpole of *R. liebigii* enable it to cling tightly.

In some other species a sucker quite separate from the lips and not homologous with the sucker that many young Batrachia larvae possess, is found on the ventral surface, doubtless for the same purpose. *Rana afghana* and several allied Himalayo-Malayan frogs have this sucker in their larval stage.

It is noteworthy that the means whereby the fishes of the streams of the Himalayas adhere to rocks are analogous to those adopted by the tadpoles which live in the same environment. *Nemachilus rupicola*, as has already been stated, clings to rocks by means of the smooth skin of its belly and of its enlarged lips, just as the tadpole of *Megalophrys parva* does; several other mountain Cyprinidae have their mouths modified in a manner that would suggest their being used in the same way as the lips of *Rana liebigii*, while *Discognathus lamta* certainly adheres to the bottom in rapid water very largely by means of its lips, which recall those of the unidentified Ranid tadpole of the Abor foot-hills. The Silurid genera *Pseudecheneis* and *Glyptosternum*, on the other hand, cling by means of a separate abdominal sucker as the tadpole of *R. afghana* does.

There can be no doubt that these are instances of convergence, and there is some evidence that even in the case of the tadpoles of mountain streams, the same method of adhering to fixed bodies in rapid-running water has been acquired independently in some instances by different species. The lips of the tadpole of *Bufo penangensis*,[1] for example, appear to resemble closely those of the unidentified Abor larva, which must certainly be assigned to the Ranidae, and enlarged lips like those of *Rana liebigii* are found in different species the adults of which are by no means closely allied. It can hardly be that the adaptation of such tadpoles, striking as it is, has been brought about by genetic relationship between the different species that possess it. The adults of most of the Abor frogs and toads have developed adhesive disks on their fingers without being in all cases closely related to one another, and we must suppose that the development of special abdominal suckers or of greatly enlarged lips is a similar phenomenon due, directly or indirectly, to environment rather than to the possession of a common ancestry by animals which have undergone parallel evolution in one particular.

PART III.—GEOGRAPHICAL.

GEOGRAPHICAL LIST OF THE SPECIES IN THE COLLECTION.

NAME.	SIKHIM.	ASSAM.	BURMA.	REMARKS.
RANA ..	x	x	x	Cosmopolitan.
1. *R. cyanophlyctis* ..	x	x	x	Throughout Oriental Region.
2. *R. liebigii* ..	x	x	x	..
3. *R. tigrina* ..	x	x	x	Almost all over Oriental Region.

[1] Flower, *P.Z.S.*, 1899, p. 909.

NAME.	SIKHIM.	ASSAM.	BURMA.	REMARKS.
4. *R. limnocharis* ..	x	x	x	Even more widely distributed.
5. *R. alticola* ..	..	x	x	Also in N. W. Himalayas, Bengal and Orissa.
6. *R. granulosa* ..	..	x	x	Also in Yunnan; in Assam only N. of Brahmaputra.
7. *R. afghana* ..	x	x	x	Not in Afghanistan.
8. *R. gerbillus* * ..	..	..	..	..
MICRIXALUS ..	..	..	x	Hitherto regarded as peculiar to S. India and Ceylon.
9. *M. borealis* * ..	..	..	..	..
RHACOPHORUS ..	x	x	x	Oriental Region, China, Japan, Madagascar
10. *Rh. maximus* ..	x	x	..	..
11. *Rh. bimaculatus* ..	..	x	..	Only known hitherto from the Khasi Hills.
12. *Rh. naso* * ..	..	..	..	..
13. *Rh. microdiscus* * ..	..	..	..	..
14. *Rh. maculatus himalayensis* ..	x	x	x	Also in Yunnan.
15. *Rh tuberculatus* ..	..	x	..	Not known S. of Brahmaputra.
IXALUS	x	x	x	S. India, Ceylon, E. Himalayas, Assam, Burma, Indo-China, Malaysia.
16. *I. asper* ..	..	..	x	Also in Malay Peninsula and islands.
17 *I. annandalei* ..	x	x	..	Not known S. of Brahmaputra.
18. *I argus* * ..	..	..	..	..
19. *I. tuberculatus* ..	..	..	x	Described from the Chinese frontier of Burma.
CHIRIXALUS ..	..	..	x	Hitherto only known from Burma.

NAME.	SIKHIM.	ASSAM.	BURMA.	REMARKS.
20. *Ch. doriae* ..	..	..	x	..
PHRYNODERMA	..	..	x	Hitherto only known from Burma.
21. *Ph. moloch* * ..	..	..	..	..
BUFO ..	x	x	x	Almost cosmopolitan; not in Australia or Madagascar.
22. *B. melanostictus* ..	x	x	x	Throughout Oriental Region.
23. *B. himalayanus* ..	x	..	..	E. Himalayas only.
MEGALOPHRYS..	x	x	x	Damper parts of Oriental Region; not in S. India or Ceylon.
24. *M. major.* ..	x	x	..	..
25. *M. hempii* * ..	..	..	..	..

So far as the genera mentioned in the foregoing list are concerned, its most striking features are the number of species of *Ixalus* included and the fact that the allied Burmese genera *Chirixalus* and *Phrynoderma* are also represented. Until recently the genus *Ixalus*, which abounds in Burmese and Malay forms, was not known from any part of the Himalayas or Assam, and even now only one species has been proved to exist in the Himalayas, west of Bhutan, namely *Ixalus annandalei*, Boulenger.[1] It is probable that another species (*I. asper*) also occurs in the Nepal foothills, but, even so, the genus is characteristically non-Himalayan.[2] *Chirixalus* and *Phrynoderma* have hitherto been monotypic genera, as the former still remains, and have only been recorded from the Karin Hills.

The occurrence of the S. Indian genus *Micrixalus* in the Abor foot-hills is exactly parallel to that of the lacertilian genus *Salea*, a species of which has recently been described from the adjacent Dafla country.

We may analyse the list further as regards species in the following manner, dividing them into seven geographical groups:—

A. Species apparently endemic in the foot-hills E. of Bhutan .. .. .. 7=28%
B. Forms found in the Himalayas, Assam and Burma .. .. .. 5=20%
C. Species of very wide distribution .. 4=16%

[1] *J.A.S.B.*, 1906 (2), p. 385.
[2] *Cf.* Blanford, *Phil. Trans. Roy. Soc.*, cxciv (B), p. 421 (1901).

D. Species known from Sikhim and from Assam S. of the Brahmaputra .. .. 2= 8%
E. Species hitherto only known from Assam .. 2= 8%
F. Species hitherto only known from Burma or Burma and Malaysia .. .. 3=12%
G. Species only known from the Himalayas .. 2= 8%

Stated in this manner the figures show at a glance how very distinct the Batrachian fauna of the N. E. corner of Assam and the Abor foot-hills is from that both of the Himalayan foot-hills W. of Bhutan and from that of the districts S. of the Brahmaputra. They also show, however, that there is considerably greater affinity in the latter direction than in the former, and it is by no means improbable that further research among the Batrachia of southern Assam will increase rather than diminish the resemblance. It is, moreover, noteworthy that one of the two purely Himalayan forms (*Bufo himalayanus*) represented in Mr. Kemp's collection of frogs and toads is of doubtful validity as a species and that specimens from the Abor hills do not agree in every respect with those from Darjiling.

Several of the species whose names occupy a place in Mr. Kemp's list were not taken actually in the foot-hills, but in the plains at their base. These species are the following:—*Ixalus assamensis* from group G; *Rana alticola* and *R. granulosa* from group B, and *Rana cyanophlyctis*, *R. tigrina* and *Bufo melanostictus* from group C. If we eliminate these names, we get the following numbers and percentages in the different groups:—

A. Species apparently endemic in the Himalayan foot-hills E. of Bhutan .. 7=37 %
B. Species from the Himalayas, Assam and Burma .. .. .. 3=16 %
C. Species of very wide distribution .. 1=5·25%
D. Species from Sikhim and from Assam S. of the Brahmaputra .. .. 2=10·5%
E. Species hitherto known only from Assam 2=10·5%
F. Species hitherto known only from Burma or from Burma and Malaysia .. 3=16 %
G. Species known only from the Himalayas .. 1=5·25%

These percentages, which are calculated roughly, show that the Batrachian fauna of the Abor foot-hills, in so far as it is illustrated by Mr. Kemp's collection, includes about 37% of apparently endemic species, about 16% of species that also occur both in Sikhim on the one hand and in Burma and Assam on the other and also of species hitherto known from Burma but not from Assam, about 10½% of species not known from Burma but common to the E. Himalayas and Assam and the same percentage of species only known hitherto from Assam, and about 5¼% both of widely distributed species and of exclusively Himalayan forms. A true jungle fauna, if the jungle be of the damp equatorial kind, rarely

includes many species of Batrachia of a very wide distribution, and it is no exception to this rule to find that such forms are scarce in the Abor foot-hills; the large number of endemic species is a correlated fact. It is well known to be the case that the reptiles and Batrachia of the E. Himalayas, Assam and Burma have a strong affinity, and it seems probable that a rich Malayan element has made its way northwards and westwards into the damp evergreen jungles of these countries, gradually becoming more and more attenuated as the climate grows drier and less equable towards the west.

All the evidence at present available, therefore, supports the view that the fauna of the extreme eastern part of the Himalayan foot-hills is not, at any rate so far as the frogs and toads are concerned Himalayan in the sense in which the term has hitherto been understood, but allied rather to the fauna of Assam south of the Brahmaputra or even to that of Burma. In other words, Blanford's "Eastern Himalayan Tract" does not extend, so far as the Batrachia are concerned, nearly so far to the east as he believed, while his "Assam Tract" extends northwards to include the foot-hills north of the Brahmaputra as well as its upper valley and the mountains lying south of it. It is probable also that no very clear line of division exists between his "Assam Tract" and his "Upper Burma Tract."

In conclusion I must thank Mr. Kemp for the very careful way in which his collection was preserved and labelled, and also those who helped him, especially Capt. the Hon. M. de Courcy, for the interesting specimens they contributed.

EXPLANATION OF PLATE II.

Abor Batrachia.

Fig. 1.—*Rana gerbillus*, sp. nov. 1*a*. Profile of head. (From type).

,, 2.—*Micrixalus borealis*, sp. nov. 2*a*. ,, ,, (From co-type).

,, 3.—*Rhacophorus naso*, sp. nov. 3*a*. ,, ,, (From type).

,, 4.—*Rhacophorus microdiscus*, sp. nov. 4*a*. ,, ,, (From type).

,, 5.—*Rhacophorus tuberculatus*, Anderson. 5*a*. ,, ,,



1.





4.





3.





5.





2.



A.C. Chowdhary, del.

ABOR BATRACHIA.

EXPLANATION OF PLATE III.

Abor Batrachia.

Fig. 1.—*Ixalus tuberculatus*, Anderson. 1*a*. Profile of head.

,, 2.—*Ixalus annandalei*, Boulgr. 2*a*. ,, ,, (×2).

,, 3.—*Ixalus argus*, sp. nov. 3*a*. ,, ,, (From type).

,, 4.—*Phrynoderma moloch*, sp. nov. 4*a*. ,, ,, (From co-type).

,, 5.—*Megalophrys kempii*, sp. nov. 5*a*. ,, ,, (From type, ×2).



3.





1.





4.





2.





5.



A.C. Chowdhary, del.

ABOR BATRACHIA

EXPLANATION OF PLATE IV.

HIMALAYAN TADPOLES.

FIG. 1.—Tadpole of *Rana alticola*, Boulgr. 1*a*. Head of younger tadpole from above (×2).

,, 2.—Tadpole of *Rana liebigii*, Günth. 2*a*. Mouth of same (×2).

,, 3.—Tadpole of *Rana afghana* (Günth.) (×1½). 3*a*. Mouth and ventral sucker of same (×2).

,, 4.—Tadpole of *Rhacophorus maculatus* (Gray), (typical form).

,, 5.—Tadpole of *Rhacophorus maculatus himalayensis*, subsp. nov.

,, 6.—Tadpole of *Phrynoderma moloch*, sp. nov. 6*a*. Head of larger tadpole from above.

,, 7.—Tadpole of *Bufo himalayanus*, Günth. (×2).

,, 8.—Tadpole of *Megalophrys parva*, Boulgr. (×1½). 8*a*. Head of same from above (×2). 8*b*. Ventral surface of same (×2). 8*c*. Mouth of same from in front (×4).

,, 9.—Tadpole of *Megalophrys* (?) *major*, Boulgr. (×1½).

,, 10.—Tadpole of *Megalophrys*, sp. indet. from Abor country (×1½).

,, 11.—Tadpole of undetermined Ranid from Abor country. 11*a*. Mouth of same (×2)



11a × 2.



11.



2a × 2.



1.



1a × 2.



2.



3 × 1½.



3a × 2



4.



10.



5.



9.



6.



8 × 1½



8c × 4.



6a.



8a × 2.



8b × 2.



7 × 2.

A. C. Chowdhary, del.

Benares, Calc. Derby.

HIMALAYAN TADPOLES.

II. REPTILIA.

(Plate v.)

By N. ANNANDALE, *D.Sc., F.A.S.B., Superintendent, Indian Museum.*

Although the reptiles brought back by Mr. Kemp are perhaps less interesting than the Batrachia, this is due solely to the fact that the reptiles of the eastern parts of the Indian Empire have been far more carefully studied than the toads and frogs. The collection consists of 83 specimens of snakes, representing 26 species (of which 3 have not previously been described); 40 specimens of lizards, representing 16 species (of which 1 is new), and a single tortoise; that is to say, 124 specimens in all, representing 43 species.

PART I.—SYSTEMATIC.

LIST OF SPECIES COLLECTED OR OBSERVED.

EMYDOSAURIA.

1. *Gavialis gangeticus.*

CHELONIA.

2. *Kachuga tectum.*

LACERTILIA.

3. *Gymnodactylus khasiensis.*
4. *Hemidactylus frenatus.*
5. *Hemidactylus bowringii.*
6. *Hemidactylus brookii.*
7. *Hemidactylus platyurus.*
8. *Draco maculatus.*
9. *Ptyctolaemus gularis.*
10. *Acanthosaura minor.*
11. *Calotes versicolor.*
12. *Calotes jerdoni.*
13. *Ophisaurus gracilis.*
14. *Varanus bengalensis.*
15. *Tachydromus sexlineatus.*
16. *Mabuia macularia.*
17. *Lygosoma indicum.*
18. *Lygosoma courcyanum*, nov.

OPHIDIA.

19. *Typhlops diardi.*
20. *Typhlops tephrosoma.*
21. *Typhlops diversiceps*, nov.
22. *Trachischium monticola.*
23. *Blythia reticulata.*
24. *Aproaspidops antecursorum*, gen. nov., sp. nov.
25. *Polydontophis collaris.*
26. *Ablabes porphyraceus.*
27. *Ablabes pavo*, nov.
28. *Ablabes frenatus.*
29. *Simotes albocinctus.*
30. *Oligodon erythrorachis.*
31. *Zamenis mucosus.*
32. *Coluber taeniurus.*
33. *Dendrophis gorei.*
34. *Pseudoxenodon macrops.*
35. *Tropidonotus platyceps.*
36. *Tropidonotus khasiensis.*
37. *Tropidonotus piscator.*
38. *Dipsadomorphus gokool.*
39. *Psammodynastes pulverulentus.*
40. *Dryophis prasinus.*
41. *Callophis macclellandii.*
42. *Amblycephalus monticola.*
43. *Trimeresurus monticola.*
44. *Trimeresurus gramineus.*

EMYDOSAURIA.

1. Gavialis gangeticus (Gmel.).

Boulenger, *Fauna*, p. 3.

Although no specimens of the Gharial were obtained, Mr. Kemp tells me that it is not uncommon at Kobo together with the Gangetic Porpoise (*Platanista gangetica*). Apparently the short-nosed Crocodile (*Crocodilus palustris*) does not make its way so far up the Brahmaputra, although it occurs between Mangaldai in the Darrang district and Gauhati.

CHELONIA.

2. Kachuga tectum (Gray).

Boulenger, *Fauna*, p. 43; *Cat. Chelonia Brit. Mus.*, p. 58; Siebenrock, *Zool. Jahrb. Jena*, 1909, suppl. x, p. 454.

A shell and skull of the genus *Kachuga* were obtained from the Dihang R. below Pasighat and must be referred to this species. The shell, however, which measures 21·7 cm. in length, is narrower than is usually the case, and Mr. Kemp tells me that the soft parts were deep olive in life without reddish marks of any kind. Possibly the specimen represents a local race, but I have examined apparently typical individuals of *K. tectum* from N. E. Assam.

The limits of the range of *K. tectum* are very imperfectly known. It has been recorded from several localities in central and western India and certainly occurs in many different parts of the river-systems of the Indus, Ganges and Brahmaputra. All specimens, however, that I have examined from central India, although several were labelled *K. tectum*, actually represented *K. intermedia*, a very closely allied and somewhat variable form that is common all over the Mahanaddi river-system and also in the lower reaches of the Godavari. I have recently seen large numbers of this form from Cuttack and Sambalpur in Orissa and find that the proportions and outlines of the neural plates are so variable that little reliance can be placed on them in separating the "species" from *K. tectum*. The skulls of the two forms are identical. The only constant feature of difference is therefore colouration, and I am inclined to think that the late Dr. Blanford[1] was right in regarding *K. intermedia* as being only a "variety" (or, as I would prefer to call it, a subspecies) of *K. tectum*. The true *K. tectum* also occurs, according to Siebenrock, in Cochin China, *Pangshura cochinchinensis*, Tirant,[2] being synonymous.

Mr. Kemp tells me that he could hear of only one land-tortoise having been seen during the Expedition and that it was not secured. Terrestrial Chelonia hibernate in northern India, but no species has as yet been recorded from the Himalayas.

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[1] *J.A.S.B.*, (2) xxxix (1870), p. 339, and xlviii (1879), p. 110.
[2] *Etudes Div. Miss. Pavie*, iii, p. 494 (1904).

LACERTILIA.

Fam. GECKONIDAE.

3. Gymnodactylus khasiensis (Jerdon).

Boulenger, *Fauna*, p. 68.

Originally described from the Khasi Hills, this lizard appears to have a fairly wide range in the mountains of Assam and northern Burma.

Two specimens were taken by Mr. Kemp at Kobo in December under the bark of a tree, together with a young *Ptyctolaemus gularis*. Others were obtained by the 32nd Sikh Pioneers at an altitude of about 2,000 feet at Upper Rotung.

My own *G. himalayicus*[1] is a very closely related species, differing in its slighter build, more obscure colouration and less compressed digits and also in having a well-defined triangular patch of enlarged scales just behind the praeanal pores. This last point, however, is not a very good character as in some specimens of *G. khasiensis*, of which I have examined a large series, there is a single enlarged scale, or even a pair of such scales, in the same position, although in others the scales are uniformly small.

4. Hemidactylus frenatus, D & B.

A very common lizard at low altitudes in the E. Himalayas, Assam, Burma and the Malay Peninsula; often found in houses.

A specimen was taken on a lamp-post in the streets of Dibrugarh in November.

5. Hemidactylus bowringii (Gray).

Not uncommon at low altitudes in the E. Himalayas and in Assam and Burma, this species is occasionally found in houses. It is, however, more often taken in the jungle.

There is a specimen in the collection from Sadiya.

6. Hemidactylus brookii, Gray.

Hemidactylus gleadovii, Boulenger, *Fauna*, p. 86, fig. 27.
Hemidactylus brookii, *id.*, *Ann. Mag. Nat. Hist.*, (7) i, p. 123 (1898), and Annandale, *Rec. Ind. Mus.*, vii, p. 45 (1912).

This species, which is one of the commonest house-lizards all over the plains of India (in northern Madras certainly the commonest), has a very wide distribution in the tropics but apparently avoids mountainous regions. The highest altitude from which I have seen a specimen is 4,500 ft., and this was on the isolated mountain Parésnath in Chota Nagpur, now in the new Province of Bihar and Orissa. Several specimens were obtained at Sadiya.

[1] *J.A.S.B.*, 1906, p. 287, and *Rec. Ind. Mus.*, I, p. 152, pl. vi, figs. 1, 1*a*, 1*b*, 1*c*, 1*d* (1907).

H. brookii is by no means always domestic in its habits, but individuals found living wild among rocks or in jungle are as a rule darker in colour and somewhat stouter in form than those which inhabit human dwellings. In either case the species is mainly nocturnal.

H subtriedroides[1] from Upper Burma only differs from *H. brookii*, of which it should probably be regarded as a variety, in its rather stouter habit and much larger dorsal tubercles. The tubercles are extremely variable in size even within the strict limits of *H. brookii*, and less frequently vary also in number. There is in the Indian Museum a specimen from Bangalore on which there are only two dorso-lateral rows of tubercles on each side, the middle region of the back being perfectly smooth. This individual was taken by myself, together with a normal one, on the post of a railing.

7. Hemidactylus platyurus (Schneid.).

This gecko is common in the E. Himalayas, in which it is found as a rule at rather higher altitudes than the two preceding species. It is widely distributed in the Indo-Malayan and Malayan countries. So far as I am aware the western limit of its range is situated in Nepal, my own *H. nepalensis*[2] being undoubtedly synonymous. In the Darjiling district *H. platyurus* is often found in houses, but it is naturally an inhabitant of tree-trunks.

An unusually dark specimen was taken by Mr. Kemp at Pasighat under the bark of a tree.

Fam. AGAMIDAE.

8. Draco maculatus (Gray).

Boulenger, *Fauna*, p. 112.

This species is widely distributed in Assam, Burma, the Malay Peninsula and Yunnan, the western limit of its range being situated near the point in Assam north of the Brahmaputra at which that river bends southwards. There are three specimens in Mr. Kemp's collection:—

16881	Janakmukh (alt. 600 ft.)	Capt. C. E. Edward-Collins.
16882	Yembung (alt. 1,100 ft.): "found in a hut in camp."	S. W. Kemp.
16997	Pasighat (alt. 500 ft.) ..	W. Cave-Brown.

Mr. Kemp describes the colouration of No. 16882, an immature male, as follows:—"Colour of back mottled warm brown, dark brown and black. Neck above with two elliptical black markings and a pair of black spots. 'Wings' above orange-brown. Belly

[1] Annandale, *Ann. Mag. Nat. Hist.*, (7) xv, p. 29 (1905), and *J.A.S.B.*, 1905, pl. ii, fig. 1.

[2] *Rec. Ind. Mus.*, i, p. 151, pl. vi, figs. 2, 2*a*, 2*b*, 2*c* (1907).

dull greenish yellow; bright yellow beneath and on either side of pouch. 'Wings' beneath dull yellowish green, the orange colouring having a tendency to show through. Lateral neck-flaps orange beneath. Predominant head-colour very dark brown."

The only other species of *Draco* as yet found in Assam is *D. norvillii*, Alcock,[1] a single specimen of which, now in the Indian Museum, was taken at Dum Duma in N.-E. Assam some years ago. This species is closely related to *D. blanfordii*, Boulenger, from which it differs in having the tympanum completely covered with small scales. From *D. maculatus* it is easily distinguished by its longer snout and by the broad patches of enlarged scales scattered on each side of the back along the base of the alar membrane.

9. Ptyctolaemus gularis, Boulgr.

Boulenger, *Fauna*, p. 117; Annandale, *J.A.S.B.*, 1905, p. 85; Wall, *Journ. Bomb. Nat. Hist. Soc.*, xviii, p. 505.

This is a very rare lizard in collections. I have only seen three specimens hitherto, two of them from Assam N. of the Brahmaputra. Major F. Wall, however, states that the species is common at Shillong in the Khasi Hills (4,900 ft.) and our third specimen is from that locality. The western limit of its range is apparently the same as that of *Draco maculatus*. It is possible that both will be found in the Buxa *duars*; we have both in the Indian Museum from Goalpara (Dhubri). *Ptyctolaemus* is certainly not indigenous in Calcutta.

Mr. Kemp found a very young specimen at Kobo in November; although probably not long hatched (or born), it bore the characteristic grooves on the side of the neck. Adults were taken at Kobo by Capt. de Courcy and at Rotung by Mr. Kemp, who did not obtain the species at altitudes of over 1,300 ft.

10. Acanthosaura minor (Gray).

Boulenger, *Fauna*, p. 127.

This species is known from both Sikhim and the Khasi Hills. It is, however, rare in the Darjiling district. A small specimen was obtained at Upper Rotung (alt. *ca.* 2,000 ft.) in January.

11. Calotes versicolor (Daud.).

Boulenger, *Fauna*, p. 135, fig. 42; Annandale, *Rec. Ind. Mus.*, vii, p. 46.

The only specimen in the collection is a very young one obtained at Sadiya.

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[1] *J.A.S.B.*, (2) lxiv, p. 14, pl. iii (1895)

12. Calotes jerdonii, Gunth.

Boulenger, *Fauna*, p. 137.

Common in the Khasi Hills; Col. Godwin-Austen obtained specimens in the Dafla Hills to the west of the Abor country, in which Mr. Kemp collected it at Komsing, Yembung and Balek. Both his specimens and Col. Godwin-Austen's are quite typical.

Fam ANGUIDAE.

13 Ophisaurus gracilis (Gray).

Boulenger, *Fauna*, p. 159, fig. 47.

A common species in the E. Himalayas at altitudes of between 4,000 and 5,000 ft.; it also occurs in the Khasi Hills, in Upper Burma and Yunnan and probably in the hills of Pegu.

A number of individuals of different ages were taken in the neighbourhood of Upper Rotung and Upper Renging (2,000—2,150 ft.) by the 32nd Pioneers while road-making. The large specimens have the back of a bright brick-red with very conspicuous blue cross-bars; on the tail the red fades to dull brown. The young are white with two blue-black stripes down each side and a somewhat indistinct and broken mid-dorsal stripe of the same colour; the latter is crossed at intervals by transverse rows of very small black spots, and there are rather larger black spots scattered on the lips and snout.

Fam. VARANIDAE.

14. Varanus bengalensis (Daud.).

All over India and Ceylon except at high altitudes; also in Upper Burma.

A skin was obtained at Kobo by Col. (now Brigadier-General) D. C. F. Macintyre and presented by him to the Indian Museum.

Fam. LACERTIDAE.

15. Tachydromus sexlineatus, Daud.

Boulenger, *Fauna*, p. 169; *Fasciculi Malayenses*, i, p. 158; Annandale, *J.A.S.B.*, 1905, p. 140.

This lizard is widely distributed in the damper parts of the Oriental Region. It is not found in Peninsular India.

A specimen was taken at Janakmukh (alt. 600 ft.) under the bark of a tree in December. It was probably hibernating, as the species is usually found among long grass.

Fam. SCINCIDAE.

16. Mabuia macularia (Blyth).

A very common skink all over the plains of India, Burma and Ceylon. Two specimens were taken at Sadiya in November, "under chips of wood."

17. Lygosoma indicum (Gray).

Lygosoma indicum and *L. zebratum*, Boulenger, *Fauna*, p. 195.
Lygosoma indicum, *id.*, *Ann. Mus. Genova* (2nd ser.), xiii, p. 319.

A very common species in the foot-hills of the E. Himalayas and also in hilly country in Assam and Burma.

Specimens were taken under stones in the neighbourhood of Rotung and Upper Rotung (1,300 to 2,000 ft.) in December, January and March.

18. Lygosoma courcyanum, sp. nov.

(Plate v, fig. 5.)

Subgenus *Hinulia*. Allied to *L.* (*Hinulia*) *cacharense*[1] from Assam but much more slender and with shorter limbs.

Habit slender, lacertiform; the distance between the axilla and the groin nearly twice that between the tip of the snout and the fore limb. Tail nearly twice as long as head and body. Total length 100 mm.

Head small, narrow, triangular; snout pointed; loreal region vertical; lower eye-lid scaly; ear-opening subcircular, much smaller than eye, without lobules; nostril pierced in a single nasal. Rostral much broader than deep, forming an extensive suture with fronto nasal; fronto-nasal undivided, much longer than praefrontals; no supranasals; praefrontals separate, short; frontal shorter than its distance from tip of snout, a little shorter than the parietals; its greatest breadth to its length as 7 to 9; parietals not meeting behind interparietal, forming a lengthy suture; interparietal small; a single pair of enlarged nuchals; 4 large, subequal supraoculars; 7 upper labials, 4th, 5th and 6th under eye.

Scales of body smooth, imbricate, in 24 rows; the ventrals slightly larger than the dorsals; two large praeanals.

Limbs short but well-formed, separated by a considerable distance where adpressed. Toes not compressed, of moderate length; 11 smooth lamellae under 4th toe.

Colouration.—Dorsal surface olive-brown minutely speckled with black; tail rather darker than back; a narrow pale band extending on each side from above the eye to the base of the tail; a rather broader black band running immediately below it; sides yellowish speckled with black; lateral surface of tail suffused with slate grey; ventral surface yellowish, speckled with slate-grey on tail.

[1] Annandale, *J.A.S.B.*, 1905, p. 145.

Dimensions of type:—

Total length	100 mm.
Length of head and body	35 ,,
Length of head	8 ,,
Breadth of head	4 ,,
Fore limb	9 ,,
Hind limb	13 ,,

Type.—No. 16900 in the Indian Museum register of Reptiles and Batrachia.

Habitat.—Two specimens were taken by Capt. the Hon. M. de Courcy, one at Rotung (1,300 ft.), the other at Upper Rotung (*ca.* 2,000 ft.).

OPHIDIA.

Mr. Kemp asks me to state that a very large proportion of the snakes in his collection were captured by the officers and men of the 32nd Sikh Pioneers at the instance of Capt. the Hon. M. de Courcy. They were found while road-making, chiefly in December and January, and were probably hibernating at the time. Other snakes were presented by Capt. J. S. O'Niell, Capt. F. H. Stewart and Capt. R. S. Kennedy of the Indian Medical Service.

Fam. TYPHLOPIDAE.

19. Typhlops diardi, Schleg.

Boulenger, *Fauna*, p. 238, fig. 70.

A considerable number of specimens of this common Himalayo-Burmese species were taken at Kobo, Pasighat, Janakmukh and Balek, several of them having been found crawling about on the surface in camp after rain.

T. diardi occurs all over Assam and Burma and is also found in the Himalayas, Siam and other adjacent countries.

20. Typhlops tephrosoma, Wall.

Wall, *Journ. Bombay Nat. Hist. Soc.*, xviii, p. 314.

A small specimen taken by the 32nd Sikh Pioneers at Janakmukh agrees well with Major Wall's description of the type from the Khasi Hills.

21. Typhlops diversiceps, sp. nov.

(Plate v, fig. 1.)

This species belongs to the same group as *T. braminus* and *T. beddomii*, but the anterior nasal is not in contact with the praeocular and the posterior nasals do not meet behind the rostral.

Snout rounded, projecting. Nostril lateral, nasal completely divided; rostral barely reaching the level of the eyes, not half as wide as snout; upper head-scales about twice as large as body-

scales, transverse; anterior nasal widely separated from praeocular, in contact with first labial below; posterior nasal much larger, in contact with second labial, not meeting its fellow on the top of the head; eyes moderately distinct; praeocular larger than ocular, in contact with second and third labials; ocular in contact with third and fourth labials; 4 upper labials. Diameter of body 40 times in total length; tail longer than broad, ending in a minute spine; 18 scales round body.

Colour dark olive-brown, slightly paler on ventral surface. Dorsal surface of head chestnut, ventral surface pale yellow; the latter shade extending upwards on either side to the level of the eyes in the form of a narrow triangle, very clearly defined posteriorly on the throat.

Length 160 mm.: length of tail 3 mm.

Type.—No. 16864, Ind. Mus.

Locality.—Pasighat (500 ft.) 25-iii-12. (Capt. R. S. Kennedy, I.M.S.)

Fam. COLUBRIDAE.

Subfamily COLUBRINAE.

22. Trachischium monticola (Cantor).

Boulenger, *Fauna*, p. 286.

A common snake in the hills of Assam, less abundant in the E. Himalayas. Ten specimens were taken by the 32nd Sikh Pioneers while road-making in the neighbourhood of Upper Rotung (alt. *ca.* 2,000 ft.) in January. Capt. de Courcy took another in the Sirpo valley near Renging.

23. Blythia reticulata (Blyth).

Boulenger, *op. cit.*, p. 287, fig. 92.

Three specimens were taken at Upper Renging, at Upper Rotung and in the Sirpo valley near Renging. The species, which is the only one in the genus, is characteristically Assamese. Fresh adult specimens are almost black in colour with a beautiful deep-blue iridescence, the pale markings becoming inconspicuous with age.

Aproaspidops, gen. nov.

This new genus is allied to *Trirhinopholis* and *Plagiopholis*, Boulenger, both of which are only known from Burma. It thus belongs to a peculiar little group of monotypic genera that includes *Blythia* and the two just mentioned and inhabits hilly country in Burma and Assam. *Aproaspidops* can be recognized easily by the fact that there is an azygous shield between the rostral and the supranasals and also a small postnasal on each side. There is no praeocular and no loreal, unless the latter name should be applied to the small scale I have called the postnasal.

Maxillary moderate, with about 20 teeth, which decrease slightly in size from before backwards; mandibular teeth similar to maxillary. Head not distinct from neck; eye small, with round pupil; nostril pierced between two nasals, the posterior of which is followed by a small scale (postnasal) in contact with the supranasal, praefrontal and first upper labial. Praefrontal entering the eye and in contact with upper labials; no praeocular; rostral separated from supranasals by a triangular azygous shield. Scales smooth, without apical pits, imbricate, in 12 straight rows; ventrals rounded Tail short; subcaudals in two rows.

24. Aproaspidops antecursorum, sp. nov.

(Plate v, fig. 2.)

Snout moderate, rounded. Rostral much wider than deep, just visible from above, much deeper than the shield which separates it from the supranasals; the latter completely divided, about half as long as the praefrontals, which are also completely divided; frontal about $1\frac{1}{3}$ times as long as broad, about as long as its distance from the snout, much shorter than the parietals. Nostril between two small, deeply concave scales, separated from the first labial; postnasal triangular, smaller than the two nasals of one side together. Praefrontal in contact with second and third upper labials, the latter and the fourth entering the eye; no subocular; a single large postocular; supraocular much longer than deep; 6 upper and 6 lower labials; loreals 1+2. Two pairs of chin-shields, posterior pair very short, in contact with the fourth pair of labials; the first pair in contact with three pairs of labials, first pair of labials forming a long suture behind the mental. Ventrals 136; subcaudals 16; anal divided; tail ending in a sharp spine.

Colour dark olive, each body-scale with a slightly darker border; ventrals and subcaudals with pale borders; an incomplete white collar extending over the greater part of the neck on each side some distance behind the gape.

Length 162 mm.: length of tail 12 mm.

Type.—No. 16844, Ind. Mus.

Locality.—Janakmukh, 600 ft.: 13-xii-11.

The single small, perhaps immature, specimen was taken by the 32nd Sikh Pioneers while road-making. It closely resembles young *Blythia reticulata* in appearance but can easily be distinguished by its circular pupil and by the extra scales behind the rostral and the nasals.

25. Polydontophis collaris (Gray).

Boulenger, *op. cit.*, p. 302.

A common snake all over the Himalayas up to 10,000 feet, in Assam, Upper Burma, etc. Specimens were taken in the Sirpo valley near Renging and at Kobo by Capt. de Courcy. They represent the typical form.

26. Ablabes porphyraceus (Cantor).

Boulenger, *op. cit.*, p. 308.

A common Malayo-Himalayan snake probably not found at great altitudes. Specimens were taken at Balek and between Kalek and Misshing by Capt. Wilson and Mr. Kemp respectively.

27. Ablabes pavo, sp. nov.

(Plate v, fig. 3.)

A magnificent species easily recognized by the large black and yellow ocelli on its back, but also to be distinguished by numerous scale-characters, notably by the large number of ventrals.

Rostral much wider than deep, visible from above; supranasals distinct, about half as long as praefrontals, which are also distinct; frontal 1⅓ times as long as broad, a little shorter than its distance from the tip of the snout, almost as long as the parietals; nasal completely divided, extending backwards as far as the suture between the second and third labial; no distinct loreal; a single praeocular; two postoculars, only the upper one in contact with the parietal; 7 upper labials, the third and fourth entering the eye; temporals 2+2; the shields on the sides of the head minutely pitted; two pairs of chin-shields, the anterior pair in contact with three pairs of labials, the posterior pair in contact with only one pair. Scales in 19 rows. Ventrals 233; subcaudals 80; anal and subcaudals divided.

Colour.—Sides and back pale bluish grey, each scale bearing an irregular patch of peach colour; back ornamented with a row of large black longitudinally oval rings, each with a yellow centre and separated one from another by only a short interspace; on the tail the yellow centres of the rings break up into small spots and finally at the tip, disappear altogether; about 50 rings in all; sides with irregular zig-zag black, yellow-edged vertical bars; ventral surface yellowish with numerous black cross-bars which are usually interrupted in the middle line; head black with a broad yellow bar across the snout, a second across the vertex behind the eyes and a third across the nape, the two latter being ∧-shaped; lips, chin and throat yellow with large black spots.

Length 640 mm.: length of tail 108 mm.

Type.—No. 16797, Ind. Mus.

Locality.—Upper Rotung; taken by 32nd Sikh Pioneers while road-making, 13-xii-11.

28. Ablabes frenatus (Gunth.).

Boulenger, *Fauna*, p. 306.

A characteristic Assamese species. Three specimens were taken at Upper Rotung (2,000 ft.) in January. Two were found while road-making, while one was sitting coiled up in the middle of a path.

29. Simotes albocinctus (Cantor).

Boulenger, *Fauna*, p. 312.

Not uncommon in the hills of Assam and Burma. Wall[1] has described, under the name *juglandifer*, a peculiar variety distinguished mainly by colouration but now regarded by him as a distinct species. It is from the E. Himalayas and Assam. Specimens of the typical form were taken by Capt. de Courcy at Kobo and in the Sirpo valley near Renging.

30. Oligodon erythrorhachis, Wall.

Wall, *Journ. Bombay Nat. Hist. Soc.*, xix, p. 923, pl.

Two specimens from Upper Rotung (alt. *ca.* 2,000 ft.) taken in December by the 32nd Sikh Pioneers must be referred to this species. Both, however, differ in colouration from the type. The smaller specimen measures 300 mm. in length and is of a brick-red colour with numerous white, black-edged cross-bars on the body and tail. There are faint traces of a dark mid-dorsal line and the head and ventral surface are marked as in Major Wall's figures. The second specimen is larger, measuring 510 mm., and differs from the smaller one in being of a deep crimson colour and having the cross-bars on the body and tail relatively broader and slate-grey instead of white.

31. Zamenis mucosus (Linn.).

Boulenger, *Fauna*, p. 324.

A small specimen of the Common Rat-Snake was taken at Janakmukh by Capt. O'Neill.

32. Coluber taeniurus (Cope).

Boulenger, *Fauna*, p. 333; *Fascic. Malay.*, i, p. 162.

Two specimens were taken in January at Upper Rotung by the 32nd Sikh Pioneers while cutting a road. The species has a somewhat curious distribution, ranging from Darjiling into not only south-western but also northern China. In the Malay Peninsula it is usually found in caves feeding on bats. Cavernicolous individuals are always very pale in colour, but it is by no means certain that this is not due to the direct effect of lack of light on the organism.

33. Dendrophis gorei, Wall.

Wall, *Journ. Bombay Nat. Hist. Soc.*, xix, p. 829, pl., fig. 1—3 (1910).

I doubt whether this is more than a local race of *D. pictus* peculiar to the north-east corner of Assam and the neighbouring

[1] *Journ. Bombay Nat. Hist. Soc.*, xix, pp. 3, 8, and xx, p. 1162, fig.

foot-hills. There are three specimens in the Abor collection which agree well with Major Wall's specimen from Dibrugarh now in the collection of the Indian Museum. They are from Kobo (400 ft.), from between Janakmukh and Balek and from the Siyom valley below Damda (*ca.* 1,400 ft.).

34. Pseudoxenodon macrops (Blyth).

Boulenger, *Fauna*, p. 340.

A specimen was taken near Sidi stream (alt. *ca.* 2,000 ft.) by the 32nd Sikh Pioneers. The species is very common in the Darjiling district from the base of the foot-hills up to 5,000 ft., occurring also in the hills of Assam and Burma but apparently in smaller numbers.

35. Tropidonotus platyceps, Blyth.

Boulenger, *Fauna*, p. 344.

A very variable species common in the Himalayas up to 10,000 ft.; also occurs in the Khasi Hills and the mountains of Burma. A specimen was taken at Upper Rotung.

36. Tropidonotus khasiensis, Boulgr.

Boulenger, *Fauna*, p. 344, and *Ann. Mus. Genova* (2nd ser.), xiii, p. 322.

A scarce species hitherto only found in the Khasi and Karin Hills. One was taken at Rotung by Capt. de Courcy.

37. Tropidonotus piscator (Schneid.).

Boulenger, *Fauna*, p. 349.

Young specimens of this very common and widely distributed species were taken at Rotung and Upper Rotung (1,300 and *ca.* 2,000 ft.). It occurs in the W. Himalayas up to at least 4,500 ft.

Subfamily DIPSADOMORPHINAE.

38. Dipsadomorphus gokool (Gray).

Dipsas gokool, Boulenger, *Fauna*, p. 360.
Dipsadomorphus gokool, *id.*, *Cat. Snakes Brit. Mus.*, iii, p. 64 (1895).

A specimen was taken at Dibrugarh. It is not improbable that this snake is actually restricted to Assam, for Cantor's localities are notoriously inaccurate and the record of this species from Penang apparently rests on a specimen from his collection in the British Museum. Bengal and Assam were not clearly distinguished by many of the older naturalists who wrote on Indian reptiles.

39. Psammodynastes pulverulentus (Boie).

Boulenger, *Fauna*, p. 363, and *Cat. Snakes Brit. Mus.*, iii, p. 173.

Specimens, 8 in all, were taken at the following places during the Expedition:—Kobo, Balek, Rotung, the Sirpo valley near Renging and Renging. The species is widely distributed in the damper parts of the Oriental Region but does not occur in Peninsular India. Mr. Kemp's series exhibits a remarkable range of colour-variation, no two individuals being precisely alike in colouration.

40. Dryophis prasinus, Boie.

Boulenger, *Fauna*, p. 369.

A widely distributed species in the E. Himalayas, Assam, Burma, Indo-China and Malaysia. Specimens were taken at Janakmukh by Capt. O'Neill and Capt. de Courcy, at Rotung by Capt. F. H. Stewart and at Balek by Capt. Wilson. All belong to the typical leaf-green form.

Subfamily Elapinae.

41. Callophis macclellandii (Reinh.).

Boulenger, *Fauna*, p. 385, and *Cat. Snakes Brit. Mus.*, iii, p. 398.

A very common snake in the hills of Assam, occurring also in the E. Himalayas, Burma, S. China, etc. Two specimens of the typical form were taken at Upper Rotung (2,000 ft.) by the 32nd Sikh Pioneers.

Fam. AMBLYCEPHALIDAE.

42. Amblycephalus monticola (Cantor).

Boulenger, *Fauna*, p. 415.

This snake, which occurs in the E. Himalayas, the hills of Assam and the Nicobar Is., is evidently very common in the Abor foot-hills. The 32nd Sikh Pioneers took 12 specimens of different sizes while road-making in the neighbourhood of Upper Rotung in January. They also caught specimens at Rotung and in the Sirpo valley.

Fam. VIPERIDAE.

43. Lachesis monticola (Gunth.).

Trimeresurus monticola, Boulenger, *Fauna*, p. 426.
Lachesis monticola, *id.*, *Cat. Snakes Brit. Mus.*, iii, p. 548.

Widely distributed in the E. Himalayas, the mountains of Assam, Burma and Yunnan and in hilly districts of the Malay Peninsula. Two specimens were obtained, one at Rotung, the other at Upper Rotung. Mr. Kemp tells me that he heard it stated

on several occasions that Russel's Viper (*Vipera russeli*) occurs in the Abor country but that these statements probably referred to *Trimeresurus monticola.*

44. Lachesis gramineus (Shaw).

Trimeresurus gramineus, Boulenger, *Fauna*, p. 429.
Lachesis gramineus, id., Cat. Snakes Brit. Mus., iii, p. 554.

A small specimen of the typical green form was taken at Kobo by Capt. Mitchell. The species is common in the hills of Assam, Burma, Malaysia, etc. and also occurs in the Himalayas.

PART II.—GEOGRAPHICAL.

The following species are only represented in Mr. Kemp's collection by specimens obtained at Dibrugarh or Sadiya or observed or caught in the Dihong R.:—*Gavialis gangeticus, Kachuga tectum, Hemidactylus frenatus, H. bowringii, H. brookii, Calotes versicolor, Mabuia macularia* and *Dipsadamorphus gokool.* These 8 species cannot, therefore, be regarded as having been proved to be inhabitants of the Abor foot-hills. The Indian Museum is, however, fortunate in possessing the collection of reptiles made in the Dafla foot-hills, which are situated a short distance to the west of the Abor country, by Col. Godwin-Austen many years ago, and it will add interest to geographical speculations about the fauna of the latter country if we combine the list of Mr. Kemp's collection with one of that obtained by Col. Godwin-Austen.

GEOGRAPHICAL LIST OF THE REPTILES KNOWN FROM THE HIMALAYAN FOOT-HILLS E. OF BHUTAN.

Name.	Assam.	Sikhim.	Burma.	REMARKS.
Nicoria tricarinata ..	x	..	..	Taken by Col. Godwin-Austen in the Dafla Hills; also known from Assam north of the Brahmaputra and from Chota Nagpur in Peninsular India.
Gymnodactylus khasiensis ..	x	..	x	Khasi Hills and Upper Burma.
Hemidactylus frenatus ..	x	x	x	Common in the Malay Peninsula; taken in the Dafla Hills; very widely distributed.

Name.	Assam.	Sikhim.	Burma.	REMARKS.
Hemidactylus platyurus.	x	x	x	The Himalayas from the Nepal Valley eastwards; also Ceylon, Malayasia, etc.
Draco maculatus ..	x	..	x	Malaya Peninsula, W. China, etc.
Ptyctolaemus gularis ..	x	..	..	Assam N. of Brahmaputra and Khasi Hills.
Acanthosaura minor ..	x	x	..	E. Himalayas and Khasi Hills.
Calotes jerdonii ..	x	..	..	Khasi Hills; both Dafla and Abor Hills.
*Japalura andersoniana**[1] ..	..	..	..	Only known from the Dafla Hills.
*Salea austeniana**[2] ..	..	..	..	Do. do.
Ophisaurus gracilis ..	x	x	x	Perhaps only in *Upper* Burma.
Varanus bengalensis ..	x	..	x	I cannot find any record of the occurrence of this common Indian species in Sikhim, but it probably does occur there.
Tachydromus sexlineatus	x	x	x	I have not seen this species in the Himalayas, but it is said to occur in Sikhim: it is also found in S. China, the Malay Peninsula, etc.
Lygosoma indicum ..	x	x	x	A common species in Burma, not known from the Malay Peninsula.
,, *courcyanum*,* sp. nov. ..	..	..	..	Only known from the Abor Hills.
,, *albopunctatum*	x	..	x	Also from Peninsular India, Malay Peninsula, etc.
Typhlops braminus ..	x	x	x	Very widely distributed; known from the Dafla Hills.

[1] Annandale, *J.A.S.B.*, 1905, p. 85.
[2] *Id.*, *Rec. Ind. Mus.*, II, p. 37 (1908).

Name.	Assam.	Sikhim.	Burma.	REMARKS.
Typhlops tephrosoma ..	x	..	..	Only known from the Khasi Hills.
,, *diardi* ..	x	x	x	Also in Indo-China, Siam, etc.
,, *diversiceps*, * sp. nov. ..	..	..	..	Only known from the Abor Hills.
Trachischium monticola	x	x	..	Common in the E. Himalayas and the hills of Assam.
Aproaspidops antecursorum,* gen. nov. ..	..	..	..	Genus only known from the Abor Hills.
Blythia reticulata ..	x	..	..	Common in the hills of Assam.
Polydontophis collaris ..	x	x	x	Also in W. Himalayas and S. W. China.
Ablabes porphyraceus ..	x	x	x	Also in Yunnan, Malay Peninsula, Sumatra, etc.
Ablabes pavo, sp. nov. ..	..	..	..	Only known from the Abor Hills.
Ablabes frenatus ..	x	..	..	Hills of Assam.
Simotes albocinctus ..	x	x	x	Common in Assam.
Oligodon erythrorhachis	x	..	..	Hitherto only known from hills S. of Brahmaputra.
Zamenis mucosus ..	x	x	x	A widely distributed Oriental species.
Coluber taeniurus ..	x	x	x	From the E. Himalayas to Yunnan; the Malay Peninsula; also Manchuria and Indo-China.
Dendrophis gorei ..	x	..	..	Only known from the N. E. corner of Assam.
Pseudoxenodon macrops	x	x	x	Hill species but not found at great altitudes.
Tropidonotus platyceps	x	x	x	Found up to 10,000 ft.
,, *khasiensis*	x	..	x	Found in Karin and Khasi Hills.
,, *piscator*..	x	x	x	Widely distributed in Oriental Region.

Name.	Assam.	Sikhim.	Burma.	REMARKS.
Psammodynastes pulverulentus ..	x	x	x	Also in Indo-China, Siam, the Malay Peninsula and Archipelago, etc.
Dryophis prasinus ..	x	x	x	Do. do.
Callophis macclellandii	x	x	x	Also in Nepal, S. China, etc.
Amblycephalus monticola ..	x	x	..	Also in Nicobars.
Trimeresurus monticola	x	x	x	Also in Yunnan, Malay Peninsula, etc.
,, *gramineus*	x	x	x	Also in Siam, S. China, Indo-China, the Malay Peninsula and Archipelago.

The only tortoise in this list (*Nicoria*[1] *tricarinata*) is one of a small group of more or less terrestrial Chelonia that occur both in Chota Nagpur in Peninsular India and in the northern part of Assam but apparently not in any intermediate locality. It is, however, evident that we know as yet very little about the distribution of the Indian land-tortoises.

The genera of lizards and snakes that are known to occur in the foot-hills N. of the Brahmaputra and E. of Bhutan are for the most part widely distributed. Only one appears to be endemic, *viz.*, the new genus *Aproaspidops*, which is allied to the Burmese genera *Trirhinopholis*[2] and *Plagiopholis*.[3] The genera *Blythia* and *Ptyctolaemus* are characteristically Assamese, while *Pseudoxenodon*, *Japalura* and *Draco* are restricted to the damper parts of the Oriental Region, the last-named being a characteristically Malaysian genus also found in S. India, while the two first are essentially continental in distribution. The genus *Salea* only occurs in the foot-hills E. of Bhutan, in Lower Burma and in S. India, being thus almost analogous in its range to the Ranid genus *Micrixalus*.

If we separate out the 42 species in the list into geographical groups as was done in the case of the Batrachia (p. 34 *antea*) we find that the following percentages can be calculated :—

I. Species of wide distribution in the Himalayas, Assam, Burma and Indo-China or Malaysia .. .. .. 16 = 38%
II. Species of very wide general distribution 6 = 14%

[1] Stejneger (*Proc. Biol. Soc. Wash.*, xv, p. 238 (1902), and Siebenrock (*Zool. Jahrb. Jena*, 1909, suppl. x, p. 494, point out that by the strict letter of the law of priority the name of this genus should be *Geoemyda*.

[2] Boulenger, *Cat. Snakes Brit. Mus.*, i, p. 419.

[3] *Id.*, *ibid.*, p. 301.

III.	Apparently endemic species ..	6 = 14%
IV.	Species only known hitherto from Assam	7 = 16·5%
V.	Assamo-Burmese species	3 = 7%
VI.	Himalayo-Assamese species ..	3 = 7%
VII.	Species only known from Assam and Peninsular India	1 = 2·5%

There are no exclusively Himalayan species in the list and none that have hitherto been known only from Burma. If we compare this analysis with that of the Batrachian fauna of the Abor Hills published on p. 35 of this volume, the chief apparent difference is that the endemic forms appear to be fewer and the representatives of what I have called elsewhere the Malayo-Himalayan fauna much more numerous. This may be due in part to the fact that the lizards and snakes of Assam are much better known than the frogs and toads, and in part to the wider distribution of species in the former groups. In the main the results are strictly comparable in what may be regarded as their essential feature, *viz.*, in illustrating the non-Himalayan nature of the Abor fauna. Unfortunately we know almost nothing of the reptiles and Batrachia of Bhutan, but the little that we do know would suggest that the eastern boundary of the true Himalayan fauna is formed by the R. Tista, which flows down south through the Himalayas to the west of Bhutan. This river, at any rate in its present course, is apparently a much more ancient one than the existing Brahmaputra.

The reptiles of the extreme east of the Himalayas, although they have strong Assamese affinities, are by no means identical with those of the Khasi Hills. It is particularly noteworthy that the species of *Japalura* which occur in the Dafla Hills is not nearly so closely related to the common *J. variegata* [1] of Sikhim as that species is to *J. planidorsata* of the Khasi Hills, and none of the six apparently endemic species have, so far as we are aware, close allies in the other mountains of Assam.

We may say therefore that the reptiles of the Abor foot-hills agree with the Batrachia in differing considerably from those of the foot-hills immediately to the west of Bhutan and in including a well-marked endemic element, but that they appear to be more closely connected with the fauna characteristic of the damp jungles of the E. Himalayas, Assam, Burma, Indo-China and the Malay Peninsula. It is to this fauna that it is convenient to apply the term "Malayo-Himalayan." Probably the comparative dryness of the forests on the foot-hills west of Nepal has prevented many damp-loving animals of Malayan origin from penetrating further afield in a westerly or north-westerly direction, while a smaller contingent has been stayed by the course of the R. Tista.

[1] I was wrong in stating that this species occurs in Assam (J.A.S.B., 1905, p. 92), having been misled by badly preserved specimens of *J. planidorsata*.

APPENDIX.

DESCRIPTIONS OF THREE NEW INDIAN LIZARDS.

As a matter of convenience I take this opportunity to describe three lizards, one of which is of particular interest in connection with the Abor fauna in that it comes from the Bengal frontier of Bhutan. The other two are from the Bombay Presidency and Sylhet respectively.

Hemidactylus platyceps, sp. nov.

Habit slender; depressed; size small.

Head narrowly ovoid, strongly depressed and very shallow; snout bluntly pointed, about as long as distance between eye and ear; eye small; ear-opening minute, longitudinally oval. Rostral much more than twice as broad as deep, feebly cleft above; nostril between rostral, first labial and three small scales; 9 upper, 7 lower labials; snout covered with strongly keeled granules, rest of head with smaller and slightly irregular convex granules; two pairs of chin-shields, followed on each side by several irregular scales; first pair of chin-shields forming a long suture behind mental; throat-scales small, smooth, imbricate.

Scales.—Back covered with small convex granules of somewhat unequal size, with 12 longitudinal rows of much larger strongly keeled tubercles; these much larger than ear-opening; dorsal surface of limbs covered with unequal keeled granules; ventral scales rather large, smooth, imbricate; tail covered above and below with smooth imbricate scales which are a little larger on the ventral than on the dorsal surface.

Limbs short, the adpressed hind limb barely reaching the axilla. Fingers and toes short, free; 8 lamellae under 4th, 4 under inner toe. Distal joint of inner digit extremely short.

Tail short, somewhat depressed as a whole, triangular in vertical section.

Colouration.—Dorsal surface dull olivaceous, with a dark longitudinal line extending on either side from the tip of the snout above the eye to the base of the tail; this line followed below by a pale one and then by a second dark one; two very narrow dark lines separated by a pale interspace below the second broader one on the sides of the belly; tail dark olivaceous; ventral surface yellowish green, suffused with dark olivaceous on the tail.

Total length	70 mm.
Length of head and body	33 ,,
Length of tail	37 ,,
Length of head	10 ,,
Length of fore limb	10 ,,
Length of hind limb	8 ,,

Habitat.—Bilimora, Bombay Presidency (*T. Bainbrigge Fletcher*), 13-ii-11.

Type.—No. 17020, Ind. Mus. (♀).

We are indebted to Mr. T. Bainbrigge Fletcher for the unique specimen of this curious little lizard, which appears to be very distinct from any hitherto described. It belongs to the section of the genus typified by *H. frenatus*, D. & B., and is perhaps nearer the S. Indian *T. reticulatus*, Beddome, than any other species. It may be distinguished from that form by its flattened head, broad rostral and longitudinal dark stripes.

Japalura bengalensis, sp. nov.

(Plate v, fig. 4.)

Japalura yunnanensis, Annandale (*nec* Anderson), *J.A.S.B.*, 1906, p. 288.

In the paper cited I referred to the specimen here described as the male of *Japalura yunnanensis*, Anderson, but having since had an opportunity of examining an example of that species and having partially dissected the one from Buxa, I find that the latter is a female and differs from the Chinese form. It may be described as follows:

Habit stout; body moderately compressed; size large.

Head triangular; its dorsal surface sloping downwards and forwards from behind the eyes, slightly concave between the orbits; scales of dorsal surface irregular, keeled, largest on snout; 9 upper and 9 lower labials; snout longer than diameter of eye, bluntly pointed. A small gular pouch, no transverse fold across the throat.

Scales of back and sides small, almost granular, mixed with much larger keeled scales which tend to be grouped in small patches; no dorso-lateral rows of enlarged scales; ventrals larger than largest dorsals, strongly keeled, imbricate, pointed behind; scales on upper surface of limbs irregular in size, leaf-shaped, strongly keeled.

Crest.—A well-developed nuchal crest (in the female) consisting of upright lanceolate scales shorter than half the diameter of the eye rising from a fold of skin covered with almost granular scales; no dorsal crest on the anterior half of back, a very slight one on the posterior half.

Limbs moderate. Adpressed hind limb reaches anterior border of orbit; tibia about as long as skull; third and fourth fingers equal.

Colouration.—Head dull olivaceous with two narrow brown cross-bars on the dorsal surface, one just in front of, the other just behind the eye; dark lines radiating from the eye; lips with dark vertical bars; sides of head irregularly marked with dark brown; back and sides (in spirit) livid bluish-grey with a fine reticulation of dark brown; tail obscurely barred; limbs marked irregularly; ventral surface yellowish; a black patch on the gular pouch.

Total length ..	..	310 mm.
Length of head and body ..	..	110 ,,
Length of tail ..	..	200 ,,
Length of head ..	..	33 ,,
Length of fore limb ..	..	55 ,,
Length of hind limb ..	..	85 ,,

Locality.—Buxa, Jalpaiguri district, Bengal frontier of Bhutan.

Type.—No. 12564, Ind. Mus. (♀).

It is probable that this species inhabits the foot-hills of Bhutan, perhaps replacing *J. variegata* east of the R. Tista and being replaced by *J. andersoniana* at some unknown point situated still further east.

J. bengalensis is one of the largest species in the genus and easily surpasses either the Sikhim, the Dafla or the Khasi form in this respect. It is distinguished from the first (*J. variegata*) not only by its larger size but also by the nature of its crest, its colouration and scale-characters. From *J. planidorsata* the shape of its body will readily distinguish it, while its hind limbs are much shorter than in *J. andersoniana*.

Tropidophorus assamensis, sp. nov.

This species is closely related to *Tropidophorus cochinensis*, D. & B., from which it differs in its more slender form, shorter limbs, keeled ventrals, etc.

Habit slender; cylindrical.

Head.—Snout sharply pointed, narrow, no longer than orbit. Dorsal scales strongly ridged; a single fronto-nasal, which is almost as broad posteriorly as it is long; praefrontals short, forming a median suture; frontal shorter than fronto-parietals and interparietal together; 4 supraoculars, the 1st and 4th longest; 5 supraciliaries, 1st longest; fronto-parietals longer than interparietal, forming a suture behind it; 5 upper labials, 4th longest; 3rd, 4th and 5th beneath eye; an azygous mental; tympanum smaller than eye-opening.

Scales, 30 round body, all strongly keeled and spinously produced; ventrals largest; throat scales not strongly keeled but ending in a sharp point posteriorly; a pair of large praeanals; dorsal and lateral tail-scales keeled; ventral tail-scales smooth.

Limbs short but well-formed. Hind limb reaches wrist. Infradigital lamellae smooth.

Tail cylindrical, tapering, longer than head and body.

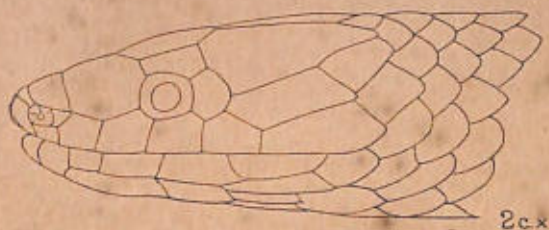
Colouration.—Dorsal surface dark brown obscurely marbled with yellow, three cross-bars of latter colour; one across hips, a second across shoulders and a third (less distinct than others) across back of neck; tail rather darker, obscurely banded; head brown; sides and lips black with small white spots; ventral surface yellowish; small black spots on chin, throat and chest; ventral surface of tail dark with an interrupted mid-ventral pale stripe, which becomes obscure distally, and numerous small yellowish spots.

Total length	.. 90 mm.
Length of tail ..	.. 51 ,,
Length of head ..	.. 9 ,,
Breadth of head ..	.. 5 ,,
Length of fore limb ..	.. 12 ,,
Length of hind limb ..	.. 14 ,,

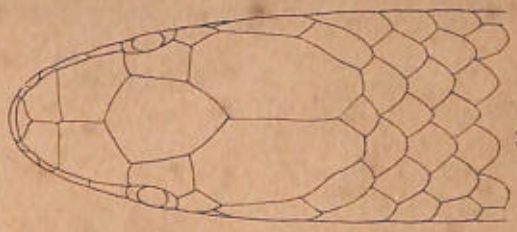
Type.—No. 17029, Ind. Mus.

Locality.—Haraigaj range, 550 ft., Sylhet hills, Assam.

A single specimen was obtained by Mr. G. Mackrell, who has kindly presented it to the Indian Museum. It differs widely from *T. berdmorii*, of which we possess the type. *T. yunnanensis*, Boulenger, is in my opinion synonymous with the latter species, of which I have examined many Burmese specimens. The scales seem to vary greatly in the degree to which they are keeled and in some cases are quite smooth, while the number of longitudinal rows of scales is not by any means constant.



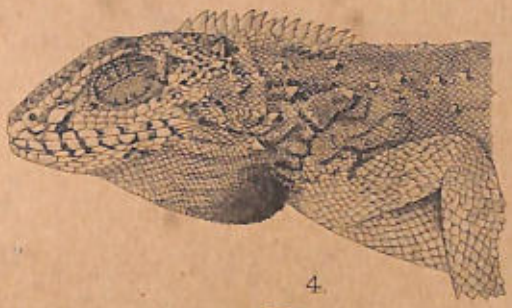
2c × 6.



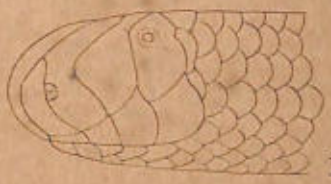
2b × 6.



1b × 8.



4.



1c × 8.



1 × 6.



3.



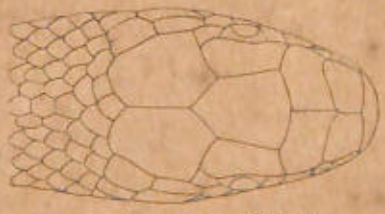
2 × 2.



2a × 2.



1a × 6.



3a × 2.



5 × 3.



3b × 2.

A. C. Chowdhary, del.

Bemrose, Colle, Derby.

1. Typhlops diversiceps, sp. nov. 2. Aproaspidops antecursorum, gen. et sp. nov.
3. Ablabes pavo, sp. nov. 4. Japalura bengalensis, sp. nov.
5. Lygosoma courcyanum, sp. nov.

III. LEPIDOPTERA.

By CAPTAIN W. H. EVANS, *R.E.*

The collection of Lepidoptera obtained on the Abor Expedition is not a large one, a fact which is doubtless explained by the season during which the military operations were undertaken. In addition to the specimens found by Mr. Kemp, a collection made by Captain H. W. Price of the Supply and Transport Corps and presented by him to the Indian Museum, has been examined while the records of other specimens collected by Major E. H. Sweet of the 2nd Gurkha Rifles are included. Permission to incorporate identifications of the species comprised in the latter collection was obtained through the courtesy of Major E. H. Sweet and the Secretary of the Bombay Natural History Society.

In all seventy-four species have been examined. The order and nomenclature followed in the list is that adopted in my "List of Indian Butterflies" published in the *Journal of the Bombay Natural History Society*, March 31st, 1912.

1. *Danais aglea melanoides*, M.
   1 ♂ Sadiya: Nov. (*S.W.K.*); 1 ♀ Kobo: Dec. (*S.W.K.*)
   1 ♂ "Abor Expedition" (*E.H.S.*).

2. *Danais melaneus*, Cr.
   1 ♀ Between Kobo and Janakmukh (*H.W.P.*).

3. *Danais plexippus*, L.
   1 ♂ "Abor Expedition" (*E.H.S.*).

4. *Euploea diocletianus*, Fab.
   1 ♂ Between Kobo and Janakmukh (*H.W.P.*).

5. *Ypthima baldus*, Fab.
   1 ♂ "Abor Expedition" (*E.H.S.*).

6. *Ypthima affectata*, El. and Ed.
   1 ♂ Rotung: March, dry season form (*S.W.K.*).

Above the specimen is uniform dark brown on the forewing with no male brand: the hindwing has all the ocelli showing and some white powdering on the margin, especially towards the anal angle. Below the ground colour is very dark brown, loosely powdered pale ochreous: the ocelli on the hindwing are minute: there are no distinct bands, but the powdering is darker on the disc of the hindwing, showing up as a dull ochreous irregular patch. The underside resembles in general appearance the underside of *Y. philomela indecora*, M., from the Western Himalayas.

7. *Lethe chandica*, M.
   1 ♂ Rotung: March (*S.W.K.*).

8. *Mycalesis perseoides khasia*, Evans.
   1 ♂ "Abor Expedition," dry season form (*E.H.S.*).

9. *Mycalesis visala*, M.
   1 ♂ "Abor Expedition," dry season form (*E.H.S.*).

10. *Mycalesis meda*, Fab.
    1 ♂, 1 ♀ "Abor Expedition," dry season forms (*E.H.S.*).

11. *Melanitis leda ismene*, Cr.
    3 ♂, 2 ♀ "Abor Expedition," dry season forms (*E.H.S.*).

12. *Melanitis phedima bela*, M.
    1 ♂ "Abor Expedition," dry season form (*E.H.S.*).

13. *Hestina nama*, Db.
    1 ♂ "Abor Expedition" (*E H.S.*).

14. *Stibochiona nicea*, Gray.
    1 ♂ Rotung: March (S.W.K.); 1 ♀ between Kobo and Janakmukh (*H.W.P.*).

15. *Liminitis procris*, Cr.
    1 ♂, 1 ♀ Kobo: Dec. (*S.W.K.*).

16. *Pantoporia zeroca*, M.
    1 ♂ Sadiya: Nov. (*S.W.K.*).

17. *Neptis hylas varmona*, M.
    1 ♂ Dibrugarh: Nov. (*S.W.K.*).

18. *Neptis soma*, M.
    2 ♂ Sadiya and Kobo: Nov. (*S.K.W.*).

19. *Neptis hordonia*, Stoll.
    1 ♂ Kobo: Dec. (*S.W.K.*).

20. *Cyrestis thyodamas*, Bdl.
    2 ♂ Sadiya: Nov. (*S.W.K.*).

21. *Junonia iphita*, Cr.
    1 ♂ Sadiya: Nov. (*S.W.K.*).

22. *Vanessa indica*, Herbst.
    1 ♂ Kobo: Dec. (*S.W.K.*).

23. *Symbrenthia hippoclus khasiana*, M.
    1 ♂ Sadiya: Nov. (*S.W.K.*).

24. *Rhinopalpa polynice birmana*, Fruh.
    4 ♂ Kobo: Nov. and Dec. (*S.W.K.*); and between Kobo and Janakmukh (*H.W.P.*).

This insect is rare in Assam generally but seems common in the Abor country.

25. *Hypolimnas bolina*, L.
    1 ♂ Between Kobo and Janakmukh (*H.W.P.*).

26. *Kallima inachus*, Bdl.
    1 ♂ Kobo; Dec. (*S.W.K.*); 2 ♂ between Kobo and Janakmukh (*H.W.P.*).

27. *Cynthia erota*, Fab.
1 ♂ Between Kobo and Janakmukh (*H.W.P.*).

28. *Cirrhochroa aoris*, Db.
1 ♂ "Abor Expedition" (*E.H.S.*); 1 ♂ Sadiya: Nov. (*S.W.K.*); 1 ♀ Rotung: Dec. (*S.W.K.*).

29. *Argynnis hyperbius*, Joh.
1 ♂ Kobo: Dec. (*S.W.K.*); 1 ♀ Sadiya: Nov. (*S.W.K.*).

30. *Pseudergolis wedah*, Koll.
3 ♂ Kobo: Nov. and Dec and Sadiya: Nov. (*S.W.K.*).

31. *Cethosia cyane*, Dr.
2 ♂, 1 ♀ Kobo: Dec. (*S.W.K.*).

32. *Cethosia biblis*, Dr.
1 ♀ Rotung: Dec. (*S.W.K.*).

33. *Zemeros flegyas*, Cr.
2 ♂ "Abor Expedition" (*E.H.S.*); 1 ♂ Sadiya: Nov. and 2 ♂ Rotung: Dec. and March (*S.W.K.*).

The specimens have the white apical spots well developed, showing a close resemblance to the race *confucius*, Fruh., from Southern Burma.

34. *Papilio philoxenus polyeuctes*, Db.
1 ♂ Rotung to Renging (*S.W.K.*).

35. *Papilio helenus*, L.
1 ♂ "Abor Expedition" (*E.H.S.*); 2 ♀ between Kobo and Janakmukh (*H.W.P.*).

36. *Papilio polytes romulus*, Cr.
1 ♂ "Abor Expedition" (*E.H.S.*).

37. *Papilio memnon agenor*, L.
1 ♀ form *butlerianus*, Roth., between Kobo and Janakmukh (*H.W.P.*).

38. *Papilio protenor euprotenor*, Fruh.
1 ♀ Sadiya: Nov. (*S.W.K.*).

39. *Papilio paris*, L.
1 ♀ Between Kobo and Janakmukh (*H.W.P.*).

40. *Leptocircus curius*, Fab.
1 ♀ Sadiya: Nov. (*S.W.K.*).

41. *Delias aglaia*, L.
2 ♂ Kobo: Dec. (*S.W.K.*).

42. *Pieris canidia*, Spaw.
1 ♂ Kobo: Dec. (*S.W.K.*).

43. *Appias lalage*, Db.
1 ♂ "Abor Expedition" (*E.H.S.*); 1 ♂ Sadiya: Nov., 3 ♂ Rotung: Dec. and 1 ♂ Kobo: Dec. (*S.W.K.*).

44. *Dercas verhueli doubledayi*, M.
1 ♂ Rotung: March (*S.W.K.*).

45. *Catopsilia florella*, Fab.
1 ♂ Sadiya: Nov. (*S.W.K.*).

46. *Colias fieldii*, Mén.
2 ♀ near Kalek, 2,500 ft., March (*S.W.K.*).

The specimens from the locality should be true *fieldii*, but are small and dull resembling the western *edusina*, But., more than the Chinese *fieldii*, Mén.

47. *Terias hecabe*, L.
3 ♂ Kobo: Dec. and 1 ♀ Sadiya: Nov., dry season forms (*S.W.K.*)

48. *Terias silhetana*, Wall.
1 ♀ Kobo: Dec., dry season form (*S.W.K.*).

49. *Hebomoia glaucippe*, L.
1 ♀ Between Kobo and Janakmukh (*H.W.P.*).

50. *Pareronia avatar*, M.
1 ♂ "Abor Expedition" (*E.H.S.*).

51. *Neopithecops zalmora*, But.
2 ♂ Rotung: Dec. and March (*S.W.K.*).

52. *Cyaniris transpecta*, M.
1 ♂ Sadiya: Nov. and 2 ♂, 1 ♀ Kobo: Dec. (*S.W.K.*).

53. *Cyaniris dilecta*, M.
1 ♂ Rotung: Dec. (*S.W.K.*).

54. *Cyaniris limbata placida*, de N.
2 ♂ Kobo: Dec., dry season forms (*S.W.K.*).

55. *Catochrysops strabo*, Fab.
1 ♂ Kobo: Dec. (*S.W.K.*).

56. *Castalius rosimon*, Fab.
2 ♂ Sadiya: Nov. (*S.W.K.*); 1 ♀ "Abor Expedition". (*E.H.S.*).

57. *Castalius elna*, Hew.
1 ♂ Sadiya: Nov. and 2 ♂, 2 ♀ Kobo: Dec. (*S.K.W.*).

58. *Lycaenesthes emolus*, God.
1 ♂ Sadiya: Nov. (*S.W.K.*).

59. *Nacaduba bhutea*, de N.
1 ♂ Kobo: Dec. (*S.W.K.*).

60. *Nacaduba nora*, Fd.
1 ♂ Rotung: Dec. (*S.W.K.*).

61. *Nacaduba noreia*, Fd.
1 ♂ Kobo: Dec. (*S.W.K.*).

62. *Lampides bochus*, Cr.
1 ♀ Sadiya: Nov. (*S.W.K.*).

63. *Lampides elpis*, God.
1 ♂ Kobo: Dec., typical and 1 ♂ Rotung: March (*S.W.K.*).

The specimen from Rotung has the border above reduced to a fine line, as in *pura*, M., and below all the markings very dull.

64. *Polyommatus boeticus*, L.
2 ♂ Rotung : March (*S.W.K.*).

65. *Poritia hewitsoni tavoyana*, Doh.
2 ♂, 2 ♀ Between Kobo and Janakmukh (*H.W.P.*).

The females have the lower part of the forewing very pale blue, while the orange spot, prominent in true *hewitsoni*, is only faintly indicated in one specimen and absent in the other.

66. *Ilerda epicles*, God.
3 ♂ Sadiya : Nov., 2 ♂ Kobo : Dec. and 1 ♂ Rotung : Dec. (*S.W.K.*).

67. *Arhopala silhetensis*, Hew.
1 ♀ Dibrugarh : Nov. (*S.W.K.*).

68. *Rapala schistacea*, M.
1 ♂ Kobo : Dec. (*S.W.K.*).

69. *Hypolycaena erylus*, God.
1 ♂ Kobo : Dec. (*S.W.K.*).

70. *Cheritra freja*, Fab.
1 ♀ Kobo : Dec., dry season form (*S.W.K.*).

71. *Zeltus etolus*, Fab.
3 ♂ Kobo : Dec. and 3 ♂ Sadiya : Dec. (*S.W.K.*).

72. *Loxura atymnus*, Cr.
1 ♂ Dibrugarh : Nov. and 1 ♂ Sadiya : Nov. (*S.W.K.*).

73. *Ampittia maro*, Fab.
1 ♂ "Abor Expedition" (*E.H.S.*).

74. *Rhopalocampta benjaminii*, Guér.
1 ♂ Rotung : March (*S.W.K.*).

IV. PORIFERA.

By N. ANNANDALE, *D.Sc., F.A.S.B., Superintendent of the Indian Museum.*

In the absence of ponds, lakes and slow-running streams it was not to be expected that sponges would be found in the Abor country, but two species were obtained by Mr. Kemp and Mr. J. Coggin Brown of the Geological Survey in N.-E. Assam. The only species hitherto found in Assam was *Spongilla* (*Euspongilla*) *proliferens*, Annandale, which was taken near Mangaldai to the north of the Brahmaputra by Mr. Kemp on a former occasion and is widely distributed in the Oriental Region. Specimens were found by Messrs. Kemp and Brown on their way to the Abor country at Dibrugarh on the south bank of the Brahmaputra. The same collectors obtained specimens of another sponge (*Spongilla* (*Eunapius*) *crassissima* var. *crassior*, Annandale) in a small muddy pond at Mariani in the Sibsagar district. This form had only been found hitherto at Rajshai (Rampur Bhulia) on the north bank of the Ganges in Bengal, while the typical form of the species is only known from the Gangetic delta and Orissa.

All the specimens from N.-E. Assam were preserved in November. Although apparently killed during a period of full vegetative vigour, they are full of gemmules.

I can detect no buds on the examples of *S. proliferens*, but these structures, although characteristic of the species, are not always present. The gemmules possess well-formed foraminal tubules.

The specimens of *S. crassissima* var. *crassior* agree well with the types except in being of a bright green colour. In external appearance (except as regards colour) they closely resemble *S. decipiens calcuttana*, which belongs to the same subgenus, but they can be easily distinguished therefrom by their much stouter megascleres and more compact skeleton.

S. proliferens is fully described on pp. 72-76 of my volume in the "Fauna" on the Freshwater Sponges, etc. and *S. crassissima* and its variety on pp. 98 and 99 of the same work.

V. SCOLOPENDRIDAE.

By F. H. GRAVELY, *M.Sc., Assistant Superintendent, Indian Museum.*

Out of the eight species collected two are new, one is only known from the E. Himalayas and Assam; but all the rest occur south and in most cases west of this area as well.

Subfamily *CRYPTOPINAE.*

Genus **Cryptops.**

C. doriae, Pocock.

Renging, 2,150 ft., 19-xii-11 (under bark).

This species has hitherto been recorded from the area between and including New Guinea and Burma. It must extend westwards right across India, however, for I recently obtained specimens from Taloshi (Satara District, Bombay) at an altitude of about 2,000 ft. in the Western Ghats.

Subfamily *OTOSTIGMINAE.*

Genus **Otostigmus.**

O. burn-murdochi, n. sp.

Upper Rotung, *ca.* 2,000 ft., Jan., 1912.

Collected by the 32nd Sikh Pioneers when roadmaking and named after Mr I. Burn-Murdoch of that regiment.

Description.—Length (apart from appendages) up to 63 mm. Antennae 19-jointed (rarely 17-jointed on one side and 19-jointed on the other, the terminal joint being present in both), the first three joints large, polished and hairless, the rest smaller and pilose. Dorsal surface of head and body dark olive green, finely and sparsely but evenly punctured throughout, the punctures on the head and first one or two segments often a trifle larger and less clearly defined than the rest, segments 3-20 with a pair of very fine and sometimes incomplete longitudinal grooves; these grooves usually more strongly impressed close to the posterior margin especially in the anterior or middle segments of the body, where they are often joined by a transverse groove between which and the posterior margin the surface may be rugose. Marginal grooves present behind segments 8-11. Anal segment

laterally with strong marginal ridges; posterior margin composed of two straight halves meeting in an angle of about 120°. Ventral surface paler than dorsal, similarly punctured, but without grooves; sternocoxal plate armed with five strong teeth (sometimes four or six on one side only). Sternum of anal segment narrower behind than in front, posterior margin more or less concave. Pseudopleural processes at least as long as sternum of anal segment, sometimes very slender behind, armed with 1-2 distal, 1-2 external, and 1-4 dorsal spinules. Tooth on inner side of femur of poison-jaws strongly developed. Legs distally of a more bluish tinge than the body. First pair of legs armed with 1 distal spine on the patella, 1 on the tibia, 2 on the proximal tarsus, and 2 at the base of the claw; second with 2 spines on the proximal tarsus and claw, with or without 1 on the tibia; third to twentieth with 2 at the base of the claw, 1, or usually in many of the anterior segments 2, at the end of the proximal tarsus; anal legs with 2 at the base of the claw only; femur of anal legs with a strong dorsal tooth on the inner side at the end ("eckdorn") with 1-3 smaller teeth behind it, beneath on the outer side with 3, on the inner with 2, 2-3, 3 teeth often irregularly arranged.

This species is allied to those grouped under the number 5 in Kraepelin's table [Revision der Scolopendriden, p. 99, in Mitt. Naturhist. Mus. Hamburg, XX, 1902 (1903)]. It differs from all of them, however, in combining the presence of external spinules on the pseudopleural processes with the absence of longitudinal grooves on the sterna.

O. insularis, Haase.

Kobo, 400 ft., 8-xii-11.

Rotung, 1,300-1,400 ft., 31-xii-11 and 1-i-12.

This species is recorded from the Seychelles, Ceylon, the Philippines, and the E. Himalayas.

Several specimens have recently been added to the Museum collection. In addition to the Abor records above noted, the following localities may be given:—

Ceylon: Kandy and Peradeniya, 1,500-2,000 ft.

E. Himalayas: Darjiling District—Ghumti, *ca.* 1,800 ft.

Assam: Mangaldai District—Assam-Bhutan Frontier.
Dikrang Valley.

Malay Peninsula: Penang.

Individuals differ greatly one from another in many respects. Kraepelin has pointed out that the Himalayan form differs from the Ceylon one in having only two instead of two and half segments of the antenna smooth and hairless. This is confirmed by the specimens I have seen, the Penang specimen agreeing with the Himalayan ones in this respect, but as two of the Himalayan ones have two and half segments bare on one antenna I am inclined to think he was right in not giving the two forms separate

varietal names. Great differences are also found in the size, proportions, and femur-armature of the anal legs. Our Ceylon specimens agree more or less perfectly with Kraepelin's description, but in the Himalayan ones the number of spines on the femur is commonly less and the femur as a whole is apt to be shorter; neither of these characters seems, however, to be constant nor are the shortest femora necessarily those with the fewest spines. This frequent reduction of the number of spines on the femora brings the species still nearer to *O. scaber*, Pocock, and although I have never yet seen a specimen with two tarsal spurs on the legs of less than about eighteen segments I cannot help thinking that the two will in course of time prove to be identical. The pseudopleural processes are also subject to variation, and the distinctness of the longitudinal keels, as well as the presence or absence of a pair of longitudinal grooves and the whole texture of the dorsal surface, is extraordinarily variable. The dorsal surface may be smooth and polished between the keels throughout, or may be granular or finely spinulose laterally, or finely spinulose throughout.

O. rugulosus, Por.

Sadiya, N.-E. Assam, 25-xi-11.
Kobo, 400 ft., 30-xi—3-xii-11 (rotten wood).
Rotung, 1,300 ft., 30-xii-11 (under stones).
Renging, 2,150 ft., 19-xii-11 (rotten wood).

Previously recorded only from the Seychelles, Mauritius, Andamans, Burma, and Siam. There are however also specimens in the Indian Museum collection which were recently collected by Mr. Kemp in Assam as far west as Mangaldai and the Assam-Bhutan frontier north of that district.

The extent to which the longitudinal grooves of the sterna are developed varies greatly; and in one or two of the Kobo specimens they are entirely absent.

Genus **Rhysida**, Wood.

R. nuda (Newp.).

Dibrugarh, N.-E. Assam, 17—21-xi-11.
Sadiya, N.-E. Assam, 25-xi-11.

This species occurs throughout the Oriental Region and also in Australia and Paraguay. The specimens from the Abor country are nearer *R. immarginata* (Por.) than *R. nuda* as these species are defined by Kraepelin (loc. cit., pp. 141 and 143-4), but as specimens combining the characters of the two seem to be far commoner in India than the latter and quite as common as the former, I feel unable to separate them, and Newport's name has priority over Porat's. Complete or incomplete marginal grooves are often present on several segments in front of the twenty-first, which alone has strong marginal ridges.

R. cuprea, Krpln.

Kobo, 400 ft., 30-xi—3-xii-11 (one in rotten wood and one in earth).

Balek, 600 ft., 24-iii-12.

Up to the present the only published record for this species is Bhutan. The Indian Museum has, however, recently received specimens from the following localities :—

E. Himalayas : Darjiling District—Kurseong, *ca.* 5,000 ft.; Ghumti Tea Estate, *ca.* 4,000 ft.

Assam : Sylhet—Shamshernager, *ca.* 100 ft.

This species is much nearer *R. stuhlmanni*, Krpln., and *R. petersi* (Por.) from Africa than Kraepelin supposed ; for the fourth joint of the antenna is often broader than long, the first stigmata may approach an ∞-shape, the pseudopleura may be terminated by 3 instead of 2 spines, and the nineteenth and twentieth legs may have 2 and 1 instead of 1 and 0 tarsal spurs respectively. It can be distinguished however by its 20-21-jointed antenna. In one specimen one of the antennae is only 18-jointed and has the terminal segment present, but presumably this is due to regeneration after mutilation.

Genus **Ethmostigmus**, Poc.

E. pygomegas (Kohlr.).

Kobo, 400 ft. (rotten wood).

Upper Rotung, *ca.* 2,000 ft. (collected by M. de Courcy).

This species is found throughout the E. Himalayas, Assam, Burma and the Nicobars.

Subfamily *SCOLOPENDRINAE*.

Genus **Scolopendra** (L.) Newp.

S. mazbii, n. sp.

Upper Rotung, *ca.* 2,000 ft., Jan., 1912.

One small specimen was found under the leaf-stem of a plantain ; the rest were obtained by Capt. the Hon. M. de Courcy and the 32nd Sikh Pioneers when road-making ; the name chosen for the species is taken from that of the caste to which the men of this regiment belong.

Description.—Length (apart from appendages) up to 95 mm. Antennae 17-jointed, the first five joints hairless, the rest uniformly pubescent throughout. Dorsal surface of head dark bluish in front, pale greenish behind, marked with a fine longitudinal groove in the middle line. First segment also pale greenish above, with or without the fine median groove ; second and third segments dark bluish with a pair of distinct longitudinal grooves ;

remaining segments with the exception of the last olivaceous in front with a dark bluish band along the posterior margin[1] and a pair of distinct longitudinal grooves throughout, about half of these segments with raised lateral margins; last segment olivaceous, little darker behind than in front, entirely without paired or median grooves, lateral margins very strongly raised, posterior margin curved Ventral surface uniformly olivaceous or with head and first segment browner or paler than the rest; sternocoxal plate armed with 5 minute and widely separated teeth, sterna of segments 2-19 or 20 with a pair of distinct longitudinal grooves; sternum of the last segment rather slender, narrower behind than in front, posterior margin straight or very nearly so. Pseudopleural processes conical, rather slender, the apex simply pointed. Tooth on inner side of femur of poison-jaws strongly developed; first pair of legs paler in colour than the rest, legs 1-19 armed with 1 tarsal and 2 claw spurs, the twentieth with 2 claw spurs and 0(-1) tarsal spurs, the anal legs usually without spurs, sometimes, however, with 1 claw-spur. Femur of anal legs armed normally with 2,2 ventral outer, 2 ventral inner, 2 dorsal inner and 1 long and always simply pointed posterior dorsal spine; the arrangement, however, is sometimes less regular than this when one or two additional spines are developed; and the proximal ventral spine is often so much reduced that it is not improbable that it may occasionally be absent. Distal tarsus of anal leg moderately slender in young specimens; much stouter proportionally in adults in which it is sometimes actually shorter than the very large claw.

This species comes next to *S. morsitans* when compared with Kraepelin's table (loc. cit., pp. 226-232), but can be distinguished therefrom at once by the simply pointed pseudopleural processes and the similarly simple posterior dorsal spine ("eckdorn") of the anal legs as well as by other minor characters.

[1] Mr. Kemp informs me that the colours were much more brilliant in life, the ground colour which is now olivaceous being then a straw-yellow.

VI. HYMENOPTERA ANTHOPHILA.

By C. A. PAIVA, *Assistant, Indian Museum.*

Among the Hymenoptera collected during the Abor Expedition there are 40 specimens of Bees, most of which appear to be fairly widely distributed. I have been able to accurately identify most of them, but there are a few the identity of which I am not quite sure about. I therefore propose to leave them undetermined for the present.

1. **Sphecodes**, sp.

One male collected at Sadiya, N.-E. Assam, on the 27-xi-11 (*Kemp*).

A genus very widely distributed in both hemispheres.

2. **Halictus**, spp. (♂ ♂).

There seem to be at least two species among the 3 specimens of this genus which were collected at Sadiya, 28-xi-11, and Dibrugarh, 11—19-xi-11, N.-E. Assam and at Kobo, 400 ft., 3-xii-11 (*Kemp*). Those from Sadiya and Kobo come very near *H. funebris*, Cam., and the one from Dibrugarh agrees with the description of *Halictus pulchriventris*, Cam., differing only in having the 2nd joint of the flagellum of the antenna black beneath instead of testaceous yellow.

There is also a very badly preserved female belonging to this genus collected at Sadiya, N.-E. Assam, 28-xi-11 (*Kemp*).

3. **Halictus rufo-zonatus**, Vachal.

Ann. Mus. Civ. Genoa (2a), 1894, p. 442, ♀ ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 439, ♀ .

Six females were found under bark at Renging, *ca.* 2,150 ft., 19-xii-11 (*Kemp*).

Bingham records the species from Bhamo, Upper Burma.

4. **Andrena mollis**, Smith.

New Sp Hym. B. M., p. 50, ♀ ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 446.

Three specimens were collected at Sadiya, N.-E. Assam, 28-xi-11, and two at Dibrugarh, N.-E. Assam, 17—19-xi-11 (*Kemp*).

Recorded by Bingham from Bombay, Assam, Burma and Tenasserim.

Represented in the Indian Museum collection from United Provinces :—Jhansi, 850 ft., 2-viii-05 (*Brunetti*).

U. Burma :—Rangoon, 12-vi-97 (*Bingham*).

E. Himalayas :—Sukna, 500 ft., 2-viii-08 (*Annandale*).

A very variable species.

5. **Nomia aurifrons,** Smith.

Trans. Ent. Soc. London, 1875, p. 43, ♀ ; Bingham, Faun. Brit. Ind. Hym., i, 1807, p. 455 ; Paiva, Rec. Ind. Mus., i, pt. i., 1907, p. 16.

One specimen from Dibrugarh, N.-E. Assam, 11—19-xi-11 (*Kemp*).

Recorded by Bingham from Bengal, Sylhet, Burma and Tenasserim.

Represented in the Indian Museum collection from Katmandu, Nepal Valley, 4,500 ft., Oct., 1906, and from Nagarkote, Nepal *ca.* 6,000 ft., Oct., 1906 (*Hodgart*)

Represented in the Pusa collection from Bihar ;—Pusa, Chupra.

6. **Nomia terminata,** Smith.

Trans. Ent. Soc. London, 1875, p. 56 ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 459 ; Paiva, Rec. Ind. Mus., i, pt. i, 1907, p. 16.

Three specimens taken at Kobo, 400 ft., 6—8-xii 11 (*Kemp*).

Recorded by Bingham from Sikhim, Burma and Tenasserim.

Represented in the Indian Museum collection from Assam :—Margherita.

E. Himalayas :—Sureil, Darjiling district, 5,000 ft., April, 1905 (*Alcock*).

7. **Lithurgus dentipes,** Smith.

Cat. i, p. 146, ♂ ; Horne, Trans. Zool. Soc. Lond., vii, 1872, p. 175 ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 470.

One specimen from Sadiya, N.-E. Assam, 27-xi-11 (*Kemp*).

Recorded by Bingham from Sikhim ; Manipuri, N.-W.P. (*Horne*) ; Tenasserim and New Holland (*Smith*).

Not previously represented in the Indian Museum collection.

Represented in the Pusa collection from Bihar :—Pusa, Chupra.

8. **Ceratina hieroglyphica,** Smith.

Cat. ii, 226, ♀ ♂ ; ? *Ceratina flavopicta*, Morawitz (*nec* Smith), Hor. Soc. Ent. Ross., xxiv, 1890, p. 356. *Ceratina hieroglyphica*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 503, pl. iv, fig. 3 ; Rec. Ind. Mus., ii, 1908, p. 365.

One specimen from Sadiya, N.-E. Assam, 28-xi-11 (*Kemp*).

Bingham records it from Mussoorie, Dehra, Barrackpore, Sikhim, Bangalore, Assam, Burma and Tenasserim extending into China and the Malayan region.

Represented in the Indian Museum collection from Kashmir, 8,000--9,000 ft.

W. Himalayas:—Mussoorie, *ca.* 7,000 ft., 20—26-v-05 (*Brunetti*).

Bihar:—Barh (*Burkill*).

Bengal:—Calcutta; Khulna, 10-iii-07 (*Caunter*).

Assam:—Sadiya and Margherita.

Borneo:—10 miles south of Kuching, Sarawak, 24-vi-10 (*C. W. Beebe*).

Represented in the Pusa collection from Bihar:—Pusa, Chupra, Daulatpur, Darbhanga.

W. Himalayas:—Mussoorie, 7,000 ft.

Bombay:—Kanara, Belgaum, 2,500 ft.

9. **Crocisa emarginata**, Lepel.

Lepeletier, Hym., ii, p. 449, ♀ ♂; Smith, Cat. Hym. Ins. B.M., ii, p. 277; Journ. Linn. Soc., xi, 1876, p. 390. *Crocisa decora*, Smith, Trans. Ent. Soc. London, n. s., ii, 1852, p. 41, ♀. *Crocisa elegans*, Smith (*nec* Moscary), New species Hym. B.M., p. 107, ♀. *Crocisa emarginata*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 517; Proc. Zool. Soc. London, 1896, p. 454; Paiva, Rec. Ind. Mus., i, 1907, p. 16.

One specimen from Dibrugarh, N.-E. Assam, 19-xi-11 (*Kemp*).

Recorded by Bingham from Sikkim, Calcutta, Bombay, Malabar, Ceylon, Pundaloya (*Green's coll.*), Burma and Tenasserim; on the west extending to South Africa, on the east to China and the Malay Archipelago.

Represented in the Indian Museum collection from Bombay:—Poona Ghats.

United Provinces:—Lucknow.

Bengal:—On the road from Magra to Trebeni, Hooghly district, 31-vii-09 (*Mus. collr.*); Basanti Forest Station, Sunderbuns, L. Bengal, 16-xi-09 (*Jenkins*); Calcutta, 7-xi-06 (*Brunetti*), 9-vi-09 (*Mus. collr.*)

Nepal:—Soondrijal, Nepal Valley, 1906 (*Hodgart*).

Assam:—Sibsagar; Margherita; Naga Hills.

S. India:—Bangalore; Oorgaum, *ca.* 2,500 ft., 20-x-10 (*Mus. collr.*).

U. Burma:—Between Tengueh and Tali Fu, Yunnan, W. China, 1909-10 (*J. Coggin Brown*).

L. Burma:—Moulmein; Mergui; Tenasserim.

Ceylon:—Kandy, vi-10.

Malay Archipelago:—Sinkep I.

Malay Peninsula:—Perak.

Represented in the Pusa collection from S. India:—Naduvatam, 7,000 ft., Nilgiris.

Bengal:—Madhyapara, Dacca district.

Bombay:—Belgaum, 2,500 ft.

10. **Habropoda fulvipes**, Cam.

Cameron, Ann. Mag. Nat. Hist., xiii (7th series), 1904, p. 211.

One specimen in very good condition taken in a jungle path, Sadiya, N.-E. Assam, 23-xi-11 (*Kemp*).

Originally described from Khasi Hills (*Rothney coll.*).

Not previously represented in the Indian Museum collection.

11. **Anthophora zonata**, Linn.

Apis zonata, Linn. Syst. Nat. (ed. 10), i, p. 576. *Anthophora subcaerulea*, Lepel. Hym., ii, p. 30, ♀ ♂. *Anthophora zonata*, Bingham, Proc. Zool. Soc. Lond., 1896, p. 455; Faun. Brit. Ind. Hym., i, 1897, p. 527; Paiva, Rec. Ind. Mus., i, 1907, p. 16.

One specimen from Sadiya, N.-E. Assam, 23-xi-11 (*Kemp*).

Recorded by Bingham from all over India, Burma, Tenasserim and Ceylon, extending through the Malay regions to Australia.

Represented in the Indian Museum from W. Himalayas:—Mussoorie, *ca.* 7,000 ft., 20—24-vi-05 (*Brunetti*); Almora, Kumaon, *ca.* 5,500 ft., 15-vii-11 (*Paiva*); Kalka, base of Simla Hills, alt. 2,400 ft., 18-vii-11 (*Mus. collr.*).

United Provinces:—Dehra Dun, base of W. Himalayas; Kaladhunji, Naini Tal district (plains) 20-iv-09 (Mus. collr.); Meerut, 25-iv-05 (*Brunetti*).

E. Himalayas:—Sikhim; Siliguri, base of E. Himalayas.

Bihar:—Rajmahal, 5-vii-09 (*Annandale*); Barh (*Burkill*).

Chota Nagpur:—Paresnath, 4,300—4,400 ft., 15-iv-09 (*Annandale*).

Bengal:—Murshidabad; Calcutta, 23-iv-07, 27-v-09, 9-vi-09; Netrakona, Mymensingh district, 4-x-09 (*Bagchi*).

Assam:—Margherita; Sadiya; Naga Hills; Sibsagar; Mazbat, Mangaldai district, 11—15-ix-10 (*Kemp*).

Burma:—Tenasserim Valley.

Madras:—Gopkuda I., Lake Chilka, Ganjam, N.-E. Madras, 7—15-viii-07; S. end of Lake Chilka, N.-E. Madras, 4-iii-10 (*Annandale*).

S. India:—Bangalore; Shasthancottah, 12 miles N.-N.-E. of Quilon; Trivandrum, 6-xi-08 (*Annandale*); Ayasamtengi, S. end of Lake Kayankulum, Travancore, 6-xi-08; Maddathoray, W. base of W. Ghats, Travancore, 17-xi-08 (*Annandale*); Trivandrum, August, 1903, November, 1890.

Ceylon:—Peradeniya, 10-vii-10, 24-v-10, June, 1910.

Malay Peninsula:—Perak.

Represented in the Pusa collection from Bihar:—Pusa, Chupra.

Orissa.—Cuttack.

Central Provinces:—Bilaspur.

Bombay:—Matheran, 2,500 ft.

12. Xylocopa latipes (Drury).

Apis latipes, Drury, Ill. Exot. Insects, ii, pl. 48, fig. 2. *Xylocopa latipes*, Fab. Syst. Piez., p. 337; Smith Cat., ii, p. 353; Trans. Ent. Soc. Lond., 1874, p. 267; Bingham, Proc. Zool. Soc. Lond., 1896, p. 456; Faun. Brit. Ind. Hym., i, 1897, p. 536, pl. iv, fig. 7; Cameron, Faun. and Geo. Mald. and Lacc. Arch., vol. i, Hym., 1900–1903, p. 62.

One specimen from Sadiya, N.-E. Assam, 27-xii-11 (*Kemp*).

Recorded by Bingham from Sikkim, Barrackpore, Kumaon, Terai, Central India, Malabar, Coonoor, Assam, Burma, Tenasserim extending to China and the Malayan region.

Cameron records it from Mamaduwari, Mahlos Atoll, Maldives.

Represented in the Indian Museum from E. Himalayas:—Sikkim; Tindharia, 2,820 ft. (*Richardson*).

United Provinces:—Saharanpur.

Chota Nagpur:—Ranchi.

Bengal:—Murshidabad; Calcutta.

Assam:—Shillong; Margherita; Naga Hills; Sibsagar; Mazbat, Mangaldai district, 11—15-x-09 (*Kemp*).

Burma:—Tenasserim; Tavoy; Mergui.

S. India:—Bangalore; Trivandrum, Travancore; S. Malabar.

Ceylon:—Colombo, 25-vi-4.

Malay Archipelago:—Sinkep I.

Malay Peninsula:—Perak; Johore.

Borneo:—Kapit, Sarawak, 21-vii-10 (*Beebe*); Sandakan.

Represented in the Pusa collection from Assam:—Naharkatia; Nangpoh, 3,000 ft. to 5,000 ft., Khasi hills

13. Xylocopa collaris, Lep.

Lepeletier, Hym., ii, p. 189, ♀; Smith Cat., ii, p. 353; Journ. Linn. Soc., xi, p. 393; Trans. Ent. Soc. Lond., 1874, p. 270. *Xylocopa dejeanii*, Lepel. Hym., ii, p. 209, ♂; Smith, Cat. Hym. Insects B.M., ii, p. 357; Journ. Linn. Soc., xi, p. 394. *Xylocopa collaris*, Bingham, Proc. Zool. Soc. Lond., 1896, p. 456; Faun. Brit. Ind. Hym., i, p. 543.

Seven females and two males from Yembung, 1,100 ft., taken on the 14-i-12, boring into rotten wood, and another taken at Rotung, 1,400 ft in rotten wood on 23-xii-11 (*Kemp*).

Recorded by Bingham from Sikhim, Allahabad, Kumaon, Burma, Tenasserim, Ceylon (Pundaloya), extending into the Malay region and Siam.

Represented in the Indian Museum collection from Tibet (*Moller*).

W. Himalayas:—Simla.

E. Himalayas:—Sikhim.

Assam:—Naga Hills; Sibsagar; Sadiya; Margherita.

Burma:—Mergui; Upper Tenasserim.

S. India :—Trivandrum, Feb., 1893.

Malay Peninsula :—Johore.

Represented in the Pusa collection from Bengal :—Buxa Duars.

14. **Bombus orientalis**, Smith.

Cat. ii, p. 402, ♀. *Bombus buccinatoris*, Sm., New Sp. Hym. Ins. B.M., p. 132, ♀. ? *Bombus simulus*, Grib., Bull Ent. Soc. Ital., xxiii, 1891, p. 114, ♀. *Bombus orientalis*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 555, pl. iv, fig. 9; Paiva, Rec. Ind. Mus., i, 1907, p. 17.

Two specimens from Rotung, 1,400 ft., 26—27-xii-11, one from near Renging, 1,500 ft., 19-xii-11, and one from Sirpo, *ca.* 1,300 ft., March, 1912 (*Kemp*).

The specimens vary very much in size, the smallest is 12 mm., the next 15 mm. and the largest 26 mm. in length.

Recorded by Bingham from Sikhim, Kunawar. "One of the commonest species about Darjiling" (*Bingham*).

Represented in the Indian Museum collection from Nepal:—Katmandu, Nepal Valley, 4,500 ft., Oct., 1906; Soondrijal, Nepal Valley; Chitlong, little Nepal Valley; Chandragiri, *ca.* 8,000 ft., Oct., 1906 (*R. Hodgart*).

E. Himalayas :—Sikhim; Kurseong, 4,700—5,000 ft., 22, 24, 25-vi-10, 5, 7, 9-ix-09 (*Annandale*); 6,000 ft., 13-x-09 (*D'Abreau*); Gumti, Darjiling district, *ca.* 4,000 ft., vii-11 (*Gravely*).

Assam :—Cheera Punji, Khasi Hills (*Warren*).

W. Himalayas :—Kanaul, British Garhwal, 18-x-07 (*Mus. collr.*).

Represented in the Pusa collection from E. Himalayas :—Phoobsering, Lebong, Darjiling district.

It might be useful to note that each of the species *Bombus orientalis* and *B. haemorrhoidalis*, which to the casual observer would appear alike, has its range of distribution quite distinct. *B. orientalis*, though recorded so far west as Kanaul in British Garhwal, is not met with in any of the western ranges of the Himalayas. It is found as far west as the western borders of Nepal and probably in some of the Kumaon Hills, where the two species may meet. *B. haemorrhoidalis* though described from Chusan in the hills of North China, has not yet been found in any Indian locality to the east of the Kumaon Hills. I found it in fairly large numbers in Almora, visiting roses.

15. **Apis dorsata**, Fab.

Fabricius, Ent. Syst, ii, p. 328; Syst. Piez., 370; Smith, Cat., ii, p. 415; Journ Linn. Soc., xi, 1876, p. 396; Horne, Trans. Zool. Soc. Lond., vii, p. 181, pl. 22, fig. 3; Lep., Hym., i, p. 405, ♀. *Apis testacea*, Sm., Journ. Linn. Soc., ii, 1858, p. 49. *Apis zonata*, Sm. (nec. Guér.), Journ. Linn. Soc., iii, 1859, p. 8. *Apis dorsata*, Bingham, Proc. Zool. Soc. Lond.,

1896, p. 457; Faun. Brit. Ind. Hym., i, 1897, p. 557, pl. iv, fig. 11; Paiva, Rec. Ind. Mus., i, p. 17, 1907.

One specimen from Dibrugarh, N.-E. Assam, 17—19-xi-11 (*Kemp*).

Recorded by Bingham from throughout India, Burma, Tenasserim, Ceylon, extending into China and the Malayan region to Java.

Represented in the Indian Museum collection from W. Himalayas:—Mussoorie, *ca.* 7,000 ft., 12-viii-05 (*Brunetti*); Kumaon; Simla, 7,000 ft., 7-v-10 (*Annandale*).

United Provinces:—Dehra Dun, base of W. Himalayas; Dhikala, Naini Tal district, 22-iv-08; Boxar, Naini Tal district, 19-iv-08; Gularbojh, Naini Tal district, 17—20-iv-08; Bareilly 15—22-iii-07; Lucknow, 5-xi-07; Meerut, 8—14-iii-07; Kaira, base of W. Himalayas, Naini Tal district, 24-iii-10; Bhogpur, Bijnor district, 2-iii-10; Amangarh, Bijnor district, 24-ii-10 (*Mus. collr.*).

Nepal frontier:—Thamaspur, 18—20-ii-08 (*Mus. collr.*).

E. Himalayas:—Sikhim.

Chota Nagpur:—Paresnath, 4,400 ft., 11-iv-09 (*Annandale*).

Bengal:—Murshidabad; Calcutta, 20-iii-07.

Assam:—Naga Hills; Sibsagar; Shillong; Margherita; Mazbat, Mangaldai district, 11—15-x-10 (*Kemp*); Lushai Hills, 3,600 ft., 7-vi-04 (*F. C. MacLeod*).

Burma:—Base of Dawna Hills, 2-iii-08 (*Annandale*).

Bombay:—Belgaum.

Malay Archipelago:—Sinkep I.

Represented in the Pusa collection from Punjab:—Lahore; Wazirabad; Jamoo.

Central Provinces:—Bula; Hoshangabad; Itarsi.

Bihar:—Chupra.

Bengal:—Rangpore.

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Arrangements are being made to figure, in a final paper dealing with the Zoological Results of the Abor Expedition as a whole, a number of the new species of insects described without figures in this Part.

VII. MAMMALS.

By HERBERT C. ROBINSON, *C.M.Z.S., Director of Museums, Federated Malay States.*

The collection of mammals made by Mr. Stanley Kemp, assisted by officers of the Abor Expeditionary Force, is not a large one and contains specimens of 26 species only. No specimens were collected at any altitude above 4000 ft. and therefore the collection contains no actual novelties as would probably have been the case if collecting had been possible above seven or eight thousand feet. The series of the recently described *Sciurus stevensi* is however interesting, while the single specimen of *Dremomys pernyi* indicates a very wide range for a very distinct species originally described from Sze-chuen. Otherwise the species present belong to the ordinary sub-Himalayan and Assamese fauna.

1. Macaca (?) rhesus (Audebert).

Macacus rhesus, Blanford, Faun. Brit. Ind. Mamm., p. 13 (1888)

A haversack obtained at Debuk Damda by Mr. Kemp appears to have been made from the body skin of this or an allied form or is possibly derived from *Macaca assamensis*. Positive identification is of course impossible.

2. Presbytes, sp.

A small pouch for flint and steel, obtained in the same locality as the preceding specimen, is evidently made from the skin of some species of Langur, probably *P. entellus* or *P. schistaceus*. The latter species is stated by Butler (*Journ. Asiat. Soc. Bengal*, xliv (i), p. 332, 1875) to occur in the Naga Hills, but Blanford (*op. cit.*, p. 30) throws doubt on the identification.

3. Viverra zibetha, Linn.

Blanford, *op. cit.*, p. 96.

The large Indian civet is represented by two ethnographical specimens, an ornament for a sword hilt made out of a tail obtained at Debuk Damda and a haversack of body skin, from Komsing, both secured by Mr. Kemp. The body fur is, as might be expected, much thicker than in southern specimens with a distinct woolly underfur, which is almost absent in examples of the same species from the Malayan region.

A fairly adult and an immature skull of the same species were found by Captain I. Burn Murdoch in an Abor hut near Upper Rotung, January 8th, 1912.

4. **Mustela flavigula flavigula**, Bodd.

Mustela flavigula typica, Bonhote, Ann. Mag. Nat. Hist., (7) vii, p. 344 (1901).

An adult skin and skull of the Indian Marten collected by Dr. J. Falkiner are now in the Museum of the Bombay Natural History Society. The fur is fairly long with a woolly underfur and the colour of the head is almost jet black.

5. **Ursus torquatus**, Wagner.

Blanford, *op. cit.*, p. 197.

A haversack purchased at Komsing is probably made from the skin of the Himalayan black bear.

6. **Tupaia belangeri** (Wagner).

Tupia ferruginea, Blanf. (*nec* Raffles), *op. cit.*, p. 210.

A single male from Kobo, altitude 400 ft., must apparently be referred to *T. belangeri* (Wagn.) which is a northern race of *T. ferruginea*, Raffles, from the Malay Peninsula, from which it differs mainly in its smaller size, and the more yellowish olivaceous speckling of the upper surface, totally devoid of any ferruginous tint. The specimen before me, which is quite adult, shows the character relied on by Anderson for the separation of his *T. chinensis*[1] from *T. belangeri*, viz. the fusion of the two median external cusps of the first molar. This feature is, however, much affected by the relative wear of the teeth and is met with in aged specimens of *T. ferruginea* from Singapore and the southern parts of the Malay Peninsula. Such dimensions as can be taken from the very imperfect skull before me indicate that it belongs to a considerably larger animal than the type of *T. chinensis*. Further material, however, is desirable before any very positive identification can be made. A second young adult animal from Misshing collected by Dr. Falkiner also differs from *T. chinensis* in its larger size.

7. **Talpa micrura**, Hodgs.

Hodgson, Journ. Asiat. Soc. Bengal, x, p. 910 (1841); Blanford, *op. cit.*, p. 225.

A female from Kobo, 400 ft., and another from Rotung, 1,300 ft., are referable to this species, which was apparently common, though difficult to procure.

The species is distinguished from *T. leucura*, which inhabits higher altitudes in the same countries and extends throughout Burma, by possessing four and not three premolars only.

[1] Anderson, Anat. and Zool. Res., p. 129, pl. vii, figs. 8, 9 (1878).

The skulls of the present specimens are rather small, measuring 33 mm. in total length against about 35 mm., which is the length given by Blanford and others. This may, however, be due to the fact that they are females and not very old specimens, though quite adult.

8. **Crocidura fuliginosa** (Blyth).

Sorex fuliginosus. Blyth, Journ. Asiat. Soc. Bengal, xxiv, p. 362 (1855).

A female in spirit from Kobo, 400 ft., and a female skin from the Upper Rotung, *ca.* 2,000 ft., present no tangible differences when compared with a series from the Malay Peninsula, which have themselves been compared with the type, which came from Central Tenasserim. Should large series from the original locality prove the existence of any real differences Himalayan specimens will have to bear the name *Crocidura rubricosa*,[1] the types of which came from Sibsagar, Assam.

Crocidura fuliginosa in its broad sense has a very wide distribution, ranging from Sikkim to Flores, through the Malay Peninsula and Borneo, analogous to the case of certain Himalayan birds such as *Muscicapula maculata*.

9. **Pteropus giganteus** subsp. **leucocephalus**, Hodgs.

Pteropus leucocephalus, Hodgson, Journ. Asiat. Soc. Bengal, iv, p. 700 (1835).

Pteropus giganteus leucocephalus, Anderson, Cat. Chir. Brit. Mus. (2nd. ed.), i, p. 333 (1912).

A male from Sadiya, N. E. Assam, belongs to the eastern race of the Common Indian Flying Fox (*Pteropus medius*, auct.), differentiated from the peninsular form by its somewhat longer and softer fur.

10. **Pipistrellus abramus** (Temm).

Vesperugo abramus, Dobson, Mon. Asiat. Chir., p. 97 (1876); Blanford, *op. cit.*, p. 313.

A pair taken at Rotung, 1,300 ft., in March and a female from Kobo, 400 ft., obtained in November are typical examples of the Common Indian Pipistrelle.

11. **Nycticejus ornatus**, Blyth.

Blyth, Journ. Asiat. Soc. Bengal, xx, p. 159 (1851); Blanford, *op. cit.*, p. 322.

Of the strikingly coloured Harlequin Bat, originally described from the Khasia Hills, there is a single female obtained at Balek on March 25th, 1912, by Capt. J. Masters.

[1] Anderson, Journ. Asiat. Soc. Bengal, xlvi, pt. ii, p. 280 (1877).

12. **Petaurista magnificus** (Hodgs.).

Pteromys magnificus, Blanford, *op. cit.*, p. 364.

A skin without skull collected by Major E. H. Sweet and Capt. B. R. Nicholl near Renging has the upper surface glistening dark maroon, intermixed with longer black hairs, parachute rich orange rufous, underparts orange buff; tail clay brown, terminal three inches black intermixed with brown and rufous, extreme tip pure white.

The specimen can be provisionally referred to this species but the whole of the Indian and Indo-Chinese section of the genus is in a state of great confusion.

13. **Sciuropterus alboniger**, Hodgs.

Blanford, *op. cit.*, p. 367.

A fragmentary specimen collected by Dr. Falkiner at Misshing in February, 1912, is evidently this species. Another was seen at Renging.

14. **Ratufa gigantea** (McClell.).

Sciurus giganteus, McClelland, P. Z. S., 1839, p. 150 (Assam).
Sciurus bicolor, Blanford, *op. cit.*, p. 373.
Ratufa gigantea, Wroughton, Journ. Nat. Hist. Soc. Bombay, xix, p. 889 (1910).

There is a specimen of the large black and buff squirrel from Upper Renging, 2,150 ft., collected by Capt. M. de Courcy and another flat skin from Pasighat, secured by Major E. H. Sweet and Capt. B. R. Nicholl which differ in no particulars. Externally they are typical examples of this race which extends through North Burma and Siam grading into the Malayan species *R. melanopepla* in northern Tenasserim. The measurements of the skull are slightly smaller than those given by Wroughton for *R. gigantea* and approach those of *R. macruroides* (Hodgs.), but the colour characters are those of the former race.

15. **Sciurus erythraeus erythrogaster**, Blyth.

Sciurus erythrogaster, Blyth, Journ. Asiat. Soc. Bengal, xi, p. 970 (1842).
Sciurus erythraeus erythrogaster, Bonhote, Ann. Mag. Nat. Hist., (7) vii, p. 162 (1901).

The whole series of red-bellied grizzled squirrels comprised under the two group names *Sc. erythraeus*, Pall., and *Sc. castaneoventris*, Gray, are involved in almost inextricable confusion, partly owing to the insufficiency of the original descriptions and the bad condition or non-existence of the types, and partly to the paucity of exactly localized and properly collected material and the doubt as to whether certain of the forms undergo seasonal

variation or not. Of the considerable series before me three (two from Pasighat and one from between Kalek and Misshing) with marked black tips to their tails and of somewhat larger size are certainly referable to this subspecies, while one from between Kalek and Misshing is intermediate between the present race and *Sc. erythraeus intermedius*, Anderson. (For particulars and measurements see table, *postea*, p. 93).

16. **Scuirus erythraeus intermedius**, Anderson.

Sciurus gordoni var. *intermedia*, Anderson, Zool. and Anat. Res., p. 241 (1878).

Sciurus castaneoventris griseopectus, Bonhote, Ann. Mag. Nat. Hist., (7) vii, p. 164 (1901).

The series from Kobo agrees well with the original type and must be referred to Anderson's subspecies, having nothing to do with *Sc. griseopectus*, Blyth, a name which has been applied to Assamese specimens by Bonhote, *loc. cit.* The median grizzled line on the abdomen is generally absent but is faintly indicated in some individuals. The specimens from between Kalek and Misshing are intermediate between this and the preceding subspecies though, with one exception, they lack the black termination to the tail. The present form is however somewhat smaller as the table of dimensions (*postea*, p. 94) shows.

17. **Sciurus stevensi**, Thomas.

Oldfield Thomas, Journ. Nat. Hist. Soc. Bombay, xviii, p. 246 (1908).

The series detailed in the table of measurements is very uniform and agrees well with the description of the type, which was obtained at Beni-Chang in the Abor-Miri Hills at an altitude of 4,000 ft. The species is regarded by its describer as allied to *Sc. atrodorsalis*, which inhabits Pegu, Northern and Central Tenasserim.

18. **Tamiops macclellandi** (Horsf.).

Sciurus macclellandi typicus, Bonhote, Ann. Mag. Nat. Hist., (7) v, p. 51 (1900).

The three specimens in the collection (for details of which see table of measurements, *postea*, p. 95) belong to the typical Himalayan form. The race inhabiting Manipur[1] is greyer and much less yellowish on the upper surface, while the Burmese and Malayan[2] forms are separated at a glance by having three black stripes on the back instead of a single median one.

[1] *Sciurus macclellandi manipurensis* (Bonhote).
[2] *Sciurus macclellandi barbei*, Blyth, and *Sc. m. novemlineatus*, Miller.

19. Dremomys lokriah (Hodgs.).

Sciurus lokriah, Hodgson, Journ. Asiat. Soc. Bengal, v, p. 232 (1836).

Sciurus locria, Blanford, *op. cit.*, p. 376 (1890).

A perfectly typical example from Komsing.

Oldfield Thomas has pointed out (*Journ. Nat. Hist. Soc. Bombay*, xviii, p. 245, 1908) that the group of squirrels to which this species belongs and to which the generic term *Dremomys*, Heude, is applicable, is readily differentiated by its more elongated muzzle and by its gently sinuous lateral profile, not regularly curved as in *Lariscus* or sharply bent as in true *Sciurus*. From *Rhinosciurus*, which it resembles in its elongated muzzle, it is at once distinguished by the characters of the teeth.

As an external means of recognition it may be stated that all the species of the genus have a tuft of pale silky fur behind the ear.

20. Dremomys pernyi (A. Milne-Edwards).

Sciurus pernyi, A. Milne-Edwards, Rev. et Mag. de Zool., p. 230 (1867); Anderson, Anat. and Zool. Res., p. 255 (1878).

Dremonys pernyi, Thomas, Journ. Nat. Hist. Soc. Bombay, xviii, p. 249 (1908).

A single female was obtained by Capt. I. Burn-Murdoch in the Sirpo Valley, indicating a wide extension of range for this Chinese species originally described from Sze-chuen. An allied form is found in Central Tenasserim, Siam and the Karen Hills and other species of the genus are found in Borneo, Formosa and the Malay Peninsula.

21. Epimys "rattus" (Linn.).

Mus rattus, Blanford, *op. cit.*, p. 406.

Without larger material from the surrounding districts and direct comparison with the types, it is impossible to say which of the numerous names available for Indian rats of this section is applicable to these specimens, details of which are given in the table on p. 96.

All four specimens are fairly uniform, having pale feet and dull grey bellies not sharply defined from the flanks. Fur of the upper surface long and soft, without spines and with numerous long black piles on the lower back. General colour above greyish black, grizzled with bistre, more abundantly on the sides.

22. Lepus sp.

I am unable to identify precisely a hare from Kobo, 400 ft., collected by Capt. R. L. Bignell. Judging from descriptions only, it seems in many respects intermediate between the common Indian hare, *Lepus ruficaudatus*, and the Burmese form, *Lepu*

peguensis, Blyth. The tail is sandy brown above with the base of the fur sooty black.

23. **Budorcas taxicolor,**[1] Hodgs.

Hodgson, Journ. Asiat. Soc. Bengal, xix, p. 65, pls. i-iii (1850).

There are three frontlets of the Takin in the collection, two purchased at Balek by Mr. Kemp and stated to come from the hills at the northern end of the Yamne Valley and a third from the Mishmi hills brought in to Sadiya, N. E. Assam, and presented by Mr. Ballantyne.

No.	Sex.	Locality.	Length of horn. In.	Circumference of horn. In.	Distance between tips. In.
9170	♂	Yamne Valley ..	17·6	11·2	10·3
9171	♀	Ditto ..	15·8	10·2	9·9
9172	♂	Mishmi Hills ..	19·75	10·9	10·4

There has been some difference of opinion as to whether the horns of the two sexes are identical, but I am inclined to follow Hume (*P.Z.S.*, 1887, p. 483) and to regard the simply curved horns not closely approximating on the forehead as those of females and not necessarily of immature animals.

24. **Capricornis sumatraensis** subsp. **jamrachi**, Pocock.

Abstract, P. Z. S., 1908, No. 55, p. 12 (1908); *id.*, P.Z.S., 1908, i, pp. 183-185, figs.

Nemorhaedus bubalinus, auct. Blanford, *op. cit.*, p. 513.

Body skin.—Shot near Balek by Capt. J. Masters.

Adult skull.—From Parong *moshup*, presented by Capt. A. L. Molesworth.

Skin.—Between Janakmukh and Balek, collected by Major E. H. Sweet and Capt. B. R. Nicholl.

The skins agree fairly well with the description and figure of the type of the subspecies, which came from Kalimpong, near

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[1] No Takin were seen on the expedition, but there is, I believe, very little doubt that they occur in the higher ranges of the Abor country, probably all along from Bhutan to the Mishmi country. As corroboration of the origin of the frontlets obtained at Balek, it may be mentioned that Sir George Duff-Sutherland-Dunbar has discovered that the Pasi-Minyongs, who inhabit this village, have themselves immigrated within comparatively recent times from the Upper Yamne.

The village '*moshups*' or bachelor-houses always contain large numbers of skulls, karkar predominating along with hog-deer, serow, mithan and monkey and an occasional sambar, tiger and leopard. In no other village but Balek did I find any Takin heads, but Major Alban Wilson found one at Geku, which was stated to have been washed down the Dihang R., and others at Dosing. He writes as follows concerning the latter:—"I found four or five Takin heads in Dosing on the right bank of the Dihang: two were quite fresh. The Abors said the heads came from the Bori country, away west of Riga, which fact, coupled with what the Geku people said about the Takin being washed down the river, certainly shows that the animal is found inside the Dihang valley." (S. K.).

Darjiling, except that there appears to be a greater admixture of white on the sides of the body possibly indicating an approach to *C. sumatraensis milne-edwardsi* (David) from Eastern Tibet, and to the Nepalese and Sikkim form *C. s. thar*, Hodgs., (*Nemorhaedus bubalinus*, auct.) from which it is only doubtfully distinct.

The horns in the skull before me, which would appear to be that of an aged male, are much larger than in either of the specimens mentioned by Pocock, which were 4 and 6 inches in length against 10·15 in length and 6 inches in circumference in the present specimen.

25. **Cervulus muntjac**, Zimmerman.

Blanford, *op. cit.*, p. 532.

A somewhat imperfect skull of an adult male Barking-deer from the village Moshup at Komsing. Length of horn from the burr, 5·45; from the base of the bony pedicel, 7·6; zygomatic breadth, 3·73; maxillary tooth row, 2·24 inches. In a Malay skull of similar age from the Dindings territory the two latter dimensions are 3·44 and 2·56 inches. The species in the broad sense are probably divisible into many local races, but large series from all localities are required before this can be attempted.

26. **Sus cristatus**, Wagner.

Blanford, *op. cit.*, p. 560; Miller, Proc. U. S. Nat. Mus., xxx, p. 745, pl. lviii, fig. 1 and lix, figs. 1, 2 (1906).

An adult female skin and skull from Kobo, 400 ft.

The Malayan form, to which probably specimens from Tenasserim and parts of Burma belong, has been separated by Miller under the name *Sus jubatus*, on account of the smaller ear and the less complicated enamel pattern of the posterior molar.

Measurements of **Sciuridæ** and **Muridæ**.

(In millimetres.)

Sex.	Locality.	Date.	Body. (Collector's measurements in flesh.)				Skull.								Remarks.	Indian Museum No.
			Head and body.	Tail.	Hind Foot.*	Ear.	Total length.	Condylo-Basilar length.	Zygomatic breadth.	Interorbital breadth.	Cranial breadth.	Diastema.	Maxillary tooth row.	Median length nasals.		
	Ratufa gigantea.															
♀	Upper Renging, 2150' ..	..	..	..	89	..	77·5	63·5	..	31·0	33·9	17·1	14·2	25·8	Adult, teeth worn ..	9166
	Sciurus erythraeus erythrogaster.															
♀	Pasighat	26-iii-12	252	230	48	22	57·2	48·0	33·3	19·9	24·1	13·0	11·2	17·2	Ditto ..	9154
♀	Pasighat	26-iii-12	251	229	49·5	22	57·8	48·8	33·8	20·0	24·9	12·6	11·2	17·5	Adult teeth slightly worn.	9153
♂	Between Kalek and Misshing	17-iii-12	260	233	49·0	18	57·1	47·0	33·1	19·3	24·1	12·4	10·7	17·8	Ditto worn ..	9150
♂	Between Kalek and Misshing	17-iii-12	223	226	48·5	20	56·3	48·1	34·5	21·7	25·0	12·8	10·4	16·6	Adult, teeth slightly worn, intermediate between *S. e. erythrogaster* and *S. e. intermedius*.	9157

*In dried skin.

Measurements of **Sciuridæ** and **Muridæ**—(*continued*).

(In millimetres.)

Sex.	Locality.	Date.	Body. (Collector's measurements in flesh.)				Skull.								Remarks.	Indian Museum No.
			Head and body.	Tail.	Hind Foot.*	Ear.	Total length.	Condylo-Basilar length.	Zygomatic breadth.	Interorbital breadth.	Cranial breadth.	Diastema.	Maxillary tooth row.	Median length nasals.		
	Sciurus erythraeus intermedius.															
♂	Between Kalek and Misshing	17-iii-12	218	210	49·0	18	53·4	45·3	31·9	18·9	24·7	12·9	10·0	16·3	Imm., teeth slightly worn	9163
♂	Kobo	9-xii-11	225	193	48·0	20	55·0	45·9	32·7	19·1	24·2	12·6	10·4	17·1	Adult, ditto ..	9159
♂	Between Kalek and Misshing	17-iii-12	218	225	49·5	20	53·3	45·8	30·8	18·0	23·5	12·0	10·5	16·3	Imm., milk dentition ..	9155
♀	Kobo	3-xii-11	224	200	44·5	20	54·2	46·2	32·8	18·2	24·2	12·3	10·2	16·3	Adult, teeth slightly worn	9164
♀	Do.	11-xii-11	230	200	45·0	20	..	..	30·9	17·1	23·0	12·8	10·2	17·0	Ditto unworn ..	9162
♀	Do.	..	220	195	45·0	19	55·8	46·9	32·3	19·3	24·1	12·7	10·2	16·9	Ditto slightly worn	9160
♀	Do.	9-xii-11	245	194	45·5	20	54·4	46·1	31·9	18·2	23·3	13·0	10·3	17·0	Ditto worn ..	9156
♀	Do.	29-iii-12	223	197	44·7	18	56·1	47·6	33·9	19·1	24·5	12·4	10·3	17·6	Ditto unworn ..	9151
♂	Do.	29-iii-12	222	199	44·5	18	53·6	45·8	..	18·1	23·4	12·9	10·1	17·2	Ditto slightly worn	9161

♀	Do.	7-xii-11	250	210	46·5	22	52·3	44·2	30·7	17·8	23·5	12·8	10·0	16·6	Imm.	9152
..	Sirpo Valley	..	..	..	..	..	..	..	..	..	..	..	..	..	....	9158
	Sciurus stevensi.															
♀	Balek	24-iii-12	212	180	42 *	20	51·9	43·5	29·3	16·1	22·0	12·8	10·1	15·8	Adult, teeth worn ..	9139
♀	Do.	26-iii-12	..	..	44 *	..	51·3	43·5	..	15·9	22·1	12·2	9·9	15·3	Ditto ..	9140
♀	Do.	23-iii-12	..	..	44·5*	..	50·7	42·0	29·5	15·7	22·2	12·6	9·7	15·2	Young adult, teeth unworn	9143
♀	Rotung, 1300′	8-iii-12	205	176	42 *	20	50·4	42·3	29·6	15·7	22·7	12·0	10·2	14·9	Ditto ..	9141
♀	Do. 1300′	7-iii-12	208	180	43 *	20	50·3	42·2	29·8	16·1	21·9	12·4	10·0	15·0	Ditto ..	9144
♀	Do. 1300′	..	201	180	42 *	17	48·1	40·2	..	15·2	22·1	11·5	9·9	14·2	Ditto ..	9145
♀	Do. 1300′	9-iii-12	200	176	41·5*	17	49·7	41·2	28·6	15·4	22·1	11·7	10·0	14·6	Adult, teeth slightly worn	9146
♂	Near Kalek	15-iii-12	215	184	43·5*	20	..	..	..	16·3	..	12·3	10·0	15·4	Ditto ..	9148
♂	Between Kalek and Misshing	18-iii-12	192	170	43·5	20	49·7	41·4	..	15·1	22·5	12·1	10·2	15·1	Young adult, teeth unworn	9147
♂	Beni-Chang, Abor-Miri Hills 4000′ (*H. Stevens.*)	19-ii-06	230	190	45	17	..	..	30·0	17	..	..	..	15	Adult, B. M. 7-11-26-2 Type. ..	..
	Tamiops macclellandi.															
♀	Kobo, 400′	3-xii-11	120	80	24	12	32·2	26·9	18·8	..	..	8·0	6·0	8·1	Young adult, teeth slightly worn.	9135
♂	Do.	8-xii-11	113	90	25·5	12	32·8	27·1	..	12·0	..	7·9	5·8	8·4	Adult, teeth worn ..	9136
♀	Rotung, 1300′	..	120	102	25·5	12	32·7	27·2	19·1	11·3	15·3	7·8	6·0	..	Ditto ..	9142

* In dried skin.

Measurements of **Sciuridæ** and **Muridæ**—(*concluded*).

(In millimetres.)

Sex.	Locality.	Date.	Body. (Collector's measurements in flesh.)				Skull.								Remarks.	Indian Museum No.
			Head and body.	Tail.	Hind Foot.*	Ear.	Total length.	Condylo-Basilar length.	Zygomatic breadth.	Interorbital breadth.	Cranial breadth.	Diastema.	Maxillary tooth row.	Median length nasals.		
	Dremomys lokriah															
♀	Komsing	24-ii-12	208	160	..	20	53·4	44·1	30·1	15·4	22·9	13·1	9·1	17·1	Adult	9149
	Dremomys pernyi															
♀	Sirpo Valley	16-iv-12	..	..	..	..	52·5	44·1	..	15·2 (app.)	22·4	12·9	9·6	15·1	Adult, teeth worn ..	9138
	Epimys "rattus."															
♀	Komsing	24-iii-12	200	190	34	24	43·7	38·6	22·0	6·1	16·7	12·3	7·2	18·2	Adult	9127
♀	Komsing	2-iii-12	195	190	35	22	..	.	..	..	..	..	..	.	Do.	9126
♀	Rotung, 1300′	10-iii-12	185	156	35	22	42·1	37·2	20·3	6·0	16·5	11·9	7·3	17·2	Adult, teeth unworn ..	9128
♀	Upper Rotung, 2,000′ ..	6-i-12	115	118	25	18	33·0	28·7	17·6	5·2	14·1	8·3	6·5	12 3	Imm., half grown ..	9125

*In dried skin.

APPENDIX.

Parasites from Mammals.

[The list of parasites obtained from the mammals taken during the Abor Expedition is not a long one, although great care was exercised (at any rate so far as external parasites were concerned) in looking for them on each specimen. We have to thank Mr. Cecil Warburton, who prefers not to describe the new forms at present, for examining the ticks, Mr. T. Southwell for identifying a parasitic worm and Mr. E. Brunetti for naming a Pupiparous fly. The various parasites are listed under the names of the mammals on which they were found. [*N. A.*]

6.—**Tupaia belangeri** (Wagner) (p. 86).

Arachnida (Ixodidae).—*Haemaphysalis* sp. near *koeningsberneri* (nymph *indet.*).

—? *Hyalomma syriacum*, Koch? (nymphs). About these specimens Mr. Warburton writes: "It is a remarkable thing that we can never find nymphs of this species (*H. syriacum*), though it is common on tortoises all over the world. I have a strong belief, however, that these specimens belong to it, but the point must remain in doubt until we see undoubted *H. syriacum* nymphs." A similar specimen was taken by Mr. Gravely on a man's leg in Tenasserim.

Kobo (400 ft.): 9-xii-11.

9.—**Pteropus giganteus leucocephalus**, Hodgs. (p. 87).

Diptera Pupipara.—*Cyclopodea horsfieldii*, de Meij. Many specimens.

Sadiya.

16.—**Sciurus ethrythraeus intermedius**, Anderson (p. 89).

Arachnida (Ixodidae).—*Ixodes angustus* var. nov. Mr. Warburton regards these specimens as representing a new variety of the American squirrel-tick.

Kobo: 29-iii-12.

26.—**Sus cristatus**, Wagner (p. 92).

Arachnida (Ixodidae).—Many specimens of *Ablyomma testudinarium*, Koch.
Kobo: 5-xii-11.

Entozoa (Acanthocephala).—Numerous specimens of *Echinorhynchus gigas*, Goeze, from the intestine.
Kobo: 5-xii-11.

In addition to the ticks actually found on mammals a small specimen of the common *Haemaphysalis bispinosa*, Neum., was taken "by sweeping" at Dibrugarh and females of the equally common *Ablyomma testudinarium* were obtained in the same manner at Kobo and on the banks of the Siyom below Damda: also under a log at Sadiya. A female of *Ixodes acutitarsis*, Karsch, of which Mr. Warburton thinks that his *H. gigas* may be the male, was taken at Yembung. *H. bispinosa* and *A. testudinarium* are commonly found among long grass through which the larger mammals are in the habit of passing, while specimens of *I. gigas* have been taken under stones near Darjiling. All three (? or four) species are parasitic on various mammals. An undescribed species of *Haemaphysalis*, probably also a mammal-parasite, was taken among grass at Yembung and indeterminate nymphs of *Haemaphysalis* were collected at several places.

VIII. COLEOPTERA, I: RHYSODIDAE, NITIDULIDAE, COLYDIIDAE, CUCUJIDAE, PASSANDRIDAE, DISCOLOMIDAE, CRYPTOPHAGIDAE, MYCETOPHAGIDAE, DRYOPIDAE.

Par A. GROUVELLE.

RHYSODIDAE.

Rhysodes alticola, n. sp.

Elongatus, oblongus, nitidus, fusco-piceus. Antennae subincrassatae; articulis 2°—11° *transversis,* 11° *apice pulvinato, haud acuto. Caput elongatum, suboblongum; lobis posticis elongatis, basi subacuminatis, intus angulosis et inter se admotis, antice cum margine laterali junctis; spatio mediano inter posticos lobos producto, acuminato, antice arcuatim attenuato. Prothorax elongatus subdepressus, capite latior, quadricostatus; costis subdepressis, sulcis externis basi latioribus; sulco mediano basi vix occluso, apice breviter aperto. Elytra valde punctato-striata; intervallis convexis, quam striis paulo angustioribus,* 4°, 5° *et* 6° *ante apicem conjunctis.*

Long. 5 *mill.*

Allongé, oblong, brillant, brun de poix. Antennes médiocrement épaisses, progressivement un peu atténuées vers l'extrémité, surtout à partir du milieu de la longueur; articles 2me à 11me transversaux, 11me au moins deux fois plus large que long, terminé par un bouton conique, surbaissé, émoussé. Tête subobblongue, un peu plus de deux fois plus longue que large au niveau des yeux; lobes postérieurs allongés, convexes, subacuminés à la base, anguleux et rapprochés en dedans, soudés en avant, près de la base des antennes aux bourrelets marginaux de la tête, espace médian en forme de fer de lance allongé, acuminé en arriére, engagé entre les lobes postérieurs jusqu'au niveau du bord antérieur des yeux, terminé en avant par un lobe allongé, subparallele, impressionné à l'extrémité. Prothorax subovale, subparallele, environ une fois et un tiers plus long que large, plus large que la tête, arrondi en avant, subtronqué à la base, chargé sur le disque de quatre côtés longitudinales, subdéprimées, subégales; sillon interne légèrement rétréci au milieu, presque fermé à la base, étroitement ouvert à l'extrémité; sillons externes subegaux au sillon interne, ouverts aux extrémités, élargis dans la partie basilaire; sillons marginaux très étroits, visibles de dessus, sauf aux angles antérieurs. Elytres oblongs, plus larges que le prothorax, profondément

ponctués-striés ; intervalles des stries convexes, un peu plus étroits que les stries ; 4me, 5me et 6me intervalles soudés un peu avant le sommet de l'élytre, prolongés en un faible bourrelet, séparé, prés du sommet, du 7me intervalle réduit à une courte carène émoussée, par une courte ligne de points qui vient se réunir à la 7me ligne ponctuée discoidale.

2 exemplaires. Kobo, 400 pieds.

Voisin de *R. longiceps*, Grouv., distinct par les carènes du prothorax toutes déprimées ; voisin également de *R. intrusus*, Grouv. mais distinct par les intervalles des stries discoidales des elytres presque plus étroits que les stries.

NITIDULIDAE

Carpophilus dimidiatus, Fabr.

Carpophilus dimidiatus, Fabr., 1792, Ent. Syst., p. 261.
Carpophilus dimidiatus var. *contingens*, Walk., 1858, Ann. Nat. Hist., (3) ii, p. 206.

1 exemplaire. Kobo, 400 pieds.

Carpophilus obsoletus, Er.

Carpophilus obsoletus, Er., 1843, Germ. Zeitschr., iv, p. 259.

1 exemplaire. Rotung, 1400 pieds.

Haptoncus ocularis, Fairm.

Haptoncus ocularis, Fairm., 1849, Rev. Zool., p. 363.
Haptoncus tetragonus, Murr., 1864, Monog. Nitid., p. 401.

2 exemplaires. Rotung, 1400 pieds.

Ipidia variolosa, Reitt. var.

Ipidia variolosa, Reitt., 1879, Deutsche Ent. Zeitschr., p. 215.

1 exemplaire. Dibrugarh, N. E. Assam.

Megauchenia angustata, Er.

Megauchenia angustata, Er. (*Ischaena*), 1843, Germ. Zeitschr., iv, p. 288.

7 exemplaires. Kobo, 400 pieds.

Megauchenia quadricollis, Reitt.

Megauchenia quadricollis, Reitt., 1883, Notes Leyden Mus., v, p. 10.

3 exemplaires. Kobo, 400 pieds.

Pria mirmidon, n. sp.

Breviter ovata, convexa, nitidula, tenue flavo-pubescens, picea; antennis, pedibus, bucca et abdominis ultimo segmento testaceis; capite prothoraceque interdum rufo-piceis. Antennae apud marem subelongatae: articulis 1°—5° plus minusve elongatis, vel subelongatis, 5° quam vicinis vix incrassatis, 6°—8° plus minusve transversis, 8°—11° piriformem clavam efficientibus; apud feminam breviores: articulis 8°—10° subcylindricam clavam efficientibus. Caput circiter tam elongatum quam latum, convexum ante antennarum bases arcuatim inflexum, antice truncatum, fronte dense punctulatum; labro profunde emarginato. Prothorax antice subvalde, postice vix angustus, transversus, dense punctulatus; margine antico parum emarginato; angulis anticis rotundatis, posticis obtusis; lateribus arcuatis; basi subtruncata. Scutellum triangulare. Elytra lateribus arcuata, vix ampliata, apice conjunctim subtruncata, paulo breviora quam simul latiora, dense punctulata, pygidium obtegentia. Striae marginales posticarum coxarum juxta apicem inflexae. Feminae caput prothoraxque angustiores.

Long. 1·2 *mill.*

Environ une fois et demie plus long que large dans sa plus grande largeur, ovale, convexe, un peu brillant, à peine visiblement alutacé, couvert d'une pubescence flave, très fine, ne masquant pas la couleur du tégument, brun de poix avec la bouche, les antennes, le pygidium et les pattes testacés; tête et thorax parfois un peu rougeâtres. Antennes du mâle modérement allongées; 1er article épais, dilaté-arrondi au côté interne, environ une fois et demie plus long que large; 2me moins épais, également environ une fois et demie plus long que large; 3me plus étroit presque trois fois plus long que large; 4me suballongé; 5me un peu allongé, un peu plus large que 4me et 6me; 6me transversal; 7me subcarré; 8me très transversal, amorcant la massue; celle-ci piriforme presque trois fois plus longue, y compris le 8me article, que large; 9me article transversal, en forme de tronc de cône; 10me à peine aussi long que 9me, sinué au sommet; 11me plus étroit que 10me, subacuminé au sommet, environ aussi long que large. Antennes de la femelle plus courtes que celles du mâle; massue subcylindrique. Tête du mâle à peine plus large que longue y compris les mandibules, rétrécie à la naissance des antennes, subparallèle en avant, tronquée au sommet, infléchie en arc vers la naissance des antennes; front convexe, densément pointillé; labre grand, profondément échancré; yeux saillants, n'échancrant pas les côtés du front, ceux-ci droits, convergents en avant. Prothorax rétréci en avant, à peine à la base, environ deux fois plus large dans sa plus grande largeur que long, densément pointillé, mais moins fortement que la tête; bord antérieur faiblement échancré; angles antérieurs arrondis; côtés arqués, subparalléles un peu en avant des angles postérieurs, ceux-ci obtus; base subtronquée. Ecusson triangulaire, égal à la base au quart de la longueur de la base du prothorax, très finement alutacé.

Elytres de la largeur du prothorax à la base, arrondis, à peine élargis sur les côtés, presque tronqués ensemble au sommet, un peu moins longs que larges ensemble, densément pointillés; marges latérales, étroitement rebordées; stries marginales des hanches postérieures infléchies à l'extrémité. Tibias allongés. Tête et prothorax plus étroits chez la femelle.

1 mâle, 2 femelles. Dibrugarh, N.E. Assam.
Dans les fruits du *Pandarus odoratissimus*.

Pria diluticollis, n. sp.

Ovata convexa nitidula, flavo-aureo-pubescens, fulvo-testacea, elytris piceis, apice dilutioribus. Antennae graciles; articulis 1°—5° *plus minusve elongatis vel subelongatis;* 6° *et* 7° *transversis;* 8°—10° *piriformem clavam efficientibus. Caput transversum, convexiusculum, antice truncatum, tenuissime alutaceum, parce punctulatum, ante antennarum bases arcuatim inflexum; labro emarginato. Prothorax antice valde, postice vix angustus, transversus, alutaceus, subparce punctulatus; margine antico subtruncato; angulis anticis rotundatis; lateribus modice arcuatis, tenuissime marginatis; angulis posticis obtusis; basi subtruncata ad extremitates late subsinuata, tenuiter marginata. Scutellum triangulare, magnum. Elytra lateribus arcuata, sat ampliata; apice separatim breviter rotundata, vix breviora quam simul latiora, alutacea, subparce punctulata, punctis transversim vix perspicue strigosis. Striae marginales posticarum coxarum juxta apicem inflexae.*

Long. 1·5 *mill.*

Un peu plus d'une fois et demie plus long que large dans sa plus grande largeur, ovale, modérement convexe, un peu brillant, alutacé, couvert d'une pubescence flave-dorée, ne masquant pas la couleur du tégument, fauve-testacé avec les elytres brun de poix plus clairs vers l'extrémité. Antennes grèles; 1er article épais, dilaté-arrondi en dedans, environ une fois et un tiers plus long que large; 2me moins épais, environ une fois et demie plus long que large; 3me plus étroit, deux fois plus long que large; 4me et 5me suballongés; 6me subtransversal; 7me transversal; 8me très transversal, amorcant la massue, celle-ci piriforme, environ deux fois plus longue, y compris le 8me article, que large; 9me article transversal, en forme de tronc de cone; 10me sensiblement aussi long que 9me, sinué au sommet; 11me plus long et plus étroit que 10me, subcylindrique, terminé à l'extrémité en forme de cône surbaissé. Tête un peu moins longue avec les mandibules que large avec les yeux, rétrécie à la naissance des antennes, puis subparalléle, tronquée en avant, infléchie en arc en avant des naissances des antennes; front subconvexe, éparsement pointillé; labre assez grand, fortement sinué; yeux médiocrement saillants, échancrant les marges du front, celles-ci convergentes en avant. Prothorax rétréci en avant, à peine à la base, un peu moins de deux fois plus large dans sa plus grande largeur que long, assez éparsement pointillé; bord antérieur subtronqué; angles antérieurs arrondis; côtés faible-

ment arqués, sauf contre les angles postérieurs, très finement rebordés; angles postérieurs obtus; base tronquée, très largement subsinuée, rebordée vers les extrémités. Ecusson triangulaire, occupant environ le quart de la longueur de la base du prothorax, éparsement et très finement pointillé. Elytres de la largeur du prothorax à la base, arqués sur les côtés, assez élargis, séparément et largement arrondis au sommet, presqu'aussi longs que larges ensemble dans leur plus grande largeur, très étroitement rebordés sur les côtés, couverts d'une ponctuation plus forte que celle du prothorax, un peu éparse, transversalement substrigueuse lorsqu' elle est vue de bas en haut. Stries marginales des hanches postérieures infléchies à l'extrémité. Tibias allongés.

1 exemplaire. Près Kalek, 2500 pieds.

Amystrops montana, n. sp.

Ovata, convexa, nitida, parce tenue flavo-pubescens, rufo-testacea, elytris sat dilute rufo-castanea. Antennae subgraciles; 3° articulo elongato quam 2° paulo longiore, clava paulo minus duplo longiora quam latiora, ultimo articulo quam praecedente longiore et angustiore. Caput modice transversum, dense punctatum, antice truncatum; labro magno, profunde emarginato. Prothorax antice angustus, parcius sed fortius capite punctatus; margine antico late emarginato; angulis anticis rotundatis; lateribus rotundatis, basin versus parallelis, tenuiter marginatis; angulis posticis acutis, retrorsum productis, basi medio subtruncata, utrinque scutelli breviter sinuata, ad extremitates inflexa et tenuiter marginata. Scutellum magnum, subtriangulare, parce punctatum. Elytra ovata, in maxima latudine prothorace vix latiora, ad apicem conjunctim truncata, breviora quam simul latiora, quam prothorace fortius et paulo densius punctata; angulis humeralibus rotundatis. Pygidium haud occultum, dense punctatum. Caput et prothorax infra subleves. Metasternum abdomenque parce punctulata.

Long. 1·6 *mill.*

Ovale, un peu plus d'une fois et demie plus long que large dans sa plus grande largeur, convexe, brillant, couvert d'une pubescence flave, fine, espacée, roux testacé avec les elytres roux marron clair. Antennes presque grêles; 1er article à peu près aussi long que large, dilaté arrondi au côté interne; 2me plus étroit que le 1er, environ une fois et demie plus long que large; 3me encore plus étroit, deux fois et demie plus long que large; 4me une fois et demie plus long que large; 5me un peu plus court que 4me; 6me, 7me et 8me progressivement plus transversaux; 8me plus large que 7me; 9me à 11me formant une massue compacte, un peu moins de deux fois plus longue que large, dont le dernier article est plus long et plus étroit que le précédent.

Tête environ une fois et demie plus large au niveau des yeux que longue avec les mandibules, densement ponctuée, biimpres-

sionnée entre les bases des antennes, rétrécie transversalement en avant des yeux, jusqu'à l'insertion des antennes, puis obliquement rétrécie et saillante en avant pour former l'épistome, celui-ci tronqué; labre grand, profondément échancré; yeux saillants. Prothorax à peine plus large en avant que la largeur de la tête, beaucoup plus large à la base, arrondi sur les côtés, paralléle à la base, plus de deux fois plus large à la base que long, plus éparsement et plus fortement ponctué sur le disque que la tête, bord antérieur largement échancré, finement rebordé aux extrémités; angles antérieurs arrondis, rebordés; côtés arqués, rebordés; angle postérieurs aigus, saillants en arriére; base tronquée au milieu, briévement sinuée de chaque côté de l'écusson, puis subtronquée et réfléchie en arriére, avant l'extrémité, rebordée de chaque côté de l'écusson. Ecusson occupant environ le quart de la base du prothorax, subtriangulaire, éparsement pointillée. Elytres ovales, de la largeur du prothorax à la base, arrondis sur les côtés, à peine élargis, presque subtronqués ensemble au sommet, nettement moins longs que larges ensemble dans la plus grande largeur, plus fortement ponctués que le prothorax, mais moins densement ponctué que lui sur les côtés; bords latéraux finement rebordés; angles huméraux arrondis. Pygidium bien découvert, triangulaire, densement pointillé. Dessous de la tête et du prothorax presque lisse; métasternum et abdomen densément ponctués. Sillons antennaires courts, convergents. Palpes maxillaires allongés, filiformes. Saillie prothoracique, subspatulée, dépassant le niveau des hanches. Mésosternum obliquement enfoncé.

6 exemplaires. Dibrugarh, N. E. Assam.
Dans les fruits du *Pandarus odoratissimus*.

COLYDIIDAE.

Xuthia parallela, Sharp.

Xuthia parallela, Sharp, 1885, Journ. Linn. Soc. Lond., xix, p. 70.

1 exemplaire. Rotung, 400 pieds.

Tarphiosoma kempi, n. sp.

Breviter ovatum, convexum, nitidum, atrum, antennis pedibusque rufo-piceum; corpore subtus setis erectis subinfuscatis, in elytris paulo longioribus et pilis plus minusve squamiformibus, sordido-ochraceis, ex parte in maculis densatis, vestito. Antennae subtenues; 9° articulo quam praecedente paulo latiore. Caput transversum, utrinque late impressum, sat dense sed inaequaliter granosum. Prothorax transversissimus, antice quam postice paulo angustior, lateribus valide arcuatus ad angulos anticos breviter, posticos vix perspicue sinuatus, granosus: disco convexo, in longi-

tudinem subsulcato ; lateralibus marginibus late explanatis ; apice late profundeque emarginato, valde pulvinato-marginato ; angulis anticis acutis, lateribus praecipue ad basin obtuse denticulatis ; angulis posticis subrectis ; basi medio subtruncata, ad extremitates oblique retrorsum producta. Elytra ad basin prothoracis quam maxima longitudine latiora, apice conjunctim acuminata, paulo breviora quam simul latiora, valde lineato-punctata ; humeris haud rotundatis.

Long. 5 *mill.*

En ovale court, convexe, brillant lorsqu'il est dégagé de l'enduit terreux que le couvre en général, noir, garni sur tout le dessus du corps de soies foncées ou jaune sale, dressées un peu plus longues sur les elytres que sur le prothorax et de poils plus ou moins squamiformes, plus nombreux sur le disque du prothorax et sur ses marges latérales et plus ou moins condensés sur les elytres, principalement sur deux bandes transversales ondulées, la première près de la base, la deuxiéme avant la declivité apicale. Antennes testacées-enfumées, presque grèles ; 6me article à peine plus étroit que le 5me ; 6me à 8me s'épaississant très légérement ; 9me nettement plus large que 8me ; 9me et 11me formant une massue environ une fois et demie plus longue que large, dont le dernier article est un peu plus court et nettement plus étroit que le précédent. Tête près de deux fois plus large que longue, subdéprimée, largement impressionnée de chaque côté, couverte de granulations fortes vers la base, faibles sur l'épistome ; bord antérieur très largement arrondi, yeux non saillants ; labre grand, roux. Prothorax un peu plus rétréci en avant qu'à la base, fortement arrondi sur les côtés, légérement sinué vers les angles antérieurs, à peine vers les angles postérieurs, présentant sa plus grande largeur vers le 1er tiers de la longueur à partir de la base, presque deux fois et demie plus large, dans sa plus grande largeur, que long dans sa plus grande longueur, couvert de granulations assez fortes, allongées sur les marges latérales, ponctué et longitudinalement sillonné sur le disque ; bord antérieur largement et profondément échancré, bordé par un fort bourrelet coupé par le sillon longitudinal du disque, angles antérieurs aigus, saillants en avant ; côtes obtusement denticulés dans la moitié basilaire, marges latérales très largement enplanées-concaves ; angles postérieurs droits, non émoussés ; base subtronquée au milieu, obliquement réfléchie en arriére aux extrémités, convexité longitudinale forte, plus accentuée en avant, séparée du bourrelet antérieur par une forte dépression ponctuée ; convexité transversale forte, presque séparée des marges latérales tuberculeuses par un sillon. Ecusson petit, suborbiculaire. Elytres un peu plus larges à la base que le prothorax dans sa plus grande largeur, anguleux aux épaules, à peine élargis, acuminés ensemble au sommet, un peu moins longs que larges ensemble, ponctués en lignes de gros points enfoncés, à contour mal défini, déterminant des intervalles fortement

ondulés, marges latérales étroites, à peine marquées, tuberculeuses, renflées vers les épaules ; bords latéraux obtusement denticulés.

1 exemplaire. Kalek, 3800 pieds.

Hyberis similis, n. sp.

Oblongo-ovatus, convexus, nitidulus tuberculato-setosus, ater ; antennis rufo-fuscis ; tarsis rufis. Antennae subgraciles ; 3° articulo quam simul 1° et 2° breviore. Caput subtransversum, depressum, antice subtruncatum, occipite vix granosum. Prothorax transversus, subcordiformis, marginibus lateralibus sat late explanatus, granosus, antice in longitudinem sulco laevi impressus, ante médium, utrinque sulci duobus contiguis gibbis, valde tuberosis ; margine antico medio rotundato, sulco late marginato, utrinque valde sinuato ; angulis anticis acutis ; lateribus ante medium, valde rotundato-productis, dentatis ; basi sulcato-marginata. Elytra oblonga, apice conjunctim breviter rotundata, magis sesquilongiora-quam simul latiora, in disco subconfuse et haud profunde lineato-punctata, in intervallis inaequaliter tuberosa ; punctorum intervallis subelevatis, ocellatis ; tuberis in disco interdum geminis ad latera et apicem versus magis ordinatis.

Long. 4·2 mill.

Suboblong, environ trois fois plus long que large dans la plus grande largeur, fortement convexe, un peu brillant, couvert de tubercules plus ou moins développés, portant chacun une soie dressée, plus longue sur les elytres que sur la tête et le prothorax, noir avec les antennes roux enfumé et les tarses rougeâtres. Antennes assez grèles ; 3me article environ deux fois plus long que large, plus court que les deux premiers réunis ; 4me plus court que 3me ; 4me à 7me progressivement plus courts ; 8me et 9me subégaux, suballongés, un peu plus longs que 7me ; 10me en forme de massue piriforme, pubescent sur la partie apicale. Tête subtransversale, déprimée, un peu moins longue que large avec les yeux, chargée de tubercules faibles et espacés sur l'occiput, plus forts et plus serrés entre les naissances des antennes, faibles et serrés sur l'épistome ; yeux échancrant le front, à peine saillants, sans soies dressées. Prothorax à peu près aussi large à la base qu'au sommet, subcordiforme, fortement dilaté, arrondi sur les côtes, environ deux fois et demie plus large dans sa plus grande largeur que long, assez largement explané-concave sur les côtes, chargé de tubercules serrés, laissant libre, en avant, un court sillon longitudinal et formant de chaque côté du disque, sur une ligne transversale, une double gibbosité un peu allongée ; bord antérieur arrondi dans le milieu et bordé par un large bourrelet subdéprimé, coupé par le sillon longitudinal du disque ; angles antérieurs aigus, saillants en avant, n'atteignant pas le niveau du milieu du bord antérieur ; côtés fortement dentés ; angles postérieurs subaigus ; base tronquée devant l'écusson, largement sinnuée de chaque côte, bordée par une forte strie

enfoncée. Ecusson petit, suborbiculaire. Elytres largement arrondis aux épaules, alors un peu plus larges que le prothorax dans sa plus grande largeur, arrondis faiblement dilatés sur les côtés, brièvement arrondis ensemble au sommet, plus d'une fois et demie plus longs que larges ensemble dans leur plus grande largeur, superficiellement et peu régulièrement ponctués sur le disque, chargés sur les intervalles de tubercules sétifères, plus ou moins forts, irrégulièrement distribués, parfois geminés; intervalles des points très légèrement relevés, ocellés; tubercules disposés en lignes plus régulières, vers l'extrémité et sur les marges latérales. Stries marginales des elytres bien marquées.

2 exemplaires. Kalek, 3800 pieds. Dessous les écorces.

Trachypholis hispida, Weber.

Trachypholis hispida, Weber (*Opatrum*), 1801, Observ. Ent., i, p. 38.

1 exemplaire. Kobo, 400 pieds.

Trachypholis decorata, Grouv.

Trachypholis decorata, Grouvelle, 1911, Notes Leyden Mus., xxxiii, p. 126.

2 exemplaires. Rotung, 1400 pieds.

Trachypholis signata, Grouv.

Trachypholis signata, Grouvelle, 1911, Notes Leyden Mus., xxxiii, p. 128.

3 exemplaires. Rotung, 1400 pieds.

CUCUJIDAE.

Cucujus kempi, n. sp.

Planus, capite prothorace, antennis, pedibus et corpore subtus niger, elytris ruber. Caput asperum, dense punctatum; punctis ex parte confluentibus; lobis posticis valde prominulis. Prothorax in maxima latudine minus duplo latior quam longior, valde asper, plus minusve crebre punctatus; punctis irregularibus saepius confluentibus, intervallis plus minusve valde elevatis; margine antico valde lateque pulvinato-marginato, pulvino postice medio et utrinque profunde excavato; lateribus arcuatis, denticulatis. Elytra in disco subregulariter lineato-punctata.

Long. 22 mill.

Forme et aspect normal des *Cucujus*. Tête, prothorax, antennes, pattes et dessous du corps noirs; elytres rouges, de nuance un peu sanguine. Antennes s'épaississant assez sensiblement vers l'extrémité. Surface de la tête très inégale, irrégulièrement

ponctuée; points souvent confluents, leurs intervalles parfois élevés presqu'en carénes; lobes des angles postérieurs fortement saillants. Prothorax rétréci à la base, moins de deux fois plus large, dans sa plus grande largeur, que long dans sa plus grande longueur, denté sur les côtés; disque inégal comme celui de la tête; bord antérieur relevé, au milieu, en un large bourrelet se prolongeant sur le disque, en deux carènes courtes, largement émoussées, bordant en dedans une forte impression et limitant chacune en dehors le bord interne d'une impression également bien marquée; devant le milieu de la base deux impressions profondes, obliques divergentes. Elytres ponctués sur le disque en lignes presque réguliéres, points mieux marqués vers la base, atténués vers le sommet, plus ou moins confus sur la région scutellaire.

1 exemplaire. Geku, 10,000 pieds.

? Uleiota atratula, Reitt.

Uleiota atratula, Reitter, 1877, Mittheil. Munch. Ent. Ver., p. 24.

1 exemplaire. Rotung, 1400 pieds.

Laemophloeus semilaetaneus, n. sp.

Oblongus, modice elongatus, depressus, nitidus, glaber, niger; elytris plus minusve nigro-piceis: singulo lata plaga laterali, lacteola notato; mandibulis, antennarum primo articulo, tarsisque rufis. Antennae elongatae: 1° articulo 2 et 1/2 longiore quam latiore; 2°—8° subelongatis, tribus ultimis parum incrassatis. Caput transversissimum, depressum, subdense irregulariterque punctatum, in disco in longitudinem bistriolatum, antice quinque sinuatum. Prothorax transversissimus, basin versus parum angustus, parce tenuissimeque punctulatus, utrinque unistriatus; lateribus arcuatis, angulis omnibus plus minusve rotundatis; basi inter strias dorsales tenuiter marginata. Scutellum subpentagonale, parce punctulatum. Elytra oblonga, vix sesquilongiora quam simul latiora, apice separatim late rotundata, vix perspicue punctulata, abdominis ultimum segmentum haud tegentia.

Long. 2·5 mill.

Oblong, modérement allongé, déprimé, brillant, glabre, noir; elytres plus ou moins noir de poix, marqués chacun d'une grande tache lactescente, latérale, n'atteignant pas l'épaule, le sommet et la suture; mandibules, 1er article des antennes et tarses rougeâtres. Antennes atteignant presque le milieu de la longueur des elytres; 1er article environ deux fois plus long que large; 2me à 8me submoniliformes; 2me et 3me subégaux, un peu plus longs que larges; 4me à 8me un peu plus longs que les précédents; 9me à 11me formant une massue lâche, peu accentuée, dont les deux premiers articles sont environ aussi longs que larges et dont le dernier est un peu

ius long que les précédents. Tête environ deux fois et demie plus large que longue y compris les mandibules, déprimée, plus ou moins densément ponctuée, marquée sur le disque de deux courtes strioles légèrement divergentes ; bord antérieur cinq fois sinuée entre les naissances des antennes, subrebordé dans la partie des trois sinuosités internes ; bords latéraux convergents en avant, dans la partie qui précède les yeux, rebordés ; yeux modérément saillants ; mandibules assez rapprochées à la base, saillantes. Prothorax rétréci vers la base, un peu plus étroit que la tête avec les yeux, environ deux fois et demie plus large dans sa plus grande largeur que long, éparsement et à peine visiblement pointillé, strié de chaque côté ; stries convergentes vers l'arrière, réunies à l'extrémité par une strie qui borde la base ; tous les angles plus ou moins arrondis ; côtés arqués-rebordés. Ecusson subpentagonal, plus large que long, tres éparsement ponctué. Elytres à la base de la largeur du prothorax un peu en avant des angles postérieures, arqués sur les côtés, peu élargis, en angles obtus émoussé aux angles postérieurs externes, largement et séparément arrondis au sommet, environ une fois et demie plus longs que larges ensemble dans la plus grande largeur, à peine visiblement pointillés. Dernier segment de l'abdomen largement visible, presqu' éparsement pointillé.

1 exemplaire mâle. Rotung, 1400 pieds.

Laemophloeus subturcicus, n. sp.

Elongatus, subparallelus, subdepressus, nitidulus, pube flava brevi tenuique vestitus, ferrugineus, antennis pedibus elytrisque paulo dilutus. Antennae elongatae, apud marem haud clavatae, apud feminam subclavatae; 2° *articulo quam* 3° *longiore. Caput transversum, subtriangulare, antice sinuatum, subdense punctulatum*; *lateribus convergentibus, tenuiter marginatis, juxta antennarum basin subelevatis*; *stria interantennali arcuata, praecipue ad extremitates manifesta*; *oculis modice prominulis. Prothorax transversus, antice vix, postice sat valde angustus, dense punctatus, utrinque unistriatus, margine antico vix arcuato*; *angulis anticis subobtusis*; *lateribus arcuatis, ad basin sinuatis et tenuiter marginatis*; *angulis posticis rectis, haud hebetatis*; *basi truncata, utrinque sinuata, margine basilari medio pulvinato-elevato. Scutellum subtriangulare, transversum. Elytra prothorace vix latiora, subparallela, ad apicem modice attenuata et apice separatim late rotundata,* 2 *et* 1/3 *tam elongata quam simul lata, in disco sex striata*; *striis* 1ª (*suturali*) 3ª *et* 5ª *impressioribus,* 2ª *ad basin attenuata*; *intervallo suturali bilineato-punctulato, aliis plus minusve regulariter unilineato-punctulatis*; *margine laterali, juxta sextam striam carinato-plicato.*

Long. 1·6—1·8 *mill.*

Subparallele, environ trois fois et demie plus long que large, subdéprimé, un peu brillant, couvert d'une pubescence flave, fine,

très courte, brun ferrugineux avec les elytres, les antennes et le pattes un peu plus clairs. Antennes allongées, atteignant chez le mâle le deuxiéme tiers de la longueur des elytres; 2me article très nettement plus long que large; 3me également plus long que large, mais plus court que le 2me; 4me deux fois plus long que large; 5me plus long que 4me et 6me; 6me à 11me tous allongés, plus de deux fois et demie plus longs que larges, également épais; chez la femelle l'antenne atteint environ le milieu de la longueur de l'elytre, les articles sont relativement moins longs et les trois derniers forment une massue lache, très peu accentuée. Tête un peu moins de deux fois plus largeque longue en tenant compte des mandibules et des yeux, subtriangulaire, longitudinalement un peu convexe, assez densement pointillée; bord antérieur largement sinué; côtés convergents, très finement rebordés, relevés vers la naissance des antennes; strie interantennaire arquée, mieux marquée aux extrémités; tempes paralleles; yeux médiocrement saillants; labre largement et faiblement arrondi au sommet, moins de trois fois plus large que longe. Prothorax à peine rétréci en avant, assez fortement à la base, environ une fois et un tiers plus large en avant que long, couvert d'une ponctuation presque serrée, un peu plus forte que celle de la tête, longitudinalement uni-strié de chaque côté, longitudinalement déprimé sur le disque, relevé en bourrelet sur la partie médiane de la base; bord antérieur à peine arqué; angles antérieurs subobtus; côtés très finement rebordés, arqués, sinués vers les angles postérieurs; ceux-ci droits, non émoussés; base tronquée, sinuée de chaque côté. Ecusson subtriangulaire, très transversal. Elytres sinués à la base, arrondis aux épaules, alors à peine plus larges que le prothorax, subparalleles, attenués dans la partie apicale, largement et séparement arrondis au sommet, environ deux fois et un tiers plus longs que larges ensemble dans la plus grande largeur, chacun avec six stries ponctuées sur le disque, 1re strie (suturale), 3me et 5me un peu plus marquées, 2me atténuée à la base; intervalle sutural avec deux lignes de très petits points, les autres avec une ligne ponctuée irréguliére; intervalles alternes subélevés vers le sommet; marges latérales limitées par une carène contre la 6me strie, à peine rebordées-explanées. Pas de stries fémorales sur le 1er segment de l'abdomen. Mesosternum se développant dans un plan à peine oblique par rapport au plan du métasternum. Hanches antérieures très écartées, leurs cavités ouvertes.

Inde (dans le corps d'un Bupreste); Yunnan (avec un lot de Cetoines moisies). Plusieurs exemplaires; Collection A. Grouvelle.

1 exemplaire. Sadiya, N. E. Assam.

Laemophloeus proximus, Grouv.

Laemophloeus proximus, Grouvelle, 1908, Ann. Soc. Ent. Fr., p. 466.

1 exemplaire. Dosing, 1400 pieds.

Silvanus lateritius, Reitt.

Silvanus lateritius, Reitter, 1878, Verhandl. zool. bot. Gesells. Wien, p. 194.

Nombreux exemplaires. Rotung, Sadiya, Pang-i.

PASSANDRIDAE.

Hectarthrum trigeminum, Newm.

Hectarthrum trigeminum, Newman, 1839, Ann. Nat. Hist., ii, p. 393.

5 exemplaires. Kobo, 400 pieds.

DISCOLOMIDAE.

Holophygus rugosus, n. sp.

Suborbicularis, latior quam longior, convexus, nitidus, setis tenuibus, erectis, subinfuscatis, subdense vertitus, nigro piceus; antennis, corpore subtus, pedibus et saepius prothoracis elytrorum que marginibus explanatis dilutioribus. Antennae subgraciles; 1° et 3° articulis elongatissimis. Caput fronte depressum, late rugosum. Prothorax transversissimus, lateribus subanguloso-productus, ante anguli apicem sinuatus, subdense valdeque punctatus, in longitudinem sulcatus; marginibus lateralibus latissime explanatis; basi medio breviter truncata, utrinque late sinuata, marginata. Elytra basi quam prothorax latiora, fere semicircumducta, circiter simul 1 et 1/2 latiora quam longiora, crebre punctata; angulis humeralibus antrorsum rotundato-productis; marginibus lateralibus late explanatis, sublaevibus, undulatis. Femora apicem versus intus dentata.

Long. 1·8—2 *mill.*

Suborbiculaire, plus large que long, convexe, explané sur les côtés, brillant, couvert de soies dressées, fines plus ou moins enfumées, brun de poix, nettement plus clair sur les antennes, les pattes, le dessous du corps et parfois les marges explanées. Antennes assez gréles; 1er article épais, arqué, plus de trois fois plus long que large; 2me encore un peu épais, subcarré; 3me environ quatre fois plus long que large; 4me environ deux fois et demie; 5me presque deux fois; 6me environ une fois et demie; 7me un peu plus court que 6me; 8me en forme de massue piriforme, composée de trois articles soudés. Tête déprimée, sur le disque, réserrée en avant des antennes, puis dilatée, infléchie, couverte de rugosités peu serrées; bord antérieur tronqué; labre petit. Prothorax beaucoup plus large que la tête, dilaté en angle émoussé sur les côtés, sinué, subcrénelé en arriére de ces angles, presque quatre fois plus large, dans sa plus grande largeur, que long dans sa plus grande longueur, plus ou moins éparsément ponctué sur le

disque, longitudinalement sillonné; bord antérieur largement échancré; angles antérieurs obtus, médiocrement saillants en avant; marges latérales très largement explanées, presque lisses, bordées par un fin bourrelet peu marqué; angles postérieurs obtus, parfois subdentés, base tronquée devant l'écusson, largement sinuée de chaque côté, rebordée. Ecusson petit, subtriangulaire. Elytres contigus à la base du prothorax, plus larges, réfléchis obliquement en avant, pour former des angles huméraux saillants en avant, fortement émoussés, arrondis, à peine élargis sur les cotés, arrondis ensemble au sommet, environ une fois et demie plus larges que longs, couverts d'une ponctuation forte, très serrée, donnant un aspect rugueux; marges latérales explanées, moins larges que celles du prothorax, presque lisses; bords largement subondulés. Fémurs postérieurs dentés au côté interne, avant l'extrémité.

9 exemplaires. Kobo, 400 pieds. Dessous les écorces.

CRYPTOPHAGIDAE.

Diphyllus odiosus, n. sp.

Ovatus, sat latus, convexus, nitidus, pube cinerea, brevi vestitus, testaceo-castaneus; antennis pedibusque paulo dilutioribus. Antennae subincrassatae; 3° articulo elongato, clava magis duplo longiore quam latiore, ultimo articulo oblongo. Caput transversum, convexiusculum, rugosulum et plus minusve dense punctatum, ante antennatum bases modice productum, antice subtruncatum. Prothorax antice valde angustus, basi 2 et 1/3 latior quam longior, utrinque in longitudinem bicarinatus; carina externa integra, interna postice abbreviata, minus elevata; disco plus minusve, marginibus lateralibus dense, punctatis; punctis, in disco duo elongata laevia spatia reliquantibus; margine antico arcuato, ad extremitates sinuato; angulis anticis obtusis; lateribus arcuatis, tenuiter marginatis; angulis posticis acutis, retrorsum modice productis; basi medio arcuata, utrinque sinuata, ad extremitates quam in medio strictius marginata. Scutellum transversum, apice rotundatum. Elytra basi quam prothorace haud latiora, lateribus arcuata, vix ampliata, apice conjunctim brevissime rotundata, circiter 1 et 2/3 longiora quam simul latiora, lineato punctata; punctis juxta basin et ad latera majoribus, ad apicem praecipue juxta suturam attenuatis; intervallis linearum latis, in disco planis, ad latera subconvexis. Lineae marginales intermediarum coxarum arcuata, episternum ante apicem attingentes; lineae femorales internae coxarum posticarum rectae, parallelae, integrae, externae rectae, integrae, obliquae.

Long. 2·2 mill.

Ovale, environ deux fois et un tiers plus long que large dans la plus grande largeur, convexe, brillant, testacé-marron avec les antennes et les pattes plus claires, couvert d'une pubescence cen-

drée, fine, inclinée, courte sur le disque, plus longue vers les côtés. Antennes un peu épaisses ; 1er article épais, carré, 2me moins épais, suballongé ; 3me environ deux fois plus long que large ; 4me à 6me subégaux, un peu allongés ; 7me a 9me s'épaississant progressivement et faiblement ; 7me et 8me subcarrés ; 9me subtransversal ; 10me et 11me formant une massue donc le 1er article, en forme de tronc de cône, est environ aussi long que large au sommet et dont le 2me article est suboblong, plus étroit que le précédent. Tête plus de deux fois plus large que longue, transversalement un peu convexe, subtronquée en avant, modérement saillante en avant des bases des antennes, ruguleuse, plus ou moins densément ponctuée de points relativement gros ; yeux gros, assez saillants, presque glabres, facettes moyennes. Prothorax fortement rétréci en avant, réguliérement arqué sur les côtés, paralléle contre la base, environ deux fois et un tiers plus large à la base que long, très faiblement convexe dans la longueur sauf en avant, longitudinalement bicaréné de chaque côté ; carénes externes subrectilignes, partant de l'angle postérieur, rejoignant le bord antérieur assez près de ses extrémités, carénes internes antérieures courtes, moins élevées, modérement éloignées des externes ; ponctuation plus ou moins serrée sur le disque, laissant libres deux étroites bandes longitudinales, rapprochées, plus forte et plus serrée vers les côtés ; bord antèrieur arrondi au milieu, sinué de chaque côté ; rebordé entre les carénes ; angles antérieurs obtus, peu émoussés ; bords latéraux finement rebordés, briévement ciliés, angles postérieurs aigus, un peu saillants en arriére, base largement sinuée de chaque côté, bordée par une strie plus rapprochée du bord aux extrémités qu'au milieu. Ecusson environ deux fois plus large que long, arrondi au sommet. Elytres aussi larges à la base que le prothorax, en angles obtus aux épaules, formant avec les côtés du prothorax un angle à peine marqué, arrondis sur les côtés, à peine élargis, présentant leur plus grande largeur vers le premier sixiéme de la longueur à partir de la base, presque acuminés ensemble au sommet, environ une fois et deux tiers plus longs que larges ensemble dans la plus grande largeur, ponctués en lignes ; points plus accentués à la base et sur les marges latérales, atténués vers le sommet, presque effacés contre la suture, sauf à la base ; base des elytres à peine rebordée en bourrelet de chaque côté de l'écusson ; lignes suturales dédoublées à la base, presque effacées en dehors de la partie géminée ; intervalles des lignes ponctuées plans sur le disque, subconvexes vers les côtés, à peine visiblement pointillés ; calus huméraux faiblement marqués. Métasternum longitudinalement substrié. Lignes fémorales internes des hanches intermédiaires effacées, lignes externes arquées, rejoignant l'épisterne un peu avant l'extrémité ; lignes fémorales des hanches postérieures droites, entiéres ; les internes paralléles, les externes obliques, atteignant le sommet du premier segment de l'abdomen près de ses extrémités.

1 exemplaire. Kobo, 400 pieds.

Diphyllus molestus, n. sp.

Oblongus, convexus, nitidus, pube flava vestitus, ater; singulo elytro rufo-fulvo bimaculato; 1ª macula humerali, 2ª apicali, ambabus linea stricta parum manifesta conjunctis. Antennae graciles; articulis 3°—5° elongatis, subaequalibus; clava paulo duplo longiore quam latiore, articulis subaequalibus, ultimo quam praecedente vix angustiore, apice subacuminato. Caput transversum, transversim convexum, dense punctatum, ante antennarum bases modice productum, antice subtruncatum. Prothorax antice valde angustus, basi magis duplo latior quam longior, utrinque bicarinatus; carina externa cum latere subparallela, interna postice abbreviata, minus elevata; disco inter externas carinas subdense punctato, punctis ad latera paulatim validioribus et densioribus; margine antico utrinque modice sinuato; angulis anticis obtusis, hebetatis; lateribus arcuatis, tenuiter marginatis, praecipue ad basin ciliatis, angulis posticis acutis, retrorsum modice productis; basi medio truncata utrinque sinuata, ad extremitates quam in medio evidenter strictius marginata. Scutellum transversissimum, apice truncatum. Elytra basi quam prothorax haud latiora, lateribus arcuata, vix latiora, apice conjunctim subacuminata, 2 et 1/3 longiora quam simul latiora, lineato-punctata, punctis juxta basin et ad latera majoribus, apicem versus attenuatis, intervallis linearum latis, depressis, punctulatis. Lineae internae metasterni apice abbreviatae, externae episternum ante apicem attingente; lineae internae abdominis primi segmenti apice abbreviatae, subrectae, divergentes, externae integrae, subrectae.

Long. 2·2 *mill.*

Oblong, environ trois fois plus long que large dans la plus grande largeur, convexe, brillant, couvert d'une pubescence flave assez serrée, plutôt courte, noir avec deux taches subferrugineuses sur chaque elytre; la première humérale, oblique, la deuxiéme apicale, toutes deux réunies par une bande longitudinale, de même couleur, mal définie comme nuance et comme contour. Antennes grêles; 1er article épais, un peu plus long que large; 2me moins épais, également un peu plus long que large; 3me et 4me subégaux, environ deux fois plus longs que larges; 5me un peu allongé; 6me à 9me subcarrés; 10me et 11me formant une massue dont le 1er article, presque en forme de tronc de cône, est presque aussi long que large au sommet et dont le second, à peine plus étroit que le premier, mais un peu plus long, est suboblong, subacuminé à l'extrémité. Tête plus de deux fois plus large que longue, transversalement un peu convexe sur le front, subpliée en arc entre les antennes et infléchie, subtronquée au bord antérieur, modérement saillante en avant des bases des antennes, couverte de gros points plus ou moins serrés; yeux gros, assez saillants, presque glabres, facettes assez fortes. Prothorax fortement rétréci en avant, régulièrement arqué sur les côtes, ceux ci convergents dès la base, environ deux fois et demie plus large à la base que long, très faiblement convexe dans la longueur sauf en avant, longitudinale-

ment bicaréne de chaque côté; carènes externes arquées, prenant naissance près des angles postérieurs, rejoignant le bord antérieur en s'écartant progressivement, mais très lentement du bord latéral; carènes internes, antérieures, courtes, moins élevées, modérement éloignées des externes; ponctuation écartée, moins forte sur le disque, devenant plus forte et plus serrée vers les carènes externes, presque disposée en lignes entre les carènes internes et externes, moins forte en dehors des carènes externes pu'en dedans; bord antérieur arrondi au milieu, sinué sur les côtes, rebordé entre les carènes internes et externes; angles antérieurs obtus, émoussés, bords latéraux finement rebordés, ciliés; angles postérieurs aigus, un peu saillants en arriére, base tronquée an milieu, largement sinuée de chaque côté, bordée par une strie plus enfoncée et plus rapprochée du bord au milieu qu'aux extrémités. Ecusson environ quatre fois plus large que long, tronqué au sommet. Elytres aussi larges à la base que le prothorax, en angle obtus aux épaules, formant avec les côtés du prothorax un angle à peine marqué, arrondis sur les côtés, à peine élargis, présentant leur plus grande largeur vers le premier quart de la longueur à partir de la base, subacuminés ensemble au sommet, environ une fois et un tiers plus longs que larges ensemble dans la plus grande largeur, ponctués en lignes; points plus accentués à la base et sur les marges latérales, atténués vers le sommet; lignes suturales dédoublées à la base, presqu'effacées en dehors de la partie geminée; intervalles des lignes ponctuées larges et plans, pointillés; calus huméraux marqués. Métasternum finement strié dans la longueur, densément pointillé. Lignes femorales internes des hanches intermédiaires n'atteignant pas le sommet du segment, arquées, subparalléles à l'extrémité; externes arquées, rejoignant l'épisterne avant l'extrémité; lignes fémorales internes des hanches postérieures n'atteignant pas le sommet du segment de l'abdomen, subrectilignes, divergentes; externes entiéres, rectilignes, atteignant le sommet du premier segment près de ses extrémités.

1 exemplaire. Sadiya, N. E. Assam. Dessous les écorces.

MYCETOPHAGIDAE.

Litargus, sp. ?

Rotung, 1400 pieds.

DRYOPIDAE.

Dryops monticola, n. sp.

Oblongo-elongatus, convexus, fusco-olivaceus, flavo-cinereo-pruinosus, sat longe denseque subfusco-flavo-pubescens; antennis pedibusque rufo-fuscis. Prothorax, transversus antice angustus, in longitudinem vix perspicue carinatus, subdense punctatus, lateribus marginatus; lateralibus carinis subrectis; pilis pruinosis ad medium disci convergentibus. Scutellum lateribus arcuatum, apice acumina-

tum. Elytra paulo duplo longiora quam simul lata, apice subacuminata, lineato-punctata; intervallis vix perspicue convexis, tenuiter parce punctulatis.

Long. 3·2 *mill.*

Oblong, presque trois fois plus long que large, convexe, noir olivâtre, revêtu d'une pruinosité flave-cendrée, plus accentuée vers la nuance flave sur le prothorax, entremélée de poils plus sombres, peu allongés, plus serrés et plus redressés sur la tête et le prothorax que sur les élytres, mais ne masquant pas la couleur du tégument; antennes et pattes d'un roux sombre. Antennes un peu plus rapprochées entre elles, à la base, que de la direction longitudinale du bord interne des yeux. Tête subéparsement pointillée sur le disque, plus densement contre les yeux. Prothorax rétréci en avant, un peu moins de deux fois plus large à la base que long dans sa plus grande longueur, à peine visiblement subcaréné dans la longueur, un peu moins densement mais plus fortement ponctué que la tête; angles antérieurs aigus, saillants; côtés arqués, rebordés, carènes latérales presque droites lorsque'elles sont vues de face, bien marquées sur toute la longueur, subimpressionnées contre leur bord interne, vers le premier tiers de la longueur à partir de la base; convexité longitudinale plus marquée en avant, transversale brusquement très atténuée de chaque côté sur les marges externes des carènes latérales; pruinosité formant sur le milieu du disque un centre de convergence. Écusson en triangle fortement curviligne; subéquilatéral. Elytres un peu plus larges après les épaules que le prothorax à la base; subparalléles, subacuminés ensemble au sommet, un peu plus de deux fois plus longs que larges ensemble, ponctués en lignes bien marquées surtout à la base, effacés au sommet; intervalles très légérement convexes, éparsement et très finement pointillés. Tarses intermédiaires presqu'aussi longs que les tibias.

2 exemplaires. Yembung, 1100 pieds.

Dryopidius montanus, n. sp.

Ovatus, elongatus, convexus, nitidus vix perspicue pubescens, niger; pedibus nigro-piceis, tarsis plus minusve rufo-piceis. Caput tenuissime alutaceum, subparce punctulatum, ante antennarum bases arcuatim inflexum, antice subtruncatum. Prothorax transversus, antice angustus, in disco tenue, ad latera validius parce punctulatus; margine antico late emarginato; angulis anticis acutis, productis; lateribus tenue marginatis, antice modice arcuatis, postice subrectis, convergentibus; angulis posticis acutis, retrorsum productis; basi pro scutello emarginata, utrinque late sinuata. Scutellum subpentagonale. Elytra subaspera, subdense punctulata.

Long. 3 *mill.*

Ovale, plus de deux fois et demie plus long que large dans sa plus grande largeur, convexe, brillant, à peine visiblement pubes-

cent, noir; pattes noir de poix, tarses plus ou moins rougeâtres. Tête très finement alutacée, presqu' éparsement ponctuée, légèrement infléchie en avant des naissances des antennes, subtronquée au bord antérieur. Prothorax rétréci en avant, environ deux fois plus large à la base que long, couvert d'une ponctuation plus éparse que celle de la tête, très fine sur le disque surtout devant l'écusson, plus forte vers les côtés; bord antérieur largement et profondément échancré; angles antérieurs aigus, saillants en avant, très finement rebordés de chaque côté; bords latéraux également très finement rebordés, arqués en avant, subrectilignes, convergents dans la partie basilaire; angles postérieurs aigus, saillants en arriére; base échancrée devant l'écusson, largement sinuée de chaque côté, bordée aux extrémités par une ligne de très petits points. Ecusson subpentagonal, un peu plus long que large. Elytres arqués sur les côtés, formant un angle très obtus avec les côtés du prothorax, acuminés ensemble au sommet, environ deux fois plus longs que larges ensemble dans leur plus grande largeur, presque subrapeux, couvert d'une ponctuation subéparse, irréguliérement serrée, plus forte que celle des côtés du prothorax; base rebordée par un bourrelet à peine marqué. Tarses allongés, presqu'aussi long que le tibias.

2 exemplaires. Yembung, 1100 pieds.

VIII. COLEOPTERA, II: MALACODERMIDAE.

By Ernest Olivier, *Correspondant of the Museum d'Histoire naturelle de Paris.*

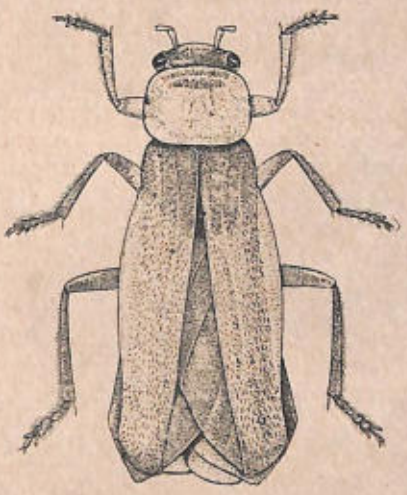
Diaphanes simulator, nov. sp.

Oblongo-elongatus, ater; antennis gracilibus, setosis, prothorace haud longioribus; oculis magnis, globosis, subtus conjunctis; prothorace breve, convexo, antice rotundato, margine laterali plano et antice leviter erecto, longitudinaliter carinato, variolose punctato, griseo-albido, macula quadrata basali laevi flavescente et duabus plagis anticis diaphanis; scutello triangulari flavescente; elytris prothorace haud latioribus, dein ampliatis et apicem versus attenuatis, pubescentibus, rugosis, unicostatis, sordide albidis, macula parva juxta scutel-



1.

Fig. 1.—*Diaphanes simulator*, n. sp., ×4.



2.

Fig. 2.—*Themus aborensis*, n. sp., ×6.

lari palide flavescente et tenuissime flavo marginatis; prosterno flavo pectore et abdomine nigris; pygidio flavo, trilobato; 5° et 6° ventris, segmentis plaga magna rosea ornatis, ultimo flavo; coxis flavis, pedibus nigris. ♀ *ignota.*

Long. 12—13 *millim.*

This species has a good deal of resemblance to *Pyroceelia lampyroides*, Ern. Oliv.: the colour of the prothorax and elytra is almost the same, but it is, however, perfectly distinct and will

easily be recognized by its shorter antennae, which are slender and not pectinate, by the longitudinal carina of the prothorax distinct throughout its whole length; by its rough and indistinctly punctured elytra, which have only one raised line, and with the base near the scutellum narrowly pale yellowish. The luminous parts are one large transverse eburated spot on the middle of the fifth and sixth ventral plates; the last and the pygidium are yellow.

The very fine yellowish margins of the elytra are sometimes scarcely marked.

A large series of specimens of this species, all males, was collected flying at dusk, at Kobo (400 feet).

Themus aborensis, nov. sp.

Oblongus, fuscus; capitis dimidio antico, antennarum duobus primis articulis, prothorace, prosterno, coxis, femorum anticorum et mediorum basi, tarsorumque unguiculis, aurantiacis; prothorace laevi, nitido, transverso, subquadrato, angulis rotundatis, marginibus erectis; scutello parvo, nigro; elytris oblongo-elongatis, pubescentibus, rugosis, flavis, basi sat late et apice tenuissime fuscis; abdomine elytris operto, fusco, ultimo ventrali segmento longitudinaliter carinato; tibiis anticis piceis; tarsorum unguiculis simplicibus.

Long. 9 *millim.*

A single specimen of this pretty species which I think to be a male was taken at Kobo (400 feet).

VIII. COLEOPTERA, III: HISTERIDAE.

By H. BICKHARDT, *Cassel (Germany)*.

Hololepta indica, Er.

Er., in Klug, Jahrb. Ins., 1834, p. 90.—Mars., Mon., 1853, p. 152, t. 4, f. 10.—(*aequata*), Lew., Ann. Mag. Nat. Hist., (5), xvi, 1885, p. 204.—(*batchiana*), Mars., Mon., 1860, p. 588, t. 11, f. 2.—Lew., Ann. Mus. Genova (2), xii, 1891, p. 631.

Sadiya (N.-E. Assam) and Rotung, 1400 ft., under bark.

Occurs in India, Sumatra, Java, Celebes, Borneo, New Guinea and Formosa.

Hololepta laevigata, Guér.

Guér., Voy. Bélanger, Zool., 1833, p. 482, t. 2, f. 4.—Lew., Ann. Mag. Nat. Hist., (7), iv, 1899, p. 5.—(*procera*), Er., in Klug, Jahrb. Ins., 1834, p. 91.—Mars., Mon., 1853, p. 189, t. 4, f. 30.

Kobo, 400 ft., in rotten wood. Several examples.

Occurs in India, Java, Sumatra, Engano, Nias and Mentawei.

Hololepta elongata, Er.

Er., in Klug, Jahrb. Ins., 1834, p. 32.—Mars., Mon., 1853, p. 190, t. 4, f. 31.

Kobo, 400 ft., and Sadiya (N.-E. Assam), in rotten wood and under bark. Many examples.

The examples from Sadiya have a very little tubercle on the front. In many specimens the tubercle is completely evanescent.

Occurs in India and the Malayan Archipelago.

Trypeticus nemorivagus, Lew.

Lew., Ann. Mag. Nat. Hist. (6), ix, 1892, p. 351.

Rotung, 1400 ft., under bark.

The single example (♂) does not exactly agree with Lewis's description. The marginal stria of the pronotum becomes obsolete towards the edge. The prosternum is not so roughly punctate. Without the female it is not possible to say certainly whether it is *nemorivagus* or a new species.

The type of *nemorivagus* was found near the Ruby Mines in Burma.

Apobletes tener, Mars.

Mars., Mon., 1860, p. 859, t. 15, f. 5.

Sadiya (N.-E. Assam), under bark. Only one damaged example.

Occurs in India, the Malayan Archipelago and the Philippine Islands.

Apobletes planidorsum, Bickh.

Bickh., Tijdschrift v. Entomol., lv, 1912, p. 219.

Sadiya (N.-E. Assam), under bark. One example.

This species differs from *A. macilentus*, Lew., in the lateral stria of the pronotum. In *A. macilentus* this stria leaves the margin at the anterior angle, cutting off a triangular space; in *A. planidorsum* the lateral stria is continued along the margin anteriorly and reaches the anterior edge rectangularly.

A. planidorsum was hitherto only known from Borneo.

Liopygus famelicus, Lew.

Lew., Ann. Mus. Genova (2), xii, 1891, p. 21.

Sukli, E. side of Dawna Hills, L. Burma, 2100 ft. One example.

Also reported by Lewis from Burma.

Platysoma (Platylister) cambodjensis, Mars.

Mars., Abeille, i, 1864, p. 300.

Kobo, 400 ft., Rotung, 1400 ft., Sadiya (N.-E. Assam), Thingannyinaung to Sukli, Dawna Hills, 900–2100 ft.

Many examples collected by the Abor Expedition do not agree exactly with Marseul's description. The lateral stria of the pronotum is distinctly interrupted in many specimens, whilst Marseul's type and the examples in my collection from Formosa, Burma and India, have a well defined complete lateral stria. But there is no other difference between the specimens collected by the Abor Expedition and the others. I therefore prefer to estimate this form as a variation without giving a new name to it.

Occurs in India, Burma, Andaman Islands and Formosa.

Platysoma (Platylister) odiosum, Mars.

Mars., Mon., 1861, p. 145, t. 3, f. 5.—Mars., Ann. Soc. Ent. Belg., xiii, 1870, p. 70.—(*marseuli*), Cand., Mém. Liège, xvi, 1861, p. 336, t. 1, f. 5.—(*dissimile*), Motsch., Bull. Mosc., xxxvi, 1863, ii, p. 451).

Rotung, 1400 ft., Sadiya (N.-E. Assam), in rotten wood.

Occurs in India, Burma and Ceylon.

Platysoma (Platylister) kempi, n. sp.

Oblongo-ovatum, subconvexum, nigrum, nitidum. Fronte cum clypeo impressa, stria antice recta. Pronoto laevi, stria laterali integra. Elytris striis 1—6 *fere integris, suturali postice abbreviata,* 4, 5 *suturalique antice punctiformibus. Propygidio pygidioque utrinque impressis, grosse denseque ocellato-punctatis, hoc tenuiter marginato. Prosterno lobo rotundato, punctulato, stria marginali antice interrupta; mesosterno antice paulo emarginato, stria integra. Tibiis anticis* 4*-dentatis.*

Long. $5\frac{1}{2}$ mm.

The lateral stria of the pronotum is convergent with the margin towards the anterior angle. The inner elytral striae are anteriorly represented by ranges of punctures, only the sutural stria is abbreviated (behind). The marginal stria of the prosternal lobe is distinctly interrupted anteriorly.

This species is not similar to any known species of *Platylister*.

Rotung 1400 ft., under bark (Dec. 23, 1911, *Kemp*). Only one example.

Platysoma (*s. str.*) confucii, Mars.

Mars., Mon., 1857, p. 404, t. 11, f. 9.—Schm., Notes Leyden Mus., xii, 1890, p. 10.

Kobo, 400 ft., Rotung, 1400 ft., Sadiya (N.-E. Assam), in rotten wood and under bark.

Occurs in India, Burma, China, Andaman Islands, Sumatra, Engano and Mentawei.

Platysoma (*s. str.*) crassum, n. sp.

Ovatum, convexum, nigro-piceum, nitidum; antennis pedibusque piceis. Fronte fere plana, stria antice recta, clypeo subconcavo, mandibulis canaliculatis. Thorace stria laterali integra, margini laterali parallela, foveola ante scutellum. Elytris striis dorsalibus 1—3 *integris,* 4 *et* 5 *aequalibus ultra medium abbreviatis. Propygidio fortiter sat dense ocellato-punctato, pygidio paulo minus punctato, lateribus impressis, margine elevato, apice laevi. Prosterno inter coxas angusto, lobo punctulato. Mesosterno emarginato, stria integra. Tibiis anticis* 4*-dentatis.*

Long. $3\frac{1}{2}$ mm.

Similar to *Platysoma silvestre*, Schm., but more convex; the fourth and fifth dorsal striae are much longer ($\frac{3}{4}$ of the length of the elytra); the front is plain, the clypeus very feebly impressed. The posterior tooth of the anterior tibiae is very small.

Kobo, 400 ft., in rotten wood. Only one example.

Hister (Atholus) philippinensis, Mars.

Mars., Mon. 1854, p. 547, t. 9, f. 118.

Sadiya (N.-E. Assam), in rotten wood. One example.

Occurs in the Philippine Islands and Burma.

Epierus nemoralis, Lew.

Lew., Ann Mag. Nat Hist. (6), ix, 1892, p. 347.

Kobo, 400 ft., Rotung, 1400 ft., in rotten wood and under bark. Several examples.

Reported only from Assam.

Parepierus, nov. gen.

Corpus ovatum, parvum. Caput planum. Fronte haud striata. Antennis sub frontis margine insertis. Foveola sub angulo prothoracis lamina pectoris obtecta. Pronotum transversum, postice in medio basali angulatum, extus marginatum. Elytra apice truncata, striata. Striis dorsalibus postice obliteratis. Epipleuris striatis. Propygidium transversum, pygidium triangulare, declivia. Prosternum latum, bistriatum, basi truncatum vel leviter incisum. Mesosternum antice in medio subrotundatum vel productum vel rectum; sutura meso-metasternali forti saepe curvata. Tibiae anticae parum dilatatae, extus brevissime multispinosae; foveola tarsali indistincta.

Different from *Epierus*, Er., in the large prosternum, the mesosternum which is obtuse or produced in front, the dorsal striae which are obliterated near the apex of the elytra. Frequently the anterior marginal stria of the mesosternum is wanting. There is no peculiar transverse mesosternal stria except the very distinct separation-line between the meso- and metasternum. This stria is frequently arched in front. All the species of this genus are very small.

This genus is proposed to receive *Epierus amandus*, Schm. (type), and its allies *monticola*, Schm., and *corticicola*, n. sp., also the New Zealand species *rusticus*, Broun, *simplex*, Broun, *sylvanus*, Lew., *rufescens*, Reitt., *abrogatus*, Broun, *planiceps*, Broun, *purus*, Broun, *crenulatus*, Broun, *punctulipennis*, Broun, belong to this genus. *Epierus foederatus*, Lew., seems also to be congeneric with the species mentioned.

Parepierus corticicola, n. sp.

Oblongo-ovalis, convexus, piceus, nitidus. Fronte plana, haud striata. Thorace punctulato, regione antescutellari impresso, stria marginali integra. Elytris striis subhumeralibus nullis, dorsalibus 1—4 distinctis postice plus minusve obliteratis, 5 obsoleta utrinque abbreviata, suturali punctiformi, geminata, antice subabbreviata. Pygidio vix perspicue puncticulato. Prosterno lato, striis subparallelis utrinque vix divergentibus. Mesosterno antice rotundato, haud marginato; sutura meso-metasternali curvata, valde crenata. Tibiis anticis multispinosis.

Long. 1½—1⅝ mm.

Similar to *Parepierus amandus*, Schm., but more oblong in outline and much more convex. Also the double sutural stria is quite different in the new species. *E. monticola*, Schm., also is

very rotunde and has no fifth dorsal stria and only one single sutural stria. The prosternum of *monticola* is a little more narrow than that of *corticicola*.

Kobo, 400 ft., in rotten wood. Several examples.

Parepierus amandus, Schm.

Schm., Ent. Nachr., xviii, 1892, p. 25.—(*Tribalus pluristriatus*), Lew., Ent. Monthly Mag., vi, 1895, p. 186.

Kobo, 400 ft., in rotten wood. One example.
Occurs in Java where the type was found.

Paromalus vermiculatus, Lew.

Lew., Ann. Mus. Genova (2), xii, 1891, p. 18.

Sadiya (N.-E. Assam), Kobo, 400 ft., Rotung, 1400 ft., in rotten wood and under bark. Many examples.
Occurs in Burma.

Paromalus pradali, Mars.

Mars., Abeille, i, 1864, p. 331.

Kobo, 400 ft., in rotten wood. One example.
Occurs in the Malayan Archipelago.

Paromalus tcibodae, Mars.

Mars., Ann. Mus. Genova, xiv, 1879, p. 278.

Kobo, 400 ft., Sadiya (N.-E. Assam), Thingannyinaung to Sukli, Dawna Hills, 900–2100 ft., in rotten wood and under bark of fallen tree-trunk. Many examples.
Occurs in Java and Sumatra.

Tribalus colombius, Mars.

Mars., Abeille, i, 1864, p. 335.

Rotung, 1400 ft., Sadiya (N.-E. Assam), in rotten wood. Several examples.
Occurs in Ceylon and Burma.

IX. ARACHNIDA, I.

A. CHELIFERA.

By E. ELLIGSEN.

Chelifer javanus, Thorell.

2♂, 1♀. Kobo, 400 ft., xi—xii-1911, under logs. *S. W. Kemp*, leg.

The species was originally described from Java, and was afterwards recorded from several other localities in the Oriental region, such as Burma, Kelantan (Malay Peninsula), Bismarck Archipelago, and the Marshall Islands.

Chelifer superbus, With.

1♀. Kobo, 400 ft., xi—xii-1911, under logs. *S. W. Kemp*, leg.

Only known from the Celebes, from where Mr. With obtained the types.

B. PEDIPALPI.

By F. H. GRAVELY, *M.Sc.*, *Assistant Superintendent, Indian Museum.*

Uroproctus assamensis, Stoliczka.

J.A.S.B., xxxviii (2).

Kobo, 400 ft., 3—7-xii-11, under logs. Banks of Siyom River below Damda, 1300 ft., 1-ii-12. Beside stream below Balek, 26-iii-12. Rotung, 1300 ft., 21 and 25-xii-11 and 12-iii-12, under logs and under stones. Upper Rotung, *ca.* 2000 ft., 1—10-i-12.

This species is the only *Uroproctus* yet known, and appears to be abundant throughout the foot-hills of the E. Himalayas and in many parts of Assam. In Burma it is replaced by the genus *Hypoctonus*, of which genus one species was described not long ago from Sylhet in W. Assam, and another still more recently from the foot of the Himalayas in the Darjeeling district. The western end of Assam and the E. Himalayas at present appear therefore to have a greater affinity to the Burmese (but not Malaysian) Thelyphonid fauna than does the country east of them; but many

kinds of Thelyphonids are so difficult to obtain unless specially looked for during the rains (a season at which no zoological work was done in the Abor country), that it is by no means unlikely that species of *Hypoctonus* will yet be found to occur in all parts of Assam and the foot-hills of the E. Himalayas.

The Pedipalpi collected recently in the Dawna Hills all belong, as was to be expected, to the genus *Hypoctonus*. They are *Hypoctonus dawnae*, Gravely (*Rec. Ind. Mus.*, vii, pp. 101-3), and *Hypoctonus wood-masoni*, Oates (*J.A.S.B.*, lvii, 2). As they have no particular bearing on the zoogeography of the Abor country they need not be discussed further here.

Uroproctus assamensis, like other Oriental Thelyphonids, is rarely seen in dry weather, and Mr. Kemp informs me that specimens always died in a day or two when kept in a box without moist soil. One specimen [illegible] he placed in a wooden box was seen to eat a cricket [illegible] after twelve to fifteen hours captivity. Mr. Kemp also tells me that specimens when handled alive produced a strong and very disagreeable odour resembling that of fermented rice or beer that had gone bad.

C. SCORPIONES.

By J. R. HENDERSON, *M.B., C.M., F.L.S., Superintendent, Madras Government Museum.*

The scorpions collected by Mr. Kemp in the Abor country, although fairly numerous in specimens, comprise but two species, both previously known. It seems probable that had the collection been made at a more favourable season of the year, others would have been discovered. The present report also deals with the scorpions obtained by Mr. F. H. Gravely in Tenasserim, between Moulmein and the Siamese frontier; they comprise five species, one of which is described as new.

The collection was worked out at the British Museum (Natural History Department) and my thanks are due in particular to Mr. S. Hirst, for the assistance which he kindly rendered during the progress of the work.

1. **Lychas mucronatus** (Fabr.).

Archisometrus mucronatus, Kraepelin, Tierr. Scorp., p. 46 (1899). *L. mucronatus*, Pocock, Fauna of India, Arachnida, p. 36 (1900).

This species, which is common in Upper Burma, Lower Burma and Tenasserim, extends into Siam and China, and occurs in the Malay Archipelago as far east as Flores.

Habitat.—Thingannyinaung, east base of Dawna Hills, 900 ft., 24—27-xi-11 (*F. H. Gravely*). Eight specimens.

Thingannyinaung to Myawadi, *ca.* 900 ft., 24—26-xi-11 (*F. H. Gravely*). Three specimens of which one is very young.

Kawkareik to Third Camp, Amherst district, 21-xi—1-xii-11 (*F. H. Gravely*). Two specimens.

2. Lychas scutilus (C. Koch).

Archisometrus scutilus, Kraepelin, Tierr. Scorp., p. 44 (1899).
L. scutilus, Pocock, Fauna of India, Arachnida, p. 37 (1900).

This species extends from Tenasserim through the Malay Peninsula to Sumatra and Java.

Habitat—Farm caves near Moulmein (*F. H. Gravely*). An adult ♀.

3. Lychas gravelyi, n. sp.

Habitat.—Moulmein, a single ♀ specimen (*F. H. Gravely*).

Colour in general black varied with yellow. Carapace and terga black, with ill-defined yellow mottlings; a yellow spot on either side of the frontal margin. Mandibles yellow, with a delicate black reticulation. Chelæ and legs yellow, with black mottlings; upper surface of humerus and brachium black, with a series of rounded yellow spots; hand yellow, fingers blackish Tail black, with traces of yellow on the first three segments; vesicle black, with a yellowish tinge at the base of the aculeus and on the tooth. Legs yellow, with black mottlings on the anterior surface. Sterna with faint black mottlings on a yellow ground; first sternum with a median black line.

Carapace and *terga* evenly granular throughout; the latter with a single median keel.

Sterna membranous with the surface polished towards the centre. Last sternum granular throughout and with four granular ridges; fourth sternum also granular, but less so than the last, with four polished tubercles on the posterior margin; slight traces of granules occur on the first three sterna, chiefly towards the lateral margins and a few bristles occur on all the sterna.

Tail somewhat stout, about four and a half times as long as the carapace. First and second segments with the median lateral keel complete, the intercarinal spaces granular; the keels well-developed and granular, the superior subspiniform apically. First segment much wider than long, the fourth not twice as long as wide.

Vesicle with a median granular line below, which is continued on to the tooth; two faint granular lines on either side. Inner edge of the tooth dentate.

Chelæ with the hand narrower than the brachium, smooth but for minute granules on the humerus and to a lesser extent on the brachium. Movable digit more than twice as long as the underhand, with eight rows of teeth. Fingers about the same length as the carapace.

Tibial spurs short. *Tarsi* with two rows of bristles.

Pectinal teeth 12/13.

Measurements.—Total length 34 mm., carapace 4 mm., tail 18 mm., movable finger 4 mm.

It is with some hesitation that I have ventured to describe this single specimen as the type of a new species, but I may state, that in deciding to do so I am materially supported by the opinion of Mr. Hirst of the British Museum staff, whose extensive experience of the group entitles his views to great respect. It is closely related to *L. rugosus*, Pocock, with the type specimen of which, and so far the only known specimen, from Raipur, in the Central Provinces



FIG. 1.—*Lychas gravelyi*, n. sp., 1. carapace; 2. sterna; 3. chela; 4. vesicle and aculeus; all × 5.

of India, I have carefully compared it. This specimen, preserved in the British Museum collection, which measures only 22 mm. in total length, is probably immature, and I was unable to determine its sex. In *L. rugosus* the carapace and terga are much more coarsely granular, while on the other hand in *L. gravelyi* the sterna are more granular, granules being present on all, whereas they are confined to the last three sterna in *L. rugosus*. In the latter species all the sterna are coriaceous and present a mat surface, while in *L. gravelyi* they are membranous and polished centrally. In *L. gravelyi* the fingers are proportionately longer and the tail thicker, the general appearance being that of a small scorpion with very slender chelæ, but possessing a moderately stout

tail. The black mottling on the sterna of the new species is characteristic. Other differences, as for example in the characters of the vesicle, exist between the two species.

4. Chærilus tricostatus, Pocock.

C. tricostatus, Pocock, Journ. Bomb. N. H. Soc., vol. xii, p. 266 (1899); Fauna of India, Arachnida, p. 59 (1900).

Habitat.—Four specimens (all ♀) from the Abor country:—
(1) Rotung, 1300 ft., under stones, 21-xii-11 (*S. W. Kemp*).
(2) Rotung, 1300 ft., 24-xii-11 (*F. H. Stewart*).
(3) Rotung, 1300 ft., 29-xii-11 (*M. de Courcy*).
(4) Upper Rotung, 2000 ft., 22-i-12 (*S. W. Kemp*).

This species was described from two dried specimens (both ♂) in the collection of the British Museum, from Sadiya, Assam, a locality close to the border of the Abor country. A comparison of the two sets of specimens reveals no difference of any importance, except in the proportions of the joints of the chelæ and these are no doubt sexual characters. The Abor specimens have a more strongly granulated carapace than those from Sadiya and it may be



FIG. 2.—Hand of *Chærilus tricostatus*, Pocock, ♀, nat. size.

that they belong to a local race of *C. tricostatus*, but this question may be deferred till more material is forthcoming. As the female was formerly unknown I take this opportunity of describing it.

Colour.—Upper surface black; ventral surface also black, with the exception of the cephalothorax which is mottled with brown and yellow. Pectinal teeth yellow. Tarsi yellowish. Mandibles pale brown. Vesicle reddish brown.

Carapace somewhat uniformly granulated, the granules best developed on the more elevated parts. Carapace longer than the first and second caudal segments, about equal to the third and fourth, longer than the fifth segment.

Terga granular throughout, with a series of larger granules on the posterior border, two of which form well-marked black pearly tubercles. The latter are best developed on the third, fourth, fifth and sixth terga, and on the last three of these have one or two enlarged granules in front, arranged in short antero-posterior lines with the tubercles.

Sterna smooth, the last with four ill-defined crests formed by granules. An oval yellow patch occurs near the posterior margin of the third sternum.

Tail about three times as long as the carapace, the upper surface faintly granular in the middle. Width of the first segment about equal to the length of the fourth; second segment about as wide as long. All the keels normal and denticulated. Lateral and inferior surfaces more distinctly granulated than the upper surface.

Vesicle with a few minute granules on the under surface near the proximal end, with a slight lateral groove on either side of the dorsal surface and a faint median ventral ridge.

Chelæ with humerus, brachium and underhand all shorter than the carapace. Humerus with its width more than half its length, slightly granular above and with coarse granules along the keels; posterior surface with a median row of granules in front, lower surface finely granular. Brachium about the same length as the underhand; the keels granulated and a few subspiniform granules arranged in a row near the lower margin of the anterior surface. Hand wide, with the inner margin strongly convex, the greatest width being more than two-thirds of the length; upper surface finely granular, but with large granules on the ridges. Movable finger about the same length as the carapace, furnished with ten rows of teeth. Immovable finger with five setal pores.

Pectinal teeth 5.

Measurements.—Total length 53 mm., carapace 8 mm., tail 31 mm., brachium 7 mm., underhand 7 mm., movable finger 9 mm., width of hand 6·5 mm.

5. **Scorpiops longimanus**, Pocock.

S. longimanus, Pocock, Ann. Mag. Nat. Hist., (6) vol. xii, p. 326, pl. xiv, fig. 12 (1893); Fauna of India, Arachnida, p. 72 (1900); Kraepelin, Tierr. Scorp., p. 180 (1899).

This species, which has been recorded from several localities in Assam (Sylhet, Dhubri, North Cachar Hills, Sadiya, Nāga Hills), is apparently common in the Abor country. The following specimens were collected :—

Kobo, 400 ft., in rotten wood and in earth, 30-xi—8-xii-11. Seventeen specimens, several of which are very young.

Janakmukh, 600 ft., 17-xii-11. One specimen under bark.

Renging, 2150 ft., 19-xii-11. One adult found in rotten wood and a young specimen under bark.

Rotung, 1300 ft., 23—30-xii-11. Ten specimens, some of which are young, found under bark, in rotten wood and under stones.

Upper Rotung, alt. *ca.* 2000 ft., 31-xii-11 (*M. de Courcy*). One immature specimen.

Yembung, 1100 ft., 13—17-i-12 and 9-ii-12. Three specimens, one of which is young.

Near Parong, 3300 ft., 27-i-12. Three very young specimens found under stones.

Below Damda, 1300 ft., 30-i-12. Five specimens, one of which is young.

In young specimens of this species the brachial teeth are blunt and the ventral surface of the cephalothorax is paler than in adults. The setal pores on the brachium and underhand show the adult number and arrangement. One young specimen from Renging has nine pectinal teeth on each side, instead of the normal six to eight.

6. Scorpiops binghamii, Pocock.

S. binghamii, Pocock, Ann. Mag. Nat. Hist., (6) vol. xii, p. 327, pl. xiv, fig. 13 (1893); Fauna of India, Arachnida, p. 74 (1900); Kraepelin, Tierr. Scorp., p. 180 (1899).

This species has been previously recorded only from the Pegu Hills and Central Tenasserim.

Habitat.—Misty Hollow, west side of Dawna Hills, 2200 ft., 22–30-xi-11 (*F. H. Gravely*). Two adults and seven very young specimens.

Young examples are paler in colour, both dorsally and ventrally, than the corresponding stage of *S. longimanus*. The present specimens possess twelve to thirteen brachial pores, in place of fourteen to fifteen in those described by Pocock, while *S. longimanus* has nine to eleven. I doubt if *S. binghamii* is more than a variety of *S. longimanus*. Kraepelin regards the latter as doubtfully distinct from the Himalayan *S. montanus*, Karsch, and places *S. binghamii*, with some doubt, also as a synonym of *S. montanus*.

7. Hormurus australasiæ (Fabr.).

H. australasiæ, Kraepelin, Tierr. Scorp., p. 154 (1899); Pocock, Fauna of India, Arachnida, p. 79 (1900).

A widely distributed species, extending from Burma and China, through the Malay Peninsula and Archipelago to Northern Australia and the Pacific islands.

Habitat.—Third Camp, west base of Dawna Hills, 400 ft. (*F. H. Gravely*). An adult ♂ and four other specimens, three of which are very young.

Third Camp to Misty Hollow, Dawna Hills, 400-2400 ft. (*F. H. Gravely*). Two specimens, one of which is very young.

Misty Hollow to Sukli, Dawna Hills, 2100—2500 ft. (*F. H. Gravely*). One specimen.

Sukli, east side of Dawna Hills, 2100 ft. (*F. H. Gravely*). Eleven specimens, four of which are very young.

Thingannyinaung to Sukli, Dawna Hills, 900 ft. (*F. H. Gravely*). One specimen.

There is considerable variation in the colour of *H. australasiæ*. Some specimens are uniformly black above, while others are in varying shades of brown. Young specimens are pale brown, with the vesicle pale yellow and in some cases with the legs yellowish.

X. DERMAPTERA.

By MALCOLM BURR, *D.Sc., F.L.S., F.E.S., F.Z.S., etc.*

The collection of Dermaptera brought back by Mr. Stanley Kemp from the Abor Expedition contains, as was to be expected, matter of considerable interest. It consists of thirty-one recognizable species, of which five are new to science; one is the third known specimen, and first known female, of a species already recorded from Burma and Assam; another species is added to the Indian list, being hitherto known only from a pair from Tonkin. The remaining species are well-known Himalayan, Burmese and generally Oriental forms.

Superfamily **PROTODERMAPTERA.**

Family PYGIDICRANIDAE.

Subfamily *DIPLATYINAE.*

Genus **Diplatys,** Serv.

The collection contains seven specimens, all, unfortunately, immature, and not therefore specifically determinable. They all present the long segmented caudal setae characteristic of the larvae and nymphs of this genus. The specimens were all taken between December 24th, 1911, and February 9th, 1912, under stones, on the banks of small streams. The exact localities are as follows:—

Dibrugarh, 17—19-xi-1911. No. $\frac{2437}{19}$.

Rotung, 1400 ft., 24-xii-11, under stones on bank of small stream. No. $\frac{2174\text{-}5}{19}$.

Yembung, 1100 ft., 15-i—9-ii-1912, on bank of stream. Nos. $\frac{2417}{19}$, $\frac{2427}{19}$, $\frac{2425}{19}$.

Pang-i, Rebang Stream, 16-i-12, under stones. No. $\frac{2414}{19}$.

Subfamily *PYGIDICRANINAE.*

Genus **Kalocrania,** Zacher.

1. **Kalocrania siamensis,** Dohrn.

There are a number of immature specimens and one female, from various localities, which I am unable to determine satis-

factorily. I think probably they are referable to this species, but some may belong to the following.

Rotung, 1400 ft., 29—31-i-1912, under stones. Nymphs. Nos. $\frac{2149}{19}$ and $\frac{2176}{19}$.

Upper Rotung, 9-i-1912, "found in water supply." ♂. No. $\frac{2448}{19}$: 4-ii-12, "rotten wood." Nymph. No. $\frac{2401}{19}$.

Kobo, 400 ft., 11-xii-1912, under bark. Nymphs. Nos. $\frac{2248}{19}$, $\frac{2348}{19}$, $\frac{2349}{19}$.

Janakmukh, bank of Dihang River, 600 ft., under stones. Nymph. No. $\frac{2314}{19}$.

Near Dosing, 1500 ft., 29-i-12. Nymph. No. $\frac{2273}{19}$.

Above Pang-i, 4000 ft., 16-i-12, under bark. Nymphs. Nos. $\frac{2332-3}{19}$ and $\frac{2415}{19}$.

2. **Kalocrania picta**, Guer.

A pair decidedly smaller than typical Bengal specimens, but I see no reason to describe them as distinct.

Kobo, 400 ft., 30-xi and 11-xii-1911, "in camp" and "in packing case." ♂ and ♀. Nos. $\frac{2346-7}{19}$.

Subfamily *ECHINOSOMATINAE*.

Genus **Echinosoma**, Serv.

1. **Echinosoma sumatranum**, Haan.

This common and widely-spread Oriental species was found in several localities.

Near Dosing, 1400 ft., 25-i-12. ♀. No. $\frac{2412}{19}$.

Above Pang-i, 4000 ft., 16-i-12, under bark. ♀ ♀ and nymphs. Nos. $\frac{2316}{19}$, $\frac{2317}{19}$ and $\frac{2318}{19}$.

Sadiya, N. E. Assam, 23-xii-11, larvae, under stones and under bark. Nos. $\frac{2293}{19}$, $\frac{2296}{19}$, $\frac{2298}{19}$ and $\frac{2302}{19}$.

Kobo, 400 ft., 30-xi—1-xii-11, larva, 1 ♀ and 1 ♂, in rotten wood. Nos. $\frac{2253}{19}$, $\frac{2256}{19}$ and $\frac{2336}{19}$.

Rotung, 1400 ft., 8—28-xii-11. 1 ♀ and nymphs, under bark. Nos. $\frac{2142-3}{19}$, $\frac{2154}{19}$ and $\frac{2207}{19}$.

Family LABIDURIDAE.

Subfamily *PSALINAE.*

Genus **Euborellia**, Burr.

1. **Euborellia aborensis**, sp. n.

	♂	♀
Long. corporis	14 mm	12—15·5 mm.
,, forcipis	2 - 2·5	2—2·5

General colour reddish chestnut, passing to yellowish anteriorly and blackish posteriorly: antennae tawny: head depressed, clear red: eyes black: pronotum orange, bordered with blackish at the sides, rectangular, slightly longer than broad: elytra rudimentary, present as darker, narrow lateral flaps, very narrow at the base: meso- and metanota of the same colour: legs fulvous, femora sometimes feebly shaded with fuscous: sternum of typical structure, orange yellow: abdomen deep reddish-chestnut, very gently dilated in ♂, more so in ♀, darker towards the apex: ventral surface of same colour: sides of segments 7-9 in ♂ carinulate, convex and rugulose: last dorsal segment smooth, deep red; in ♂ rectangular, simple, with a longitudinal fold down the side in both sexes: whole abdomen punctulate and clothed with long reddish hairs, penultimate ventral segments rounded in the ♂, narrower apically in the ♀: forceps with branches subcontiguous, asymmetrical, especially in the ♂, and unarmed in both sexes.

Rotung, 1400 ft., 24—25-xii-11. 2 ♂, 5 ♀. Under leaf-stem of plantain. Nos. $\frac{2156-58}{19}$ and $\frac{2392-6}{19}$.

Janakmukh, 600 ft., 17—19-xi-11. ♀ and nymph. Nos. $\frac{2313}{19}$ and $\frac{2308}{19}$.

Dibrugarh, 17—19-vi-11. ♂. No. $\frac{2432}{19}$.

The nomotype is No. $\frac{2156}{19}$.

This species is different in colouration and appearance from all known species of *Euborellia*.

Genus **Anisolabis**, Fieb.

1. **Anisolabis pervicina**, sp. n.

	♂	♀
Long. corporis	14—15 mm.	12 mm.
,, forcipis	2	1·5—2.

Shining black: antennae dull brown: pronotum nearly square, not longer than broad, sides paler, very slightly wider posteriorly than anteriorly: legs tawny, the femora and tibiae banded with black: abdomen very minutely punctulate, sides of 6-9th segments in ♂ convex and striolate: last dorsal segment of ♂ smooth,

gently narrowing, with median depression: forceps with branches subcontiguous, tapering and gently asymmetrical.

Rotung, 1400 ft., 26—29-xii-11, under bark and in rotten wood. 2 ♂, 5 ♀. Nos. $\frac{2155}{19}$, $\frac{2198}{19}$, $\frac{2148}{19}$, $\frac{2187}{19}$, $\frac{2188}{19}$, $\frac{2190}{19}$, $\frac{2210}{19}$.

Kobo, 7-xii-11, under logs. ♂, 2 nymphs. Nos. $\frac{2339}{19}$, $\frac{2340}{19}$, $\frac{2342}{19}$.

Puging, 3000 ft., xi-11, ♂ nymph. No. $\frac{2289}{19}$.

Dibrugarh, 17—19-xi-11. Nos. $\frac{2434-5}{19}$, nymphs.

Bank of Dihang R. below Pasighat, 16-xii-11, ♀. No. $\frac{2315}{19}$.

Sadiya, 26-xi-11. ♀. Under bark. No. $\frac{2297}{19}$.

Also Bhutan: Maria Basti, 1 ♀ (Mus. Paris).

Assam-Bhutan Frontier. Mangaldai District, N.E., 31-xii-10, in Deshnoi river-bed. ♂ and ♀. (Indian Museum, Nos. $\frac{8598-9}{16}$. *S. W. Kemp*).

No. $\frac{2198}{19}$ is the nomotype.

I have long been familiar with this species, always considering that it could scarcely be *A. annulipes*: it has the appearance of a very finely developed race of that species, but my reasons for considering it distinct are its restriction, so far as we know, to the mountains of Assam, Bhutan, and further to the north-east, its larger size and finer development, the uniform brown antennae, more remote forceps and rather shorter pronotum.

2. **Anisolabis gaudens**, Burr. ?

I refer here, with some doubt, a female from Rotung, 1400 ft., 25th December, 1911, found under bark. This specimen has a black head, while the type has the head red. Unfortunately I described the species from a single female, an unpardonable fault. The type, from Bhutan, is in the Paris Museum.

Genus **Psalis**, Serville.

1. **Psalis femoralis**, Dohrn.

Rotung, 1400 ft., 23-xii-11, in rotten wood. No. $\frac{2216}{19}$.

2. **Psalis dohrni**, Kirby.

Sadiya, 27-xi-11. ♂. No. $\frac{2305}{19}$.

Kobo, 400 ft., 7-xii-11, under logs, nymphs. Nos. $\frac{2343}{19}$ and $\frac{2338}{19}$.

A macropterous specimen.

This species has been recorded hitherto only from Ceylon, Travancore, and the Nilgiris. The record from Northern Australia probably refers to a distinct species.

Subfamily *LABIDURINAE.*

Genus **Forcipula**, Bol.

1. **Forcipula pugnax**, Kirby.

Of this well-known North Indian form, several specimens were brought back. It is noteworthy that all the specimens, except the female from Sadiya, N.E. Assam, are brachypterous.

Dosing, Shimang River, 1400 ft., 29-i-12, under stones, 2 ♂. Nos. $\frac{2271-2}{19}$.

Janakmukh, 600 ft., 17-xii-11, under stones. ♀. No. $\frac{2449}{19}$.

Yembung Stream, 1100 ft., 13-17-i-12, under stones, 3 ♂, 4 ♀ and 3 nymphs. Nos. $\frac{2471-4}{19}$, $\frac{2419-20}{19}$, $\frac{2421}{19}$ and $\frac{2423-4}{19}$.

Yembung, Bank of Dihang, 23-i-12. Nymph. No. $\frac{2418}{19}$.

Pang-i, Rebang Stream. ♂, under stones. No. $\frac{2413}{19}$.

Rotung, bank of Sireng Stream, 1400 ft., ♀, under stones. No. $\frac{2406}{19}$.

Sadiya, 26-xii-11, under bark, ♀. No. $\frac{2299}{19}$.

Genus **Nala**, Zacher.

1. **Nala nepalensis**, Burr.

This species has not previously been recorded outside Nepal.

Yembung, 1100 ft., 13-i—9-ii-1912, under stones, 3 ♂. Nos. $\frac{2422}{19}$, $\frac{2426}{19}$, $\frac{2431}{19}$.

Below Damda, bank of Siyom, 1-ii-12, ♀, under stones No. $\frac{2284}{19}$.

Rotung, 1400 ft., 28-xii-11. Bank of stream. ♀. No. $\frac{2287}{19}$ and bank of Dihang River, 23-xii-11. ♀. No. $\frac{2407}{19}$.

Subfamily *BRACHYLABINAE.*

Genus **Metisolabis**, Burr.

1. **Metisolabis caudelli**, Burr.

Of this Burmese species there is a single specimen.

West bank of the Dihang River, 22-xii-11, ♂, under stones. No. $\frac{2416}{19}$.

Family APACHYIDAE.

Genus **Apachyus**, Serv.

1. **Apachyus feae**, Borm.

This species, known from Tonkin, Burma and Assam is represented by a number of nymphs and larvae, but there are no adult specimens; all were found under bark and in rotten wood.

Rotung, 1400 ft., 23-xii-11—2-i-12 and 6-ii-12. Nos. $\frac{2451-65}{19}$ and $\frac{2206}{19}$.

Yembung, 1100 ft., 14-i-12. No. $\frac{2475-6}{19}$.

Above Pang-i, 4000 ft., 16-i-12. No. $\frac{2450}{19}$.

Dibrugarh, 17—19-xi-11. Nos. $\frac{2446-7}{19}$.

Superfamily **EUDERMAPTERA.**

Family LABIIDAE.

Subfamily *SPONGOPHORINAE.*

Genus **Spongovostox**, Burr.

1. **Spongovostox luteus**, Borm.

Upper Renging, 2150 ft., 4-ii-12. ♂ and ♀, brachypterous. Nos. $\frac{2409-10}{19}$.

Kobo, 400 ft., 3—8-xii-11, 3 ♂, 5 ♀, brachypterous. Under bark and in rotten wood. Nos. $\frac{2352}{19}$, $\frac{2375-6}{19}$, $\frac{2357}{19}$, $\frac{2264}{19}$, $\frac{2254-55}{19}$ and $\frac{2380}{19}$.

Sadiya, 26-xi-11. ♀, brachypterous. No. $\frac{2291}{19}$.

Rotung, 1400 ft., 23—24-xii-11, 1 ♂, 2 ♀. Nos. $\frac{2100}{19}$, $\frac{2209}{19}$ and $\frac{2218}{19}$.

2. **Spongovostox aborum**, sp. n

	♂	♀
Long. corporis	6·5—7·5 mm.	4·5—6 mm.
,, forcipis	2·5—3	1·5

Small, shining, deep red and black: antennae greyish brown, paler at the apex, with about 14 slender segments: head broad, blackish red, smooth and shining: pronotum subquadrate, slightly broader than long, black, lighter at the sides: elytra smooth, with long stiff hairs, deep red-brown or black: wings, when developed, of same colour, but the scale basally banded with yellow: legs yellowish, femora sometimes shaded with blackish: abdomen deep red, darker to black at the sides, brighter towards the apex: last

dorsal segment in ♂ smooth, transverse, gently raised just before the posterior margin into a transverse, smooth, simple crest, which slopes abruptly in the apical side down to the margin itself: in the ♀ simple: penultimate ventral segment ♂ ample, nearly square: pygidium ♂ tumid, gently narrowed, with a minute spinule at each angle, the apex gently concave: forceps with the branches ♂ remote, rather stout, elongate and arcuate: in the basal third, on inner margin, underneath, there is a prominent, laminated, acute tooth, and in the middle third, the inner margin is feebly laminated: in the ♀ the branches are simple and contiguous.

Rotung, 1400 ft., 23-xii-11—2-i-12, 11 ♂♂ and 8 ♀♀, brachypterous. Nos. $\frac{2127}{19}$, $\frac{2138}{19}$, $\frac{2145}{19}$, $\frac{2151}{19}$, $\frac{2152}{19}$, $\frac{2222}{19}$, $\frac{2223}{19}$, $\frac{2230}{19}$, $\frac{2134}{19}$, $\frac{2132}{19}$, $\frac{2137}{19}$, $\frac{2139}{19}$, $\frac{2140}{19}$, $\frac{2226}{19}$, $\frac{2215}{19}$, $\frac{2219}{19}$, $\frac{2224}{19}$, $\frac{2228}{19}$, $\frac{2252}{19}$: also 6 ♀♀, macropterous. Nos. $\frac{2124\text{-}6}{19}$, $\frac{2128}{19}$, $\frac{2135}{19}$, $\frac{2397}{19}$. Under bark and in rotten wood. Also No. $\frac{2130}{19}$ with no locality label.

Kobo, 400 ft., 2—8 xii-11, macropterous, 7 ♀♀. Nos. $\frac{2266}{19}$, $\frac{2351}{19}$, $\frac{2354}{19}$, $\frac{2356}{19}$, $\frac{2358}{19}$, $\frac{2363}{19}$, $\frac{2365}{19}$: brachypterous, 5 ♂♂, and 7 ♀♀, under bark and in rotten wood. Nos. $\frac{2249}{19}$, $\frac{2254}{19}$, $\frac{2257}{19}$, $\frac{2265}{19}$, $\frac{2267\text{-}8}{19}$, $\frac{2334}{19}$, $\frac{2353}{19}$, $\frac{2367}{19}$, $\frac{2373}{19}$, $\frac{2377}{19}$, $\frac{2378\text{-}9}{19}$.

Sadiya, 26-xi-11, 1 brachypterous ♂, under bark. No. $\frac{2292}{19}$.

Brachypterous specimens seem to be present in a majority; it will be observed that there are no macropterous males, and 13 macropterous females, but of the brachypterous form there are 16 males and 15 females. All are recorded as occurring under bark or in rotten wood.

It somewhat recalls the Ethiopian *S. kristenseni*; of the Oriental species it is perhaps nearest to *S. luteus*, but the form of the forceps is very distinctive.

No. $\frac{2151}{19}$, a brachypterous male (for want of a macropterous male) is the nomotype.

Genus **Irdex**, Burr.

1. **Irdex nitidipennis**, Borm.

Rotung, 1400 ft., 24-xii-11. 2 ♀, under bark. Nos. $\frac{2099}{19}$ and $\frac{2141}{19}$.

Subfamily *LABIINAE*.

Genus **Labia**, Leach.

1. **Labia mucronata**, Stål.

Sadiya, 23-xi-11. 2 ♂, under stones. Nos. $\frac{2303}{19}$ and $\frac{2444}{19}$.

2. **Labia curvicauda**, Motsch.

Rotung, 1400 ft., 23-xii-11. 2 ♂, 5 ♀, in rotten wood and under bark. Nos. $\frac{2122-3}{19}$, $\frac{2129}{19}$, $\frac{2131}{19}$, $\frac{2217}{19}$, $\frac{2225}{19}$ and $\frac{2229}{19}$.

Upper Rotung, 9-i-12. ♀, under bark. No. $\frac{2404}{19}$.

Below Dosing, 1400 ft., 29-i-12. 2 ♀, under bark. No. $\frac{2274-5}{19}$.

Kobo, 400 ft., 1—2-xii-11. 8 ♂♂ and 5 ♀♀, under bark. Nos. $\frac{2258-9}{19}$, $\frac{2262}{19}$, $\frac{2355}{19}$, $\frac{2359}{19}$, $\frac{2360}{19}$, $\frac{2362}{19}$, $\frac{2364}{19}$, $\frac{2369}{10}$, $\frac{2368}{19}$, $\frac{2370}{19}$, $\frac{2374}{19}$

Sadiya, 13-xi-11. 1 ♂, 3 ♀, under bark. No. $\frac{2445}{19}$.

Genus **Chaetospania**, Karsch.

1. **Chaetospania feae**, Borm.

Rotung, 23-xii-11. 2 ♂, 4 ♀, in rotten wood and under bark. Nos. $\frac{2220-1}{19}$, $\frac{2211}{19}$, $\frac{2213-4}{19}$, $\frac{2136}{19}$.

Renging to Rotung, 2600 ft., 20-xii-11. ♀, under bark. No. $\frac{2411}{19}$.

No. $\frac{2213}{19}$ is a specially fine and well-developed specimen, with the pygidium somewhat dilated at the sides and the forceps toothed.

2. **Chaetospania**? sp.

Upper Renging, 2150 ft., 3-ii-12. ♀. No. $\frac{2286}{19}$.

Kobo, 400 ft., 1-xii-11. 1 ♀ and 1 larva, in rotten wood. Nos. $\frac{2337}{19}$ and $\frac{2371}{19}$.

Sadiya, 26-xii-11. ♀, in rotten wood. No. $\frac{2295}{19}$.

This species may be new, but without the male it is impossible to determine it with accuracy.

Family CHELISOCHIDAE.

Genus **Chelisoches**, Scudder.

1. **Chelisoches morio**, Fabr.

Rotung, 1400 ft., 24-xii-11. 5 ♂, 8 ♀, under leaf-stem of decomposing plantain. Nos. $\frac{2381\text{-}91}{19}$ and $\frac{2469}{19}$.

Dibrugarh, 17—19-xi-11, ♀. No. $\frac{2433}{19}$.

It is interesting to find this species in this district: in India it is almost unknown: it occurs in Ceylon, probably as a straggler from the Malayan islands, as also in Burma: probably indigenous to Assam from the North East

2. **Chelisoches tigris**, sp. n.

Antennae yellow, the basal segment and one ante-apical segment black: head black, depressed, posterior margin tumid: pronotum gently dilated and rounded posteriorly; prozona black, shading to tawny in the metazona: femora and tibiae black, tarsi fulvous: elytra smooth, fulvous, shading to black on the costal margin: wings fulvous, shaded with black: abdomen brick-red, shading to blackish at the sides: last dorsal segment with a row of minute black tubercles along posterior margin, which are rather bigger near the middle line, which is smooth and somewhat depressed: pygidium short, thick, broad, with 2 minute spinules: forceps with branches stout, arcuate, with a short, blunt, double tooth in the middle.

Rotung, 1400 ft., 1-i-12. ♂, under leaf of screw pine. No $\frac{2398}{19}$

The colouration of this species is very distinctive I cannot think that it is a mere colour-variation of *Ch. morio*. Unfortunately, the specimen has been damaged in transit.

Genus **Lamprophorus**, Burr.

1 **Lamprophorus kervillei**, Burr.

Rotung, 1400 ft., 28-xii-11. 2 ♀, under bark. Nos. $\frac{2201}{19}$ and $\frac{2204}{19}$.

Below Dosing, 1400 ft., 26-i-12. ♀. No. $\frac{2280}{19}$.

Dibrugarh, 22-xi-11. 3 ♂ and 3 ♀, under leaf-sheath of bamboo. Nos. $\frac{2438\text{-}43}{19}$

It is interesting to find this species in Northern India: it has hitherto only been known from a single pair from Tonkin: these

specimens are much darker and deeper in colour than the types, but do not differ in any important structural particulars.

Genus **Adiathetus**, Burr.

1. **Adiathetus glaucopterus**, Borm.

Rotung, 1400 ft., 23-xi-11—24-i-12. 4 ♂♂, 7 ♀♀ and 2 larvae, under bark. Nos. $\frac{2161}{19}$, $\frac{2177-85}{19}$, $\frac{2199}{19}$, $\frac{2200}{19}$, $\frac{2466-8}{19}$.

Below Dosing, 1400 ft., 29-i-12. 2 ♂, under bark. Nos. $\frac{2276-7}{19}$.

Dosing, 1400 ft., 29-i-12. 2 ♂, under bark. Nos. $\frac{2269-70}{19}$.

Kobo, 400 ft., 1-xii-11. 1 larva in rotten wood. No. $\frac{2260}{19}$.

Sadiya, 23-xi-11. ♂ and 2 ♀, under bark. Nos. $\frac{2300-01}{19}$, and one without number.

These specimens are slightly different from typical Burmese ones in having the pygidium of the female truncate apically, but one with no number, from Sadiya, presents the intermediate form, the sight of which confirmed me in my original idea of not differentiating it, but in other respects it agrees.

Genus **Hamaxas**, Burr.

1. **Hamaxas kempi**, sp. n.

	♂	♀
Long. corporis ..	11·5—13 mm.	11—12·5 mm.
,, forcipis ..	5—6·5 ,,	4— 5·5 ,,

General colour reddish black: antennae slender, black, 3 or 4 ante-apical segments white. Head reddish black or quite black, depressed, sutures indistinct. Pronotum longer than broad, parallel-sided, narrowed and convex anteriorly, rounded posteriorly, deep reddish black or black. Elytra and wings perfect, dull reddish dark brown or black, very finely punctulate: legs dull brown, shading to blackish or yellowish, strongly pubescent, rather short, femora rather thick: sternal plates black. Abdomen parallel-sided, deep red-brown or black, lateral folds distinct, the whole surface exceedingly finely and densely punctulate, almost smooth, the edges of the segments milled. Last dorsal segment lighter in colour; nearly square in the ♂, transverse in the ♀: in the ♂ no suture visible, posterior margin truncate, black and feebly tumid over the insertion of the forceps, with a slight, black, crested tubercle on each side of the middle line, and a similar but smaller pair nearer together just before them: pygidium of the ♂ short, transverse, rectangular, truncate: in the ♀

narrower, rounded, with a short square rectangular lobe. Forceps with the branches in the ♂ remote, slender, elongate and gently arcuate, with fine nearly obsolete denticulation on the inner margin: in the ♀ similar, but shorter and unarmed.

Rotung, 1400 ft., 20—27-xii-11. 6 ♂, 2 ♀. Nos. $\frac{2105-08}{19}$, $\frac{2159}{19}$, $\frac{2203}{19}$, $\frac{2408}{19}$ and $\frac{2470}{19}$.

Upper Rotung, 4—5-i-12. 1 ♂, 2 ♀ Nos. $\frac{2399}{19}$ and $\frac{2402-3}{19}$.

Janakmukh, 600 ft., 18-xii-11. 2 ♂ No. $\frac{2311-12}{19}$.

Below Damda, bank of Siyom R., 1300 ft., 30-i-12. 1 ♂ and 1 ♀, under leaf-stem of plantain and one under bark. No. $\frac{2282-3}{19}$.

No. 2470 is the nomotype.

This species closely resembles *H. nigrorufa*, Burr, from New Guinea, but differs in the sculpture of the last dorsal segment; in that species the pairs of minute black tubercles along its posterior margin are wanting, the margin itself is incrassate and depressed in the middle: the pygidium also in that species has a minute spine at each angle: *H. feae* is smaller, quite differently coloured, and the structure of the last dorsal segment is also different. *H. dohertyi*, Burr, and *H. semiluteus*, Burr, are probably only colour varieties of *H. feae*, or *H. nigrorufa*.

All but one of the males are macrolabious; one (No. 2311, Janakmukh) is cyclolabious; the branches are robust, shorter and arcuate, with a pair of sharp teeth.

Genus **Solenosoma**, Burr.

1. **Solenosoma birmanum**, Borm.

Janakmukh, 600 ft., 17-xii-11. ♀, under bark. No. $\frac{2310}{19}$.

This is the third known specimen of this curious and rare species. The other two are the type from Bhamo in Burma, and a male from Assam, recorded by me, in the Indian Museum.

The forceps are contiguous, straight, slender, elongate, and unarmed. Their length is 3·5 mm.

Family FORFICULIDAE.

Subfamily *ANECHURINAE*.

Genus **Allodahlia**, Verh.

1. **Allodahlia scabriuscula**, Serv.

Kobo, 400 ft., 20-xi-11—6-xii-11. 9 ♂♂ and 9 ♀♀, under bark and rotten wood. Nos. $\frac{2231-47}{19}$, $\frac{2263}{19}$ and $\frac{2350}{19}$.

Rotung, 1400 ft., 23—28-xii-11. 3 ♂, 3 ♀, under bark and rotten wood. Nos. $\frac{2101}{19}$, $\frac{2146-7}{19}$, $\frac{2160}{19}$, $\frac{2195-6}{19}$.

Vembung, 1100 ft., 14-xii-11. ♂, in rotten wood. No. $\frac{2429}{19}$.

Below Dosing, 1400 ft., 29-i-12. 2 ♂, under bark. Nos. $\frac{2278-9}{19}$.

2. **Allodahlia coriacea**, Borm.

Upper Rotung, 24-i-12. ♂. No. $\frac{2405}{19}$.

Subfamily *FORFICULINAE*.

Genus **Elaunon**, Burr.

1. **Elaunon bipartitus**, Kirby.

Above Pang-i, 4000 ft, 16-i-12. 5 ♂♂ and 6 ♀♀, under bark. Nos. $\frac{2319-29}{19}$.

This species has a remarkable distribution: it is common in the Himalayas, occurs also in the extreme south of India but has not yet been recorded in the centre: it is also found in Ceylon. It is unknown in the Malay Archipelago, in Further India, Annam, Tonkin and Siam, but appears again in Formosa: unknown in New Guinea, it is found in New South Wales. In spite of the erratic distribution, I have seen no variation, except the usual dimorphic brachy- and macrolabiism.

Genus **Kosmetor**, Burr.

1. **Kosmetor brahma**, Burr.

Renging, 2150 ft., 19-xii-11. ♂, at light. No. $\frac{2285}{19}$.

A rare species recorded from Bhutan.

Subfamily *OPISTHOCOSMIINAE*.

Genus **Eparchus**, Burr.

1. **Eparchus insignis**, Haan.

Above Pang-i, 4000 ft., 16-i-12. ♂ and ♀, under bark. Nos. $\frac{2330-1}{19}$.

Vembung, 1100 ft., 14-i-12. 2 ♂♂ in rotten wood. Nos. $\frac{2428}{19}$ and $\frac{2430}{19}$.

Kobo, 400 ft., 2-xii-11, in rotten wood. No. $\frac{2335}{19}$.

Rotung, 1400 ft., 21—30-xii-11, 14 ♂♂ and 8 ♀♀. Nos. $\frac{2102-4}{19}$, $\frac{2144}{19}$, $\frac{2162-73}{19}$, $\frac{2191-5}{19}$, $\frac{2202}{19}$.

Abundant throughout the Oriental region.

Genus **Timomenus**, Burr.

1. **Timomenus** sp.?

Below Dosing, 1800 ft., 31-i-12. ♀, from bank of Siyom River. No. $\frac{2281}{19}$.

Indistinguishable from the Formosan *T. aeris*, Shir. The discovery of the male would finally decide the question.

Genus **Cordax**, Burr.

1. **Cordax forcipatus**, Haan.

Upper Rotung, 9-i-12, ♂, under bark. No. $\frac{2288}{19}$.

Known from India and Burma.

XI. DIPTERA.

By E. BRUNETTI.

(Plate vi).

In view of the comparatively small number of species and the insufficiency of our knowledge of Oriental Diptera, any attempt to gauge the nature of the fauna of the Abor district must be little more than surmise.

Of eighty-five named species, including all the new ones (of which several are known to occur outside the region collected over by the expedition), 4 are found also in the Palaearctic Region, 16 in the Himalayan, 13 in Assam, 23 in the Indian plains, 7 in Ceylon and 14 in the Malay Peninsula or East Indian Islands.

Grouping them roughly into "Temperate" species (Palaearctic and Himalayan together) as against "Tropical" species (all the remainder), there are 16 species which occur at least in Himalayan localities (four occurring also in Palaearctic latitudes) whilst about 30 species occur in one or more of the tropical localities.

MYCETOPHILIDAE.

Leia arcuata, Brun.

One specimen from Komsing, 1-iii-12.

In the Indian Museum from Darjiling, Kurseong and Naini Tal.

Allactoneura cincta, Meij.

One specimen under bark in rotting wood, Kobo, 2-xii-11. A widely distributed species, occurring in Nepal, Sylhet, various parts of India, Ceylon and Java.

Sciara orientalis, Brun.

Three specimens; Rotung, 24 and 25-xii-11, and Dibrugarh, 17—19-xi-11.

Also a widely distributed species, in India, Ceylon, the Himalayas and Assam.

Sciara, sp.

Two specimens, too damaged to identify. The species falls in the group with the 1st longitudinal vein ending much before the fork of the 4th vein, and with blackish thorax. One is from Yembung (13-i-12), "in camp," the other from below Dosing (1400 ft.), 29-i-12, "under bark."

BIBIONIDAE.

Pleciomyia melanaspis, Wied.

Six specimens altogether, from Dibrugarh, 17—19-xi-11; between Kalek and Misshing (4500 ft.), 17-iii-12, Kalek (2300 ft.), 15-iii-12. It is common in Abor villages.

Bibio obscuripennis, Meij.

A headless example from Rotung, 25-xii-11 (on the sand banks of the Dihang River), is in all probability this species. In this specimen the 3rd vein forks immediately over the anterior cross-vein; this is abnormal, as it usually forks very distinctly before it.

SIMULIIDAE.

Simulium ? indicum, Becher.

There are three specimens of a *Simulium*, of which at least one is likely to be *indicum*, Becher, but they are much too worn to identify with precision. The one in the best condition is from Rotung (23-xii-11), the others from Rotung (24-xii-11) and Upper Rotung (6-i-12). One bears the laconic note "bites."

CHIRONOMIDAE.

Calyptopogon albitarsis, Kief.

One specimen (17—19-xi-11) from Dibrugarh.

Kieffer (Mem. Ind. Mus. ii, p. 219) comments on Meijere's note (Tijd. v. Ent. 1, 216) on a specimen from Java which he identified with *Macropeza gibbosa*, Wied, saying that as that author said nothing about the form of the thorax, he (Kieffer) concludes that it is shaped as in the European (type) species of *Macropeza*, Mg. (*albitarsis*, Mg.): that is to say without the conspicuous projection over the head which characterizes Wiedemann's species.

But as it seems impossible that Meijere could have avoided reading Wiedemann's very distinct statement, "thorace antice supra caput producta," it must be assumed that he correctly identified the older author's species, though possibly considering a new genus for it unnecessary. If this be the case, Kieffer's *nom. nov.* (*Macropeza javanenis*) for the species identified by Meijere as *gibbosa*, Wied. will sink as synonymous. The erection of a new genus for *gibbosa* seems quite just.

C. albitarsis differs from *gibbosa* by the hind metatarsus being twice as long as the corresponding tibia; whilst, according to Meijere it is "longer" than the tibia in *gibbosa*. It seems to me the relative lengths of the tarsal joints are not always consistent. Although the present specimen is referred to this species, the hind metatarus is only a little more than one and a half times as long as the hind tibia, and in two other specimens of the same species in the Indian Museum from South India (Kerumaadi, at the south end of Vembanaad Lake, Travancore (6-xi-08) and Trivandrum

(13-xi-08) both taken by Dr. Annandale) the relative lengths are not constant, the hind metatarsus in one being about one and three quarter times as long as the tibia. The abdomen in the Dibrugarh specimen is tinged with dull red, and in one of the other specimens referred to the legs are brown instead of black, the tarsi being less white than usual.

N.B.—Two specimens of *Chironomus* (*sensu lato*) are in the present collection but are too damaged to identify. One is from Dibrugarh, the other from Sadiya.

PSYCHODIDAE.

Psychoda notatipennis, mihi, sp. nov.

(Pl. vi, fig. 4).

Sex? N.E. Frontier of India. Long. barely 1 mm.

Head crushed by pin but one perfect antenna remains and this is densely covered with greyish white pubescence; there are also long whitish hairs about the frons.

Body.—Pale yellowish, thorax mainly brown, abdomen with a little blackish across the middle of the dorsum. Both thorax and abdomen with rather long whitish hairs in moderate density. Belly yellowish with whitish hairs.

Legs.—Dark brown with a little pale pubescence.

Wings.—Clear, with two divaricate rows of fine whitish grey hairs to each vein, the rows lying across one another between the veins. Six small but very distinct spots composed of dark brown hairs are placed in a transverse row at one third of the wing's length, situated respectively over the auxiliary vein, 1st vein, 2nd and 4th veins at their forks, 5th and 7th veins, in the case of the 7th vein near its tip, which is nearly opposite the tip of the 1st vein but rather more proximad. A second row of similarly formed spots crosses the wing a little beyond the middle, the third spot of which is a little more proximad than the others. In this second row the 1st spot is at the tip of the first ending of the 2nd vein, very close to the costa, the 2nd (the largest) on the lower branch of the 2nd vein, the 3rd spot (the most proximad one) on the upper branch of the 4th vein, and the 4th spot near tip of 5th vein, close to the wing margin. There is a similar spot at the tip of the 1st longitudinal vein, which lies on the costa, a little proximad of the second transverse row of spots. Two other similar spots are placed close to the wing tip, respectively at the tips of the lower branch of the 2nd vein and of the upper branch of the 4th vein.

Described from a single specimen in good condition, except for the partially crushed head, from Rotung, 1400 ft. (24-xii-11), taken under the leaf-stem of a decomposing plantain.

Owing to the long hair at the abdomen tip it is not easy to distinguish the sex. This specimen is the only one of this family obtained upon the Expedition.

CULICIDAE.

Toxorhynchites, sp.

One specimen of this genus, very much worn, from Dibrugarh, 17—19-xi-11.

Stegomyia fasciata, F.

Rotung (26-xii-11), a single ♂ in good condition. A very widely distributed species in the East as well in other parts of the Tropics

N.B.—One other specimen of *Culicidæ* is present, which I am unable to determine; it has the yellow appearance of a *Chrysoconops*.

TIPULIDAE.

Tipula majestica, Brun.

One ♀, a small specimen, from between Kalek and Misshing (4000 ft.), 15-iii-12. A not uncommon species, represented in the Indian Museum from Naini Tal, Kurseong, the Nilgiri Hills and Assam.

Diçronomyia saltans, Dol.

Several (♂ ♀) from Dibrugarh, 17—19-xi-11. Described originally from Central Java; it occurs also in Travancore, and is probably generally distributed in the East.

Dicronomyia marmoripennis, Brun.

Four specimens, ♂ ♀; Kobo (400 ft.) (2—3-xii-11), by sweeping in thick jungle. A species widely distributed in India; in the Indian Museum from Darjiling, Kurseong, Purnea, and Bangalore.

Limnobia, sp.

One ♂ in indifferent condition, probably of an undescribed species: Kobo, 12-xii-11.

Geranomyia notatipennis, mihi, sp. nov.

(Pl. vi, fig. 1).

♂ N.E. Assam. Long. 5 mm.

Head.—Blackish grey, frons lighter; antennae dark reddish brown, 1st scapal joint very large and long; proboscis curved, black, about as long as extreme length of head and thorax together.

Thorax.—Rather bright light brownish yellow, three dorsal brown stripes, the median one continued over the anterior margin along the moderately lengthened neck; outer stripes shorter as usual. Traces of a pale brown lateral stripe from neck to root of wings; post-sutural surface of dorsum darker brown, scutellum concolorous, metanotum blackish.

Abdomen.—Brownish yellow, hind margins of segments indistinctly but obviously broadly brownish; belly mainly black.

Legs wholly brownish yellow.

Wings.—Pale yellowish; five pale brown moderately small spots on costa; 1st a little before origin of 2nd longitudinal vein; 2nd over origin of 2nd vein but extending to the costa; 3rd at tip of auxiliary vein and over subcostal cross-vein; 4th over tip of 1st longitudinal vein and marginal cross-vein; 5th at tip of upper branch of 2nd longitudinal vein. Of these spots the 2nd and 4th are slightly the largest. Halteres brownish yellow.

Described from a single ♂ from Dibrugarh, 17—19-xi-11.

Libnotes punctipennis, Meij.

One ♂, Dibrugarh, 17—19-xi-11. The species described from Java; in the Indian Museum from Assam, Darjiling and Peradeniya.

Libnotes fuscinervis, Brun.

One ♂ between Kalek and Misshing (4000 ft.), 18-iii-12.

In the three specimens in the Indian Museum of this species (apart from the present example) the submarginal cell has a cross-vein as well as the marginal, except in one wing only of one specimen. This fact seems to prove that the unusual presence of an additional cross-vein is not specific. No such extra cross-vein is present in the Abor example. The three ♂ ♂ in the Indian Museum are from Darjiling.

Rhamphidia, sp.

One example without legs or antennae, taken between Kalek Misshing (17-iii-12) at 4000 ft.

Teucholabis biannulata, Brun.

Two specimens (one is a ♀, the other has the abdomen tip missing); taken below Damda (3000 ft.) under leaf-stem of plantain and at Rotung, 27-xii-11. It occurs at Kurseong.

Conosia irrorata, Wied.

Dibrugarh, 17—19-xi-11. Two specimens.

Amalopis glabripennis, Brun.

One ♀ is evidently this species, taken at Yembung (1100 ft.) (15-i-12) on bank of stream. Occurs at Darjiling.

Limnophila claripennis, mihi, sp. nov.

♀ N.E. Frontier of India. Long. 3½ mm.

Head and *thorax* nearly ash grey or a little darker, with a pale brown median stripe on the latter, with, on each side of the stripe,

a little darkening of the surface about the "pits," that is, in the spots where the subcontiguous side stripes usually appear. Viewed from behind, the thorax is a little darker and more brown in colour. Scutellum, metanotum and sides of thorax more or less concolorous; palpi blackish; antennae brownish yellow.

Abdomen.—Dark brown above, with indistinct blackish margins to segments and a blackish side stripe; belly dirty brownish yellow.

Legs.—Wholly brown or dark brownish yellow except coxae and basal part of femora which are pale yellowish, the colour in the latter darkening to brown by about the middle.

Wings.—Quite clear; 5 posterior cells; petiole of 2nd posterior cell shorter than the cell; 4th posterior cell as long as the discal cell; posterior cross-vein distinctly before the discal cell. Halteres pale yellow.

Described from three ♀ ♀ from Yembung (1100 ft.), 13-i-12; in jungle, near plantain trees.

In the two examples other than the type, the head and thorax are much darker, but this is apparently due to their being somewhat stained.

Limnophila quartarius, mihi, sp. nov.

♂ ♀ N.E. Frontier of India. Long. 3-4½ mm.

Head.—Occiput cinereous grey, or nearly ash grey; antennae bright brownish yellow; palpi a little darker.

Thorax.—Brownish yellow; the pre-sutural dorsum brownish, the post-sutural part, shoulders and pleurae lighter, nearly pale yellowish; two large round black spots on the sides, one before and one behind the wing-root; post-sutural callosities a little deeper brown.

Abdomen.—Brownish yellow; a lateral black stripe; posterior margins of segments more or less blackish, and a fine black transverse line across the middle of each segment. Tip of abdomen darker, genitals concolorous in ♂, pale yellow in ♀.

Legs.—Brownish yellow, tips of femora sometimes a little blackish.

Wings.—Very pale grey, rather large, broad, and rounded at the tip. The 2nd longitudinal vein, after the origin of the 3rd, forks at one fourth of its remaining length, the branches strictly parallel, just sufficiently turned upwards at their tips to make them bisinuate; the 3rd vein springs from the 2nd (at the lowest point of the downward curve of the praefurca), without any curve or angle, and the anterior cross-vein is situated at the same spot. The 1st posterior cell with strictly parallel sides; discal cell distinctly shorter than 2nd and 3rd posterior cells; posterior cross-vein just after base of discal cell, but slightly variable in position. Halteres obscure.

Described from 5 specimens from Rotung (1400 ft.), 26—27-xii-11.

The only ♀ present is stained and nearly black, but it is obviously of this species.

Epiphragma kempi, mihi, sp. nov.

(Pl. vi, fig. 2).

♀ N.E. Frontier of India. Long. 10 mm.

Head.—Bright brownish yellow, a little darker immediately above the antennae, of which the 1st scapal joint is dark brown, long and cylindrical, the 2nd being cup-shaped, short and brownish yellow, (flagellum missing). Palpi and underside of head brownish yellow.

Thorax.—Brownish yellow, a little darker brown on each side of the middle, on and around the scutellum and metanotum and below the wings, but in all cases the brown colour ill-defined.

Abdomen.—Wholly brownish yellow, a lateral black stripe and a faint pale transverse line across the middle of each segment as is usual in this genus. Belly pale brownish yellow.

Legs.—Wholly brownish yellow; a moderately broad subapical pale brown band on all the femora, anterior to which the limb is distinctly paler.

Wings.—Pale yellowish grey with a brownish yellow ornamentation arranged as follows. The base of the wing is so coloured but the costal cell is clear at the base. Beginning (by punctiform contact only) at the basal brown part is a zigzag line of moderate width, proceeding to the costa, with which it is in moderately broad contact; it then descends to the 5th longitudinal vein, where it is sharply demarcated, thence proceeding upwards to the costa with which it is again in broad contact, at a little distance before the characteristic cross-vein between the costa and the auxiliary vein. It proceeds downwards again to the 4th longitudinal vein, at which point it is deflected backwards somewhat, reaching the hind margin of the wing where it encloses the tip of the 7th longitudinal vein. From the middle of the 1st basal cell a branch band proceeds again to the costa, with which it is broadly in contact, and whence the band proceeds directly hindwards to the wing margin (narrowing considerably at the inner side of the discal cell), which it reaches broadly behind the 5th vein.

An oblong spot, placed transversely to the wing's length, extends from the 3rd longitudinal vein (embracing the outer side of the discal cell) to the 5th longitudinal vein, where it sharply ends. A pear-shaped spot begins on the costa at the tip of the upper branch of the 2nd longitudinal vein, ending at about the upper branch of the 4th longitudinal vein, at which spot it is joined to another spot which gives out four branches to the wing tip, ending respectively at the tips of the lower branch of the 2nd vein, of the 3rd vein and of both ends of the upper branch of the 4th vein. A small spot beyond the middle in both the 3rd and 4th posterior cells. A spot in the middle of the axillary cell. Halteres brownish yellow.

Described from one ♀ taken between Kalek and Misshing (4000 ft.), 16-iii-12.

Dicranophragma gracilis, mihi, sp. nov.

(Pl. vi, fig. 3).

♀ N.E. Frontier of India. Long. just over 2 mm.

Head.—Occiput ash grey; eyes and mouth parts black; palpi blackish (antennae missing). *Thorax* seen from in front, grey, seen from behind, brownish; sides of thorax dirty brown.

Abdomen.—Dirty brown, a median stripe and a lateral one on each side, the emargination of the segments obscure; belly dirty yellow.

Legs.—All brownish yellow, very shortly pubescent, extreme tips of coxae and trochanters black.

Wings.—Pale grey. Auxiliary vein ending opposite the middle of the discal cell. The 1st longitudinal vein ends midway between the tip of the auxiliary and the wing tip; the praefurca takes a wide curve, its upper branch approximating very closely to the 1st longitudinal vein just beyond the tip of the auxiliary vein; marginal cross-vein just before tip of 1st vein. The two submarginal cells about equal in length, both distinctly longer than the marginal cell; base of 1st roundly pointed, that of the 2nd nearly square. Anterior branch of 4th longitudinal vein forked; petiole of 2nd posterior cell shorter than the cell; 4th posterior cell about as long as the discal cell; posterior cross-vein just before the discal cell. A distinct cross-vein in the 1st submarginal cell just beyond the marginal cross-vein. Costal part of wing from tip of auxiliary vein to nearly the end of the marginal cell, brownish, and most of the veins, except the basal half of the 4th and 5th and all the 6th and 7th, faintly but obviously narrowly tinged with pale brown here and there.

Described from a single ♀ from Yembung (1100 ft.) (13-i-12), in jungle near plaintain trees.

STRATIOMYIDAE.

Microchrysa albitarsis, mihi, sp. nov.

♀ N.E. Frontier of India. Long. 5 mm.

Head.—Frons one-fifth the width of the head, with a slight deep blue tinge, but brilliant violet immediately above the antennae. Head below antennae bronze green with black hairs. Antennal 1st joint black, 2nd and 3rd yellow, the latter divided by two annulations into three divisions, arista long. Back of head blackish.

Thorax.—Wholly brilliantly shining metallic green, with very short whitish pubescence.

Abdomen.—Dark green with very short sparse whitish pubescence, which is a little longer around the margin and at the tip. Belly darker, nearly black.

Legs.—Black, with microscopic whitish pubescence, all the tarsi wholly yellowish except the extreme tips.

Wings.—Clear, veins and the region of the stigma yellowish; halteres apple green.

Described from a single perfect ♀ from Dibrugarh, 17—19-xi-11.

Tinda indica, Walk.

One ♂, Dibrugarh, 17—19-xi 11. A not uncommon and rather widely distributed species, occurring in India, Assam, Celebes and Manila.

TABANIDAE.

Chrysops ? designata, Ricardo.

Two ♀ ♀ of a species of this genus agree fairly closely with Miss Ricardo's *designata*, and may be a varietal form of it. It was described from specimens from Naini Tal, Nepal and Yunnan.

ASILIDAE.

Of this family only four specimens are present. Two are not in sufficiently good condition for identification, one belonging to the *Dasypogoninae*, the other to the *Asilinae*: both from Sadiya, taken respectively 23-xi-11 and 28-xi-11. The remaining two specimens are in good condition, representing *Asilus (sensu lato)*, coming respectively from Kalek (3200 ft) (19-iii-12), and Dibrugarh, 17—19-xi-11. In view of the large number of species of this group described from the East and the extreme difficulty of differentiating the species, any attempt at identification would be little better than conjecture.

DOLICHOPIDAE.

Six specimens are present belonging to this family, but identification is practically impossible, from the indifferent condition of most of them, and the fact that they are mostly females. Moreover, until the Oriental species already described are placed upon a firm foundation, it would be hazardous in the extreme to encumber the catalogue with further names. One is a *Psilopus*,[1] of which over seventy species have been described from the East, mostly from single specimens, the types of which are now probably in greater part unrecognizable or completely lost.

SYRPHIDAE

Paragus rufiventris, mihi, sp. nov.

♂ Assam, Western Himalayas, Ceylon. Long. 5 mm.

Head.—Frons shining black, almost bare. Eyes subcontiguous only, and for a very short distance; posterior orbit of eyes with a

[1] Aldrich, the leading expert in North America in this family, has shewn that the use of this name by Poda previously was not in a zoological sense, and therefore its abandonment in favour of *Agonosoma* is unjustifiable.

fringe of white hairs, weakest behind the vertex, where the hair is darker. Face very pale lemon yellow, shining, bare, becoming nearly whitish towards the mouth, above which is a little white hair on each side. A black shining median line on the face from immediately below root of antennae to the mouth. The middle part of the face in profile a little protuberant. Antennae blackish brown, 3rd joint more or less reddish brown below at base, arista dorsal, placed at about one-third of the length of the joint. Proboscis shining blackish brown.

Thorax.—Shining black, covered rather closely with black socketed hairs, which give a punctured appearance to both the dorsum and the scutellum, which latter is concolorous. Sides black, a little conspicuous white hair in front of the wing roots.

Abdomen.—Black or blue black, shining; about the hind half or a little more or less, bright reddish brown; the whole surface of the abdomen with white hairs extending over the sides. The tip of the abdomen is sometimes black, or the reddish part may be black at the sides. Belly generally a replica of the upper side

Legs.—Coxae and basal half of femora black, shining, apical part of femora brownish yellow, shading into the lemon yellow tip, this colour extending over about the basal third of the tibiae, the remainder being brownish yellow. Tarsi brownish yellow, a little golden yellow pubescence below the hind pair.

Wings.—Clear, venation normal, halteres pale yellowish white.

Described from a single ♂ from Sadiya, 23-ix-11, and also from four ♂ ♂ in the Indian Museum; the *type* from Mangaldai, Assam —Bhutan Frontier (1 or 2-i-11) [*Kemp*]; the others from Dhikala, Gharwal District, base of Western Himalayas, 10-iii-10; Bijrani, Naini Tal District, 19-iii-10; Peradeniya, Ceylon, 15-vii-10.

Paragus serratus, Fab.

Two ♂ ♂ from Sadiya, 23-xi-11, and Dibrugarh, 17—19-xi-11, respectively. A common and widely distributed species in South Asia, India, Sokotra, Ceylon and Java, and probably in many other parts of the Orient also.

Chilosia apicalis, mihi, sp. nov.

♀ N.E. Frontier of India. Long. 7½ mm.

Head.—Eyes with grey pubescence; the frons at just above the antennae, nearly one-third the width of the head, narrowing to the vertex, where it is only two-thirds as wide. Whole head aenous, with darker and with greyish reflections. Vertex and frons with black hairs, also the large transverse callosity just above the antennae, which reaches from eye to eye and is rather impressed in its middle. Facial bump moderately projecting, with a little yellowish grey hair on each side of the mouth opening. Proboscis blackish, with large reddish brown labella. Underside of head with a little white hair. Antennae reddish brown, upper

side and tip of 3rd joint blackish. Posterior border of eyes with white hair on the lower half.

Thorax.—Aenous, with a very slight bronze green tint viewed in certain directions, with short black and yellow hairs. Scutellum concolorous; black hairs on dorsum, with which some yellow ones are intermixed, yellow hair only on underside, softer and closer and there are at least six long black bristles on the hind border A few inconspicuous black bristles behind the wings; pleurae with light yellowish hair.

Abdomen with 1st segment brownish, the remainder dull black, with yellowish hairs, which are thicker towards the base at the sides. Belly similar, nearly bare.

Legs.—Coxae black, a little reddish brown about the trochanters; femora black except narrowly yellowish at tips; tibiae orange, with a rather narrow median band which is narrower and incomplete on the anterior legs, and broader and complete on the hind legs. Tarsi orange, tips brown; hind tarsi with all the upper side dark.

Wings.—Nearly clear; stigma brownish yellow, extending to the end of the cell; a blackish infuscation over the apical third of the wing, extending from the stigma posteriorly to about the hinder limits of the 1st posterior cell. Halteres dirty yellow.

Described from one ♀ from Rotung (1400 ft.), 4—13-iii-12.

Syrphus balteatus, Degeer.

Seven specimens (♂ ♀) of this widely distributed Palaearctic, North American and Himalayan species; from Sadiya (23-xi-11), Rotung (26-xi-11) and Dibrugarh, 17—19-xi-11.

Syrphus aeneifrons, mihi, sp. nov.

♂ N.E. Frontier of India. Long. 10 mm.

Head.—Eyes with dense dark brown pubescence; touching for more than half the distance from the upper corner of the frons to the elongate vertical triangle. This latter is black, with a few stiff black hairs curved forwards. Frons aenous bronze, antennal tubercle black, both with long black hairs. Face orange yellow, barely produced in the middle, just above the mouth, where it is blackish. Mouth border and lower edge of face black, with a few black hairs. Proboscis brownish. Antennae wholly black, 2nd joint emarginate, with black bristles at tip; 3rd joint elongo-conical, arista black. Posterior orbit of eyes with a fringe of bright orange scale-like thick hairs; occiput grey.

Thorax.—Shining black, with brownish yellow hairs. Sides dark grey; pleurae with grey or yellowish grey hairs; scutellum yellowish with dark brown hairs.

Abdomen.—Ovate, black, moderately shining; 2nd segment with a pair of elongo-triangular yellowish spots; their bases placed near the lateral margins, their apices nearly reaching the centre of

the segment; 3rd segment with a pair of elongate spots near the anterior margin, and not attaining the lateral margins. (They are slightly widened towards the sides in one specimen, but are of uniform width in the type). These spots nearly meet in the centre of the segment (probably in individual specimens actually are united). The 4th segment with two similar spots but rather smaller. (These in the type are of uniform width, but in the 2nd specimen are distinctly wider towards the sides as in the previous segment). Pubescence of abdomen concolorous with the ground colour; a quantity of pale yellow or whitish yellow hair laterally at base. Belly blackish, with greyish reflections, yellowish about the middle.

Legs.—Coxae and basal half of femora black, the tarsi brown; remainder of legs yellowish or brownish yellow; a little whitish and pale yellowish hair on the femora, longer on the underside.

Wings colourless; stigma dirty brownish yellow; halteres dull red brown.

Described from two ♂♂; the *type* taken between Kalek and Misshing (4000 ft.), 18-iii-12; the second example taken at Yembung (1100 ft.), 17-iii-12.

Syrphus transversus, mihi, sp. nov.

♀ Assam. Long. 10 mm.

Head.—Eyes with yellowish white pubescence. Frons gradually widening from vertex to a line drawn through the base of the antennae, where it is fully one-third the width of the head at that point. Vertex shining violet, bare, except for the ocellar triangle which bears a few short black hairs. Rest of frons yellowish white dusted, but for a large space around the antennal protuberance it is shining black. Face pale yellow, more whitish below, central bump rather small, shining black, the colour extending in a stripe to the mouth. The whole frons (except the vertex) down to the antennae bears black pubescence, the whole face bears whitish pubescence, which is longest on the lower part and around the black mouth border. Proboscis blackish brown. Antennae wholly black, much as in *aeneifrons*, 3rd joint a little shorter. The anterior edge of the antennal protuberance brownish yellow. Back of head ash grey; upper posterior orbit of eyes with a fringe of bright yellow scale-like thick hairs, the lower part of the orbit with similar white scaly hairs.

Thorax.—Aenous, with pale brownish yellow hairs. Sides ash grey with whitish hairs. Scutellum yellowish, with yellow hairs on the dorsum and long black hairs in the region of the posterior border, and soft pendant white hair below.

Abdomen.—Ovate, black, 1st segment aenous, very short; 2nd, 3rd and 4th segments with a moderately broad yellow band on each, none of them attaining the side margins, all narrowed in the middle, the 1st and 3rd bands practically interrupted there. In fact the 1st band is really composed of two elongate triangular

yellow spots, their apices not contiguous, but connected by a small grey dusted patch. The 3rd band is actually interrupted for a very short space and in individual specimens might easily resolve itself into two elongate spots. Pubescence of abdomen concolorous with ground colour; a good deal of white hair laterally at the base and short pubescence along the side margins except where the black parts of the abdomen intervene. Belly blackish, the two wider yellow bands duplicated as on the dorsum, the pubescence sparser. In certain lights the dorsal abdominal bands have a creamy shade, especially the 1st band.

Legs.—Coxae rather less than half as long as the anterior femora, and more than half the hind femora, black. Tibiae brownish yellow, tarsi brown or blackish brown, hind pair with golden brown pubescence below. Femora with pale hair, hind tibiae with minute black pubescence on outer side.

Wings clear, subcostal cell pale yellow; halteres yellowish white.

Described from one ♀ from Sadiya, 28-xi-11.

Syrphus fulvifacies, mihi, sp. nov.

♀ N.E. Frontier of India. Long. 9 mm.

Head.—Eyes bare; frons twice as wide at the level of the antennae (where it forms one third of the head) as at the vertex; wholly dull black, but for a short space below the black vertical triangle and also above the antennal protuberance it has a brassy aenous tinge. From the vertex to the antennae with black hairs. Face wholly, from roots of antennae downwards to lower margin, bright golden orange, rather deeper on central knob, which is of moderate size; mouth black but the mouth border itself yellow, with a small black spot at the extreme tip of the snout. Proboscis dark brown. Face with a little short black pubescence on sides of protuberance, on the remainder with very soft pale yellow hairs. Antennae dull black, basal two-thirds of underside of 3rd joint dull reddish brown, arista black. Occiput grey with a complete marginal fringe all round of uniformly sized bright yellow scale-like thick hairs.

Thorax.—Dull blackish, with soft pale brownish yellow hairs. These are so sparsely placed and of such fineness that the dorsum appears at first sight denuded of pubescence except towards the lateral margins and at the sides, where it is bright golden yellow and much thicker both in texture and quantity. The pleurae and wing bases also covered with similar golden yellow hair; sides of thorax cinereous grey. Scutellum yellow, with rather copious long black pubescence.

Abdomen.—Ovate, black. A pair of elongate yellow spots in the centre of the lateral margins of 2nd segment, their inner ends rounded but well separated from one another. A yellowish band in the middle of the 3rd and 4th segments, their anterior corners only reaching the lateral margins. These bands are emarginate in the

middle, more conspicuously so behind, both are of uniform width with the spots on the 2nd segment. Extreme posterior margin of 5th segment yellow. Pubescence of abdomen black, even on the yellow parts, but there is the usual amount of hair about the anterior corners, where it is bright yellow. Belly blackish, the yellow bands present about the same appearance as on the dorsum.

Legs.—Coxae, nearly the basal half of the anterior femora, all the hind femora except the tips, and hind legs wholly, except the basal third of their tibiae, black; the remainder of the legs yellow, tips of anterior tarsal joints with a row of black bristles, giving a darkened appearance to these parts, and the anterior tarsi with short black bristly hairs below. Hind tibiae with golden yellow pubescence on inner side; hind tarsi with similar pubescence below.

Wings clear, subcostal cell brownish yellow; halteres yellow.

Described from a single ♀, Rotung, 26-ix-11.

N.B.—This species is remarkably like the very common Palaearctic *S. ribesii*, L. and may possibly be a variety of it, unless the limits of that species are truly known. If so, it differs from *ribesii* by the hind femora being principally black. In this respect it resembles *vitripennis*, Mg., if this latter is really distinct. Verrall states of *vitripennis*, in comparing that species with his wonderfully correct description of *S. ribesii*, that its best specific distinction from the latter is "the scarcity of the tiny black bristles about the tip of the hind femora in both sexes." In *ribesii* these bristles are wholly yellow on all the femora except the middle pair (where they are black); in *vitripennis* they are all black and scarce. In the present form they are black and numerous. The hind tibiae are all black except about the basal third, whereas in *ribesii* there is at most an obscure dark patch on the front side, and in *vitripennis* the tibiae are wholly yellow.

The present form is as distinct from both *ribesii* and *vitripennis* as these two are from one another, but I am still open to question whether the three forms are not merely three well-marked varieties of one species. There are also so-called "species" in North America so near *ribesii* that further confirmation of their distinctness would be very satisfactory.

Syrphus maculipleura, mihi, sp. nov.

♀ N.E. Frontier of India. Long. 6 mm.

Head.—Frons at base of antennae one third of the head, diminishing to half this width on the vertex, where it is shining with a dark violet aenous tinge. Remainder of frons shining aenous black, except for a narrow pale yellow eye margin which joins the pale yellow face, on which is a broad shining black middle stripe from the base of the antennae to the mouth. The small space between the roots of the antennae, yellow. Antennae with 1st and 2nd joints brown, 3rd with upper half black and lower part dull reddish brown. Frons with fine black hairs, face

with sparse short fine yellow hairs. Proboscis black with yellow labella. Hinder orbit of eyes with whitish yellow scaly hairs, back of head blackish grey. In profile the head does not extend downwards below the level of the eyes.

Thorax.—Bright shining aenous with a bronze tint, with short black or blackish brown hairs. Scutellum with dull black (almost velvet black) dorsum, the colour becoming dark brown on the hind margin; the extreme base is narrowly pale yellow; the surface covered with black hairs. Sides of thorax dull aenous or aenous grey, with a small quantity of yellowish or yellowish grey hair. A small oblong, pale yellow, inconspicuous callus-like spot on each shoulder; a small similar spot on the prothorax on each side just above the first pair of coxae. Three elongate similarly coloured small spots placed in a curved line below and behind the wings, the lowermost spot situated on the sternopleura.

Abdomen elongate, of uniform width, about as long as head and thorax together, black; 1st segment yellow except a little blackish in the middle at the base; 2nd segment with a pair of elongate yellowish spots across the middle, their outer ends touching the lateral edges of the segment, their inner ends well separated. The 3rd and 4th segments each with a slightly arcuate yellowish band, emarginate in middle on hinder side, placed just before the middle of the segment, and almost attaining the lateral margins (or if reaching them in individual examples, the contact probably practically punctiform only). The 5th segment with two oval yellow spots placed diagonally from anterior border to each hind corner. The whole abdomen with fine short black hairs, the sides also with black hairs; very little pale hair about the anterior corners of the abdomen. Belly mainly yellowish; the black parts of the dorsum more or less duplicated below.

Legs.—Anterior pairs pale yellow; an infuscated streak on upper side of fore femora and on outer side of fore tibiae; middle femora and tibiae similar but the obscure mark on the tibiae forms more nearly a median band. Fore tarsi all rich brown, middle tarsi black. Hind legs all black except base of femora a little yellowish; rich golden brown pubescence below hind tarsi. Pubescence of legs weak, pale yellow on anterior legs and black on hind pair.

Wings.—Clear, iridescent; subcostal cell pale brownish yellow; halteres yellow.

Described from one ♀, Rotung, 25-xii-11.

N.B.—According to Verrall, species with distinct yellow spots on the pleurae should not be included in *Syrphus*, yet it is difficult to know where else to place the present species. The shoulder spots are not continued as a yellow border to the thorax, and both this character, the *Syrphus*-like *facies* of the insect and width of abdomen (relatively broader than such species as *cinctus* and *cinctellus*) and the distinct *Syrphus*-like markings of the abdomen, all prevent it coming in *Sphaerophoria*. In its general appearance it is still less like *Mesogramma* or *Allograpta*. From *Xanthogramma*

its comparatively narrow abdomen and general appearance and also the absence of yellow side lines to the thorax, separate it.

As it seems to all intents and purposes a *Syrphus*, it is left in this genus, at least for the present.

Asarkina salviae, Wied.

One ♂, typical, Sadiya, 23-xi-11.

Asarkina aegrotus, F.

One ♂, Sadiya, 28-xi-11. The wings are infuscated on the entire basal half instead of bearing, as in typical forms, a broad cross band, but other specimens in the Indian Museum have only the shortest possible clear space at the wing base.

Melanostoma mellinum, L.

Two specimens of this common and widely distributed Palaearctic species: Dibrugarh, 17—19-xi-11 and Kobo (400 ft.), 3-xii-11, both females. It is common in many Himalayan localities.

Melanostoma orientalis, Wied.

One ♀, Sadiya, 28-xi-11; two ♀ ♀, Dibrugarh, 17—19-xi-11.

Very near *scalare*, F. of Europe, as Wiedemann says; it is still nearer *mellinum*, L. The absence of the bump above the antennae seems to have been overlooked by Wiedemann, but it appears a sound and consistent specific character. The antennae are described as wholly bright orange yellow, but in one or two examples seen by me from other localities, as well as in the present specimens, there is a little brown on the upper side and the tip of the 3rd joint. Also, the frons is rather more grey-dusted. The species is in the Indian Museum, as determined by me, from Bangalore and Mergui.

Melanostoma univittatum, Wied.

Four ♂♂, Dibrugarh, 17—19-xi-11, agree exactly with the description, as do other specimens in the Indian Museum from Bangalore and Mergui.

Sphaerophoria scutellaris, F.

Sadiya, 23—28-xi-11, Rotung, 1400 ft., 26-xii-11, Kobo, 400 ft., 30-xi-11, four specimens in all, both sexes being present. One of the most widely distributed species of Syrphidae, extending (probably) over the whole of the Orient, North and South Africa, the Canaries, Madagascar and Formosa.

Bacha flavopunctata, mihi, sp. nov.

(Pl. vi, figs. 5-6).

♀ Assam. Long. 9 mm.

Head.—Vertex, and the frons for a short distance, shining black; remainder of frons, down to the antennal protuberance, yellow-dusted. From this part downwards, the whole face pale yellow, with a median shining black stripe and a black spot immediately above the antennae, which latter are wholly bright yellow. Below the mouth opening, shining steel colour; proboscis yellow, occiput dark grey with a fringe of short yellow hairs.

Thorax.—Dorsum shining dark aenous black, an oblong bright callus-like yellow spot on the shoulders; an elongate perpendicular stripe on the mesopleura, with a small spot below it on the sternopleura: a diagonal stripe on the metapleura from the just mentioned spot, passing behind the wing root; all these spots bright yellow, callus-like, smooth and shining. Scutellum bright yellow, with a central brown oval spot; a few grey hairs.

Abdomen.—Very attenuated on basal half except at base of 1st segment; some white lateral hairs towards the base, the rest of the surface with sparse short black hairs. The 1st segment pale yellow, 2nd light brown, very narrow to tip, 3rd and 4th gradually widening to the tip of the latter, each with a wide black band on posterior margin; 3rd blackish also at base, especially towards the sides; 5th segment brownish yellow. Belly similar to dorsum.

Legs.—Coxae black; anterior legs (except coxae) wholly bright yellow down to tarsi tips; a broad median band on hind femora, and the apical half of hind tibiae, dark brown or black; upper side of hind metatarsus rich dark golden brown, the colour more or less extending to the under side, which is covered with golden brown hair; remainder of hind tarsi orange-yellow.

Wings.—Clear grey; subcostal cell blackish, costal cell and about the basal half of the marginal cell brownish, and the costa from the end of the stigma to the tip of the 3rd vein, narrowly and distinctly black suffused. Halteres yellow.

Described from a single ♀ from Dibrugarh, 17-19-xi-11.

N.B.—This species must be near *gratiosa*, Big. Several specimens were already in the Indian Museum from Sukna (base of Darjiling hills) and one from Rungpo, Sikkim, 6-ix-09, all males.

Sphegina tristriata, mihi, sp. nov.

(Pl. vi, fig. 7).

♀ N.E. Frontier of India. Long. 6 mm.

Head.—Frons uniformly wide, about one-fourth of the head, shining black, but not brilliant. Eyes dull red, antennae brownish yellow, 1st joint brownish, 3rd a little infuscated above at the tip. Mouth parts and proboscis yellowish.

Thorax.—Ground colour brownish yellow, but dorsum almost wholly occupied by three practically contiguous dark brown

stripes, with only a brief space between them, at their middles, as they are united on the anterior margin and practically so near the posterior margin also. Pleurae dark brown; scutellum concolorous.

Abdomen.—Mainly black, base of 2nd segment and whole of 3rd, pale whitish yellow.

Legs.—Anterior pairs pale yellow, tarsi tips brownish; hind legs yellowish brown, with femora broadly dark brown at tips and on upper side, the colour extending over the sides, but not attaining the ventral surface for a certain space beyond the all pale yellow base.

Wings.—Pale grey, subcostal cell darker grey. Tip of wing infuscated as far inwards as just proximad of the up-turned section of the 4th longitudinal vein; but, in the marginal cell, implanted in the infuscated part, is a tear-shaped clear spot in contact with the clear part of the wing. Small infuscations over the origin of the 3rd vein, the anterior cross-vein, and the up-turned section of the 5th vein. Halteres dirty white.

Described from a unique ♀ from Rotung, 6–13-iii-12.

Rhingia binotata, Brun.

The ♂ was described by me from a specimen in my own collection from Darjiling, since when a perfect example has been acquired by the Indian Museum from Kurseong.

A ♀ occurs in the Abor collection from the banks of the Siyom River, near Yekshi, taken 3-ii-12. It resembles the ♂; the frons is one-fifth of the head, dark grey, of uniform width, the general colour less bright, the thorax rather more grey than yellowish grey, and the general pubescence grey instead of yellow.

Rhingia sexmaculata, mihi, sp. nov.

Long. 8 mm.

♀ Assam.

Head.—Frons rather more than one fourth the width of the head, just perceptibly narrower at vertex, the ground colour aenous, brownish yellow-dusted, with short, comparatively fine, black hairs. Ocelli red, distinct, placed in an impressed triangle. Face immediately below antennae, concolorous, the snout orange, comparatively short, being only as long as the lateral width of the eyes; haustellum blackish, the mouth parts brownish yellow. Antennal protuberance of moderate size, concolorous with frons; antennae wholly orange, upper margin and tip of 3rd joint very narrowly brownish, arista black.

Thorax.—Ground colour aenous, brownish yellow-dusted. Two narrow, closely approximated narrow median lighter stripes, and an outer under stripe each side, none of the stripes very obvious. Scutellum concolorous, posterior margin very narrowly brownish yellow; dorsum with a few short black hairs. Sides of thorax concolorous, a little pale yellow hair about the pleurae and wing bases.

Abdomen.—Blackish; 1st segment pale whitish yellow except for the dark posterior corners; 2nd, 3rd and 4th segments each with a pair of well-separated oblong yellowish spots (about as wide as one-third the length of the segment), placed towards but not on, the anterior margin, their extremities attaining the lateral edges of the segments. A little yellowish hair at the sides of the abdomen, basally; belly blackish.

Legs.—Brownish yellow; coxae, and, to a slight extent the extreme base of the femora, black; tarsi tips a little brown; the femora with a very little pale hair.

Wings.—Clear-yellowish grey; stigmatic region of subcostal cell yellowish; tegulae brown with yellow fringe; halteres brownish yellow.

Described from one ♀ from Dibrugarh, 17-xi-11.

Graptomyza brevirostris, Wied.

One ♀, Rotung (1400 ft.), on bank of Dihang River, 25-xii-11. There is another specimen in the Indian Museum from the Nilgiri Hills.

Graptomyza ventralis, Wied.

A ♀, which appears to be the typical form of this species, from Rotung, 26-xii-11.

G. ventralis, W.; nigripes, mihi, var. nov.

This form differs from the normal one by the partly black femora, instead of being honey yellow. The anterior pairs have the apical half black except for the very narrowly yellow tips; in the hind pair the black is more extensive. The middle and hind tarsi are brownish yellow, with only the last joint black.

One ♀, Sadiya, 27-xi-11.

Helophilus bengalensis, Wied.

One ♀, Dibrugarh, 17–19-xi-11. It shows a slight variation from the typical form as the antennae and antennal protuberance are both wholly black; also the inverted V-shaped mark on the 4th abdominal segment is hidden by a triangular black spot.

Sericomyia eristaloides, mihi, sp. nov.

♀ N.E. Frontier of India. Long. 13 mm.

Head.—Frons barely projecting in profile beyond eyes; face moderately swollen, the protuberance elongate and not conspicuous; haustellum somewhat thick and long, the mouth parts blackish. Frons, at a line drawn through the base of the antennae, one-third as wide as the head, narrowing considerably at

vertex; the upper half barely shining, black; ocelli distinct, red, set on the surface of the frons, enclosed by a slightly impressed line; lower half of frons brownish yellow-dusted. The whole frons with long soft black hairs, which towards and on the vertex become dark brown. Whole underside of head, and face from parallel with the antennae, yellowish pollinose, the central bump dark brown (a little lighter in the centre), with a fairly wide black stripe on each side of it. Some black hairs towards the sides of the central bump, and a little short bright yellow hair on the other parts of the underside of the head, including the two black stripes. Antennae without any protuberance; a small shining rich mahogany-brown triangle immediately above and contiguous to their roots. The 1st antennal joint shining black, the 2nd nearly quadrate, viewed from in front, with a few stiff black hairs, 3rd joint much wider than 2nd, twice as long, quite bare, dark reddish-brown, oval, a little whitish dust on underside; arista long, yellow, plumose above and below, the upper rays distinctly the longer. Occiput ash grey, nearly whitish on ocular orbits, which on the upper half of the head do not project beyond the margin of the eyes themselves, but they do so on the lower half, where they bear long white hair.

Thorax.—Dull brownish, barely shining, and with the sides brownish grey; the whole rather thickly covered with yellowish brown hair. Scutellum brownish yellow, paler on hind margin; dorsum with brown hairs at base which become yellow and longer towards the tip; underside with a fringe of soft whitish yellow hairs.

Abdomen.—The 1st segment whitish yellow, the remainder blackish; 2nd yellowish on anterior corners, 2nd, 3rd and 4th with an uninterrupted rather narrow yellowish band just before the middle and reaching the lateral margins or nearly so. All the bands of the same width; 5th segment all black. Some long soft yellow hairs at the sides at the base. Surface of abdomen with very short pubescence concolorous with the ground-colour; a fringe of very short yellow hairs on hind margin of each segment, most conspicuous on the 4th segment, and the extreme edges of the segments themselves, brownish yellow. Genitalia consisting of a short cylindrical tube, from which emerge two oval brownish yellow lamellae.

Legs.—Coxae black. Fore femora black, with a yellow streak on hinder side, middle femora yellow, with a wide black streak on front side, hind femora with basal half brownish yellow, and apical half black; all the femora with a little pale yellow hair; the hind femora with a number of stiff black bristles of different lengths below, on apical half. Tibiae mainly black, fore pair at base, and middle pair at base and tip yellowish; hind tibiae black; all tibiae with close pubescence, which is brownish yellow on the front side of the fore tibiae, and whitish on the hinder side, where it is much longer; hind tibiae with very short pubescence which is black in front and whitish on hinder side. Tarsi black or

dark brown, with short golden yellow pubescence; hind pair with rich golden brown pubescence below.

Wings.—Pale grey; a small brownish yellow infuscation in the middle from the costa and the brown stigma, reaching posteriorly to the 4th longitudinal vein. Tegulae and halteres brownish yellow.

Described from a single ♀ taken between Renging and Rotung (2200 ft.), 20-xi-11.

N.B.—Although with the general appearance of an *Eristalis*, this is a true *Sericomyia* in every character.

Chrysotoxum sexfasciatum, Brun.

One ♂ taken between Rotung and Kalek (2000–3500 ft.), 14–15-iii-12. In this specimen the antennae show hardly any red at their base, and the antennal protuberance is wholly shining black. In all other respects it meets the description exactly.

Mixogaster vespiformis, mihi, sp. nov.

(Pl. vi, figs. 8-10).

♀ Assam. Long. barely 8 mm.

Head.—Frons about half as wide as the head, with parallel sides, black, closely wrinkled; the dull-red eyes, bare, seen in profile, not attaining either the upper or lower limits of the head. Face with short bright yellow hair; a narrow reddish brown stripe across the frons, from eye to eye, immediately above the antennae. The vertex gently curved, the whole of the face quite flat. Antennae reddish brown, absolutely bare; 1st joint moderately long, elongate, 2nd very short (easily overlooked), 3rd about six times as long as the 1st, elongate, slender, sub-cylindrical, very slightly thickened beyond the middle, and tapering to a blunt point, the whole antenna as long as from the frons to the tip of the scutellum. A bare, comparatively small, curved arista near the base of the 3rd joint. This joint is bent backwards across the eyes after the fashion of Aculeate Hymenoptera. Back of head blackish, a little bright yellow hair behind the eyes.

Thorax.—Bright red, with a median black stripe about one-third the width of the dorsum. Sides blackish with a stripe of bright yellow hair from the ends of the transverse suture nearly to the legs; posterior margins of the dorsum with yellow hair. Scutellum black, covered with bright yellow hair.

Abdomen.—The 1st segment narrowed immediately after the base, black, the posterior border reddish brown; 2nd segment at base of same width as the tip of the 1st, but from its middle rapidly widening; 3rd segment widening still further, the greatest width of the abdomen being at the juncture of the 3rd and 4th segments, after which it rapidly narrows. The 2nd segment black on basal half, with a peculiar dirty milk-white stripe each side of the median line; apical half of segment reddish brown,

with a fringe of short bright yellow hairs on posterior margin. The 3rd and 4th segments mainly blackish with very short bright yellow hairs, the sides of the former obviously but not conspicuously reddish brown; the tip of the abdomen similarly coloured. Belly blackish, whitish at base, the genitalia orange.

Legs.—All coxae black; remainder of anterior legs brownish yellow, the tibiae with some whitish reflections. Hind legs black, knees brownish yellow, and tarsi tips yellowish, the tibiae and tarsi with minute whitish pubescence. Underside of hind tarsi brownish yellow.

Wings.—Pale grey, stigmatic cell yellowish. A blackish infuscation at tip of wing from about the tip of the 1st longitudinal vein to just below the 3rd vein. The appendix in the 1st posterior cell very distinct. Halteres bright lemon-yellow.

Described from a single ♀ from Dibrugarh, 17–19-xi-11.

N.B.—This peculiar genus is only previously known from Australia, Mexico, Central America and Brazil. All the species must possess a more or less vespiform appearance from the remarkable resemblance in the 3rd antennal joint being bent back as is usually the case in Aculeate Hymenoptera.

MUSCIDAE.

1st Division CALYPTRATA.

TACHININAE.

Of this sub-family six species are present, represented by eight specimens, but there are no means available for determining them. Two specimens of a species of *Sarcophaga* are present.

MUSCINAE.

Of *Muscidae verae* six species are represented.

Rhinia limbipennis, Macq.

Four ♀ ♀; Sadiya, 23-xi-11. Occurs in various parts of India and Assam.

Rhynchomyia (*s. lato*).

Four ♀ ♀ of a *Rhynchomyia* in the wide sense, from Sadiya, 23–28-xi-11 and Kobo (400 ft.), 1-xi-11.

Pyrellia violacea, Macq.

Eight specimens, representing both sexes, of what I have always regarded as this species; Sadiya, 28-xi-11. It is commonly distributed in India.

Philaematomyia insignis, Aust.

Dibrugarh, 17–19-xi-11 and Sadiya, 25-xi-11, some taken by "sweeping *Artemisia*," seven specimens in all, both sexes. A very widely distributed species of "blood-sucking fly," found in India, Ceylon, Sokotra, Cyprus, Palestine, Senegal, Congo Free State, Burma, Assam, Borneo.

N.B.—Of the remaining true Muscids there are 5 of a species of *Lucilia*, ♂ ♀; and several of both sexes of a species of *Musca* allied to *domestica*, L.

ANTHOMYINAE.

Ophyra caerulea, mihi, sp. nov.

♂ ♀ N.E. Frontier of India. Long. 4 mm.

Head.—Eyes not quite touching in ♂, for some little distance; frons dead black; face black, with a greyish shimmer if viewed from certain directions; the eye margins with a row of bristles along the distance of greatest contiguity, that is from the lowest point of the small triangular frons to the brilliant white spot above the root of the antennae. This spot is semicircular in outline on its upper side and pointed below. Antennae blackish, not reaching mouth opening, without greyish shimmer; proboscis and palpi blackish.

In the ♀ the frons is one-third the width of the head, blackish, but with a brownish yellow tinge. (This may be due to the head having been moistened).

Thorax.—Shining indigo blue, the colour less bright on the sides in the region below and behind the wing base, and below the shoulder where it is more or less dirty brown-tinged. A very distinct small cream-yellow spot on the humerus.[1] Dorsum of thorax with rather thick blackish brown hair. Scutellum concolorous, a pair of post-basal bristles and a pair of long convergent apical ones.

Abdomen.—Rather narrow, shining indigo blue; when viewed from in front a little brownish about the base. Belly pale dirty brown.

Legs.—Dull yellowish brown, pubescent; tarsi black, the inner sides of the femora lighter (?).[2]

Wings.—Clear, veins yellowish; tegulae whitish with short white fringe; halteres black.

Described from a single ♂ and ♀ from Rotung, 1400 ft., 31-xii-11.

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[1] In the ♀ the humeri are darkened, but this may be due to accident, the front part of the specimen shewing signs of having been wetted.

[2] This is so in the ♀ example, but may be individual variation, or perhaps the more normal colouration, or even a sexual difference, though this latter seems unlikely.

N.B.—This species differs from all other Eastern ones by the brilliant blue colour, its yellowish shoulder spots, and rather smaller size. It is near, but quite distinct from, the European *O. anthrax.*

Limnophora kempi, mihi, sp. nov.

♂ Assam. Long. 3 mm.

Head.—Eye margins narrowly pale yellowish grey, the width not uniform but continued with extreme narrowness to between the points of greatest contiguity of the eyes. The whole of the remainder of the front part of the head very pale grey-dusted with a slight bluish tinge. Two or three short bristles on upper part of eye margin, alongside of the dull-reddish brown frontal triangle. Vertical triangle dark grey, a few short bristly hairs, the three ocelli very small, brilliantly shining ruby-red, placed on extreme angles of the triangle. A longer pair of bristles just behind the vertex, convergent, placed one behind each corner of the ocellar triangle. Antennae black, arista microscopically pubescent only. A pair of strong oral vibrissae. Back and underside of head dark grey with short stiff black hairs. Proboscis black; palpi black, slender, rather long, slightly enlarged at tips.

Thorax.—Pale cinereous grey (centre part damaged by pin), with at least four rows of bristles of various sizes. There are three stronger ones in the humeral region, four more or less in a row from below the humerus to the wing root, three or four above and in front of the wing. Scutellum concolorous, with three pairs of bristles, one post basal, near the sides, a smaller pair near the middle of the dorsum, and a long apical pair.

Abdomen.—Dark grey, the dorsum of the segments appearing more or less darker according to the angle at which they are viewed. Surface of abdomen covered with soft black hairs and a row of stronger bristly hairs near posterior border of each segment.

Legs. – Dark brownish black, shortly pubescent; femora and tibiae with numerous spines and bristles; all tibiae with a circlet of spines near tip.

Wings.—Colourless, squamae yellowish white; halteres yellow.

Described from one ♂ from Sadiya, 25-xi-11.

Lispa ? pallitarsis, Stein.

Two specimens from Dibrugarh, 17—19-xi-11, agree so closely with the description of this species that it seems likely they are identical, although disagreeing in one or two points. They agree in the shining black unmarked thorax, in the absence of strong bristles in this part except towards the sides, in the black face and antennae, in the oblong or sub-cylindrical abdomen with a narrow whitish mark on the anterior margin towards each side of the 2nd to the 4th segments. This character alone is quite

unusual in the genus. They also agree in the last four joints of the fore tarsi being whitish yellow. The palpi are pale yellow, but in Stein's species they are black or "rarely dirty yellow," but as he described from only three specimens the "rarely" is somewhat discounted.

In the face of such close agreement it is impossible to describe the present form as distinct, yet I cannot decide for certain that it represents *pallitarsis*. The latter was described from Java.

The remaining *Anthomyidae* consist of 4 species of *Spilogaster*, each represented by a single specimen only, and two specimens of a *Coenosia*.

Many species have been described of both these genera and on such small material it seems inadvisable to add to the number.

2nd Division ACALYPTRATA.

BORBORINAE.

Limosina magna, mihi, sp. nov.

N.E. Frontier of India. Long. 3 mm.

Head.—Wholly black. Eye two-thirds the vertical height of the head. Antennae dark reddish brown; 3rd joint large, oval with microscopic yellowish grey pubescence and very long black shortly pubescent arista, situated at its upper corner; 2nd joint strongly projecting over the 3rd on the inner side with a circlet of strong spines. Two rows of dorso-frontal converging bristles placed so as to divide the frons into three nearly equal parts; of these the middle ones seem the larger but both the exact number and their size appear variable. A pair of strong proclinate bristles on ocellar triangle, which is black, and barely distinguishable from the frons. Four pairs of strong long orbital bristles, the upper pair diverging, near vertex and upper corner of eye; the 2nd pair set midway between the frontal triangle and the eye margin, strongly converging, and on a level with the ocellar ones; the 3rd and 4th pairs in a line with the upper pair, contiguous to eye margin and opposite the strongest of the dorso-central bristles. A pair of converging vertical bristles, set rather widely apart and a diverging pair near the eye corners. Underside of head blackish, mouth opening very large, projecting well forward on upper side. A double row of stiff bristly hairs on each side, the uppermost, a very strong bristle, directed forwards, placed between the lower anterior corner of the eye and the oral margin. A still more powerful one at lower corner of mouth opening, directed perpendicularly, and a much smaller one at the same spot directed downwards. Some bristles (at least a pair on each side) can be perceived in the mouth opening, but it is not obvious if they are affixed to the root of the mouth or to the proboscis, which latter is withdrawn, blackish, with very large ribbed yellow labella; palpi reddish yellow, moderately short, very slender.

Thorax.—Blackish, shortly pubescent with stiff short hairs, (bristles, mostly broken off). One or two weak dorso-central ones remain and a strong pair on posterior margin. Scutellum, metanotum and sides of thorax blackish, the first with the usual basal and apical pair of strong bristles.

Abdomen.—Blackish, shortly and apparently barely pubescent.

Legs.—Coxae brownish yellow, marked with blackish; femora black, brownish yellow at base and tips; tibiae and tarsi brownish yellow, hind tibiae with a blackish indistinct ring towards tip; hind metatarsus dilated, blackish at base. Middle tibiae with several strong but quite conspicuous bristles.

Wings distinctly yellowish, a little darker anteriorly; halteres yellow.

Described from a single specimen from Kalek, 3800 ft., 29-xii-11.

Limosina subtinctipennis, mihi, sp. nov.

Assam. Long. 1 mm.

Head.—Frons blackish grey, a little reddish brown above the antennae; three or four small dorso-frontal bristles; four pairs of orbital bristles, situated as in *L. magna*, but the two lower pairs relatively smaller; a pair of proclinate ocellar bristles. Antennae dark brownish yellow, 2nd joint, relatively large, as large as 3rd, which is oval at the tip with a circlet of bristles; arista pubescent.

Thorax.—Black with short stiff hairs; three bristles below shoulder, a very strong supra-alar bristle and one below the wing; several stiff bristly hairs on hinder part of dorsum the dorso-central bristles (if present) apparently weak. Scutellum with a post-basal pair set on the margin, a much smaller inner pair and a strong apical pair.

Abdomen.—Black, dull, bare, except for a few soft side hairs. Belly similar.

Legs mainly yellow; femora, especially the hind pair, more or less brown, except at base and tip; tibiae with two more or less indistinct equidistantly placed blackish brown rings, which are quite distinct on the hind legs. Hind metatarsus emarginate near base so that it appears as a small thumb. Middle tibiae with numerous strong spines of different lengths, and a strong preapical one; middle tarsi with first two joints bearing a circlet of spines at tip, the middle metatarsus with an additional bristle in the middle on inner side. Hind tibiae with only stiff hairs of different lengths.

Wings.—Grey, a slightly clearer transverse streak just beyond discal cell, which cell, with the basal cells, are also slightly clearer The veins with a suspicion of suffusion; halteres yellow.

Described from a single specimen from Dibrugarh, 17–19-xi-11.

HETERONEURINAE.

Trigonometopus trilineatus, mihi, sp. nov.

(Pl. vi, fig. 11).

Assam. Long. 3–3¼ mm.

Head.—Frons flattened, horizontal (generic character); at its narrowest part, which is opposite the frontal bristles, more than one-third the width of the head, widened rapidly at vertex, brownish yellow. Ocellar triangle well below vertex, small, black. A single pair of frontal bristles just below narrowest part of frons, and removed from eye margins. Two sub-triangular brownish marks on frons placed, so to speak, base to base, but separated from each other, situated midway between the ocellar triangle and the base of the antennae. Two pairs of vertical bristles, the median pair converging, the outer pair, near the corners of the eyes, diverging. Occiput wholly yellow, with a few soft yellow hairs. Face very retreating, with a deep groove each side near the eyes (both generic characters). These grooves and a median stripe are dark brown and very conspicuous, extending from the base of the antennae to nearly behind the eye, and to the mouth opening. Cheeks with a row of about six bristles, placed behind the ends of the facial groove. Proboscis and palpi concealed, brownish yellow the latter moderately long, cylindrical, slender. Antennae brownish yellow 1st and 2nd joints with a row of spines at the tip; 3rd as long as 1st and 2nd together, bare, except for miscroscopic pubescence, and with a long black pubescent arista inserted on the inner side. A small black spot between the eye margin and the base of the antennae, contiguous to both.

Thorax.—Dull brownish yellow, violet-grey-dusted seen from certain directions, and with two narrow, well separated median brown stripes from anterior to posterior margin where they nearly or quite meet, and are then continued as a single broad stripe to the tip of the concolorous scutellum. Sides of thorax mainly yellowish, but brownish about the shoulders and from there to the wings, the colour probably extending in individuals to a varying extent. Three pairs of dorso-central bristles, of which the most anterior pair are placed but little in front of the middle of the thorax; a row of four similar bristles from shoulder to root of wing; two mesopleural, one sternopleural, all three weak. A pair of strong lateral scutellar bristles placed midway between base and tip, and a pair of strong apical ones also.

Abdomen.—Brownish yellow, blackish at base, and apparently here and there elsewhere; shortly black pubescent; belly more or less similar.

Legs.—Pale brownish yellow; fore femora with a number of stiff black hairs below; posterior femora nearly bare, and with a small bristle near tip; all tibiae with a preapical bristle. Legs generally shortly pubescent.

Wings.—Pale grey, slightly clearer here and there; veins rather indistinct except the 3rd and 4th longitudinals (which however become very weak at their tips), and the posterior cross-vein; these three veins being very conspicuous. A sub-apical smoky band of moderate width begins just below the costa, above the tip of the 2nd vein, and nearly reaches hind border of wing. Auxiliary vein quite distinct throughout from 1st longitudinal, which ends but little beyond it, distinctly before middle of wing. The 2nd vein ends towards wing tip, the 3rd at the rounded wing tip, the 4th just below, these two latter veins parallel. Anterior cross-vein slightly infuscated, a little before middle of wing; posterior cross-vein erect, a little before midway between anterior cross-vein and wing margin; anal cell large, rather clearer in middle.

Described from two specimens from Sadiya, 23-xi-11.

N.B.—Apparently only four species are at present known in this genus beyond the present one, the *frontalis*, Mg. of Europe and three from North America.

SCIOMYZINAE.

Sciomyza trypetoptera, Hend. (*Sapromyza*).

Sapromyza histrio, Meij.

Several specimens from Sadiya, 27-xi-11, Dibrugarh, 17–19-xi-11 and Kobo, 6-xii-11, cannot fail to be this species, but Hendel and Meijere refer it to *Sapromyza*. It appears to me a *Sciomyza*.

Sciomyza strigata, Meij. (*Lauxania*).

Five ♀ ♀ from Rotung, 1400 ft. (25-xii-11), agree exactly with Herr Meijere's description and wing figure of this species. Very near *S. quinquevittata*, Meij., of which the Indian Museum possesses a specimen from Java named by that author, but the two species are obviously distinct, and I cannot help regarding *strigata* as a *Sciomyza*.

Sciomyza ocellata, mihi, sp. nov.

(Pl. vi, fig. 12).

♀ Assam and N.E. Frontier of India. Long. 3 mm.

Head.—Cream yellow, with marks of a nearly uniform brownish colour placed as follows: an oval spot on frons, from each side of ocellar triangle nearly to base of antennae; a row of three round spots on frons between the oval spot and the eyes (the fronto-orbital bristles being set in these spots); a spot between base of antennae and eye margin, contiguous to both; and a row of three above the mouth opening, contiguous or sub-contiguous to one another, but placed clear of both mouth border and eye margins. Antennae brownish yellow, 3rd joint more or less brown-

ish, arista plumose. Proboscis rather long with large labella; palpi long, cylindrical, all pale yellow. Back of head blackish in middle. Three pairs of fronto-orbital bristles, the upper (and strongest) pair nearly on vertex; a pair of ocellar, a pair of small central vertical and a strong vertical bristle situated on the absolute margin, behind the corner of each eye. Smaller post-vertical bristles are present.

Thorax.—Brownish; maculated with numerous small light grey spots and short zigzag lines, the most conspicuous of the latter beginning on each side of the anterior margin and passing over the shoulder, below which it encloses at its end a round black spot.

Bristles: 3 dorso-central, 1 humeral, 1 post-humeral, 1 prealar, 1 sternopleural; numerous acrostichal bristles. The scutellum with one pair of post-basal (marginal) and a pair of widely separated apical ones. Scutellum generally brown with grey marks as the thorax, but all the marks are variable, so that in some specimens the ground colour may be considered light grey, and the markings brown.

Abdomen.—Dark brown. The 1st segment mainly light grey with a triangular brown mark at base, and the hind margin brown spotted. Each of the remaining segments bear a pair of large light grey spots on the front border, approximately semicircular (emarginate on lower outer part) and bearing a distinct round black spot in each. Posterior margins of segments with bristles; surface of abdomen generally shortly pubescent. Belly dark, with grey markings.

Legs.—Pale yellow; posterior femora (especially hind pair) mainly brown or brownish for basal three-fourths, the intensity of the colour variable; bristles on lower sides of all the femora, longest and fewest on fore pair, weakest on hind pair. Tibiae and tarsi pale yellowish or pale brownish yellow, pubescent; hind metatarsi more or less brownish above; posterior tibiae with preapical bristle, middle tibiae with a few spines at tip.

Wings.—Blackish, with several semicircular or sub-triangular pale whitish grey spots around margin and numerous smaller similarly coloured spots over the disc. The larger spots are placed thus. An oval one on the costa (with a black spot in its middle), filling the costal cell as far as the auxiliary vein. Four spots on the costa, between tip of 1st longitudinal vein and tip of 2nd; of these, the first three are subtriangular, the first one separated further from the second than the latter is from the third, and in this intervening space a small yellowish costal spot, often indistinct; the fourth spot is more rounded. The remaining spots on the wing margin are more or less semicircular and approximately uniform in size. The submarginal cell has two (a large and a small one), the 1st posterior cell, two, the upper one the smaller and more triangular; the 2nd posterior cell has three, the uppermost the smallest. Behind the 5th longitudinal vein tip there are four on the wing margin, the first immediately behind the 5th vein tip and practically contiguous to

it. These spots vary from sub-triangular to semicircular. The spots on the disc are very small, though varying in size, and there is usually a row just in front of and another just behind the 2nd, 3rd and 4th longitudinal veins; those in the anal cell being the largest. Halteres dull pale yellow.

Described from 10 specimens; Kobo, 400 ft., 3-xii-11 (*type*), Sadiya, 28-xi-11, Rotung, 25-xii-11.

N.B.—One specimen only appears to be a male, but is in too bad a condition to set up as the type.

Sciomyza septemlineata, mihi, sp. nov.

(Pl. vi, fig. 13).

♀ N.E. Frontier of India. Long. 2½ mm.

Head.—Very pale yellow; frons from vertex to antennae broadly dark brown, leaving a rather wide ocular orbit each side. Two conspicuous round dark brown spots above mouth border. Proboscis pale yellow, palpi black. Antennal 1st and 2nd joints black, 3rd pale yellow, slightly brownish at tip, arista black. Back of head yellowish. Bristles normal; a row of short bristles behind each eye.

Thorax.—Brownish yellow; a broad median dark brown stripe from anterior to posterior margin, carried continuously over scutellum to its tip. Three lateral dark brown stripes each side of thorax; one from the shoulder, passing on inner side of wings, the second from just below the shoulder to the wing base, the third across the pleurae.

Abdomen.—Blackish, pubescent, bristles on hind borders of segments, belly blackish.

Legs.—Uniformly pale whitish yellow; bristles normal, as in *S. strigata*, Meij.

Wings.—Blackish brown, with pale spots as follows: a round spot below tip of 2nd longitudinal vein, not touching margin of wing; a squarish one near tip of 1st basal cell, extending a little above 3rd vein; a squarish one over 3rd vein just beyond middle of wing; a semi-oval marginal one at tip of 1st posterior cell, and three smaller ones arranged more or less in the form of a triangle, on distal half of same cell; a round one in middle of 2nd posterior cell; a rather large squarish one towards end of discal cell, extending above the 4th vein. Anal cell clearer. Halteres dirty grey.

Described from a unique ♀; Rotung, 1400 ft., 24-xii-11

SAPROMYZINAE.

Lonchaea montana, mihi, sp. nov.

♂ Assam and N.E. Frontier of India. Long. 3 mm.

Head.—Frons ¼ to ⅓ width of head; two frontal bristles on upper part, from the ocellar spot; a pair of long converging

vertical bristles and a pair of smaller outer diverging ones. Face with a little grey shimmer viewed from certain directions; proboscis and palpi black. Antennae dull black; from base of 2nd joint to tip of 3rd, exactly equal to half the height of the eye; 2nd joint with a single bristle above; arista very finely but not shortly plumose above and below. Back of head black.

Thorax.—Blackish with an aenous green tint and microscopic pubescence. A row of four bristles near posterior margin; 2 supra-alar, 2 notopleural, 2 sternopleural bristles. Sides of thorax dull black. Scutellum concolorous with thoracic dorsum; two post-basal bristles towards sides; a pair of converging apical ones.

Abdomen.—Dull black, with a suspicion of a faint aenous green tinge in certain lights; a little shining towards the base at the sides; very shortly pubescent. Belly black.

Legs.—Black, a row of bristly hairs below femora, remainder of legs shortly pubescent, as are the femora also.

Wings.—Pale but distinctly yellowish; halteres black.

Described from 3 ♂♂; Rotung, 1400 ft., 25—26-xii-11, and Sadiya, 23-xi-11.

This must be near Meijere's *aenea*, described from East Austria but not known to Schiner. It is rather larger, and seems to have affinities with more than one of Meijere's lately described species from Java.

Lonchaea, sp.

Two specimens in very indifferent condition represent a second species, noticeable by the reddish yellow antennae. Slightly but appreciably larger than *L. montana*. From Kobo, 400 ft., 3-xii-11, and Dibrugarh, 17—19-xi-11.

Lauxania flavicornis, mihi, sp. nov.

Assam. Long. 3 mm.

Head.—Frons shining black, the sides parallel, distinctly but not greatly more than one-third the width of the head. A median velvet-black stripe from vertex, gradually narrowing on reaching base of antennae; the very distinct but small yellow ocelli placed on this stripe well below the vertex. Antennae orange-yellow, normally shaped, the 2nd with a few bristly hairs at tip, 3rd very elongate cylindrical, nearly twice as long as first two joints together, black, with a long white arista which is yellowish at its base and microscopically plumose. Two pairs of dorso-frontal bristles, the upper pair just below the ocelli, situated half-way between the velvet-stripe and the eye margin, the lower pair half-way between the upper pair and the base of the antennae, set rather more widely apart.

A pair of long, converging vertical bristles placed midway between the velvet-stripe and the eye margin; a pair of similar ones outside of these, and a pair of very small ones immediately behind middle of vertex. Occiput black, a little behind vertical

corners of eyes. Underside of head shining black, very smooth, slightly swollen; proboscis and palpi concealed, black.

Thorax.—Wholly shining black (bristles mostly damaged); three or four dorso-central, one or two supra-alar and the usual basal and apical pair on the scutellum are visible Scutellum and metanotum shining black.

Abdomen.—Shining black, minutely pubescent.

Legs.—Fore femora brownish yellow, becoming blackish on apical third or half, middle femora black, broadly brownish yellow at base and tip, hind femora black up to the middle or a little beyond, remainder brownish yellow. Fore tibiae black on basal half, the remainder whitish; fore tarsi black. Posterior tibiae and tarsi brownish yellow, hind metatarsus a little brownish above. Posterior tibiae with one preapical bristle.

Wings.—Pale yellowish, veins yellow, halteres whitish with black knobs.

Described from a single specimen from Sadiya, 25-xi-11.

Drepanephora multimaculata, mihi, sp. nov.

(Pl. vi, figs. 14-15).

♀ ♂ N.E. Frontier of India. Long. 3 mm.

Head and appendages entirely very pale yellow except for a little brown at the base below the head, for the black occiput, which is perpendicular, and for the upper side of the antennae which is narrowly dark brown, with thickly pubescent arista, the latter black. The vertex is in the form of a truncated cone.[1] Three pairs of fronto-orbital bristles, the uppermost pair practically on the vertex; a pair of vertical bristles, close together, immediately behind the ocelli, which latter are brown, closely approximated, each bearing a bristle. A row of rather short bristly hairs along the cheeks. The 2nd joint of the antennae has the normal single long bristle above, and two or three of different lengths below. Proboscis well developed, perpendicular; palpi long, cylindrical, with a few stiff hairs.

Thorax.—Pale brownish yellow, with numerous moderately stiff hairs. On each side of the dorsum are four very conspicuous elongate black spots, the anterior one over the shoulder, the fourth ending in the wing-base, the other two intermediate and equidistant. On the pleurae each side, in a line with the coxae, are four similar black elongate spots or short stripes, the two posterior ones bifid at the upper end.

Abdomen.—Pale brownish yellow with a broad blackish brown median stripe occupying one-third the width of the segments, terminating at the end of the 4th segment. Soft hairs cover the surface of the abdomen, and a row of long stiff hairs on the posterior margin of each segment. Belly pale yellowish, nearly bare.

[1] As illustrated by Hendel, Gen. Ins. Fasc. 68, pl. I, fig. 1.

Legs.—Pale yellow; fore femora with two dark brown bands (which give the impression that in some individuals they may be incomplete), placed, one at the base, the other at the middle. Posterior femora with a subapical band, not always complete below; all the tibiae with two narrower bands dividing the limb equidistantly; tarsi all pale yellowish. All the femora with long soft hairs on underside; tibiae with shorter soft hairs, and hind tibiae with three preapical bristles.

Wings clear, with narrow brown streaks from the costa to the hind margin. The first two very narrow, the 3rd slightly widening towards the hind margin; the 4th is bifid on the costa, single at the 2nd longitudinal vein, and extending only to the 5th vein. The 5th streak has three endings on the costa, the distal two uniting at the 2nd longitudinal vein, the proximal one uniting also at the 3rd vein; the band being almost interrupted in the discal cell, and reaching the hind margin of the wing broadly, half way between the tip of the 5th vein and the anal angle. The remaining wing marks may be best described as a streak (longitudinal to the axis of the wing) between the 2nd and 3rd veins at the end of the wing, and a streak each on the last fourth of both the 3rd and 4th longitudinal veins, these three streaks being united proximally by a narrow oblique band which continues over the posterior cross-vein to the wing margin, where it broadens and runs along the margin of the 2nd posterior cell. The hind border of the wing is also brown except narrowly between the hinder terminations of the 3rd and 5th bands (the 4th does not reach the wing margin). The tip of the 2nd vein is darkened but not suffused; the costa is brown on the parts where the bands beg n, otherwise clear. Halteres pale yellow.

Described from one specimen (? ♂) from Rotung, 1400 ft., 27-xii-11, under leaf stem of plantain.

Camptoprosopella notatifrons, mihi, sp. nov.

(Pl. vi, figs. 16-17).

♂ ♀ N.E. Assam. Long. 3½ mm.

Head.—Wholly orange yellow or brownish yellow, except for a more or less quadrate lemon-yellow space touching the vertex. Frons distinctly more than one-third the width of the head, with a large jet-black circular spot from the vertex reaching more than half way to the base of the antennae, and a similar round spot each side of the face a little below the antennae. Antennae concolorous, 3rd joint elongate, the thickly pubescent black, basally situated arista very conspicuous, as long as the 3rd joint. Proboscis brownish yellow, palpi very small, cylindrical, black, with a bristly hair or two. A row of three fronto-orbital bristles, each set in a small brown spot on the frons, but the upper pair practically on the vertex; post vertical bristles close behind these latter, divergent.

Thorax.—Brownish yellow, with four well-separated very thin black lines which fade away at or just behind the middle of the dorsum; pleurae a little lighter. Bristles (mostly damaged) comprise at least one post-humeral, one mesopleural (notopleural?), one supra-alar and one or two dorso-central; there being a row of four near the posterior margin of the dorsum. Scutellum and metanotum brownish yellow, former rather elongate, with bristles beyond the base each side, and an apical pair.

Abdomen.—Brownish yellow, 1st segment paler; segments towards sides, especially on apical half of abdomen, more or less brown or blackish brown; sometimes a small round black spot each side on dorsum of penultimate segment. Belly brownish yellow. The colour of the whole abdomen varies in shade in individual specimens. The ♀ (?) has a long thick conical bisected process curled under its belly.

Legs.—All brownish yellow, minutely pubescent, tarsi darker.

Wings.—Distinctly brownish yellow, unmarked; venation in conformity with Hendel's figure (Gen. Ins. Fasc. 68, pl. I, fig. 11); haltereres pale yellowish.

Described from four specimens, Sadiya, 23—28-xi-11.

Stenopterina flavofemorata, mihi, sp. nov.

♂ N.E. Assam. Long. 7 mm.

Head.—Frons less than one-third of the head, blackish; face blackish, dull brownish yellow about the cheeks and immediately below the antennae; of the latter, the two basal joints are dull brownish yellow, the 3rd blackish grey with microscopic grey dust, the arista yellowish and minutely pubescent at base, the remainder being black and bare. Back of head black, slightly shining, a little grey-dusted around the eyes, both narrowly on the frons and on their hinder margin. Proboscis rather bulky, brownish yellow, blackish in parts. A pair of median converging, and a pair of outer diverging vertical bristles; (frontal bristles broken off).

Thorax.—Dorsum dull aenous green, with a pair of obvious but not very distinct, approximated, moderately narrow grey stripes from anterior margin to near posterior border; shoulders bluish violet tinged. Sides dull aenous green, the hinder part of the sternopleura blackish with miscroscopic grey dust; scutellum and metanotum dull aenous green, former with the two normal pairs of bristles.

Abdomen.—Ground colour black, with, when viewed from certain directions, a dark violet tinge; covered with miscroscopic yellowish grey hairs.

Legs.—Coxae blackish grey, a little grey-dusted, brownish yellow at tips; femora wholly brownish yellow except for a small (possibly variable) blackish streak on underside of hinder pair; tibiae and tarsi all black, underside of hind tarsi with minute golden yellow pubescence.

Wings pale grey. Costa as far as auxiliary vein quite clear, thence narrowly blackish up to just beyond the tip of the 4th longitudinal vein. A median blackish longitudinal streak fills the 1st basal cell, and extends in attenuated form to the upper end of the posterior cross-vein; 2nd basal, anal and discal cells, and remainder of wing wholly clear. Halteres dirty yellow.

Described from a single ♂ from Sadiya, 25-xi-11.

Stenopterina aenea, Wied.

One specimen from Dibrugarh, 17—19-xi-11, is either this species or *eques*, Sch., and I am not convinced that these two forms are really distinct. Yet when describing *eques* (from six specimens) Schiner had also before him three examples that he referred to *aenea*. The characters he draws do not seem at all consistent. There is much variation in a small series in the Indian Museum which I had previously referred to *aenea*, and a close approximation to two specimens sent by Herr Meijere from Java as *eques*. The amount of reddish colour in the face, about the mouth, on the antennae and occasionally the frons also, and also its extent at the femora tips, the length of the median longitudinal black streak on the wing, the violet or bluish shoulder tips and other characters all seem liable to variation independently of one another.

Nerius obscurus, mihi, sp. nov.

♀ N.E. Frontier of India. Long. 6½ mm. (excl. ovipositor).

Head.—Chocolate brown on frons and upper side of neck; sides of head dark brown, very shining. Underside of head, proboscis and palpi yellowish. Antennae with 1st and 2nd joints subequal, 3rd a little longer, tip rounded, arista white, yellow at base (a character common to several species); the antennae brownish yellow, more or less marked with black, especially on upper side of all three segments.

Thorax.—Yellowish brown; dorsum, sternopleurae and metanotum chocolate brown.

Abdomen.—Dark chocolate brown; ovipositor two-thirds the length of the abdomen.

Legs.—Coxae brown, femora brownish yellow, with narrowly black tips and a narrow yellow ring, incomplete below, just before the black tips. All femora with a row of minute bristly hairs below, from base to tip, weakest on hind legs; middle femora without any very short stiff bristly hairs on upper side towards base. Anterior tibiae dark brown, hind pair lighter; all tarsi black.

Wings.—Yellowish; 3rd longitudinal vein nearly straight, 4th approximating normally to 3rd at the tip. Tip of 2nd vein, of the 3rd and 4th veins jointly, and both cross-veins very faintly

but perceptibly darkened. Halteres whitish yellow, a little brownish at tips.

Described from one ♀: Rotung, 1400 ft., 26-xii-11.

N.B.—From the narrow yellow ring on the femora this species must be near *annulipes*, Dol., but that species has both the fore femora slightly but distinctly thickened and the fore tibiae conspicuously dilated. The synonymy of *tibialis*, Dol., with *annulipes* is not mine but from Doleschall's figure of *tibialis* it evidently stands out by the peculiar construction of its forelegs from all other eastern species of the genus, yet he does not mention this character in his description of *annulipes*; in which he says all the femora have a reddish ring.

CELYPHINAE.

Celyphus scutatus, Wied.

Five specimens from Sadiya, 23-xi-11, and Rotung, 1400 ft., 25-xii-11. In the Indian Museum in plenty from Calcutta, Tenasserim, Upper Burma and the Nilgiris.

Celyphus ? lucidus, Karsch.

Five specimens appear to be this species. The species is represented in the Indian Museum by a considerable number from various localities, but I cannot identify it with any of the older descriptions. As Karsch notifies *lucidus* from Ceylon, differentiating several new species in a table but giving no further description of it, I here append some notes from the specimens before me.

Brownish yellow; antennae similar, 2nd joint with a circlet of short bristly hairs near base, arista thickened for three-fourths of its length, and of a dirty blackish grey colour Thorax, viewed from certain directions, with a light but obvious aenous blue-green tinge. Scutellum granulated at sides but hinder part nearly or quite smooth; a faint but distinct middle, pale, very narrow line. Colour of abdomen varying from brownish yellow to blackish Legs brownish yellow, fore femora with a few bristles below. Wings and veins yellowish.

The Abor specimens were taken as follows: Rotung, 25-xii-11; Sadiya, 27-xi-11; Kobo, 3-xii-11; and Dibrugarh, 17—19-xi-11.

DIOPSINAE.

Diopsis indica, Westw.

Rotung, 1400 ft., 25-xii-11; Dibrugarh, 17—19-xi-11. Six specimens. The Indian Museum has a series taken by Mr. Kemp on the Assam-Bhutan Frontier in December, 1910; also others from Bhim Tal, Naini Tal, Tenasserim and Rangoon.

TRYPETINAE.

Ptilona dunlopi, Wulp.

Dibrugarh, 17—19-xi-11; one ♂, two ♀♀. In these specimens the wing marks agree exactly with Van der Wulp's plate; his type coming from Padang.

Rioxa, sp. nov.

One ♂, Dibrugarh, 17—19-xi-11.
This is identical with a new species to be described by Prof. Bezzi in his forthcoming paper on Indian *Trypetinae*.

Acidia fossata, F.

One ♂, Kobo, 400 ft., 7-xi-11. Described from Tranquebar. In the Indian Museum from Travancore, Tenasserim, Assam and Sukna. This species has been referred to the genus (sub-genus) *Anomoea*, Walk.

Spheniscomyia sexmaculata, Macq.

Sadiya, 23-xi-11, one specimen. Described from Sumatra. In the Indian Museum from Naini Tal, Calcutta and Sarawak, and I have taken it myself at Batavia.

Themara maculipennis, Westw.

One ♂, Kobo, 400 ft., 1-xii-11. Evidently a somewhat widely distributed species, as it occurs in Singapore, Java, Borneo, Amboina and other places.

SEPSINAE.

Sepsis indica, Wied.

One ♂, Dibrugarah, 17—19-xi-11. A widely distributed common Oriental species.

Sepsis viduata, Thoms.

Three ♀♀, Dibrugarh, 17—19-xi-11. Extensively distributed in the East.

Sepsis bicolor, Wied.

Kalek, 3800 ft., 29-xii-11, by sweeping. A very widely distributed species in the East, extending to China.

Sepsis coprophila, Meij.

Kalek, 3800 ft., 27-xii-11, by sweeping. A widely distributed species at least in India; described originally from Java.

MICROPEZINAE.

Calobata trifascipennis, mihi, sp. nov.

(Pl vi, fig. 19).

♂ ♀ Assam. Long 10 mm. (excl. ovipositor).

Head.—Frons shining black, with a brilliant dark blue tinge on lower part; a velvet black spot on the frons, elongate-triangular in shape, its apex at the vertex, and with a small triangular prolongation at its lower extremity; the minute ocelli set just before the apex of the spot. Face dull blackish, a little brownish yellow on lower margin of eyes, around the mouth border and immediately below the antennae. Proboscis and palpi blackish, antennal 1st and 2nd joints blackish, 3rd dull brownish yellow, with microscopic greyish pubescence; arista black, minutely pubescent at base, where it is yellowish. Back of head shining brownish black, the normal pair of vertical bristles and a pair of post-vertical ones. (In the type there is a supplementary very short bristle in front of one of the vertical ones).

Thorax, scutellum and metanotum dull blackish. (Bristles mostly broken off). One pair of dorso-central, near hind margin, one or two supra-alar and an apical pair of scutellar bristles.

Abdomen blackish, a little blue tinged, hardly shining, an indistinct greyish band on hind margins of 2nd and 3rd segments; belly obscure, genitalia large.

Legs.—Coxae black, fore legs dark brown, tips of metatarsus and remainder of tarsus whitish yellow. Posterior femora and tibiae brownish yellow; middle tibiae sometimes darker; posterior tarsi mainly black for a greater or less distance from the tips. Posterior femora with three indistinct or incomplete blackish bands, the first basal, the second just beyond the middle, the third subapical, all these bands subject to variation in extent and intensity, sometimes reduced to a mere trace. The hind femora have in addition a narrow bright yellow ring at the extreme base.

Wings nearly clear; 1st posterior cell closed immediately before the border. An ill-defined but distinct, brownish transverse band across the middle from the costa to just below the discal cell, its proximal edge passing distad of the anterior cross-vein. The wing tip still more indistinctly but obviously clouded brownish; an irregular, indistinct brownish spot over the 1st basal cell and basal half of the discal cell. Halteres very small, obscurely brown.

Described from 3 examples; Dibrugarh, 17—19-xi-11.

N.B.—Judging from the description this form appears to be new, although in such a critical genus as *Calobata* the species require very careful comparison, and the Oriental ones are badly in want of complete revision.

PSILINAE.

Psila kempi, mihi, sp. nov.

(Pl. vi, fig. 18).

♂ ♀ N.E. Frontier of India. Long. 5½ mm.

Head.—Bright yellow, a little brownish from vertex to antennae; the vertex, which is deeply cut away behind, mainly occupied by a large velvet black spot with a semicircular outline on its lower part. A very large semicircular velvet black spot on each side of the frons, widely separated from the vertical spot, but absolutely contiguous throughout its whole width with the eye margin, and contiguous to the base of the antennae, the interval between the two spots being equal to one-fifth the width of the frons at that spot. Ocellar spot brought well forward on the frons, contiguous to the lowermost edge of the vertical black spot; it is blackish, the ocelli pale yellow. The frons proper bears two pairs of dorso-central strong curved bristles, the lower pair situated at the middle of the inner margin of each large frontal spot, the upper pair placed in a line with the lower edge of the vertical spot, but separated from both it and the eye margin. A third pair of bristles is vertical, between the upper corners of the vertical spot and the eye margin. Behind these, and distinctly behind the vertical margin, is another pair. Antennae yellow, 3rd joint elongate-oval, with rounded tip, the upper and outer edge blackish; the arista black, long plumose on upper side, bare on underside except for a few short hairs towards the tip The face bears a black median stripe Proboscis light yellow, with large labella, each bearing a black spot; palpi long cylindrical, pale yellow, with a few light hairs.

Thorax.—Light ferruginous, a brownish median stripe of moderate width from anterior margin, diminishing in intensity posteriorly Sides of thorax concolorous, a small darker longitudinal streak below shoulders. A pair of dorso-central bristles just in front of the scutellum; two supra-alar bristles; one notopleural. Scutellum and metanotum brownish yellow, dorsum of former wholly blackish; a strong basal bristle each side and a pair of strong apical bristles

Abdomen.—Dull black, basal half of 1st segment and genitalia yellow. There is a transverse yellowish band across the middle of the abdomen which fades after death.

Legs.—Femora yellow, posterior femora narrowly black at tips; tibiae black; tarsi black, fore metatarsi pale yellow; all metatarsi equal in length to rest of tarsus.

Wings.—Very pale yellowish; apical margin from in front of 3rd longitudinal vein to about tip of 5th vein very narrowly brown suffused; a narrow brown band of irregular width from tip of 2nd vein, traversing the posterior cross-vein, ending on 5th vein.

A brown streak, widest in the middle, on posterior side of 5th vein, not quite extending as far as opposite the anterior and posterior cross-veins. This streak varies in extent, as in one specimen it reaches the hind margin and is more diffused in nature.

Described from 3 specimens, Kobo, 400 ft., 2-xii-11, by sweeping in thick jungle.

OSCININAE.

Chlorops maculipleura, mihi, sp. nov.

N.E. Frontier of India. Long. barely 1½ mm.

Head.—Bright yellow; upperside and tip of 3rd antennal joint black, arista black, pubescent; ocellar triangle black; a little blackish about mouth opening; centre of back of head black. Frons with about 5 or 6 stiff hairs as orbital bristles, a pair of small vertical bristles behind the ocellar triangle, and two vertical similar bristles behind the corner of each eye.

Thorax.—Dorsum yellowish brown, or it may be considered yellowish with three rather indistinct nearly contiguous brown stripes, of which the median is the widest. A very distinct oval black spot of moderate size on the sternopleura. Sides of thorax, scutellum and metanotum yellow. Thoracic bristles mostly broken off, but there is at least a pair of strong dorso-central bristles near the posterior margin and several less strong ones, laterally from the shoulder to the wing base. Scutellum with a pair of bristles towards the sides, midway between base and apex, and an apical strong pair.

Abdomen.—Brownish yellow, a brown indistinct spot towards the sides of 2nd and 3rd segments; belly yellow.

Legs yellow. *Wings* clear, venation normal; halteres yellow.

Described from one specimen from Kobo (400 ft.), 9-xi-11.

Meromyza, sp.

One example in bad condition, the antennae and most of the bristles being missing, the wings are also damaged.

It is bright yellow with three broad black shining thoracic stripes nearly contiguous; a black spot on the mesopleura, a larger one on the sternopleura and one on the metapleura; also one on each side below the abdomen. Frons shining blackish brown; legs all yellow. Yembung, 1100 ft., 13-i-12.

? Pachylophus rufescens, Meij. (*Myrmemorpha*).

Assam, India. Long. 1½-2 mm.

Head.—Yellowish or brownish yellow, underside paler yellow, generally with a little whitish dust on face and cheeks. Ocellar triangle black, small; the configuration of a large triangular frontal

spot more or less visible by a darker outline; in occasional specimens a large shining brownish triangle distinctly visible. Antennae yellow, 3rd joint elongate, with a thickened black densely pubescent arista twice as long as the joint, turned inwards slightly but obviously. Back of head yellowish, often with an irregularly shaped black spot in the middle.

Thorax varying from yellowish to rather dark brown, the usual three dorsal stripes present in some specimens but indistinctly. Usually the stripes are not visible, in some cases the spaces between them appear as two fine indistinct whitish lines. In other examples the whole thorax, including sides and scutellum, are dark brown, nearly blackish. The scutellum bears a few weak stiff hairs about its tip.

Abdomen varying from brownish yellow to dark mahogany brown; sometimes a little pale yellowish about the base, generally with posterior margins of segments very narrowly pale. Belly usually similar to upperside.

Legs wholly bright brownish yellow; fore pair often a little paler, front and hind tibiae often obscurely blackish, and some of the tarsi often more or less darkened. Hind femora distinctly but not greatly enlarged.

Wings clear; 3rd longitudinal vein not parallel with 2nd or 4th; anterior cross-vein just beyond tip of 1st vein (in some specimens barely so); posterior cross-vein distant from anterior cross-vein by a little more than its own length, its position not being quite stable. Halteres very pale yellowish.

Described from 3 specimens from Dibrugarh, 17—19-xi-11; also from a considerable series in the Indian Museum. Calcutta, 13-iii-07 [*Annandale*]; 17-v-07; 17-vii-07; 9-viii-07; Allahabad, 15-viii-09 [*Lord*]; Manbhum Dist., Bengal, 13-x-09 [*Jenkins*]; Monghyr, Bengal, 23-ix-09 [*Jenkins*]; Kulti, Bengal, 10-viii-09 [*Lord*]; Rajmahal, Bengal, 14-ii-10 [*Chaudhuri*]; Mangaldai, Assam-Bhutan Frontier, 30—31-xii-10 [*Kemp*]; Jahada, Nepal, 14-ii-08.

Some uncertainty attaches to this species. The generic characters agree perfectly with Becker's plate of *Pachylophus*, and figure of the antennae (Ann. Mus. Hung. viii, pl. xiii, 5-6), except that the hind femora in the present species is not spinose below. Loew says in his generic description that the frons protrudes forwards considerably in front of the eyes, and figures this character very definitely, but it is not obvious in Becker's figure, and it is certainly absent in my species.

As regards the spinose underside of the hind femora, Loew did not make it a generic character, nor is it necessarily one, and it does not appear in the description of *rufescens*, Meij. As the present species agrees with remarkable precision with Becker's description of *rufescens*, Meij., it is reasonable to assume the identity, especially as the present is a quite variable species and apparently widely distributed.

Oscinis[1] **obscuripes**, mihi, sp. nov.

Assam and N.E. Frontier of India. Long. 2—2½ mm.

Head.—Occiput dark grey, frons on upper part blackish, with a large triangular shining black spot reaching from vertex nearly to antennae; frons below this spot bright yellow. Head below antennae brownish yellow, rather variable in shade. Antennae yellowish, upperside broadly dark brown, arista dark; proboscis darkened.

Thorax, scutellum and metanotum wholly blackish grey.

Abdomen.—Blackish grey, underside paler, sometimes nearly whitish.

Legs.—Yellowish, femora mainly blackish, leaving a broad yellow part at base and a narrow yellow ring at tip. Tibiae and tarsi mainly blackish, the former always pale at base for a greater or less distance; underside of tarsi paler, and hind tarsi sometimes yellowish on upper side also.

Wings clear; halteres whitish.

Described from six specimens from Dibrugarh, 17—19-xi-11, and one from Kobo, 9-xi-11.

Amongst the remainder of the *Acalyptrata* there is an Ephydrid, a Geomyzid, two Drosophilids and about half a dozen other species that owing to their indifferent condition it is impossible to classify generically; all these except one species of (?) *Drosophila* being represented by single specimens only.

PUPIPARA.

Cyclopodia horsefieldi, Meij.

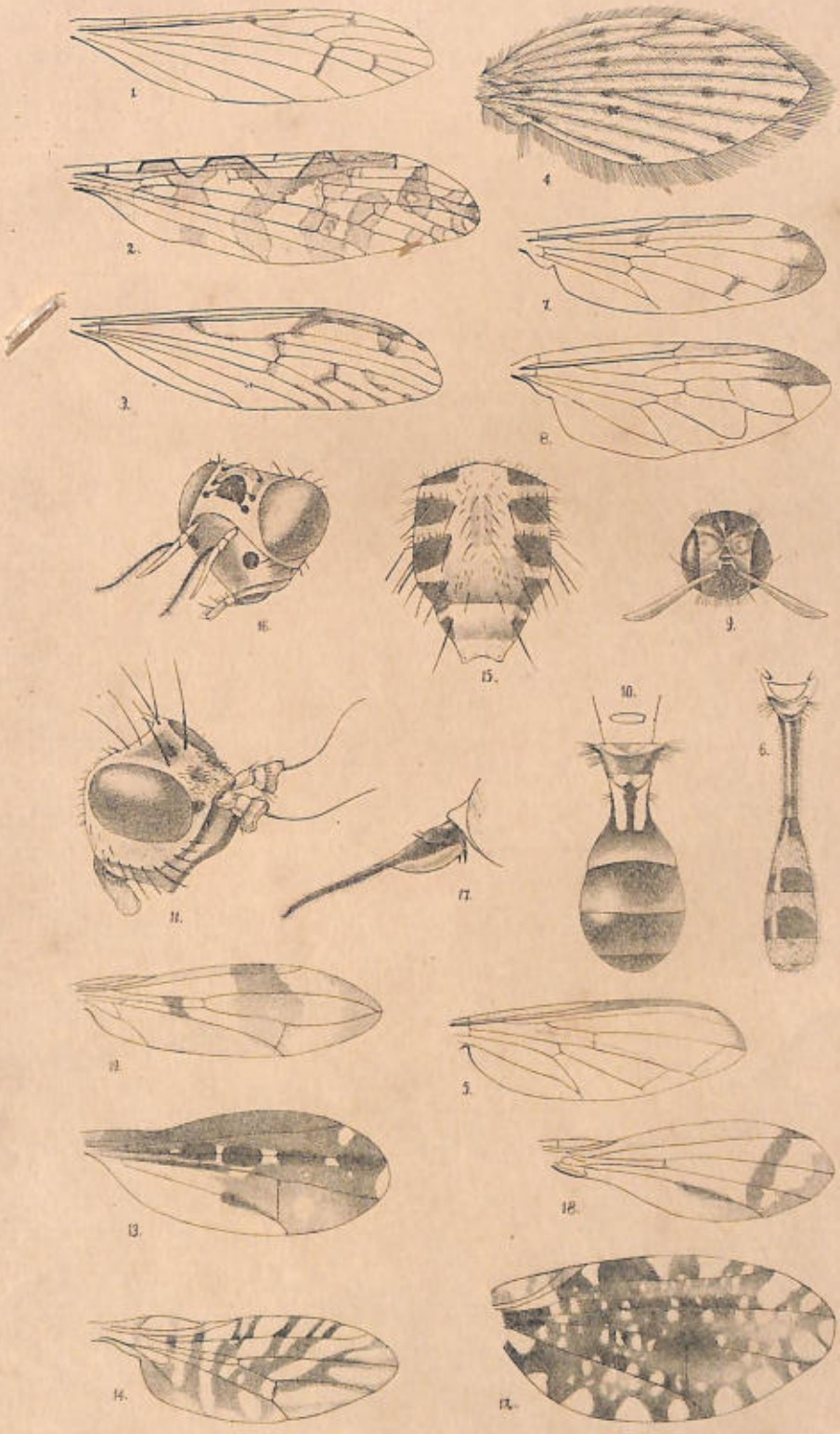
Two specimens taken on a flying-fox (*Pteropus medius*, Temm.); Sadiya, 24-xi-11.

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[1] There is no justification for altering this generic name to *Oscinella*, Beck. as *Oscinis* has stood unchallenged since 1804.

EXPLANATION OF PLATE VI.

FIG. 1.—*Geranomyia notatipennis*, Brun., sp. nov. wing.
,, 2.—*Epiphragma kempi*, ,, ,, ,,
,, 3.—*Dicranophragma gracilis*, ,, ,, ,,
,, 4.—*Psychoda notatipennis*, ,, ,, ,,
,, 5.—*Bacha flavopunctata*, ,, ,, ,,
,, 6.— *id.* ,, ,, abdomen.
,, 7.—*Sphegina tristriata*, ,, ,, wing.
,, 8.—*Mixogaster vespiformis*, ,, ,, ,,
,, 9.— *id.* ,, ,, head.
,, 10.— *id.* ,, ,, abdomen.
,, 11.—*Trigonometopus trilineata*, ,, ,, head.
,, 12.—*Sciomyza ocellata*, ,, ,, wing.
,, 13.— ,, *7-lineata*, ,, ,, ,,
,, 14.—*Drepanephora multimaculata*, ,, ,, ,,
,, 15.— *id.* ,, ,, thorax.
,, 16.—*Camptoprosopella notatifrons*, ,, ,, head.
,, 17.— *id.* ,, ,, antenna.
,, 18.—*Psila kempi*, ,, ,, wing.
,, 19.—*Calobata trifascipennis*, ,, ,, ,,



D. Bagchi, del. et lith.

XII. COLEOPTERA, IV: LAMELLICORNIA

By G. J. Arrow, *F.E.S.*

The Lamellicornia consist of only 28 species, many of them represented only by single specimens. Nearly half the species are very widespread and familiar Indian insects and the complete absence of any representative of the Rutelinae, including such ubiquitous genera as *Anomala* and *Adoretus*, is probably accidental. Three species are here described as new, all of them being already represented in the British Museum collection.

CETONIINAE.

1. **Trigonophorus nepalensis**, Hope.

Rotung, 1400 ft., 23-xii-1911 (*Kemp*). One male specimen.

2. **Macronota nigricollis**, Jans.

Upper Renging, 2150 ft., 4-ii-1912. One specimen was found under rotten wood by Mr. Kemp.

3. **Glycyphana nepalensis**, Kraatz.

Rotung, 1400 ft., 23-xii-1911. One specimen was found by Mr. Kemp in rotten wood.

G. minima, Bates, although closely related, is not the same as *G. nepalensis*, Kr., but, as I have found by examination of the type in M. Oberthür's collection, is a form occurring in Java, Borneo and the Malay Peninsula. It seems to me doubtful whether it really occurs, as supposed, in the Punjab and for this reason it was omitted from my volume in the "Fauna of India" series. Another insect, *Melolontha argus*, Burm., recorded by Bates from the same locality, I believe to be purely Malayan and I am therefore inclined to believe that a few Malayan specimens were accidentally mingled with the Indian collection described by him.

4. **Protaetia inanis**, Wall.

Rotung, 1400 ft., 23-xii-1911. One specimen found with the preceding. This is of the usual copper-coloured Indian race (var. *cuprea*).

5. **Protaetia fusca**, Herbst.

Rotung, 1400 ft., 2-i-1912. A single example.

DYNASTINAE.

6. **Eupatorus hardwickei**, Hope, var. **cantori**, Hope.

Upper Rotung, 5-i-1912. A male specimen was found by the 32nd Sikh Pioneers while road-making. This is the only representative of the Dynastinae taken and the Rutelinae are entirely unrepresented.

MELOLONTHINAE.

7. **Hoplia** sp.

Three minute specimens, two males and one female, taken together at Rotung probably belong to one species, but the sexes are quite dissimilar and further evidence of their specific identity is necessary.

8. **Lachnosterna sikkimensis**, Brenske.

Rotung, 1400 ft., 31-xii-1911; Upper Rotung, 26-i-1912; Kobo, 400 ft., 30-xi-1911. Several examples of this species were found under stones.

9. **Lachnosterna serricollis**, Hope.

Rotung, 1400 ft., 31-xii-1911. One specimen taken by Capt. the Hon. M. de Courcy.

10. **Lachnosterna** sp.

Above Upper Renging, 7-ii-1912. One specimen of a species not previously known to me, taken by Capt. the Hon. M. de Courcy.

11. **Melolontha indica**, Hope, (=**flabellata**, Sharp).

Kobo, 400 ft., 7-xii-1911. A male taken by Mr. Kemp.

This species "described" in Gray's Zool. Misc., 1831, p. 23, was omitted from the Munich Catalogue. It is one of the species with an acute mesosternum for which the genus *Hoplosternus* was formed. I am not able to recognize that genus, for the process is found in every stage of development and in *M. guttifera*, Sharp, is long in the female and absent in the male. *M. indica*, Hope, is probably the insect described by Burmeister as *Hoplosternus nepalensis*, Hope. That name was used by Blanchard but not by Hope.

12. **Apogonia** sp.

Rotung to Kalek, 2000-3500 ft., 14—15-iii-1912. A single specimen of a species unknown to me.

13. **Microserica viridicollis**, sp. nov.

Nigra, opaca; capite, pronotoque viridi-æneis, elytris nonnunquam rufis, leviter opalescentibus, corpore brevi, globoso; clypeo

nitido, grosse punctato, margine antico fortiter elevato, fere recto, fronte opaco, sicut pronoto minute punctato; scutello antice lato, apice sat acuto, lateribus fere rectis; elytris sulcatis, irregulariter haud minute punctatis, interstitiis convexis, pygidio grosse punctato; tibiis anticis fortiter bidentatis:

♂, *antennis 5-foliatis*; ♀, *antennis 3-foliatis.*

Long. 5—5·5 *mm. Lat. max.* 3·5—4 *mm.*

Hab. Assam: Sylhet; Rotung, 1400 ft., 6—13-iii-1912.

Found by Mr. Kemp under bark and also on flowers.

This is less brightly coloured than the majority of the little species which compose the genus *Microserica*. The head and pronotum are deep green-black, the elytra black or brick-red and slightly iridescent posteriorly. The body is globose, the clypeus shining and coarsely punctured, with its anterior edge strongly reflexed and nearly straight. The forehead is opaque and, with the pronotum, finely punctured. The scutellum is broad in front and acute at the apex. The elytra are irregularly sulcate and fairly strongly punctured. The pygidium is coarsely punctured. The front tibiae are strongly bidentate. The club of the antenna consists of 5 joints in the male and 3 in the female.

14. **Serica** sp.

Below Damda, 300 ft., 31-i-1912—1-ii-1912; Rotung, 1400 ft., 31-xii-1911. Under stones. Two specimens in bad condition.

15. **Serica** sp.

Janakmukh, 600 ft., 17-xii-1911. One specimen found under bark by Mr. Kemp, in bad condition.

COPRINAE.

16. **Gymnopleurus assamensis**, Wat.

Kobo, 400 ft., 30-iii-1912. Two specimens were found by Mr. Kemp.

This species is common in Assam and Burma, where it replaces *G. sinuatus*, Oliv., the closely allied corresponding form of Siam, China and Japan. Korea was quoted by Mr. Waterhouse as a habitat of *G. assamensis*, but this was an error due to wrong labelling of specimens.

17. **Paraphytus hindu**, sp. nov.

Niger, nitidus, elongatus, convexus, capite inæquali; clypeo 4-dentato; pronoto crebre punctato, elytris subtiliter (octes) striatis, striis sat remote punctatis; corporis subtus lateribus grosse et crebre punctatis, metasterno postice modice punctato, antice laevi, sutura meso-metasternali fere recta.

♂ *pygidio polito, impunctato, paulo bigibboso, apice emarginato, basi medio fossulato*; ♀ *pygidio fortiter punctato, apice profunde fisso.*

Long. 5—6 *mm. Lat. max.* 3—3·5 *mm.*

Hab. ASSAM: Khasi Hills; Upper Rotung, 1400 ft.

This has an extremely close resemblance to the Malayan species *P. ritsemae*, Har., of which it has the same size, shape and sculpture. The two may be distinguished by examination of the pygidium. This in the (apparent) male of *P. hindu* is very smooth and bigibbose, the apex being deeply indented as in *P. ritsemae*, while the basal furrow has a large pit in the middle, so that the pygidium is partially divided into two lateral halves. In the other sex, the basal pit is hardly visible, but the apical notch is very deep, reaching to the middle of the segment, and the whole surface of the latter is strongly punctured. The metasternum is very distinctly punctured in its posterior median part and the suture between the meso- and metasternum, which is angular in *P. ritsemae*, is almost straight, or gently curved, in *P. hindu*.

Specimens of the two forms were found together by Mr. Kemp under bark and in rotten wood in January at 1400 ft. alt., but the male is represented by a single specimen only. Three males from the Khasi Hills (taken in July, 1894) previously existed in the British Museum and one of these is the type of the new species.

18. Catharsius molossus, L.

Sadiya, N. E. Assam, 24-28-xi-1911; Kobo, 400 ft., 30-xi-1911.

This large and common beetle is probably one of the most familiar of all Oriental insects.

19. Copris magicus, Har.

Rotung, 1400 ft., 31-xii-1911. One specimen was found by Mr. Kemp under a stone.

20. Onitis philemon, F.

Sadiya, N. E. Assam, 24—28-xi-1911. A single specimen.

21. Oniticellus vertagus, F.

Sadiya, N. E. Assam, 23-xi-1911. A number of examples were found on cow-dung by Mr. Kemp.

22. Onthophagus tarandus, F.

One specimen was found together with the preceding. It appears to be a common species throughout India.

23 **Onthophagus triceratops**, sp. nov.

Niger, vel aeneoniger, ore antennisque ferrugineis, nitidus, sat laevis, clypeo pronotoque minute et modice crebre punctatis, vertice fere impunctato; elytris fortiter punctato-striatis, interstitiis convexis, parce et minutissime punctulatis; pygidio distincte sat crebre punctato:

♂, vertice late retrorsum producto in laminam horizontalem cujus margo postica medio paulo, utrinque longe producta est, cornubus duobus gracilibus intus curvatis facientibus; clypeo paulo producto, reflexo, medio truncato; pronoto antice retuso haud dentato.

Long. 8—8·5 *mm. Lat. max.* 4·5—5 *mm.*

Hab. N. E. Assam: Sadiya, 23-xi-1911.

A male specimen of this species has long existed in the British Museum and another was taken by Mr. Kemp with the two species just previously mentioned. It is exceedingly like *O. luzonicus*, Lansb., but the elytral striæ are rather coarsely punctured and the interstices very finely, whereas in the Philippine form the scattered punctures are more evident than those in the striæ, which are very fine. In the male of the Indian species the cephalic lamina is a little produced in the middle between the horns, but in the other it is straight or slightly emarginate there, and on the other hand the prothorax is slightly prominent in the middle in the Malayan, but not in the Indian form.

24. **Onthophagus** sp.

Kobo, 400 ft., 30-iii-1912. A single specimen of a minute unknown species of this enormous genus.

APHODIINAE.

25. **Aphodius elegans**, All.

Yembung, 1100 ft., 8—9-ii-1912. One specimen.

26. **Aphodius urostigma**, Har.

Sadiya, N. E. Assam, 23-xi-1911.

This is an extremely common and widely distributed insect, ranging from the Himalayas to Ceylon and also to China, Japan, the Malayan Region and as far as east and south-east Africa.

27. **Aphodius chinensis**, Har.

Rotung, 1400 ft., 25-xii-1911. A single specimen was taken at light.

The species is common at Hong-Kong, but it is surprising to find it ranging so far westward.

28. **Saprosites marchionalis,** Har.

Kobo, 400 ft., 30-xi-1911. One specimen was taken by Mr Kemp from a Polyporus fungus.

XII. COLEOPTERA, V: ANTHRIBIDAE.

By Dr. K. Jordan.

Only 6 specimens belonging to four species were obtained by Mr. Kemp during the Abor Expedition. In the list given below 13 more specimens are enumerated, 2 being from Lower Burma, collected by Mr. F. H. Gravely, and the other 11 from the Lakhimpur district, obtained by Mr. H. Stevens. None of the species are new. We know as yet a very small percentage of the Anthribidae existing in Northern India and Burma. Judging from the number of species described from Southern India and the Malay Peninsula we may expect the family to be represented by an abundance of species in the wooded hill-tracts of Burma and Assam, and in the foot-hills of the Himalayas from North-East Assam and Bhutan westward.

1. **Acorynus carinifrons**, Jord. (1895).

2 ♂♂ from Dejoo, North Lakhimpur (base of hills), Upper Assam, 29-vi and 7-vii-1910 (*H. Stevens*).

The species is only known to us from the Khasi Hills in Assam, where it appears to be fairly abundant.

2. **Litocerus khasianus**, Jord. (1903).

2 ♀♀ from Dejoo, 26-vi-1910 (*H. Stevens*).

Likewise only known to us from the Khasi Hills.

3. **Litocerus paviei**, Lesne (1891).

1 ♂ from Kobo, Abor Expedition, 1400 ft., 1-xii-1911, in rotten wood (*Kemp*).

1 ♂ from Kawkareik, Amherst district, Lower Burma, 19—20-xii-1911, under bark of fallen tree (*F. H. Gravely*).

4. **Mecocerus allectus maculatus**, Jord. (1894).

1 ♂ from Thingannyinaung to Sukli, Dawna Hills, Lower Burma, 900-2100 ft., 23—27-xi-1911 (*F. H. Gravely*).

This form appears to be restricted to Burma. We have it from the Ruby Mines, Charin Cheba.

5. **Phloeopemon acuticorne,** F. (1801).

1 ♂ from Dejoo, North Lakhimpur (base of hills), 29-vi-1910 (*H. Stevens*).

An Indo-Malayan species, not known from South India and Ceylon.

6. **Xenocerus khasianus,** Jord. (1895).

1 ♂ and ♀ from Dejoo, 28-vi-1910 (*H. Stevens*).

Abundant in the Khasi Hills and Tonkin, but not known to occur further south.

7. **Xenocerus rectilineatus,** Jord. (1894).

1 ♂ from Dejoo, 6-vii-1910 (*H. Stevens*).

Fairly abundant in the Khasi Hills and in Burma; occurs also in Ceylon.

8. **Xylinades annulipes,** Jord. (1895).

1 ♂ from Rotung, Abor Expedition, 1400 ft., 23-xii-1911, in rotten wood (*Kemp*).

Known to me from the Khasi Hills, Siam and Tonkin.

9. **Xylinades plagiatus,** Jord. (1895).

1 ♂ from Rotung, Abor Expedition, 1400 ft., 7—8-vii-1911, under bark (*Kemp*).

1 ♂ from Dejoo, North Lakhimpur (base of hills), 6-v-1910 (*H. Stevens*).

We have numerous specimens from the Khasi Hills and Burma.

10. **Eucorynus crassicornis,** F. (1801).

1 ♂ and 2 ♀ ♀ from Rotung, Abor Expedition, 1400 ft., 28-xii-1911 and 7—8-iii-1911, under bark (*Kemp*).

A very common Indo-Malayan species.

11. **Anthribus macrocerus,** Jord. (1904).

1 ♀ from Dejoo, 28-vi-1910 (*H. Stevens*).

Only known to me from Darjiling, where the species appears to be fairly abundant.

12. **Basitropis hamata,** Jord. (1903).

1 ♂ from Dejoo, North Lakhimpur (base of hills), 29-vi-1910 (*H. Stevens*).

Described from Calcutta, but occurs also in the Nilgiri Hills

XII. COLEOPTERA, VI : UNE NOUVELLE ESPÈCE DE MALACODERMES DES INDES.

Par MAURICE PIC.

Idgia arbori, n. sp.

Angustatus, nitidus, griseo pubescens et pilis nigris hirsutus, nigro-plumbeo micans, pygidio testaceo. Antennis ad basin rufo notatis, pedibus nigris. Capite elongato ; antennis gracilibus ; thorace elongato, pro parte ruguloso-punctato, in medio aliquot subcaniculato ; elytris elongatis et angustatis, subparallelis, punctato-rugulosis et lineato tuberculatis.

Etroit, brillant, orné d'une pubescence grise et hérissé de poils noirs redressés, d'un noir plombé brillant, parfois à reflets faiblement verdâtres ou bleuâtres, avec le pygidium testacé. Palpes un peu teintés de roux et antennes foncées, ces dernières tachées de roux en dessous des premiers articles, pattes foncées. Tête allongée, creusée entre les yeux ; antennes grêles, pas très longues, presque entièrement foncées ; prothorax étroit, plus long que large, rétréci aux deux extrémités, orné d'une ponctuation en partie ruguleuse, avec d'ordinaire une trace de sillon médian non complet ; élytres bien plus larges que le prothorax, longs et étroits, plus étroits encore chez ♂ que chez ♀, subparalléles, arrondis séparément à l'extrémité, ornés d'une ponctuation ruguleuse et ayant des rangées de petits tubercules ou de granules brillantes plus ou moins marqués. Dessous du corps foncé comme le dessus, à l'exception de l'extrémité abdominale qui est testacée ; pattes grêles, foncées, hanches parfois un peu roussâtres. Long. 8–9 mill.

Yembung, 1100 pieds et Rotung, 1400 pieds.

Les types et co-types de cette espèce, au nombre de cinq, font partie des collections de l'Indian Museum de Calcutta et de la collection Pic.

Peut se placer près de *I. foveifrons*, Fairm ; bien distinct par sa coloration, le prothorax plus étroit et foncé au lieu d'être testacé.

XIII. THYSANOPTERA.

By RICHARD S. BAGNALL, *F.L.S., Hope Department of Zoology, University Museum, Oxford.*

No doubt specialized collecting in more propitious season and circumstances would have produced numerous species of Thysanoptera. Only one species was collected, however, namely:

Sub-order **TUBULIFERA.**

Fam. ECACANTHOTHRIPIDAE, Bagnall.

Genus **Ecacanthothrips,** Bagnall.

E. sanguineus, Bagnall.

Acanthothrips sanguineus, Bagnall, Ann. Mag. Nat. Hist., ser. 8, i, p. 361, 1908 (Apl.).

Ecacanthothrips sanguineus, Bagnall, Ann. Soc. Ent. Belgique, lii, p. 349, 1908 (Dec.).—Trans. Nat. Hist. Soc. Nd. and Durham, n. s. iii, p. 535, 1909.

Ormothrips sanguineus, Buffa, Redia, v, fasc. 2, p. 166, 1909 (March).

Originally described from a single dried specimen collected by Dr. A. R. Wallace in New Guinea, it has since been recorded by Buffa from Sumatra, and the islands Mantawi (Mentawei) and Engano, and Dr. Karl Jordan has sent me it in large numbers from the Island of Nias. More recently Mr. E. Green has met with it in Ceylon.

It is a bizarre form, chiefly characterized by the congregation of finger-like sense-cones on the enlarged third antennal joint.

1 ♂ and 1 ♀ taken under bark by Mr. Stanley Kemp below Dosing (1400 ft.), January 29, 1912 ($\frac{2+11+8}{19}$). Its occurrence in Northern India is interesting.

XIV. ARACHNIDA, II: OPILIONES.

By Dr. C. Fr. Roewer, *Bremen.*

The collection of Opiliones, collected by Mr. Kemp in 1911–1912 in the Abor country (N.E. Assam), contains 122 specimens representing fifteen species and eight genera.

This collection consists of:—

A. Subord. **PALPATORES.**

I. Fam. PHALANGIDAE.

(*a*) Subfam. Gagrellinae.

1. Gagrella feae (form. typ.) Thorell.

17 specimens: Sadiya (N.E. Assam), 25-xi-1911, under logs.
8 ,, : Kobo (400 ft.), 30-xi-1911, under logs.
10 ,, : Kobo (400 ft.), 30-xi-1911, from rotten wood and under bark.

2. Gagrella feae-humeralis, Thorell.

7 specimens: Janakmukh (600 ft.), 18-xi-1911, under decomposing plantain leaf-stem.
13 ,, : Sadiya (N.E. Assam), 25-xi-1911, under logs.

3. Gagrella lepida, Thorell.

2 specimens: Egar stream, between Rotung and Renging, 9-i-1912.
1 ,, : Rotung (1300 ft.), 1-i-1912.
1 ,, : Upper Rotung (*ca.* 2000 ft.), 11-i-1912.

4. Melanopa varians (With) Roewer.

3 specimens: Dibrugarh (N. E. Assam).

5. Melanopa atrata (Stoliczka) Roewer.

4 specimens: Kobo (400 ft.) 30-xii-1911, from rotten wood.
8 ,, : ,, (400 ft.), 30-xi—8-xii-1911, under bark.
1 ,, : Rotung (1300 ft.), 26-xii-1911.
1 ,, : Upper Rotung (*ca.* 2000 ft.), 9-i-1912.

6. **Zaleptus sulphureus**, Thorell.

2 specimens: Yembung (1100 ft.), in small stream on E. side of Dihang.
1 ,, : Rotung (1300 ft.), 20-xii-1911.
4 ,, : Upper Rotung (*ca.* 2000 ft.), 5—6-i-1912, found when road-making and under leaf-stem of plantain.

B. Subord. LANIATORES.

I. Fam. ASSAMIIDAE.

(*a*) Subfam. ASSAMIINAE, Roewer.

7. **Assamia sexdentata**, Thorell.

2 specimens: Rotung (1300 ft.), 30-xii-1911, under bark.
1 ,, : Kobo (400 ft.), 30-xi—8-xii-1911.

8. **Assamia aborensis**, sp. nov.

2 specimens: Upper Rotung (*ca.* 2000 ft.), 31-xii-1911.
1 ,, : Sirpo, near Renging (1000 ft.), iii-1912.

Measurements in mm.: Length of body 5; of 1st leg 7; 2nd 15; 3rd 10; 4th 13.

Dorsal scutum nearly rectangular; laterally, beyond the 1st transverse groove, very little rounded, with five distinct transverse grooves; its surface and also that of the free dorsal segments of the abdomen not roughened, but deeply shagreened; on each of the 1st—3rd areas of the abdominal scutum there are two and two submedian distinct tubercles, which are nearly thorn-like on the 3rd area; 4th and 5th area entirely unarmed. Under the *anterior margin* of the cephalothorax there are projected five horizontal teeth (one of them in the middle, the four others in pairs on either lateral corner); the upper anterior margin of the cephalothorax is, moreover, finely granulated all over and presents one erected tooth in the middle. *Ocular tubercle* twice as far from the 1st transverse groove of the scutum as from the anterior margin of the cephalothorax, transversely oval, low, only over either eye scattered with a few blunt granules. *Free ventral segments* of the abdomen deeply shagreened, also the 1st–4th *coxae*, the first of which however has one frontal and one median longitudinal row of blunt tubercles, and the second coxa has only a median one. Spiracula hidden under several bridge-teeth, which overarch the groove between the 4th coxa and the 1st free ventral segment. *Mandibles* small; the 1st segment with a well-separated, entirely smooth apical hump. *Palps* slender, crossed over one another; trochanter with two ventral tubercles; femur forming an **S**, compressed laterally, scattered dorsally with 4–5 small tubercles, armed ventrally with a complete series of pointed teeth; there is an inner apical tooth in addition; patella flattened ventrally with

both of its edges armed with a series of small pointed teeth; tibia and tarsus flattened ventrally with both edges armed with a longitudinal series of small pointed teeth; besides these teeth there are on the inner edge of the tibia one stout apical spine, on the outer edge of the tibia and on the outer and inner edge of the tarsus two and two prominent spines. *Legs* slender and long; trochanters unarmed and femora only scattered with very small granules. Number of the tarsal segments: 6; 11; 7; 8. There are two segments in the apical part of the 1st tarsus and three segments in that of the 2nd tarsus.

Dorsal surface of the body dark brownish; cephalothorax with one ferruginous median line and on either side of this line much sprinkled with the same colour. Also the transverse grooves of the abdominal scutum as well as the point of the two thorns of the 3rd area ferruginous. The lateral edges of the abdominal scutum present a large whitish band. *Ventral surface* of the body ferruginous, closely sprinkled with black, as well as the *mandibles* and *palps*. *Legs* ferruginous; trochanters, femora and tibiae with small and distinct black apical rings; only the patellae entirely black.

9. **Pygoplus trifasciatus**, Thorell.

8 specimens: Kobo (400 ft.), 30-xi-1911, from rotten wood and under bark.

1 ,, : Rotung (1300 ft.), 21-xii-1911, under stones.

10. **Macrobunus singularis**, Roewer.

5 specimens (2 ♂, 3 ♀): Kobo (400 ft.), 30-xi-1911, from rotten wood and under bark.

11. **Macrobunus longipes**, sp. nov.

1 specimen: Upper Rotung (*ca.* 2000 ft.), 6-i-1912, under leaf-stem of plaintain.

Measurements in mm.: body 5·5; 1st leg 18; 2nd 35; 3rd 24; 4th 34.

Differing from *Macrobunus singularis*, Rwr., only in the following particulars:

Measurements of *legs* comparatively much longer and more slender than those of the allied species; number of segments of the tarsi: 7; 12; 10; 11.

Colour of the cephalothorax and of the eye-tubercle unicolourous pale yellowish, also the median region around the two cones of the abdominal scutum, which is on the lateral and posterior margins almost black, thus surrounding on either lateral margin of the abdominal scutum one very white trilobate spot. This spot is much larger than that in *Macrobunus singularis*, Rwr. Free dorsal segments of the abdomen black, but edged by a narrow white transverse line on every posterior margin as well as on that

of the scutum. *Mandibles* and *palps* unicolourous pale yellowish. *Legs* pale yellowish; trochanters, femora and tibiae with small, but very distinct black apical rings; only the patellae entirely black.

12. **Macrobunus aborensis,** sp. nov.

7 specimens (2 ♂, 5 ♀): Renging, 19-xii-1911, under bark.
1 ,, (♂): Upper Rotung (*ca.* 2000 ft.), 6-i-1912, under leaf-stem of plantain.
1 ,, (♀): Yembung (1100 ft.), 13—17-i-1912.

Habitus, *armature* and *measurements* entirely the same as in *Macrobunus singularis*, Rwr., differing from this species only in the absence of the two trilobate white spots on the lateral margins of the abdominal scutum. There is a very distinct and very narrow pale ferruginous line on each lateral margin of the scutum and on the posterior margin of it and of every free dorsal segment of the abdomen.

II. Fam. PHALANGODIDAE.

(*a*) Subfam. Epedaninae.

Metathyreotus, gen. nov.

This new genus has precisely the same diagnosis as the genus *Thyreotus*, Thorell (*cf.* Roewer 1912 in: Arch. f. Naturg., A. 3, p. 226), except that the femur of the palp has no inner apical spine and is unarmed there, while *Thyreotus*, Thorell, shows there two long spines.

13. **Metathyreotus aborensis,** sp. nov.

2 specimens: Rotung (1300 ft.), 30-xii-1911, under stones.

Measurements in mm.: body 3; palp 7; 1st leg 7; 2nd 13; 3rd 9; 4th 11.

Habitus and *armature* of the body, of the mandibles and of the legs entirely the same as in *Thyreotus bimaculatus*, Roewer (1912), except for the following particulars:

Palp with the same habitus as *Thyreotus bimaculatus*, Rwr., but differing in the armature. Coxa dorsally entirely smooth; trochanter dorsally with one small granule and ventrally with two; the long cylindrical femur dorsally and at the inner apical tip entirely smooth, ventrally with four or five short tubercles (no spines!); patella on the inner tip with two and on the outer one with one long spine; tibia with three inner and four outer long spines; tarsus with three inner and four outer long spines.

Number of the tarsal segments 10; 20; 7; 7; terminal part of the 1st tarsus with 2, of the 2nd tarsus with 3 segments

Colour of the body and of the limbs the same as in *Thyreotus bimaculatus*, Rwr.; but wanting only the two white spots on the cephalothorax of the latter.

14. **Metathyreotus kempi**, sp. nov.

1 specimen: Rotung (1300 ft.), 21-xii-1911, under stones.

Measurements in mm.: body 3·5; palp 7; 1st leg 9; 2nd 14; 3rd 10; 4th 13. *Number* of the tarsal segments: 7; 17; 7; 7. Terminal part of the 1st tarsus with 2, of the 2nd tarsus with 3 segments.

Habitus, *armature* and *colour* of the body and the limbs entirely the same as in *Metathyreotus aborensis*, except that the femur of the palp is entirely unarmed ventrally.

III. Fam. ONCOPODIDAE.

15. **Pelitnus aborensis**, sp. nov.

1 specimen: Upper Rotung (*ca.* 2000 ft.), 31-xii-1911.
1 ,, Rotung (1300 ft.), 21-xii-1911, under stones.

Measurements in mm.: body 6; 1st leg 7; 2nd 10; 3rd 7·5; 4th 9·5.

This new species agrees almost entirely with the diagnosis of *Pelitnus annulipes*, Pocock (1897), but differs from it in the following particulars:

The *intraocular area* of the cephalothorax is elevated in the form of a large blunt and rounded dome, at the base of which the eye is situated on each side.

Abdominal scutum formed by 8 segments, distinctly indicated by deep transverse grooves; an equal longitudinal median groove connects the first transverse groove (between cephalothorax and abdomen) with the eighth, running through the 1st–7th segments of the abdominal scutum; the last (8th) of these segments of the scutum shows no longitudinal median groove.

Femur of the *palp* entirely unarmed ventrally, without any tubercle.

Colour of the body and of all the limbs blackish-brown throughout, except the tarsi of the legs, which are pale yellowish.

XV. MOLLUSCA, I: RATHOUISIIDAE.

By EKENDRANATH GHOSH, *L.M.S., B.Sc., Assistant Professor of Biology, Calcutta Medical College.*

(Plates x–xiii).

Two species of this family were obtained by Mr. Kemp in the Abor foot-hills, both new to science. I have described them under the following names :—

Atopos (*Podangia*) *kempii* and *Prisma aborense.*

Atopos (Podangia) kempii, n. sp.

Two slugs, obtained at Kobo (400 ft.), belong to a new species which may be named *Atopos* (*Podangia*) *kempii*, and briefly defined as follows:—

Notum of light straw-colour, being dirty in its upper two-thirds, with an irregular network of dark blue lines (mostly passing diagonally in two directions), with dark elongated dots at the points of intersections. Surface of notum finely and uniformly granulated, with minute dark blue dots in the interspaces of the network in addition. Ommatophores and lower tentacles slaty-blue. Keel well-developed and prominent in the posterior three-fourths of the length of the body. Foot light yellow and extending beyond the inflexed posterior margin of the mantle, but not to its extreme posterior end. Length of notum 5·5 cm., breadth ·7, height ·9. Female genital aperture 1·0 cm. from the male genital aperture.

EXTERNAL CHARACTERS.

General.—The animal is elongated, limaciform. The body is flattened from side to side, having the shape of a narrow-based isosceles triangle in transverse section. The thickest part of the body lies at the junction of the anterior one-fourth and posterior three-fourths of its length. At that position the surface of the body presents a rounded prominence on each side, just below the keel. The prominence is more marked on the right side than on the left. The surface of the mantle (notum) is finely and uniformly granulated. The keel, in the middorsal line, is rounded and not very prominent in front of the thickest part of the body; it ends a little behind the anterior end of the mantle, which forms a hood over the head. Behind the anterior one-fourth of the length of the body, the keel forms a distinct vertical crest flattened from side to side, and extends to the posterior end of the mantle, gradually lessening in

height towards the posterior end. The margin of the mantle (perinotum) is thin, sharp and inflexed, but not wrinkled. The margin of the mantle-hood is entire. The mantle at the extreme posterior end of the body is inflexed, so that the posterior end of the foot projects below and a little behind the posterior margin of the mantle, which is thus placed in front and on the ventral aspect of the posterior end of the mantle.

The head is distinctly separate from the anterior end of the foot. The proboscis, which is protruded in the larger of the two specimens, is cylindrical, and ends in a blunt tip with the triradiate oral aperture in the centre. The ommatophores are short, stout and faintly annulated; they seem to be non-retractile. The lower tentacles are stout and short, being narrower at the base than at the tip. They are fused with the precephalic flap beneath except at the extreme anterior end for about ·1 cm. They are bounded externally by a deep sulcus, which extends from the base to the ventral aspect of their free anterior end. Each precephalic flap is a continuation forward of the head from the ventral aspect, and is united to that of the other side by a thin flattened band of integument above the mouth and beneath the ommatophores. The anterior and outer borders of the flap are convex, the inner one is nearly straight. The antero-external angle is acute but rounded, and the antero-internal angle is obtuse.

A small triangular process of integument is placed above the foot at its antero-lateral aspect, being continuous at its outer side with the lateral surface of the foot above the sole and in front of the attachment of the mantle to the side of the foot. The inner end of the process (corresponding to the apex of the triangle) is connected to the ventral surface of the precephalic flap at the outer side of its base by a thin band of integument. Below, the process is separated from the dorsal aspect of the anterior end of the foot by an oblique groove extending downwards and outwards from the inner side. These two triangular processes form the lateral boundary of the crescentic aperture of the pedal gland.

The foot is wide in front and tapering behind. It is widest at the junction of the anterior one-fourth and posterior three-fourths of its length, being a little constricted just in front of it. The anterior end is truncated and slightly concave. The posterior end is tapering but rounded, and extends a little downwards and backwards beyond the inflexed posterior margin of the mantle, but terminates in front of the extreme posterior end of the latter. The sole is lobulated in its anterior three-fourths, but smooth in the posterior one-fourth of the length.

Colouration.—The mantle is light straw-coloured, being dirty in its upper two-thirds. The surface of the mantle, in its upper two-thirds, is marked with an irregular network of dark blue lines, mostly arranged in two sets passing diagonally in opposite directions and crossing one another at obtuse angles (on the dorsal and ventral aspects). The points of intersection become thickened to form elongated dark blue dots varying from ·05 to ·1 cm. in

length. There are also minute dots of the same colour in the interspaces. The lower third of the mantle presents small elongated dots with a very faint trace of a network similar to that in the upper two-thirds. The striping is not symmetrical on both sides. The ommatophores and the tentacles are slaty-blue in colour. The precephalic flap is pale slaty-blue in colour. The foot is pale yellow.

Measurements.—The measurements of the two specimens in cm. are as follows :—

		1	2
1.	Length along the middorsal line ..	7·1	5·3
2.	Length along the midventral line after straightening the animal ..	5·5	4·5
3.	Greatest height (ventral)	·9	·8
4.	Greatest breadth at the same part of the body	·7	·65
5.	Height of the keel at the junction of the posterior one-fourth and anterior three-fourths of the length ..	·125	..
6.	Height of the keel at the junction of the anterior one-fourth and posterior three-fourths	·05	..
7.	Length of ommatophores	·25	..
8.	Breadth of ,, ...	·15	..
9.	Length of lower tentacle	·15	..
10.	Breadth of lower tentacle	·1	..
11.	Distance of the male aperture from the anterior end of the foot ..	·2	..
12.	Distance between the male and female genital apertures	1·0	..
13.	Depth of the groove round the foot (to the margin of the mantle) ..	·2	..

ANATOMY.

1. Body-wall.

The body has the shape of an isosceles triangle in transverse section in the middle of its length. The triangle has a short base and the sides slightly concave in their upper one-fourth and markedly convex in their lower three-fourths Towards the posterior end, the sides become more convex than they are in the middle, the body assuming a broadly ovate shape in transverse section.

The body-wall is traversed by the following blood-sinuses, which pass longitudinally throughout the whole length of the body :—

(1) A sinus lying in the middle line beneath the keel, and in the middle of the thickness of the body-wall.

(2) A sinus, one on each side, lying above the groove between the foot and the mantle margin.

(3) A sinus, one on each side, in the middle of the thickness of the body-wall at the junction of the upper two-thirds and lower one-third of the body.

Minute structure.—The body-wall consists of a superficial epidermis and a deeper dermis (or cutis).

The surface of the body shows small arch-like prominences with more or less pointed notches between them. The epithelium consists of a single layer of columnar cells placed side by side. The free margin of the epithelial cells presents a thick refractile border. The cells are broad at the free end but tapering and pointed at the other. Those lining the notches are much longer and narrower than those lining the prominences. The epithelial cells lying in the immediate neighbourhood of the glandular cells become cubical in shape, or even flattened in a direction parallel to the surface. The protoplasm is coarsely granular in the outer two-thirds of the cells. The nuclei are oval or elongated, and are placed towards the inner ends of the cells.

Beneath the epidermis is a mass of connective tissue cells, which form a compact layer. Between these masses are found vertical strands of connective tissue fibres which pass inwards into the deeper layer of dermis. The cells are irregular in outline with spherical or oval nuclei.

The unicellular glands, lying in the outer portion of the dermis, vary much in shape and size. They can be divided into the two following groups:—

(i) Small glands, roundish or pyriform in shape, placed just beneath the epidermis; the neck and a portion of the body of the glands lie between the inner portions of the epithelial cells, which are, in some cases, flattened out to make room for the glandular cells. The necks of the glands open to the exterior between the adjacent epithelial cells, there being no distinct ducts. The protoplasm is finely granular and stained brownish yellow (pale) with haematoxylin and Van Giesen's stain. The nuclei are spherical and placed in the centre of the cells. The glands of this group are abundant in the side walls of the body, being very scanty in the keel and upper part of the body-wall.

(ii) Large pyriform glands, the largest ones of which extend to half the thickness of the body-wall from the outer surface. The glands are of 4 or 5 sizes, all being exactly similar in structure. A crescent-shaped portion of the glandular cells at the base is homogeneous and is stained deep yellow with Van Giesen's method, while the remaining portion is granular and takes a red stain when treated with the same reagent.

The dermis consists of a loose network of connective tissue fibres (mainly white) with connective tissue corpuscles dispersed between them. The connective tissue fibres form strands of various thickness, which extend inwards at right angles to the surface of the body from beneath the epidermal layer and between

the compact layer of connective tissue cells beneath the latter. As they pass downwards, the fibrous strands give off branches from the sides, which pass on to neighbouring strands. Just beneath the glandular portion of the dermis the strands break down to form an open network of connective tissue with numerous irregular spaces between them. In the interspaces of the network are placed numerous unstriped muscle fibres. Beneath the glandular layer the fibres are arranged diagonally and longitudinally, there being more fibres in the longitudinal direction. Towards the inner side the diagonal arrangement becomes more prominent than the longitudinal one. Lastly, on the inner side the fibres take a transverse (circular) course with a few longitudinal ones between them In the interspaces of the connective tissue network are seen numerous connective tissue corpuscles, some of which are very big, with large nuclei.

The blood sinus beneath the keel is elongately oval in transverse section, and consists of a thick layer of muscle fibres arranged transversely, lined by a single layer of flattened epithelium. The muscle fibres are separated by thin layers of connective tissue and a few connective tissue corpuscles. The other two pairs of blood-sinuses are broadly oval in transverse section and have a similar structure.

The inner surface of the mantle (hyponotum?), which forms the outer boundary of the groove round the foot, is lined by a single layer of cubical cells below and of flattened cells above. The nuclei are oval and are placed in a direction parallel to the surface. Beneath the epithelium is a thick layer of muscle fibres arranged longitudinally with little connective tissue between them. On the outer side, the structure corresponds to the dermal layer of the mantle wall with which it becomes continuous. Just beneath the muscular layer are seen numerous small pyriform unicellular glands, with long sinuous ducts opening into the circumpedal groove amongst the epidermal cells. The bodies of the glands take a deep blue stain with hæmatoxylin. The blue colour becomes least affected by subsequent treatment with Van Giesen's stain.

Minute structure of the foot.—The epithelium consists of a single layer of narrow elongated columnar cells with more or less fusiform nuclei. Between the epithelial cells are seen numerous ducts of unicellular glands (similar to those opening into the hyponotum) placed in the deeper layers of the wall of the foot. Beneath the epithelium is a thick compact layer of muscle fibres arranged longitudinally. Internal to this layer the muscle fibres are arranged in loose bundles which pass vertically upwards to end in the next layer. These fibres seem to be continued from the longitudinal muscle layers. The vertical muscle fibres give off branches from their sides, which pass to the neighbouring bundles. Amongst these vertical fibres are seen numerous narrow longitudinal bundles, which seem to be continuous with the lateral branches from the vertical ones. Above, the vertical fibres change their course and

form a network with connective tissue fibres similar to that in the mantle-wall.

II. Pallial Complex.

The pallial complex is a more or less circular area underlying the mantle, the centre corresponding to a point a little behind the anterior one-fourth of the body-length. It extends equally on each side to the junction of the mantle with the base of the foot. The pulmonary chamber lies on the right side of the animal and occupies about one-third the area of the pallial complex. The roof of the pulmonary chamber is fused with the under surface of the mantle, and the floor is continuous with that of the pallial complex. The pulmonary aperture (?) is situated at the right antero-lateral corner in the same transverse line with the anterior end of the pericardium.

The pericardium lies in the right anterior quadrant of the pallial complex, forming a prominence on the surface of the body on the right side (mentioned in the description of the external characters). The pericardium is a broad oval sac having the heart obliquely placed inside it. The roof of the pericardium is fused with that of the pallium, while the floor is continuous with that of the latter also.

The heart is placed obliquely in the pericardium and extends from near the centre towards the right antero-lateral corner of the pulmonary area. The ventricle lies in front of the auricle. It is a thick-walled sac, wider than it is long. The origin of the aorta is directed anteriorly, and to the right. The pulmonary artery lies along the right border of the kidney in its posterior half.

The kidney occupies the left half of the pulmonary area. It forms a flattened hatchet-shaped body, with the two corners prolonged along the margin of the pulmonary area towards the right border of the same. It is adherent to the under surface of the mantle above and to the floor of the pulmonary area below, and lies over the salivary glands and the anterior end of the liver. The organ is thick in the centre and is thinned out at the margin. There is no distinct ureter; the kidney seems to open directly into the pulmonary chamber close to the pulmonary aperture. The tissue of the kidney has a spongy appearance; it consists of long wavy tubules held together by loose connective tissue.

The female genital aperture lies on the anterior aspect of the pulmonary area; the anus lies anteriorly to, and on the outer aspect of the female genital aperture.

III. Digestive System.

There is a large protrusible proboscis. In the larger of the two specimens obtained, the proboscis was everted to its full extent. It is a hollow, thin-walled cylindrical body, with the mouth of the animal forming a triradiate aperture in the centre of the blunt rounded tip. The base of the proboscis is attached to

the head just in front of the anterior end of the foot, and behind a narrow transverse band of integument unites the bases of the precephalic flaps beneath the ommatophores. The proboscis was retracted in the other specimen.

On making a longitudinal section of the everted proboscis and examining the half left in connection with the pharynx, I found that the pharynx, radular sac, oesophagus and two ducts of the salivary glands were placed in the cavity of the proboscis. The pharynx was continuous with the anterior end of the proboscis, but its wall was absolutely free and separate from that of the proboscis. The space between the pharynx and the wall of the proboscis is filled with a mass of fragile substance, undoubtedly coagulated blood. From the hinder end of the radular portion of the pharynx, strands of muscle-fibres could be traced behind to a narrow flattened band of muscular tissue attached to the dorsum of the foot behind.

In the other specimen, the proboscis was found to be folded twice, the distal third of the organ being placed inside the invaginated proximal two thirds. The distal third of the proboscis is thus not invaginated, like the proximal two-thirds, but is left as it is in the protruded proboscis. It will thus be seen that in the process of inversion of the proboscis tube, the proximal end is invaginated first. As the process extends from the base to the tip, the distal portion (*i.e.* the portion towards the tip) comprising about one-third the length is simply drawn in without any inversion. So that as the proximal portion of the proboscis becomes inverted, it gives rise to a cylindrical cavity which makes room for the distal portion of the same. It has already been noted that there is no connection in the way of muscular or fibrous strands between this distal portion of the proboscis and the pharynx inside it. It seems to be the final step in the retraction of the proboscis as, in the case of being otherwise, the tip would have been drawn too far behind into the cavity of the body to have any appreciable space for it.

Minute structure of the proboscis.—The wall of the proboscis consists of the following layers:—

(i) A single layer of flattened cells lining the outer surface of the proboscis. The nuclei are elongated and rod-shaped, and are placed parallel to the surface.

(ii) A layer of transversely arranged muscle fibres separated from the epithelium by a thin layer of connective tissue.

(iii) A layer of longitudinally arranged muscle fibres which are grouped into bundles by transversely running fibres. The longitudinal bundles communicate with one another by smaller bundles. Interspersed through the muscle layer are unicellular glands, the contents of which take a deep blue stain with haematoxylin. Their ducts open into the outer surface of the proboscis.

(iv) On the inner side the wall contains numerous intercommunicating spaces containing blood.

The pharynx (buccal bulb or buccal mass) is a stout thick-walled tube lying in the anterior portion of the proboscis. The mouth opens into the anterior portion of the pharynx. There is no mandible. The radular portion of the pharynx (radular sac) is a thick conical body placed on a lower level than the pharynx proper. The tip of the radular portion is curved forwards, and gives attachment to retractor muscles which can be traced to a broad muscle band behind. The radula lies in the radular portion, forming a membranous expansion which spreads on the anterior end of a prominence in the cavity of the radular portion. The membranous expansion consists of radiating fibres held together by transverse fibres placed sparingly in an arch-like fashion. The teeth are arranged in V-shaped rows, the angle of the V being turned backwards. The teeth are lateral, there being no central or marginal; they are unicuspid and uniform in shape, but they increase in size from within outwards. The three outermost teeth are very small in size, while the fourth one is larger in proportion than the outer three. From the fifth onwards the teeth gradually increase in length, the longest one being 0·45 mm

The salivary glands form a much-lobulated mass lying in contact with the anterior end of the digestive gland on the ventral aspect and to the left. The posterior surface of the left gland presents a shallow concavity which fits into the convex surface of the liver. The two glands are apposed to one another to form a single mass, the left one being larger than the right. The small right salivary gland lies beneath the left one over the tip of the pedal gland, being connected to the latter by strands of connective tissue.

The two salivary ducts are much coiled and very fine. They run with the oesophagus through the aperture in the ganglionic mass to the right side beneath the radular sac till they reach the circular groove in front of the radular sac. Then they turn upwards along the right side of the groove nearly to the dorsal aspect, where they open into the base of the pharynx by the side of the oesophagus.

In connection with the anatomy of *Atopos* (*Podangia*) *sanguinolenta*, I described the salivary glands as an accessory digestive gland, as I could not trace the salivary ducts in those specimens. Now taking the minute structure into consideration, I find these two organs are identical, and the accessory digestive gland is nothing but the salivary glands forming a single mass.

Minute structure.—The gland consists of numerous lobules held together by very thin layers of connective tissue. Each lobule consists of a group of irregularly polyhedral cells closely applied to one another. The cells fall into two groups—(1) mucous and (2) serous, the latter preponderating over the former in number. The mucous cells contain coarse granules which are stained blue with haematoxylin; their nuclei are indistinguishable. The serous cells have clearer protoplasm with fine granules which take a brownish yellow stain with Van Giesen's stain. The nuclei

are oval or spherical, and are placed on one side of the cells. The cells open into very minute salivary ducts which are generally placed in the centre of the lobules. In each lobule a duct begins from the elongated neck of a cell or a group of cells (generally mucous in nature), and then runs for a short distance receiving in its course the secretion of other cells which open into it. The duct in this portion of its course is bounded by the cells themselves, there being no other wall of its own. Several ducts converge from the outer portions of the lobule towards the centre, where they unite to form a lobular duct. The outer portions of the primary ducts and the beginnings of the lobular ducts have their walls consisting of a single layer of elongated cells with fusiform or triangular nuclei. Then the cells lining their lumen become more or less columnar in shape. At the point of union of these ducts may be seen mucous cells opening directly into them by long narrow necks.

The oesophagus is a stout tube (a little narrower than the pharynx) which arises from the posterior end of the pharynx in the middorsal line. In the specimen with protruded proboscis, the oesophagus formed a straight tube, extending from behind the pharynx, through the aperture behind the cerebral ganglia, to the anterior end of the midgut gland on the ventral aspect. In the specimen with retracted proboscis, the oesophagus after its origin curves downwards to the left along the groove in front of the radular sac at the ventral aspect. It then passes a little forwards, and bending sharply backwards runs along the midventral line to end in the midgut gland. The oesophagus passes along the ventral surface of the midgut gland for a short distance and then enters into the substance of the gland and ends in the intestine. From the hinder end of the oesophagus at its junction with the intestine, it gives off a short tube which widens out and becomes continuous with the cavity of the midgut gland.

The digestive or midgut gland (liver) is a large elongated conical body, extending over the posterior three-fourths of the cavity of the body. Anteriorly it is truncated obliquely and forms a concave surface directed downwards, forwards and to the left. Posteriorly it is tapering, and is connected to the posterior end of the body by a strand of connective tissue. The surface of the gland is finely lobulated. The cavity of the gland is narrow, with numerous fine slit-like branches projecting into the substance of the wall of the gland. The cavity becomes still narrower and irregular towards the posterior end of the gland.

Minute structure.—The gland consists of numerous extremely elongated glandular cells, which are arranged side by side upon a thin layer of connective tissue which projects inwards from all sides towards the cavity of the gland. At the outer side this layer is continuous with the thin sheath of the gland. Each cell consists of granular protoplasm and contains an elongated nucleus towards its attached end. Amongst these cells are found goblet

cells, the pear-shaped bodies of which are placed upon the connective tissue layer.

The intestine begins from the hinder end of the oesophagus, and passing through the substance of the midgut gland for a short distance emerges from its anterior end towards the right side. It then curves forwards and outwards to the right and then passes backwards to end in the anus, which lies just in front of the female genital aperture.

Minute structure.—The intestine consists of the following coats from without inwards:—

(1) A thick transverse layer of muscle-fibres.

(2) Scattered and irregular longitudinal bundles of muscle-fibres, widely separated from one another by the transverse muscle-fibres and connective tissue.

(3) A layer of sub-mucous tissue thrown into a number of longitudinal folds, being very thick along the folds but quite thin at the intervals. The layer consists mainly of white fibres with a few yellow elastic fibres and connective tissue cells. In this layer are seen numerous unicellular glands, the ducts of which open into the cavity of the intestine.

(4) The mucous membrane consists of a single layer of columnar epithelium, with ducts of the unicellular glands between the cells.

IV. Reproductive System.

The animal is hermaphrodite. The male genital organs are very compressed and are placed beneath the proboscis sheath to the right. The main portion of the female genital organ also forms a flat triangular mass lying on the right side of the anterior end of the midgut gland and applied to its side. The female portion lies behind the male portion, the retractor penis muscle of the latter only passing over the female portion to be attached to the body-wall behind it. I could not find any connection between the male and female genital organs. On examining the section of the female portion from the smaller specimen (as that of the larger specimen was accidentally lost), I could not find any spermatozoon in the acini. The question about the connection between the male and female portions still remains unsettled as I could not examine the mature specimen.

The main portion of the female genital organ consists of a glandular mass which lies on the right side of the liver. The glandular mass is placed a little obliquely, with the flattened surfaces applied to the liver on the inner side and to the inner surface of the body-wall on the outer. The anterior border is broad and irregular, while the posterior border is tapering and pointed. The ovarian portion of the organ is inseparable from the albumen gland, both of which are included in a single mass. It forms a translucent portion occupying about the anterior three-fourths of the

gland. Under the low power of the microscope the ovarian portion is seen to consist of thin-walled alveoli held together by connective tissue. The posterior portion of the mass (corresponding to about one-third the length) forms a dead white mass, which extends as a narrow strip for a little distance along the lower border of the gland and terminates in a round end towards the anterior portion. The duct of the gland begins from the lower border of the glandular mass and then runs backwards to the dead-white portion posteriorly; there it forms a close coil and then emerges from the posterior end of the mass. It then curves upwards and forwards along the upper border of the gland for a short distance, and at last bends downwards on the outer side of the mass to end in the oviduct. The albuminiparous portion forms a narrow strip in the upper border of the mass.

Minute structure.—The ovarian portion consists of thin-walled acini bound together by thin layers of connective tissue. Each acinus is lined by a single layer of flattened cells with disk-like nuclei. Inside this layer are numerous cells, more or less rounded in shape and lying attached to the cells of the wall. These cells are massed together in mullberry-like bunches projecting into the cavity of the acini. The cells have large spherical nuclei with a thin layer of protoplasm round them. The chromatin forms a close network with numerous dot-like nucleoli. Attached to the cellular lining are several ova in each acinus, in different stages of development. At first they are fusiform in shape, but become spherical when fully developed. The protoplasm is granular with a large spherical nucleus placed in the centre. The nucleolus is a refractile spherical body placed towards one side of the nucleus. The ovum is surrounded on the inner surface (*i.e.* towards the lumen of the acinus) by a single layer of flattened-cells continuous with that forming the wall. Each acinus gives rise to a duct which opens into the main oviduct. The acinar duct consists of a single layer of ciliated columnar epithelium with elongated nuclei, surrounded by a thin layer of muscular tissue. The main oviduct, which is coiled to form the dead-white mass, consists of a single layer of narrow, much-elongated cells with very long narrow nuclei. The cells are so closely arranged that even in a very thin section, the nuclei seem to be heaped together at right angles to the surface with very little protoplasm surrounding them. The inner surface of the cells is provided with distinct cilia which are as long as the cells themselves. The inner surfaces of the contiguous cells form a continuous refractile border in section. The individual coils of the oviduct are separated by a thick layer of connective tissue with numerous connective tissue corpuscles.

The albuminiparous portion of the gland consists of a scattered mass of small acini more or less rounded in shape, and separated from one another by thick layers of connective tissue. The epithelial lining of the acini consists of a single layer of elongated polyhedral cells with large oval or elongated nuclei. The protoplasm

is very granular. The cavities of the alveoli are mostly filled with secreted material. Amongst the acini are seen their ducts which consist of a layer of cubical epithelium with round or slightly oval nuclei.

The oviduct after emerging from the main mass of the female portion passes downwards to end in the vagina.

The vagina is a short tube which passes outwards to end in the genital aperture.

The receptaculum seminis is a pyriform body opening into the vagina by a very short neck just before the vagina ends in the genital aperture.

The male genital organs consist of the following parts :—

A fine thread-like tube which opens into the penial sheath at its dorsal end near the attachment of the retractor penis muscle. It is coiled several times round the distal end of the penial sheath. It passes forwards along the outer side of the penial sheath to its base, and then turns backwards along the inner border to the base of the right Simrothian gland to nearly half the length of the coecal tube from its attached end.

The penial sheath consists of a tubular structure which opens in connection with the right Simrothian gland at the base of the right lower tentacle on its outer side.

The penis is a short cylindrical body, connected to the penial sheath at its distal end.

The rectractor penis muscle is a long narrow strand, extending from the posterior end of the penial sheath to the body-wall on the right side a little behind the female genital aperture. The muscle passes over the female genital organs to its destination.

The right Simrothian gland is a long tubular body which can be divided into two portions—(1) a long and fine tubular portion which is closely coiled to form a more or less irregular mass, and (2) a thick tubular portion produced at its distal end into a tubular coecum on the inner side. A few muscular strands are seen to arise from the surface of the coecum and pass to be inserted into the dorsum of the muscular foot. There is no left Simrothian gland.

Minute structure.—The distal portion of the Simrothian gland is so closely coiled that the adjacent portions of the loop become more or less fused with one another by their outer coats, and it is impossible to uncoil them without tearing through the outer coats. The wall of the tube consists of the following layers from without inwards :—

(1) A layer of elongated cells, the protoplasm of which is highly granular. The granules are stained with haematoxylin. The nature of these cells is obscure. The layer is ensheathed by a membrane consisting of a layer of flattened connective tissue cells attached end to end

(2) A layer of muscle fibres arranged circularly.

(3) A single layer of short columnar cells with elongated rod-shaped nuclei.

The first and second layers may in some cases be fused in adjacent portions of the tube.

V. Nervous System.

The nervous system is of euthyneurous type. Like the other species of the same genus, the ganglia are concentrated to form a rectangular mass, with a hole behind the closely apposed cerebral ganglia for the oesophagus and two salivary ducts. The cerebral ganglia are placed on a higher level than the others. The two viscero-pleural and two pedal ganglia form a flattened squarish mass, being only indistinctly separated from one another by a shallow cruciform groove. The buccal ganglia are placed at their usual position at the junction of the proboscis and the radular sac on the ventro-lateral aspect. The stomato-gastric connectives are very long in correspondence with the protrusible nature of the proboscis.

VI. Pedal Gland.

The pedal gland is an elongated tubular body 1·7 cm. in length, and is situated beneath the ganglionic mass on the dorsal surface of the foot. It extends about one-fourth the length of the body from the anterior end of the foot. The organ is slightly flattened dorso-ventrally towards the base, but cylindrical in the posterior two-thirds The gland opens externally, in the middle line, in the shallow groove between the head and anterior end of the foot.

Minute structure.—The lumen of the gland is circular in transverse section in the distal two-thirds of its length. but more or less elongated and flattened in its anterior one-third. The lumen is lined by a single layer of broadly columnar epithelial cells in the lower third of its circumference, while at the sides they become gradually cubical which again become flattened out at the upper third. Outside the epithelium lies a layer of connective tissue continuous above with what forms a sheath round the whole gland. In the anterior flattened portion of the gland, the lower half of the lumen is lined by a single layer of columnar epithelium, while the upper half is lined by a single layer of flattened cells. Between the epithelial cells are seen the openings of the ducts of numerous unicellular glands, which form the whole mass of the gland.

The unicellular glands are more or less club-shaped, with wide ducts opening into the lumen of the tube. The granular contents are stained blue with haematoxylin.

VII. Muscular System

On the dorsal surface of the foot towards the anterior end is a muscular cushion with strands passing in all directions and becoming continuous with the musculature of the foot. This cushion

does not seem to be connected to any other muscle strands passing to other portions of the body-wall. It seems to be the remains of the well-developed columellar muscle of typical pulmonates.

Prisma aborense, n. sp.

A single specimen of the present species was obtained under stones at Rotung, 1300 ft.

The animal seems to belong to a new species. The presence of precephalic flaps is a remarkable point to note.

Notum finely granulated, with small tubercles in addition. Notum of sepia colour with black dots and lines, the latter forming an open meshwork not symmetrical on both sides. Foot sole light lamp-black, with the rims and circumpedal groove (including the inner surface of the free mantle margin) yellowish white. Body prismatic in transverse section with a faint rounded keel in the middorsal line. Mantle forming a hood over the head; mantle-margin thick and directed inwards. A thick precephalic flap beneath each lower tentacle and fused with it. Tentacles and flaps slaty-black. Length of notum 2·7 cm., breadth ·15, height ·7, breadth of foot sole ·3, ♀ aperture ·35 from ♂ aperture.

EXTERNAL CHARACTERS.

The animal is elongated, limaciform and is prismatic in transverse section. The height of the body is greatest in the middle third of its length. The body tapers slightly to a rounded end anteriorly, and gradually to a bluntly-pointed end behind, the margin of the mantle (perinotum) being inflexed at the latter end.

The mantle is rounded with a keel in the middorsal line. The keel is prominent and ridge-like in the anterior-third of the body, but is broad and rounded in the posterior two-thirds. The foremost part of the mantle is bent at a right angle to the part behind and forms the hood covering the head. The hindermost part of the mantle is bent downwards and forwards just behind the posterior extremity of the foot, the outer surface being thus directed downwards and backwards. The anterior border of the mantle presents a wide rounded notch in the middle line. The mantle-border (perinotum) is thick and slightly inflexed; it forms a convex surface about ·08 cm. wide, which narrows down to disappear at the posterior end. The surface of the mantle is granulated.

The head is separated from the body by a distinct transverse groove. The ommatophores are short, stout and cylindrical, they are transversely wrinkled, and seem to be non-invaginable. The precephalic flaps are placed on the lateral aspects of the head, and form the lateral boundary of a trapezoid-space leading into the mouth. The two flaps are united to each other by a thin narrow flap of integument extending across the middle line beneath the ommatophores, and forming the dorsal wall of the trapezoid spaces mentioned above. The outer (dorsal) surface of each precephalic

flap is fused with the lower tentacle at the inner side, being slightly grooved on the inner aspect for the reception of the ommatophore. The infero-external surface is directed downwards and outwards, and lies on a thin flattened process of integument placed over the lateral aspect of the anterior surface of the foot. The infero-internal surface is directed downwards and inwards and is continuous behind with the lining of the cavity leading to the mouth. The anterior border is thick. The outer border is also thick. The inner border gives attachment, at its back, to an integument which forms the dorsal wall of the cavity mentioned above. The inferior border is continued at its base to a transverse ridge of integument, which forms the inferior boundary of the cavity leading into the mouth.

The lower tentacle is fused with the precephalic flap except at the rounded tip.

A thin flap of integument extends transversely below the cavity leading into the mouth, forming its ventral wall. On either side it is attached to the inferior border of the precephalic flap at its base. From the attachment of this membrane to the precephalic flap, arises a thin integument which at once ends in a triangular process on its upper aspect. The triangular process is attached behind to a thin band extending, from the outer aspect of the head at its posterior end, downwards to the side of the foot at its anterior end. This post-cephalic band is bounded behind by a groove which is a continuation of what forms the boundary between the head and the body. This band forms the dorsal wall of a slit-like cavity into which the pedal gland opens.

The mantle is attached to the dorsal surface of the body about ·2 cm. behind the head. The line of attachment then passes forwards and downwards to come within ·5 mm. of the groove behind the head, at the level of the lower border of the precephalic flap; then it runs parallel to the groove behind the band (just described) and ends in the groove between the foot and the margin of the mantle.

The foot is widest at a point ·3 cm. from the anterior margin and tapers very gradually to a point at the posterior end. The foot projects beyond the mantle border for about ·12 cm. at its posterior end. The anterior end of the foot forms a concave surface, the lateral borders of which are sloping from above downwards and backwards for about ·2 cm. from the anterior margin. The sole is finely wrinkled in a transverse direction, the margin of the sole forming a thick rim.

Measurements (in cm.)

Length along the middorsal line of the mantle	4·0
Length along the midventral line	2·7
Greatest height (at the junction of the anterior one-third and posterior two-thirds)	·7
Greatest breadth	·75

Depth of the circumpedal groove	·2
Length of the foot	2·6
Width of the foot sole	·3
Distance of the male aperture from the anterior end of the foot	·15
Distance of the female aperture from the anterior end of the foot	·5
Length of the head	·25
Length of ommatophore	·1
Thickness ,, ...	·05
Length of the precephalic flap	·055
Length of the protruded proboscis	·45
Width of the keel	·05
Width of the mantle border	·08

Colouration.—The surface of the mantle (notum) is sepia, marked with numerous black lines which pass in various directions forming a very irregular open meshwork; the wide and irregular meshes are occupied by blotches of the same colour. The ommatophores, the lower tentacles and the dorsal aspect of the precephalic flap (excepting a narrow strip along the anterior border) are slaty-blue, the sole is of the colour of light Indian ink with the rim yellowish white.

ANATOMY.

I. Pallial Complex.

The pulmonary area is broadly reniform in shape, the greatest breadth lying in a transverse direction. It lies behind the line of attachment of the mantle to the body behind the head. The area extends both to the right and left side of the body beneath the mantle, being continued to the junction of the mantle to the base of the foot on the right side, but ending about 1·5 mm. above on the left. The roof of the pulmonary area is fused with the mantle, as well as with the dorsal wall of the pericardium. The floor lies on the anterior end of the liver, the salivary gland and the radular portion of the pharynx. There is no pulmonary chamber.

The pericardium lies in the anterior one-third of the pulmonary area. It extends a little more to the right than to the left.

The heart lies a little obliquely, the ventricle being placed a little in front of the auricle and to the left. The auricle is placed just beneath the middorsal line of the body.

The kidney occupies the rest of the pulmonary area. It is a spongy mass bounded both on the inner and outer aspect by a thin membrane forming the floor and roof of the pulmonary area.

II. Digestive System.

The proboscis was protruded in the specimen and the pharynx was placed inside the proboscis sheath. Fine strands of connective tissue were seen extending from the inner side of the proboscis

sheath to the anterior portion (about one-sixth the length) of the pharynx.

The pharynx is a stout tubular structure, a little flattened from above downwards. When the proboscis is protruded, the whole of the pharynx with a portion of the radular sac is drawn into the cavity of the proboscis, the hinder two-thirds of the radular sac being left in the cavity of the head.

The radular portion of the pharynx is stouter and more flattened than the pharynx proper; it is placed at an angle with the pharynx and is itself curved so that the posterior end is bent downwards.

The radula is a narrow band which is placed on an elongated cushion from the ventral wall of the sac. The anterior end of the band is curved downwards and backwards round the blunt anterior end of the cushion. The teeth are unicuspid and are arranged in **V**-shaped rows. Each presents a crescentic notch toward the distal end.

The oesophagus begins from the middorsal line of the pharynx a little in front of its middle (including the radular portion). It runs backwards for a short distance, and then curves downwards to come to the ventral aspect. It passes through the aperture in the ganglionic mass and then passes along the ventral aspect of the liver, and opens into its cavity at a little distance behind the anterior end.

The salivary glands form a single inseparable mass lying in front of the liver. The mass is triangular in shape, and is placed on the distal portion of the pedal gland. The salivary ducts, two in number, arise from the ventral surface of the glandular mass, the left one arising a little in front of the right. They pass through the aperture in the ganglionic mass, and open into the pharynx on the ventro-lateral aspect in the same vertical line with the beginning of the oesophagus.

The liver is a stout conical sac with thick walls. The anterior end is broad and is bevelled at the ventral aspect. The posterior end is tapering and ends in a blunt point. The surface is uniformly lobulated, with small depressed areas bounded by raised white lines. The cavity of the liver is spacious and presents an irregular lining of ridges and papillae. The cavity of the organ was filled with a granular mass, which on microscopic examination was seen to consist of the remains (the cellulose lining) of various sorts of unicellular and branching filamentous algae.

The intestine begins from the ventral aspect of the liver on its left side. It passes forwards and to the right to end in the anus placed close to the ureter.

III. Reproductive System.

The animal being of very small size, it was impossible to trace the connection between the male and female portions.

Male genital organs.—The penis when contracted forms a small conical prominence inside the lumen of the long tubular penial sheath at its distal end. The flagellum lies along the side of the penial sheath, extending from the base of the penis to the proximal end of the sheath. The penial sheath is a tubular structure fused with the Simrothian gland about half its length from the proximal end, and having a common lumen for the two. The right Simrothian gland is a tubular structure fused with the penial sheath for a short distance from its proximal end. The tube consists of a narrow and loosely coiled distal portion, and a thicker proximal portion provided with a rounded projection into its cavity at the beginning.

Female genital organ.—The female genital organ forms a small flattened body applied to the inner surface of the pulmonary area and opening into the external aperture by a short duct. There is no distinct albuminiparous portion of the gland.

IV. Nervous System.

The ganglia form a squarish mass with the aperture for the oesophagus and two salivary ducts. The cerebral ganglia are closely united to each other and are placed on a higher level than the others. The pedal and viscero-pleural form a compact mass behind the cerebral. The pedal cords, one from each ganglion, pass backwards to the posterior end.

The two buccal ganglia lie in the angle between the radular portion of the pharynx and the oesophagus, a little behind the beginning of the latter. They form a pair of oval bodies closely applied to one another like a pair of beads. There are three nerves from each ganglion, one of which is connected to a nerve from the cerebral ganglion.

V. Pedal Gland.

It is a stout tube more or less flattened on the dorso-ventral line. It is bent on itself a little in front of its middle so that the posterior portion is directed to the left of the animal. The latter portion of the tube lies in contact with the ventral aspect of the salivary glandular mass, with which it is connected by means of connective tissue.

LITERATURE.

In addition to the literature mentioned in my last paper "On the Anatomy of *Atopos* (*Podangia*) *sanguinolenta* (Stol. MS.), the following papers were also consulted:—

1. E. Ghosh, "On the Anatomy of *Atopos* (*Podangia*) *sanguinolenta* (Stol., MS.)." Records of the Indian Museum, Vol. vii, Part ii, No. 17, 1912.

2. Collinge, W. E., "*Atopos* list and distribution, spp; *A. onwense*, sp. n. Java." Journ. Conch., 12, p. 199, 1908.
3. Simroth, H., "Uber das Vaginuliden genus *Atopos* n.g." Zeit. f. Wiss. Zool., 1891, Bd. iii, pp. 593—616.

EXPLANATION OF PLATE X.

FIG. 1.—*Atopos* (*Podangia*) *kempii* (nat. size).

,, 2.—Head of the animal, dorsal view, × 2.

,, 3.—Head of the animal, ventral view, × about 4.

,, 4.—Pallial complex, × 2; the right half of the figure is shown to be reflected outwards with the mantle wall 1, rectum; 2, pulmonary aperture; 3, kidney; 4, ventricle.

,, 5.—Transverse section of a portion of body-wall, × 230.

,, 6.—Transverse section of the blood sinus under the keel, × 51.

,, 7.—Transverse section of a portion of foot, × 103.

,, 8.—Transverse section of the body through the middle, × 2.

,, 9.—Proboscis, proboscis sheath and radular sac with salivary glands and their ducts, × about 10.

,, 10.—Diagrammatic longitudinal section of the proboscis and its sheath, × about 10.

,, 11.—Longitudinal section of the protruded proboscis, × 2.

,, 12.—Liver and salivary glands, dorsal view, × 2.

13.—Liver, ventral view (of the smaller specimen), × 2: *a*, *b* and *c* are transverse sections at different parts of the organ, shown by lines in the same.



E. N. Ghosh, del. A. Chowdhary, lith.

EXPLANATION OF PLATE XI.

Atopos (*Podangia*) *kempii*.

FIG. 14.—Section of a portion of salivary gland, × 103; the figure shows the formation of the primary lobular duct.

,, 15.—Transverse section of the wall of the proboscis, × 103.

,, 16.—Transverse section of the liver, × 10.

,, 17.—Transverse section of a portion of liver, × 460.

,, 18.—Teeth of radula (of one side), × 460.

,, 18*a*.—A tooth of radula, × 230.

,, 19.—Anterior portion of the radula.

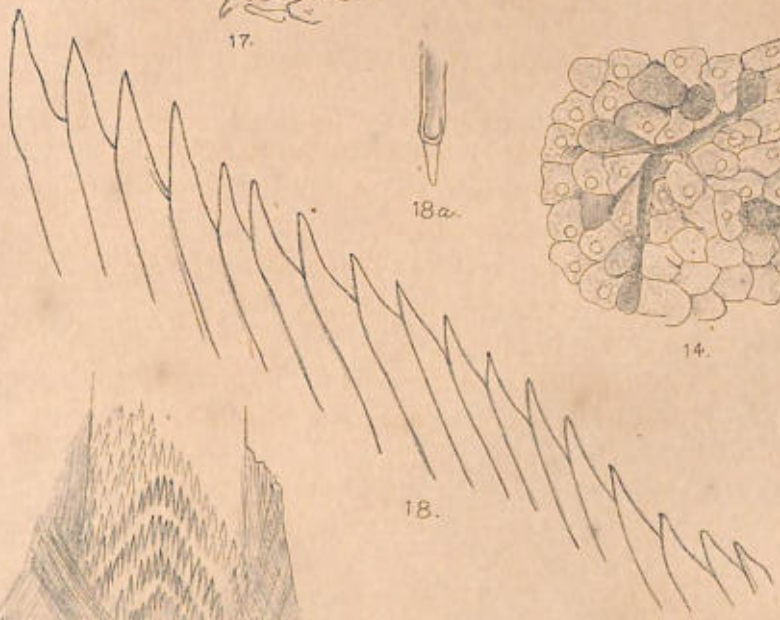
,, 20.—Transverse section of intestine, × 15.



17.

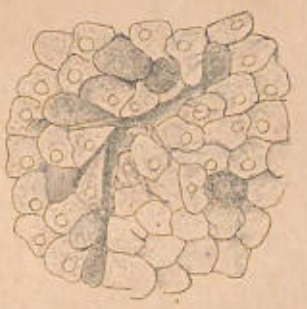


15.

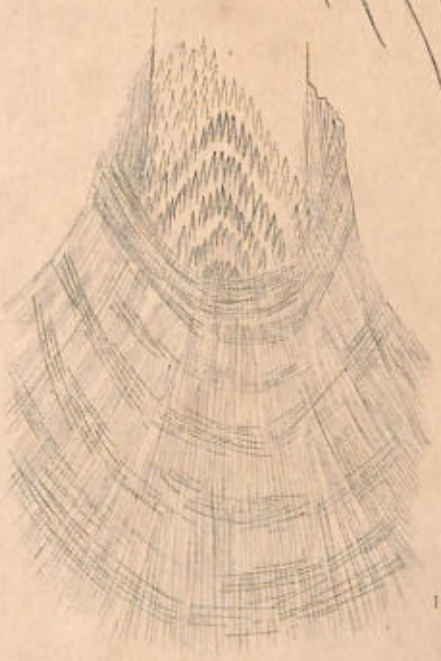


18.

18a.



14.



19.



16×10.



20.

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EXPLANATION OF PLATE XII.

Atopos (*Podangia*) *kempii*.

FIG. 21.—Transverse section of a portion of the wall of intestine, × 230.

,, 22.—Female genital organ: *a*, from outer side; *b*, from inner side.

,, 23.—Portions of the walls of two contiguous acini from the female genital organ, × 103.

,, 24.—Portion of the wall of an acinus, showing an ovum, × 103.

,, 25.—Two acini from the albuminiparous portion of the female genital organ, × 103.

,, 26.—Portion of the oviduct and receptaculum seminis, × 4.

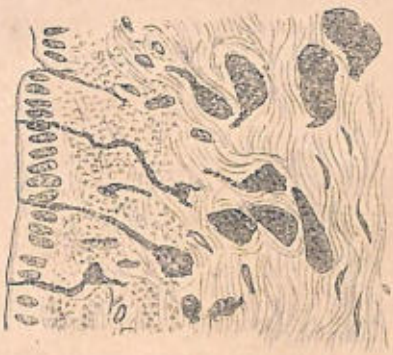
,, 27.—Male genital organ and the right Simrothian gland, × 10.

,, 28.—Transverse section of Simrothian gland, Leitz's drawing eyepiece and objective 6.

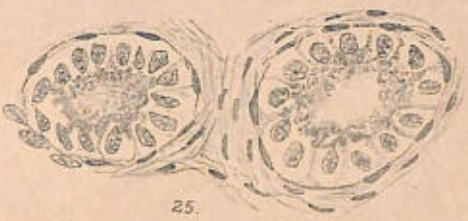
,, 29.—Nervous system, × 8.

,, 30.—Pedal gland, × 2.

,, 31.—Transverse section of the pedal gland, × 103.



21.



25.



23.



22.



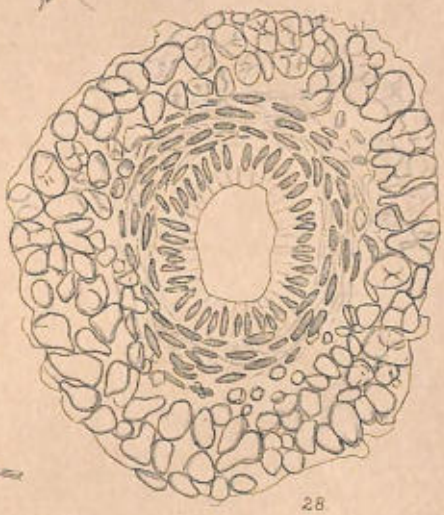
26.



24.



27.



28.



29.



30.

31.



E. N. Ghosh, del. A. Chowdhary, lith.

EXPLANATION OF PLATE XIII.

FIG. 1. Side view of *Prisma aborense* (nat. size).

,, 2. Head of the animal (dorsal view).

,, 3. Side view of the head.

,, 4. Ventral view of the head.

,, 5. Alimentary canal and pulmonary area: 1, proboscis; 2, radular sac; 3, salivary gland; 4, intestine; 5, oesophagus; 6 kidney; 7, pericardium.

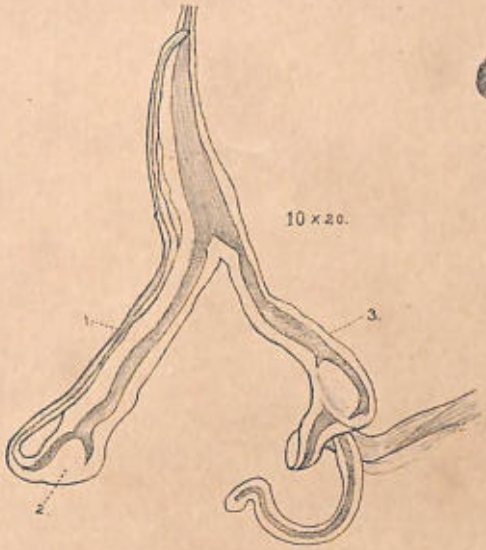
,, 6. Salivary gland, × 2: *a*, dorsal view; *b*, ventral view.

,, 7. Pharynx (side view), × 2: 1, salivary ducts; 2, radular portion of the pharynx; 3, oesophagus.

,, 8. Three teeth of radula , × about 255.

,, 9. Pedal gland, × 2.

,, 10. Male genital organ, × about 20: 1, flagellum; 2, penis; 3, right Simrothian gland.

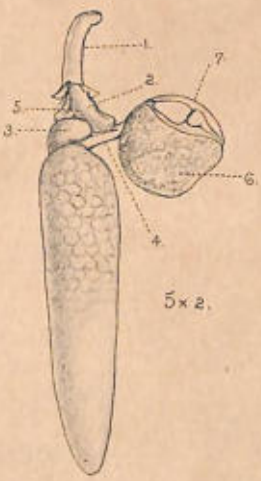




















E.N. Ghosh, del. A. Chowdhary, lith.

XVI. TEMNOCEPHALIDAE.

By F. H. GRAVELY, *M.Sc.*,
Assistant Superintendent, Indian Museum.

(Plate xiv).

The only representative of this family found by the Abor Expedition was *Temnocephala semperi*, Weber. This species was first found by Semper on crabs in Luzon and Mindanao, from the plains up to an altitude of 5000 ft. (1872, p. 307). It has since proved to have a wide distribution in the Oriental Region; for according to Max Weber, who first described it as a distinct species (1890), it occurs on "*Telphusa*"[1] spp. in Sumatra,[2] Java and various parts of Celebes and it has been found both by Dr. Annandale and by myself in the Dawna Hills of Tenasserim, where it occurs on *Potamon manii* and probably also on *P. andersonianum*. Specimens in the Indian Museum collec ion of *P. manii* from Tavoy, and of *P. andersonianum* from Yunnan and from the Sheetee (Kakhyen) and Manipur Hills, bear eggs closely resembling those evidently belonging to this species on crabs from the Abor country and Dawna Hills. In the Abor country it is not uncommon on *Potamon adiatretum* and *P. superciliosum*,[3] and in the absence of any record of another species of *Temnocephala* from Asia, it is probable that the specimen found by Wood-Mason in a bottle of fish from the Dafla Hills (1875, p. 337) was also *T. semperi*, and had become associated with the fish accidentally. Mr. Kemp, it may be pointed out, was unable to find any kind of *Temnocephala* on fish in the Abor country, which adjoins the Daflas, although he was looking for confirmation of this record. The Abor and Dawna records are as follows:—

Abor Country: Yembung River, 1100 ft., 13-i—9-ii-12.
Lalek stream between Renging and Rotung, 10-i-12.
Below Damda, banks of Siyom River, 1-ii-12.

Dawna Hills: Third Camp, western base of hills, *ca.* 400 ft., 30-xi-11.
Misty Hollow, western side of hills *ca.* 2200 ft., 29-xi-11.

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1 *i.e. Potamon* of recent monographs.

2 I have to thank Prof. Max Weber for sending me some of his specimens from Sumatra for comparison with the Burmese and Abor specimens, the identification of which they have greatly facilitated. I have also to thank Dr. J. H. Ashworth for specimens of other species with which to compare these.

3 A new species shortly to be described by Mr. Kemp in this volume.

Sukli, eastern side of hills, *ca.* 2100 ft., 22—29-XI-11.

Below Sukli, *ca.* 1500 ft.

The habits of *Temnocephala semperi* seem to be very like those of other species of the genus. My observations on Burmese specimens were very hurried, but, so far as they go, they confirm Mr. Kemp's on Abor ones. The following account is based on these.

The creatures are extremely contractile and their great activity is most striking—indeed it is apt to be startling the first time living specimens are seen. They live, often in large numbers, on the lower surface of the body and among the basal joints of the legs of their host, which is apparently always a crab of the genus *Potamon*, and of the subgenus *Potamon* or *Geotelphusa*. *Temnocephala* has not so far been found on specimens of *Potamiscus*, the only other subgenus of *Potamon* found in India, possibly on account of the fact that the members of this subgenus are less aquatic in their habits. When the animal is quiescent, its median tentacle is extended directly forwards, the intermediate tentacles are elevated, and the posterior ones are depressed. As a rule the last-named tentacles do not assist in progression but remain outstretched and curved slightly forwards, while the tips of the other three are applied to the ground. The body is then hunched up and pressed forwards till these three tentacles lie entirely beneath it, after which the posterior sucker lets go its hold to find a new one further forwards; then the same process is repeated.

When separated from its host, *T. semperi* stands and waves its tentacles around, as though trying to perceive a new one, or crawls rapidly about. Occasionally, when it is greatly irritated, the tentacles are doubled back and tucked away beneath the concave ventral surface of the body.

Haswell (1888, p. 283) found that the food of Australian Temnocephalidae consisted of small crustacea and insect larvae. In the specimens examined from the Dawna Hills, remains of the latter are abundant, of the former very rare. The Abor specimens do not throw much light on the nature of the food, but one contains a lot of diatoms and other matter, so arranged as to leave little doubt that they were introduced in the gut of some other animal, perhaps an aquatic Oligochaet.

The animal as a whole is white and semi-translucent in life, with the stomach showing through as a yellowish patch a little behind the single pair of small black eyes. I have nothing to add to our present knowledge of the general anatomy of the animal, though I can confirm from sections the results of both Weber's and Merton's investigations of the species; but the chitinous lining of the penis appears, on account of its special importance in taxonomy, to be worthy of greater attention than has been bestowed upon it in any paper I have yet seen.

This cuticle is most readily examined in detail after the animal has been treated with hot caustic potash and then crushed

and triturated under a cover-slip till the tissues have been disintegrated; but when a number of specimens of different sizes are to be compared together, I have found it more convenient to mount them whole under simple pressure, after the preliminary treatment with potash. As boiling with potash rapidly disintegrates the animal and usually results in the loss of the penis, the plan adopted has been to pour boiling 5% caustic potash solution on to the specimens, which then in a few minutes become clear without falling to pieces.

Haswell has pointed out that in several species of *Temnocephala* two distinct regions can be recognized in the penis (1887, p. 296). This is so in *T. semperi* as has already been noticed by Semper (1872, pl. xxiii, fig. 7) and Weber (1890, pl. i, fig. 1). In the proximal region the chitin is smooth, whereas in the distal region or glans it is armed internally with fine, close-set spines (fig. 6). In the smallest specimens of *T. semperi* that I have seen, the proximal region is very little longer than the distal (fig. 7), but as the animal grows the former becomes more rapidly enlarged than the latter, so that in approximately full-grown specimens the chitinous lining comes to have the form shown in fig. 5. Finally, in a few specimens from the Dawna Hills, all of them full-grown, the whole organ has become very much longer and slenderer, as is shown in fig. 4.

Temnocephala semperi lays its eggs on the sides of the femora, and occasionally on the abdominal terga and the sides of the carapace, of its host. They are very like those of *T. fasciata* figured by Haswell (1887, pl. xxii, fig. 18). They vary greatly in size, being from about 0·5–1·0 mm. in length, and two or three times as long as broad. They are covered with a hard brown shell, from a little towards one end of which arises a thin (? chitinous) thread, that is commonly broken during the preservation of the specimens. The animal appears to develop inside the egg with its tentacles bent along the body as in *T. madagascariensis* (Vayssiere, 1891, pl. i, fig. 6).

Although *Temnocephala semperi* is the only species of its group of which adults were obtained in the course of the Abor Expedition, there is some evidence that another occurs at the base of the Abor Hills. Dr. Annandale, while examining specimens of a race of the Atyid prawn *Caridina weberi* from the Assam-Bhutan frontier, noticed in their gill-chambers eggs in every respect similar to those of the peculiar little Temnocephaloid recently described by him as *Caridinicola indica* (1912). In one egg the shell had been ruptured and a young *Caridinicola* was protruding from it. In the gill-chamber of a specimen of the same prawn taken at Dibrugarh by Mr. Kemp, Dr. Annandale found other eggs which differed in their smaller size and in being apparently devoid of a coloured shell. It is therefore probable that *Caridinicola* or an allied animal lives on Atyid prawns that inhabit the streams of north-eastern Assam.

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EXPLANATION OF PLATE XIV.

Temnocephala semperi.

FIG. 1.[1]— A specimen fully expanded, from above, much magnified.

,, 2.[1]— A specimen attached by three tentacles and the sucker, in the act of progression, much magnified.

,, 3. — A preserved full-grown specimen, much contracted, showing the position of the elongated penis and principal organs, × 30.

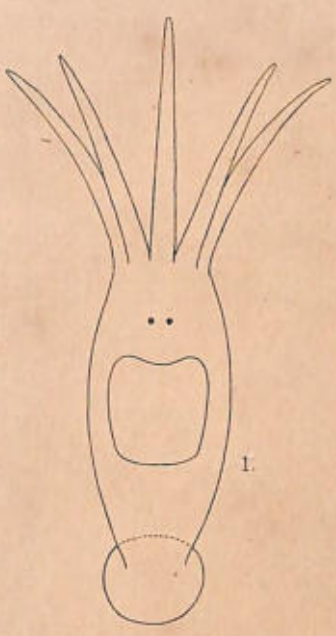
,, 4. — Penis of a similar specimen, × 210.

,, 5. — Penis of a normal full-grown specimen, × 210.

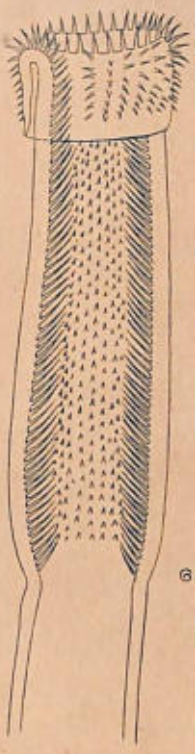
,, 6. — Distal portion of penis of the same specimen, × 1080.

,, 7. — Penis of a very young specimen, × 210.

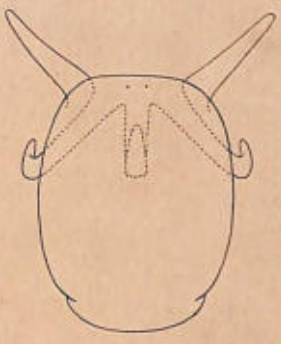
1 I am indebted to Mr. Kemp for these two figures.



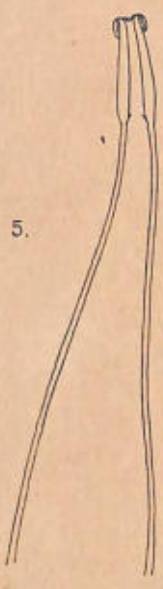
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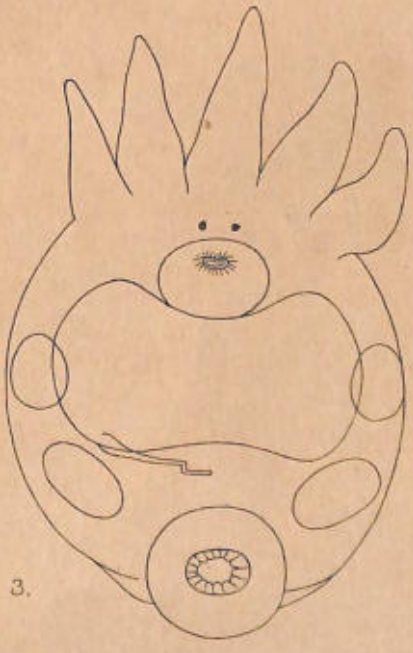
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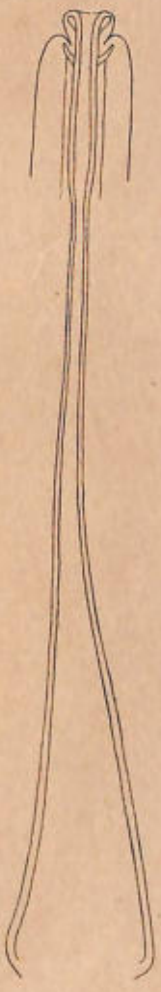
2.



5.



3.



4.



7.

del.

A. Chowdhary, lith.

TEMNOCEPHALA SEMPERI, Weber.

XVII. HYMENOPTERA, II: ANTS (FORMICIDAE).

By WILLIAM MORTON WHEELER.

Subfamily PONERINAE.

1. *Myopopone castanea*, F. Smith var. *maculata*, Roger.
   Several workers from Kobo, 400 ft.; "in rotten wood," "under logs" and "under bark."
2. *Centromyrmex feae*, Emery.
   Two workers from Sadiya, N. E. Assam; "under logs"
3. *Odontomachus monticola*, Emery.
   One worker from Yembung, 1100 feet.
4. *Leptogenys* (*Lobopelta*) *assamensis*, Forel.
   One worker from Kobo, 400 ft.
5. *Euponera* (*Brachyponera*) *nigrita*, Emery.
   Several workers from Kobo, 400 ft.; "in rotten wood."
6. *Ponera confinis*, Roger, var.
   Two winged females from Farm Caves, near Mulmein; "in depths of a large cave."

These specimens are even darker than the var. *wroughtoni*, Forel, of Ceylon, but without the corresponding workers I hesitate to describe them.

7. *Pachycondyla* (*Ectomomyrmex*) *astuta*, F. Smith.
   A single worker from Rotung, 1400 ft.; "under stones."
8. *Pachycondyla* (*Ectomomyrmex*) *javana*, Mayr subsp. *materna*, Forel.
   Several workers from Rotung, 1400 ft.; "under leaf-stem of plantain."

Subfamily DORYLINAE.

9. *Dorylus* (*Alaopone*) *orientalis*, Westwood.
   Many workers from Kobo, 400 ft.; "in rotten wood."
10. *Dorylus* (*Alaopone*) *vishnui*, sp. nov.

Worker. Length 1·5—6 mm.

Resembling *A. orientalis*. Mandibles falcate, pointed, with a single large tooth or more rarely with two teeth besides the apical point. Head subrectangular, about ¼ longer than broad, scarcely

broader in front than behind, with straight sides and deeply, arcuately excised posterior margin, and a median longitudinal groove which is faint or obsolete in the region of the vertex. Smallest workers with the head a little broader behind than in front, with more convex sides and the longitudinal groove often indistinct or lacking, except on the anterior and posterior portion of the head. Clypeus projecting somewhat only in the largest workers. Antennae 9-jointed in all the workers, joints 3-7 of the funiculus broader than long. Thorax as in *orientalis*, epinotum with a distinct longitudinal impression. Petiole fully 1¼ times as long as broad in the large workers, at least as long as broad in the smallest. Hypopygium with three subequal points as in *orientalis*.

Whole body more glabrous and shining than in *orientalis*, punctures on the head decidedly smaller and further apart; somewhat coarser on the thorax and petiole. These parts are also shagreened so that they appear somewhat less shining than the head, especially on the sides.

Minute, yellow, appressed hairs arising from the punctures on the head and body much shorter and less conspicuous than in *orientalis*.

Head, thorax, petiole and antennæ of the large workers rich ferruginous red; mandibles and clypeus darker; gaster and legs paler; in the smallest workers the whole body is reddish yellow, the mandibles light red.

Described from a dozen workers from Mulmein, Lower Burma.

This form is certainly distinct from *orientalis* in the longer head of the large worker, in sculpture and pilosity, and in having the petiole longer than broad instead of distinctly broader than long. As both Emery and Forel are agreed that *Alaopone curtisi*, Shuckard and *A. oberthüri*, Emery, are merely synonyms of *orientalis*, Westwood, and as this latter species is the only one known from the Oriental Region, I am compelled to regard th Burmese specimens as representing a new form. It may, perhaps, have only subspecific value and may be the hitherto unknown worker of *A. fusca*, Emery or *longicornis*, Shuckard, two subspecies of *orientalis* known only from male specimens. *A. vishnui* differs from *A. conradi*, Emery, of Togo, the only other *Alaopone* besides *orientalis* with a known worker, in its much shorter head (the head of the large worker *conradi* is nearly twice as along as broad) and in the darker colouration.

Subfamily MYRMICINAE.

11. *Sima rufonigra*, Jerdon.

One worker and two deälated females from Sadiya, N.E. Assam and Kobo, 400 ft.

12. *Pheidologeton* (*Aneleus*) *aborensis*, sp. nov.

Soldier. Length 3—3·5 mm.

Head large, subrectangular, distinctly longer than broad, very slightly narrower in front than behind, with straight sides, broadly rounded posterior corners and the posterior margin distinctly but not deeply emarginate. Upper and lower surfaces convex. Median longitudinal furrow extending the full length of the head but shallow. Eyes small, rather convex, but consisting of numerous facets, situated near the anterior third of the head. Median ocellus present in some individuals. Mandibles with 5 subequal teeth, moderately convex, with rather straight external borders. Clypeus short, flattened in the middle, its anterior border broadly rounded, feebly and sinuately excised in the middle. Antennæ short, rather slender; scapes reaching to about $\frac{1}{3}$ the distance between the eyes and the posterior corners of the head; basal joint of the two-jointed club scarcely half as long as the apical; first funicular joint as long as joints 2-4 together; joints 2-8 scarcely longer than broad. Frontal carinæ short and diverging. Frontal area large, flat. Thorax shorter than and half as broad as the head, broadest through the pronotum, which is broader than long and, when seen in profile, very convex and rounded above, with rounded humeri. Mesonotum small, transversely concave in the middle, separated from the pronotum by a distinct suture and ridge, its general outline in profile rapidly sloping to the epinotum from which it is separated by a deep suture. Epinotum much lower than the pronotum, about as long as high, in profile with subequal base and declivity, the former horizontal, the latter sloping, armed with two small acute upwardly directed teeth, which are as long as broad at their bases. These bases are prolonged anteriorly and posteriorly on each side into a ridge along the base and declivity of the epinotum. The space between these ridges is slightly concave. Petiole slender, longer than high through the node, which has a long, concave anterior and flat posterior surface, with the summit rounded in profile and transverse when seen from above. Lower surface of petiole without a tooth. Postpetiole small, rounded, transversely elliptical, a little broader than long and a little broader than the petiole. Gaster large, ovate, narrowly emarginate at the insertion of the postpetiole. Sting well-developed.

Mandibles, clypeus and frontal area shining, the mandibles coarsely and sparsely punctate, longitudinally rugose at their bases. Clypeus and cheeks finely and regularly longitudinally rugose. Remainder of head opaque, more coarsely rugose, the rugæ on the front diverging backwards and covering a fan-shaped area, those on the posterior fourth of the head transverse but not coarser than the frontal rugæ, and those on the sides longitudinal. Thorax, petiole and postpetiole opaque, pro- and mesonotum transversely and rather irregularly rugulose; epinotum and base of petiole reticulately, upper surfaces of petiolar and postpetiolar nodes irregularly rugulose. Gaster subopaque or slightly shining above and, especially at the base, finely reticulate and sparsely punctate; base of first segment also with traces of

fine longitudinal rugæ. Antennal scapes and legs sparsely punctate.

Hairs on the head, thorax and gaster yellow, erect, delicate, pointed, very sparse; on legs and scapes short and appressed. Pubescence sparse, distinct only on the gaster.

Dark brown, base of gaster, thorax, petiole and postpetiole more reddish and paler, especially on the sides, head darker; clypeus and cheeks red; mandibles red, with black borders; posterior edges of gastric segments reddish or yellowish; antennæ and legs brownish yellow or testaceous.

Worker. Length 1·3—1·5 mm.

Head much smaller than in the soldier, scarcely longer than broad, with rather convex sides and nearly straight posterior border. Clypeus not bicarinate, its anterior border entire or very feebly and sinuately excised. Frontal area and eyes very small, the latter consisting of only two facets. Antennæ similar to those of the soldier, but their scapes reaching to the posterior corners of the head. Thorax like that of the soldier, more than half as broad as the head, the pronotum somewhat less convex, the mesonotum without a transverse impression, the base of the epinotum convex and the teeth reduced to mere minute angles. Petiolar node rounded and conical, not compressed anteroposteriorly.

Whole body smooth and shining, finely and very sparsely punctate, sides of epinotum and peduncle of petiole finely reticulate-rugose.

Pilosity similar to that of the soldier but the erect hairs much sparser and shorter.

Colour paler than in the soldier; body yellowish brown; antennæ and legs paler, head and gaster somewhat darker.

Described from numerous soldiers and workers taken at Kobo, 400 ft.; "in rotten wood."

This species is closely related to the other described species of *Ancleus* (*pygmaeus*, Emery from Ternate, *similis*, Mayr from the Nicobar Islands, *minimus*, Emery from Beliao Island and *sarasinorum*, Emery from Celebes). It differs in its greater size, in sculpture and pilosity from *minimus*, in its smaller size and in sculpture and colouration from *pygmaeus* and *sarasinorum*, and from the latter also in lacking conical projections on the posterior corners of the head in the soldier. Only the worker of *similis* is known, but this has a bicarinate and deeply excised clypeus and its colour is paler than that of the worker *aborensis*.

13. *Crematogaster rogenhoferi*, Mayr.

Numerous workers from Rotung, 1400 ft., and Dibrugarh, N.E. Assam.

14. *Crematogaster biroi*, Mayr var. *aitkeni*, Forel.

Many workers from Upper Rotung, 2000 ft.; "under leaf-stem of plantain."

15. *Meranoplus bicolor*, Guérin.
A single worker from Sadiya, N.E. Assam.

16. *Pristomyrmex brevispinosus*, Emery.
Numerous workers from Kobo, 400 ft.; "in rotten wood."

Subfamily DOLICHODERINAE.

17. *Tapinoma melanocephalum*, Fabr.
Four workers from Thingannyinaung to Myawadi, Burma, 900 ft.

18. *Technomyrmex albipes*, F. Smith.
Numerous workers from Kobo, 400 ft.; "in rotten wood."

Subfamily CAMPONOTINAE.

19. *Plagiolepis longipes*, Jerdon.
A single worker from Misty Hills, east side of Dawna Hills, 2000 ft.

20. *Oecophylla smaragdina*, Fabr.
Three workers from Dibrugarh, N.E. Assam and Kobo, 400 ft.

21. *Camponotus nicobarensis*, Forel.
Numerous workers and a single deälated female from Kobo, 400 ft., "under bark"; Rotung, 1400 ft., "in dead bamboo," and Dibrugarh, N.E. Assam.

22. *Camponotus taylori*, Forel var. *albosparsus*, Forel.
Several minor workers from Sadiya, N.E. Assam; "under logs."

23. *Polyrhachis striatorugosa*, Mayr.
One deälated female from Upper Rotung, 2000 ft.

24. *Polyrhachis mayri*, Roger.
Several workers from Upper Rotung, 2000 ft.

25. *Polyrhachis halidayi*, Emery.
Several workers from Rotung, 1400 ft.

26. *Polyrhachis laevissima*, F. Smith.
Several workers from Sadiya, N.E. Assam.

27. *Polyrhachis dives*, F. Smith.
Several workers from Dibrugarh, N.E. Assam, "from nest in tree."

28. *Polyrhachis tibialis*, F. Smith.
One winged female from Kobo, 400 ft.

XVII. HYMENOPTERA, III: TENTHREDINIDAE.

By S. A. ROHWER, *Bureau of Entomology, United States Department of Agriculture, Washington, D.C.*

The Tenthredinidae or sawflies collected by the Abor Expedition represent four species, three of which are new, and one new variety. These four species belong to genera which are well represented in the Oriental Region.

Family TENTHREDINIDAE.

Subfamily *EMPRIINAE*.

Genus **Blennocampa**, Hartig.

Blennocampa gracilicornis, sp. nov.

This species seems to have its nearest ally in *B. tenuicornis* of Europe.

Female.—Length 3·5 mm. Anterior margin of the clypeus broadly, arcuately emarginate; the lobes triangularly acute at apex; supraclypeal area subconvex; antennae separated from the eyes by the width of the base of the scape, separated from each other by the distance, but little shorter than the length of the first two antennal joints; middle fovea shallow, transverse; frontal foveae deep, elongate; antennal furrows obsolete; pentagonal area obsolete; eyes large, strongly converging to the clypeus; postocellar area well defined laterally, about two and one-half times as wide as long; postocellar line distinctly longer than the ocellocular line; antennae elongate, slender, hairy; pedicel subequal in length with the scape, much longer than wide; third antennal joint slightly longer than the fourth; claws cleft, teeth subequal in length; transverse median slightly basad of the middle of the cell; stigma rounded below, tapering to an acute apex; transverse radius received in the apical fifth of the cell, inclined at the same angle as the third transverse cubitus; apical dorsal segment sharply triangular; sheath narrow, parallel-sided, at apex narrowly rounded; saw feebly ridged, the lower margin regularly, finely dentate with the teeth triangular in outline, pointed below. Black; labrum, scape, palpi and legs yellowish white; base of the four posterior tibiae and their tarsi white; wings dusky hyaline; venation pale brown, costa and basal venation dark brown.

Dibrugarh, North-East Assam. Described from one female collected November 12th-19th, 1911.

Type in the collection of the Indian Museum, Calcutta.

Subfamily *PHYMATOCERINAE.*

Genus **Tomostethus**, Konow.

Konow, in his "Genera Insectorum," says that the genus *Tomostethus* has simple tarsal claws. On examination of the European species in the collection of the United States National Museum, it is found that four of the European species have the tarsal claws with an erect inner tooth. Two of the North American species also have the claws with an inner tooth.

If we wish to be consistent and to form genera or subgenera on the dentation of the tarsal claws, it will be necessary to divide this genus; but as a division of the genus based on the dentation of the claws would group together some species which on other characters would not be associated, and as all the species are not available at present, no division of this genus is given. The pentagonal area is obsolete in most of the species which have simple tarsal claws, while it is large and defined by ridges in all but one species which has the claws dentate.

Tomostethus hirticornis, sp. nov.

Superficially this species resembles *T. barda*, but may be readily separated from that species by the hairy antennae and the white markings on the legs.

Female.—Length 7 mm. Anterior margin of the clypeus truncate, the sides rounded; supraclypeal area flat; middle fovea large and deep; lateral foveae opposite the middle fovea large, connected with the broad shallow antennal furrows; pentagonal area hexagonal, consisting of a depression which is sharply v-d above the anterior ocellus; postocellar furrow obsolete; postocellar area sharply defined laterally by the antennal furrows, about one and one-half times as wide as long; postocellar line distinctly shorter than the ocellocular line; antennae short, the first two joints subequal, flagellum strongly hairy, the third joint almost as long as the fourth and fifth; stigma angulate near base, slightly tapering to the subtruncate apex; tarsal claws with an erect inner tooth; sheath straight above, broadly rounded at the apex, convex below; saw strongly ribbed and regularly, finely dentate. Black, shining; pronotum, mesonotum, tegula, first perapteron, prepectus and most of the mesepisternum rufous; extreme base of the anterior tibiae, the basal two-thirds of the four posterior tibiae white; wings dusky hyaline; venation black; hind wings with one discal cell.

Male.—Length 6 mm. Besides the usual differences the male differs from the female only in having the anterior tibiae white on the basal two-thirds; hypopygidium broadly rounded apically.

Sadiya, North-East Assam. Described from one female and one male collected November 23rd, 1911, in a jungle path.

Type in the Indian Museum, Calcutta.

Allotype.—(Male) Cat. No. 15445, U.S.N.M.

Tomostethus assamensis, sp. nov.

This species is related to *T. formosanus*, Enslin, but does not agree in all points with Enslin's description of this species and may be separated from it by having the tibiae almost entirely white.

Male.—Length 4 mm. Anterior margin of the clypeus truncate, sides oblique, with the angles sharp; supraclypeal area flat; supraclypeal foveae confluent with the antennal foveae, more sharply defined, punctiform; middle fovea large, deep, rectangular in outline; frontal foveae punctiform, deep, opposite the dorsal margin of the middle fovea; antennal furrows poorly defined; ocellar basin large, pentagonal in outline, defined by rounded walls, not v-d above the anterior ocellus; postocellar furrow present, angulate anteriorly; postocellar area defined laterally by elongate foveae, convex, about twice as wide as long; postocellar line distinctly shorter than the ocellocular line; posterior orbits narrow, without a carina; eyes strongly converging to the clypeus; antennae short, flagellum hairy; scape and pedicel subequal in length, the pedicel slightly longer than its apical width; third antennal joint a little shorter than the fourth and fifth; claws with a simple erect inner tooth; hind wings with one discal cell; stigma angulate at base, tapering to a subtruncate apex; transverse radius in apical third of cell; hypopygidium broadly rounded. Black, shining; apices of femora, tibiae except a small spot on the dorsal apices, the first joint of the tarsi, white; remaining joints of the tarsi brown; wings strongly dusky; venation black.

Sadiya, North-East Assam. Described from one male collected November 23rd, 1911.

Type in the Indian Museum.

Subfamily *SELANDRIINAE*.

Genus Stromboceros, Konow.

Stromboceros (Neostromboceros) congener, Konow.

Three specimens forwarded from the Indian Museum and collected on the Abor Expedition come from the following localities: Dibrugarh, North-East Assam (female, collected November 17th-19th, 1911). Kobo, altitude 400 feet (female, collected December 3rd, 1911). Sadiya, North-East Assam (male, collected November 27th, 1911).

Stromboceros (Neostromboceros) congener, variety tarsalis, nov.

This variety differs from the typical form in having the tibiae (except the extreme apices, which are brown) yellow, and in having the tarsi yellowish brown.

Described from four females and three males. Two females and three males were collected at Sadiya, North-East Assam, November 27th-28th, 1911. One female was collected at Kobo at an altitude of 400 feet, December 5th, 1911, and one female was collected at Dibrugarh, North-East Assam, November 17th-19th, 1911.

Type (female) and allotype (male), two female paratypes and one male paratype in the collection of the Indian Museum.

A female paratype and a male paratype. Cat. No. 15446, U.S.N.M.

XVIII. FISH.

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(Plate vii—ix.)

The total number of species of fish collected in the course of the Abor Expedition is forty-three, among which there is a mountain-loach representing a new genus. The discovery of this new genus affords some indication of the richness of the unexplored Himalayan fauna of the N. E. Frontier of India. There are also three new species and two new varieties of known generic groups, one of which belongs to Himalayan and sub-Himalayan districts, while the rest are of rather extended distribution. Nearly half the species collected have a very wide range, which includes Assam and Burma on the one hand and more westerly districts on the other. This was to be expected, as collecting commenced at Dibrugarh. Four species, viz. *Oreinus sinuatus* (Heckel), *Oreinus richardsonii* (Gray), *Oreinus plagiostomus* (Heckel) and *Schizothorax progastus* (McClell.), represent a Himalayan or sub-Himalayan element; four species, viz. *Exostoma labiatum* (McClell.), *Amblyceps mangois* (H. B.), *Barbus chola* (H. B.), *Danio aequipinnatus* (McClell.) occur, among other places, both in Assam and Burma. Of these latter the rare species *Exostoma labiatum* had been previously reported only from the Mishmi country and from Burma. Seven species, viz. *Barbus hexastichus*, McClell., *Barbus hexagonolepis*, McClell., *Barbus sophore* (H. B.), *Labio dyochilus* (McClell.), *Pseudecheneis sulcatus* (McClell.), as well as *Danio aequipinnatus* and *Exostoma labiatum*, show the preponderating Assamese (as distinct from Himalayan) character of the fish-collection from the Abor country. One young eel of two inches and a half in length, found under a stone in a stream at an altitude of 2000 ft., is very interesting; adult specimens of the same species were found in numbers buried in the mud of a stream at a lower altitude. The collection includes one species previously reported from Eastern Tibet only, viz. *Exostoma davidi*. This perhaps indicates some influence of the fauna of Eastern Tibet on that of the North-East Frontier of India.

LIST OF THE SPECIES OBTAINED.

1. *Aborichthys kempi*, gen et sp nov.
2. *Lepidocephalichthys guntea* (H. B.).
3. *Discognathus lamta* (H. B.).

4. *Oreinus plagiostomus* (Heckel).
5. *O. richardsonii* (Gray and Hardw.).
6. *O. sinuatus* (Heckel).
7. *O. molesworthi*, nov.
8. *Schizothorax progastus* (McClell.).
9. *Labeo angra* (H. B.).
10. *L. dyochilus* (McClell.).
11. *L. gonius* (H. B.).
12. *Cirrhina reba* (H. B.).
13. *Barbus chola* (H. B.).
14. *B. hexagonolepis*, McClell.
15. *B. hexastichus*, McClell.
16. *B. sarana* (H. B.).
17. *B. sophore* (H. B.).
18. *B. spilopholus*, McClell.
19. *B. ticto* (H. B.).
20. *B. tor* (H. B.).
21. *Nuria danrica* (H. B.).
22. *Rasbora rasbora* (H. B.) var. *kobonensis*, nov.
23. *Danio aequipinnatus* (McClell.).
24. *Amblyceps mangois* (H. B.).
25. *Clarias assamensis*, Day.
26. *Exostoma davidi*, Sauvage.
27. *E. labiatum* (McClell.).
28. *Macrones merianiensis*, nov.
29. *M. montanus* (Jerdon) var. *dibrugarensis*, nov.
30 *M. tengara* (H. B.).
31. *M. vittatus* (Bloch).
32. *Pseudecheneis sulcatus* (McClell.).
33. *Pseudeutropius atherenoides* (Bloch).
34. *P. garua* (H. B.).
35. *Saccobranchus fossilis* (Bloch).
36. *Moringua hodgarti*, nov.
37. *Ophiocephalus gachua* (H. B.).
38. *Belone cancila* (H. B.).
39. *Ambassis ranga*, L.
40 *Badis badis* (H. B.).
41. *Nandus nandus* (H. B.).
42. *Osphromenus nobilis* (McClell.).
43. *Trichogaster fasciatus*, Bl. Schn.

Sub-order **OSTARIOPHYSI.**

Fam. CYPRINIDAE.

Sub-family *COBITIDINAE.*

Aborichthys, gen. nov.

The body is elongate, compressed at the sides and still more so at the caudal peduncle ; it has minute scales on the sides and back.

The head and snout are naked and considerably depressed. The position of the lateral line is much higher than the middle of the sides, the depth of the body above it being almost half of the depth below it. The mouth is wide, inferior, surrounded by a circular suctorial lip which is deficient in the middle below. There are three pairs of barbels, two on the snout and one at each side of the mouth. The eyes are small, without suborbital spine. The gill openings are not restricted to the sides. The dorsal fin is short, with nine rays, and is situated behind the vertical from the anterior root of the ventral. The vent is situated very far forward, its distance from the root of the caudal being five-sixths to eight-ninths of its distance from the snout. The position of the pectorals and ventrals is very low, their lengths being very much shorter than the intervals between the root of each and that of the next succeeding fin. The anal fin is short, with seven rays. The air-bladder is entirely enclosed in a bony capsule open at the sides. The fontenelle between the frontal and parietal bones is not large. The intestinal canal is short and broad, forming only one loop.

The new genus differs mainly from the two allied genera *Nemachilus* and *Nemachilichthys*, both of which are without suborbital spine, in having (1) the vent situated far forward close to the middle point, (2) the dorsal fin situated behind the vertical from the anterior limit of the root of the ventral fin, and (3) the lateral line much higher upon the body.

Aborichthys kempi, sp. nov.

(Pl. vii, figs. 1, 1*a*, 1*b*.)

The depth of the body is contained seven times in the total length, the length of the head five times. The head is depressed, and a little less than one and a half times as long as broad. The snout is a little shorter than the post-orbital part of the head. The eyes are small; their breadth is contained seven and a half times in the length of the head and is two-fifths of the interorbital width. The mouth is inferior, half as wide as the length of the head, and is surrounded by a circular suctorial lip, fringed in front and dilated into two fleshy knobs in the middle of the lower lip, where it is deficient. The two nostrils are separated by a thin partition, tubular below, open and tapering above. There are three pairs of barbels, two on the snout not superimposed but with a considerable interval between, and one at the side of the mouth; all are nearly equal, the maxillary being the longest and two and a half times the diameter of the eye. The covering flaps of the gill openings are continuous with the skin of the isthmus, leaving less than half the width of the ventral surface between. The lateral line is incomplete, ending in front of the vertical from the anterior part of the root of the ventral, and is less than one-fourth of the total length; the distance of the lateral line from the dorsal profile is only half of its distance from the ventral profile. The scales are extremely minute and deciduous.

Dorsal II 7, first entire, second articulated, rest branched; the origin of the dorsal is somewhat posterior to the vertical from the anterior part of the root of the ventral, its distance from the gill opening being twice the depth of the body. The dorsal is equidistant between the tubular nostril and the root of the caudal; the longest ray is two-fifths the length of the head. The positions of the pectoral and ventral are low; the length of the pectoral is nearly two-thirds of the distance between the roots of the pectoral and ventral while the length of the ventral is nearly half the distance between the roots of the ventral and anal. The vent is placed far forward, being equidistant from the post-orbital line and the root of the caudal, and twice as much nearer the root of the ventral than the anal. Anal II 5, short. The free portion of the caudal end of the body is one and two-thirds as long as deep. The caudal fin is entire, longer than the length of the head and with its free end highly convex. The air-bladder is enclosed in a bony capsule open at the sides and covered with membranous skin only. The intestinal canal has only one convolution and a loop below the muscular stomach on its right-hand side.

Colour.—The head is marbled with round black and grey blotches and loops: the sides of full-grown specimens are striped—from the gill openings to above the anal fin—with dark brown transverse stripes 18 to 21 in number, inclined away from the head, on a yellowish white ground, the caudal peduncle being quite free from these transverse stripes. The stripes are broader at the top, become thinner gradually and disappear before reaching the ventral surface; in their broadest part they are only half as broad as the interspaces; the posterior ones are short, the last being less than half the depth of the body. The barbels, pectoral, ventral and anal fins, together with the ventral sides of the body, are dull white; the dorsal fin is banded with dark brown spots and there is an irregular blotch at the upper corner of the root of the caudal. The caudal fin is beautifully banded with two broad black concentric curves, one about the middle which is somewhat blurred and deep and the other intensely black almost bordering the margin, but leaving a narrow white fringe. From the large series of young ones it has become possible to study the developmental changes in colouration and striping. In the young the dorsal and caudal fins are immaculate, but broad stripes are visible all over the sides of the body including the caudal peduncle. With the progress of age dark spots appear on the dorsal and caudal fins, and at the same time the broad transverse stripes on the sides of the body gradually get thinner and entirely disappear from the sides of the caudal peduncle. The dark spots on the dorsal and caudal fins are gradually arranged in banded series on the dorsal and into two beautiful broad concentric curves on the caudal fin.

Three full-grown specimens from Egar stream between Renging and Rotung, collected by Mr. S. W. Kemp. Their registered numbers in the Museum register and their total lengths with

the caudal are:—F. $\frac{7721}{1}$ (figured) = 93 mm., F. $\frac{7722}{1}$ = 100 mm., and F. $\frac{7723}{1}$ = 78 mm. (caudal damaged). Nine young specimens of all sizes from the same locality collected by Captain the Hon. M. de Courcy. Two young specimens from the Dihang River (east side), near Yembung (alt. 1100 ft.), and three young specimens from the Sirpo River near Renging, collected by Mr. S. W. Kemp. All the specimens were collected in the middle of the month of January, 1912.

Lepidocephalichthys guntea (H. B.).

Dibrugarh.

Sub-family *CYPRININAE.*

Discognathus lamta (H. B.).

Siyom River, below Damda, 1400 ft. Found in an Abor fish-trap. There is also a young *Discognathus* (36 mm. with the caudal) from Yembung, 1100 ft. The chest of the young specimen is without scales; it probably represents the common Assam race of the species.

Dr. N. Annandale has published a note on some of the so-called species and local races of this genus from Assam and elsewhere (Journ. As. Soc. Bengal, vol. ix, p. 36; 1913). He identifies the Abor specimens as probably *Discognathus lamta* subsp. *nasutus* (McClell.).

Oreinus plagiostomus (Heckel).

Yembung

The anal opening is immediately in front of the anal fin. The species has been previously reported from Afghanistan, Kashmir and Bhutan.

Oreinus richardsonii (Gray and Hardwicke).

Yembung. Two specimens in a very much damaged condition.

Oreinus sinuatus (Heckel).

Yembung, alt. 1100 ft.

The scales of the lateral line are more numerous than usual.

Oreinus molesworthi, sp. nov.

(Pl. vii, figs. 2, 2*a*, 2*b*.)

The body is compressed and its depth is contained four times in the total length. The length of the head is contained four and a half times in the total length, and the width of the head is five-eighths of its length. The snout is broadly rounded. The eyes are nearer the end of the snout than the posterior border of the head; they are almost lateral and their diameter is contained five

times in the length of the head. The interorbital width is slightly less than half the length of the head, and the width of the mouth is nearly two and a half times the length of the head. The edge of the rostral flap is entire; on it as well as all over the snout there are numerous conical warts with pointed denticles. There is a narrow groove in front of the paired nostrils, the anterior nostril being fleshy and tubular. There are four barbels; those of the rostral pair are longer than half the diameter of the eye; those of the maxillary pair are partially concealed by the over-turned lower lip and are three-fourths of the diameter of the eye Both the lips are overturned to form a suctorial disk, the lower lip being more broken up. The margin of the lower jaw is mounted with a hard horny covering and there is a narrow transverse groove at the anterior edge of the opercle in the lower three-fourths. Dorsal V 7. The first two spines are very small, almost like scales; the last spine is the longest and is less than the length of the head by one length of the diameter of the eye. It is strongly serrated with a double row of thirty teeth in each series. The upper edge of the dorsal is cut almost straight; it is equidistant between the anterior orbital and the root of the caudal; in front of it there are sixty-four scales. The pectoral is less than two-thirds of the distance between the bases of the pectoral and ventral, and is slightly shorter than the length of the dorsal. The length of the ventral is equal to five-sixths of the interval between the bases of the ventral and anal. Anal II 5. The first branched ray is the longest; it is as long as the ventral and does not reach the root of the caudal. The caudal is deeply divided, and the caudal peduncle is one and a one-third times as long as deep. The head is smooth and the portion of the body behind the opercle and below the lateral line is scaleless and smooth down to half the length of the pectoral fin. The scales are minute and thickset over the rest of the body, those over the sheath enclosing the vent and the base of the anal being one and a half times as large as those in the middle of the body. There are 113 scales in the lateral line, $\frac{21}{25}$ in the transverse series, 14 between the lateral line and the ventral fin, and 42 round the caudal peduncle.

Colour.—The head and scaleless portion of the lower part of the side just behind the opercle are bluish grey, the rest of the body black with a deep bluish tint. The ventral and lower side of the paired fins is dull white, the rest of the fins grey with irregular dark blotches on the caudal

One specimen numbered F. $\frac{7735}{1}$ in the Museum register, measuring 202 mm. with the caudal, from Yembung, 1100 ft., collected by Mr. S. W. Kemp. The species is named after Captain A. L. M. Molesworth of the 8th Gurkha Rifles.

Schizothorax progastus (McClell.).

The Siyom River below Damda, altitude 1400 ft., found in Abor fish-trap. Also one young specimen from the Egar stream

between Renging and Rotung, measuring 36 mm., collected on the 9th January, 1912.

The latter record affords some clue to the breeding season of this mountain barbel, for the young specimen was probably in its first year. It is interesting to note in this connection Captain F. H. Stewart's remarks on the breeding habits of *Schizopygopsis stoliczkae* (Rec. Ind. Mus., vol. vi, p. 84).

Labeo angra (H. B.).

Yembung, 1100 ft. Two specimens, both in a damaged condition.

Both examples agree with Burmese specimens in lacking the black lateral band, but differ from them in being without the black blotches on the side of the tail. Barbels also are wanting, as in Burmese examples, in one specimen (F. $\frac{7742}{1}$); in the other, barbels are present as usual.

Labeo dyochilus (McClell.).

Yembung.

Cirrhina reba (H. B.).

Dibrugarh.

Barbus chola (H. B.).

Dibrugarh; four specimens.

The customary dark blotch on the sides is entirely absent. In some a black spot and in others a black band is present on the dorsal fin. The caudal fin is tinged with blue in the middle.

Barbus hexagonolepis, McClell.

Yembung, 1100 ft. One young specimen 60 mm. (without caudal) and another very young scarcely longer than 15 mm., probably only a month old.

These specimens were collected between the 13th and the 17th January, 1912. The record gives an approximate idea of the breeding season and the rate of growth; the young specimen, 60 mm. in length, is likely to be a fingerling of a year's growth. On the 17th January, Major Wilson caught an unripe female of a total length of 664 mm. (without caudal) weighing 15 lb.

Barbus hexastichus, McClell.

Yembung, 1100 ft. Three adult specimens much damaged and three young specimens in good condition

In the adult specimens the eyes appear to be larger, and the dorsal fin longer than usual. In the young specimens the dark band along the lateral line ends in a black blotch in front on the root of the caudal fin.

Barbus sarana (H. B.).

Dibrugarh.

Barbus sophore (H. B.).

From the stream below Balek.

There are ten rows of scales in front of the dorsal fin instead of nine. *Colour*—reddish brown.

Barbus spilopholus, McClell.

(Pl. viii, figs. 1, 1*a*, 1*b*.)

The body is deep and strongly compressed, its greatest depth, at the origin of the dorsal fin, is contained three and one-third times in the total length, the length of the head is a little over three and a half times. The snout is rounded, its length is contained two and one-fourth times in that of the head. The diameter of the eye is contained five times and the interorbital width two and a half times in the length of the head. The mouth is small and anterior. There are two barbels on each side, the anterior one and one-third times the diameter of the eye and the posterior one and a half times; the distance between them measures one and one-third times the diameter of the eye. Dorsal III 8, equidistant from the end of the snout and the root of the caudal; the last undivided spine is strongly denticulated and the longest ray is two-thirds the length of the head. In front of the dorsal there are sixteen scales. Anal III 6. The posterior four rays are nearly equally elongated, they almost reach the root of the caudal and are one and one-third times the length of the anterior shorter rays. The caudal peduncle is nearly twice as long as deep. There are 46 scales in the lateral line, 6 between the lateral line and the ventral fin, $\frac{11}{9}$ in the transverse line and 12 round the caudal peduncle.

Colour in life, as noted by Mr. Kemp "general colour greyish, silvery below. Anal and posterior part of dorsal tinged with pink, caudal fin also tinged with pink, slightly bluish at extreme end, ventral side also pink." The base of each scale is deeply marked with black, giving the characteristic spotted appearance.

One specimen, 248 mm. in length with caudal, obtained at Kobo by dynamiting a pool in the Brahmaputra river.

This species of McClelland was merged somewhat unfairly in the synonymy of *Barbus chagunio* (H. B.) by Day; probably he was misled by a casual remark in the descriptive lettering of plate xxxix of McClelland's Indian Cyprinidae. McClelland corrected this mistake about ten years later in Cal. Jour. Nat. Hist., vol. v, p. 280. Moreover, Günther in the Zoological Record for 1869 and subsequently in Proc. Zool. Soc. of 1872, p. 875, demonstrated the absurdity of the attempt to identify *B. chagunio* (H. B.) with an unpublished manuscript drawing of Hamilton Buchanan marked *B. kunta*. After this Day was compelled in a manner to admit the independent existence of *Barbus spilopholus*, but relegated it in

his "Fishes of India" and in the "Fauna of British India" to the position of a variety of *Barbus chagunio* (H. B.), which itself remained undetermined. As the specimen secured by Mr. Kemp happens to be an excellent example and as McClelland's description and figure were both imperfect and meagre, the present opportunity is taken to supply a short description and a figure of the species.

Barbus tor (H. B.).

An unripe female, 1245 mm. in length without caudal fin and weighing 52 lb, was caught by Major Wilson on 15th January, 1912, at Yembung. This was the largest mahseer obtained on the expedition.

Barbus ticto (H. B.).

Dibrugarh.

The specimens have a reddish tinge on the abdomen.

Nuria danrica (H. B.).

Dibrugarh.

The end rays (external) both of the pectoral and ventral fins are considerably elongated beyond the fin-membranes.

Rasbora rasbora (H. B.) var. **kobonensis**, nov.

(Pl. viii, figs. 2, 2*a*, 2*b*.)

The depth of the body is contained three and three-quarter times in the total length, the length of the head three and a half times. The head is a little less than twice as long as broad, and the upper profile is slightly convex; the snout is three-fourths as long as the diameter of the eye, which is contained three times in the length of the head. The interorbital length is contained two and one fifth times in the length of the head. The mouth extends to below the anterior border of the eye; the lower jaw is prominent. The prominences on the jaws are well marked. Dorsal II 7, originating midway between the root of the caudal and the anterior border of the eye, the longest ray is nearly as long as the head. There are thirteen scales in front of the dorsal fin. Anal II 5, the longest ray being two-thirds the length of the head. The pectoral is pointed, shorter than the length of the head and also than the interval between the roots of the pectoral and ventral. The caudal is deeply forked and the caudal peduncle is one and one-third times as long as deep. The scales have numerous radiating striae, the lateral line is concave to the dorsal profile and is incomplete. Nineteen out of the thirty scales in the line are perforated, the series of perforated scales stopping just in front of the anal fin. There are $\frac{5}{3}$ scales in a lateral transverse row and two between the lateral line and the ventral fin; round the peduncle there are fourteen.

Colour.—The body is brown, with a broad black band running along the middle of each side beginning from the corner of the mouth passing through the middle of the eye and body to the root of the caudal; the band extends to the middle of the caudal fin in two attenuated black lines. There is also a black line on the dorsal side from the occiput to the root of the caudal, and the margin of each scale is spotted with minute black points. The fish resembles *Rasbora rasbora* (H. B.) more than *Rasbora daniconia* (H. B.), except in having the middle band distinctly black, instead of being merely a faint streak.

The new variety differs from both these species in having the lateral line incomplete, in the number of scales in front of the dorsal fin and in other particulars, including the proportions.

One specimen, type of the new variety, numbered F. $\frac{7796}{1}$ in the Museum register, was found at Kobo, 400 ft.: its length with caudal is 47 mm. Three specimens were taken at Dibrugarh.

Danio aequipinnatus (McClell.).

Yembung, alt. 1100 ft. Twelve specimens.

The broad black band extends along the middle line to the caudal fin. Another damaged specimen which was received with this lot probably belongs to the same species but is a deeper fish.

Fam. SILURIDAE.

Amblyceps mangois (H. B.).

Four specimens were found in a stream south of Yembung.

One specimen is dark grey, the rest are dark brown, the usual colour of the species.

Clarias assamensis, Day.

Dibrugarh.

Exostoma davidi, Sauvage.

Between Rotung and Renging. Two specimens only.

The pectoral fins reach the root of the ventral.

This species has previously been reported only from Eastern Tibet.

Exostoma labiatum (McClell.).

Egar stream, between Rotung and Renging, six specimens. Previously reported from the Mishmi hills, Eastern Assam and Burma.

Of the mandibular barbels the two internal ones, which are very small, are attached to the margin of the middle lobe of the overturned lower lip, but the outer pair are fairly long, attached to the skin of the isthmus outside the margin of the outer lobes. There is a broad dark brown band along the middle line from the operculum to the root of the caudal.

Macrones merianiensis, sp. nov.

(Pl. ix, figs. 1, 1*a*, 1*b*.)

The depth of the body is contained four and a half times in the total length, the length of the head five times. The eye is situated in the middle of the head, its diameter is contained three and a half times in the length of the head, one and a half times in the length of the snout and one and a quarter times in the interorbital length. The width of the mouth is equal to the inter-ocular width. The lips are fimbriated; there are villiform teeth on the jaws. The barbels are thin and slender, the nasal is one-third the length of the head; the maxillary barbels are longer, five-sevenths the length of head; the outer mandibular is one-fourth the length of the head and nearly double the length of the inner. Dorsal I 7, entirely in advance of the vertical from the root of the ventral fin and twice as distant from the root of the caudal as from the end of the snout. The spine of the dorsal is perfectly smooth and measures three-fourths the length of the head; the second ray is the longest and is quite as long as the head. The pectoral fin nearly reaches the root of the ventral, its spine is as long as and stronger than that of the dorsal and is strongly denticulated on the inner side. The anal opening has a fimbriated margin and is nearer to the root of the ventral than to the anterior root of the anal. The ventral fin reaches the anal papilla close to the anterior end of the anal fin; the anal papilla is thick and produced into a short filament. The distance of the anal opening from the root of the caudal is four-fifths its distance from the snout, and its distance from the anterior base of the ventral is one-fourth its distance from the anterior root of the anal. The adipose fin is midway above the root of the caudal and the end of the dorsal, slightly longer than the length of the head and as high as half the diameter of the eye. The caudal peduncle is nearly twice as long as deep. The caudal fin is deeply forked, the lobes being equal and twice as long as the undivided base. The air-bladder is osseous and is placed behind the gill-opening, communicating with the outside by a thin membranous covering.

Colour in spirit—head greenish grey, body deep brown variegated with markings: a broad but faintly black band extends from the back of the neck obliquely to the middle line, another irregularly broad but deeply black band extends from the anterior root of the dorsal fin to the middle line, and a broad deeply black blotch extends from below the adipose fin to the middle line. The fins are dull white, with a deep black blotch on the outer upper half of the dorsal fin.

This species resembles *Macrones affinis* (Blyth) more than any other species in the genus, but differs from it in having a shorter head and longer snout, longer maxillary barbels and a smooth spine in the dorsal, and also in having the adipose fin situated further back. Blyth's type-specimen was from Tenasserim.

From a pond at Mariani junction, Assam. Type specimen numbered F. $\frac{7781}{1}$ in the register of the Indian Museum: length 73 mm. with caudal.

Macrones montanus (Jerdon) var. **dibrugarensis**, nov.

(Pl. ix, figs. 2, 2*a*, 2*b*.)

The depth of the body is contained four and one-eighth times in the total length, the length of the head three and three-quarter times. The eye is slightly in front of the middle of the head; its diameter is contained four and a quarter times in the length of the head, one and a half times in the length of the snout and one and three-quarter times in the interorbital length. The upper jaw is slightly protruding, villiform teeth are present on both jaws. The nasal barbel is longer than half the length of the head and reaches the post-orbital region; the maxillary barbels reach the middle of the caudal peduncle and are thrice as long as the length of the head; the outer mandibular reaches the end of the pectoral and the inner mandibular reaches the root of the pectoral; the inner mandibular is two-thirds the length of the outer mandibular. Dorsal I 7. The last rays are just over the vertical of the ventral fin, the distance of the anterior base of the dorsal from the snout is three-fourths of the distance of the posterior root from the caudal; its spine is perfectly smooth on both sides, and is nearly half the length of the head. The pectoral spine is one and a half times as long as the dorsal spine; it is strongly denticulated on the inner and feebly serrated on the outer side. The margin of the anal opening is lobulated; it is situated quite close to the root of the ventral. The end of the ventral if laid along the body reaches down to the anal papilla close to the anterior base of the anal fin. The distance of the anal opening from the root of the caudal is two-thirds of its distance from the snout; the distance of the anal papilla from the root of the caudal is just half its distance from the snout; the distance of the anal opening from the anterior base of the anal is three times its distance from the root of the ventral; the distance of the anal papilla from the root of the ventral is three times its distance from the anterior root of the anal. The anterior end of the adipose fin is a little in front of the vertical from the anterior base of the anal, and ends in a raised lobe above the posterior base of the anal fin. The length of the base of the fin is contained five and one-eighth times in the total length. The caudal is deeply forked; the lobes are equal and widely apart, the length of the lobe being three times the length of the undivided base.

Colour.—Head grey, dorsal side dark brown, body brownish. The membranous covering of the air-bladder behind the gill opening is black, and a black line from above this membrane extends through the middle of the side to the middle of the root of the caudal fin, ending in a black circular blotch. The barbels are black, except the inner mandibular, which, with the fins, is dull white.

Dibrugarh. Type specimen numbered F. $\frac{7795}{1}$ in the Museum register; total length with caudal 68 mm.

Macrones tengara (H. B.).

Kobo and Dibrugarh.

In some cases the maxillary barbels reach beyond the anal fin. In some specimens the longitudinal bands cannot be distinguished.

Macrones vittatus (Bloch).

Mariani, Assam. Two specimens.

The tips of the anal, ventral and dorsal fins are dark. The maxillary barbels reach beyond the anal fin.

Pseudecheneis sulcatus (McClell.).

Yembung, 1100 ft.

This species has previously been reported only from Darjiling and the Khasi Hills.

Pseudeutropius atherinoides (Bloch).

Dibrugarh. Six specimens.

These specimens lack the collections of black spots forming longitudinal bands. The anal fin has more numerous rays than usual.

Pseudeutropius garua (H. B.).

Dibrugarh.

Saccobranchus fossilis (Bloch).

Dibrugarh.

Two longitudinal yellow bands extend along the middle of each side. The caudal fin is injured.

Sub-order APODES.

Fam. MORINGUIDAE.

Moringua hodgarti, sp. nov.

(Pl. ix, figs. 3, 3*a*, 3*b*.)

The length of the head from the snout to the gill opening is contained eleven and one-quarter times in the distance from the snout to the vent; the length of the tail is contained three times in that distance (from snout to vent), and four and one-quarter times in the total length. The height of the body is contained one and a half times in the length of the head. The eyes are rather high up, very small, immediately behind the posterior nostrils and right above the opening of the mouth. The upper jaw is slightly the longer. The interorbital length is slightly shorter than the length of the snout. The length of

the head is contained three times in the distance between the end of the snout and the apex of the heart. The gill openings form two oblique slits on the ventral side as far behind the cleft of the mouth as the end of the snout is in front of it. The teeth are uniserial, directed backwards and pointed. The dorsal and caudal fins are slightly developed, confined to the posterior one-third of the tail and continuous with each other. There are no pectorals.

Colour.—Muddy grey, the ventral side being slightly lighter.

Upper Rotung, alt. 2000 ft. Five adult specimens from the streams reserved for drinking purposes, found buried in the mud, total lengths from 220 mm. to 182 mm. One young specimen, found in a small branch of a shallow stream in Upper Rotung, under a stone, is only 62 mm. in total length. The occurrence of such a young specimen in a shallow hill stream is extremely interesting.

Sub-order PERCESOCES.

Fam. OPHIOCEPHALIDAE.

Ophiocephalus gachua, Ham. Buch.

Yembung, 1100 ft.; Balek and Dibrugarh.

Fam. SCOMBRESOCIDAE.

Belone cancila (H. B.).

Dibrugarh.

Black patches are wanting. The longitudinal band does not extend quite up to the eye.

Sub-order ACANTHOPTERYGII.

Division—Perciformes.

Fam. SERRANIDAE.

Ambassis ranga (H. B.).

Dibrugarh.

Fam. NANDIDAE.

Badis badis (H. B.).

Kobo, 400 ft.; also from a stream below Balek.

The Balek specimen has two distinct round black blotches on the dorsal fin—one at the commencement and the other at the end, but the specimens from Kobo have only one black blotch near the posterior base of the dorsal fin.

Nandus nandus (H. B.)

Dibrugarh.

Fam. OSPHROMENIDAE.

Osphromenus nobilis (McClell.).

Dibrugarh.

Every specimen has a black light-edged ocellus on the upper part of the base of the caudal fin. The superbranchial respiratory organ is well developed.

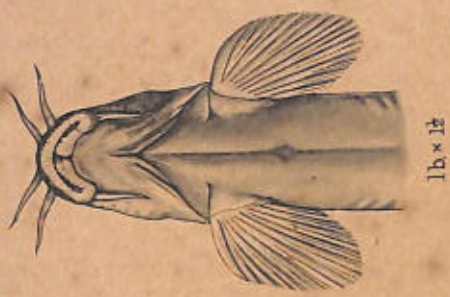
The Assam streams appear to be a favourable habitat for the genus, and *O. olfax* (Com.) would be likely to prove more successful in them than in Southern India, where several attempts have been made to acclimatize that species. The indigenous Indian species of the genus is confined to Assam.

Trichogaster fasciatus, Bl. Sch.

Dibrugarh.

EXPLANATION OF PLATE VII.

FIG. 1.—*Aborichthys kempi*, gen. et sp. nov.
,, 1*a*.— ,, ,, dorsal view of head, × 1½.
,, 1*b*.— ,, ,, ventral view of head, × 1½.
,, 2.—*Oreinus molesworthi*, sp. nov., × ⅔.
,, 2*a*.— ,, ,, dorsal view of head, × ⅔.
,, 2*b*.— ,, ,, ventral view of head, × ⅔.



1b. × 1½



2b. × ⅓



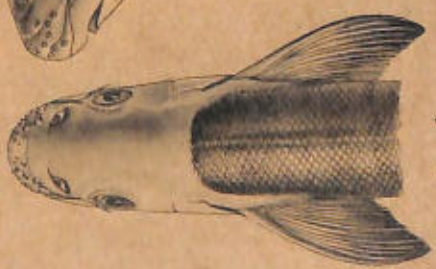
1.



2. × ⅓



1a. × 1½



2a. × ⅓

ABOR FISH.

A. C. Chowdhary. del.

Bemrose Ltd. Derby.

EXPLANATION OF PLATE VIII.

FIG. 1.—*Barbus spilopholus*, McClell., × $\frac{2}{3}$.

,, 1*a*.— ,, ,, dorsal view of head, × $\frac{2}{3}$.

,, 1*b*.— ,, ,, ventral view of head, × $\frac{2}{3}$.

,, 2.—*Rasbora rasbora* (H. B.) var. *kobonensis*, nov.

,, 2*a*.— ,, ,, ,, dorsal view of head, × $1\frac{1}{2}$.

,, 2*b*.— ,, ,, ,, ventral view of head, × $1\frac{1}{2}$.



ABOR FISH.

A. C. Chowdhary

Bemrose Pt. Derby

EXPLANATION OF PLATE IX.

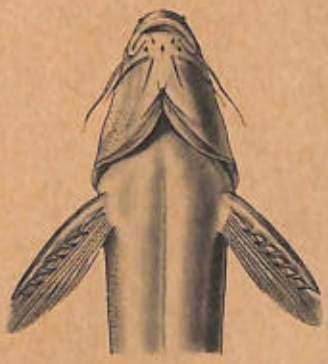
FIG. 1. —*Macrones merianiensis*, sp. nov.
,, 1*a*.— ,, ,, dorsal view of head, × 1½.
,, 1*b*.— ,, ,, ventral view of head, × 1½.
,, 2.—*Macrones montanus* var. *dibrugarensis*, nov.
,, 2*a*.— ,, ,, ,, dorsal view of head, × 1½.
,, 2*b*.— ,, ,, ,, ventral view of head, × 1½.
,, 3.—*Moringua hodgarti*, sp. nov.
,, 3*a*.— ,, ,, upper jaw, × 3.
,, 3*b*.— ,, ,, lower jaw, × 3.



1.



1a. × 1½.



1b. × 1½.



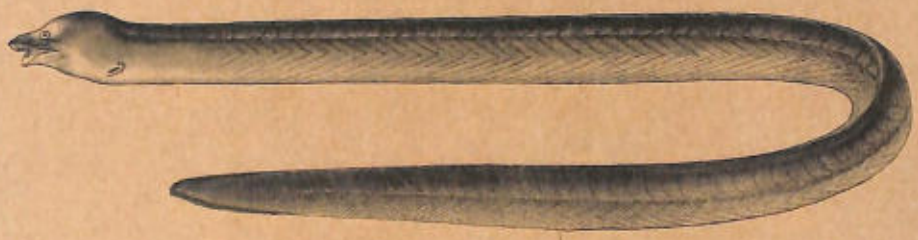
2.



2a.



2b.



3.



3a. × 3.



3b. × 3.

A.C. Chowdhary, del.

ABOR FISH.

Bemrose Pr., Derby.

XIX. BIRDS.

By E. C. STUART BAKER.

In addition to the birds collected by Mr. Kemp on the Abor Expedition, I have had sent me for examination a large series of skins collected by Dr. J. M. Falkiner, who accompanied the column as Medical Officer, as well as a few others collected by Capt. F. M. Bailey. The skins obtained by Mr. Kemp are all in the collection of the Indian Museum, and bear numbers which I give, prefixed by the abbreviation "I.M." The remainder of the skins bear the catalogue numbers of the Bombay Natural History Society, and against these specimens I note the catalogue numbers together with the letters "B.N.H.S." The whole of these latter have been collected by Dr. Falkiner, with the exception of a few against which I have given in brackets the initials F.M.B. (Capt. Bailey). The names of Capt. Sir George Duff Dunbar and Capt. the Hon. M. de Courcy, who appear also to have collected a few specimens on behalf of the Indian Museum, are also added in some instances.

The total number of skins I have had to examine is 192 which are referable to 111 species; a not inconsiderable number when one takes into account the great difficulties under which the collectors worked and the impossibility of collecting at any distance from the camps or stockades. As might be expected from the nature of the expedition, the birds collected are for the most part species which are conspicuous either on account of their plumage or their habits and the small skulking birds of the Timeliine groups, the Wrens and similar insignificant forms, amongst which we might have hoped to obtain a new species, are very poorly represented.

Of the 111 species collected all belong to the true Indo-Himalayan avifauna with the exception of *Cryptolopha jerdoni*, which is closer to the eastern than the western form, *Aethopyga seheriae seheriae*, the specimens of which are curiously like those collected in Bhamo and separated by Hume under the name of *andersoni*, and *Sitta cinnamoneoventris* which shows an approach to *S. neglecta*.

The specimens obtained of the genera *Megalaema* and *Cyanops*, *Pitta*, *Myophoneus* and *Petrophila*, which might have been expected to show some slight approximation to the Burmese forms, are all quite typical specimens of the western races.

On the whole, therefore, we may say that the collection of birds is representative of what one would have expected to find in the Indo-Himalayan-Burmese Region; but that they are more completely Himalayan and less Burmese in character than are similar collections made south of the Brahmaputra in the same longitude or even further west.

A very striking feature in this collection of birds is the very deep tint observable in the colour of so many of the specimens, attributable, doubtless, to the heavy rainfall and dense forests of this part of India. This depth of colour is especially noticeable in all the specimens of *Sturnopaster*, *Megalaema*, *Harpactes* and *Rhopodytes*, whilst in the case of *Rhipidura albicollis* I have considered it so marked as to make it necessary to form the north-eastern bird into a new subspecies.

One other point calling for remark is the comparatively low elevation at which certain birds, such as *Chelidorhynx*, have been found. This feature is common to the whole of the extreme north-east of Assam, where one meets with a fauna, and I believe flora, which elsewhere obtains at some 1500 or 2000 feet higher elevation. This may be due to the comparatively small area covered by the foot-hills between the higher ranges, upon which there is heavy snow-fall, and the plains. This naturally gives a correspondingly low temperature and the avifauna elsewhere inhabiting a much greater elevation here consequently works much lower down and even well into the plains.

In compiling the following catalogue I have generally given references to only two works, the "Avifauna of British India" by Oates and Blanford and the "Catalogue of Birds in the British Museum." The abbreviations I have used in referring to these are "O. & B." and "B.M. Cat." respectively.

I have in one or two places also referred to Dr. Hartert's recent work "The Birds of the Palaearctic Region" published in Germany. This is the latest publication on the subject and is one mass of information and research put in the simplest and most direct manner, and I refer to it as the authority upon which the sub-specific value of many of our Indian birds must be taken. The abbreviation used for this book is "D.V.P." (Die Vögel der Paläarktischen Fauna).

The following abbreviations are also used on one or two occasions:—

"B.N.H.S.J."=Journal of the Bombay Natural History Society and "N.Z."=Novitates Zoologicae.

I have to thank the British Museum authorities for much assistance in placing material at my disposal for the purpose of comparison and for constant help in facilitating my work generally.

Order PASSERES.

Family CORVIDAE.

Sub-family *CORVINAE*.

1. **Cissa chinensis** (Bodd.).

O. and B., vol. i, p. 28.
B. M. Cat., vol. iii, p. 85.

(*a*) ♂, Sadiya, N.-E. Assam, 28-ii-11. I.M. No. 25271.
(*b*) Not sexed. Rotung, March, 1912. B.N.H.S. No. 18.
(*c*) Not sexed. Mishmi Hills, Jan.—Feb. 1912. B.N.H.S (*F.M.B.*).

This beautiful but conspicuous bird is common both N. and S. of the Brahmaputra from the level of the plains to about 3000 feet.

2. **Dendrocitta frontalis** (Maclell.).

O. and B., vol. i, p. 33.
B. M. Cat., vol. iii, p. 78.

(*a*) ♀, Kobo, 400 ft., 1-xii-11. I.M. No. 25287.

The Black-browed Magpie is generally to be found at elevations far higher than this, seldom, indeed, below 2000 ft., but here in the extreme N.-E. of the Empire, it is common both N. and S. of the Brahmaputra in the foot-hills of the Himalayas extending some way into the plains. Dr. H. N. Coltart found it common at and around Margherita.

Sub-family *PARINAE.*

3. **Parus major cinereus** (Vieill.).

O. and B., vol. i, p. 46.
B. M. Cat., vol. viii, p. 16.
Hartert, D.V.P., part iii, p. 345.

(*a*) ♂, Kobo, 400 ft., 10-xii-11. I.M. No. 25351.

Dr. Hartert, in his splendid work on Palaearctic Birds, has gone very carefully into the sub-division and nomenclature of the Titmice of this genus, *Parus*, and this particular sub-species of *Parus major* which we, in India, have hitherto known as *atriceps* will now have to be known as *cinereus*. The name *cinereus* (Vieill.) dates from 1818 and not 1823 as shown by Oates and so undoubtedly has priority over *atriceps*, which dates four years later. The specimen in this collection is a bird with a wing of 78·1 mm.

Sub-family *PARADOXORNITHINAE.*

4. **Scaeorhynchus ruficeps ruficeps** (Blyth).

O. and B., vol. i, p. 68.
B. M. Cat., vol. vii, p. 491.
Hartert, N.Z., vol. vii, p. 548.

(*a*) Unsexed. Rotung, March 1912. B.N.H.S. No. 17.

This bird is identical with Sikkim specimens, having a wing of only 85 mm. as against 90·95 mm. in the form found in the hills south of the Brahmaputra. The under surface is very white with the buff on the sides restricted entirely to the flanks.

Family CRATEROPODIDAE.

Sub-family *CRATEROPODINAE.*

5. **Dryonastes ruficollis** (Jard. and Selby).

O. and B., vol. i, p. 73.
B. M. Cat., vol. v[illegible]

(*a*) [illegible] sexed. Rotung, 1400 ft., 7-iii-12. I. M. No. 25310.
(*b*) ♂, Kobo, 400 ft., 29-iii-12. I.M. No. 25282.
(*c*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 21.

6. **Garrulax leucolophus leucolophus** (Hardw.).

O. and B., vol. i, p. 77.
B. M. Cat., vol. vii, p. 435.

(*a*) ♂, Rotung, 2-i-12. I.M. No. 25281.
(*b*) Not sexed. Rotung, March 1912. B.N.H.S. No. 29.
(*c*) ♀, Krolling, Dibang Valley, Mishmi Hills, 14-i-12. B.N.H.S. (*F.M.B.*)

All three of these specimens are quite typical *leucolophus* and do not in any way approach the Burmese sub-species *belangeri.*

"Iris reddish brown, bill black, gape yellow, legs grey. Mishmi name Puhu, Naga name Ngo." (*F.M.B.*)

7. **Garrulax moniliger** (Hodg.).

O. and B., vol. i, p. 81.
B. M. Cat., vol. vii, p. 442.

(*a*) ♀, Kobo, 400 ft., 13-xii-11. I.M. No. 25256.

8. **Grammatoptila striata austeni** (God.-Aus.).

O. and B., vol. i, p. 104.

(*a*) and (*b*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. Nos. 25306 and 25307.
(*c*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 9.

These birds are all *austeni*, but this is merely a sub-species of *striata* and a specimen of the latter from Kumaon in the B.M

collection shows distinct signs of the dark coronal bands, the feature which distinguishes *austeni* from *striata*. South of the Brahmaputra throughout the Cachar and Naga Hills only *austeni* is met with, and it would appear to work as far west on the north as Bhutan and perhaps into Eastern Nepal.

9. **Pomatorhinus ferruginosus** (Blyth).

O. and B., vol. i, p. 120.
B. M. Cat., vol. vii, p. 422.

(*a*) ♂, Upper Rotung, 2150 ft, 6-i-12. I.M. No. 25262.

This is unfortunately rather a poor specimen, but it appears to have the rufous on the breast a good deal more restricted in extent than in any of the series in the British Museum.

Sub-family *TIMELIINAE*.

10. **Pellorneum mandellii** (Blanf.).

O. and B., vol. i, p. 140.
B. M. Cat., vol. vii, p. 518.

(*a*) ♀, Kobo, 400 ft., 10-xii-11. I.M. No. 25261.

The so-called Burmese sub-species, *P. m. minus*, must I think be suppressed. Many years ago when working in the N. Cachar Hills, where *P. mandellii mandellii* was the usual form met with, I was constantly also obtaining birds which appeared to be nearer *minus* than *mandellii*, and often there would be one of a pair, one of which was *minus* and the other of which was a quite typical *mandellii*. The same thing occurs in the Khasi and Naga Hills where the two extremes are almost equally common and where every intermediate form exists. Again, in the Southern Shan States, though, perhaps, there are more *minus* than *mandellii*, yet the latter is quite common, and specimens which cannot be said to be either one or the other are even more so. In order to create a sub-species it is essential that there should be some dividing line either in latitude, longitude or in elevation, but all that can be said as regards this species is that the form *mandellii* is the more prominent in the north and *minus* in the south and east of its range.

The specimen in this collection is a very dark bird with the streaks on the lower plumage exceptionally dark and broad.

11. **Alcippe nepalensis** (Hodg.).

O. and B., vol. i, p. 157.
B. M. Cat., vol. vii, p. 620.

(*a*) ♀, Upper Rotung, 2150 ft., 6-i-12. I.M. No. 25323.
(*b*) ♂, Upper Rotung, 2150 ft., 13-iii-12. I.M. No. 25340.

12. **Stachyris nigriceps** (Hodg.).

O. and B., vol. i, p. 162.
B. M. Cat., vol. vii, p. 532.

(*a*) Not sexed, Rotung, Dibang Valley, Mishmi Hills, 2500 ft., 9-i-12 (*F.M.B.*).

As I have already recorded, Hume was quite correct in stating that the bill of this bird has a seasonal change of colour becoming much darker during the breeding season.

13. **Stachyris chrysaea** (Hodg.).

O. and B., vol. i, p. 163.
B. M. Cat., vol. vii, p. 601.

(*a*) Rotung, Dibang Valley, Mishmi Hills, 2500 ft., 9-i-12.

"Iris reddish brown; legs yellowish; bill dark grey. Mishmi name Pra-li-ne or Pe-ma-ra." (*F.M.B.*)

During the breeding season the bill of the male, but not of the female, becomes very dark brown.

14. **Pseudominla castaneiceps** (Hodg.).

O. and B., vol. i, p. 172.
B. M. Cat., vol. vii, p. 600.

(*a*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25370.

Sub-family *BRACHYPTERYGINAE*.

15. **Tesia cyaniventris** (Hodg.).

O. and B., vol. i, p. 192.
B. M. Cat., vol. vii, p. 604.

(*a*) ♂, Balek, 24-iii-12. I.M. No. 25332.

Sub-family *SIBIINAE*.

16. **Sibia picaoides** (Hodg.).

O. and B., vol., i, p. 195.
B. M. Cat., vol. vii, p. 401.

(*a*) ♀, Misshing, 2800 ft., Feb. 1912. B.N.H.S. No. 6.

(*b*) Not sexed. Misshing, 2800 ft., Feb. 1912. B.N. H.S. No. 50.
(*c*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25266.
(*d*) ♂, Upper Rotung, 21-i-12. I.M. No. 25278.

All four of these specimens are somewhat darker, and also have less of a reddish tinge than the specimens in the British Museum. At the same time the latter skins which are nearly all from the Southern Shan States are mostly old specimens and the oldest are palest and most red, so that, possibly, the difference is due only to their having become somewhat bleached. It must be noted, however, that in being so dark in colouration *Sibia picaoides* merely agrees with the general trend in the plumage of the birds of these hills.

17. **Lioptila annectens** (Blyth).

O. and B., vol. i, p. 199.
B. M. Cat., vol. vii, p. 80.

(*a*) Not sexed. Misshing, 2800 ft., Feb. 1912. B.N. H.S. No. 35.

The elevation is somewhat low for Blyth's Sibia, but I have seen it quite as low down in the N. Cachar Hills in winter and nearly as low as this in the Khasi Hills. It extends north of the Brahmaputra River from Sikkim to Karennee, meeting its southern range—which extends throughout the Khasi, Garo, Cachar and Naga Hills—to the east of Dibang and the Dihang Rivers. I can see no variation in its colouration throughout this wide area.

18. **Lioptila pulchella** (God.-Aus.).

O. and B., vol. i, p. 200.
B. M. Cat., vol. vii, p. 407.

(*a*) Not sexed. Kalek, 19-iii-12. I.M. No. 25269.
(*b*) "♂, Indoling, Dibang Valley, Mishmi Hills, 4-ii-12, about 4500 ft. Bill black, legs greyish brown, soles yellow." (*F.M.B.*).

In these two specimens the whole of the cheeks, ear-coverts and patch behind the latter are black. This appears, however, to be only an individual variation for the series collected by Godwin-Austen in the Naga and Dafla Hills have the ear-coverts, etc., ranging from brown with practically no sign of black to wholly black.

19. **Actinodura egertoni egertoni** (Gould).

O. and B., vol. i, p. 201.
B. M. Cat., vol. vii, p. 403.

(*a*) Not sexed. Rotung, March 1912. B.N.H.S. No. 46.

(*b*) "♀, Bipani, Dibang Valley, Mishmi Hills, 18-i-12. Bill brown, lower mandible yellowish, legs brown, iris grey. Naga names Nya-si or Ko-yu." (*F.M.B.*).

20. **Siva cyanuroptera** (Hodg.).

O. and B., vol. i, p. 209.
B. M. Cat., vol. vii, p. 640.

(*a*) ♂, Kobo, 400 ft., 11-xii-11. I.M. No. 25355.

This is the lowest elevation from which this bird has been recorded, though Dr. H. N. Coltart got it in the hills round about Margherita at little over 1000 ft. Generally speaking it is never found below 2000 ft., and but seldom below 3000 ft.

21. **Ixulus occipitalis** (Blyth).

O. and B., vol. i, p. 217.
B. M. Cat., vol. vii, p. 613.

(*a*) ♂, Rotung, 1400 ft., 7-i-12. I.M. No. 25316.
(*b*) Not sexed. Rotung, March 1912. B.N.H.S. No. 33.

22. **Ixulus flavicollis** (Hodg.).

O. and B., vol. i, p. 218.
B. M. Cat., vol. vii, p. 612.

(*a*) ♂, Komsing, 24-ii-12. I.M. No. 25333.

Sub-family *LIOTRICHINAE.*

23. **Liothrix lutea** (Scop.).

O. and B., vol. i, p 221.
B. M. Cat., vol. vii, p. 644.

(*a*) ♀, Rotung, 8-iii-12. I.M. No. 25345.
(*b*) ♀, Rotung, 1-i-12. I.M. No. 25346.
(*c*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 27.
(*d*) Not sexed. Misshing, 2000 ft., March 1912. B.N.H.S. No. 28.

24. **Cutia nepalensis** (Hodg.).

O. and B. vol. i, p. 222.
B. M. Cat., vol. vii, p. 646.

(*a*) and (*b*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25303 and 25265.
(*c*) No data. B.N.H.S. No. 15.

Although none of these birds are sexed they are all undoubtedly males.

25. **Pterutheus melanotis** (Hodg.).

O. and B., vol. i, p. 226.
B. M. Cat., vol. viii, p. 117.

(*a*) Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25326.

Although this bird is not sexed it is undoubtedly a female.

26. **Chloropsis hardwickii** (Jard. and Selby).

O. and B., vol. i, p. 236
B. M. Cat., vol. vi, p. 18.

(*a*) ♂, Rotung, 10-xii-11. I.M. No. 25258.
(*b*) ♀, Rotung, 13-xii-11. I.M. No. 25291.
(*c*) ♂, Rotung, 18-xii-11. I.M. No. 25350.
(*d*) No data. I.M. No. 25375.
(*e*) and (*f*) Not sexed. Rotung, March 1912. B.N.H.S. Nos. 23 and 48.

Specimen (*b*) which is marked ♀ is really a young ♂, (*c*) is a young ♂ in juvenile plumage.

27. **Melanochlora sultanea** (Hodg.).

O. and B., vol. i, p. 241.
B. M. Cat., vol. viii, p. 6.

(*a*) ♂, Rotung, 9-iii-12. I.M. No. 25268.
(*b*) Not sexed. March 1912. B.N.H.S. No. 22.

The second specimen is also a male.

Sub-family *BRACHYPODINAE.*

28. **Criniger flaveolus flaveolus** (Gould).

O. and B., vol. i, p. 255.
B. M. Cat., vol. vi, p. 77.

(*a*) ♂, Kobo, 8-xii-11. I.M. No. 25293.
(*b*) and (*c*) Not sexed. Rotung, March 1912. B.N.H.S. Nos. 43 and 45.

All three of these specimens are typical *flaveolus* and show no approach to the Burmese form *C. f. burmanicus.*

29. **Hemixus flavala flavala** (Hodg.).

O. and B. vol. i, p. 263.
B. M. Cat., vol. vi, p. 49.

(*a*) ♀, Rotung, 1400 ft., 10-iii-12 I.M. No. 25267.
(*b*) ♂, Rotung, 2-i-12. I.M. No. 25295.
(*c*) ♀, Bipani, Dibang Valley, Mishmi Hills, 2100 ft., 16-i-12 (*F.M.B.*).

"Bill grey, feet light horn. Mishmi name Echo-chi. Naga names Kurkapa or Gasha-totai." (*F.M.B.*).

As with the *Criniger* so with this *Hemixus*, there is no trace of any approach to the Burmese forms, though in this case we should hardly expect it as the Himalayan forms extend well into Northern Burma. The specimens, however, are all three rather exceptionally dark though I can match them with birds from Cachar and the Khasi Hills.

30. **Hemixus maclellandi maclellandi** (Horsf.).

O. and B., vol. i, p. 265.
B. M. Cat., vol. vi, p. 50.

(*a*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 40.

The single specimen obtained of this species agrees exactly with Sikkim and Nepal birds.

31. **Alucurus striatus** (Blyth).

O. and B., vol. i, p. 266.
B. M. Cat., vol. vi, p. 91.

(*a*) and (*b*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. Nos. 25304—5.

32. **Molpastes haemorrhous bengalensis** (Hodg.).

O. and B., vol. i, p. 271.
B. M. Cat., vol. vi, p. 128.

(*a*) ♂, Kobo, 400 ft., 10-xii-11. I.M. No. 25300.
(*b*) ♀, Kobo, 400 ft., 29-iii-12. I.M. No. 25259.

Here also we have the purely Himalayan and Northern Indian form, although south of the Brahmaputra in the extreme east of Assam we have birds which more nearly approach *Molpastes h. burmanicus*, and in Cachar, Sylhet and Chittagong meet with specimens which are identical with the Burmese birds in all respects.

Specimen (*b*) is a curiously "bleached" specimen, one cannot call it albino, with the blacks and browns reduced to a cinnamon brown.

33. **Otocompsa emeria emeria** (Linn.).

O. and B., vol. i, p. 276.
B. M. Cat., vol. vi, p. 157.

(*a*) ♂, Kobo, 400 ft., 9-xii-11. I.M. No. 25329.
(*b*) ♀, Sadiya, 25-xi-11. I.M. No. 25270.
(*c*) ♂ and (*d*) ♀, Krolling, Dibang Valley, Mishmi Hills, 2300 ft., 14-i-12. "Mishmi names Pya-jo, Naga Jango" (*F.M.B.*).

34. **Otocompsa flaviventris** (Tick.).

O. and B., vol. i, p. 278.
B. M. Cat., vol. vi, p. 161.

(*a*) Not sexed. Pasighat, 600 ft., no date. I.M. No. 25373.

Family SITTIDAE.

35. **Sitta cinnamomeoventris** (Blyth).

O. and B., vol. i, p. 301.
B. M. Cat., vol. viii, p. 351.

(*a*) ♂, Rotung, 1400 ft., 8-iii-12. I.M. No. 25318.
(*b*) ♂, Rotung, 1400 ft., 1-i-12. I.M. No. 25339.
(*c*) Not sexed. Misshing, Feb. 1912. B.N.H.S. No. 10.

Specimen (*c*), which is a male, is a very interesting specimen with a curiously pale, almost white throat and the colour of the underparts very pale also, little darker in fact than in many females. It is one of the few birds obtained in these hills on this expedition which shows an approach to any Burmese form, this specimen being a decided approach to *Sitta neglecta* which is common in Pegu, Tenasserim and further south.

Family DICRURIDAE.

36. **Chaptia aenea** (Viell.).

O. and B., vol. i, p. 318.
B. M. Cat., vol. iii, p. 244.

(*a*) ♀, Kobo, 400 ft., 1-xii-11. I.M. No. 25279.
(*b*) ♂, Bipani, Dibang Valley, Mishmi Hills, 16-i-12 (*F.M.B.*).

37. **Chibia hottentotta** (Linn.).

O. and B., vol. i, p. 320.
B. M. Cat., vol. iii, p. 235.

(*a*) ♂, Rotung, 1400 ft., 13-iii-12. I.M. No. 25283.

38. **Bringa remifer** (Temm.).

O. and B., vol. i, p. 324.
B. M. Cat., vol. iii, p. 257.

(*a*) ♀, Balek, 24-iii-12. I.M. No. 25288.

Family CERTHIIDÆ.

39. **Certhia discolor** (Blyth).

O. and B., vol. i, p. 331.

(*a*) ♀, Upper Rotung, 6-i-12. I.M. No. 25324.

Family SYLVIIDAE.

40. **Orthotomus sutorius** (Forst.).

O. and B., vol. i, p. 366.
B. M. Cat., vol. vii, p. 215.

(*a*) ♀, Balek, 26-iii-12. I.M. No. 25331.

41. **Cryptolopha affinis** (Hodg.).

O. and B., vol. i, p. 422.
B. M. Cat., vol. iv, p. 398 (part).

(*a*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25325.

42. **Cryptolopha xanthoschista jerdoni** (Brooks).

O. and B., vol. i, p. 425.
B. M. Cat., vol. iv, p. 398 (part).

(*a*) ♀, Kobo, 400 ft., 1-xii-11. I.M. No. 25312.
(*b*) ♀, Rotung, 1400 ft., 10-iii-12. I.M. No. 25314.
(*c*) ♂, Sadiya, N.-E. Assam, 25-xi-11. I.M. No. 25363.

Over the whole of the extreme N.-E. of the Indian Empire, throughout the western hills of the Assam Valley and Cachar, and the Miri, Dafla and Sub-Himalayan ranges to the north of the Brahmaputra, the grey-headed Flycatcher-Warbler cannot be said to be either typical *xanthoschista* or *jerdoni*, and the birds of the Abor Hills come, as might be expected, into the same category. The three specimens as far as one can tell—one specimen has practically no feathers on the head—in this collection are on the whole nearer *jerdoni* than *xanthoschista*. The two sub-species are very close together and the intermediate range over which the indefinite form extends is greater than the two extremities over which one finds specimens which are easily determined. The Kashmir and Hazara birds appear to be all *xanthoschista*, and the birds of Eastern Assam,

Chittagong, Manipur, Arrakan and the Shan States are all typical *jerdoni*, but over the whole of the immense intervening country it is really hard to say to which race they are most closely allied.

43. **Abrornis superciliaris** (Tick.).

O. and B., vol. i, p. 429.
B. M. Cat., vol. iv, p. 402.

(*a*) Not sexed. Rotung, 1400 ft., 12-iii-12. I.M. No. 25313.

44. **Abrornis albigularis** (Hodg.).

O. and B., vol. i, p. 430.
B. M. Cat., vol. iv, p. 405.

(*a*) ♂, Rotung, 1400 ft., no date. I.M. No. 25315.

Family LANIIDAE.

45. **Lanius tephronotus** (Vigors).

O. and B., vol. i, p. 465.
B. M. Cat., vol. viii, p. 260.

(*a*) ♀, Kobo, 400 ft., 11-xii-11. I.M. No. 25254.
(*b*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 24.

Both of these specimens are immature with the under-surface considerably barred and the eye-streak undeveloped. Specimen (*b*) also has the tail coverts strongly barred; but (*a*), though the younger bird of the two, has these latter immaculate.

46. **Hemipus capitalis** (Maclell.).

O. and B., vol. i, p. 472.
B. M. Cat., vol. iii, p. 306.

(*a*) ♂, Rotung, 1400 ft., 11-iii-12. I.M. No. 25319

47. **Pericrocotus speciosus** (Lath.).

O. and B., vol. i, p. 479.
B. M. Cat., vol. iv, p. 71.
Stuart Baker, B N.H.S.J., vol. xvii, p. 794.

(*a*) ♂, Kobo, 400 ft, 9-xii-11. I.M. No. 25352.
(*b*) ♂, Rotung, March 1912. B.N.H.S No. 52.
(*c*) ♂, Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 55.

These three Minivets are extremely interesting specimens and strongly bear out what I have already noted in the Bombay

Natural History Society's Journal in reference to the impossibility of distinguishing between *speciosus* and *fraterculus*.

In this case we find that No. 25352 is a most typical specimen of the eastern form which was named *fraterculus* by Swinhoe in the Ibis for 1870, and which Oates in the 'Avifauna' accepted as a good species. This specimen is quite typical *fraterculus* as defined by Oates; the colour is a very rich red, the whole of the outer webs of the central tail feathers red and the wing of 3·85″ though the tail is exactly 4″.

The two birds sent to the Bombay Society by Dr. Falkiner are on the other hand equally typical specimens of *speciosus*; No. 52 has but little red on the outer tail feathers whilst No. 55 has none, the wing measurement of both is 4·15 and the two tails measure respectively 4·4 and 4·2. Nor does this mean that there is a very wide area over which the two races are indefinite whilst easily divided forms are found on either side of the area, for I have seen specimens from southern Burma which are more *speciosus* than *fraterculus*, and others again from Nepal which are more *fraterculus* than *speciosus*. From the same flock of birds, I have myself more than once obtained specimens referable to the two species, whilst the majority of specimens are half way between the two. I am of opinion that the name *fraterculus* must be reduced to a synonym of *speciosus*, and that it cannot rank even as a sub-species.

48. **Pericrocotus solaris** (Blyth).

O. and B., vol. i, p. 485.
B. M. Cat., vol. iv, p. 82.

(*a*) ♂, between Kalek and Misshing, 15—18-iii-12. I.M. No. 25368.

This specimen agrees with others in the British Museum in having the under parts rather more richly coloured than is the case with the skins from Sikkim and Nepal. The difference, however, is very slight and not altogether constant and is insufficient ground for creating a new sub-species.

49. **Graucalus macii macii** (Less.).

O. and B., vol. i, p. 496.
B. M. Cat., vol. iv, p. 34.

(*a*) ♂, Sirpo, 21-iii-12. I.M. No. 25280.

This is an extraordinarily large bird with a wing of 7·1. The Ceylon bird of this species is very small with a wing averaging very little over 6″ and is worthy of being made a sub-species; it would bear the name *layardi* of Blyth which, though given to a young bird under the impression that the markings of immaturity were those of a new species, is the first name given to a Ceylon bird and will therefore stand. Birds from southern India are a

good deal smaller than those from northern India, but grade into them and thence through North Burma into an equally small form in South Burma.

Sub-family *ARTAMINAE.*

50. **Artamus fuscus,** Vieill.

O. and B., vol. i, p. 498.
B. M. Cat., vol. xiii, p. 11.

(*a*) ♀, Kobo, 400 ft., 29-iii-12. I.M. No. 25356.

Family ORIOLIDAE.

51. **Oriolus melanocephalus** (Linn.).

O. and B., vol. i, p. 506.
B. M. Cat., vol. iii, p. 215.

(*a*) ♂, Kobo, 6-xii-11. I.M. No. 25297.

This is a young bird with the forehead still yellow and the black of the wings well edged with greenish.

52. **Oriolus traillii** (Vigors).

O. and B., vol. i, p. 508.
B. M. Cat., vol. iii, p. 222.

(*a*) Not sexed. Morsing, 1000 ft., 27-i-12. I.M. No. 25273.

This bird, although not sexed, is undoubtedly a young female.

Family STURNIDAE.

53. **Sturnopasta contra** (Linn.).

O. and B., vol. i, p. 542.
B. M. Cat., vol. xiii, p. 57.

(*a*) ♂, Sadiya, N.-E. Assam, 28-xi-11. I.M. No. 25260.

This Myna as far as the supercilia and the markings on the forehead are concerned shows no approach, as might have been expected, to the Burmese sub-species *superciliaris.* It is, however, as is the case with so many birds in this N.-E. corner of India, of a remarkably dark colouration, the back being practically a glossy black with little or no tinge of chocolate in it. There is unfortunately but one specimen collected, which is, however, matched with another from Dikrang in the Museum collection; had there been a series all showing the same depth of blackness, it would certainly have formed a good sub-species. A further series—they

should be easy enough to procure—should be obtained as soon as possible.

Family MUSCICAPIDAE.

54. **Siphia?** (Bechst.).

O. and B., vol. ii, p. 9.
B. M. Cat., vol. iv, p. 161.

(*a*) ♀, Sadiya, 25-xi-11. I.M. No. 25335.

This little Flycatcher is almost certainly *Siphia albicilla*, which is very common both north and south of the Brahmaputra throughout Assam in the winter. *S. parva* has not yet been found in the eastern part of Assam.

55. **Cyornis hyperythrus** (Blyth).

O. and B., vol. ii, p. 15.
B. M. Cat., vol. iv, p. 206.

(*a*) ♂, between Kalek and Misshing, 13—18-iii-12. I.M. No. 25327.

56. **Stoparola melanops** (Vigors).

O. and B., vol. ii, p. 28.
B. M. Cat., vol. iv, p. 438.

(*a*) ♂, no data. B.N.H.S. No. 26.

57. **Culcicapa ceylonensis** (Swain.).

O. and B., vol. ii, p. 38.
B. M. Cat., vol. iv, p. 369.

(*a*) ♂, Upper Rotung, 2150 ft., 6-i-12. I.M. No. 25322.
(*b*) Not sexed. Misshing, 2500 ft., Feb. 1912. B.N.H.S. No. 31.

58. **Niltava sundara** (Hodg.).

O. and B , vol. ii, p. 41.
B. M. Cat., vol. iv, p. 463.

(*a*) ♂, below Damda, 2-ii-12 (*A. Molesworth*). I.M. No. 25371.

59. **Niltava macgrigoriae** (Burton).

O. and B., vol. ii, p. 42.
B. M. Cat., vol. iv, p. 465.

(*a*) ♂, Rotung, 1400 ft., 10-iii-12. I.M. No. 25311.
(*b*) ♂, Rotung, 1400 ft., 31-xii-11. I.M. No. 25348.

60. **Hypothymis azurea** (Bodd.).

O. and B., vol. ii, p. 49.
B. M. Cat., vol. iv, p. 277.

(*a*) ♂, no data. B.N.H.S. No. 54.

61. **Chelidorhynx hypoxanthum** (Blyth).

O. and B., vol. ii, p. 51.
B. M. Cat., vol. iv, p. 279.

(*a*) ♂, Rotung, 1400 ft., 4-iii-12. I.M. No. 25317.
(*b*) Not sexed. Kobo, 400 ft., 8-xii-11. I.M. No. 25349.
(*c*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 19.
(*d*) ♂, Bipani, Dibang Valley, Mishmi Hills, 2100 ft., 18-i-12 (*F.M.B.*).

"Bill: upper mandible black, lower yellowish; legs brown, iris dark. Naga names Pongking-lo or Bang-ho-go." (*F.M.B.*).

This little bird was once supposed to be a Flycatcher of high elevations only, but Mr. H. Stevens found it was comparatively common at the foot of the Dafla Hills in winter and Dr. H. N. Coltart obtained it at the foot of the hills near Margherita; there is nothing surprising therefore in its being found as low as 400 ft. at Kobo. The fact of its having been obtained by each collector at so many places upon this expedition shows that it must be comparatively common throughout the Mishmi, Dafla and Abor Hills.

62. **Rhipidura albicollis kempi**, sub-sp. nov.

O. and B., vol. ii, p. 53.
B. M. Cat., vol. iv, p. 317.

(*a*) ♂, Rotung, 7-iii-12. I.M. No. 25342.
(*b*) Not sexed. Kobo, 9-xii-11. I.M. No. 25353.
(*c*) ♂, Upper Rotung, 2150 ft. I.M. No. 25358.

These three specimens are very interesting, their extremely dark colouration at once attracting notice when laid amongst a large series of birds from south of the Brahmaputra. It is exactly matched by a specimen from the Dikrang Valley, in the same district at the foot of the Abor Hills, and is approached by some of the more eastern Nepal skins and by a few from Sikkim. In addition to being darker in colour there is less of a brown tint in the plumage of the Abor birds, the grey black portions showing more as deep ashy than as deep brown. The dimensions do not differ from those of the typical sub-species

The range of the two sub-species would appear to be as follows:—

R. albicollis albicollis. Central Provinces, Bombay, Deccan, western, central and eastern Bengal and northern Orissa; Behar and northern Bengal and Assam, south of the Brahmaputra Valley, but running up into the Duars west of the Teesta Valley. The whole of Burma except, perhaps, the hill ranges to the extreme N. W. and Cochin China.

R. albicollis kempi. Eastern Nepal, the Dafla, Mishmi and Abor Hills; Assam from Goalpara in the west to Dibrugarh in the east, north of the Brahmaputra on the hills between Assam and Burma.

I have named the bird after Mr. S. W. Kemp, the Zoologist in charge of the zoological work of the expedition, who appears personally to have collected all three specimens obtained.

Family TURDIDAE.

63. Pratincola torquata przewalskii (Pleske).

Pratincola maura, O. and B., vol. ii, p. 61.
B. M. Cat., vol. iv, p. 188.
Hartert, D.V.P., p. 709.

(*a*) ♂, Kobo, 400 ft., 1-xii-11. I.M. No. 25354.

Not a very good specimen and therefore it is not easy to say to which of the numerous sub-species, now admitted, this specimen belongs, but it appears to be nearest *przewalskii*.

64. Henicurus schistaceus (Hodg.).

O. and B., vol. ii, p. 84.
B. M. Cat., vol. vii, p. 316.

(*a*) ♂, Yembung, 1100 ft., 15-ii-12. I M. No. 25337.
(*b*) ♂, Rotung, 7-iii-12. I.M. No. 25341.

65. Henicurus leschenaulti (Vieill.).

O. and B., vol. ii, p. 86.
B. M. Cat., vol. vii, p. 313.

(*a*) ♂, Misshing, 2000 ft., Feb. 1912. B.N.H.S No. 11.

66. Microcichla scouleri (Vigors).

O. and B., vol. ii, p. 88.
B. M. Cat., vol. vii, p. 322.

(*a*) ♀, Yembung, 1100 ft., 15-ii-12. I.M. No. 25336

67. Chimarrhornis leucocephalus (Vigors).

O. and B., vol. ii, p. 89.
B. M. Cat., vol. vii, p. 47.

(*a*) ♂, Yembung, 1100 ft., 15-iii-12. I.M. No. 25290.
(*b*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 20.

68. **Ruticilla frontalis** (Vigors).

O. and B., vol. ii, p. 91.
B. M Cat., vol. v, p. 349.

(*a*) Not sexed. Rotung, March 1912. B.N.H.S. No. 39.

This specimen is an unmistakable male.

69. **Ruticilla aurorea leucoptera** (Blyth).

O. and B., vol. ii, p. 93.
B. M. Cat., vol. v, p. 345.
Hartert, D.V.P., p. 72.

(*a*) Not sexed. Rotung, March 1912. B.N.H.S. No. 38.

This Redstart also is a male. The sub-species to which it belongs is undoubtedly *leucoptera*.

70. **Rhyacornis fuliginosus** (Vigors).

O. and B., vol. ii, p. 98.
B. M. Cat., vol. iv, p. 253.

(*a*) ♀, Rotung, 7-iii-12. I.M. No. 25338.
(*b*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25367.
(*c*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25369.
(*d*) Not sexed. No data. B.N.H.S. No. 47.

Specimen (*b*) is a female, (*c*) and (*d*) are males. This little Redstart is, of course, very common right into the plains wherever the rivers and streams run clear and fast.

71. **Ianthia rufilata** (Hodg.).

O. and B., vol. ii, p. 106.
B. M. Cat., vol. iv, p. 256.

(*a*) ♂, Endoling, Dibang Valley, Mishmi Hills, about 4500 ft., 4-ii-12 (*F.M.B.*).

"Iris dark brown, bill and legs black" (*F.M.B.*).
This is a young male, not fully adult.

72. **Ianthia hyperythra** (Blyth).

O. and B., vol. ii, p. 108.
B. M. Cat., vol. iv, p. 257.

(*a*) ♂, Upper Rotung, 5-i-12. I.M. No. 25359.
(*b*) ♀, Bipani, Dibang Valley, Mishmi Hills, about 2100 ft., 17-i-12 (*F.M.B.*).

"Bill black, feet very dark brown, iris dark. Naga name Aching-yon or Tsen-tsen-gi." (*F.M.B.*).

This Bush Robin has hitherto been found according to present records only in Sikkim and the Khasi and N. Cachar Hills. Dr. Coltart, however, procured it in Margherita and I have received it from Nepal and the Bhutan Hills above Kamrup, so that the present record practically links it up with the hills south and east.

73. **Cittocincla macrura macrura** (Gmel.).

O. and B., vol. ii, p. 118.
B. M. Cat., vol. vii, p. 85.

(*a*) ♂, Kobo, 10-xii-11. I.M. No. 25264.

74. **Myiophoneus temmincki temmincki** (Vigors).

O. and B., vol. i, p. 178.
B. M. Cat., vol. vii, p. 7.

(*a*) Not sexed. Komsing, 25-ii-12. I.M. No. 25277.

It is possible that this genus is not even now placed in its proper position. It certainly should be placed amongst the Turdidae as it is a true Thrush in every way, but exactly where it should go it is difficult to say. Possibly it should be placed somewhere near *Grandala* and *Notodela* together with *Brachypteryx* and *Drymochares* which must also be withdrawn from the Timeliidae and placed amongst the Turdidae.

The present specimen is a typical *temmincki* and quite distinct from the Burmese sub-species *eugenii*.

75. **Merula ruficollis** (Pall.).

O. and B., vol. ii, p. 130.
B. M. Cat., vol. v, p. 269.

(*a*) ♀, Balek, 23-iii-12. I.M. No. 25296.
(*b*) ♀, Misshing. Feb. 1912. B.N.H.S. No. 30.
(*c*) ♂, Misshing. Feb. 1912 B.N.H.S. No. 49.

Specimen (*a*) appears to be a male

Hartert (Die Vogel Palaarktischen, p. 659 *et seq.*) considers *M. atrogularis* to be a sub-species of *ruficollis*, but I cannot make out where these two sub-species overlap, and I look upon them as perfectly good species always easily distinguished one from the other and having much the same range and migration even if not the same breeding area. The red-throated Ouzel visits the extreme north eastern part of the Indian Empire in enormous numbers in the cold weather and I have seen it in flocks of hun-

dreds in Margherita. It appears not to migrate in company with *atrogularis* and not to follow the same main routes. Thus to the extreme east in Tezpur, Sadiya and Dibrugarh, one will get at least ten *ruficollis* to one *atrogularis*, whilst in North Cachar the exact reverse is the case.

76. **Petrophila erythrogastra** (Vigors).

O. and B., vol. ii, p. 143.
B. M. Cat., vol. v, p. 325.

(*a*) Not sexed. Upper Rotung, 2150 ft., Jan. 1912. I.M. No. 25309. (*M. de Courcy*).

This bird is a ♂ in full adult plumage.

77. **Petrophila solitarius pandoo** (Sykes).

O. and B., vol. ii, p. 146.
B. M. Cat., vol. v, p. 316.
Hartert, D.V.P., p. 675.

(*a*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 32.

This bird is also a male and is a fairly typical specimen of the western *solitarius*. Hartert unites *Petrophila* with *Monticola* but, for the present at all events, I prefer to keep them distinct.

Family PLOCEIDAE.

Sub-family *VIDUINAE*.

78. **Urolonchа acuticauda** (Hodg.).

O. and B., vol. ii, p. 184.
B. M. Cat., vol. xiii, p. 356.

(*a*) ♀, Balek, 26-iii-12. I.M. No. 25334.

Family FRINGILLIDAE.

Sub-family *FRINGILLINAE*.

79. **Haematospiza indica** (Gmel.).

O. and B., vol. ii, p. 209.
B. M. Cat., vol. xii, p 397.

(*a*) and (*b*) No data. B.N.H.S. Nos. 41 and 36.

It is very unfortunate that these two fine finches are without data, for it would have been most interesting to know at what elevation they were obtained as hitherto they have never been found much under 5000 ft. Their being obtained in the Abor Hills links up the two places Nepal and Sikkim in the west and the

Khasi Hills in the east from which the bird has so far been recorded.

80. **Passer rutilans cinnamomea** (Gould).

O. and B., vol. ii, p. 240.
B. M. Cat., vol. xii, p. 325.
Hartert, D.V.P., p. 162.

(*a*) Not sexed. Kalek, 19-iii-12. I.M. No. 25365.
(*b*) Not sexed. Kalek, 19-iii-12. I.M. No. 25364.

Specimen (*a*) is a male and specimen (*b*) is a female. Hartert (*loc. cit.*) shows that *cinnamomea* is only a sub-species of *rutilans*, described from Japan by Temminck in 1829. He (Hartert) also makes a sub-species of the Nepal Cinnamon Sparrow under the name *debilis*, on the grounds of its smaller size, *i.e.* a wing of 70—73 mm. as against 77—79 mm. in *cinnamomea*.

Family HIRUNDINIDAE.

81. **Cotile sinensis** (Gray).

O. and B., vol. ii, p. 273.
B. M. Cat., vol. x, p. 104.

(*a*) ♀, Rotung, 1400 ft., 2-i-12. I.M. No. 25321.
(*b*) Not sexed. Kobo, 30-iii-12. I.M. No. 25328.

This little Martin is *not* a sub-species of *riparia*, differing not only in colouration but also in the comparative length of the wing and tail, as well as in not having the curious tuft of feathers which *riparia* always has at the back of the tarsus. Moreover, their breeding ranges overlap as well as their areas of winter migration, for *riparia* also breeds within Indian limits.

Family MOTACILLIDAE.

82. **Motacilla alba ocularis** (Swin.).

O. and B., vol. ii, p. 289.
B. M. Cat., vol. x, p. 471.

(*a*) Sadiya, N.-E. Assam, 25-xi-11. I.M. No. 25362.

I am very doubtful as to the propriety of reducing this species to be only a sub-species of *alba*. The eye-streak, the distinguishing mark of this Wagtail, is always present, even in young birds, and there does not appear to be any overlapping of the two forms.

83. **Anthus trivialis maculatus** (Hodg.).

O. and B., vol. ii, p. 304.
B. M. Cat., vol. x, p. 547.

(*a*) Not sexed. Kalek, 19-iii-12. I.M. No. 25330.

(*b*) Not sexed. Kobo, 400 ft., 9-xii-11. I.M. No. 25357.
(*c*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 14.

All of these specimens are true *maculatus*, and here again it is doubtful whether the differences between *maculatus* and *trivialis* are not more than sub-specific. Both birds breed in the Himalayas it is said, though it is not beyond doubt that *trivialis* does so.

84 **Anthus richardi richardi** (Vieill.).

O. and B., vol. ii, p. 307.
B. M. Cat., vol. x, p. 564.

(*a*) ♀, Sadiya, in cleared ground, 25-xi-11. I.M. No. 25361.

Family NECTARINIIDAE.

Sub-family *NECTARINIINAE*.

85. **Aethopyga seheriae seheriae** (Tickell).

O. and B., vol. ii, p. 348.
B. M. Cat., vol. ix, p. 18.

(*a*) Not sexed. Pasighat. No date. I.M. No. 25377.

This bird, a male in full plumage, agrees well with Oates' *andersoni*, but one would not expect this Sunbird, since suppressed, to appear in this region, his birds having been obtained in Bhamo. The specimen obtained is in a very battered condition, but a good series might well prove interesting; the wing is only about 2·1".

86. **Aethopyga saturata** (Hodg.).

O. and B., vol. ii, p. 354.
B. M. Cat., vol. ix, p. 15.

(*a*) ♂, Rotung, 2-i-12. I.M. No. 25347.
(*b*) ♂, Balek, 26-iii-12. I.M. No. 25366.
(*c*) Not sexed and no data. I.M. No. 25374.
(*d*) Not sexed. Feb. 1912. B.N.H.S. No. 4.
(*e*) No data. B.N.H.S. No. 34.

Specimens (*c*) and (*d*) are males and (*e*) an adult female.

Sub-family *ARACHNOTHERINAE*.

87. **Arachnothera magna** (Hodg.).

O. and B., vol. ii, p. 369.
B. M. Cat., ix, p. 105.

(*a*) Rotung, 10-iii-12. I.M. No. 25343.
(*b*) Rotung, 8-iii-12. I.M. No. 25344.

Family PITTIDAE.

88. **Pitta nepalensis nepalensis** (Hodg.).

O. and B., vol. ii, p. 389.
B. M. Cat., vol. xiv, p. 414.

(*a* Not sexed. Rotung, 1400 ft., 8-iii-12. I.M. No. 25301.
(*b*) No data. B.N.H.S. No. 51 (*Dunbar*).

On specimen (*b*) Sir George Duff Dunbar has the following interesting notes: "The Abor name for this bird is 'Pajuk.' It appears in their mythology as one of the earlier mates of *Tani*, the first man, who married the creatures of the forest from the leech upwards in search for a wife. This bird possessed the objectionable habits of the Harpy which dissolved this particular partnership. At last the Sun gave him a woman. The Hill Miris are known to have a similar legend."

Order **PICI.**

Family PICIDAE.

Sub-family *PICINAE.*

89. **Gecinus chlorolophus** (Vieill.)

O. and B., vol. iii, p. 23.
B. M. Cat., vol. xviii, p. 59.

(*a*) Not sexed and no data. B.N.H.S. No. 42.

The specimen obtained is a male.

90. **Chrysophlegma flavinucha** (Gould).

O. and B., vol. iii, p. 28.
B. M. Cat., vol. xviii, p. 127.

(*a*) Not sexed. Between Kalek and Misshing, 15—16-iii-12. I.M. No. 25308.

This specimen is a male.

91. **Gecinulus grantia** (Maclell.).

O. and B., vol. iii, p. 30.
B. M. Cat., vol. xviii, p. 134.

(*a*) Not sexed. Rotung, March 1912. B.N.H.S. No. 13.

92. **Dendrocopus macii macii** (Vieill.).

O. and B., vol. iii, p. 39.
B. M. Cat., vol. xviii, p. 260.

(*a*) ♀, Kobo, 400 ft., 1-xii-11. I.M. No. 25263.
(*b*) ♀, Rotung, 1400 ft., 13-iii-12. I.M. No. 25320.

Specimen (*a*) is really a male and has been wrongly sexed. Both these specimens are typical *macii* whereas in the Khasi Hills I obtained *D. m. atratus*. Several birds, however, got by myself on their nests both in Gauhati and Dibrugarh were all *macii*.

93. **Pyrrhopicus pyrrhotis** (Hodg.).

O. and. B., vol. iii, p. 50.
B. M. Cat., vol. xviii, p. 380.

(*a*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25274.

This specimen is a male.

Sub-family *PICUMNINAE*.

94. **Sasia ochracea** (Hodg.).

O. and B., vol. iii, p. 77.
B. M. Cat., vol. xviii, p. 555.

(*a*) Not sexed. Rotung, March 1912. B.N.H.S. No. 7.

Family CAPITONIDAE.

95. **Megalaema marshallorum marshallorum** (Swinhoe).

O. and B., vol. iii, p. 84.
B. M. Cat., xviii, p. 53.

(*a*) ♀, Rotung, 1400 ft., 2-i-12. I.M. No. 25276.

This specimen has the upper back, scapulars and lesser wing coverts a duller, darker maroon-brown than any specimen in the British Museum, and there are also practically no pale streaks on the upper back. The skin is a fairly good one and the differences do not appear to be in any way due to faulty skinning, at the same time it is hardly safe to create a sub-species on the strength of this single specimen. In measurements it agrees with the normal bird.

96. **Cyanops asiatica asiatica** (Lath.)

O. and B., vol. iii, p. 92.
B. M. Cat., vol. xix, p. 62.

(*a*) ♂, Kobo, 400 ft., 9-xii-11. I.M. No. 25275.
(*b*) ♀, Rotung, 1400 ft., 9-iii-12. I.M. No. 25255.
(*c*) ♂, Rotung, 1400 ft., 13-iii-12. I.M. No. 25292.

Like so many birds in this humid corner of India all three of these specimens are rather darker than most specimens from elsewhere, but none of them show any trace of the rich red markings of *C. a. rubescens* from the higher ranges of North Cachar and the Khasi and Naga Hills.

97. **Cyanops franklini franklini** (Blyth).

O. and B., vol. iii, p. 96.
B. M. Cat., vol. xix, p. 69.

(*a*) ♂, Komsing, 24-ii-12. I.M. No. 25299.
(*b*) Not sexed. Rotung, March 1912. B.N.H.S. No. 25.
(*c*) Not sexed. Rotung, March 1912. B.N.H.S. No. 37.
(*d*) Not sexed. Misshing, 2000 ft., Feb. 1912. B.N.H.S. No. 53.

All these four birds are typical *franklini* and show no approach to the Burmese *C. f. ramsayi.*

Order **ANISODACTYLI.**

Sub-order ***MEROPES.***

Family MEROPIDAE.

98. **Melittophagus swinhoii** (Hume).

O. and B., vol. iii, p. 114.
B. M. Cat., vol. xvii, p. 55.

(*a*) ♂, Kobo, 400 ft., 29-iii-12. I.M. No. 25360.

Sub-order ***UPUPAE.***

Family UPUPIDAE.

99. **Upupa epops indica** (Reich.).

O. and B., vol. iii, p. 161.
B. M. Cat., vol. xvi, p. 10.

(*a*) No data. B.N.H.S. No. 12.

This is a very large bird, the wing being nearly 5·8″ (147·3 mm.) but there is practically no white on the crest, there being only a tinge of this on one or two of the longest feathers. The bill is over 2″ (52·20 mm.) from front to tip. The breast and under parts are typical *indica.*

Order TROGONES.

Family TROGONIDAE.

100. Harpactes erythrocephalus (Gould).

O. and B., vol. iii, p. 200.
B. M. Cat., vol. xvii, p. 448.

(*a*) No data. B.N.H.S. No. 5.
(*b*) Not sexed. Rotung, March 1912. B.N.H.S. No. 16.
(*c*) Not sexed. Rotung, March 1912. B.N.H.S. No. 44.

All three of these specimens are males. No. 16 is very much darker above than either of the other two, which are about equal to the average bird. Had all three been as dark as this bird, it would certainly have been justifiable to consider it a new sub-species, and this is rather a good example of the danger of making new species or sub-species from a single specimen.

Family CUCULIDAE.

Sub-family *PHOENICOPHAINAE.*

101. Rhopodytes tristis (Less.).

O. and B., vol. iii, p. 232.
B. M. Cat., vol. xix, p. 386.

(*a*) No data. B.N.H.S. No. 2.

This specimen, with which most unfortunately there is no data, is a very dark bird and has the chin and throat almost concolourous with the breast, instead of very decidedly paler as is usually the case. The forehead also is very dark and the striae well developed, whilst the whole prevailing tint of the plumage is not only darker but is of a purer grey and less suffused with rusty than any other specimen I have ever seen. There is a good series of this Cuckoo in the British Museum, but this Abor bird is quite different to any of them and should subsequently obtained specimens prove to be like it, it will certainly require to be raised to a sub-species. The plumage of *Rhopodytes* does not vary with the seasons though, of course, newly moulted birds are darker and brighter than birds just about to moult whose feathers have become slightly bleached.

102. Centropus sinensis (Steph.).

O. and B., vol. iii, p. 230.
B. M. Cat., vol. xix, p. 343.

(*a*) No data. (*M. de Courcy*). I.M. No. 25376.

103. **Centropus bengalensis** (Gmel.).

O. and B., vol. iii, p. 243.
B. M. Cat., vol. x, p. 352.

(*a*) Not sexed. Abor Hills, 16-iii-12. Collected by Capt. M. de Courcy.

Order **PSITTACI.**

Family PSITTACIDAE.

104. **Palaeornis fasciatus** (Mull.).

O. and B., vol. iii, p. 256.
B. M. Cat., vol. xx, p. 464.

(*a*) ♀, Kobo, 400 ft., 29-iii-12. I.M. No. 25289.

This specimen has been wrongly sexed for it is an undoubted male

Order **ACCIPITRES.**

Family FALCONIDAE.

Sub-family *FALCONINAE.*

105. **Buteo desertorum** (Daud.).

O. and B., vol. iii, p. 393.
B. M. Cat., vol. i, p. 180.

(*a*) No data. B.N.H.S. No. 8.

This bird is evidently a male with a wing of 14·5″ (265·4 mm.).

106. **Tinnunculus alaudarius alaudarius** (Linn.).

O. and B., vol. iii, p. 428.
B. M. Cat., vol. i, p. 425.

(*a*) ♀, Sadiya, 26-xi-11. I.M. No. 25298.

This is a somewhat worn specimen with faded plumage, but appears to belong to the migratory form.

Order **COLUMBAE.**

Family COLUMBIDAE.

Sub-family *CARPOPHAGINAE.*

107. **Ducula insignis insignis** (Hodg.).

O. and B., vol. iv, p. 21.
B. M. Cat., vol. xxi, p. 216.

(*a*) Not sexed. Pasighat, 600 ft., no date. I.M. No. 25372.
(*b*) Not sexed. Kobo, 400 ft., 5-xii-11. I.M. No. 25272.

These specimens are quite typical *insignis*, showing no approach to *D. i. griseicapilla* as do a good many of the birds on the south of the Brahmaputra and in the Surma Valley.

Order GALLINAE.

Sub-order *ALECTOROPODES.*

Family PHASIANIDAE.

108. **Gallus ferrugineus** (Gmelin).

O. and B., vol. iv, p. 74.
B. M. Cat., vol. xxii, p. 344.

(*a*) ♂, Yembung, 1100 ft., 17-ii-12. I.M. No. 252[illegible]
(*b*) ♀, Yembung, 1100 ft., 19-ii-12. I.M. No. 25294[illegible].
(*c*) ♂, No data. B.N.H.S. No. 1.
(*d*) ♂, No data. B.N.H.S. No. 3.

109. **Arboricola rufigularis rufigularis** (Blyth).

O. and B., vol. iv, p. 120.
B. M. Cat., vol. xxii, p. 212.

(*a*) Not sexed. Between Kalek and Misshing, 15—18-iii-12. I.M. No. 25302.

This specimen is a quite typical *rufigularis*, not *intermedia*, and has a very well-developed black band below the rufous gorget. I have already noted (B.N.H.S. Journal, vol. xi) that *intermedia* is but a sub-species of *rufigularis*, and that in the hills south of the Brahmaputra many specimens are intermediate between the two races.

Order LIMICOLAE.

Family CHARADRIIDAE.

Sub-family *TOTANINAE.*

110. **Totanus ochropus** (Linn.).

O. and B., vol. iv, p. 262.
B. M. Cat., vol. xxiv, p. 437.

(*a*) ♀, Kobo, 400 ft., 29-iii-12. I.M. No. 25257.

ORDER **ANSERES.**

Family ANATIDAE.

Sub-family *MERGINAE.*

111. **Merganser castor** (Linn.).

O. and B., vol. iv, p. 469.
B. M. Cat., vol. xxvii, p. 472.

(*a*) ♂, Kobo, 400 ft., 11-xii-11. I.M. No. 25285.

This specimen is a fully adult female and has probably been marked as a male through a slip.

mal

XX. CRUSTACEA DECAPODA.

By STANLEY KEMP, *B.A., Assistant Superintendent, Indian Museum.*

(Plates xvii—xxi.)

In the present report twelve different forms of Decapod Crustaceans are recorded, *viz.*:—

Potamon (*Potamiscus*) *decourcyi*, sp. nov.
,, ,, *aborense*, sp. nov.
,, ,, *obliteratum*, sp. nov.
,, (*Geotelphusa*) *adiatretum*, Alcock.
,, ,, ,, var. *lophocarpus*, nov.
,, ,, *superciliosum*, sp. nov.
,, (*Acanthotelphusa*) *feae*, de Man.
Paratelphusa (*Barytelphusa*) *harpax*, Alcock.
Palaemon hendersoni, de Man.
Caridina weberi, de Man, var.
,, *excavata*, sp. nov.
,, *hodgarti*, sp. nov.

One of the species, *Potamon* (*Potamiscus*) *obliteratum*, was found by Mr. F. H. Gravely in the Dawna Hills on the Burmo-Siamese frontier, and is included here in order to render more complete the account of the subgenus to which it belongs. Of the remainder, six are to be regarded as true hill forms, having been found in the small mountain streams draining into the Dihang river, while five, *Potamon* (*Acanthotelphusa*) *feae*, *Paratelphusa* (*Barytelphusa*) *harpax* and the three species of *Caridina* were found at the base of the hills and in the Brahmaputra valley.

No less than seven of the eleven Abor forms appear to have been undescribed hitherto, and the collection is, in consequence, of but little assistance in determining the geographical relationships of the fauna.

The subgenus *Potamiscus*, as far as is at present known, extends from Rajputana, Nepal and Darjiling to Burma and has been found at Cachar in Assam, while *Potamon* (*Geotelphusa*) *adiatretum* has been recorded from the Dafla country, from the Khakyen Hills and from Moulmein. *Potamon* (*Acanthotelphusa*) *feae*, described from the Upper Irrawaddy, seems to be not uncommon in Assam north of the Brahmaputra, and *Paratelphusa* (*Barytelphusa*) *harpax* is a species of wide distribution in north-

east India. *Palaemon hendersoni* is known from Darjiling and the border of the Southern Shan States. *Caridina weberi*, which appears to have a very wide distribution in India, Burma and Malaysia, is represented in the Brahmaputra valley by a race which will in all probability prove to have a definite geographical significance. The collections in the Indian Museum indicate that *Caridina hodgarti* extends along the base of the Himalayas from the Tista and Mahananda rivers eastwards to the Abor country.

Of the new forms which are described the most interesting appear to be *Caridina excavata* and *C. hodgarti*, which, in the reduced number of their epipods differ from all species of the genus in which such details have received attention. In a previous paper[1] I have remarked on the presence of *Xiphocaridina curvirostris*, a primitive form hitherto known only from New Zealand, in the Upper Brahmaputra valley, and the existence of these two aberrant species of *Caridina* suggests that the Atyid fauna of N.-E. India is likely to prove of exceptional interest.

It need hardly be pointed out that the description of the crabs noticed in this paper would have been almost impossible had it not been for Alcock's comprehensive memoir on the Indian Potamonidae.

On the species of *Geotelphusa* obtained in the Abor country many examples of a Temnocephalid were found. These have been identified by Mr. F. H. Gravely as *Temnocephala semperi*, Weber (see p. 229 of this volume). Moreover, certain eggs found in the gill-chambers of *Caridina*, on comparison with those found in a similar situation in other parts of India, afford evidence of the existence of *Caridinicola*[2] in the Brahmaputra valley.

For assistance in making collections both of Decapoda and of other groups I am under a great debt of gratitude to the Officers of the 32nd Sikh Pioneers. To them, and in particular to Capt. the Hon. M. de Courcy, I have to express my thanks.

The type specimens of the new species are preserved in the Indian Museum.

Family POTAMONIDAE.

Sub-family *POTAMONINAE*.

Genus **Potamon**, Savigny.

Sub-genus **Potamiscus**, Alcock.

The sub-genus *Potamiscus* was instituted by Alcock to receive those species of *Potamon* in which the flagellum of the exopod of the outer maxillipedes is absent or vestigial. It is probable that several species of Potamonidae already described really belong to this sub-genus, but the character has been overlooked by the majority of authors, and the confusion is increased by the fact

[1] Rec. Ind. Mus., VII, p. 113 (1912).

[2] *Caridinicola*: a genus belonging to the Temnocephaloid family Scutariellidae (see Annandale, Rec. Ind. Mus., VII, p. 243, 1912).

that it is only since the publication of Alcock's memoir that it has been possible to separate the sub-families Potamoninae and Gecarcinucinae in a satisfactory manner. The classification of the great majority of the known species of the family will have to be revised in the light of Alcock's work.

It might, indeed, be argued that the species allocated to *Potamiscus* do not form a natural group and that the character used for distinguishing the sub-genus is one of doubtful value, more especially in view of the fact that the exopodite of the outer maxillipede shows varying stages of degeneration in *Phricotelphusa* and *Globitelphusa*, sub-genera of the Gecarcinucinae, and that in one of the specimens of a new species of *Potamiscus*, described below, the lash of the exopod is well developed on both sides, though quite vestigial in the other six examples.

Two undescribed species of *Potamiscus* were obtained in the Abor country and another very remarkable form, also hitherto unknown, has recently been found by Mr. F. H. Gravely in the Dawna Hills. Excluding *P. tumidulum*, Alcock, concerning which additional information is still lacking, five representatives of the sub-genus are now known from India.

These fall into two very distinct groups. One, which comprises *P. annandalei* and *P. decourcyi*, shows clear affinities with *Potamon*, *s.s.*, while the relationships of the three allied forms included in the second group are much less easy to trace. In course of time it may be necessary to restrict the sub-genus to this group, with *P. sikkimense*, Rathbun, as type, though it will then be very difficult to frame a satisfactory diagnosis which will exclude *P. annandalei* and its ally.

For the present it is not proposed to make any alteration of the kind. Alcock's classification has at least the great merit of convenience, no small advantage in a group presenting such difficulties as do the Potamonidae, and until the extra-Indian species have been classified on the lines which he has advocated, such questions as the mutual relationships of the different sub-genera are best left untouched.

The five species may be tabulated as follows:—

1. Post-orbital crests sharp-edged and undermined.
   - *a*. Post-orbital crests not separated from epigastric crests and continued as a well-defined ridge to the blunt epibranchial tooth; crenulate anterolateral margin of carapace not sharply pinched off from the general surface .. *annandalei*, Alc.
   - *b*. Post-orbital crests separated from epigastric crests by a groove and broken into tuber-

cles in the vicinity of the small but acute epibranchial tooth; crenulate antero-lateral margin sharply pinched off from the general surface — *decourcyi*, sp. nov.

II. Post-orbital crests not sharp-edged or undermined, but merged to some extent in the large rugosities of the anterior part of the carapace.

a. Carapace feebly convex fore and aft; crenulate antero-lateral margin well defined, but not strongly curved inwards; a very small and inconspicuous gap in the margin anterior to the obsolete epibranchial tooth .. — *sikkimense*, Rathbun.

b. Carapace strongly convex fore and aft; crenulate antero-lateral margin well defined and strongly curved inwards; a deep gap in the margin anterior to the large blunt epibranchial tooth .. — *aborense*, sp. nov.

c. Carapace strongly convex fore and aft; crenulate antero-lateral margin obsolete, defined merely by a few isolated tubercles behind the small but acute epibranchial tooth; a small nick in the margin anterior to the latter — *obliteratum*, sp. nov.

Potamon (Potamiscus) decourcyi, sp. nov.

(Plate xvii, figs. 1–3.)

The length of the carapace slightly exceeds three quarters of the breadth and its depth is rather less than half its breadth; it is decidedly convex fore and aft and slightly so from side to side. The surface is pitted and a little roughened. The antero-lateral portions are strongly tuberculo-rugose, as are also, but to a less marked extent, the anterior regions behind the epigastric and post-orbital crests. On the side walls are fine oblique striae which pass across the postero-lateral border.

The cervical groove is well marked, though not deeply graven, where it defines the mesogastric area; but its lateral continuations towards the orbits are almost entirely or entirely suppressed. No trace of them exists in a very large male, but they are just perceptible as very faint and extremely shallow depressions in the younger

examples. The fore lobe of the mesogastric areola is well defined and the median groove is continued, though not always very clearly, almost to the margin of the front.

The epigastric and post-orbital crests are sharp and distinct. The epigastric crests are narrow and are separated from the post-orbitals by well-defined grooves; though considerably in advance of the post-orbital crests in the middle line, they slope away on either side and in conjunction with these crests form a common curve across the anterior portion of the carapace. The post-orbital crest is sharply cut and trenchant up to the point where the cervical groove would cut it, if it were defined, but beyond this it is broken up into a number of sharp tubercles (fig. 1).

The front in adults is much less than one-third the breadth of the carapace; in small individuals about one-third. Immediately behind and parallel with its edge it bears a bilobed eminence which in dorsal view almost or quite conceals the margin. In this respect the species resembles *Potamon pealianum*, but the eminences are not quite so pronounced. The edge is sometimes very feebly bilobed when seen from in front.

In the smaller specimens there is only a faint indication of a gap between the upper and lower borders of the orbit; this feature, however, is very strongly developed in the adult male. The antero-lateral borders are sharply pinched off from the carapace, strongly crenulate and well arched, and the epibranchial tooth is well developed.

In the abdomen of the adult male (fig. 3) the sixth segment is twice as broad as long and the seventh a little more than three quarters as long as broad.

The mandibular palp is simple. The flagellum of the exopodite of the external maxillipedes is vestigial in six specimens (fig. 2), but moderately developed in the seventh (a small example). The merus of the endopod is nearly as long as broad.

The chelipedes are almost or quite equal in all the specimens examined. The external surfaces of the merus, carpus and propodus are squami-rugose; the spine at the inner angle of the carpus is strong and sharp. The fingers are as long as the palm, pitted in the large example, both pitted and fluted in the smaller individuals. The upper border of the propodus bears vesiculous granules, some of which are also found at the base of the dactylus.

The dactyli of the walking legs are longer than their propodi; in the two middle pairs the propodus is rather more than two and a half times as long as broad.

In an adult male, the type specimen, the carapace is 63 mm. broad, 49 mm. long and 29 mm. deep. In the next largest specimen, also a male, the breadth of the carapace is 26 mm., its length 20 mm. and its depth 11·5 mm.

The species which bear the closest resemblance to *Potamon decourcyi* appear to be *Potamon* (*Potamon*) *pealianum*, Wood-Mason, and *Potamon* (*Potamiscus*) *annandalei*, Alcock. From the former it differs in the total suppression of the cervical groove, in the

marked separation of the epigastric and post-orbital crests and in the vestigial condition of the flagellum of the outer maxillipedes. From the latter it is distinguished by the much greater rugosity of the antero-lateral portions of the carapace, by the more strongly arched and better defined antero-lateral borders, by the narrower epigastric crests and by the deep groove which separates them from the post-orbitals. In *P. annandalei* the post-orbital crests are continued sharply and uninterruptedly to the blunt epibranchial tooth, whereas in *P. decourcyi* they are broken up into tubercles external to the point where the cervical groove would, had it existed, have cut them. The epibranchial tooth is moreover much sharper in the present species.

The large male specimen was obtained for me by Capt. the Hon. M. W. R. de Courcy (Regd. no. $\frac{8006}{10}$, TYPE) in the Sirpo valley near Renging. The other examples were taken at Rotung ($\frac{8007}{10}$), at a point a few miles south of Kebang ($\frac{8009}{10}$), and on the banks of the Siyom R. below Debuk Damda ($\frac{8008}{10}$). All were found under stones in small hill streams at altitudes of between 1000 and 1500 ft.

Potamon (Potamiscus) aborense, sp. nov.

(Plate xviii, figs. 4, 5.)

This species differs conspicuously from the preceding and from *P. annandalei* in that the post-orbital crests are not sharply cut and prominent, but are merged to a great extent in the rugosities of the carapace. Its nearest allies are *P. sikkimense*, Rathbun, and *P. obliteratum*, sp. nov.

The length of the carapace is about five-sixths its greatest breadth and the depth is about half the breadth. The carapace is much more convex fore and aft than in *P. sikkimense* and is slightly but decidedly convex from side to side. The anterior and antero-lateral parts of the carapace are very strongly rugose (fig. 4), the whole dorsal surface is pitted and there are well-marked oblique striae on the side-walls which pass across the postero-lateral borders.

The cervical groove is distinct where it defines the mesogastric area, but thence onwards to the post-orbital crests is obsolete, its course being only discerned with the greatest difficulty.

The epigastric and post-orbital crests, as in *P. sikkimense*, are not distinctly separated from one another and form a common curve. The crests are not sharp and salient but are to a great extent merged in the large and conspicuous rugosities of the anterior part of the carapace, this is more particularly the case with the post-orbitals. The position of the epibranchial tooth is marked by a strong blunt angular lobe (fig. 4) of a far more evident nature than in *P. sikkimense* (fig. 8)—a lobe the prominence of which is greatly emphasized by the large gap which separates it from the outer orbital angle. In *P. sikkimense*, moreover, the post-

orbital crest near the lateral border is faint and the dorsal surface in these regions is, except for the rugosities, smoothly curved from the orbit backwards. In *P. aborense*, however, the surface in the neighbourhood of the outer orbital angle is situated at a much lower level than the lateral portions behind the post-orbital crest, the latter being in this part precipitous and becoming steeper and more strongly emphasized the nearer it approaches the epibranchial lobe. It is in the mutual relations of the surface of the carapace in the neighbourhood of the epibranchial lobe and the orbit that the readiest distinctions between the two species are to be found (*cf.* figs. 4 and 8).

Behind the epibranchial lobe the antero-lateral margin is defined by a crenulate ridge which is relatively much shorter and curves inwards further and more abruptly than in *P. sikkimense*.

The front is deflexed, a trifle more than a third the breadth of the carapace, and the area between its margin and the epigastric crests is tuberculo-rugose.

Posteriorly the whole carapace is more definitely narrowed than in the allied species, or rather, appears to be so, because the lateral parts of the dorsal surface slope downwards somewhat sharply, leaving only a trifle more than one-third of the actual breadth on the same level as the median horizontal line. The distinction in this respect between the present species and *P. obliteratum* is very marked.

The antepenultimate abdominal segment of the male is shorter than the penultimate (fig. 5), and in this particular *P. aborense* resembles the Nepalese examples of *P. sikkimense* recorded by Alcock in his Catalogue as *P. sikkimense* var. (fig. 6). In typical *P. sikkimense* the antepenultimate segment is longer than the penultimate (fig. 7).

The terminal segment of the mandibular palp is simple. The merus of the external maxillipedes is a trifle broader than long, and in no case is there a vestige of a flagellum on the exopod.

The chelipedes are equal in the adult female, but markedly unequal in males of similar dimensions; they are if anything slightly smoother than in the allied species. The spine at the inner angle of the carpus is sharp and the fingers are almost as long as the palm, pitted, but not fluted, and between them when the claw is closed there is no appreciable gap. In adult males the palm of the larger claw is strongly inflated, more so than in *P. sikkimense*.

The legs are decidedly more slender than in *P. sikkimense* and the propodus of the penultimate pair is more than two and a half times as long as broad.

The three specimens in the collection are of closely similar size. The breadth of the carapace varies from 17 to 18 mm., the length from 14 to 15 mm. and the depth from 8·5 to 9·5 mm. In life two of the examples were rather conspicuously mottled with deep brown on a pale brown or olivaceous ground, the colouring being particularly noticeable on the side walls of the carapace. The female is ovigerous and carries a number of eggs, in life of a

bright red colour, averaging 2·4 × 2 mm. in longer and shorter diameter.

P. aborense appears to be rare in the Abor country, but as all the specimens were found under stones in dry situations it may be that the species has habits different from the majority of forms obtained in the country and this perhaps accounts for its apparent scarcity.

All three type-specimens come from the vicinity of Rotung at altitudes of between 1000 and 1300 ft.; one ($\frac{8012}{10}$) was found at no great distance from the Egar stream; another, the ovigerous female ($\frac{8013}{10}$), was taken in March from a short burrow with a slightly enlarged terminal chamber behind a large stone on a steep hillside; the remaining example was obtained by Capt. de Courcy when cutting a road between Rotung and the Sireng stream ($\frac{8011}{10}$).

Potamon (Potamiscus) obliteratum, sp. nov.

(Plate xviii, figs. 9, 9*a*.)

I take this opportunity of describing a very fine species of *Potamiscus* obtained recently by Mr. F. H. Gravely in the Dawna Hills. In most cases I would hesitate to give an account of a species of Potamonid represented, as in the present instance, only by a single individual; but the specimen is in several respects highly peculiar and this fact, together with the circumstance that two other new species of the sub-genus are described in the present paper, may perhaps be held to justify its inclusion.

The individual is a female with the carapace 19 mm. long, 23·5 mm. broad and 13 mm. deep; it is thus proportionately slightly deeper even than in *P. aborense*. The carapace (fig. 9) is strongly and evenly convex fore and aft and slightly so across its greatest breadth, and everywhere on its dorsal surface it is rather coarsely pitted.

Seen from above it is very noticeably quadrate in shape. The sides of the carapace are, indeed, less convergent posteriorly than in the allied species; but the principal reason of its square appearance is that the postero-lateral portions do not slope away obliquely to the bases of the last two pairs of walking legs, as in *P. sikkimense* and *aborense*, but are inflated and have the lateral walls abruptly declivous.

The antero-lateral portions of the carapace are strongly rugose and a number of prominent ridges and tubercles obscure the post-orbital and epigastric crests. The frontal surface in advance of the latter is sharply tuberculous.

The cervical groove is deeply cut where it defines the posterior part of the mesogastric lobe and with its lateral backward continuations forms a well-defined figure in the form of an H. The course of its anterior branches towards the post-orbital crests can only be traced with great difficulty.

The epigastric crests are a little in advance of the post-orbitals and are separated from them by a distinct furrow: both are obscured by large rugae. The post-orbital crests break into tubercles in the vicinity of the epibranchial tooth and, as in *P. aborense*, the surface in front of them is situated at a much lower level than that behind them.

The front is square-cut, not very strongly deflexed and occupies about one-third of the greatest breadth of the carapace.

The outer orbital angle is acute and beneath it there is no notch in the lower border. The epibranchial tooth is small, but acute, and is separated by a sharp nick from the margin in front of it.

The antero-lateral margin is for the most part rounded off; the usual crest is obsolete and is represented merely by a few tubercles in the immediate neighbourhood of the epibranchial tooth (fig. 9). This peculiar feature at once distinguishes *P. obliteratum* from every other Indian species of the genus *Potamon*.

The side walls of the carapace bear short oblique rows of tubercles which, posteriorly, take the form of ridges and pass across the border to the dorsal surface.

The mandibular palp is simple. The outer maxillipedes along with the adjacent parts of the carapace and all the segments of the walking legs bear coarse, scanty, yellowish hairs. The ischium of the outer maxillipedes is, as usual, deeply grooved in a longitudinal direction. The merus is about as long as broad. The right exopod bears a short and rudimentary flagellum (fig. 9*a*); but of this, on the other side no vestige can be found.

The chelipedes in the single female specimen are slightly unequal and are rather more strongly tuberculate than in the two allied species. The carpal spine is long and slender. The palm of the chela is somewhat inflated; on its dorsal surface tubercles are conspicuous and a few of these extend on to the base of the dactylus. The fingers are grooved and pitted; when the claw is closed their tips are crossed and no appreciable gap remains between them.

The walking legs are long and slender, those of the second pair, which are the longest, measuring 46 mm. The propodus of this limb is two and three quarter times as long as broad and the dactylus is as long as the propodus and half the carpus.

Though the evidence afforded by the flagellum on the exopod of the outer maxillipedes is somewhat inconclusive, the affinities of this species are clearly with *P. aborense* and *P. sikkimense* from both of which, as from all other Indian species of the genus, it is readily distinguished by the obliteration of the antero-lateral crest of the carapace.

The single type specimen was obtained by Mr. F. H. Gravely in November, 1911, at Sukli on the E. side of the Dawna Hills near the Burmo-Siamese frontier. It was found in a log of rotten wood lying by the roadside at an altitude of about 2100 ft. (Regd. no. $\frac{8147}{10}$).

Sub-genus **Geotelphusa**, Stimpson.

Potamon (Geotelphusa) adiatretum, Alcock.

(Plate xviii, figs. 10–12.)

1910. *Potamon (Geotelphusa) adiatretum*, Alcock, Cat. Indian Decapod Crust., pt. I, fasc. ii, p. 59, pl. iii, fig. 11.

This species has hitherto been known from four specimens only: the type, which is said to have come from Moulmein, an individual from the Khakyen Hills and two examples found by Col. Godwin-Austen in the Dafla country.

On critical comparison the following differences are found between the Abor specimens and the type:—The surface of the carapace in the former is more distinctly pitted, the frontal and post-orbital regions are a little less strongly deflexed (fig. 10), the cervical groove where it defines the mesogastric area is wider and more deeply graven, the crenulate antero-lateral margin of the carapace is better defined and the spine at the inner angle of the carpal segment of the chelipede is shorter (fig. 12).

In respect of the prominence of the antero-lateral margin, the specimens agree much more closely with the Dafla examples than with the type. In course of time it will perhaps be possible to separate one or more geographical races of the species, but this can only be done satisfactorily when a good series of Burmese specimens is available.

In the collection, which comprises fourteen specimens, are several adult males. In these the chelipedes are markedly unequal and in the larger one the fingers are both very strongly curved and meet only at the tip, leaving a huge gap between them when the claw is closed.

The number of teeth with which the fingers are armed is very variable. In the oldest specimens, in which the gape is widest, each finger bears as a rule a single tooth near the middle of its inner margin. In rather less well-developed individuals these teeth are also found, with, in addition, others between them and the apex of the claw (fig. 11).

In full-grown males the last abdominal segment is a trifle wider than long, rounded at the apex, and as a rule with sinuous lateral margins. In the largest specimen the carapace is 21 mm. in breadth and 15 mm. in length.

All the specimens were found under stones in small streams running into the Dihang river or its tributaries at altitudes of between 900 and 2000 ft. The precise data are as follows:—

Jan. 13th, 1912. Five specimens, 3 ♂ and 2 ♀ (Regd. no. $\frac{8018}{10}$), from a stream on the left bank of the Dihang R. near Yembung.

Jan. 17th, 1912. One male, with symbiotic Temnocephalidae, from the Yembung river ($\frac{8021}{10}$).

Feb. 1st, 1912. Three specimens, 1 ♂ and 2 ♀, with symbiotic Temnocephalidae, from a small stream flowing into the Siyom R. below Debuk Damda ($\frac{8019}{10}$).

Feb. 5th to 10th, 1912. Five specimens, 3 ♂ and 2 ♀, from a stream between Renging and Upper Renging, collected by Capt. de Courcy and Mr. I. Burn Murdoch ($\frac{8020}{10}$).

Var. **lophocarpus**, nov.

(Plate xviii, figs. 13, 14.)

Thirty-five additional specimens of *P. adiatretum* are distinguished from the preceding by characters of sufficient importance to merit varietal recognition.

In general facies these examples bear an exceedingly close resemblance to the others. The form of the carapace is identical and differs in the features already noted from the type of *P. adiatretum*. Examined with a lens, the same pitting is observed, but the surface is dull and does not present the polished appearance which characterizes the majority of the typical specimens.

It is, however, in the structure of the chelipedes that the most distinctive varietal differences are to be found. In the var. *lophocarpus* no trace whatever remains of the spine at the inner angle of the carpus (fig. 14) and, were it not that this spine is reduced in size in the Abor examples of *P. adiatretum* (fig. 12), this character alone might be held sufficient for specific differentiation.

In the variety also a tuft of coarse hairs, entirely absent in the case of the other specimens, springs from the antero-internal face of the carpus, *i.e.* the portion on which the palm of the chela abuts when the limb is flexed. In addition, short hairs of a similar nature are to be found round the base of the dactylus and at the proximal end of the inner margins of both fingers (fig. 13). These hairs are scanty or, in rare instances, wholly missing in some of the largest individuals, but it may, I think, be assumed that their absence in these cases is due solely to mechanical agencies.

The eggs of an ovigerous female were in life of a bright red colour.

To specialized local races in which the geographical factor can be successfully demonstrated the term 'sub-species' is perhaps more properly applicable; but as the term 'variety' has frequently been used with a geographical significance in the case of freshwater crabs, it should be noted that all the evidence available with reference to the var. *lophocarpus* negatives the view that it is a localized race. Although the two forms of the species were not actually found together, the localities in which one or other occurred have no precise correlation with either horizontal or vertical distribution: the variety was found at a place exactly intermediate between others in which only the typical form was taken.

The specimens were found in hill streams at an elevation of 600–2000 ft. above sea-level.

Dec. 31st, 1911. One male from Upper Rotung, collected by Capt. de Courcy (Regd. no. $\frac{8022}{10}$).

Jan. 9th, 1912. Three specimens, one ♂ and two ♀, from the Egar stream between Renging and Rotung ($\frac{8023}{10}$).

Jan. 10th, 1912. Three specimens, one ♂ and two ♀, from the Lalek stream near Renging ($\frac{8027}{10}$).

Feb. 6th–12th, 1912. Two males from the neighbourhood of Rotung, collected by Capt. de Courcy ($\frac{8028}{10}$).

Feb. 11th, 1912. Sixteen specimens, nine ♂ and seven ♀, some with symbiotic Temnocephalidae, in small streams between two and three miles S. of Yembung ($\frac{8026}{10}$, TYPES).

March 21st, 1912. Six specimens, five ♂ and one ♀, in the Sirpo valley between Janakmukh and Renging ($\frac{8024}{10}$).

March 26th, 1912. Two males in a stream near Balek ($\frac{8025}{10}$).

Potamon (Geotelphusa) superciliosum, sp. nov.

(Plate xviii, figs. 15–18.)

This species is allied to *P. adiatretum* but differs in the following particulars:—

1. The carapace has much the same proportions but the front is less deflexed and posteriorly the surface is slightly flatter, with the divergent branches of the cervical groove on either side of the mesogastric area more conspicuous.
2. The epigastric and post-orbital crests are well defined and separated in most cases by a rather definite groove. *The post-orbital crests are specially prominent* and exist as a thin but salient ridge which disappears before reaching the lateral margin (fig. 15).
3. In young specimens the epigastric and post-orbital crests and the surface in the vicinity of the antero-lateral margin are finely rugose, and the oblique wrinkles on the side walls of the carapace are much more conspicuous. In very large examples the rugosity of the crests is diminished though traces of it are always found near the antero-lateral margin.
4. The epibranchial tooth, wholly absent in *P. adiatretum*, is represented by a small and inconspicuous nick in the finely crenulate antero-lateral ridge, the latter being sharper and better defined even than in the Abor specimens of the preceding species (fig. 16).
5. There is, as in *P. adiatretum*, no trace of an external orbital tooth, but the lower border of the orbit does not run quite flush into the upper border, the two margins joining at slightly different levels.

In young specimens the outer surfaces of the carpus and chela are strongly pitted, but scarcely any trace of this remains in adult

males. The spine at the inner angle of the carpus is strong and sharp (fig. 18) and is much better developed than in the Abor examples of *P. adiatretum*. The fingers of the chela are grooved. In adult males the chelipedes are very unequal and, as in *P. adiatretum*, the fingers of the larger claw when closed leave between them a huge gap, meeting only at the tips (fig. 17). The teeth on the fingers appear to be very variable in number and position and the tufts of hairs found in *P. adiatretum* var. *lophocarpus* are entirely absent.

The mandibular palp is simple. The merus of the outer maxillipedes is much broader than long and its anterior margin is rather deeply concave; the exopod is provided with a long flagellum.

This species appears to reach a much greater size than that described by Alcock, but the characteristic differences between the two forms are quite distinct even in the very smallest individuals. In a large male the carapace is 38 mm. broad, 27 mm. long and 16 mm. deep.

It will be noticed that in the possession of a rudimentary epibranchial tooth and prominent post-orbital ridges *P. supercilliosum* departs somewhat from the definition of the sub-genus *Geotelphusa* as laid down by Alcock. The affinities of the species with *P. adiatretum* are, however, clear.

The twelve specimens obtained were found in hill streams between altitudes of 600 and 2000 ft.

Jan. 13th–17th, 1912. Six males, some with symbiotic Temnocephalidae, in the Yembung river (Regd. no. $\frac{8014}{10}$).

Jan. 19th, 1912. One male in the Egar stream between Renging and Rotung ($\frac{8015}{10}$).

Feb. 9th, 1912. Three males and one female, some with symbiotic Temnocephalidae, in the Yembung river ($\frac{8016}{10}$).

March 26th, 1912. Four males, two very large, in a stream near Balek ($\frac{8017}{10}$, TYPES).

Sub-genus **Acanthotelphusa**, Ortmann.

Potamon (Acanthotelphusa) feae, (de Man).

1898. *Paratelphusa feae*, de Man, Ann. Mus. Civ. Genova (2), XIX, p 393, pl. iv, fig. 3.

1910. *Potamon (Acanthotelphusa) feae*, Alcock, Cat. Indian Decapod Crust., pt. I, fasc. ii, p. 66, pl. xi, fig 51.

The Abor specimens are all small, the carapace of the largest being only 17 mm. in breadth.

The carapace is much less distinctly areolated than in the four larger specimens examined by Alcock; the post-orbital crest does not form the definite tubercles found in those individuals, but exists as a very obscure and ill-defined eminence which

extends laterally almost to the longitude of the outer orbital tooth. In typical *feae*, also, a broad transverse ridge across the epibranchial region in the neighbourhood of the posterior antero-lateral spine limits anterior and posterior depressions and of this, in the Abor examples, only the merest indication can be found.

I have been able to examine a number of *P. feae* taken in December, 1910, in the Deshnoi river on the Assam-Bhutan frontier in the north-east of the Darrang district (Regd. no. $\frac{8032}{10}$) This series comprises both large and small specimens and the evidence they afford leads me to believe that it may be necessary at some future date to recognize different races of this species. On comparing specimens of equal size, a slight but quite noticeable difference can be observed in the prominence of the transverse epibranchial ridges and in the character of the post-orbital crests. The more important features of *P. feae* are well shown in all the examples.

This species was described by de Man from Bhamo and Teinzo in the Upper Irrawaddy and has been recorded by Alcock from Sadiya and the Dafla country.

The specimens in the Abor collection were found at the following localities:—

Nov. 26th, 1911. One very small example from the Dikrang river near Sadiya (Regd. no. $\frac{8029}{10}$).

Dec. 12th, 1911. Three very small examples from the Brahmaputra river at Kobo ($\frac{8030}{10}$).

March 26th, 1912. Seven males and two females from a stream near Balek ($\frac{8031}{10}$).

All were found on the plains between elevations of 400 and 600 ft. I am almost certain that the species does not exist in the hill streams at higher altitudes, though it was apparently in such situations that specimens were obtained in the Dafla country by Col. Godwin-Austen.

Sub-family *GECARCINUCINAE*.

Genus **Paratelphusa**, Milne-Edwards.

Sub-genus **Barytelphusa**, Alcock.

Paratelphusa (Barytelphusa) harpax, Alcock.

1910. *Paratelphusa* (*Barytelphusa*) *harpax*, Alcock, Cat. Indian Decapod Crust., pt. I, fasc. ii, p. 95.

A single small specimen with the carapace 14 mm. in breadth was found near Sadiya in the Dikrang river (Regd. no. $\frac{8033}{10}$). The species appears to be widely distributed in Assam south of the Brahmaputra and is also recorded from the vicinity of Harmutti in the Dafla country.

Family PALAEMONIDAE.

Genus **Palaemon**, Fabricius.

Palaemon hendersoni, de Man.

(Plate xix, figs. 19-23.)

1907. *Palaemon* (*Parapalaemon ?*) *hendersoni*, de Man, Trans. Linn Soc., Zool. (2) IX, p. 446, pl. xxxiii, figs. 66-68.
1910. *Bithynis* (*Parapalaemon*) *hendersoni*, Rathbun, Bull. Mus. Comp. Zool., Harvard, LII, p. 316, pl. v, fig. 3.

The length of the carapace and rostrum is a little less than that of the abdomen, excluding the telson. The carapace, except on the walls covering the branchial chamber, is closely covered with very minute prickles which are easily removed by wear. The anterior margin is lobed at the base of the orbit and at the lower limit of this lobe there is a sharp antennal spine arising close behind the edge. The hepatic spine is small (figs. 19, 20).

The rostrum commences as a blunt dorsal crest a little in front of the middle point of the carapace and extends beyond the end of the first segment of the antennular peduncle, sometimes as far as the junction of the second and third segments. Dorsally it bears from five to seven teeth, of which from one to three (usually two) are situated on the carapace behind the longitude of the posterior limit of the orbital notch. The teeth are more or less evenly spaced, but the posterior one is as a rule separated by a greater distance than the rest. Between the dorsal teeth are numerous hairs. On its ventral margin the rostrum bears one or two teeth near the apex.

The eyes are deeply pigmented. In dorsal view a small ocellus is visible, imperfectly separated from the cornea.

The basal segment of the antennular peduncle is considerably longer than the two following combined. The laminar plate, which forms the outer portion of the segment, terminates in a stout external tooth which reaches beyond the middle of the succeeding segment; the lateral process consists of a sharp spine which extends as far forwards as the eyes. Anteriorly the inferior margin of the second segment is strongly produced. The two rami composing the upper (and outer) flagellum are fused basally for a distance scarcely greater than the extreme length of the last peduncular segment (fig. 20).

The antennal scale is about two and a half times as long as broad, and the spine which terminates the slightly convex external margin does not nearly reach the broadly rounded apex of the lamellar portion.

The outer maxillipedes extend to the end of the antennular peduncle; the ultimate segment, including the corneous terminal spine, is only a trifle shorter than the antepenultimate.

The first peraeopods reach beyond the antennal scale by a little more than the length of the propodus. The proportional

lengths of the merus, carpus and chela are respectively as 13, 15 and 10. The dactylus is almost exactly equal in length to the palm.

The second peraeopods may attain a monstrous size in males; the two limbs may be equal in length or markedly unequal, but as a rule show varying degrees of inequality in large individuals. In very large specimens the greater of the two legs extends beyond the apex of the scale by the whole of the chela and carpus. The second peraeopods of eight large specimens yield the following measurements :—

Measurements, mm.							Proportion of length of larger chelipede to total length (100).	Proportional lengths of segments of larger chelipede to propodus (100).		
Total length.	Length of right chelipede.	Length of left chelipede.	Larger chelipede.							
			Length of merus.	Length of carpus.	Length of propodus.	Length of dactylus.		Merus.	Carpus.	Dactylus.
59	60	46·5	11	7·7	29·5	16·0	101·7	37·3	26·1	54·2
57	57·5	53	11	8·5	29·0	16·0	100·9	37·9	29·3	55·2
56	50	59	10·5	7·3	30·0	16·0	105·4	35·0	24·3	53·3
53	49	42·5	8·7	6·7	24·0	12·0	92·5	36·3	27·9	50·0
49	36·5	42	7·5	5·7	19·5	10·3	85·7	38·5	29·2	52·8
49	40·5	44·5	8·5	5·5	21·5	11·5	90·8	39·5	25·6	53·5
46	44	40	8·0	6·0	20·5	10·3	95·7	39·0	29·3	50·2
44	37	34	7·0	5·1	17·5	8·8	84·1	40·0	29·1	50·3

The whole limb (fig. 21) is closely covered with minute prickles and these become upstanding spinules on the inferior surfaces of the ischium and merus. The palm is devoid of setae, but both fixed and movable fingers are strongly fluted and, in the hollows between the ridges, are numerous pits from which tufts of coarse hair arise (fig. 22). In living specimens these hairs always retain a quantity of fine mud. The grooving of the fingers is much more marked than in *Palaemon dayanus*, Henderson, and by this feature alone *P. hendersoni* is readily distinguished from its allies. The palm is flattened, the depth being scarcely more than three-quarters of the breadth. In large males the fingers are toothed and may gape considerably. The fixed finger usually bears two teeth in its proximal half, while the dactylus also has two, situated distally of those on the opposite edge. The distal tooth of the fixed finger is frequently broad at the apex with two or more tubercles upon it.

The third peraeopods reach a trifle beyond the apex of the antennal scale, the fourth almost to the end of the antennular peduncle and the fifth a little beyond the eye. All three pairs are beset with small prickles, most strongly developed on the posterior surfaces of the ischium and merus, and bear also scattered hairs. On the posterior and postero-internal aspects of the propodus are

a number of small movable spines arranged in two linear series. The dactylus bears a single terminal spine and numerous short hairs and is about two-sevenths the length of the propodus.

The branchial formula is the same as in other species of the genus.

The telson is broad with a triangular apex. It bears two pairs of dorsal spinules and two pairs at the apex (fig. 23). Of the latter, those of the outer pair are very small, while those of the inner are larger and extend a little beyond the apex. Between these spinules the margin is furnished with long plumose setae.

There can, I think, be very little doubt that the specimens described above are correctly referred to de Man's *P. hendersoni* from Darjiling; but it is strange that in the original description no mention is made of the characteristic grooving of the fingers of the large chelipede. In the Indian Museum are numerous examples of this species from the valley below Kurseong, a locality at no great distance from Darjiling, collected by Dr. Annandale and Mr. F. H. Gravely, and in these specimens the grooves on the fingers are clearly shown.

The Abor specimens agree with de Man's description and differ from the Kurseong examples and from most of those recorded by Miss Rathbun in having the fingers of the second peraeopod as long as, or a trifle longer than the palm.

The species has hitherto been recorded only from Darjiling (*de Man*) and from the Gokteik gorge on the border of the southern Shan States in Burma (*Rathbun*).

Palaemon hendersoni was found plentifully in the Abor country in the Sirpo stream near Renging (Regd. nos. $\frac{8139\text{-}41}{10}$, $\frac{8143\text{-}4}{10}$), and in the Egar stream between Renging and Rotung ($\frac{8142}{10}$, $\frac{8145\text{-}6}{10}$).

Family ATYIDAE.

Genus **Caridina**, H. Milne-Edwards.

Caridina weberi, de Man, var.

(Plate xix, figs. 24, 25; plate xx, figs. 26-28.)

A *Caridina* which occurs in abundance in the Darrang district in tributaries of the Brahmaputra and has been found in the main river itself at Dibrugarh and Kobo appears to represent a race of *C. weberi*, de Man. This species was originally described from Flores and Celebes (de Man, 1892)[1] and a variety called *sumatrensis* is recorded from Sumatra (de Man, 1892),[2] from Engano I., near Sumatra (Nobili, 1900)[3] and from Cochin China, Siam and the environs of Bombay (Bouvier, 1905).[4]

[1] In Max Weber's Zool. Ergebn. Reise niederl. Ost.-Ind., II, p. 371, pl. xxii, fig. 23.
[2] *Ibid*, p. 375, pl. xxii, fig. 23g.
[3] Ann. Mus. Civ. Genova (2), XX, p. 476.
[4] Bull. Sci. France et Belg., XXXIX, p. 83.

I have compared specimens from the Brahmaputra system with examples from Bombay determined by Prof. Bouvier as var. *sumatrensis* and with others which appear to represent the same form from Medha, Yenna Valley, Satara district, collected by Mr. F. H. Gravely, and find a few differences which may ultimately prove of importance.

The rostral teeth are less numerous. Those on the dorsal margin vary in number from 10 to 17 (12—14 in 74% of the specimens examined) and of these 3 to 5 (usually 4) are situated on the carapace behind the orbital notch. On the ventral margin there are from 1 to 5 teeth (2 or 3 in 78% of the specimens examined).

The fact that a number of dorsal teeth are situated on the carapace behind the orbit (figs. 24, 25) shows that the Brahmaputra race is more closely allied to the var. *sumatrensis* than to the typical form. In the variety, however, the dorsal teeth are decidedly more numerous (16—20), and comparison with specimens from the Satara district seems to indicate that the Assamese individuals are more stoutly built with rather shorter and less slender limbs.

In the chelae of the second peraeopods (fig. 27) the palmar portion is decidedly more than half the length of the dactylus, a feature noticed by Bouvier in examples of var. *sumatrensis*.

C. weberi appears to be one of the commonest species of *Caridina* in India and Burma: a large collection of specimens from widely different localities awaits examination in the Museum. It will probably be possible to distinguish a number of local races, but to attempt to do so at the moment would be premature and beyond the scope of the present paper.

The colour of living specimens is very variable. They may be uniformly dark, blotched or mottled. Frequently a broad whitish mid-dorsal stripe is found running the whole length of the animal and occasionally specimens are obtained which are vertically barred on the sides.

Specimens of the Brahmaputra race of *C. weberi* were found on the Abor expedition at Kobo (Regd. no. $\frac{8162}{10}$) and at Dibrugarh ($\frac{8163}{10}$). The form is also represented in the Museum collections by numerous examples from the Darrang district on the right bank of the Brahmaputra,—from the Dhansiri R. at Kowpati ($\frac{8164}{10}$), from the Deshnoi and Rowta rivers on the frontiers of Assam and Bhutan ($\frac{8165\cdot6}{10}$), from Mazbat ($\frac{8167}{10}$) and Mangaldai ($\frac{8168}{10}$).

Caridina excavata, sp. nov.

(Plate xx, figs. 32-35; plate xxi, figs. 36, 37.)

The rostrum extends beyond the end of the antennular peduncle and in some examples reaches just to the apex of the antennal scale. In lateral view it is dorsally a little convex in the

neighbourhood of the orbit and a trifle concave towards the apex. In the proximal half of the upper margin it bears a series of 9 to 16 teeth (10 to 13 in 71% of the specimens examined). They are evenly spaced and movable and from 0 to 3 (usually 1 or 2) are situated on the carapace behind the orbital notch. The distal half of the rostrum is wholly unarmed dorsally, the small tooth found close behind the apex in *C. nilotica* and numerous other species being absent. On the ventral margin there are 2 to 8 fixed teeth (4 to 6 in 87% of the specimens examined). These teeth are placed in the distal half and the posterior one is, as a rule, situated immediately below the foremost of the dorsal series (fig. 36).

The antero-lateral margin of the carapace is obtusely lobed below the orbital notch and immediately beneath this lobe there is a strong antennal spine. The orbital notch is excavated to a very unusual extent (fig. 37); the antero-lateral angles of the carapace are rounded.

The eyes are well pigmented. The segments of the antennular peduncle decrease progressively in length. The lateral process reaches beyond the eyes but does not extend to the end of the basal segment. The second segment is about one and two third times as long as wide. The antennal scale is about three times as long as broad and its straight outer margin terminates in a stout spine which is far exceeded by the rather narrowly rounded apex of the lamella.

The third maxillipedes reach to the end of the second segment of the antennular peduncle.

All the peraeopods are unusually slender. In those of the first pair, which reach about to the extremity of the eyes, the carpus (fig. 32) is *three* times as long as wide and is only very slightly excavated anteriorly. The chela is longer than the carpus, the dactylus is one and a half times as long as the palm and the length of the propodus is about three and a half times its greatest breadth.

The peraeopods of the second pair (fig. 33) reach a little beyond the end of the antennular peduncle. The carpus is slender, about five and a half times as long as wide and is equal in length to the chela. The dactylus is longer than the palm and the breadth of the palm is less than a quarter the length of the entire chela.

The third peraeopods reach almost to the apex of the antennal scale and the fourth to the end of the antennular peduncle. The merus in each pair bears a single tooth in the middle of its posterior margin and one at the distal end; a similar tooth is found at the end of the carpus. The dactylus bears from eight to ten small teeth on its margin exclusive of the spinous apex.

In the fifth pair (fig. 34) the propodus is longer than in the fourth and the whole limb is consequently of greater length; the merus and carpus are usually provided with teeth as in the preceding pairs. The slender dactylus is about one third the length of

the propodus and is armed with from 40 to 50 close-set serrated spines (figs. 34, 35).

The branchial formula is as follows :—

	Maxillipedes.			Peraeopods.				
	1	2	3	1	2	3	4	5
Pleurobranchiae ..	..	..	..	1	1	1	1	1
Arthrobranchiae ..	..	..	2	1	..	..	..	..
Podobranchiae ..	ep. rud.	1	ep.	ep.	ep.	± ep.	..	..

The epipod on the third peraeopods is sometimes present, sometimes absent: more usually it is suppressed.

The telson bears two pairs of dorso-lateral spinules; there is a small spinule on either side of the apex and the margin between them is rounded and bears eight spines, the outermost slightly the largest.

Large specimens reach a length of about 25 mm. In an ovigerous female (only one example obtained) the eggs average 1·0 mm. × ·68 mm. in longer and shorter diameter.

A characteristic feature in the colouration of living specimens is the presence of a broad vertical band of pigment on the side-walls of the carapace immediately over the pleurobranch at the base of the third peraeopods.

In many species of *Caridina* the branchial formula is unknown; but in all cases in which it has hitherto been examined epipods have been found at the bases of the first four pairs of peraeopods. The absence of these appendages from the fourth pair and their occasional absence from the third seems therefore to constitute a very important feature of *C. excavata*. Apart from this character its nearest ally appears to be *C. acutirostris*, Schenkel,[1] from Celebes.

A single example of *C. excavata* was found at Sadiya in the Dikrang river, while numerous other specimens were obtained in January, 1911, in the Tezpur district on the Assam-Bhutan frontier. These were taken, for the most part, in a small back-water of the Rowta R. in the Brahmaputra drainage system (Regd. no. $\frac{8158}{10}$), and in this particular spot the species was found to the exclusion of *C. weberi* var. and *C. hodgarti* which were abundant in other parts of the district. A few specimens were found in the Rowta R. itself ($\frac{8160}{10}$) and in irrigation channels at Mazbat in the same vicinity ($\frac{8161}{10}$), but the species was for the most part decidedly rare.

1 Verhandl. naturf. Ges. Basel, XIII, 1902, p. 496, pl. viii, fig. 3.

The specimen from Sadiya has unfortunately been mislaid. Those from the backwater of the Rowta R. may be recognized as types of the species.

Caridina hodgarti, sp. nov.

(Plate xx, figs. 29-31; plate xxi, figs. 38, 39.)

The rostrum is slender and in well-grown specimens reaches well beyond the apex of the antennal scale. Its dorsal margin is slightly concave in lateral view and at the apex it is straight or trends a little upwards. In the proximal half of the upper margin there is a series of 8 to 16 rather close-set equidistant movable teeth. The number most commonly found is 11; 10 to 12 occur in 67% and 9 to 13 in 92% of the specimens examined. The posterior tooth is in rare cases situated on the carapace behind the orbital notch; between each pair of teeth there is a single seta. Immediately behind the slender apex there is a single fixed tooth; occasionally two are found in this position and in rare instances none at all. The ventral margin is furnished with from 1 to 7 stout fixed teeth, widely separated. The number most commonly found (48% of the specimens examined) is 4. and 3 to 5 occur in 91% of the examples (fig. 38).

The carapace is compressed, of greater proportional length than in most species of the genus, and the only spine present is the antennal.

The eyes are well pigmented. The lateral process of the basal segment of the antennular peduncle is sharply pointed and extends beyond the eyes. The second segment is twice as long as wide and is nearly twice the length of the third. The antennal scale is narrow, about four and a half times as long as wide; its inner margin in the distal half is straight or even very slightly concave and the straight outer margin terminates in a sharp spine far behind the narrow apex of the lamella (fig. 39).

The third maxillipedes and all the peraeopods are very short. The former scarcely reach the distal end of the second segment of the antennular peduncle.

The first peraeopods only reach a trifle beyond the base of the antennal scale. The carpus (fig. 29) is one and a half times as long as broad; it is scarcely at all excavate anteriorly and is three quarters the length of the chela. The palm is as long as broad and is shorter than the dactylus.

The peraeopods of the second pair (fig. 30) reach a little beyond the eyes. The carpus is about three times as long as broad and is about equal in length to the chela. The palm is scarcely longer than broad and is a little shorter than the dactylus.

The last three pairs of peraeopods bear spines on the meral and ischial segments much as in the preceding species. The third reach nearly to the end of the second segment and the fourth to the end of the first segment of the antennular peduncle, while the fifth reach as far forwards as the eyes. The dactyli of the third

and fourth pairs bear six or seven spines, that of the fifth (fig. 31) is comparatively broad, a little more than one third the length of the propodus, and bears about twenty-five spines.

The branchial formula resembles that of *C. excavata*, but epipods are invariably absent from both third and fourth peraeopods.

The telson bears from four to six pairs of dorsal spinules and the round margin between the small spinule on either side of the apex bears two pairs of spines.

Large specimens reach a length of 33 mm. The eggs, in the single ovigerous female examined, average ·8 mm. by ·4 mm. in longer and shorter diameter.

Caridina hodgarti appears to find its nearest ally in Stimpson's *C. grandirostris*[1] from the Liu Chiu Is., but is easily distinguished by the characters of the rostrum. The gill-formula of Stimpson's species is unknown.

The pigmentation of living specimens is characteristic. The lower edge of the rostrum is deeply pigmented and there is a broad dark stripe, sometimes produced outwardly in the middle, along the inner margin of each antennal scale. The inferior portions of all the abdominal pleura are dark and the telson is pigmented in its distal three quarters. The inner uropod is pigmented throughout, except for a small pale area in the centre; the outer uropods are transparent. The actual tint, as in all species of *Caridina*, is very variable; in *C. hodgarti* the dark patches are frequently claret-coloured.

Caridina hodgarti is a common species in the Upper Brahmaputra valley. Specimens have been found at Kobo in the Abor country (Regd. no. $\frac{8151}{10}$, TYPES), at Dibrugarh ($\frac{8152}{10}$) and in the Darrang district on the right bank of the Brahmaputra in irrigation channels at Mazbat ($\frac{8153}{10}$), in the Dhansiri R. at Kowpati ($\frac{8154}{10}$), at Mangaldai ($\frac{8155}{10}$) and in the Deshnoi R. on the frontiers of Bhutan ($\frac{8156}{10}$). The species has also been obtained in the Mahananda R. at Siliguri ($\frac{8157}{10}$) and in the Tista R. at Jalpaiguri ($\frac{8158}{10}$), both localities being near the base of the Sikhim Himalayas.

The distribution, as far as it is known, may therefore be said to extend along the base of the foot-hills from the Darjiling district to the Abor country.

[1] Proc. Acad. Sci. Philadelphia, 1860, p. 28.

EXPLANATION OF PLATE XVII.

Potamon (*Potamiscus*) *decourcyi*, sp. nov.

FIG. 1.—Photograph of a large male, the type specimen, nat. size.

,, 2.—Third maxillipede of the same specimen.

,, 3.—Abdomen of the same specimen.



2.



1.



3.

S. K. Photo.
A.C. Chowdhary, del.

POTAMON (POTAMISCUS) DECOURCYI, sp. nov.

Bemrose, Calla., Derby

EXPLANATION OF PLATE XVIII.

Potamon (*Potamiscus*) *aborense*, sp. nov.

FIG. 4.—Right half of the carapace in dorsal view, × 2½.
,, 5.—Abdomen of the same specimen.

Potamon (*Potamiscus*) *sikkimense*, Rathbun.

,, 6.—Abdomen of the variety described by Alcock from Nepal.
,, 7.—Abdomen of a typical specimen.
,, 8.—Left half of the carapace of a typical specimen in dorsal view, × 3.

Potamon (*Potamiscus*) *obliteratum*, sp. nov.

,, 9.—Right half of the carapace in dorsal view, × 2.
,, 9*a*.—Third maxillipede.

Potamon (*Geotelphusa*) *adiatretum*, Alcock.

,, 10.—Left half of the carapace in front view, × 4.
,, 11.—Chela and carpus in lateral view.
,, 12.—Carpus viewed dorso-laterally.

Potamon (*Geotelphusa*) *adiatretum* var. *lophocarpus*, nov.

,, 13.—Chela and carpus in lateral view.
,, 14.—Carpus viewed dorso-laterally.

Potamon (*Geotelphusa*) *superciliosum*, sp. nov.

,, 15.—Right half of the carapace in front view, × 2.
,, 16.—Carapace in dorsal view, nat. size.
,, 17.—Chela and carpus of the same specimen, a male, nat. size.
,, 18.—Carpus viewed dorso-laterally, nat. size.


7.

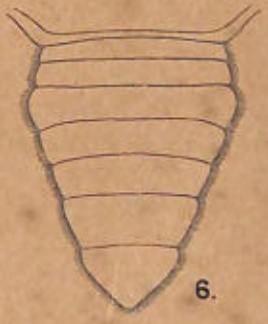

8.


4.


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9.


9a.


6.


12.


14.


11.


13.


15.


10.


18.


16.


17.

S. C. Mondul, A.C. Chowdhury, del.

Bemrose Calte., Derby

ABOR POTAMONIDAE.

EXPLANATION OF PLATE XIX.

Palaemon hendersoni, de Man.

FIG. 19.—Anterior part of carapace, etc., in lateral view, × 2½.

,, 20.—Anterior part of carapace, etc., of another specimen, dorsal view, × 2.

,, 21.—Second peraeopod of adult male, × 1½.

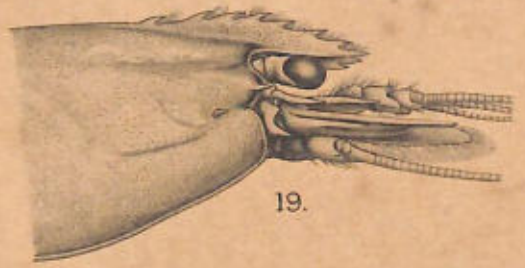
,, 22.—Denuded fingers of the same limb, further enlarged.

,, 23.—Apex of telson.

Caridina weberi, de Man, var.

,, 24.—Lateral view of a specimen of the race inhabiting the Brahmaputra river system.

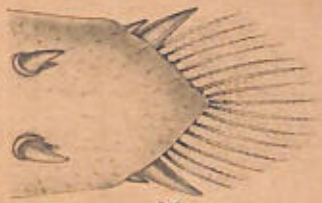
,, 25.—Anterior part of carapace, etc., of the same specimen.



19.



22.



23.



24.



20.



21.



25.

Bemrose, Colls., Derby

S. C. Mondul, A.C. Chowdhury, del.

19-23, PALAEMON HENDERSONI, de Man. 24,-25, CARIDINA WEBERI, de Man, VAR.

EXPLANATION OF PLATE XX.

Caridina weberi, de Man, var.

FIG. 26.—Part of first peraeopod of a specimen of the race inhabiting the Brahmaputra river system.

,, 27.—Part of second peraeopod of the same specimen.

,, 28.—Part of fifth peraeopod of the same specimen.

Caridina hodgarti, sp. nov.

,, 29.—Part of first peraeopod.

,, 30.—Part of second peraeopod.

,, 31.—Part of fifth peraeopod.

Caridina excavata, sp. nov.

,, 32.—Part of first peraeopod.

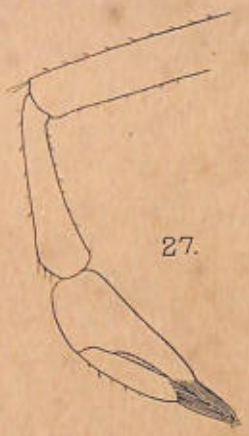
,, 33.—Part of second peraeopod.

,, 34.—Part of fifth peraeopod.

,, 35.—Apex of dactylus of fifth peraeopod, further enlarged.



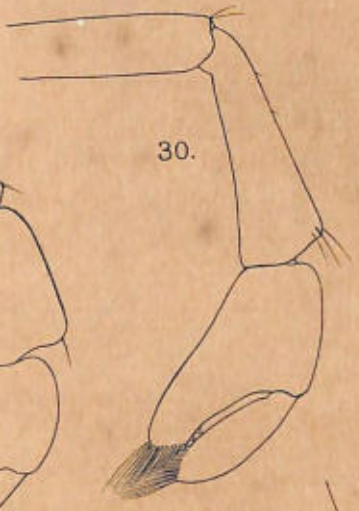
26.



27.



28.



30.



29.



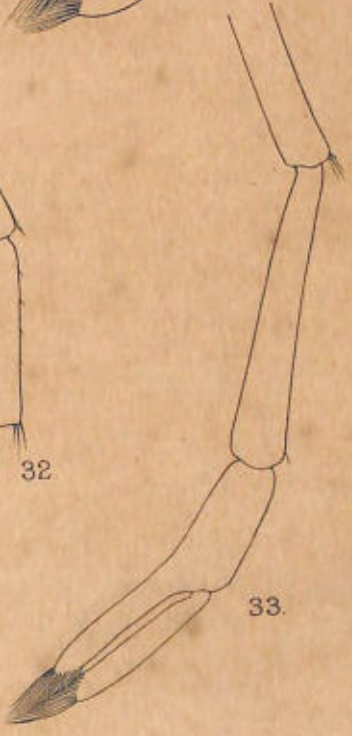
31.



34.



32



33.



35.

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APPENDAGES OF CARIDINA.

EXPLANATION OF PLATE XXI.

Caridina excavata, sp. nov.

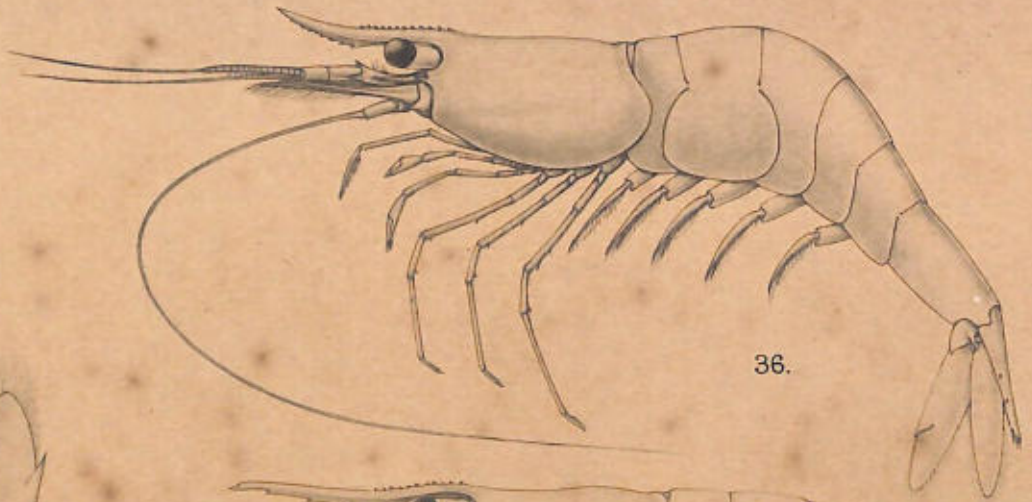
FIG. 36.—Lateral view of one of the type specimens.

,, 37.—Anterior part of carapace etc. in dorsal view.

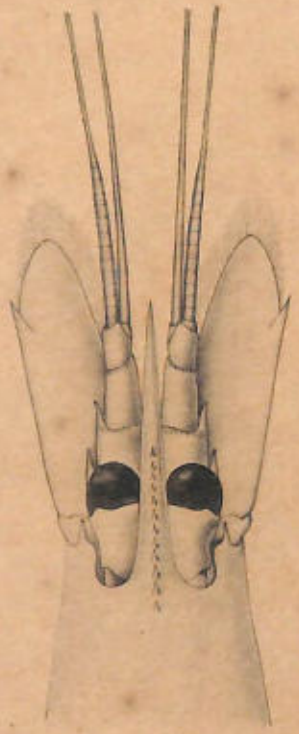
Caridina hodgarti, sp. nov.

,, 38.—Lateral view of one of the type specimens.

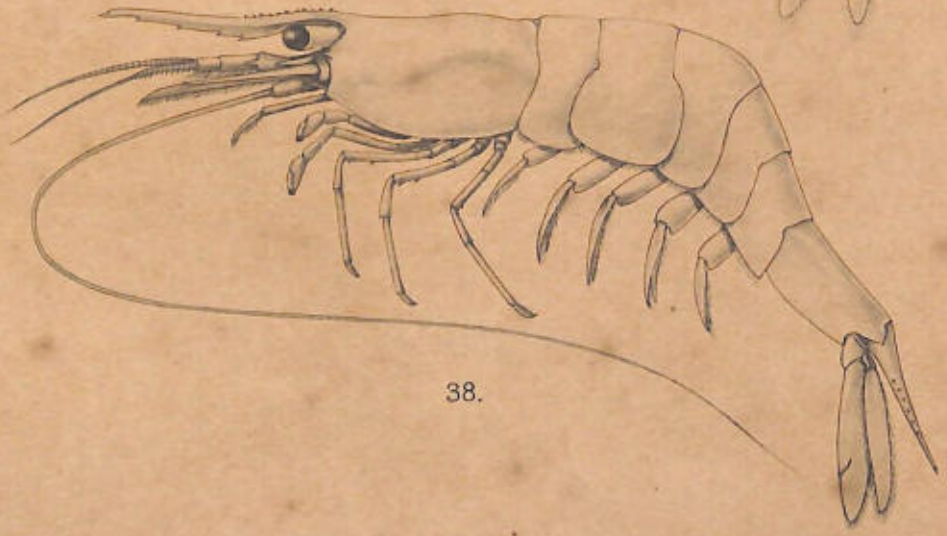
,, 39.—Anterior part of carapace etc. in dorsal view.



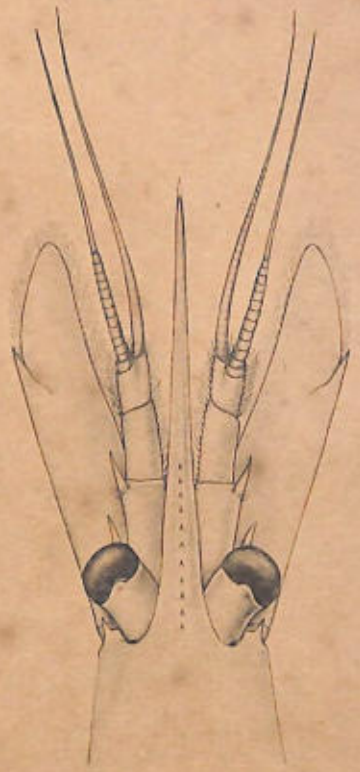
36.



37.



38.



39.

A.C. Chowdhury, del.

Bemrose, Calla. Derby

36, 37. CARIDINA EXCAVATA, sp. nov. 38, 39, CARIDINA HODGARTI, sp. nov.

XXI. ORTHOPTERA, I: TETRIGINAE (ACRIDIINAE).

By Dr. J. L. Hancock, *F.E.S.*

(Plate xv.)

Of the twenty-five specimens of these small Orthoptera obtained by Mr. Kemp on the Abor Expedition, ten species are represented, four of which are new.

List of Species.

1. *Scelimena india.*
2. *Criotettix maximus*, sp. nov.
3. *Criotettix orientalis*, sp. nov.
4. *Thoradonta spiculoba.*
5. *Coptotettix indicus.*
6. *Coptotettix tumidus*, sp. nov.
7. *Coptotettix parvulus.*
8. *Coptotettix nullipennis*, sp. nov.
9. *Euparatettix parvus.*
10. *Euparatettix tenuis.*

Genus **Scelimena**, Serv.

1. **Scelimena india**, Hanc.

Hancock, Trans. Ent. Soc. Lond., p. 219, 1907.

Two specimens found "under stones," Rebang Stream above Pang-i, 4000 ft., Jan. 16, 1912 (*Kemp*).

The male type [1], from which the original description was drawn, is from Cherrapungi, Khasi Hills, Assam. The female, which is one of the pair found on the Abor Expedition, measures: entire length of body 23 mm.; pronotum 22·5 mm.; posterior femora 9 mm. In this species the pronotum anteriorly bears a tubercle on each side, and the first joints of the posterior tarsi are only slightly dilated in comparison with other species.

Genus **Criotettix**, Bol.

2. **Criotettix maximus**, sp. nov.

(Pl. xv, figs. 1, 1*a*.)

Resembling *C. extremus*, but slightly larger; coloured fuscous, obscurely pale mottled. Vertex subnarrower than one of the eyes; frontal costa arcuate between the antennae, and slightly protuberant, divided above the paired ocelli, moderately sulcate below the insertion of the antennae, wider than *extremus*. Pronotum deplanate, dorsum uneven, rather rugose and granose,

[1] In the author's collection.

the posterior process lengthily extended backward beyond the hind femoral knees, the base subnodulose: median carina very low and undulate; lateral lobes deflexed and armed with acute transverse spines. First articles of the posterior tarsi narrow, not at all dilated, the first and second pulvilli acute, the third longest and flattened below.

Male and female, entire length of body 18·5—22·5 mm.; pronot. 17·5—21 mm.; post. fem. 6·5—9 mm.

Five specimens: three were found "under stones" on the bank of a stream, Yembung, 1100 ft., Jan. 14, 1912; two were found "among stones" on bank of the Dihang river, Janakmukh, 600 ft., Dec. 17, 1911 (*Kemp*).

This is one of the largest species of *Criotettix*, and has the general appearance of a *Scelimena*. It is darker coloured than *grandis*.

3. Criotettix orientalis, sp. nov.

(Pl. xv, figs. 4, 4*a*.)

Body not so large as the preceding, coloured greyish-cinerous. Vertex subequal in width to one of the eyes, ampliate backward; frontal costa arcuate, not at all sinuate, divided barely above the paired ocelli, and somewhat narrowly sulcate forward; antennae inserted distinctly between the lower part of the eyes; paired ocelli placed between the middle of the eyes; eyes globose and scarcely elevated. Pronotum deplanate, transversely convex between the shoulders; dorsum granose, slightly tuberculate and rugose; median carina low, thin, and irregularly crassate-undulate; prozonal carinae convergent backward; posterior process extended only slightly beyond the hind femoral apices in the short-wing form, or lengthily extended beyond them in the long-wing form; lateral lobes distinctly deflexed laterally and armed on each side with an acute spine directed very slightly obliquely backward. Elytra elongate-subovate, externally punctate; wings explicate, extended to the apex of pronotal process or beyond. Femoral margins entire; hind tibiae armed with spines, the first and second pulvilli of the posterior tarsi acute subspinose, the third flat below.

Male, long and short-wing forms, entire length of body 11—14 mm.; pronot. 10—13 mm.; post. fem. 7 mm.

Two males from Dibrugarh, N.-E. Assam, Dec. 17, 1911 (*Kemp*).

This species resembles *C. tricarinatus*, but is larger and the pronotum is more rugose.

Genus Thoradonta, Hanc.

4. Thoradonta spiculoba, Hanc.

Hancock, Mem. Dept. Agricult. India, iv, p. 138, 1912.

One male from Dibrugarh, N.-E. Assam (*Kemp*).

In this specimen the posterior process of the pronotum and the wings reach backward nearly as far as the apices of the extended hind tibiae. It is doubtless a long-wing form. The entire length of the body is 9·5 mm.; pronot. 9 mm.

Genus **Coptotettix**, Bol.

The four species of this genus taken by Mr. Kemp may be distinguished by the following key:—

1. (2)	Wings well developed; pronotal process lengthily extended backward beyond the hind femoral knees ..	*C. indicus*, Hanc.
2. (1)	Wings not visible; pronotal process abbreviated.	
3. (4)	Body minute; apex of pronotal process truncate	*C. parvulus*, Hanc.
4. (3)	Body crassate, more or less tumid.	
5. (6)	Elytra wanting	*C. nullipennis*, sp.nov.
6 (5)	Elytra present	*C. tumidus*, sp. nov.

5. **Coptotettix indicus**, Hanc.

Hancock, Mem. Dept. Agricult. India, iv, p. 144—5, 1912.

One specimen found "on flowers," Rotung, 1400 ft., Apr. 6, 1912 (*Kemp*). This is a rather slender long-wing species; the measurements of the female not heretofore recorded: entire length of body 13·5 mm.; pronot. 12·5 mm.; post. fem. 7 mm.

6. **Coptotettix tumidus**, sp. nov.

(Pl. xv, figs. 3, 3*a*.)

A crassate tumid species; body bearing elytra but no visible wings; allied to *C. inflatus*, Krauss. Head slightly retracted under the pronotum; vertex short, much wider than one of the eyes; frontal costa arcuate protuberant between the antennae, barely sinuate between the eyes, viewed in front rather widely divergent forward to the median ocellus; antennae inserted barely between the lower part of the eyes; body above granose, interspersed with tubercles; coloured fusco-rufescent, with pale mottlings, hind tibiae pale grayish cinereous; dorsum tumid, between the shoulders transversely arcuate; humeral angles subrounded, front margin subobtuse angulate or truncate; prozonal carinae abbreviated; median carina compressed forward before the shoulders and lightly arcuate, backwards low and interrupted, crassate and undulate; posterior process deplanate and cuneate, extended backward nearly to the apices of the hind knees; lateral lobes expanded laterally, the posterior angles transversely or obliquely truncate; elytra elongate, narrow and elliptical. Anterior and middle femoral margins entire; posterior femora very stout, the superior carinae

serrulate, the antegenicular and genicular denticles moderately prominent; hind tibiae stout, dilated towards the apices and armed with spines; first joints of the posterior tarsi much longer than the third, the third pulvilli nearly as long as the first and second united.

Male and female, entire length of body 11—13 mm.; pronot. 10—11 mm.: post. fem. 8 mm.

Three specimens including one larva, Dibruarh, N.-E. Assam, Nov. 17—19, 1911 (*Kemp*).

7. **Coptotettix parvulus**, Hanc.

Hancock, Mem. Dept. Agricult. India, iv, p. 145—6, 1912.

Six specimens; four from Dibrugarh, N.-E. Assam, Nov. 17—19, 1911; one from Kobo, 400 ft., "in rotten wood"; one from Janakmukh, Dec. 17, 1911, "under bark" (*Kemp*).

8. **Coptotettix nullipennis**, sp. nov.

(Pl. xv, figs. 2, 2*a*.)

Coloured fuscous, obscurely pale mottled on the sides, hind femora bearing a pale longitudinal fascia on the external paginae, the tibiae pale, biannulate with black, body underneath dark. Body crassate; vertex broad, twice the width of one of the eyes, in profile slightly elevated and produced beyond the eyes, forming an obtuse angle with the frontal costa; frontal costa narrowly divided above the paired ocelli, rather widely sulcate forward, subarcuate between the antennae and slightly sinuate between the eyes; paired ocelli placed distinctly in advance of the middle of the eyes; antennae inserted between the lower portion of the eyes. Pronotum deplanate, dorsum granose, backward toward the apex rugose; between the shoulders transversely convex; humeral angles subobliterated and roundly sloping downwards; median carina forward subarcuate before the shoulders, backward interrupted undulate; prozonal carinae thin, convergent backward, and widely separated, front border subangulate; posterior process not extended backward as far as the knees, the apex narrowly emarginate; lateral lobes moderately expanded laterally, the posterior angles obliquely truncate; elytra and wings wanting. Anterior femoral margins below subundulate; middle femoral margins below barely subbilobate; hind femora very stout, the superior and inferior margins serrulate and armed with an antegenicular and genicular denticle; hind tibiae curvate, armed with spines, the three pulvilli of the first joint of posterior tarsi obtuse and equal in length; the first joint of posterior tarsi longer than the third.

Female type, entire length of body 14 mm.; pronot. 10 mm.; post. fem. 8·5 mm.

One specimen, Janakmukh, 600 ft., "on shore" (*Kemp*). This species resembles *Mazarredia aptera*, Rhen, from Labuan, W. Borneo.

Genus **Euparatettix**, Hanc.

9. **Euparatettix parvus**, Hanc.

Hancock, Spolia Zeylanica, ii, p. 145, 1904.

Three specimens: one from Upper Renging, 2150 ft., Nov. 4, 1912; two from Dibrugarh, N.-E. Assam, Nov. 17—19, 1911 (*Kemp*).

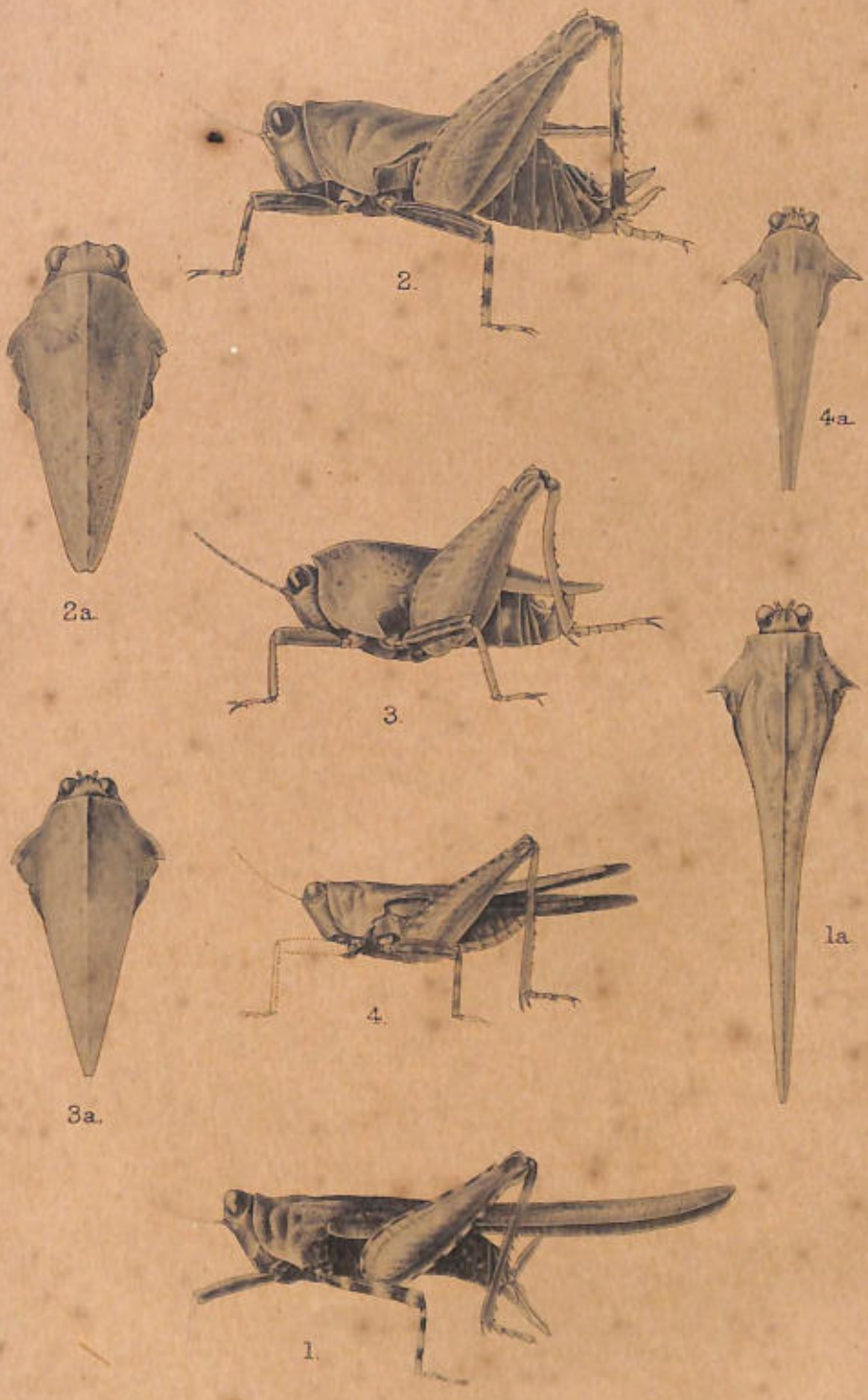
10. **Euparatettix tenuis**, Hanc.

Hancock, Mem. Dept. Agricult. India, iv, p. 151—2, 1912.

One specimen from Dibrugarh, N.-E. Assam, Nov. 17—19, 1911 (*Kemp*).

EXPLANATION OF PLATE XV.

Figs. 1, 1*a*.—*Criotettix maximus*, sp. nov., × 3.
,, 2, 2*a*.—*Coptotettix nullipennis* sp. nov., × 4.
,, 3, 3*a*.—*Coptotettix tumidus*, sp. nov., × $3\frac{2}{3}$.
,, 4, 4*a*.—*Criotettix orientalis*, sp. nov., × 4.



D. Bagchi, del.

Bemrose, Cliffe Derby.

ABOR ORTHOPTERA, I.

XXII. FRESHWATER PLANARIA.

By RICHARD H. WHITEHOUSE, *M.Sc., Zoological Department, Queen's University, Belfast.*

(Plate xxii.)

The collection of freshwater Planarians made in the Abor country consists of two species only, both found under stones in a hill-stream. I am asked to state that some of the specimens were collected and preserved by Capt. F. H. Stewart, I.M.S.

Planaria aborensis, n. sp.

(Plate xxii, figs. 1-3.)

This species bears a striking resemblance to *Planaria subtentaculata* (Draparnaud in such features as the shape of the head, the absence of male genital organs and the much branched alimentary canal. The collection also included a number of young specimens which were produced by transverse fission, and which corresponded exactly with the form of newly budded animals of *P. subtentaculata* as figured by Zacharias (4).

However, the very definite colouration the animals possess, and which is quite different from *P. subtentaculata*, as well as some internal anatomy, at least not recorded for this species, seemed to me to justify its separation from *P. subtentaculata*, and I have therefore called it *Planaria aborensis*.

All the specimens were collected in the Yembung stream at an altitude of 1100 ft, and were found on the under surface of stones.

The collection included 22 animals of this species; most of the specimens were much contorted, but a few remained extended. Of these the large ones measured 9 mm. in length and 2 mm. across the widest part of the trunk. The head (fig. 1) is triangular in form, often markedly so, with a prominent lappet on each side, which gives the animal a distinct neck. The posterior end of the body tapers bluntly. In colour, the dorsal side of the body is a rather light brown with a definite line of much darker tone running in the middle line along the length of the body from the neck to the posterior; this darker line expands at about the middle of its course; at the root of the pharynx, into a broad patch.

The crescentic eyes, which are two in number, are situated about midway between the anterior extremity and a line drawn across the head from the extreme points of the lappets at the side;

in those animals with a more extended head region they lie slightly posterior to this position. The eyes are about equidistant from one another and from the side of the head, and each lies in a small area containing somewhat less pigment than the general surface of the body.

A very distinct non-pigmented area occurs on either side, immediately anterior to the neck, and indicates the lateral sensory cephalic groove ("Auricularsinnesorgan" of German writers).

The ventral surface is of a milky white colour and possesses only a single aperture, the mouth; the position of the mouth varies very considerably from 2 to 4 mm. from the posterior end of the animal. This is probably due to the fact that the animal multiplies by transverse fission, those animals with the mouth situated well back being those which have recently budded off new individuals.

Cleared in cedar-wood oil, much of the general anatomy is visible. The pharynx is comparatively long (2 mm. long in a specimen 9 mm. in length); the rest of the alimentary tract consists of the usual single anterior and two posterior trunks; the secondary branches are very numerous, and in an 8 mm. specimen the anterior trunk sent off about 20 on each side, while the branches of the posterior trunks numbered about 33 on each side, 7 alongside the pharynx and 26 posterior to the mouth. The extreme anterior branches of the gut extend as far forward as the eyes.

From entire mounts and also from serial sections, it was found that the animal had no male generative organs; even the rudiments of these organs were missing, as was also a genital aperture. Absence of reproductive organs has been found to be a character of many species, such as *P. subtentaculata* (4), *P. venusta* (1) and *P. vitta*; Zacharias considers it to be a feature of *P. subtentaculata* during the summer months, and that the sexual organs appear in the autumn. He says:—" . . . es schient, dass die Fortpflanzung durch Quertheilung nur während der Sommermonate stattfindet;" and further: "es müssen zur Herbstzeit Eier producirende, resp. geschlechtlich differenzirte Individuen vorhanden sein, und diese habe ich unter den Händen gehabt." However, he does not describe the genital apparatus. Dugès also referred to the same thing when he mentioned the likelihood of some small specimens of the same species which he found in the autumn being produced from eggs: "Ces individus ne pouvaient avoir une origine par séparation; des oeufs sans doute leur avaient donné naisssance" (3).

A search between the anterior branches of the gut revealed a definite compact aggregation of cells comparable to the ovary in other planarians, situated on either side of the body. So consistent in position and nature are these bodies with the ovaries in other species, there does not seem to me to be any doubt that they are ovaries, though at first I had some hesitation owing to the entire absence of any other genital organs. As will be seen from fig. 3 the cells composing this cell mass are undoubtedly

developing egg-cells in different stages of development. However, serial sections reveal no trace of oviducts or uterus, which accessories may be later developments. This condition of things seems to support the suggestion that this and some other species are sexual individuals at one time of the year and asexual at another. The animals examined were collected in January. There is of course the possibility that here we have a dioecious species of *Planaria* only the female of which has been discovered.

Planaria kempi, n. sp.

(Plate xxii, fig. 4.)

Only a single specimen of this species was obtained; it was 9·5 mm. in length, and 2 mm. across the widest part of the body at the root of the pharynx.

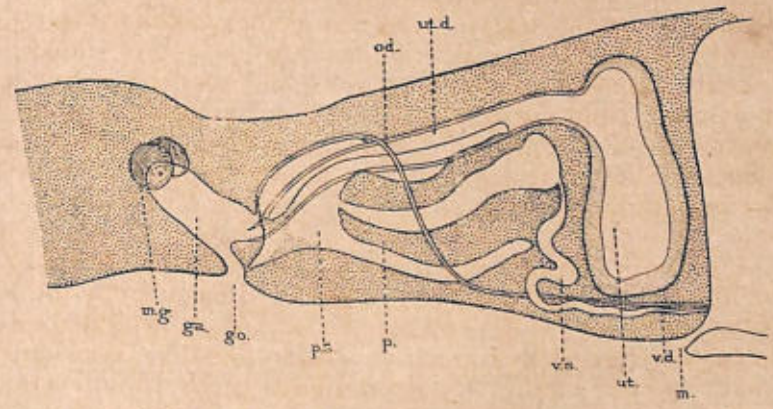


FIG. 1.—Genital apparatus of *P. kempi* (semi-diagrammatic and drawn by reconstruction from serial sections). g.a. genital atrium; g.o. genital opening; m. mouth; m g. muscular mucous glands; od. oviduct; p. penis; p.s. penis sheath; ut. "uterus" or shell gland; ut. d. "uterine duct"; v.d. vas deferens; v.s. vesicula seminalis.

The head merges gradually into the trunk and thus no neck is differentiated. The hind end of the body tapers very little less than the head. The two eyes are fairly closely approximated, the distance between them being about half the distance from the eye to the margin of the head; each eye is surrounded by a non-pigmented area. The colour of the dorsal surface is a medium brown of even distribution. The ventral surface is much paler in colour than the dorsal side, and possesses two apertures, the mouth 3·75 mm., and the genital aperture 2·75 mm. from the posterior end.

The pharynx occupies a position in the middle of the body, and is about 2·5 mm. in length and less than 1 mm. in width. The rest of the gut conforms to the usual plan, and is much less branched than in the previous species; neither does it extend so far forward.

The genital atrium is divided unequally into two divisions, the atrium genitale commune and atrium masculinum by a projecting ridge; into the former, which is posterior, open the medium unpaired oviduct, the "uterine duct" and the muscular mucous glands; while the latter and anterior division receives the opening of the penis chamber.

The ovaries are situated in the usual position between the first and second anterior secondary branches of the gut, and close to the middle line; the oviduct, on each side, starts from the actual substance of the ovary as a funnel-like opening, richly ciliated and surrounded by glands, passing gradually into a fine duct which runs ventrally; at the region of the penis, it suddenly takes a vertical course to the dorsal side, where it meets its fellow of the opposite side to form a medium unpaired oviduct; this latter, still a narrow duct, continues until it enters the genital atrium anteriorly from the dorsal side.

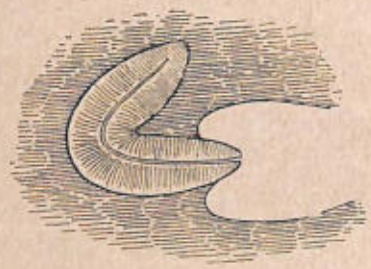


Fig. 2.—Diagram of the muscular mucous gland of *P. kempi* (purely diagrammatic) opening into the posterior part of the genital atrium. The two parts do not lie in quite the same plane.

The "uterus"—better called shell-gland—with its wide duct shows no peculiarities. The muscular mucous glands (muskulöse Drüsenorgane of German writers) are two in number, and each possesses a lumen; a peculiarity of these structures however is that there is but a single exit for the secretion of both glands. As shown in text fig. 2 they are both pear-shaped structures, one of which is entirely embedded in the parenchyma, while the other protrudes by its tapering extremity in the form of a papilla into the common genital atrium, further, the rounded end of each gland forms with the other a common mass through which the two lumina become continuous. Thus there is but one aperture for the two glands. The exact angle of inclination of one gland to the other it was not possible to determine, since only a single specimen was available.

Numerous testes are present dorsally and ventrally, and extend nearly the whole length of the body. The vasa deferentia expand into vesiculae seminales before entering the cavity of the penis or ductus ejaculatorius. There is no appreciable differentiation of the penis into bulbus, etc.

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EXPLANATION OF PLATE XXII.

FIG. 1. *Planaria aborensis*, n. sp., × 14. As seen when cleared in cedar-wood oil.

,, 2. *P. aborensis*. Young animal newly budded off, × 14. As seen when cleared in cedar-wood oil.

,, 3. Ovary of *P. aborensis*, × 620.

,, 4. *Planaria kempi*, n. sp., × 5.

All the figures were drawn with the aid of the camera lucida.



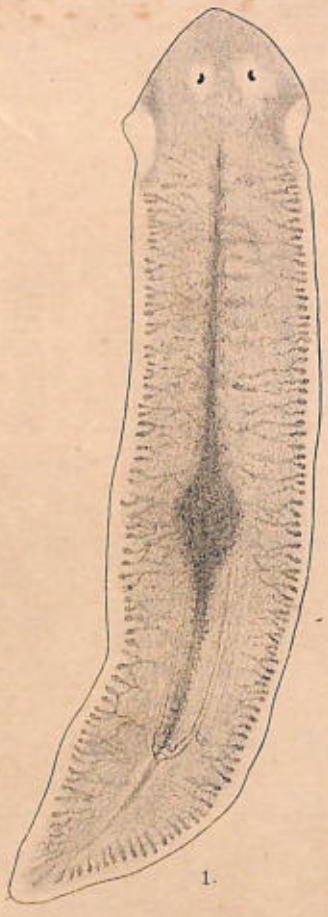
4.



2.



3.



1.

R.H.Whitehouse, del.

A.Chowdhary, lith.

Figs.1-3. PLANARIA ABORENSIS, sp. nov. Fig. 4. PLANARIA KEMPI, sp.nov.

XXX. COLEOPTERA, VII: IPIDEN und PLATYPODIDEN.

Von HEINR. E. WICHMANN *in Waidhofen (a. d. Thaya, Austr.).*

Die Zahl der bei der Abor expedition gesammelten Borkenkäfer ist sowohl an Arten als auch an Exemplaren gering. Es sind nur fünf *Xyleborus* in acht Stücken und drei Platypodiden in vier Exemplaren vorhanden. Trotzdem finden sich darunter einige noch unbeschriebene Arten.

IPIDAE.

Xyleborus Gravelyi, n. sp.

Gross, fast schwarz, glänzend, spärlich und abstehend behaart, die Haare gelb.

Kopf infolge einer schon bei ungefähr 35 maliger Vergrösserung deutlich erkennbaren Netzung matt, auf der Stirn mit einer undeutlichen Beule, sehr grob und tief eingedrückt-längsrunzelig punktiert, die Punkte gegen die Augen dichter stehend. Ober dem Munde lange gewimpert. Stirn spärlich, starr und abstehend behaart. Vorderrand der Augen ausgebuchtet.

Halsschild fast quadratisch, Seiten flach, gegen die Vonder- und Hinterecken stärker gerundet, an den Vorderecken nicht so breit wie an den Hinterecken, Vorderrand abgeflacht. In der Mitte des Thorax ein breiter Querrücken, vor dem er sich flach zum Kopfe vorwölbt. Dort ziemlich fein und dicht quergekörnelt; vor der Querbeule erlischt die Körnelung und nimmt die Form einer Schuppung an. Zwischen den Höckerchen matt. Rückwärtiger Teil des Halsschildes glänzend, (jedoch auch mikroskopisch fein genetzt) spärlich fein eingestochen punktiert. Die Behaarung ist steif, abstehend und schütter Halsschild kaum länger als breit

Flügeldecken rund zweiundeinviertel mal so lang als breit, hinter dem letzten Drittel beginnend gleichmässig gerundet verschmälert, in klaren Reihen punktiert. Die Punkte rund, scharf eingeprägt aber flach. Zwischenräume sehr breit, eben, nur im vorderen Deckenteil undeutlich gewölbt, mit einer Reihe weitabstehender borstentragender Punkte versehen, die mit Ende des ersten Drittels in ebensolche Körnchen übergehen. Absturz flach, im Gegensakte zum vorderen Teil der Elytren matt, von der Seite gesehen allmählich abgewölbt und vor der Spitze auf jeder Decke mit einem angedeuteten Eindruck.

Hinterschienen auf der Aussenkante mit starrer und langer Bewimperung.

Long.: 5·2—5·4 mm.

Patria: Kobo, 400 ft.

Von Kemp im Dezember 11, " under bark in rotten wood " gesammelt.

Es sind zwei Exemplare (♀) mit den Nummern 2706/19 und 2708/19 vorhanden.

Ich widme diese neue Art Herrn Assistant Superintendenten F. H. Gravely am Indian Museum.

Xyleborus aplanatus, n. sp.

♀ : Mittelgross, schwarz, matt, Beine und Fühler rötlichgelb.

Stirn flachgewölbt, mattglänzend, schütter mit ungleich grossen, unregelmässigen, eingedrückten Punkten überstreut, ober dem Munde ein flacher Kiel, der über die gange Stirn reicht, und, besonders seitlich des Mundes mit wenigen langen gelben Haaren.

Halsschild quadratisch, an den Seiten gerade, Vorderrand ebenfalls gerade, beide in starkem Bogen verrundet, Hinterecken angedeutet. In der Mitte des Halsschildes ein noch kenntlicher Querbuckel. Körnchen des Halsschildes mit überwiegender Quererstreckung, zu unregelmässigen Runzeln angeordnet, in der Nähe des Buckels zu einer feinen Schuppung reduziert. Hinter dem Buckel matt, mikroskopisch fein gefeldert, mit seltenen Pünktchen versehen.

Flügeldecken so lange als breit, fast parallel, erst im letzten Teile stumpfspitz verrundet, in deutlich geschlossenen Reihen flacher Punkte von kreisrunder Form punktiert, am Absturze die Reihen etwas vertieft. Zwischenräume mit spitzen borstentragenden Körnchen versehen, diese am Absturze kräftiger. Sechster Zwichenraum im Absturze scharf gerandet.

Halsschild nur an den Seiten stark gewimpert, Flügeldecken infolge der zahlreichen haartragenden Körnchen der Zwischenräume dichter behaart.

Long.: 4 mm.

Patria: Upper Rotung.

" Under bark ", 1 Exemplar am 1-i-12 gesammelt; trägt die Nummer 2696/19.

♂ : Bedeutend kürzer, nach vorne übergebeugt-hochgewölbt, licht kastanienbraun, stark und dicht behaart.

Kopf in das Halsschild zurückgezogen, Stirn flach, glatt glänzend, sehr spärlich fein punktiert.

Halsschild kaum so lang als breit, annähernd quadratisch, an den Seiten gerade, der Vorderrand flach. Vorderecken stark abgerundet. Die Körnelung viel schütterer als beim Weibchen, die Körnchen einzelnstehend und kürzer. Die geschuppte Region fehlt, an ihrer stelle ein räumlich beschränkter Fleck mit ganz ebenen querstrichelartigen Körnchen. Buckel nur schwach angedeutet, von einer tiefen Längsfurche durchzogen, die nur wenig in den Körnerfleck hineinreicht und auch nicht weit in die glatte Hinterpartie des Halsschildes eindringt. Diese selbst nicht dicht punktuliert.

Flügeldecken viel länger als breit, mit vor dem ersten Drittel beginnendem flachem Absturze, Punktierung in wenig geordneten Reihen, die Punkte rund, gedrängt. Reihen im Absturze vertieft; dadurch dass der zweite Zwischenraum etwas tiefer liegt, erscheint der Absturz wie doppelt ausgehöhlt. Die langen starren Borsten sitzen auf den feinen Körnchen des Absturzes.

Long.: 2·3 mm.

Patria: Sadiya, N.E. Assam.

1 Stück von Kemp, "under bark" am 15-xi-11 gesammelt, mit dem Zettel 2702/19 versehen.

Diese Art ähnelt der früher beschriebenen, unterscheidet sich aber durch die Grössen-und Formverhältnisse des Körpers, etc.

Xyleborus sp.?

Drei Exemplare, die die Nummern: 2703/19, 2704/19 und 2705/19 tragen und wahrscheinlich mit *Xyleborus perforans*, Woll. identisch sind, einem Insekt, das in den Tropen weitverbreitet ist.

Patria: Kobo, 400 ft., leg. Kemp, "rotten wood", am 1-xii-11.

Xyleborus sp.?

Ahnelt dem *Xyleborus capucinus*, Eichh.

Kemp sammelte ein Exemplar in Upper Rotung "under bark" am 9-i-12.

PLATYPODIDÆ.

Platypus cupulifer, n. sp.

Aus der Gruppe der Platypi cupulati.

Mittelgross, schlank, stark glänzend, hell gelbbraun. Stirn, Schienen und Absturz dunkler. Fast unbehaart..

Stirn eben, glanzlos, unregelmässig stark punktiert, zwischen den Augen mit angedeuteter runder Grube, deren vorderer Rand von einem scharfen Längsstrichel durchzogen wird, gleich lang, wenig dicht und kurz behaart.

Halsschild einundeinviertel mal so lang als an der Basis breit, nach vorne kennbar verschmälert. Vorderecken angedeutet, Hinterecken gerundet. Die Seiten nicht stark geschwungen, die Ausrandung, die der Grube zur Aufnahme der Vorderbeine entspricht, liegt dicht hinter der Mitte und ist nicht ausgeprägt. Vorder-und Hinterrand gerade, an letzterem in der Mitte eine kleine vorspringende Ecke. Der Vorderrand wird von einem schmalen verloschen punktierten Streifen begleitet, dahinter bis Ende des ersten Viertels dichtere und gröbere Punkte auf stark glänzendem Grunde, die allmählich in zerstreute längsgerichtete Pünktchen übergehen. Am Hinterrand verdichten sich die Pünkte wieder und werden gröber. Hinter der Halsschildmitte beginnt eine scharf eingerissene, sich nach rückwärts verschmälernde Längsfurche, an ihrem Voderende jederseits ein kleiner Punktfleck.

Flügeldecken an der Basis etwas schmäler als der Halsschild, sich in sehr sanftem Bogen bis zur Mitte erweiternd, von da ab sich ebenso verschmälernd, mit deutlich breit-schüsselförmig gerandetem Absturz. Die Punktstreifen sehr schmal und scharf eingerissen, vor der, den hervortretenden Absturz von den Flügeldecken abtrennenden Abschnürung erlöschend, im ersten Achtel bedeutend verbreitert, vertieft und netzige Punkte zeigend. Die ungeraden Zwischenräume an der Basis zu zweien verbunden, dort ebenso wie die geraden Interstitien etwas kielartig erhöht. Von der dritten Punktreihe an nur mehr reihige Punkte. Zwischenräume mit wenigen entfernten Pünktchen. Die Einschnürung des Absturzes nicht sehr dicht aber stark punktiert, die Absturzrandung spärlich punktuliert. Absturz steil, am scharfen Rande kurz gewimpert, kreisförmig. Die Decken klaffen im Absturze in ihren Spitzen; der freibleibende Spalt ist an den Spitzen breit, verschmälert sich in breitem Dreieck bis etwa zur Mitte und erreicht schmal spaltförmig fast den oberen Rand des Absturzes. Im breiten Teile des Spaltes ist der Rand der Elytren schneidenförmig erhaben und trägt in der Mitte ein dreieckiges schief nach innen weisendes Zähnchen. Der Grund des Absturzes selbst ist glatt, spiegelglänzend.

Long.: 4·7-5·0 mm

Zwei Exemplare. Eines aus Rotung, 1400 ft. leg. Kemp 2-i-12 " rotten wood " (No. 2699/19) und eines " at light " gesammelt in Dibrugarh, N.E. Assam, 9-xi-11 durch Kemp (No.2700/19).

Es ist von hohem Interesse, dass es in den Tropen Ipiden gibt, die Nachtschwärmer sind. Eine solche Art ist auch *Cladoctonus eggersi*, Wichm. Hier hat die Forschung noch manches zu klären.

Platypus sp. ?

Ein Exemplar " under bark " in Rotung leg. Kemp am 2-i-11 (No. 2698/19)

Platypus sp. ?

Von Kemp ein einzelnes Stück in Sadiya, N.E. Assam, 25-xi-11 " under bark " gesammelt (No. 2701/19).

XXXI. ORTHOPTERA, III: MANTIDAE ET PHASMIDAE.

Del Dr. Prof. Ermanno Giglio-Tos, *Direttore della Stazione biologica della R. Università in Cagliari.*

Rendo vivissime grazie al Direttore dell " Indian Museum " di Calcutta per avermi usato la cortesia e fatto l'onore di affidarmi lo studio dei Mantidi e Fasmidi raccolti durante l'Abor Expedition.

Le specie raccolte sono le seguenti :

Mantidae.	Phasmidae.
1. *Amorphoscelis annulicornis*, Stal.	1. *Phyllium celebicum*, de Haan.
2. *Theopompa servillei*, de Haan.	2. *Clitumnus ablutus*, Brun.
3. *Statilia haanii*, Saus.	3. *Clitumnus operculatus*, Brun.
4. *Tenodera aridifolia*, Stoll.	4. *Clitumnus aboricus*, n. sp.
5. *Hierodula crassa*, Giglio-Tos.	5. *Cuniculina rotungina*, n. sp.
6. *Iridopteryx irina*, Saus.	6. *Cuniculina perfida*, n. sp.
7. *Acromantis japonica*, Westw.	7. *Mencxenus rotunginus*, n. sp.
	8. *Myronides baucis*, Westw.
	9. *Myronides dawnanus*, n. sp.
	10. *Calvisia fusco-alata*, Redt.

Delle 7 specie di Mantidi nessuna è nuova. Ma delle 10 specie di Fasmidi ben 5 sono nuove ed una (*Cuniculina perfida*) presenta speciale interesse, perchè essa fu da Wood-Mason disegnata, ma confusa con un'altra specie di Westwood, e Brunner von Wattenwyll più tardi la confuse ancora con un, altra specie.

MANTIDAE.

Gen. **Amorphoscelis**, Stål.

A. annulicornis, Stål.

Amorphoscelis annulicornis, Stål, *Öfvers. Vet. Akad. Förh.* XXVIII, p. 401 (1872). Wood-Mason, *Journ. As. Soc. Bengal*, LI, Part II, p. 21 (1882); *Cat. Mant.*, p. 4, fig. 1, 2, 3 (1889). Bolivar, *Ann. Soc. ent. France*, LXVI, p. 303 (1897). Giglio-Tos, *Gen. Ins. Orth.* 144 fasc., p. 8 (1913).

Un ♂. Dibrugarh, N. E. Assam.

Specie, secondo Wood-Mason, abbondante in Calcutta sul tronco deggi alberi.

Habitat. India (*Stål*), Nazeerah, Assam, Calcutta, Khurda, Orissa (*Wood-Mason*), Assam, Darjeeling, Madura (*Bolivar*).

Gen. **Theopompa**, Stål.

T. servillei, de Haan.

Mantis (Mantis) servillei, de Haan, *Bijdr. tot de Kenn. Orth.*, p. 81, tab. 16, figs. 5, 6 (1842).-Saussure, *Mitth. Schweiz. ent. Gesells.* III, p. 62 (1869). *Mém. Soc. Phys. Hist. Nat. Genève*, XXI, p. 24 e 274 (1871) (*Humbertiella*). Stål, *Bihang till sv. Vet. Akad. Handl.* IV, No. 10, p. 48 (1877) (*Theopompa*).

Una larva ♀. Thingannyinaung to Myawadi, Lr. Burma, ca. 900 ft.

Habitat. Specie diffusa dalla Birmania, a Siam, Giava, isole della Sonda, Ceram.

Gen. **Statilia**, Stål.

S. haanii, Saus.

Mantis (Mantis) maculata, de Haan, *Bijdr. tot de Kenn. Orth.*, p. 77, pl. 18, fig. 5 (1842).

Pseudomantis haanii, Saussure, *Mém. Soc. Phys. Hist. Nat. Genève*, XXI, p. 37, e 276 (1871).

Pseudomantis maculata, Saussure, ibidem, XXIII, p. 23 (1872).

Statilia maculata, Bolivar, *Ann. Soc. ent. France*, LXVI, p. 309 (1897).

Statilia haanii, Giglio-Tos, *Bull. Soc. ent. ital.* XLIII, p. 6. (1911).

Una ♀.—Kobo, 400 ft.—Un ♂. Dibrugarh, N. E. Assam.

Habitat. Specie molto diffusa e comune in tutta l' Asia orientale da Ceylon alle isole Filippinee Giapponesi e alla Nuova Guinea.

Gen. **Tenodera**, Burm.

T. aridifolia, Stoll.

Mantis aridifolia, Stoll, *Spectres, Mantes, etc.*, p. 65, pl. xxii, fig. 82.—Serville, *Ins. Orth.*, p. 178 (1839).

Mantis chloroeudeta, Burmeister, *Handb. Ent.* II, p. 535 (1838).

Tenodera aridifolia, Saussure, *Mittheil. schweiz. ent. Gesells.* III, p. 69 (1869). *Mém. Soc. Phys. Hist. Nat. Genève*, XXI, p. 97, var. *a.e* pag. 294. Giglio-Tos, *Bull. Soc. ent. ital.* XLIII, p. 37 (1911).

Paratenodera, Rehn, *Proc. Acad. Nat. Sc. Philadelphia*, p. 705 (1903).

Una ♀.—La-ai R., Kalem V., Mishmi Country.

Habitat. Anche questa specie è comune e diffusa dall' India a tutta l' Asia orientale fino alle isole della Sonda, alle Filippine, al Giappone.

Gen. **Hierodula** Burm.

H. crassa, Giglio-Tos.

Hierodula crassa, Giglio-Tos, *Bull. Soc. ent. ital.* XLIII, p. 93 (1911).

Un ♂ e una ♀. La-ai R., Kalem V., Mishmi Country.

Habitat. Specie, a quanto pare, propria dell' India e già da me segnalata a Darjeeling.

Gen. **Iridopteryx**, Saus.

I. irina, Saus.

Gonypeta irina, Saussure, *Mittheil. Schweiz. ent. Gesells.* III, p. 244 (1870). *Mém. Soc. Phys. Hist. nat.* XXI, p. 56, pl. 6, fig. 42 (1871).

Un ♂. Thingannyinaung to Myawadi, Lr. Burma, ca. 900 ft.

Habitat. Specie dell Amboina.

Gen. **Acromantis**, Saus.

? **A. japonica**, Westw.

Acromantis japonica, Westwood, *Rev. Mant.*, p. 43 (1889). Jacobson et Bianki, *Prem. i Lozhn. Ross. Imp.*, p. 153 (1902).

Una ♀.—Thingannyinaung to Myawadi, Lr. Burma, ca. 900 ft.

Habitat. Specie segnalata finora solo al Giappone. Nelle collezioni del Museo civico di Storia naturale di Genova ne trovai un esemplare proveniente da Formosa.

PHASMIDAE

Gen. **Phyllium.**

P. celebicum, de Haan.

Phyllium celebicum, de Haan, *Bijdr. tot de Kenn. Orth.*, p. 111 (1842). Gray, *Zoologist*, I, p. 121. Westwood, *Cat. Phasm.*, p. 173, pl. xi, fig. 6 (1859). Wood-Mason, *Journ. As. Soc. Bengal* XLIV, Part II, p. 218, pl. xvi (1875).

Quattro ♀.—Tra Kobo e Janakmukh. Yambang a 1100 ft.; Sirpo, Rotung a 1400 ft.

Habitat. Specie diffusa dalle isole Seychelles a tutta l'Asia orientale fino alle isole Filippine ed all'Amboina.

Gen. **Clitumnus**, Stål.

C. ablutus, Brun.

Clitumnus ablutus, Brunner, *Insektenfam. Phasm.*, p. 190 (1908).

Un ♂ e due larve ♂. Sukli. E. Side of Dawna Hills, Lr. Burma, ca. 2100 ft.

Habitat. Specie segnalata finora solo all'isola di Ceylon.

C. operculatus, Brun.

Clitumnus operculatus, Brunner, *Insektenfam. Phasm.*, p. 192 (1908).

Un ♂. Parong a 2200 ft.

Habitat. Specie dell' Assam.

C. aboricus, n. sp.

♀.—Pallide olivaceus vittis duabus contiguis a vertice ad apicem abdominis perductis vix fuscioribus ornatus. Caput elongatum, depressum, retrorsum nonnihil angustatum, occipite utrinque sulcato, antennis brevissimis parte attenuata femorum anticorum vix longioribus. Pronotum laeve. Mesonotum et metanotum minime obsolete granulosa, utrinque ad margines laterales granulis 3-5 majoribus fuscioribus instructa, carinula media tenuissima. Sterna fusco marmorata. Abdomen tenuiter pluricarinulatum, segmento ultimo apice bilobo, lamina supraanali minutissima, carinata apposita. Operculum naviculare,

haud inflatum, apicem abdominis subattingens. Cerci brevissimi, conici. Pedes longi. Femora antica triquetra, carina supera acute serrato-dentata, carinis coeteris muticis. Femora intermedia superne carina antica in lobum tridentatum humilem, sed plus quam tertiam partem medianam nuncupatim elevata, carina media infera apicem granulis minimis 4-5 instructa. Femora postica carinis muticis vel fere muticis. Tibiae anticae et intermediae superne spinulis 2-3, tibiae posticae apicem versus superne spinulis 3-4 armatae.

Long.	corp.	mm. 71
,,	capit.	,, 6
,,	pron.	,, 3
,,	meson.	,, 12·5
,,	metan.	,, 8·5
,,	segm. med.	,, 3
,,	femor. ant.	,, 23
,,	,, interm.	,, 14
,,	,, post.	,, 18·5

Due ♀ senza indicazione di località.

Gen. Cuniculina, Brun.

C. rotungina, n. sp.

♀.—Gracillima, parva, pallide straminea. Caput nonnihil depressum, retrorsum angustatum, vertice griseo, inter antennas carinulis duabus divergentibus instructo, summo vertice inter oculos in carinam transversam medio ab incisura angulata in lobos duos triangulares divisa instructo. Antennae brevissimae, capite cum pronoto subaeque longae, articulo apicali vix infuscato. Pronotum laeve margine postico utrinque medio nigro subtillime signato, utrinque ad angula postica verruca minuta fusca signatum. Mesonotum et metanotum laevia. Meso-et metapleurae supra insertionem coxarum infuscatae. Meso-et metasterna minutissime granulosa. Femora antica superne basi spinis nigris 4 minutis, dehinc spinula minuta in medio et ante apicem fuscis. Femora intermedia mesonoto aeque longa, nonnihil incurvata, superne carinis obsolete undulatis, inferne utrinque spinulis infuscatis obtusis instructa. Femora postica uti intermedia constructa. Tibiae omnes subtus utrinque spinulis obtusis fuscis nonnullis remotis instructae. Segmentum anale apice truncato, vix emarginato, lamina supraanali triangulari apposita. Cerci breves conici, acuminati, lamina supraanali aeque longi. Operculum gracile, compressum, carinatum, acutum, apicem abdominis superans.

Long.	corp.	mm. 50
,,	capit.	,, 3·5
,,	pron.	,, 2
,,	meson.	,, 11
,,	metan.	,, 5

Long. segm. med.	mm.	2
,, fem. ant.	,,	17
,, ,, interm.	,,	11·5
,, ,, post.	,,	13·5

Una ♀. Rotung, alt. 1300 ft.

Specie alquanto affine a *C. detrectans* Br. ma differente per la forma speciale della cresta del vestice, e per la struttura dei piedi.

C. perfida, n. sp.

Bacillus (*Baculum*) *artemis*, Wood-Mason, *Journ. As. Soc. Bengal*, XLII, Part II, p. 51, pl. vi, fig. 2, 2*a*, 2*b*, 2*c*, 2*d*, var. (1873); (*nec* Westwood, *Cat. Phasm.*, p. 10, pl. xxvi, fig. 9, 9*a* (1859); *nec* Wood-Mason, *loc. cit.*, pl. vi, fig. 1).

♀ —Terrea, undique dense granulosa. Caput retrorsum angustatum, vertice pone antennas utrinque cornu brevi compresso armato, sparse acute granoso. Antennae brevissimae, articulo primo laminato-ampliato, flagello capiti cum pronoto aeque longo. Segmentum 6 (7) ventrale margine postico in medio spina depressa triangulari procumbenti armato. Segmentum anale apice late bilobo, incisura medio angulata, lamina supraanali apposita minuta, apice truncato, carinata. Cerci breves, conici. Operculum naviculare, compressum, apice carinato, apicem abdominis haud attingens. Femora antica superne densius subtus remote serrata. Femora intermedia subtus pone basim carina postica spina lobulari triangulari rotundata instructa, ante apicem bispinosa, carina media apice quadridentata, superne carina media spinis 3-4 remotis armata. Femora postica subtus spina lobulari basali nulla, carina media apice quadridentata, carina postica 5-6 remote spinosa, carina antica 3-5 spinosa, superne carina media remote 4 spinosa. Tibiae anticae superne spina unica pone basim armatae. Tibiae intermediae superne carina media pone basim dentibus lobularibus triangularibus acutis 2, spinisque 2 ante apicem armata, subtus mutica, carina media tantum ad basim elevato ampliata. Tibiae posticae superne 6 spinosae, subtus muticae, carina media tantum ad basim elevata.

Long. corp.	mm.	110
,, capit.	,,	6·5
,, pron.	,,	4
,, meson.	,,	21
,, metan.	,,	14
,, segment. med.	,,	4
,, fem. ant.	,,	33
,, ,, interm.	,,	20
,, ,, post.	,,	25

Una femmina adulta. Upper Rotung, alt. ca. 2000 ft.

Una femmina giovane. Rotung, alt. 1300 ft.

Questa specie somiglia assai all'esemplare figurato da Wood-Mason e da lui ritenuto come varietà di *Bacillus artemis*, Westw. dal quale invece è ben distinta.

Brunner von Wattenwyll nella sua Monografia dei Fasmidi riconobbe giustamente questa distinzione e designò col nome di *Clitumnus porrectus* l'esemplare suddetto figurato da Wood-Mason, dandone una descrizione in parte desunta dalla figura del Wood-Mason ed in parte, ma sovratutto, fatta su un esemplare della collezione *Pantel* raccolto a Kurseong nell' India settentrionale, che egli credette uguale a quello figurato da Wood-Mason. Ma il Brunner incorse in un errore. Dalla figura del Wood-Mason, per quanto imperfetta, risulta però evidente che il vertice non è privo di sporgenze, carattere distintivo del gen. *Clitumnus*, ma munito di appendici cornute lamellari (nella figura sopra citata mal rappresentate perchè somigliano quasi ad una cresta trasversale) carattere distintivo del gen. *Cuniculina*. L'esemplare dunque della collegione Pantel, descritto da Brunner ha il vertice privo di corna e quindi è un vero *Clitumnus* e ben distinto da quello figurato da Wood-Mason. Anche le figure date dal Westwood per *Bacillus Artemis* sono prive di corna al vertice, quindi appartenggono al gen. *Clitumnus*.

Si tratta quindi di tre specie distinte :

1. *Clitumnus artemis*, Westwood, *Cat. Phasm.*, p. 10, pl. xxvi, fig. 9, 9*a* (1859)—Wood-Mason, *Journ. As. Soc. Bengal*, XLII, Part II, p. 51, pl. vi, fig. 1 (1873)—Brunner, *Insektenfam. Phasm.*, p. 195 (1908) (*nec* Wood-Mason, *loc. cit.* var. pl. vi, fig. 2, 2*a-d*).

2. *Clitumnus porrectus*, Brunner, *Insektenfam. Phasm.*, p. 196 (1908) (synom. *Cl. artemis*, Wood-Mason excludenda)

3. *Cuniculina perfida*, Giglio-Tos, ? *Bacillus* (*Baculum*) *artemis*, Wood-Mason, *loc. cit*, p. 51, var. pl. vi, fig. 2. 2*a-d* (*nec* Westwood, *nec* Brunner, *nec Clitumnus porrectus*, Brunner).

Che l'esemplare da me descritto corrisponda precisamente alla figura del Wood-Mason non si può dire. I femori mediani portano presso la base un lobo da ciascuna parte al di sotto, mentre nell'esemplare da me osservato il lobo non si trova che dalla parte posteriore. Tutte le spine che armato i piedi sono poi nella figura citata molto esagerate, ma forse ciò è stato fatto appositamente da Wood-Mason per far risaltare meglio, come egli dice appunto a p. 51, i caratteri differenziali della specie tipica. "A variety found in all the districts mentioned above with the exception of the Bhután Doars is figured side by side with the typical form on the same plate as showing the value of the armature of the legs unsupported by other characters in making a species . . . ." Ma in tutti gli altri caratteri risultanti dalla figura e dei particolari: granulosità del corpo, proporzioni delle parti, forma dell' opercolo e dei cerci, forma del segmento anale e della lamina sopraanale e sopratutto poi la spina del settimo segmento ventrale, caratteristica di questa specie, vi corrispondono esattamente.

Le località menzionate da Wood-Mason sono : Sikkim, Cachar, Samagooting in Naga Hills.

Gen. **Menexenus**, Stål.

M. rotunginus, n. sp.

♂. ♀.—Fuscoterreus, rugosus et granulosus. Caput pone antennas utrinque spina antrorsum versa, acuta, armatum, in ♀ pone spinas dense granosum, in ♂ sublaeve. Antennae longae, setaceae, articulis omnibus flavo-testaceis apice infuscato, qua de re antennae fusco-annulatae. Pronotum in ♀ grosse in ♂ obsolete granosum. Mesonotum in ♀ tectiformiter compressum, carinatum, sparsim granosum et rugulosum, ad latera et in carina media granulis nonnullis majoribus, margine postico medio bituberculato, in ♂ sparsim minute granulosum, subcylindricum, carina media nulla, margine postico tuberculis binis minoribus. Metanotum in ♀ uti mesonotum constructum, in ♂ sublaeve, margine postico granulo unico minutissimo instructum. Segmentum medianum metanoto dimidio brevius, margine spina armato, in ♀ depressa, procumbente, in ♂ conica, erecta. Abdomen in ♀ depressum, pluricarinulatum grosse granosum, segmentis 1–5 margine postico spina media procumbenti armatis, segmento 8° in lobum compresso-cristatum triangularem, acutum, retrorsum nutantem elevatum, segmento anali brevi, grosse granoso, tricarinato, apice truncato, lamina supraanali brevi, transversa, carinata apposita. Abdomen ♂ subcylindricum, nodosum, obtuse granosum, segmentis 1–5 ante marginem posticum spina conica, acuta, erecta, armatis, segmentis 6–8 ante apicem tuberculo medio obtusissimo instructis, segmento anali compresso, apice profunde fisso, lobis lateralibus intus minute denticulatis. Pectus et venter in ♂ minute in ♀ grosse granosa. Cerci in utroque sexu brevissimi, crassi, deplanati apice truncato. Operculum naviculare, ampliatum, carinatum, apice rotundato. Segmentum ventrale 8 ♂ cucullatum, globosum, margine postico rotundato, apice carinato. Femora antica ♀ margine supero irregulariter undulato, ♂ subrecto. Femora intermedia ♀ metanotum cum segmento mediano superantia, utrinque superne dentibus lobatis, rotundatis 4 instructa, 2 intermediis majoribus, subtus utrinque lobo praeapicali triangulari rotundato instructa. Femora intermedia ♂ superne utrinque minute et obtuse quadridentata, subtus utrinque dente praeapicali triangulari acuto armata. Femora postica ♀ superne utrinque irregulariter minute undulata, subtus ante apicem utrinque dente triangulari armata. Femora postica ♂ superne subteretia, subtus utrinque dente praeapicali armata. Tibiae omnes ♀ superne plurioundulato-lobatae, lobis in tibiis anticis majoribus in posticis minimis, in ♂ subteretes.

		♂	♀
Long. corp.	mm.	58	69
,, capit.	,,	4·5	6
,, pron.	,,	4	4·5
,, meson.	,,	13·5	16
,, metan.	,,	6	6
,, segm. med.	,,	3	4

		♂	♀
Long. fem. ant.	mm.	18	17
,, ,, interm.	,,	13	13
,, ,, post.	,,	17	19

Un ♂ ed una ♀ adulti. Rotung alt. 1500 ft.

Una larva ♀. Below Damda, 3000 ft.

Un altra larva ♀. Kobo, alt. 400 ft.

Specie somigliante alquanto a *M. semiarmatus*, Westw., ma distinta per la struttura dei piedi e sovratutto per il lobo triangolare che si eleva sull' 8° (9°) segmento dell'addome nella femmina.

Il maschio somiglia alquanto a quello di *Medaura Austeni* figurato da Wood-Mason in Journ. As. Soc. Bengal, XLVI, Part II, p. 343, pl. iii, fig. 4, 4*a*, 4*b* ma ne differisce per le spine del capo, mancanti in quest' ultima, per la struttura dei piedi e per la mancauza di spina al margine posteriore del meso-e del metanoto.

Gen. **Myronides**, Stål.

M. baucis, Westw.

Bacteria Baucis, Westwood, *Cat. Phasm.*, p. 21, pl. viii, fig. 8 (1859). ♀
Lopaphus Baucis, Wood-Mason, *Journ. As. Soc. Bengal*, XLVI, Part II, p. 349, pl. ii, fig. 2 (1877) ♂.
Myronides Baucis, Brunner, *Insektenfam. Phasm.*, p. 254 (1908).

Tre ♂ che corrispondono esattamente alla figura del Wood-Mason. La-ai R., Kalem V., Mishmi country.

Wood-Mason dice che questa specie è abbondante nei dintomi di Sibságar nell'Assam.

M. dawnanus, n. sp.

♂. Gracillimus, cylindricus, fusco-olivaceus, laevis. Caput laeve, muticus. Antennae corpore longiores. Mesonotum utrinque punctis tribus nigris subobsoletis signatum, angulis posticis elytris minimis squamiformibus albis instructis. Metanotum angulis posticis alis minimis squamiformibus albis ut in mesonoto instructis. Segmentum anale fornicatum in lobos duos acuminatos intus denticulatos angulatim divisum. Cerci breves, crassi, apice incurvo, rotundato. Lamina subgenitalis brevis, cucullata, apice late rotundato truncata. Pedes gracillimi, longissimi, mutici. Femora omnia ante apicem subtus carina media spina triangulari armata.

Long. corp.	mm.	81
,, meson.	,,	21
,, metam.	,,	8
,, segm. med.	,,	4·5
,, fem. ant.	,,	28
,, ,, interm.	,,	21
,, ,, post.	,,	29

Un solo ♂. Third Camp to Misty Hollow, Dawna Hills, Lr. Burma, 400–2400 ft.

Somiglia assai a *M. baucis* ma è assai più piccolo, manca di linea nera lungo il dorso, è più gracile e presenta agli angoli posteriori del meso-e del metanoto dei rudimenti degli organi del volo che appaiono a mo, di due piccole squamette bianche.

Gen. **Calvisia**, Stål.

C. fusco-alata, Redt.

? Calvisia fusco-alata, Redtenb., in: *Insektenfam. Phasm.*, p. 367 (1908).

Un individuo solo molto guasto. La-ai R., Kalem V., Mishmi country. Sono quindi assai incerto sulla esattezza della determinazione.

XXXII. TERMITIDAE.

By F. Silvestri (*in Portici, Italy*).

The Termitidae here recorded were collected either by Mr. F. H. Gravely in Lower Burma or by Mr. S. W. Kemp in the Abor country and belong to eleven species, of which seven are described as new.

1. **Schedorhinotermes magnificus**, sp. n.

MILES MAJOR. Corpus subluteum mandibulis nigris.

Caput (fig. i) subaeque longum[1] atque postice latum, antrorsum gradatim aliquantum angustatum, labio subtrapezoideo, paullum latiore quam longiore, mandibulis robustis, quam caput magis quam dimidium brevioribus, dentibus consuetis magnis. Antennae 18-articulatae, articulo tertio quam quartus aliquantum longiore, articulo quarto quam quintus parum breviore (in exemplo uno antenna altera 17-articulata, articulo tertio quam quartus vix longiore et articulo quarto quam quintus etiam vix longiore).

Pronotum (fig. i) quam caput multo angustius, angulis late rotundatis margine postico paullum sinuato; meso-et metanoto lateribus late rotundatis.

Abdomen ovale elongatum segmentorum margine postico setis sat numerosis brevibus et paucis longiusculis instructum. Cerci sat elongati. Pedes longi, breviter setosi, tibiae spinis apicalibus elongatis.

Long. corp. mm. 7·6; long. capitis cum mandibulis 3·9, ejusdem lat. 2·6, long. antennarum 3, mandibularum 1·55, tibiae III 2.

MILES MINOR. Corpus flavescens, mandibulis nigris.

Caput (fig. ii) parum minus quam $\frac{1}{3}$ longius quam latius, lateribus parallelis, antice parum angustatum, postice late rotundatum, labio subrectangulari mandibulas vix superante, parum minus quam duplo longiore quam latiore, mandibulis dentibus consuetis instructis. Antennae 16-articulatae, articulo tertio quam quartus aliquantum longiore, articulo quarto quam quintus paullum breviore.

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[1] Capitis longitudo a margine postico ad labii basim mensa est.

Long. corp. mm. 5; long capitis cum mandibulis 2·22, ejusdem lat. 1·05, long. antennarum 2·05, mandibularum 0·94, tibiae III 1·18.

OPERARIUS.—Corpus stramineum, capite cremeo.

Caput paullum latius quam longius, clypeo parum convexo. Antennae 18-articulatae, articulo tertio quam quartus parum longiore, articulo quarto quam quintus breviore

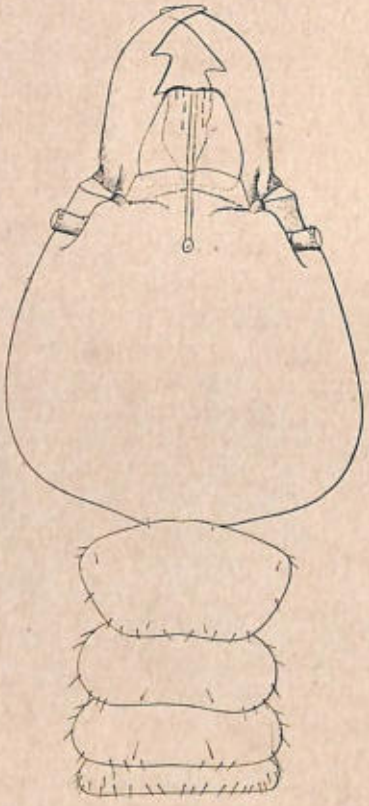


FIG. i.—*Schedorhinotermes magnificus*, miles major: caput, thorax et urotergitum primum prona.

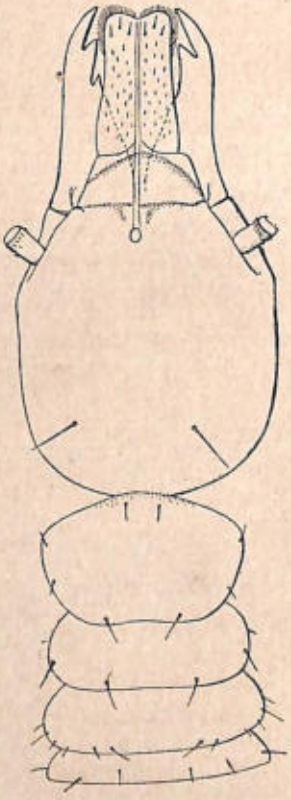


FIG. ii.—*Schedorhinotermes magnificus*, miles minor: caput, thorax et urotergitum primum prona.

Pronotum lobi antici margine late rotundato, medio indistincte sinuato. Abdomen setis numerosis brevibus instructum.

Long. corp. mm. 5; long. capitis 1·70; lat. cap. 1·85; long. antennarum 2·10, tibiae III 1·62.

Habitat. Misty Hollow, W. side of Dawna hills, Lr. Burma, *ca.* 2200 ft. (F. H. Gravely—22-30. xi. 1911).

Observatio. Species haec ad *S. malaccensis* Holmgr. proxima est, sed magnitudine et antennarum articulorum numero distincta est.

2. Termes annandalei, sp. n.

MILES MAJOR. Corpus capite sublatericio, mandibulis nigris, cetero supra badio, subtus sordide fulvescente.

Caput (fig. iii, 1) partem anticam versus paullum angustatum, paullum longius quam postice latius, parum convexum, fontanella multo longe a clypeo, parum ante dimidium caput, sita, labro antice subtriangulari et albicante, mandibulis robustis apice bene arcuato. Antennae 17-articulatae, articulo tertio quam secundus *ca.* 1-3 longiore et quam quartus *ca.* 1-6 longiore, articulo quarto quam quintus vix longiore.

Pronotum (fig. iii, 2) quam capitis dimidia latitudo paullum latius, antice et postice late, parum profunde sinuatum, lateribus angustatis margine rotundato. Pedes tibia infra setis subspiniformibus sat numerosis et spinis apicalibus consuetis 3,2,2 armata.

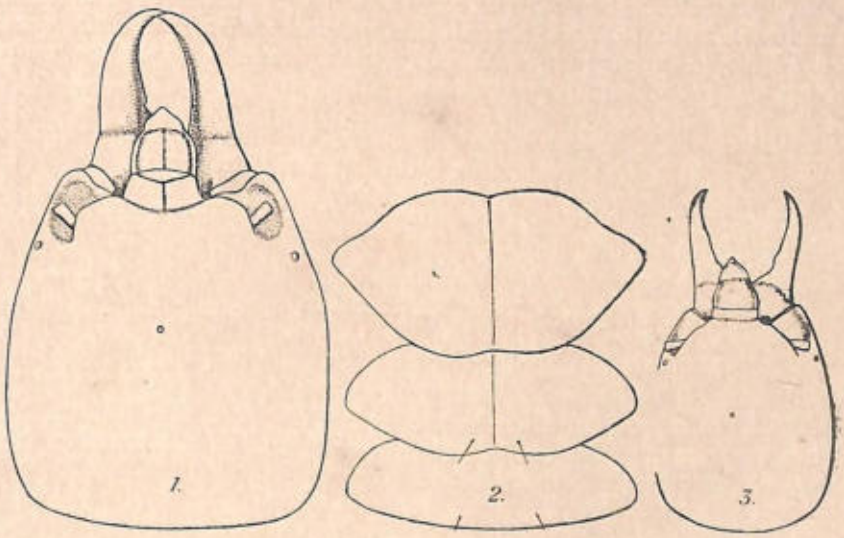


FIG. iii.—*Termes annandalei*: 1. militis majoris caput; 2. ejusdem thorax (magis ampliatus); 3. militis minoris caput.

Abdomen tergitis et sternitis setis sat longis, 2-3 seriatis, instructis.

Long. corp. mm. 12; long. capitis sine mandibulis 5, ejusdem lat. 4·3; long. mandibularum 2·6, tibiae III 3·5.

MILES MINOR. Militi majori similis est sed differt mandibulis (Fig. iii, 3) magis attenuatis, antennarum articulo secundo quam tertius vix breviore.

Long. corporis mm. 7·5; long. capitis 3, ejusdem lat. 2·6; long. mandibularum 2, tibiae III 2·5.

OPERARIUS MAJOR. Corpus capite badio macula subcirculari mediana albicante ornato, clypeo fulvo-castaneo, cetero supra fulvo-castaneo, subtus fulvescente, pedibus isabellinis.

Caput subcirculare, clypeo sat inflato. Antennae 17-articulatae, articulo tertio quam secundus vix breviore et quam quartus fere 1-5 longiore, articulo quarto quam quintus paullum longiore.

Pronotum lobi antici margine medio haud sinuato.

Abdomen tergitis setis 2-3-seriatis, sternitis setis sat longis 2-3 seriatis et aliis brevibus instructum.

Long. corp. mm. 7; lat. capitis 2·3; long. antennarum 3·5, tibiae III 2·5.

OPERARIUS MINOR operario majori similis est, sed capitis colore parum pallidiore, antennarum articulo tertio quam secundus parum et quam quartus paullum breviore.

Long. corp. mm. 4·6: lat. capitis 1·5; long. antennarum, 2·5, tibiae III 1·9.

Habitat. Moulmein (Lower Burma).

Observatio. Species haec, Calcuttae Musei Directori Prof. Annandale dicata, ad *Termes malaccensis*, Hav. proxima est, sed militis majoris statura et militum fontanella cephalica multo magis a clypeo remota praesertim distinctissima est.

3. Odontotermes assamensis, Holmgren.

Specimens collected by the Abor Expedition at Sadiya, Dibrugarh and Yembung.

4. Odontotermes microdens, Holmgren.

A few specimens, collected by the Abor Expedition in rotten wood near Kobo at 400 ft. alt., agree with co-types received by Dr. N. Holmgren and collected by Fletcher at Chaumahani. Other specimens, collected at Gurdaspur, are a little smaller than those from Kobo.

5. Odontotermes feae (Wasm.)

The Abor Expedition collected at Sadiya a few specimens of *Odontotermes* that differ from the typical form of *O. feae* in their smaller size, having the soldiers with the head, without mandibles, mm. 2·40 long, and 1·88 wide, and the mandibles 1·45 long.

6. Odontotermes gravelyi, sp. n.

MILES. Corpus cremeo—flavum capite ferrugineo mandibulis nigris.

Caput (fig. iv, p. 429) parum longius quam latius, partem anticam versus paullum angustatum, supra parum convexum, labro antice parum angustato rotundato, fontanella obtecta, mandibulis robustis apice bene arcuato. Antennae 17—articulatae, articulo secundo quam tertius *ca.* 1-4 longiore, articulo quarto quam tertius vix longiore.

Pronotum (fig. iv) lobi antici margine medio paullum sinuato, margine postico parum sinuato, marginibus lateralibus late rotundatis. Mesonotum quam pronotum paullo minus latum, metanotum quam mesonotum parum latius.

Pedes longi, setosi, tibiae spinis apicalibus consuetis robustis.

Abdomen tergitis et sternitis setis brevibus et setis brevioribus numerosis instructis.

Long. corp. mm. 8, long. capitis cum mandibulis 4·8, sine

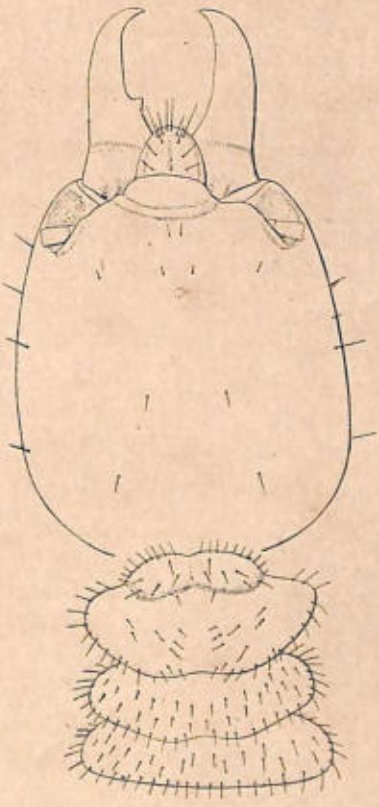


FIG. iv.—*Odontotermes gravelyi*: militis caput et thorax prona.

mandibulis 3·2; lat. cap. 2·6; mandibularum 1·60, antennarum 3·5, tibiae III 2·4.

OPERARIUS MAJOR.—Corpus cremeum capite fulvo-ochroleucum, fontanella ochroleuca magna, macula mediana parva fulvescente instructa.

Caput subrotundatum, clypeo sat inflato. Antennae 19-articulatae, articulo secundo quam tertius duplo longiore, articulo quarto quam tertius crassiore et parum longiore, articulum quinto subaequante.

Pronotum lobi antici margine medio vix sinuato.

Long. corp. mm. 6; lat. capitis 2; long. antennarum 2·5; tibiae III 1·9.

Habitat. Sukli, E. side of Dawna Hills, Lr. Burma *ca.* 2100 ft.

Observatio. Species haec ad *O. feae* proxima est, sed militis capitis magnitudine et ejusdem mandibulis apice parum magis arcuato et operarii majoris antennarum articulo tertio quam quartus breviore saltem distincta est.

7. Eutermes roboratus, sp. n.

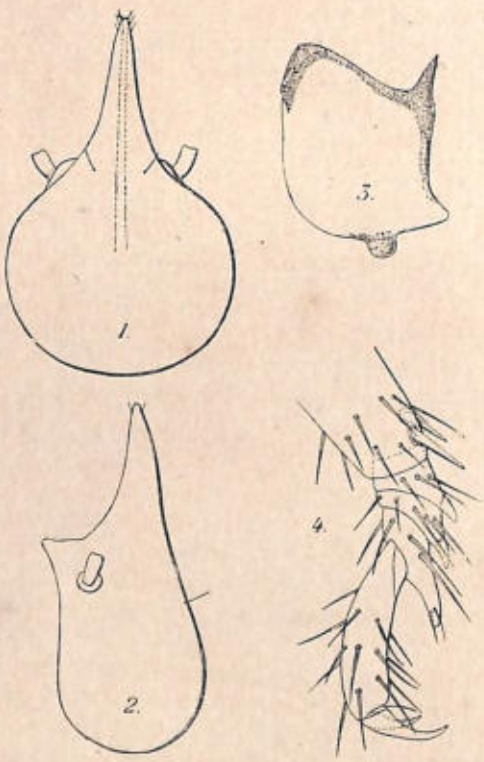


FIG. V.—*Eutermes roboratus*: 1. nasuti caput pronum; 2. idem lateraliter inspectum; 3. mandibula; 4. pedum tertii paris tibiae apex, tarsus et praetarsus.

MILES. Corpus fulvo-ferrugineum capite fulvo-latericio nasi apice paullum obscuriore, pedibus fulvo-isabellinis.

Caput (fig. V, 1-2) *ca.* 3/10 longius quam latius, fronte subplana, naso[1] recto quam caput ceterum parum breviore, gradatim attenuato. Antennae 13-articulatae, articulo tertio quam secundus 1/3 longiore et quam quartus duplo longiore, articulo quinto quam quartus 1/3 longiore. Mandibulae *vide* fig. V, 3.

Pronotum lobi antici margine medio vix sinuato. Pedes omnes tibiae apice (fig. V, 4) spinis duabus internis armato.

[1] Nasus semper ab antennarum foveae margine antico mensus est.

Abdomen tergitis subnudis, a quinto setis 1+1, a sexto setis 2+2 posticis sat longis instructis, sternitis setis brevibus sat numerosis et setis nonnullis posticis longis vel sat longis instructis.

Long. corp. mm 4; long. capitis 1·94, ejusdem lat. 1·24, long. antennarum 1·64, tibiae III 1·30.

OPERARIUS. Corpus ochraceo-isabellinum, capite badio, sutura medianae parte antica sat lata et suturis lateralibus, antennis pedibusque avellaneis.

Caput parum latius quam longius, clypeo parum inflato. Antennae 14-articulatae, articulo tertio secundum longitudine aequante et quam quartus fere duplo longiore, articulo quinto quam quartus c. 1-3 longiore.

Pronotum lobi antici margine antico medio parum sinuato.

Pedes et abdomen eisdem militis similia.

Long. corp. mm 4·5; lat. capitis 1·45; long. antennarum 1·43; tibiae III 1·36.

Habitat. Moulmein (Lr. Burma).

8. **Eutermes moratus**, sp. n.

NYMPHA. Straminea oculis nigrescentibus appendicibus alaribus fumosis. Antennae 15-articulatae, articulis 3° et 4° brevioribus.

Long. corp. mm. 7; append. alarium 1.

MILES. Corpus stramineum capite pallide ochraceo, naso testaceo-latericio.

Caput (fig. vi, p. 432) parum magis quam 1/3 longius quam latius, lateribus paullum arcuatis, lineo dorsuali subrecta, naso attenuato, mandibulis processu externo sat longo, antennis 13-articulatis, articulo tertio quam secundus 1/3 longiore et quam quartus fere duplo longiore, articulo quinto quam quartus aliquantum longiore.

Pronoti lobus anticus margine medio vix sinuato. Pedes sat setosi, tibiae calcaribus longis.

Abdominis tergita setis minimis sat numerosis et setis nonnullis posticis sat longis, sternita setis brevioribus et brevibus sat numerosis et setis nonnullis posticis longis instructa.

Long. corp. mm 4, long. capitis 1·69, ejusdem lat. 1, long. nasi 0·78, antennae 1·43, tibiae III 0·98.

OPERARIUS ignotus est.

Habitat. Yambung. Alt. 1100 ft. (Abor Expedition). S. W. Kemp.

Observatio. Species haec ad *E. ceylonicus* Holmgr. et *E. fletcheri* Holmgr. proxima est, sed magnitudine et militis capitis forma saltem distincta est.

9. **Speculitermes cyclops**, Wasm.

Some specimens (workers) collected at "Third camp to Misty Hollow, Dawna Hills, Lr. Burma."

10. **Globitermes audax**, sp. n.

MILES. Corpus cremeum capite ochraceo-luteo, mandibularum dimidia parte distali fusco-sufa.

Caput (fig. vii, p. 433) subaeque longum atque latum, subrotundatum, dorso convexiusculo et setis nonnullis instructo, labro pullum longo quam postice lato, antice angustato, apice pallido, parum rotundato. Antennae 14-articulatae, articulo tertio secundum longitudine subaequante et quam quartus *ca.* 1/3 longiore, articulo quarto quam quintus *ca.* 1/5 breviore. Mandibulae quam

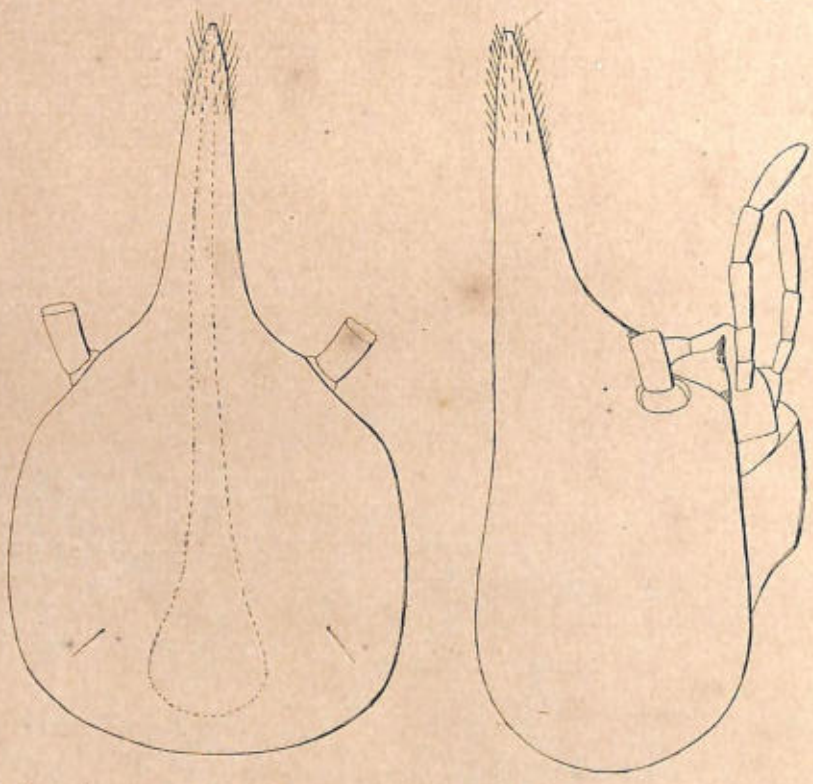


Fig. vi.—*Eutermes moratus:* 1. militis caput pronum; 2. idem lateraliter inspectum.

caput parum breviores, dente submediano robusto, parte apicali valde arcuata apice attenuato acuto.

Pronoti lobus anticus sat magnus, margine antico medio aliquantum inciso.

Abdomen setis brevioribus numerosis et setis brevibus nonnullis instructum.

Pedes tibiae spinis apicalibus (fig. viii, 2, p. 433) brevibus armati.

Long. corp. mm 5; long. capitis sine mandibulis 1·17, ejusdem lat. 1·20; long. mandibularum 1·06, tibiae III 1·18.

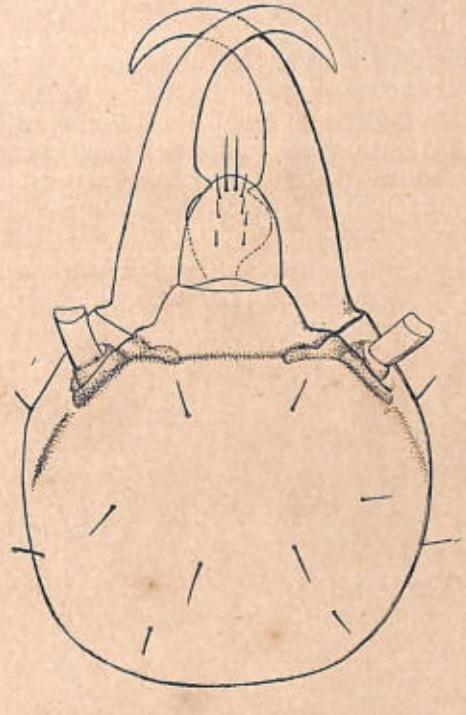


FIG. vii.—*Globitermes audax*: militis caput.

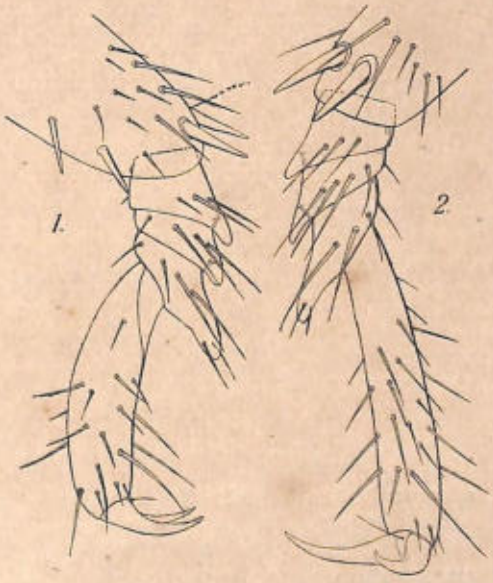


FIG. viii.—*Globitermes audax*: 1. operarii secundi paris tibiae apex, tarsus et praetarsus; 2. militis tertii paris tibiae apex, tarsus praetarsus.

OPERARIUS. Corpus stramineum capite cremeo.

Caput paullum latius quam longius, clypeo bene inflato, antennis 14-articulatis, articulo secundo quam tertius aliquantum longiore, articulo tertio quam quartus aliquantum longiore, articulo quarto quam quintus aliquantum breviore.

Pronoti lobus anticus sat magnus, medius paullum incisus.

Long. corp. mm 5; lat. capitis 1·23; long tibiae III 1·04.

Habitat. Exempla nonnulla ad Moulmein (Burma); *Gravely legit.*

Observatio. Species haec ad *G. sulphureus* (Hav.) proxima est, sed magnitudine et mandibularum parte distali magis arcuata praesertim distinctissima est.

11. **Capritermes laetus,** sp. n.

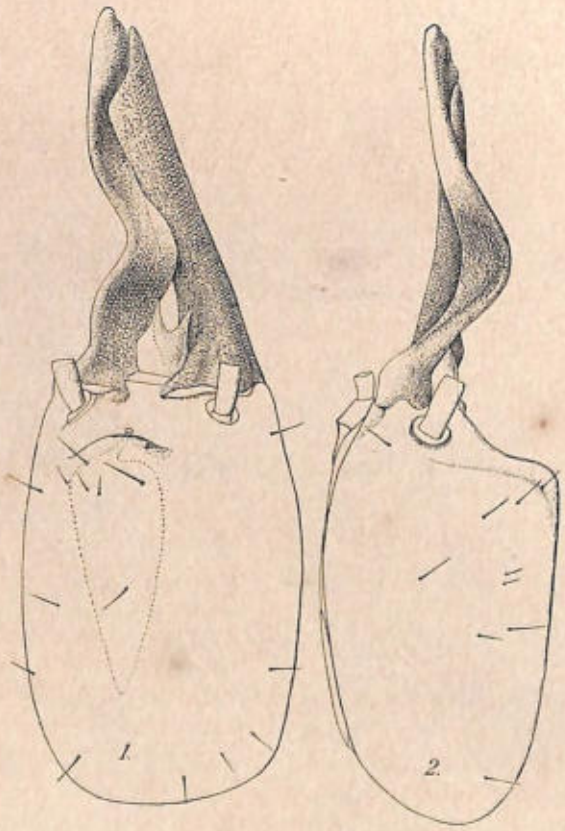


Fig. ix.—*Capritermes laetus:* 1. militis caput pronum; 2. idem lateraliter inspectum.

MILES. Corpus stramineum capite cremeo, mandibulis nigrescentibus.

Caput (fig. ix) circa 1/3 longius quam latius lateribus paul-

lum convexis, dorso convexo, fronte super fontanellam rotundatim aliquantum inflata, superficie setis nonnullis instructa, labro profunde inciso et lateribus anticis attenuatis elongatis, acutis. Antennae 14-articulatae, articulo tertio secundum subaequante et quam quartus vix longiore. Mandibula laeva quam caput paullum brevior, minus arcuata quam eadem *C. nemorosi*, Hav.

Pronoti lobus anticus sat magnus, haud incisus est.

Abdomen setosum, cercis sat longis.

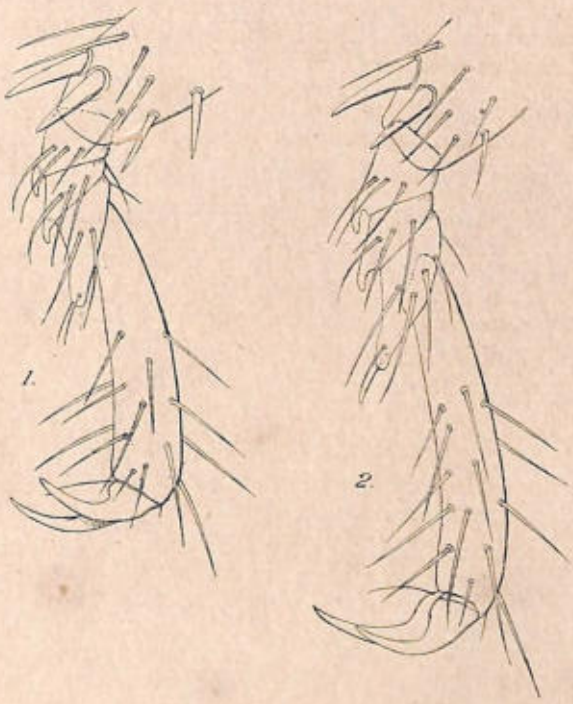


FIG. X.—*Capritermes laetus*: 1. militis secundi paris tibiae apex tarsus et praetarsus; 2. militis tertii paris tibiae apex, tarsus et praetarsus.

Pedes longi, sat robusti, tibiae (fig. x) spinis apicalibus sat longis, tarsi articulis 1-3 postice infra attenuatis et elongatis.

Long. corp. mm 6.5; long. capitis sine mandibulis 2·25; ejusdem lat. 1·45; long. mandibulae laevae 2·08, tibiae III 1·32.

Habitat. Exemplum typicum ad. Sukli, E. side of Dawna hills, Lr. Burma *ca.* 2100 ft. *Gravely legit.*

Observatio. Species haec ad *C. incola*, Wasm. proxima, sed magnitudine, antennarum articulo quarto quam tertius vix breviore bene distincta est.

XXXIII. LEPIDOPTERA, II. MOTHS.

By GEORGE M. HENRY.

The Moths collected by Mr. Kemp in the Abor country are few in number and mostly of no great geographical interest, being for the most part, species of wide distribution No new species are described. I have identified the specimens mainly by comparison with specimens in the Dudgeon collection from Sikhim, Bhutan, etc., and the Green collection from Ceylon, both of which are now in the Indian Museum. I have also used the old Indian Museum general collection to a considerable extent.

The nomenclature and classification adopted is that of Sir G. F. Hampson in the Fauna of British India, Moths, and in his supplementary papers on the Moths of India in the Journal of the Bombay Natural History Society.

1. **Saturnia pyretorum,** Westw.

2 specimens. Yambung. March 1912.

The previously recorded distribution of this species is China and Sikhim.

2. **Dilemera arctata,** Wlk.

1 specimen. Rotung. 28-xii-11.

Previously recorded from Sikhim; Khasis; Nagas and Bhutan.

3. **Nyctemera varians,** Wlk.

1 specimen. Sadiya. 27-xi-11.

Previously recorded from Sikhim; Bhutan; N. E. India and Burma.

4. **Nyctemera coleta,** Cram.

1 specimen. Kobo. 30-xi-11.

Previously recorded from Assam; Ceylon; Burma; Malacca, Java and Ceram.

5. **Miltochrista perpallida,** Hamp.

1 specimen. Rotung. 20-xii-11.

The Abor specimen is ochreous on head, thorax and abdomen. This species is recorded from Sikhim.

6. **Miltochrista undulosa,** Wlk.

1 specimen. Rotung. 25-xii-11.

Previously recorded from Kángra; Sikhim; Khásis and Moulmein.

7. **Agrotis flavirena,** Moore.

1 specimen. Rotung. 23-xii-11. Caught at light.

Previously recorded from Sikhim.

8. **Prodenia littoralis.** Boisd.

1 specimen. Kobo. 7-xii-11. Caught at light.

This species is widely distributed through the Mediterranean sub-region and throughout the tropical and sub-tropical zones of the Old World.

9. **Amyna selenampha,** Guen.

1 specimen. Dibrugarh. 22-xi-11.

Previously recorded from Natal; Madagascar; China; throughout India and Ceylon; Andamans; Philippines; Borneo and Java.

10. **Sypna quadrisignata,** Wlk.

1 specimen. Margharita. 26-xi-11.

Previously recorded from Dharmsala; Sikhim; Shillong; Tavoy.

11. **Acantholipes pansalis,** Wlk.

1 specimen. Dibrugarh. 22-xi-11.

Previously recorded from Formosa; Andamans; Singapore; throughout India; Ceylon and Burma.

12. **Thermesia rubricans,** Boisd.

1 specimen. Kobo. Undated.

Previously recorded from Africa; throughout the Indian region: Java and the Pacific Islands.

13. **Plusia orichalcea,** Fabr.

1 specimen. Rotung. 10-iii-12.

Previously recorded from the Azores; Madeira; Canaries; St. Helena; Ascension; S. Africa; Mauritius; Arabia; Japan; China; Formosa; throughout India and Ceylon.

14. **Raparna digramma,** Wlk.

1 specimen. Sadiya. 26-xi-11.

Previously recorded from N. W. Himalayas; W. and S. India and Ceylon.

15. **Simplicia niphona,** Butl.

2 specimens. Rotung. 27-xii-11. Caught at light.
1 specimen. Rotung. 22-xii-11.

This species is recorded from Japan; N W. Himalayas; Sikhim.

16. **Nodaria externalis,** Guen.

1 specimen. Rotung. 21-xii-11.

The Abor specimen is very pale in colouration. The species is recorded from S. Africa; Mauritius; Japan; Formosa; Borneo: throughout India, Burma and Ceylon.

17. **Nodaria innocens,** Butl.

1 specimen. Yambung. 14-i-12.

Previously recorded from Japan: Dharmsála; Sikhim; Assam; Nilgiris.

18. **Hypena occata,** Moore.

1 specimen. Rotung. 26-xii-11.

This species appears to vary considerably. The Abor specimen is pale compared with Ceylon specimens and some of the Dudgeon collection specimens. It closely resembles specimens in the latter from Bhutan.

The previously recorded distribution of this species is Dharmsála; Sikhim; Bhutan; Khásis; Nilgiris; Ceylon.

19. **Heterolocha falconaria,** Wlk.

2 specimens, one unlabelled. Between Kalek and Mishing. 4500 ft 17-iii-12. Caught at light.

Previously recorded from the Punjab; N. W. Himalayas; Sikhim.

20. **Luxiaria contigaria,** Wlk.

1 specimen. Sireng river, below Kalek. 2000 ft. 15-iii-12. Caught at light.

Previously recorded from Dharmsála; Sikhim; Khásis; Mahableshwar; Nilgiris; Ceylon; Sumatra and Borneo.

21. **Macaria emersaria,** Wlk.

1 specimen. Kobo. 6-xii-11.

Distributed throughout India, Ceylon and Burma.

22. **Hyperythra lutea,** Cram.

1 specimen. Sadiya. 28-xi-11.

Distributed throughout India, Ceylon and Burma; China; Andamans; Sumatra; Java; New Guinea.

23. **Boarmia ochrifasciata,** Moore.

1 specimen. Sireng river, below Kalek. 2000 ft. 15-iii-12. Caught at light.

Previously recorded from Dalhousie; Dharmsála; Sikhim; Khásis.

24. **Eumelia rosalia,** Cram.

1 specimen. Abor country (no precise locality given) undated.

This is a widely distributed species recorded from China; Formosa; throughout India, Ceylon and Burma; the Malayan and Austro-malayan sub-regions.

25. **Naxa textilis,** Wlk.

1 specimen. Between Kobo and Janakmukh. Undated.

Recorded from Amur; N. W. Himalayas; Sikhim; Bhutan; Assam; Nilgiris; Ceylon; Burma; Borneo.

26. **Cidaria catenaria,** Moore.

1 specimen. Yambung. 13-i-12.

Previously recorded from Sikhim and the Khasis.

27. **Chloroclystis admixtaria,** Wlk.

1 specimen. Yambung. 13-i-12.

Previously recorded from the Nilgiris and Ceylon.

28. **Trichopteryx sikkima,** Moore.

1 specimen. Rotung. 8-iii-12. Flying in sunshine.

My identification of this species is not very satisfactory as the Abor specimen is a very poor one.

T. sikkima has hitherto been recorded only from Sikhim.

29. **Sauris abortivata,** Guen (= lineosa, Moore).

1 specimen. Yambung. 13-i-12.

Recorded from Sikhim; Khásis; Ceylon; Sumatra.

30. **Ephestia cautella,** Wlk.

1 specimen. Kobo. 9-xii-11.

Recorded from Aden; Bhutan; Ceylon; Sumbawa.

31. **Piletocera ægimiusalis,** Wlk.

1 specimen. Yambung. 14-i-12. At light.

Recorded from Sikhim; Khásis; Margharita; Assam; Andamans; Borneo; Mysol.

32. **Sufetula sunidesalis,** Wlk.

1 specimen. Yambung. 17-i-12.

Recorded from Sikhim; Margharita; Assam; Ceylon; Malayan sub-region.

33. **Syngamia floridalis,** Zell.

1 specimen. Abor country. Undated.

This species is distributed through S. Africa; India; Ceylon; Burma; the Malayan sub-region; New Hebrides; Duke of York Island; Tahiti.

34. **Glyphodes unionalis,** Hubn.

1 specimen. Sireng river below Kalek. 2000 ft. 15-iii-12. At light.

Distributed through S. Europe; S. and W. Africa; Madagascar; Mauritius; Aden; throughout India and Ceylon; Australia.

35. **Platyptilia taprobanes,** Feld.

1 specimen. Upper Rotung. 6-i-12.

This species has hitherto been recorded from the Palni Hills; Khási Hills; W. Java; Ceylon hills.

36. **Atteva subaurata,** Dout.

1 specimen taken in thick jungle. Rotung. 1-i-12.

37. **Atteva niveigutta,** Wlk.

1 specimen. Rotung. 9-iii-12.

XXXIV. HYMENOPTERA, V: FOSSORES. DIPLOPTERA, CHRYSIDIDAE.

By Lieut.-Colonel C. G. NURSE.

With a few exceptions, the specimens obtained belong to species well known as occurring in Burma, Tenasserim, and N. E. India. Our knowledge of the smaller aculeate Hymenoptera still leaves much to be desired, and I have not attempted to describe, except in the case of an *Ampulex* which is undoubtedly unknown, new species from the very insufficient material available. Many of the genera occurring in India badly require revision, and it is quite likely that as more material becomes available, several of the forms now passed over as "sp. inc." may prove to be new.

FOSSORES.

MUTILLIDAE.

Mutilla blanda, Smith.

One ♀ from E. bank of Dihong River, between Pasighat and Kobo, 15-xii-11.

Mutilla cassiope, Smith.

One ♀ from Dibrugarh, N. E. Assam, 26-xi-11.

Mutilla sp. inc.

One ♀ from Sadiya, N. E. Assam, 26-xi-11.

SCOLIIDAE.

Tiphia intrudens, Smith.

A ♂ from Dibrugarh, 17-19-xi-11.

Scolia, sp. inc.

A ♀ from Kobo, 9-xii-11.

There is no specimen exactly like this either in the B.M. or in my own collection. It is nearest to *S. floridula* (Bingh.) but I note that Bingham, in arranging the B. M. collection, placed his type of that species under *sikkimensis* (Bingh.) though in his volume I of the "Fauna of India" series, he gives his *floridula* as a synonym of *S. kirbyi*, Magretti. The species of this genus are very variable.

Elis iris, Lepel.

Three ♂ ♂ and two ♀ ♀ of this widely spread species, from various localities.

Elis annulata, Fab.

A specimen of each sex. This species is common and extends almost throughout the Oriental Region.

CEROPALIDAE (POMPILIDAE).

Macromeris honesta, Smith.

One ♀ from Upper Rotung, 21-i-12.

This species, which was described by Smith as a *Pompilus*, and is included by Bingham in the genus *Pseudagenia*, is undoubtedly a *Macromeris*. The specimen is quite typical, and differs in no way from others in the B. M. and my own collection. The generic character must have been overlooked by Bingham, but is quite obvious.

Pseudagenia tincta, Smith.

A ♀ from Dibrugarh, 17-19-xi-11.

Salius praestabilis, Bingh.

One ♀ from Sadiya, 23-xi-11.

Pompilus, spp.

There are four specimens from different localities, belonging to probably three different species. Two of them are in indifferent condition. I cannot identify with certainty either of the others as this genus badly requires revision. The largest specimen from Kobo (3-xii-11) is very probably undescribed.

SPHEGIDAE.

Tachysphex, sp. inc.

One ♀ from Kobo, 4ooft., 6-xii-11.

Notogonia, sp. inc.

One ♀ from Janakmukh, 6ooft., 17-xii-11.

Neither of the above are in sufficiently good condition for accurate determination.

Liris aurata, Fab.

Two ♀ ♀; one Sadiya, 23-xi-11, and one Kobo, 4ooft., 9-xii-11.

There is an error in Bingham's description of this species in Vol. I—Hymenoptera. He says "median segment long, as long as the rest of the thorax and head united." This should read

"as long as the rest of the thorax." I have compared the specimens with those in the B. M. collection, and the determination is quite certain. It is an extremely widely spread species.

Liris ducalis, Smith.

Six ♀ ♀, five of which are from Sadiya, various dates, and one from Rotung, 1400ft., 25-xii-11.

Paraliris faceta, Bingh.

A ♀ from Dibrugarh, 22-xi-11.

Trypoxylon, sp. inc.

One specimen from Rotung, 1400ft., 24-xii-11.
Not in sufficiently good condition for certain determination.

Ammophila atripes, Smith.

One ♂ from Sadiya, 27-xi-11.

Sceliphron madraspatanam, Fab.

A ♀ from Dibrugarh, 19-xi-11.

Sphex umbrosus, Christ.

One ♀ of this very widely spread species from Dibrugarh.

Ampulex aborensis, n. sp.

♀. Head with the frontal area sparsely and shallowly punctured, vertex and pronotum almost impunctate; mesonotum with a few large and sparse punctures; mesopleurae somewhat sparsely punctured; abdomen impunctate. Clypeus with a very conspicuous central longitudinal carina, which makes it appear almost rostrate when viewed sideways, this carina produced backward to the anterior ocellus; besides the central carina there are two other carinae, which, starting behind the anterior ocellus, lead towards the base of the antennae, becoming more pronounced as they near the latter. Pronotum nearly half as long again as mesonotum, widening gradually towards it; median segment longer than the mesonotum, transversely striate above, and reticulate at the sides, the reticulations gradually disappearing towards the lower portion of the segment. First abdominal segment with the petiole less than half its length, the apex of the segment not much narrower than the 2nd segment.

Brilliant metallic blue, with greenish reflections, the metallic colour continued to nearly the apex of the femora of all the legs, the tibiae also metallic above; below the tibiae and tarsi are rufescent; mandibles black. Pubescence sparse, greyish; there

are a few strong yellowish hairs on the anterior margin of the clypeus and the tibiae and tarsi are covered with a rufous pile; tarsal claws unidentate. Wings fuscohyaline, with 3 cubital cells.

L. 16 mm.

Hab. Kobo, 400 ft., 3-xii-11. "Flying on fallen tree trunk."

This is quite distinct from any described Indian species, most of which have red femora.

Psenulus, sp. inc.

Two specimens from Dibrugarh, which may be a variety of *P. pulcherrimus*, Bingh., but differ somewhat in the colour of the petiole.

Stigmus niger, Motsch.

One ♀ from Kobo, 400ft., 9-xii-11.

Crabro, sp. inc.

One damaged specimen from Kobo, 3-xii-11. Impossible to determine.

DIPLOPTERA.

EUMENIDAE.

Eumenes arcuata, Fab.

One ♂ from Sadiya, 28-xi-11.

Labus humbertianus, Sauss.

One ♂ from Kobo, 400ft., 3-xii-11.

Rhynchium argentatum, Fab.

One ♂ from Sadiya.

Odynerus fragilis, Smith.

Two ♂ ♂ from Dibrugarh, and 3 ♀ ♀ from Sadiya.

Odynerus icaroides, Bingh.

One ♀ from Sadiya, 28-xi-11.

VESPIDAE.

Polybia orientalis, Sauss.

Sixteen specimens, all ♀ ♀, from Yembung and Kobo.

Polybia indica, Sauss.

Eight specimens from Upper Rotung; all ♀ or ☿.

Icaria ornaticeps, Cam.

One ☿ from Puging, 3000ft., and one from Sadiya.

Icaria artifex, Sauss.

One ♂ from Sadiya, and 3 ♀ ♀ from Sadiya and Dibrugarh.

Icaria variegata, Smith.

Two ♂ ♂ and several ♀ ♀ from Rotung and Sadiya.

Polistes hebraeus, Fab.

One pair from Sadiya.

Vespa magnifica, Smith.

Two ♀ ♀ and two ☿ ☿ from Rotung, Kobo, Sadiya, and Dibrugarh.

Vespa ducalis, Smith.

One ☿ from Rotung, and one from Dibrugarh.

Vespa cincta, Fab.

One ♀ from Kobo.

Vespa dorylloides, Sauss.

One ♀ from Upper Rotung.

Vespa basalis, Smith.

Four ☿ ☿ from Sadiya and Kobo.

Vespa bicolor, Fab.

Two ☿ ☿ and 3 ♀ ♀ from various localities.

CHRYSIDIDAE.

Chrysis durga, Bingh.

One ♀ from Sadiya, 23-xi-11.

XXXV. CRUSTACEA AMPHIPODA.

By WALTER M. TATTERSALL, *D.Sc., Keeper of the Manchester Museum.*

(Plate xxviii).

The Amphipoda collected by Mr. Stanley W. Kemp on the Abor expedition may all be referred to a single species, which, after much hesitation, I have described as new to science. They are of further interest inasmuch as they are the first semi-terrestrial Amphipoda which have ever been collected in the Indian Empire, to my knowledge. The species shows very close affinity with those described by Weber from Java and other islands of the Dutch East Indies and in particular, with *Orchestia parvispinosa* from Java.

I desire to express my thanks to Dr. Annandale and Mr. Kemp for the privilege of examining and describing these specimens.

Talorchestia kempii, sp. nov.

(Plate xxviii, figs. 1–16).

Locality of capture :

Reg. No. $\frac{8053}{10}$, Dibrugarh, N. E. Assam, November 1911, under stone, one male, adult, 8 mm.

Reg. No. $\frac{8133}{10}$, Rotung, near Sireng stream, eleven females, six adult males and six immature males, 6·5–9 mm. (coll. *M. de Courcy*).

Body smooth, without dorsal ridges of any kind; eyes of moderate size, pigment black; postero-lateral angle of the third segment of the pleon (fig. 1) quadrate, with a slightly produced point and the hind margin straight, without serrations.

First antenna with the flagellum shorter than the peduncle, three jointed.

Second antenna with the third joint of the peduncle longer than the second; flagellum about one fifth as long again as the peduncle and composed of about thirteen joints.

First gnathopod of the female (figs. 2 and 3) simple, without any appreciable palm; propodus shorter than the carpus with three or four groups of two strong spines on the inner margin, and a row of about six or seven setae on the inner face just inside the margin.

Second gnathopod of the female (figs. 4 and 5) with the usual shagreened lobes on the merus, carpus and propodus, that on the latter extending considerably beyond the short oblique palm; setae very few and short.

First gnathopod of the adult male (figs. 6 and 7) with the third joint not widening towards the distal end; merus with a well marked shagreened lobe on its hinder margin; carpus slightly longer than the propodus with a well marked produced shagreened lobe on the distal end of the hinder margin, and a few setae scattered on its inner face; the propodus widens distally to the usual rounded shagreened lobe which itself increases in width distally; the finger not covering the whole apex of the propodus; the arrangement of setae on the limb can best be seen on the figures.

In specimens which I take to be immature males, the first gnathopod has the form seen in fig. 10. It is subchelate, but the propodus is much less dilated than in the adult so that the dactylus is at least as long as, or a little longer, than the distal margin of the propodus. The shagreened lobes on the merus, carpus and propodus are also less developed than in the adult.

Second gnathopod of the adult male (figs. 8 and 9) with about seven quite small setae on the margin of the side plate; third joint widening somewhat distally; propodus broadly oval, about one and a half times as long as broad, anterior margin convex, without setae, posterior margin convex with the palm slightly oblique, not excavate, not defined by a tooth, fringed with about nine small setae and furnished with a groove or excavation into which the distal end of the finger fits; finger more than half as long as the posterior margin of the propodus, strongly curved and tapering at the end.

The second gnathopods of the immature male (fig. 11) do not differ markedly from those of the adult female.

Fifth peraeopods (fig. 12) with the second joint slightly broader than long, its anterior margin bearing six or seven spinules in addition to one long and one short spinule on the distal corner, its posterior margin well rounded and bearing about eight minute serrations, a small seta being placed in each serration; fifth joint longer than broad; fourth and fifth joints not expanded or incrassated in any way; the arrangement and number of setae on the limb are shown on the figure.

First uropods (fig. 13) with the peduncle longer than the subequal rami and bearing two rows of four spines one row on each ridge of the posterior margin; inner ramus with three lateral spines and one long, one medium and two short spines at the apex; outer ramus with two or three spines at the apex only.

Second uropods (fig. 14) with the peduncle longer than the rami and bearing four strong spines on its inner edge; inner ramus with two spines on the margin and two large and three small spines at the apex; outer ramus with two lateral spines and two large and one small spine at the apex.

Third uropods (fig. 15) with the peduncle somewhat swollen and slightly longer than the single-jointed ramus; peduncle with one large and one small spine at the centre of the lateral margin and one small spine at the outer distal corner; ramus with one large and two or three small spines at the apex.

Telson (fig. 16) triangular in shape, about as broad as long, slightly notched at the apex, a long and a short spine at the tip of each lobe of the apex, a single rather strong spine somewhat distal to the centre of each lateral margin.

Length of an adult male and female, 9 mm.

The determination of the generic position of this species has been a matter of some difficulty. The fourth joint of the palp of the maxilliped is distinctly present, but exceedingly small and cannot be called anything more than a vestige. The value of the presence or absence of this joint in the classification of the genera of the Talitridae has never been satisfactorily set forth. Stebbing (1906) separates the genus *Parorchestia* from the *Orchestia* group of genera on the ground that the fourth joint of the palp of the maxilliped is "distinct though very small, conical and having a spine on the truncate apex." In *Orchestia* the same joint is described as an "obscure rudiment." Unfortunately there does not seem to be any published figure of the maxilliped palp of *Parorchestia* and, having no material of this genus at my disposal, I have not been able to form any opinion as to the amount of difference implied in the above two descriptions. I have, therefore, decided that in the present species the fourth joint of the maxilliped palp is 'an obscure rudiment" and referred it to the *Orchestia* group of genera. In this group, consisting of *Talitrus*, *Orchestoidea*, *Orchestia* and *Talorchestia*, it seems to belong to the last genus by the combination of the characters of the first and second gnathopods in the two sexes, namely, first gnathopod simple in the female, subchelate in the male, the second gnathopod feebly chelate in the female, strongly subchelate in the male. But, among described species, *T. kempii* comes nearest to *Orchestia parvispinosa* which seems to me to be certainly congeneric with the present form. This species was placed by its describer, Weber (1892), in the genus *Orchestia* and both Stebbing (1906) and Chilton (1912), who examined specimens from the type locality, have retained it in this genus. But the figures of the first gnathopod of the female given by both Weber and Chilton, illustrate, in my opinion, a limb which can only be described as simple and, therefore, of a form which would exclude the species from the genus *Orchestia*. I propose, therefore, to transfer the species *O. parvispinosa*, Weber, to the genus *Talorchestia* and to include the present species in the same genus.

The problem is, however, still further complicated by the form of the first and second gnathopods in the specimens which I have called immature males (figs. 10 and 11). I do not know what other interpretation can be placed on these specimens though it is unfortunate that the sex of immature specimens of the Talitridae is exceedingly difficult to determine, for want of an external label in the form of copulatory organs. We know from the researches of Barrois (1887) that the males of some species, at any rate, of this group of Amphipoda, do not attain the full development of their gnathopoda till the final moults, up till which

stage they resemble more or less closely, those of the female. I, therefore, regard the present specimens as males which have not yet undergone complete metamorphosis. It will be seen from the figures that the first gnathopods of these immature specimens differ from those of the females in being subchelate instead of simple, but they have not yet attained the full subchelate form of the adult male, in that the nail more than covers the palm whereas in adult males, the nail is shorter than the palm. The shagreened lobes on the merus, carpus and propodus, moreover, are not so completely developed. The second gnathopods, on the other hand, resemble those of female specimens almost completely. The interest of these specimens lies in the fact that their gnathopods have the form characteristic of females of the genus *Orchestia*. In other words, if my interpretation of their nature is the correct one, we have here a species of *Talorchestia* in which the male passes through a female *Orchestia* stage during metamorphosis. I do not think it is a question of two species living together. All the specimens were collected together, in the same place, at the same time and agree closely in all details except in the form of the gnathopods. It does seem to me to indicate how very slender are the grounds on which certain genera of Talitridae have been instituted, and how very important it is to have a complete range of specimens before attempting to increase the number of genera. If only the immature and mature males of *T. kempii* had been collected, the species would have been referred to the genus *Orchestia*. On the other hand, if only females and mature males had been found, the species would, with equal justice, have been referred to *Talorchestia*. May not the validity of these two genera be justly questioned in the light of the present material and may not one go further and inquire how many species of either genera have been instituted on specimens of the nature of those I have interpreted as immature males?

For the rest, *T. kempii* is very closely related to *T. parvispinosa* and only differs in the rather different form of the propodus of the second gnathopod of the male and in the armature of the telson. We are indebted to Chilton (1912) for a description of the telson of *T. parvispinosa* and his figure depicts three long spines on each margin in addition to the apical spines. In *T. kempii* there is but one spine on each lateral margin, and this character is constant in all the specimens in the collection. It may be useful to indicate the position of these two species in Stebbing's key to the genus. They come at the end of the table which may therefore be extended as follows:—

18	Gnathopod 2 in the male, palm excavate near finger-hinge	18.	*T. novaehollandiae.*
	Gnathopod 2 in the male, palm not excavate near finger-hinge	19.	
19	Gnathopod 1 in the male, nail longer than the apex of the 6th joint	19.	*T. martensii.*
	Gnathopod 1 in the male, nail shorter than the apex of the 6th joint	20.	

20 { Telson with three spines on the lateral margins ... ... 20. *T. parvispinosa.*
Telson with a single spine on the lateral margins ... ... 21. *T. kempii.*

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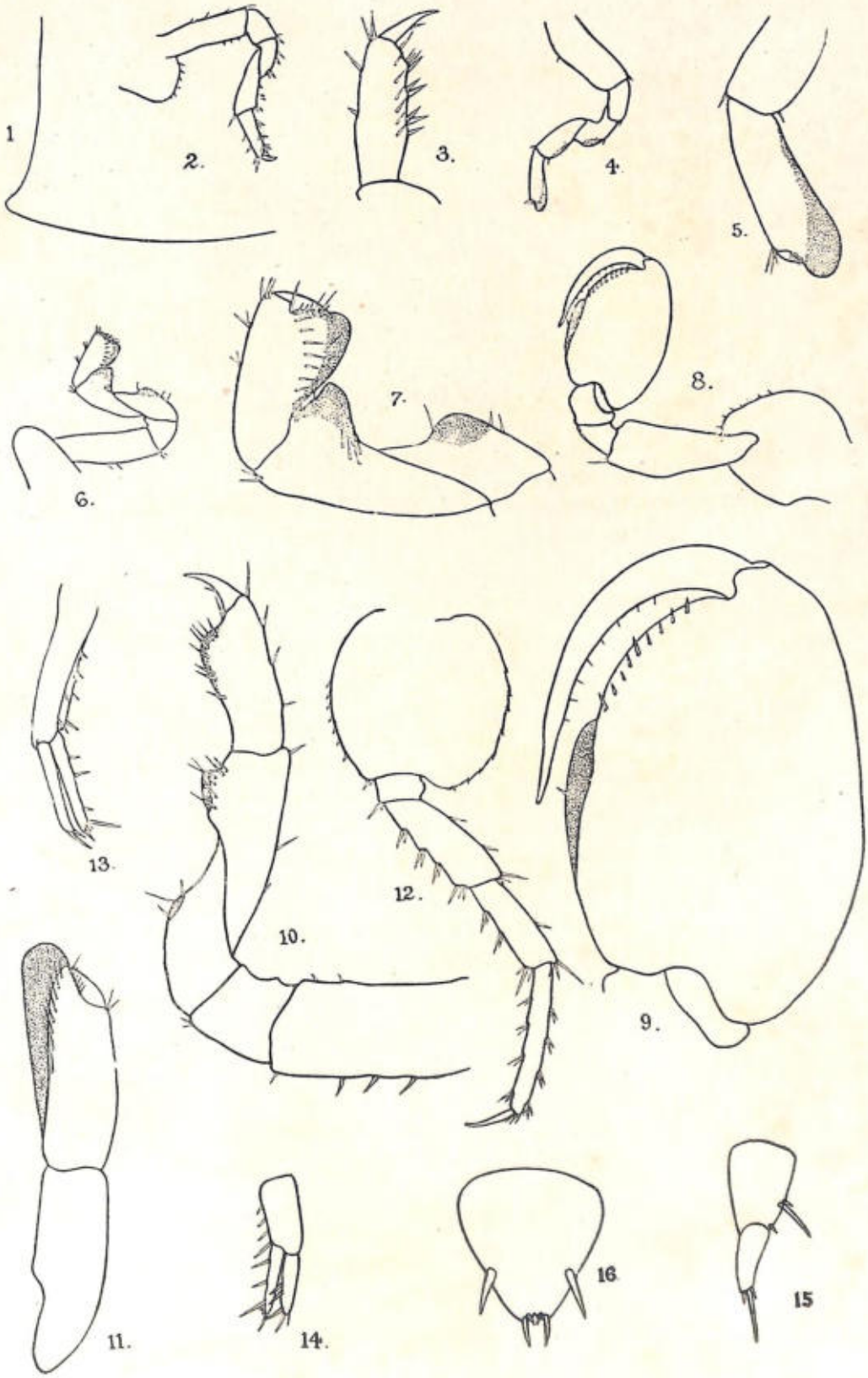
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EXPLANATION OF PLATE XXVIII.

Talorchestia kempii, sp. nov.

FIG. 1.—Epimeral plate of the third segment of the pleon, ×68.
,, 2.—Gnathopod 1 of the female, ×21.
,, 3.— ,, ,, ,, ,, ,, , terminal joints, ×68.
,, 4.— ,, 2 ,, ,, ,, ×21.
,, 5.— ,, 2 ,, ,, ,, ,, , terminal joints, ×68.
,, 6.— ,, 1 ,, ,, male, ×21.
,, 7.— ,, 1 ,, ,, ,, ,, , terminal joints, ×68.
,, 8.— ,, 2 ,, ,, ,, ×21.
,, 9.— ,, ,, ,, ,, ,, ,, , terminal joints, ×68.
,, 10.— ,, 1 ,, of immature male, ×68.
,, 11.— ,, 2 ,, ,, ,, ,, , terminal joints, ×68.
,, 12.—Fifth peraeopod of the female, ×21.
,, 13.—First uropod, ×21.
,, 14.—Second uropod, ×21.
,, 15.—Third uropod, ×68.
,, 16.—Telson, ×68.



TALORCHESTIA KEMPII, sp. nov.

Although this part is dated December, 1914, and was completely printed off in that month, unexpected delay in the receipt of some of the plates from Europe prevented its publication until January 11th, 1915.

XXXVI. LAND PLANARIANS.

By RICHARD H. WHITEHOUSE, M.Sc., *Professor of Biology, Agra College, late of Queen's University of Belfast.*

(Plates xxix, xxx.)

INTRODUCTION.

The collection of land planarians to be described will probably rank as one of the most interesting of Mr. Kemp's many collections from the Abor Country. I particularly wish to express my indebtedness to Mr. Kemp for the privilege of working at these planarians; the task has been made much easier by his excellent series of sketches and notes on colour made from the living animals. These notes have been incorporated in the descriptions, the reliability of which has thereby been greatly increased.

The present accounts are the result of external examination only, but it is hoped that at least some of the species will be subjected to full anatomical investigation as soon as possible.

I wish to express my gratitude to the Belfast Natural History and Philosophical Society for assistance which enabled me to examine the land planarians in the British Museum collection; my best thanks are also tendered to Mr. H. A Baylis for providing me with opportunities and accommodation for the examination of the Museum material.

Bipalium dihangense, n. sp.

(Plate xxix, figs. 1—3.)

Nine specimens of this species are included in the collections. It appears to be the commonest *Bipalium* in the Abor and surrounding country, it having been procured along the whole of the valley of the Dihang River. The animals were found attached to a variety of objects including stones, logs and leaf-stems of plantain, and in districts varying from 600 ft. to 2000 ft. in altitude.

In shape the animals conform to the typical *Bipalium* outline with broadly spread semicircular recurrent head-lobes, which in some cases curve so far inwards as to meet the sides of the neck (see fig. 3). The trunk, rather stoutly built, tapers gradually to a pointed extremity. The smallest specimen measured 53 mm. in length and 4 mm. in breadth, while the largest was 92 mm. and 7 mm. in length and breadth respectively; they present a

comparatively stout build measuring from 3 mm. to 4 mm. in thickness, a measurement which includes the raised ambulacral surface of the ventral side.

It is not easy to assign any definite position in the body for the mouth and genital aperture, but there is very little error in stating that, in the larger animals, the mouth is about half-way along the ventral surface; in the smaller specimens, the mouth is considerably further back, approximately two-thirds from the anterior end. The genital aperture is not very far removed from the mouth and its position is best described as being 7 mm. to 10 mm. behind it. As a rule both apertures were clearly visible, though in two cases the most careful examination failed to reveal more than one aperture.

The ground colour of the dorsal surface in the living animal is described by Mr. Kemp as a 'dull reddish brown'; the preserved animal presents more of a yellowish brown, frequently, however, with a reddish tint at the sides of the body. Occasionally a distinct bluish shade is to be observed; closer scrutiny shows that it is the deeper tissues that are a very dark greenish blue, and this colour can be seen through the brown; where the outer tissue has been removed by injury, the clear greenish blue is well shown. Thus in one or two cases a variety of colour is shown by an indiscriminate distribution of light blue, dark blue, green and various shades of brown.

Along the mid-dorsal line runs a thin dark line from the head to the caudal extremity, which usually widens very slightly above the regions of the mouth and genital aperture. In some specimens there is just a suspicion of a lateral darker band at the edge, much broader than the median line, and only to be seen in certain parts; this, not being constant, must be regarded as a variation. A little distance inwards from the posterior edge of the lobes of the head is a dark line not usually so prominent as the median line (see fig. 1).

The ventral colouration in the living animal is described by Mr. Kemp as brownish pink with a pale ambulacral surface, the head being somewhat dusky. In the preserved animal, the general surface is a light creamy brown or light biscuit colour; at the edges, the reddish (in some cases greenish) tint of the dorsal surface encroaches in the form of a seam. The head is always a little darker than the rest of the ventral surface. From the neck to the extreme posterior, in the mid-ventral line, is the whitish ambulacral surface, forming a prominently raised ridge, rather less than one-third the width of the body; in the region of the pharynx and genital organs it is somewhat wider; anteriorly, it is flat, and the shading gives, as in *B. giganteum*, a remarkable arrow-head appearance (see fig. 6).

Eyes surround the entire fringe of the head and lobes, and are continued round to the sides of the neck where they form a black patch; they are extremely numerous, and at the sides of the neck are much more closely approximated than on the head.

Bipalium giganteum, n. sp.

(Plate xxix, figs. 4—6.)

Eleven specimens of this species were obtained from three different localities, viz., the Rotung district, Kobo, and Dibrugarh in Assam; it thus appears that it has a fairly wide distribution. In many particulars, it bears a close resemblance to *B. dihangense*, and was occasionally found side by side with that species.

The animals are large, the smallest measuring 103 mm. in length and 7 mm. in breadth, while the largest attained the length of 217 mm. and a breadth of 15 mm.; these measurements are those of spirit-preserved animals, and thus the living creatures must be capable of extending to a considerably greater length.

The colour of the dorsal surface resembles that of *B. dihangense* and is an even dull brown; in the majority of cases, however, the brown is considerably altered by the presence of an underlying dark bluish colour; in fact the appearance is strongly suspicious of a dark slaty blue colouration covered by a secreted brown mucus.

Ventrally, the colour is markedly different from *B. dihangense*; it is an unmistakable blue grey, and lighter in shade than the blue of the underlying tissues of the dorsal surface. The under surface of the head is generally a little paler than the trunk. The ambulacral surface is much paler than the rest of the ventral surface, and forms a very prominent ridge to the extreme posterior; the anterior end of the ambulacral surface, which is flat, by reason of the shades of colour, presents very markedly the form of an arrow head (see fig. 6); true, the same thing is shown in other species, but is not nearly so pronounced as in this one.

In the majority of cases, the mouth is situated near the middle of the body, but its position is variable and it may lie nearly two-thirds from the anterior end. In many specimens, the pharynx was protruded through the mouth as a creamy frill, and in some instances had also been forced through the body wall on the dorsal surface; this suggests that the pharynx is of enormous size. The genital aperture is usually about one-third the distance between the mouth and the posterior end of the body, though this distance may be increased to one-half.

Note on **Bipalium smithi** (v. Graff).

With regard to *Bipalium giganteum*, it appeared from v. Graff's description of *Bipalium smithi*, reported from Darjiling, that the two might be identical; but a careful examination of the type specimen in the British Museum disposed of this likelihood. It may not be out of place to add a brief account of this species which refers to the complete specimen in the British

Museum of Natural History, South Kensington. Its measurements are: length 54 mm., breadth 8 mm., breadth of the head 7 mm., breadth of the neck 4 mm., breadth of ambulacral surface 3 mm. The colour dorsally is a velvety bluish black with just a touch of dull brown; the brown is more emphasized anteriorly until on the head the colour is a dirty yellowish brown with touches of rust colour. Ventrally, from the edge, the dorsal colouration passes gradually into a rusty brown, which is then sharply defined from the ambulacral surface; the flat ambulacral surface is made up of two colours (1) a narrow median deep cream, bordered on each side by (2) a light green band. The dorsal surface is much flatter than the ventral, but I would scarcely say that the edges were sharp. The ambulacral surface is not raised above the general surface, and its extreme anterior end has a pale arrow-head form of light biscuit-brown colour. The under surface of the head is a dark rusty brown. The position of the mouth and genital aperture were not to be made out with certainty.

Bipalium delicatum, n. sp.

(Plate xxix, figs. 7 and 8.)

Two specimens from Rotung, at an altitude of 1300 ft., have been included under this name, the form and colour pattern of which are similar; the general colour, however, is markedly different, one being light brown and the other a very dark brown. Both specimens were found under stones.

The light coloured specimen attains a length of 55 mm., a breadth of 5 mm. and a thickness of 3 mm. The head, which appears a little damaged, is semicircular in form and is not a great deal wider than the trunk. The mouth is placed 30 mm. from the anterior end, and the genital aperture 19 mm. behind the mouth. The ground colouration of the dorsal surface is light brown with a median band of a much paler colour extending nearly the whole length of the animal, and not well defined at the edges; this median stripe expands somewhat on the head and loses itself gradually in the general colour of the head (see fig. 7). The ventral surface is pale and about the same shade as the dorsal median band.

The dark specimen measures 39 mm. long and 4 mm. broad; the mouth is situated 15 mm. and the genital aperture 35 mm. from the anterior end. Except for two apparently bleached patches, the whole of the ventral surface is of the same colour as the dorsal. The eyes are distributed indiscriminately round the head, and are continued for a very considerable distance along the sides of the body, approaching half the animal's length. At the sides of the neck they form a well-marked patch. The paler specimen appears to have been dead some time before being preserved, and consequently, except at the neck, the eyes have been removed along with the rather disintegrated outer tissues.

Bipalium rotungense, n. sp

(Plate xxix, figs. 9 and 10.)

One individual only of this species was secured, together with the specimens of *Bipalium delicatum*. It measures 55 mm. in length, 7 mm. in breadth, and 3 mm., including the raised ambulacral surface, in thickness. The head is a little broader than the body, and is followed by a neck 4 mm. wide. The ambulacral surface is 1·5 mm. wide; the mouth is placed 32 mm. and the genital aperture 42 mm. from the anterior end. The animal is thrown into deep wrinkles over the whole of its surface, indicating that it is capable of extending considerably longer than its present length.

The colour of the dorsal surface, in spirit, is a bluish grey with touches of brown here and there. Medially is a pair of narrow dark lines separated only by a narrow pale central band. Anteriorly, both these lines and the middle band gradually merge into the general colour of the head. On the extreme edge of the dorsal surface is a rather indefinite darker line, contrasting sharply with the paler ventral surface, but indefinitely marked off on its inner dorsal side. The eyes appear to be confined to the anterior margin of the head, to which they form a dark seam (see fig. 10).

The ventral surface is paler than the dorsal and of a medium grey colour, except on the head, where the shade is darker. The median ambulacral surface is almost white; in the region of the mouth and the genital aperture it is a little broader than elsewhere.

Bipalium sordidum, n. sp.

(Plate xxx, figs. 11—14.)

This planarian, of which one specimen only was found under a stone on the bank of the Yembung River, agrees in many features with v. Graff's *B. robiginosum*, but the head colouration differs in at least one important feature.

The specimen is 28 mm. long; the greatest breadth, a little beyond the middle of the trunk, is 4·5 mm.; at the neck it is only 2 mm. broad and the head measures 3 mm. across; in thickness the body attains 3 mm. The mouth and genital aperture are respectively 14 mm. and 21 mm. from the anterior end.

The dorsal surface is flat, and the colour in the living animal is described by Mr. Kemp as "very deep umber brown with profuse black mottling, leaving an irregular very pale median band" (see fig. 11). This very narrow pale band extends from the base of the head to the extreme posterior; its boundary is very irregular and its continuity is occasionally interrupted; above the mouth and genital aperture it widens very slightly. The mottling is much denser near the middle line than at the sides, and it is in this latter position that the reddish brown is shown most clearly; the base of the head is the darkest part of

the animal, and here it is practically black. In all these features of pattern this species agrees with *B. robiginosum* (v. Graff); one difference, however, is that in the latter species, there are two prominent patches of clear reddish brown on the head, one on each side, inclined towards the middle line; such patches are not found in *B. sordidum*. Further, *B. robiginosum* is described as having a greenish or yellowish tone in the brown, though the colour seems variable; and the median line is described as stopping short of the extreme posterior.

The eyes are numerous and extend all round the head to the sides of the neck, where they are somewhat more ventral than dorsal. The head itself is not so broad as the body, whereas in *B. robiginosum* it is a little wider; preservation may have effected some contraction, but Mr. Kemp remarks that the head is not broadly expanded.

Ventrally, on either side of the ambulacral surface, the colour, in the living animal, is pale umber with very minute black specks; in the preserved animal it is a dirty brown colour. The ambulacral surface is much paler and in the preserved creature is a dirty white except in the middle line, which has a shade of brown (see fig. 14); this median portion is the only part of the ambulacral surface that is raised; at the mouth and genital aperture, it broadens out a little (see fig. 14). The under surface of the head is darker than the rest of the ventral surface.

Mr. Kemp notes that this planarian is much more sluggish in its habits than other allied species.

Placocephalus superbus, n. sp.

(Plate xxx, figs. 15—20*a*.)

All the eleven specimens of this species were found in the Rotung district. In length they range from 52 mm. to 18 mm.; the difference in length is due to the state of contraction, the 52 mm. specimen measuring only 2 mm. in breadth, while a 24 mm. specimen measured 4 mm. across. The dorsal surface is flat and the ventral strongly convex; the ambulacral surface is not perceptibly raised above the general surface. The greater part of the trunk is of similar width, though the body tapers for some little distance from the posterior end to a rather pointed extremity.

The head is much depressed dorso-ventrally, has no prominent lappets, and is only marked off from the trunk by a slight constriction. The eyes are not very numerous but extend along the free edge of the head and on the sides of the neck; in some cases they are continued for a short distance along the sides of the trunk.

The dorsal colouration of this beautiful planarian consists of the following elements: an inner pair of black lines, closely approximated, with a narrow median pale buff stripe between; on their outer edges, these thin black lines fade gradually into a pale

umber stripe, which in turn merges into a broader band of dark chestnut colour; outside this, and sharply defined at both edges, is a broad black stripe; beyond this, and at the extreme edge of the body, most specimens show a very narrow pale buff stripe, which, however, may be regarded as an encroachment of the ventral colouration. In general, the posterior end of the body is darker than the rest, the paler bands being much suppressed; the relative breadths of the colours between the broad and narrow black lines also vary frequently; occasionally, too, the inner pale umber is absent and its place taken by the dark chestnut colour which pales on reaching the outer black band.

In the region of the neck all the bands merge into a dusky area, but the head itself has a distinctive colouration, consisting of two semicircular bands, well defined from one another, a black border piece and an inner pale buff band (see fig. 17).

Ventrally, the ambulacral surface, scarcely raised above the general level, is very pale yellow—almost white—its width being about a quarter that of the body. On either side the colour may be described as a warm straw shade, slightly paler anteriorly. The mouth is situated at about the middle of the under surface, though occasionally it is a little beyond the middle. The genital aperture is three or four millimetres behind the mouth.

Appendix I.

It has been thought advisable to include a separate description of one specimen ($ZEV\frac{222}{7}$) on the ground of a striking difference in the form and colour pattern of the anterior extremity, as well as minor differences in colour. Future investigation of the internal anatomy of this specimen will finally decide its position, but in the meantime it is probably better to include it here.

The specimen is 52 mm. long with an almost uniform breadth of 24 mm.; its thickness measures only 1 mm. against the 3 mm. of the 24 mm. specimens; and the mouth and genital aperture are respectively 21 mm. and 36 mm. from the anterior end.

The patterns of the dorsal surface of the trunk are almost identical with the other specimens so far as the longitudinal black lines are concerned, except that the inner black stripes are proportionately a very little thicker. The real colour difference in the trunk is that between the inner and outer black lines is a pale lemon shade, chestnut-brown being entirely absent. Such comparatively insignificant a variation is not sufficient justification for separate treatment, but there is a striking difference in the form and colour of the anterior end. Here the specimen conforms to the Geoplanid type; no head-lobes are present and there is no sign of a neck; the eyes are placed laterally and are sparsely distributed (see figs. 18 and 19). In colour there is a complete absence of the broad black seam round the anterior end, and nothing but a general dusky tone indicates the clearly defined head of the other specimens (see fig. 18). It is possible that the

extremely attenuated form of the body has resulted in the obliteration of the head lobe, which is never very prominent: such a striking correspondence of general colour pattern suggests that the difference in form of the head may thus be accounted for. Should the animal prove to belong to the Geoplanidae, the almost identical trunk colouration could only be accounted for by regarding it as an excellent case of mimicry.

The ventral surface colouration agrees with the other specimens.

Appendix II.

Special attention should be drawn to one specimen (No. ZEV$^{\frac{8.8.1.7}{7}}$, fig. 20*a*) which shows a distinct variety in dorsal head colouration. The dorsal colours are well defined, consisting of a pale buff median stripe, flanked on either side by a thin well-defined black line, which, on reaching the head, expands into two broad patches. On the outer side of each of these median black lines is a definite chestnut brown band, followed by the rather broad pale buff stripe before reaching the broad lateral black band; the body is edged by a repetition of the pale buff marking. As in the normal specimens, the head is fringed all round with a black seam.

The head markings remind one of *Bipalium diana* with its black edge to the head lobe, and the cephalic expansions of the median pair of black lines; this latter feature is also reminiscent of *Bipalium ceres*. But neither of these species has the same general colours or the lateral black bands in the trunk. The general colour of the animal closely resembles that of some varieties of *Bipalium proserpina*, but this latter species has no black edge to the head lobe. The animal under consideration might, of course, be regarded as a variety of *B. proserpina* in which the black edge to the head is a new feature, and the broad paired central black bands (see v. Graff's Monograph) have differentiated into a thin median pair of black, and an adjacent brown, band. For the present, however, I think it is advisable to include it as a variety of *Placocephalus superbus*.

Pelmatoplana aurantia, n. sp.

(Plate xxx, figs. 21—26.)

Only a single specimen of this species was found, and was taken from under stones at Rotung. It measures 50 mm. in length, 4 mm. across, at its widest part, the region of the genital pore, and 3 mm. in thickness. The mouth is situated 18 mm. and the genital aperture 29 mm. from the anterior end. The body is sub-cylindrical for the first third of its length, beyond which it gradually becomes more depressed, tapering slowly from the genital region to a pointed extremity.

A number of eyes are present and extend round the sides and front of the uptilted head; they are more numerous at the sides

than at the front where they practically form only a single row. The extreme anterior, in this specimen, is slightly insunken, a feature which is due to contraction (see figs. 22—24).

The living animal has, dorsally, a ground colour of orange yellow (brownish yellow in spirit), with a well-defined thin median black line, and a black line, a little distance removed from the edge, on either side, a little broader, and rather less defined, particularly on its inner border (see fig. 25). At the extreme posterior all three merge, forming an almost black extremity (see fig. 26). Between the black lines the tone is somewhat dusky compared with the outer edge which is bright orange yellow. This bright zone is carried to the ventral side with very little difference in shade except at the flat ambulacral surface itself which is much paler, and measures a millimetre or less in width. On the dorsal side of the head the longitudinal markings merge into a dark grey pigmentation (see fig. 22)

The genital aperture is very prominent, but the mouth is much less so.

In many features, this species resembles *P. sondaica* (Loman), but its colour, greater breadth and flat ambulacral surface differ from the latter species.

Cotyloplana pilleata, n. sp.

(Plate xxx, figs. 27—31.)

About thirty specimens of this planarian are included in the collection, all from the Yembung and Rotung districts. The largest specimen measures 105 mm. in length, even in a contracted condition, and the smallest is 50 mm. long; most specimens are a little more than 70 mm. long, 4 to 5 mm. broad and 3 mm. in thickness. Judging from the amount of wrinkling shown, it would appear that some of these planarians are capable of an extension to quite 130 mm., and probably much more.

The dorsal surface is rather flat, while the ventral surface may be strongly convex, though in one collection made in Upper Rotung the ventral surface in all the specimens is nearly as flat as the dorsal. The anterior end is raised at a considerable angle (see fig. 29) and bears, on its upper side, the two eyes, and on the ventral side, practically at the extreme anterior, a single sucker (see figs. 28 and 30). Mr. Kemp remarks that in the living animal the head appears slightly swollen, but this is scarcely noticeable in the preserved specimens.

While the colour-pattern remains constant, the shades of colour vary very considerably. There is a mid-dorsal d ep black line running from the extreme anterior (in some few cases starting short of this) to the posterior extremity, widening quite perceptibly above the pharyngeal and genital regions. On either side of this line is a narrow strip of bright lemon yellow, which is not always well defined from a broad lateral brown band,

which completes the dorsal colouration. Occasionally the yellow is absent and the brown meets the black centre line; in other cases, a paler brown takes the place of the yellow. The brown band is liable to much variation in shade; it may be little more than a dusky yellow on the one hand, or a dirty brown on the other, between which are all intermediate shades of bright orange brown and chestnut brown. The upper surface of the head is a dusky grey, with rather lighter patches round the eyes; the general impression is that of a cap on the head. The median line merges gradually into this area.

The dorsal lateral colouration is carried round the sides of the body to the ventral surface, though often paler, as far as the ambulacral surface, which is a pale yellow (whitish in spirit); the creeping surface is about a quarter the breadth of the body, but wider at the mouth and genital pore; and in some cases forms a raised ridge, while in others it is quite flat or even depressed. The mouth is placed at less than half way along the ventral surface from the anterior end, and the genital pore at positions varying from midway between the mouth and posterior extremity to two-thirds the same distance.

EXPLANATION OF PLATE XXIX.

Bipalium dihangense, n. sp.

FIG. 1.—Dorsal aspect, natural size. *e.*, eyes.

,, 2.—Ventral aspect, natural size. *m.*, mouth; *g. o.*, genital opening.

,, 3.—Enlarged view of the head of another specimen showing the strongly recurrent head lobes.

Bipalium giganteum, n. sp.

FIG. 4.—Dorsal aspect, natural size.

,, 5.—Ventral aspect, natural size. *g. o.*, genital opening; *m.*, mouth.

,, 6.—Enlarged view of the ventral surface of the head, showing the arrow-head form of the anterior end of the ambulacral surface.

Bipalium delicatum, n. sp.

FIG. 7.—Drawing made from the light coloured specimen. Natural size.

,, 8.—Enlarged view of the dorsal surface of the anterior end of the dark specimen, showing the distribution of the eyes, which, however, extend nearly half the animal's length.

Bipalium rotungense, n. sp.

FIG. 9.—The entire animal, natural size. *a. s.*, ambulacral surface; *g. o.*, genital opening; *m.*, mouth.

,, 10.—Enlarged dorsal view of the head, showing the distribution of the eyes.

Bipalium sordidum, n. sp.

FIG. 11.—Dorsal aspect, enlarged twice natural size. The positions of the mouth and genital opening are indicated by a slightly expanded area in the median pale line.

,, 12.—Enlarged dorsal view of the head, showing the distribu- of the eyes. *e.*, eyes.

,, 13.—Enlarged ventral view of the head, showing the eyes in the region of the neck. *e.*, eyes

,, 14.—Enlarged view of the ventral surface in the region of the genital opening.



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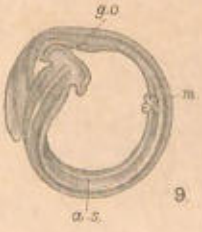
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EXPLANATION OF PLATE XXX.

Placocephalus superbus, n. sp.

FIG. 15.—Dorsal aspect, natural size.

,, 16.—Ventral aspect. *g.o.*, genital opening; *m.*, mouth.

,, 17.—Enlarged dorsal view of the head.

? *Placocephalus superbus*. (See appendices, pp. 461 and 462.)

FIG. 18.—Enlarged dorsal view of the head of specimen No. ZEV $\frac{5299}{7}$ (see p. 461).

,, 19.—Enlarged lateral view of anterior end.

,, 20.—Enlarged view of ventral side of the anterior end.

,, 20*a*.—Enlarged dorsal view of head of specimen No. ZEV $\frac{5317}{7}$ (see p. 462).

Pelmatoplana aurantia, n. sp.

FIG. 21.—The entire animal, natural size. *g. o.*, genital opening; *m.*, mouth.

,, 22.—Enlarged dorsal view of the head. *e.*, eyes.

,, 23.—Enlarged ventral view of the head.

,, 24.—Enlarged lateral view of the head. *e.*, eyes.

,, 25.—Enlarged view showing markings on the mid-dorsal surface.

,, 26.—Enlarged view of the extreme posterior end of the body.

Cotyloplana pilleata, n. sp.

FIG. 27.—Dorsal view, natural size. The positions of the mouth and genital opening are shown by the expansions of the mid-dorsal line.

,, 28.—Enlarged ventral view of the head, showing the sucker.

,, 29.—Sketch to show the raised anterior end.

,, 30.—Enlarged antero-lateral view of anterior end showing the sucker.

,, 31.—Ventral surface in the region of the genital opening.



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31.

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XXXVII. TERRESTRIAL ISOPODA.

By WALTER E. COLLINGE, *M.Sc.*, *F.L.S.*, *F.E.S.*

(Plates xxxi–xxxiii.)

The small collection of Terrestrial Isopoda collected by the Abor Expedition in the foot-hills of the Eastern Himalayas and by Mr. F. H. Gravely in Tenasserim have been placed in my hands for identification and description. Unfortunately the number of individual specimens is with one exception small and most of them are imperfect, so that their identification has not always been easy.

The *Philoscia* spp. 1 and 2 are in all probability new. I have previously seen an imperfect specimen of No. 1 from Saharanpur, U. P. Budde-Lund in 1894 (Ann. Mus. Civ. Stor. Nat. Genova, s. 2, vol. xiv, p. 612) described a species, *Philoscia coeca*, without figures, from the Farm Caves, Moulmein. The fragmentary condition of all the examples is, however, such that I do not feel justified in describing them from this material. The cosmopolitan species *Porcellionides pruinosus* (Brandt) occurs in four of the localities collected in. An interesting addition to cave fauna is the new genus *Burmoniscus*. Most of the specimens of *Cubaris* are immature, one from Sadyia, N. E. Assam, No. 8083/10, and another from the Dawna Hills, No. 8078/10, are undoubtedly new and these are here described and figured.

Porcellionides pruinosus (Brandt).

This species has previously been recorded by Stebbing[1] from Kurseong, 5,000 feet, E. Himalayas, 15-vii-07. In the present collection the localities are as follows:—

Rotung Abor Country, 1,300 feet. Under stones. 25-xii-11. No. 8080/10. Two specimens.

Kobo, 400 feet. In rotten wood. 30-xi-08. No. 8081/10. Two specimens.

Kobo, 400 feet. In rotten wood. 30-xi-08. No. 8086/10. One imperfect specimen

Sadyia, N. E. Assam. Under logs. 25-xi-11. No. 8083/10. Two specimens.

Philoscia, sp. 1.

An interesting form, but unfortunately all the specimens are imperfect. Specimens were obtained from the following localities:—

[1] Rec. Ind. Mus., 1911, p. 189.

Sadyia, N. E. Assam. Under logs. 25-xi-11. No. 8083/10. Two specimens.

Sadyia, N. E. Assam. 28-xi-11. No. 8087/10. Seven imperfect specimens.

Kobo, Abor Country, 400 feet. In rotten wood. 30-xi-08. No. 8086/10. Three imperfect specimens.

Near Parong, 3,300 feet. 27-i-12. No. 8088/10.

Philoscia, sp. 2.

One imperfect specimen from Sadyia, N. E. Assam. 28-xi-11. No. 8087/10.

Burmoniscus, n. gen.

Burmoniscus moulmeinus, n. sp.

(Pl. xxxi, figs. 1-8.)

Body (fig. 1) oblong oval, dorsal face strongly convex, perfectly smooth and shining. Cephalon small, flanked laterally by the lateral plates of the 1st segment of the mesosome. Eyes absent. Antennulae (?). Antennae (fig. 2) slender and elongated with 3-jointed flagellum. Mandibles (fig. 3) small, beneath the teeth is a single palp terminating in setose bristles. 1st maxillae (fig. 4): outer lobe terminates in eight spines, the four innermost of which are bifurcated; the inner lobe terminates in a number of fine spines. 2nd maxillae (fig. 5) thin and flexible, on the outer side it is produced into a tooth-like plate and a smaller tooth on the inner side, between which is a palp terminating in setose bristles. The segments of the mesosome are strongly convex, the lateral plates of 1—4 overlap one another slightly, whilst those of 5—7 are produced backwardly, especially the 7th. Maxillipedes (fig. 6) poorly developed. Thoracic appendages (fig. 7) elongated, with simple and plumose spines on the protopodite. Metasome narrow, lateral plates small and slightly incurved. Uropoda (fig. 8): basal plate flattened, extending beyond the telson, exopodite long and pointed, endopodite similar in shape, but smaller. Telson triangular, with peculiar lateral bosses. Colour deep brown. Length 9 mm.

Habitat.—Farm caves near Moulmein, in depths of large cave. No. 8079/10. (F. H. Gravely).

Type.—In the collection of the Indian Museum

Unlike any other cave-inhabiting species I know of, this species has a very distinct colour. Packard[1] in his account of the cave fauna of North America states, "As regards change of colour, we do not call an exception to the general law, that all cave-animals are either colourless or nearly white, or, as in the case of Arachnida and insects, much paler than their out-of-door relatives."

[1] Packard, Nat. Acad. Sci., 1887, vol. 4, pp. 3-156, pp. i-xxvii.

In the form of the uropoda, *Burmoniscus* somewhat approaches that present in *Brackenridgia cavernarum*, Ulrich [1], from Ezell's Cave and Beaver Cave, near San Marcos, Texas.

[This species, which is the one referred to in the recent paper on the cave-fauna [2] of Burma and Malaya by Dr. Annandale and myself, was found among wood that appeared to have been washed by a flood into one of the deepest recesses of the large Farm Cave. —*F. H. G.*]

Cubaris caeruleus, n. sp.

(Pl. xxxii, figs. 1–10.)

Body (fig. 1) oblong oval, dorsal face convex, slightly rugose, first segment almost twice the length of any other. Cephalon small (figs. 2 and 3), lateral lobes not well-developed, median lobe fainty indicated, epistoma with triangular-shaped depression immediately below median lobe. Eyes prominent. Antennulae longer than usual and 3-jointed. Antennae (fig. 4) slender, with the last peduncular segment long, 2-jointed flagellum, the distal joint being the longer. Mandibles (fig. 5) small, variable in three examples examined. 1st maxillae (fig. 6): the outer lobe terminates in four stout, curved spines and six more slender and almost straight ones, with numerous setae distally on the outer side, inner lobe terminally rounded, thin and with two setose spines. 2nd maxillae (fig. 7) terminating in an outer, blade-like lobe and an inner one with a dense mass of fine setae. The segments of the mesosome are fairly convex and well separated from one another laterally, with the posterior angles of the lateral plates somewhat pointed. Maxillipedes (fig. 8) well-developed, the outer lobe terminates in a large curved spine with a series of minute spinous processes, there are two small spines at the base of this on the inner side and a large one more internally, the inner lobe has a slightly flattened surface with three small marginal spines. Thoracic appendages (fig. 9) comparatively short, setaceous and fringed on the inner side with numerous strong spines, the distal extremity terminating in a prominent incurved claw. Uropoda (fig. 10): basal plate stout and not extending beyond telson; exopodite articulating in a groove on the dorsal side, endopodite large and triangular in section, fringed with numerous setae and terminating distally as three hair-like setae. It articulates on the inner side of the extreme inner dorsal border. Telson (fig. 1) compressed laterally, strongly convex, posterior margin rounded. Length 12·2 mm. Colour (in alcohol) deep blue with irregular whitish patches.

Habitat.—Thingannyinaung to Sukli, Dawna Hills, 900-2,100 ft., Tenasserim, 23–27-xi-11. No. 8078/10. (*F. H. Gravely.*)

Type.—In the collection of the Indian Museum.

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1 Ulrich, Trans. Amer. Micros. Soc., 1902, vol. 23, pp. 90-93, figs. 1-9.

2 Journ. As. Soc. Bengal (N.S.), IX, pt. 10, 1913.

[In life this species is slate-grey with bright lemon-yellow markings. It is common on exposed banks and on the leaves of bushes, where its colours render it a conspicuous and striking object.—*F. H. G.*]

Cubaris robusta, n. sp.

(Pl. xxxiii, figs. 1-9.)

Body (fig. 1) oblong oval, convex, with lateral margins of the segments slightly revolute, mesosomatic segments marked mid-dorsally with a broken white line and laterally with raised longitudinal tubercles. Cephalon (figs. 2 and 3) small with deep epistoma and small triangular lateral lobes, median lobe absent; the dorsal surface exhibits a slight median depression whilst posteriorly it is slightly raised. Eyes (figs. 2 and 3) prominent, sub-dorsal. Antennulae 3-jointed. Antennae (fig. 4) short, setaceous, flagellum 2-jointed, the distal joint two-and-a-half times longer than the proximal one. Mandibles variable. 1st maxillae (fig. 5): the outer lobe terminates in four stout, incurved spines and five more slender ones; numerous long hair-like setae on the outer margin. 2nd maxillae (fig. 6) small, terminating in a thin blade-like outer lobe with numerous setae, inner lobe tooth-like with dense mass of long setae. The segments of the mesosome are convex, the 1st strongly so; lateral plates of anterior segments well separated and slightly revolute. Maxillipedes (fig. 7): outer palp terminates in a strong spinous process with a multispinous termination, there are two smaller spines on the inner border and a fourth basally; the inner palp has a single spine and a small tooth-like process on the inner border. Thoracic appendages (fig. 8) elongated, with numerous strong spines mostly on the inner border. Uropoda (fig. 9) somewhat robust, with triangular basal plate not extending beyond the telson; exopodite small and articulating in a groove on the inner dorsal margin, endopodite a little larger, articulating with the under side of the extreme inner border, and not extending beyond the basal plate. Telson strongly convex, contracted laterally, posterior margin almost straight. Length 8·5 mm. Colour (in alcohol) horny brown.

Habitat.—Sadyia, N.E. Assam. Under logs. 25-xi-11. No. 8083/10. (*S. W. Kemp.*)

Type.—In the collection of the Indian Museum.

This interesting species finds its nearest ally in *Cubaris fragilis*, Cllge.,[1] a species I have recently described from the Andamans. It differs, however, from that species in the much stouter and stronger build of the first mesosomatic segment, the lateral plates of which, ventrally, are much thickened, dorsally the mid-dorsal portion of the segment anteriorly has a raised triangular area. In the form of the telson and uropoda there are also important differences and the antennae are rather shorter. The

[1] Rec. Ind. Mus., 1914, vol. x, p. 209, pl. xxv.

mouth parts were found to be exceedingly variable, thus four different variations were noted in the mandibles and in one specimen the outer lobe of the 1st maxilla had four stout spines and nine more slender ones, instead of five.

EXPLANATION OF PLATE XXXI.

Burmoniscus moulmeinus, gen. et sp. nov.

FIG. 1.—Dorsal view. × 8.
,, 2.—Antenna.
,, 3.—Mandible.
,, 4.—First maxilla, inner and outer lobes.
,, 5.—Second maxilla.
,, 6.—Maxillipede.
,, 7.—Second thoracic appendage.
,, 8.—Telson and uropoda.



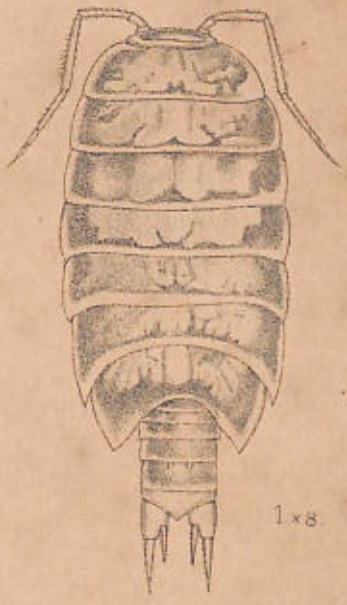
2.



3.



4.



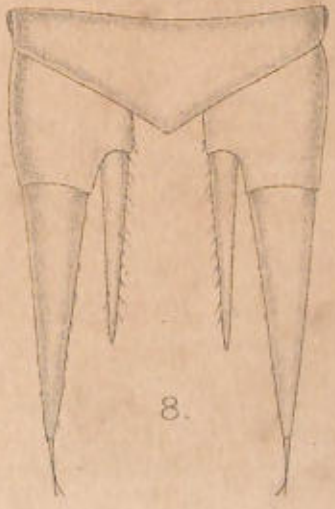
1×8



5.



7.



8.



6.

A. Chowdhary, lith.

BURMONISCUS MOULMEINUS, gen. et sp. nov.

EXPLANATION OF PLATE XXXII.

Cubaris caeruleus, n. sp.

FIG. 1.—Dorsal view. × 5.
,, 2.—Dorsal view of the cephalon.
,, 3.—Anterior view of the cephalon.
,, 4. Antenna.
,, 5.—Mandible. 5*a*. Outer side.
,, 6.—First maxilla, inner and outer lobes.
,, 7.—Second maxilla.
,, 8.—Maxillipede.
,, 9.—Second thoracic appendage.
,, 10.—Right uropod.



3.



2.



4.



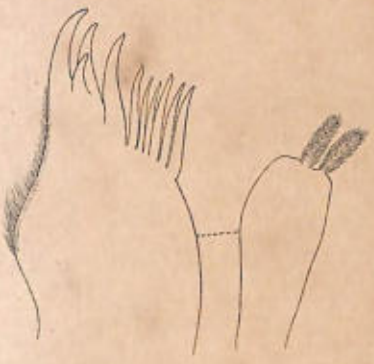
5.



5a.



1×5.



6.



8.



7.



9.



10.

A. Chowdhary, lith.

CUBARIS CAERULEUS, n. sp.

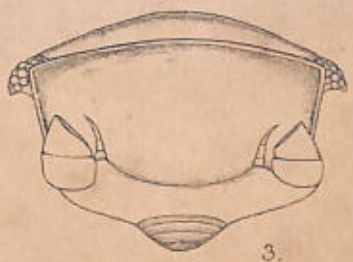
EXPLANATION OF PLATE XXXIII.

Cubaris robusta, n. sp.

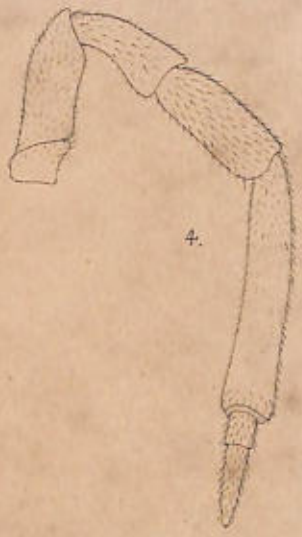
FIG. 1.—Dorsal view. × 6.
,, 2.—Dorsal view of the cephalon.
,, 3.—Anterior view of the cephalon.
,, 4.—Antenna.
,, 5.—First maxilla, inner lobe.
,, 6.—Second maxilla.
,, 7.—Maxillipede.
,, 8.—Third thoracic appendage.
,, 9.—Right uropod.



2.



3.



4.



5.

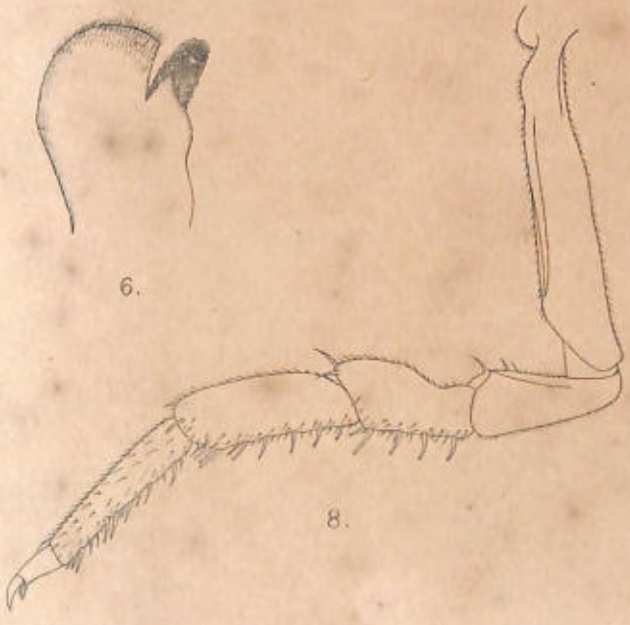


1×6.



7.

6.



8.



9.

A. Chowdhary, lith.

CUBARIS ROBUSTA, n. sp.

XXXVIII. ONYCHOPHORA.

By STANLEY KEMP, *B.A., Assistant Superintendent, Indian Museum.*

(Plates xxxiv-xxxvii.)

CONTENTS.

	Page
Introduction	471
Habits	472
External features—	
Colour	474
Skin	475
Antennal region	475
Buccal region	476
Oral tentacles	476
Legs	477
Ventral organs	478
Genital apertures	478
Internal anatomy—	
Nervous system	478
Salivary glands	479
Renal glands	479
Crural glands	480
Male reproductive organs	480
Female reproductive organs	484
Ova and development	486
Affinities	487

INTRODUCTION.

The discovery of a species of Peripatus on the north-east frontier of India at the foot of the Eastern Himalayas, must be reckoned as one of the most interesting zoological results of the Abor expedition. The Abor country lies far to the north of the nearest point at which specimens have previously been obtained, and no member of the group was hitherto known to occur within the limits of the Indian Empire. The single species found is, moreover, highly peculiar in many respects and, though showing traces of alliance with *Eoperipatus*, which occurs in Sumatra and the Malay Peninsula, differs sufficiently in regard to the characters employed by Bouvier, Evans and other authors to entitle it to separate generic rank; in the absence of any external trace of eyes it appears to be unique.

In describing this form it is not my intention to deal at length with the status of the different genera of Onychophora which have been proposed, or to support either of the systems of nomenclature upheld respectively by M. E. L. Bouvier and the late Dr.

Sedgwick. The species, as both authors have clearly shown, fall into groups comparatively well-defined both structurally and geographically and it seems convenient to recognize such groups by either generic or subgeneric titles. But the arrangement of these groups in separate families, as suggested by Bouvier and other authors, implies adherence to a particular view of the line which evolution has taken, and any such view, though it may ultimately prove correct, seems at present to be based on insufficient evidence.

I am therefore inclined to regard the existing species of Peripatus as constituting a single family, the Peripatidae, leaving the difficult problem of the descent of the various subgenera and genera until further information is available.

For the Abor species the name *Typhloperipatus williamsoni* is suggested. The specific name is given in honour of the late Mr. Noel Williamson, one time Assistant Political Officer at Sadiya, who was treacherously murdered by Minyong Abors on March 30th, 1911, at Komsing, a village not many miles distant from the spot where the specimens were obtained. It was owing, chiefly, to the murder of Mr. Williamson and of his companion, Dr. Gregorson, that the expedition of 1911–12 was undertaken.

Typhloperipatus williamsoni, Kemp.

1913. *Typhloperipatus williamsoni*, Kemp, Rec. Ind. Mus. IX, p. 241.

The camp at Rotung, where the majority of the specimens were found was situated at an elevation of 1320 ft. on a small plateau about 600 ft. above the Dihang River, one of the few approximately level pieces of ground seen in the Abor country. The site was at one time occupied by a village of Minyong Abors; but this was demolished in the latter half of 1911 and the villagers put up temporary dwellings half a mile further to the north at a considerably greater elevation.

The country in the vicinity of the camp was overgrown with dense scrub-jungle interspersed with stones and large trees, mostly jack-fruit. Here, as in so many parts, the ground had at one time been cleared for cultivation and the scrub, which as a rule was not more than ten feet high, probably represented some eight or ten years' growth.

It was on the eastern side of the camp on dry, gently sloping ground immediately above the edge of the great gorge of the Dihang River that Peripatus was found. In this particular spot the scrub is lower than elsewhere, exceptionally dense and interspersed with large stones and boulders. On December 29th, 1911, the first specimens, three in number, were found by my assistant, Mr. R. Hodgart, and a considerable number was subsequently obtained in the same locality.

Early in January 1912, only a few days after the capture of the first examples, it was decided to cut and burn the scrub in the vicinity of the stockade and the services of Nagas belong-

to one of the carrier corps were utilized for the purpose. Capt. T. Timbrel, who was in command of the carrier corps concerned, kindly allowed the coolies to assist in the collection of specimens, and it is entirely owing to the interest which they evinced that so large a number was obtained.

The specimens were all found under stones and this is a point of some interest seeing that all the Malayan species were found in dead wood. There was an abundance of rotten wood in the vicinity of Rotung and from it large collections of insects were made, but no Peripatus were ever discovered in such a situation. The majority of the specimens were found in chinks and crannies under comparatively large stones among the roots of jungle plants: we found it useless to search under small stones or those that were very large and deeply rooted. It needed considerable effort to obtain any number of examples, though several were often found under a single stone. Solitary individuals were occasionally met with, but more usually two to four adults accompanied by a number of young (sometimes as many as six) were collected together.

The Abor country has a very high rainfall and the expedition was undertaken during the driest months of the year. Many animals appeared to be seeking wet places in order to tide over this period of comparative drought, and the closed chambers behind the leaf-stems of plantains, where the air must always have been saturated with water-vapour, were inhabited by a large community of beetles, earwigs, slugs, snails, planarians, earth-worms and frogs; Peripatus, however, was never found in this situation.

The area in which the great majority of the specimens was obtained was very limited in extent, being about 200 yds. in length by 100 yds. in breadth. Subsequently a close search in a somewhat similar locality, situated to the N. E. near the mouth of the Sireng stream, resulted in the discovery of a few more individuals. In addition, a solitary example was found at a higher altitude by the 32nd Sikh Pioneers, while cutting a road between Upper Rotung and Renging. The distance between the two furthest points at which specimens were obtained did not exceed four and a half miles, the altitude ranging from about 1200 to 2000 ft.

Specimens were kept alive for some time in boxes; but the breeding season appeared to be over and no observations on the reproduction of the species were made. The young ones found with the adults appeared to be more or less of an age and it seems probable that reproduction takes place only during the wet season.

When touched, the specimens, as is usual in the Onychophora, ejected a semitransparent viscous fluid from the oral papillae. The discharge was directed with considerable accuracy towards the objects by which it was irritated, and was at first abundant in quantity: on succeeding occasions it was much less copious and, after a day or so of captivity, it was only by violent

stimulation that the specimens could be induced to perform the action at all. The viscous fluid rapidly solidified and formed long strings of a rubber-like consistency which adhered to everything with which they came in contact. That they never stuck to the animal itself was doubtless due to the special skin processes which, in life, give it such a deep velvety appearance.

We were never able to observe Peripatus feeding; but insects placed in the same box with it were afterwards found dead, in nearly all cases overwhelmed by the viscous secretion and firmly adherent to the earth with which the bottom of the box was covered.

When walking the antennae diverged and were held in the same horizontal plane as the body with the tips flexed a little outwards. Moving leisurely, the limbs of a single pair act in unison, having an opposite motion to those of the pairs immediately in front and behind: the claws of one pair almost touch those of the adjacent pair at each step. When moving more hurriedly the limbs of four or five adjacent pairs act together, waves of contraction and expansion pass from behind forwards, and a whole series of limbs is simultaneously lifted clear of the ground, so that the body of the animal has an undulating appearance and is only in contact with the ground in two or three places. The species walks backwards with great facility, employing the more rapid type of movement in so doing.

The limbs of the first four or five pairs are rather irregular in their motions. Those of the first pair are frequently held clear of the ground and this is generally the case with those of the last two pairs. At every step the claws are rapidly raised upwards, so that their dorsal surface touches the side of the limb. It seems that the pads are the most important organs in ordinary locomotion, the claws being of little apparent use in progression on a level surface.

External Features.

Colour.

Living specimens of adults were dorsally of a deep and rich raw umber brown colour, with the apices of the antennae for a distance of about 1 mm. of a very pale brown tint. When fully extended a small pale brown lenticular area situated dorso-laterally at the base of each antenna is exposed and on close examination the tips of all the larger dorsal skin-papillae are seen to be pale. The ventral surface, both of the body and its appendages was wholly pale brown.

In a few adults in which the dorsal colouration was somewhat lighter than that most usually met with, a very narrow black mid-dorsal stripe was perceptible and in preserved specimens, in which most of the original colour has disappeared[1], this is often a conspicuous feature. Microscopic examination shows

[1] The specimens have become quite pale after two years in alcohol.

that there is, in the middle of this stripe, an exceedingly fine pale line.

The young specimens obtained with the adults differed from them noticeably in colour. They were invariably of a pale, warm, buff tint, with the apices of the antennae pure white.

Skin.

The skin is thrown into the customary transverse folds bearing papillae. In dorsal view from 12 to 14 such folds may be counted between each pair of limbs. Towards the posterior end of the animal the interspaces between the appendages are reduced in size; the skin-folds are, however, as numerous here as elsewhere, being crowded together. The folds do not anastomoze with one another and appear at first sight to be continuous across the mid-dorsal region; they are, in reality, cut by the fine unpigmented longitudinal line referred to above. Laterally 7 or 8 skin-folds pass between each pair of limbs.

In the anterior part of the animal the skin-folds are separated by wide interspaces, which, in well-extended specimens are as broad as the ridges themselves: in this part of the body the primary papillae are small, the largest occurring laterally and on the appendages. Posteriorly the skin-folds are closely adjacent to one another, leaving practically no interspaces and in this region the papillae are considerably more numerous and frequently much larger than those on the anterior part of the animal.

The primary skin-papillae bear a close resemblance to those of *Eoperipatus*; but the round apical portion is, as a rule, less clearly separated from the basal portion than is shown in Evans' figures. In dorsal view the primary papillae have a rounded basal outline; they are confined to the skin-folds, but secondary papillae are not infrequent in the interspaces.

Antennal region.

The antennae (pl. xxxiv, fig. 1) are ringed in the usual manner. There are 27 or 28 large annulations and, except at the apex, intercalated between them, are secondary annulations, 18 to 20 in number and often incomplete. The antenna tapers from the base up to about the tenth primary annulation and from this onwards is parallel-sided. The apex is not swollen or club-shaped; but the five or six rings of which it is composed are closely packed together and are not separated by the interspaces which in the middle portion are conspicuous.

On the dorsal surface of the antenna the annulations bear small spine-tipped papillae of the usual form and larger papillae, similar in structure, are also to be found on the ventral surface in its distal half. On the proximal part of the ventral surface, however, a well-defined area, lanceolate in shape and extending from the base to about the middle of the antenna, is closely set, on both primary and secondary annulations, with papillae of a

curiously modified type. The basal portions of these papillae are round and well elevated above the general surface and their apical spines, usually very fine and slender, take the form of large broad scales with their apices directed forwards. The tips of one row of scales overlap the bases of the row immediately in front. Each scale is flat about ·25 mm. in length, lanceolate in outline and finely pointed distally; the margin is slightly roughened at the base of the apical portion (pl. xxxiv, fig. 3). There are very frequently two secondary annulations on the ventral aspect of the antenna between those of the primary series. These additional annulae, which are apparently developed in order to increase the number of scales, are restricted to the ventral surface and do not extend round to the dorsal side (pl. xxxiv, fig. 2).

The appearance of this scale-bearing patch is shown in pl. xxxiv, fig. 1, and in more detail in fig. 2, which represents a portion of the antenna viewed laterally; it constitutes one of the more striking external features of *T. williamsoni*, for a similar structure has not, I believe, been observed previously in any species of Peripatus.

The closest examination of the area at the base of the antenna and of the row of papillae which Bouvier terms the "*arceau oculaire*" fails to reveal any trace of the eye. I have also been unable to detect the "*organe frontale*." It seems not improbable that the patch of scales on the under surface of the antenna is tactile in function, compensating in some degree for the complete loss of sight.

Buccal region.

The mouth (pl. xxxiv, fig. 1) is surrounded by large whitish lobes or tips. The lobes of the outer ring are sixteen in number, the pairs at the anterior and posterior extremities being sometimes fused. Those of the four anterior pairs bear a single spinule, while on those situated further back there may be one, two, or more rarely three such spinules. The inner ring only exists in the anterior part of the buccal opening and consists of six lobes, three on each side; the posterior pair is usually concealed by the adjacent lobes of the outer ring. The anterior lobe is the largest and bears three spinules, while the middle lobe has two. The "tongue" is longitudinally ridged and bears a single row of spinules.

The jaws are similar to those of *Eoperipatus*. On the outer blade (pl. xxxiv, fig. 4) there are two, less commonly three, accessory teeth close to the main tooth. On the inner blade pl. xxxiv, fig. 5) there are, apparently always, three accessory teeth and a series of from eight to ten small denticles separated from the accessory teeth by a short diastema.

Oral tentacles.

The oral tentacles or papillae are short and bear skin-papillae only on the lateral portions of their distal extremities. The open-

ing is surrounded by four whitish lips similar to those round the mouth.

Legs.

Of legs there are nineteen or twenty pairs. Apparently there are usually nineteen in the male and twenty in the female. I have found one male, however, with twenty legs. In the female the legs at the posterior end of the body are, as a rule less widely separated than those at the anterior end. In the male this feature is less pronounced.

The crural grooves, or openings of the coxal organs, are usually conspicuous on all the legs except those of the first and of the last two pairs. In several specimens, of both sexes, the margins of the grooves are revolute at their distal ends, forming thick, white, ∩-shaped lips.

Owing perhaps to the somewhat contracted condition of the majority of the specimens, I have found it impossible to detect the papillae observed by Evans in connection with the crural grooves. The apertures of the crural glands are visible in one individual only, a male. In this example a single, prominently exserted, white papilla, bearing the orifice of the gland at its apex, is found at the base of the two pre-genital appendages (pl. xxxiv, fig. 7).

The pads on the sole of the limb are of the usual crescentic shape and are closely covered with fine setae. On the last pair of legs there are only two pads, both small and rudimentary; on the penultimate there are three. On all the remaining legs there are four pads. On appendages in the anterior and middle portions of the body the papillae of the first transverse row below the proximal pad, though not fused together, are often transversely elongated and are beset with fine setae in all respects similar to those of the pads (pl. xxxiv, fig. 6). This row of papillae thus constitutes, in effect, a fifth pad of a rudimentary character, incomplete and much narrower than those which form the true sole of the appendage.

The renal apertures on the fourth and fifth pairs of legs are found in the third pad counting from the base of the claw. On these limbs the pad in question is completely divided into two portions, and near this division at the end of the longer and anterior of the two portions of the pad the renal orifice is situated (pl. xxxiv, fig. 6).

The foot (pl. xxxv, figs. 3, 4) is similar to that of *Eoperipatus*. On either side of the curved claws is situated a single primary papilla: one papilla being, therefore, anterior and one posterior. The papillae are conspicuous in dorsal view by reason of their large size and each is furnished with a slender apical spine. Behind the papillae the lower surface of the foot exhibits four extremely slight elevations, two, on each side, each bearing a few longish setae (pl. xxxv, fig. 4); a lateral view of the foot consequently

differs noticeably from that of *Eoperipatus*[1] in which two secondary papillae are found on each side behind the primary papilla. The elevations mentioned above do not seem to represent vestigial secondary papillae.

Ventral organs.

In the young specimens the ventral organs are distinctly seen in external examination, occurring as small whitish areas, in some of which a minute aperture is visible, in the mid-ventral line between the leg-bases. In the adults I have been unable to discover any trace of them, either on external examination or in sections.

Genital apertures.

The genital aperture in both sexes is found between the limbs of the penultimate pair. The orifice is frequently cruciform in shape and is surrounded by the customary tumid, papillose lips. The accessory glands of the male open separately, in this respect differing from those of *Eoperipatus*. The two orifices are very inconspicuous; they are provided with small whitish lips and are placed side of side behind the base of the last pair of limbs (pl. xxxiv, fig. 7).

Internal Anatomy.

The internal anatomy of Peripatus has been so minutely investigated that it is only necessary to discuss a few points in any detail.

Nervous system.

Although no trace of the eye is visible externally the optic ganglion is well-developed and has the form of a spherical mass situated laterally at the base of the antennary nerve (pl. xxxv, figs. 1, 2, *o.g.*). The skin overlying the ganglion is wholly undifferentiated and bears papillae precisely comparable to those of the surface in the near vicinity. The epidermis is not specialized to form a cornea, the lens is entirely absent and there is no black retinal pigment.

The optic ganglion comprises a large number of ganglionic cells, but does not form a solid mass. Sections passing through it show that in the centre there is a cavity which ramifies irregularly throughout the ganglion and is lined by a loosely compacted non-cellular structure. On comparison with the fully developed eye in *Peripatoides novae zealandiae* (Hutton), it is evident that the structure which lines the cavity represents the remains of retinal rods, and it appears that the ganglionic cells which originally formed a cup-shaped mass round the base of the retina have grown round the base of the rods and have completely enveloped them. The optic nerve is well-developed and is broadly expanded within the

[1] See Evans' fig. of *E. horsti*, Quart. Journ. Microsc. Sci., XLIV, pl. xxxiv, fig. 17, 1901.

ganglion. It extends backwards through the ganglionic substance of the brain, but decreases rapidly in diameter; at its actual point of attachment with the white matter it is exceedingly slender (pl. xxxv, fig. 2).

The antennary nerve appears to be considerably stouter than usual. Possibly, as some compensation for its blindness, the antennae are more sensitive in *Typhloperipatus* than in other forms. The curious scale-bearing patch on the lower surface may well be tactile in function.

The brain differs rather noticeably in shape from those of the species figured by Balfour and Bouvier. Fig. 1, plate xxxv represents a dorsal view of the entire brain in its grosser detail, reconstructed from serial sections, the white matter being indicated as a solid mass lying within the ganglionic substance, which is shown in partial transparency.

Salivary glands.

These glands are well-developed in *Typhloperipatus*, but vary considerably in length in the specimens in which I have examined them. They may extend only to the twelfth pair of legs or may reach to a point between the fifteenth and sixteenth pairs. In sections they are sometimes, but by no means always, found lying in a cavity which may have considerable dimensions. In one instance a cavity is found surrounding the posterior end of the gland; but, as far as I am able to detect, there is no communication between it and the gland: there is no such cavity on the other side of the body.

Evans writes of "coelomic end-sacs of enormous size" in *Eoperipatus* which form a most conspicuous feature in transverse sections. I presume that the asymmetrical cavity found in the Abor specimens must be homologous with these "coelomic end-sacs", but it is evident that the resemblance between the two genera is by no means close in this respect, unless the spaces should prove in both cases to be artificial. Bouvier does not seem to regard the presence of these sacs in *Eoperipatus* as a feature of any importance, since he has omitted all reference to them in his memoir.

Renal glands.

A typical renal gland from the ninth leg-bearing segment is shown in pl. xxxv, figs. 5 and 6. It consists of the customary five parts, namely the ectodermal duct, the bladder, the coiled tube, the funnel and the coelomic end-sac. There is, of course, no renal gland at the base of the legs opposite the genital opening and that of the last leg-bearing segment is but little developed in the female and, apparently, wholly absent in the male. In the male, too, the renal glands of the two pregenital segments are poorly developed, the bladder being much reduced in size and the coiled tube practically non-existent (pl. xxxv, figs. 7–10). The gland of the third pregenital segment is, however, well formed.

Crural glands.

A single crural gland is found in the male at the base of each of the two pregenital pairs of appendages. Each gland is tubular in form, often much convoluted, and placed in close juxtaposition with the renal organs of the same segment. The glands at the base of the seventeenth legs are much longer than those of the preceding segment; as will be seen from pl. xxxv, figs. 8–10, they may show considerable differences in length. Their external openings are situated a little behind those of the renal organs.

Male Reproductive Organs (pl. xxxvi).

The testes have the form of slender tubes which arise from the dorsal aspect of the seminal vesicles and extend forwards as far as the interspace between the ninth and tenth pairs of legs. They run together throughout the greater part of their length and, in the specimen figured (pl. xxxvi, fig. 1), the distal ends turn downwards towards the ventral surface, the actual apices being directed backwards.

The seminal vesicles are large sacs, sometimes 4 mm. in length; they are placed one behind the other, overlapping slightly at their point of contact, and occupy almost the whole of the body cavity between the tenth and thirteenth pairs of legs.

The vasa deferentia arise from the inferior surface of each seminal vesicle and extend backwards as a closely convoluted mass of tubes as far as the seventeenth pair of legs. At this point, in the specimen figured, the left vas deferens, that supplied by the anterior vesicle, passes beneath both nerve-cords before running forwards to join its fellow; in a second specimen one vas deferens passes under the right nerve-cord only. The two vasa deferentia, running forwards, lie close together and become enveloped in a common sheath[1], their lumina not joining until they reach the level of the eighth or ninth legs.

The common duct is of very great length, as long as the entire animal; it passes forwards from the junction of the two vasa deferentia and in one specimen reaches the fifth, in another the interspace between the seventh and eighth legs before turning backwards. The common duct has a single loop in its downward course and runs throughout the posterior part of its length on the left side of the animal. At its termination, however, between the eighteenth or penultimate pair of legs, it passes, in both specimens examined, to the right of the two nerve-cords

The testes are in an active state of spermatogenesis. The lumen, which is not sharply defined, contains quantities of sperm-mother-cells, mostly in the spireme phase. Only quite close to the seminal vesicle is any trace of the subsequent development found, the formation of the spermatozoa taking place for the most part within the vesicle. I have been unable to detect a muscular layer in the wall of the testis near its junction with the seminal

[1] They are separated in the figure.

vesicle. The vesicles themselves are full of spermatozoa in various stages of development and among them considerable numbers of sperm-mother-cells are to be found.

The structure of the vas deferens is, in one respect, peculiar. At the point where it leaves the seminal vesicle it has thick walls, the small and sharply-defined lumen being surrounded by long columnar cells with nuclei at their bases (pl. xxxvi, fig. A). It continues backwards in this character for a short distance and then rapidly changes to a thin-walled tube with a vastly larger lumen surrounded by flattened cells (pl xxxvi, fig. B). Further backwards still it returns to its original form and again becomes a thick-walled duct, while finally, before reaching the posterior limit of its length, it reverts once more to a thin-walled condition, wholly similar in structure to that found further forwards, and in this condition passes upwards and eventually joins its fellow from the other vesicle.

That two types of structure are to be found in the vas deferens is well known and sections through the thin- and thick-walled portions of the Abor species bear a close resemblance to figures given by Gaffron and Evans. But that the duct should revert to its previous condition after once having changed to the thin-walled type has not, I believe, been noticed previously in any species of Peripatus, and it is extremely difficult to suggest any reasons for such a modification.

The thick-walled portions of the duct are distinguished by oblique hatching in the central figure on plate xxxvi. In preparing this figure I was obliged to have recourse to reconstruction from serial sections, a task which, owing to the great length of the system (2500 sections were made) proved somewhat tedious: the vasa deferentia form such an intricately convoluted mass that it was found impossible to unravel them in dissection.

When the curious change in the character of the ducts was first noticed, it was natural to conclude that some error had been made in tracing their course; but a repetition of the process led to the same result and precisely similar phenomena were observed in tracing the vas deferens on the other side of the animal. It may also be pointed out that, in sections passing through the interspaces between the fifteenth and sixteenth pairs of legs, the walls of all coils of both ducts seen in cross-section are of the thin type, whereas the thick type is to be found both in front of and behind this region. This, in itself, is sufficient to prove that the thick-walled part of each duct at the posterior end of the animal must be separated by a thin-walled interval from the portion of the duct of similar structure that opens from the seminal vesicle.

The common duct, at its point of origin, is composed of an inner layer of cells of considerable depth provided with numerous nuclei and an outer muscular layer of no great thickness (pl. xxxvi, fig. C). The inner layer, which is doubtless glandular in function and is concerned with the formation of the spermatophore, increases gradually in thickness until the anterior limit of the loop of

the common duct is reached at the level of the fifth pair of legs and is at this point very densely nucleated (fig. D). On the downward course of the duct the inner layer gradually becomes thinner, the muscular coat at the same time thickening, and after looping across from the right to the left-hand side of the animal between the tenth and eleventh pair of legs the muscular envelope is very greatly developed, and from this point onwards the duct is doubtless used for expelling the spermatophores. The lumen of this ductus ejaculatorius has at first the form of a four-rayed star (fig. E), further down it changes and becomes slit-shaped, while for some distance in front of the genital aperture its outline is conspicuously lobose (fig. F).

In the material which I have examined I have not been able to find any spermatophores completely developed, but their formation in the spermatic duct is sufficiently far advanced to enable the more characteristic features to be recognized.

In every male I have examined the mass found in the lumen of the common duct is continuous, i.e. is not divided into separate spermatophores. In the case of the male figured on plate xxxvi the coating of the mass is very distinctly thickened at four points and it is clear that three separate spermatophores are in process of development. The appearance of the contents of the duct is diagrammatically indicated in fig. 2 in optical section. The mass is at several points attached to the wall of the duct by mucus.

The spermatophore would appear to be about 2 mm. in length when fully formed. Posteriorly is a large thin-walled sac in which the bulk of the sperm products are situated. The contents consist of spermatozoa, apparently embedded in a structureless matrix together with a few large pale yellowish granules. In transverse sections such granules may often be observed, along with the cut heads and tails of spermatozoa arranged in a haphazard fashion and not radiating from a central core as in *Eoperipatus* (pl. xxxvi, fig D).

In the younger spermatophores the wall of the main sac is at several points longitudinally pleated in a somewhat irregular manner[1] and this is also the case with the most fully developed spermatophore, which, however, possesses in addition a thin and smooth horny coat (fig. H).

At the distal end of the main sac the diameter of the spermatophore is slightly lessened and the wall thickened, the lumen being in consequence considerably reduced; further forward a small expansion with a thinner wall is to be found. Beyond this again the wall is very thickly chitinized and the lumen gradually disappears, giving place to a long conical cap formed entirely of chitin (fig. J). At the anterior end of the spermatophore at least four coats are to be found.

[1] This appearance is not, I believe, due to shrinkage in preservation.

Transverse sections through the anterior ends of the two less fully developed spermatophores at the point where the walls are thickening preparatory to the formation of the cap present the very characteristic appearance shown in fig. G. In the case of the most fully developed spermatophore only the faintest indications of this structure can be made out, the star-shaped central portion having been obliterated in the further thickening which has taken place.

It seems that the spermatophore of *Typhloperipatus* differs from that of *Eoperipatus* in possessing a chitinous coating throughout its length and in the fact that the spermatozoa are not arranged radially round a central core. The coat is evidently a great deal thinner than that of *Peripatus*, as typified by "*P. edwardsii*" and studied by Gaffron[1], and the three to five swellings or chambers described by that author—separate receptacles in which masses of spermatozoa are accommodated—do not appear to have their counterpart in the Abor genus. The spherical globules found by Gaffron on the surface of the spermatophore do not seem to exist in *Typhloperipatus*.

But the most noteworthy feature of the male reproductive system of *Typhloperipatus* is the extremely great length of the unpaired duct. Evans in his account of *Eoperipatus* lays stress on this character and makes use of it in maintaining the close affinity of the Malayan genus with the neotropical *Peripatus*, a conclusion also accepted by Bouvier. In *Typhloperipatus* the common duct is about as long as the entire animal, much longer than in *Eoperipatus* and, in its proportional development, at least equalling that of any neotropical species.

The male accessory glands (pl. xxxvi, fig. 1, *m.a.g.*). open by separate openings placed side by side close behind the last pair of legs. They consist of simple tubes, which, however, are much convoluted. They run directly upwards from the openings and lie for the most part near the dorsal aspect of the animal, terminating blindly when they have reached the middle of the interspace between the sixteenth and seventeenth pairs of legs. In structure the glands agree with those of previously described forms; near the aperture the lumen is lined for a short distance with a thin investment of chitin.

In the possession of separate openings to the male accessory glands *Typhloperipatus* resembles *Peripatus* (American species only), the Australasian species (*Peripatoides* and *Ooperipatus*) and the S. African *Peripatopsis cinctipes*[2] (Purcell) and differs from *Eoperipatus* and all other species.

[1] Gaffron, Zool. Beiträge (Schneider), I, pp. 152-157, pl. xxiii, figs. 62-76 (1885). According to Bouvier, Ann. Sci. nat. Zool. (9), II, p. 292 (1905), the specimens used by Gaffron for his study of the genital organs should properly be referred to *Peripatus sedgwicki*, Bouvier.

[2] According to the views expressed by Sedgwick (Quart. Journ. Microsc. Sci., I.II, p. 379, 1908) this species belongs to the group "Capo-peripatus" or to

Female reproductive organs (pl. xxxvii).

It is extremely difficult to dissect out the female reproductive organs in a satisfactory manner, for the uteri, laden with the large heavily-yolked eggs and embryos are coiled within the body-cavity in such fashion that they cannot be separated in their entirety from one another or from the intestine folds of which completely fill all space superfluous to their development. The coats of the embryos and eggs, though they rupture at the slightest touch during dissection, are very impervious and I have consequently found it impossible to obtain satisfactory serial sections of the entire animal in this part of the body.

The ovary of *Eoperipatus* is described by Evans as being attached to the floor of the pericardium "not by a single ligament, but by an extensive surface, thus differing from all the genera as yet described .... It spreads itself out over the rectum and uteri like a saddle and pushes itself into any space that may be unoccupied, both between as well as outside the uteri." The ovary in *Typhloperipatus* is similar (pl xxxvii, figs. 1, 2). It lies closely pressed against the pericardium in the latitude of the sixteenth and seventeenth pairs of legs, its shape being determined entirely by the space available between the adjacent coils of the uteri and intestine. But though lying close against the pericardial floor, it does not appear to be attached immovably to it. I have found it easy to raise it from the surface and the fact that at the posterior end a well-marked funiculus is found, fused to the pericardial floor at the level of the eighteenth legs suggests that the ovary itself is in reality unattached. Evans did not find any structure resembling a funiculus in the specimens he examined, but Bouvier's account and figure of the ovary of *E. weldoni*[1] seems to show that the method of attachment in the Malaysian genus is sometimes precisely similar to that of *Typhloperipatus*: Bouvier found that the ovary was closely pressed against the pericardial floor, but was separable from it, and that it was attached posteriorly by a large funiculus.

The ovary varies from about 1·5 to 2·5 mm. in length: on external examination the follicles in which the maturing ova lie are conspicuous. Anteriorly it narrows and leads into a long oviduct which is unpaired for a distance equal to more than half the length of the ovary. It divides, in the specimen figured, before reaching the level of the fifteenth legs and one branch soon afterwards bears a small receptaculum ovorum on its inner side and a large receptaculum seminis on its outer side, the latter, though it is in reality fed by two ducts, appearing practically sessile (pl. xxxvii, figs. 1, 3, 4). Similar structures are visible in the

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the genus *Peripatopsis* of Bouvier's terminology. Bouvier himself regards it as the type of a separate genus *Opisthopatus*, in which he also includes *O. blainvillei*, a Chilian species in which the openings of the male accessory glands have not been described. Sedgwick places this form in a separate group "Chilioperipatus."

[1] Bouvier, Ann. Sci. nat. Zool. (9), II, p. 365, text-fig. 34, p. 32 (1905).

other branch, the receptacula ovorum and seminis being situated, however, (in all the specimens examined) somewhat further forwards; in the individual figured they lie between the legs of the fourteenth pair. From this point onwards the uteri may be twisted together or more or less straight and soon exhibit large swellings through the thin walls of which developing embryos are visible. In the specimen figured (fig. 1) the coils of the uteri reach to the eleventh legs before turning backwards; in other examples they extend further, as far as the ninth or tenth pairs. The uteri are in all cases almost filled with developing embryos and are so closely coiled together that I have found it impossible to dissect them out in a satisfactory manner. At the posterior end of the body the uterus of each side passes round the nerve cord[1]; the two join together in an extremely short vagina and open on the ventral surface between the penultimate legs.

Transverse sections show that the ovary bears a close resemblance to that of *Eoperipatus*. The walls are very deeply folded and bear follicles containing ova in various stages of development as in the species described by Evans. The right and left ovaries are completely fused and enclose a single large cavity.

The walls of the oviduct are, in structure, closely similar to those of the ovary; they do not seem to possess a muscular layer either in the unpaired portion or when they first separate. The walls are thickened, with a consequent reduction in the size of the lumen, shortly before the receptaculum ovorum is reached and in this region a narrow muscular layer is visible Beyond this point the ducts may more properly be termed uteri; the muscular layer becomes thicker and the cells of the inmost layer are very deep and apparently take on a glandular function.

The receptacula ovorum, except for the fact that they are situated at a considerable distance from the ovary, resemble those of *Eoperipatus*. They have the form of small pouches in the wall of the oviduct and are found a little behind the receptacula seminis. They are, indeed, so inconspicuous that I was at first inclined to regard them as accidental, due to some injury or malformation of the specimen. The fact that they occur in all the specimens examined proves, however, that this is not the case. As in *Eoperipatus* there is great doubt if they ever perform the function implied by their name; no eggs have been found in them and their development, compared with that found in the neotropical species, is insignificant.

The receptacula seminis are of normal structure and are completely filled with spermatozoa The two ducts, which each possesses, are applied to the wall of the vesicle and open close together into the oviduct.

The female reproductive organs are, on the whole, closely comparable to those of *Eoperipatus*; in the complete fusion of the

1 In all specimens examined.

ovaries they agree with this genus and differ from all other known forms of Onychophora.

The most remarkable feature of the system is the extremely great length of the unpaired portion of the oviduct. It is clear that the fusion between the right and left portions of the system, well seen in *Eoperipatus*, is still further developed in *Typhloperipatus* and this fact points to the conclusion, also indicated by other characters, that the Abor genus has reached a higher degree of specialization than its Malaysian relative.

Development.

Uterine ova in which no traces of the blastopore have yet appeared are completely filled with yellowish yolk and are from 1·5 to 1·6 mm. in length and about 1 mm. in breadth; they are consequently larger than those found in any genus with the exception of the Australasian *Peripatoides*.

The ova and embryos in any one female show a certain range of variation in age; but it seems that the whole cycle of development is not to be found in the uteri of any one individual. In one female the uteri are filled with ova in which no trace of structure is apparent. In another similar ova are to be found along with others in which some of the primitive segments are differentiated, the blastopore being either open or completely closed[1]. In other specimens only comparatively well developed embryos, bent double with the anterior and posterior ends in contact, are to be seen and but little difference in age is to be found between the embryo nearest the receptaculum seminis and that nearest the genital opening. I imagine that the subsequent stages will only be found in material collected at a later period of the year than that in which my material was obtained; I have not found any embryos which exhibit ring-like markings, nor any in which the feet are at all well developed.

It is clear that for purposes of classification on the lines adopted by Sedgwick it may safely be asserted that the uterine embryos of *Typhloperipatus* are nearly of the same age, in contradistinction to the condition found in *Peripatus*, *Eoperipatus*, *Mesoperipatus*, *Paraperipatus* and in some species of *Peripatoides* in which almost the entire cycle of development may be found in the uterus of a single female.

The distinction is perhaps not a very important one, for it appears probable that it is, in a large measure, due to climatic conditions. It seems likely that in the Abor country, with seasons well-defined both as regards temperature and humidity, young are produced at one period of the year only, probably in the wet season. In such a country as the Malay Archipelago, on the other hand, the climate is far more equable and the conditions are con-

[1] It was an examination of these specimens that led me, in my preliminary diagnosis (Rec. Ind. Mus., IX, p. 242, 1913), to make the erroneous statement that the embryos are of all ages.

sequently favourable for the production of young throughout the year.

Evans has noted that in the case of *Eoperipatus* it is difficult to imagine how the receptacula seminis obtain fresh supplies of spermatozoa, seeing that the uteri are completely filled with developing embryos and that young are apparently produced throughout the year He concludes that in *Eoperipatus* fertilization can only take place once during life; but it is not altogether clear that such an assumption is necessary. When the stock of spermatozoa in the receptacula is either exhausted or, through age, has become powerless, the production of embryos must perforce cease, giving opportunity in due course for the admission of a fresh supply. Naturally, the same difficulty does not arise in the case of *Typhloperipatus*, in which fertilization can be effected annually at the close of each breeding season.

The development of the external form in the embryo does not, so far as I have been able to determine from an examination of a limited number of stages [1], offer any very striking peculiarities.

In the manner of formation of the primitive somites there appears to be a considerable resemblance to *Peripatoides novæzealandiae* [2]. The germ-bands develop in a curved line on either side; they are widely separated from one another and between them a ventral protrusion of the yolk-mass is visible (pl. xxxvii, figs. 5, 6). I have not found any embryo at all similar to the second stage in the development of *Eoperipatus weldoni* figured by Evans (Quart. Journ. Microsc. Sci., pl. V, fig. 2, 1902).

A number of females were found to contain embryos in a comparatively advanced stage, with annulate antennae and all, or nearly all, the limbs differentiated. Two of these are figured in pl. xxxvii, figs. 7-9, illustrating the two different ways in which the embryo may be folded.

AFFINITIES

Following the method adopted by Sedgwick in his concise account of the distribution and classification of the Onychophora (Quart. Journ. Microsc. Sci., LII, p. 379, 1908) the principal characters of the genus *Typhloperipatus* may be thus summarized:—

1. Number of legs, nineteen or twenty, variable in the same species.
2. Inner jaw with a diastema and saw of denticles.
3. Legs with four complete spinous pads.
4. Nephridial openings of the fourth and fifth legs situated on the third pad.

[1] In my material the embryos which are well preserved (fixed in hot corrosive) represent only comparatively late stages. The early stages are not in very good condition and, being exceedingly brittle, it was extremely difficult to remove them from the uteri in an entire state. I am thus not able to figure as many stages as I wished.

[2] Sheldon Quart. Journ. Microsc. Sci., XXVIII, XXIX, 1888-9.

5. Feet with two distal papillae, one anterior, one posterior.
6. Genital opening between the legs of the penultimate pair.
7. Receptacula seminis present, with two ducts opening into the oviducts.
8. Receptacula ovorum present
9. Oviducts united for some distance in front of ovary.
9*a*. Ovaries completely fused, with a single cavity. They lie closely pressed against but not directly attached to the floor of the pericardium, to which, however, they are connected posteriorly by means of a funiculus.
10. The ovary is exogenous, i.e. it is studded with follicles in which the maturing ova lie.
11. The ova are large and heavily charged with food-yolk; they measure about 1·5 mm. in their longest diameter.
12. Embryo without a trophic vesicle.
13. Uterine embryos of about the same age.
14 Unpaired part of vas deferens of very great length.
15 Spermatophores long, with horny coat and cap.
16. Skin-pigment brown, disappearing in course of time in alcohol.
17. Legs with well-developed coxal glands.
18. A single crural gland in the male in each of the two pre-genital pairs of legs.
19. The accessory glands of the male open separately on the ventral surface between the genital opening and the anus.

To these it must be added that there is no external trace of eyes and that there is a patch of highly modified scales, probably sensory in function, on the lower surface of each antenna.

The absence of eyes and the curious modifications in the antennae are doubtless to be regarded as evidence of specialization. They are not shared by any other genus of Onychophora and have consequently been omitted in the table below [1] which is intended to give a general idea of the manner in which the various genera are related.

[1] In this table I have employed the division of species, based on geographical distribution, advocated by Sedgwick (*loc. cit.*), following Bouvier's monograph in the matter of nomenclature so far as it is consistent with Sedgwick's scheme. I follow Sedgwick in placing *Opisthopatus cinctipes*, Purcell, in the S. African group, the name *Chilioperipatus* being available for the species which Bouvier refers to as *Opisthopatus blainvillei*. Sedgwick has already pointed out that *Ooperipatus*, Dendy, here merged with *Peripatoides*, is, according to Bouvier's own showing, a polyphyletic genus. Since Sedgwick's paper appeared a species of Peripatus, *P. ceramensis*, has been recorded from Ceram (Muir and Kershaw, Quart. Journ. Microsc. Sci., LIII, p. 737, 1909). This form is unquestionably to be referred to *Paraperipatus* and two additional species, also belonging to the same genus, have been described from New Guinea (Sedgwick, Nature, LXXIII, p. 369, 1910, and Horst, Notes Leyden Mus., XXXII, p. 217, 1910).

Typhloperipatus. Foot-hills of N.-E. Himalayas.	*Eoperipatus*. Malaysia.	*Peripatus*. Tropical America.	*Mesoperipatus*. Tropical Africa.	*Peripatoides*. Australasia.	*Paraperipatus*. New Britain, New Guinea, Ceram.	*Peripatopsis*. S. Africa.	*Chilioperipatus*. Chili.
Number of legs 19 or 20 pairs	23—25	23—43	23—27	14—16	21—29	16—25	19—
Number of legs variable ...	±	+	+	—	+	±	+
Inner jaw with a diastema and saw of denticles	+	+	+	—	—	—	—
Legs with 4 complete spinous pads	4	4—6	3	3	3	3	3
Nephridial openings of 4th and 5th legs on 3rd pad ...	—	+	+	+	+	+	+
Feet with two distal papillae, one anterior, one posterior ...	+	—	—	—	—	—	—
Genital opening between penultimate legs	+	+	+	—	—	—	—
Receptacula seminis present with two ducts	+	+	+[1]	+	+	—	—
Receptacula ovorum present ...	+	+	+	—	—	—	—
Oviducts united in front of ovary	+	+	—	+	+	+	+
Ovaries completely fused with a single cavity	+	—	—	—	—	—	—
Ovary attached to pericardial floor	+	+	—	+	—	±	—
Ovary exogenous ...	+	—	—[2]	+	+	+	—
Ova large	+	—	—	+	—	—	—
Embryo without trophic vesicle	+	—	[2]	+	+	—[2]	—
Uterine embryos of nearly the same age	—	—	—	±	—	+	+
Unpaired part of vas deferens of great length... ...	+	+	+	+	—	—	—
Spermatophore large, with horny cap	+	+	?	+	—	—	—
Skin-pigment brown, evanescent in alcohol ...	+	+	+	—	—	—	—
Legs with well-developed coxal glands	+	+	+	—	—	±	—
Crural glands of male in two pre-genital pairs of legs only	+	—	+	±	—	—	?
Accessory glands of male opening ventrally between genital opening and anus ...	+	+	+	+	—	±	?
Accessory glands of male opening separately	—	+	—	+	—	±	?

It is clear that the affinities of *Typhloperipatus* are primarily with its nearest geographical neighbour, *Eoperipatus*, with which, except for the unique characters mentioned above, it agrees in all important structural details but four, viz.—(i) the position of the renal openings of the fourth and fifth legs which, as in most genera

[1] It is not known if two ducts are present.

[2] According to Bouvier a tendency towards the formation of a trophic vesicle is found in certain species.

of Onychophora, are situated on the third pad, (ii) the presence of a horny coat, as well as a cap, on the spermatophore, (iii) the separation of the openings of the male accessory glands, and (iv) the similarity in age between the embryos found in a single female. It may also be noted that in *Typhloperipatus* the oviducts are united for a long distance in front of the ovary and that in the male there is only a single crural gland in each of the two pregenital pairs of limbs in place of the two found in *Eoperipatus*. In the number and position of the leg papillae and in the complete fusion of the ovaries, the Abor genus agrees with *Eoperipatus* and differs from all other known forms. It can scarcely be doubted that *Typhloperipatus* is an offshoot from the original Malaysian stock and that it is, on the whole, much more highly specialized than its allies in the Malay Archipelago and in Sumatra.

In other respects the affinities of *Typhloperipatus* seem to lie with the neotropical forms (*Peripatus*) and with those found in Australia and New Zealand (*Peripatoides*).

Evans lays stress on the points of resemblance between the Malaysian species and *Peripatus*, separating these two genera, along with *Mesoperipatus*, in a distinct subfamily. Bouvier goes still further and places them in a separate family, while Sedgwick holds the view that it is premature and inconvenient even to establish separate genera.

In *Typhloperipatus* the affinity with the neotropical species is even more pronounced than in the case of *Eoperipatus*, for it possesses several characters in common with *Peripatus* which are not shared by the Malaysian forms. Thus, the unpaired portion of the vas deferens is of much greater length than in *Eoperipatus*, being fully as long as in any neotropical species; the spermatophore is provided with a horny coat and the male accessory glands have separate openings. It also agrees with *Eoperipatus* in all the characters which that genus shares with the neotropical forms.

It seems probable, therefore, that the structure of the Abor genus will be adduced as further evidence that the views advanced by Evans and Bouvier are correct, though it is, I think, reasonable to hold that the belief in the close genetic relationship of the four genera *Peripatus*, *Mesoperipatus*, *Eoperipatus* and *Typhloperipatus*—the only interpretation that can be placed on Bouvier's classification—is not sufficiently well substantiated by the evidence available. As Sedgwick has shown, the characters of the different geographical groups or genera intermingle in a most intricate way and, in attempting to assess the value of the various combinations which are met with, it is, in the present state of our knowledge, almost impossible to determine which indicate affinity and which are merely examples of convergence.

Though agreeing in the segregation of the four genera mentioned above Bouvier and Evans hold diametrically opposed views as to the question, which is the most primitive genus now existing. A small and yolkless egg, which Bouvier holds to be the primitive condition, Evans regards as evidence of specialization,

Peripatus, according to the former author, *Eoperipatus*, according to the latter, comprising the least modified known species In effect, Bouvier maintains that the heavily-yolked eggs found in *Eoperipatus* and in *Peripatoides* are examples of convergence and for the discrimination of the "families" relies on other characters which at first sight seem less important.

Although it appears at present that the points in which the Abor and Malaysian genera show affinity with the neotropical species outweigh the characters which might be adduced as evidence of relationship with any other genus, it is possible that future research may indicate that a preponderant value should be assigned to characters based on development and in this respect the widest differences exist between the neotropical species and those found in the Abor country and Malaysia. In this event the possibility of relationship with the Australasian forms cannot be overlooked. *Peripatoides*, in the manner of its development, shows a close resemblance to *Eoperipatus* and *Typhloperipatus* and also agrees with them in many important anatomical details.

It is interesting to note that a line of migration such as would be implied in this last view is not altogether without support when the known distribution of other groups of animals is considered. Michaelsen[1] has shown that certain genera of Megascolecid Oligochaetes are found in New Zealand and India and not, apparently, elsewhere and that abundant evidence exists in this group of a faunistic connection between Australia and New Zealand on the one hand and India and Ceylon on the other. Another instance of this connection is afforded by the small freshwater prawn, *Xiphocaridina curvirostris* (Heller), which is at present known only from N.-E. Assam and from New Zealand[2]. *Xiphocaridina* belongs to the Atyidae, and is one of the most primitive genera in a family whose ancestral characters have long been recognized.

On the other hand there is a large body of evidence in favour of a faunistic connection between India and the neotropical region, traced in most cases, so far as land and freshwater forms are concerned, by way of tropical Africa. As instances of this the Aetheriidae among freshwater Lamellibranchs[3], the Cichlidae or Chromides in freshwater fish[4] and the Caecilians[5] may be cited.

It seems then that the existence of lines of migration between India and Australasia on the one hand and between India and the neotropical region, *viâ* Africa, on the other hand is in some measure established. From a geographical point of view it would therefore be possible that *Eoperipatus* and *Typhloperipatus* might

[1] Michaelsen, Mem. Ind. Mus., I, pp. 118–129 (1909) and Abhandl. Naturwiss. Verein Hamburg, XIX, 5, pp. 21–26 (1910).

[2] Kemp, Rec. Ind. Mus., VII, p. 113 (1912).

[3] See Annandale, "The African Element in the Freshwater Fauna of British India," IX Congrès Internat. Zool., Monaco, 1913, p. 583 (1914).

[4] Gunther, "Introd. to Study of Fishes," p. 534 (1880).

[5] Alcock, "Ann. Mag. Nat. Hist. (7)," XIV, p. 267 (1904).

be genetically connected either with *Peripatoides* or with *Peripatus* with both of which it also possesses morphological affinities

As the question stands at present the evidence for a neotropical connection seems to outweigh that for a migration from the Australasian region, and if we accept the view that the former has occurred, some support is given by what is known of the structure of the tropical African *Mesoperipatus*, which both Evans and Bouvier associate with *Peripatus* and *Eoperipatus*. A further study of the tropical African species may be expected to prove of considerable interest from this point of view and if any Onychophore should be discovered in S. India or Ceylon results of great importance may be anticipated.

EXPLANATION OF PLATE XXXIV.

Typhloperipatus williamsoni, Kemp.

FIG. 1.—Cephalic region and first pair of legs in ventral view.

,, 2.—Lateral view of antenna, showing the scales and additional secondary annulations on the ventral surface.

,, 3.—One of the scales from the lower surface of the antennae, further enlarged.

,, 4.—Outer jaw-blade.

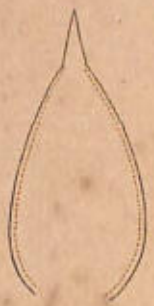
,, 5.—Inner jaw-blade.

,, 6.—Fourth and fifth legs, seen from below, showing the spinous pads and the positions of the renal apertures.

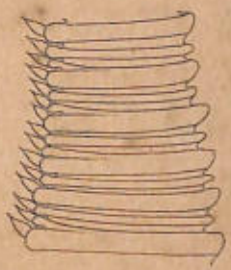
,, 7.—The posterior end of a male with the last four pairs of legs, showing the genital orifice and the crural glands at the base of the two pre-genital pairs of limbs.

REFERENCE LETTERS.

c.g.a., apertures of crural gland.
m.a.g., apertures of male accessory glands.
r.a., renal aperture.



3.



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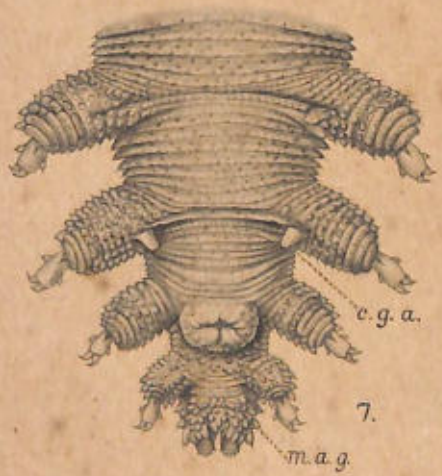
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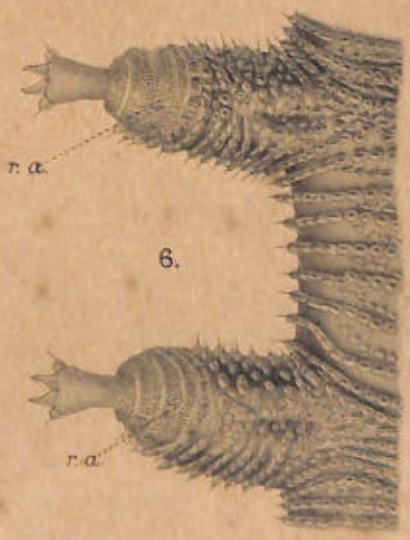
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D. Bagchi & A. Chowdhary, del.

TYPHLOPERIPATUS WILLIAMSONI, KEMP.

Bemrose, Colls., Derby

EXPLANATION OF PLATE XXXV.

Typhloperipatus williamsoni, Kemp.

FIG. 1.—Brain in dorsal view. The white matter is indicated as a solid mass lying within the ganglionic substance which is shown in partial transparency.

,, 2.—Portion of a longitudinal horizontal section of the brain passing through the antennary nerve (*a.n.*) and the optic ganglion (*o.g.*). The optic nerve is expanded within the ganglion, but is completely surrounded by ganglionic cells. A loosely compacted structure within the ganglion (*r r.*) apparently represents the remains of the retinal rods.

,, 3.—A foot in dorsal view.

,, 4.—Lateral view of another foot.

,, 5.—Lateral view of a renal gland from the ninth leg-bearing somite, the coelomic end-sac indicated diagrammatically.

,, 6.—Anterior view of the same gland.

,, 7.—A renal gland from the sixteenth leg-bearing somite of a male, seen from in front.

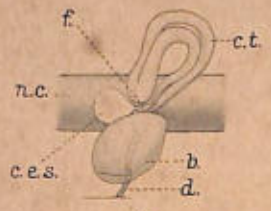
,, 8.—Crural and renal glands from the seventeenth leg-bearing somite of a male in lateral view.

,, 9.—Crural and renal glands from the sixteenth leg-bearing somite of the same specimen in lateral view.

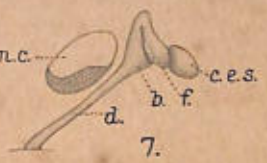
,, 10.—Crural and renal glands of the three pregenital somites of another male, seen in lateral view, the nerve cord being indicated diagrammatically in the background. The somites are numbered in roman numerals (XV–XVII).

REFERENCE LETTERS.

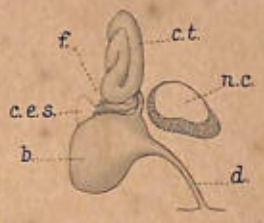
a.n., antennary nerve
b., bladder.
c.e.s., coelomic end sac.
c.g., crural gland.
c.t., coiled tube.
d., duct.
f., funnel.
n.c., nerve cord.
o.g., optic ganglion.
o.n., optic nerve.
r.g., renal gland.
r.r., remains of retinal rods.



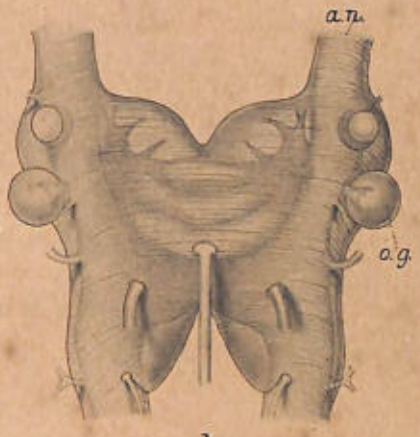
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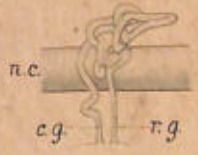
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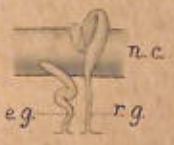
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TYPHLOPERIPATUS WILLIAMSONI, KEMP.

Bemrose, Colls., Derby.

EXPLANATION OF PLATE XXXVI.

Typhloperipatus williamsoni, Kemp.

Male Reproductive Organs.

FIG. 1.—The entire system seen from above, displayed semidiagrammatically, magnified about 7 times. In order to show the various parts clearly a certain amount of lateral displacement has been necessary. The testes, separated in the figure, run together for the greater part of their length; the right seminal vesicle slightly overlaps its fellow and the vasa deferentia form an intricate mass in the hinder part of the body.

The dotted lines in the background indicate the position, in relation to the reproductive organs, of the body-wall and legs, the latter being numbered (V–XIX) in roman numerals. The thick-walled portions of the vasa deferentia are distinguished by oblique hatching.

The position of the sections shown on either side is indicated by horizontal lines and reference letters A–F.

A. Section through one of the thick-walled portions of the vas deferens.

B. Section through one of the thin-walled portions of the same duct.

C. } Sections through the common duct. In C and D
D. } sections of partially formed spermatophores are
E. } shown. E and F pass through the ductus ejacula-
F. } torius.

,, 2.—The anterior loop of the common duct of the same specimen indicated by dotted lines, with the spermatic mass shown diagrammatically in optical section. It will be noticed that the walls are thickened at various points and that the mass comprises three partially formed spermatophores. The position of the sections shown to the right is indicated by horizontal lines and reference letters G–J.

G. Section through the thick-walled portion joining two partially formed spermatophores The lumen almost obliterated and characteristically star-shaped.

H Section through the main sac of a spermatophore: the inner wall irregularly fluted and surrounded by a smooth chitinous coat.

J. Section through the chitinous cap.

REFERENCE LETTERS.

c.d., common duct.
d.e, ductus ejaculatorius.
l.t., left testis.
l.v.d., left vas deferens.
l.v.s., left vesicula seminalis.
m.a.g., male accessory gland.
n.c., nerve cord.
r., rectum.
r.t., right testis.
r.v.d., right vas deferens.
r.v.s., right vesicula seminalis.



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Bemrose, Colls., Derby.

TYPHLOPERIPATUS WILLIAMSONI, KEMP.

EXPLANATION OF PLATE XXXVII.

Typhloperipatus williamsoni, Kemp.

Female Reproductive Organs and Embryos.

FIG. 1.—The female reproductive organs, seen from below, magnified about 8 times. A considerable portion of the embryo-laden uterus is omitted. The ovary, which is laid over on the right side, is attached posteriorly to the pericardial floor in the mid-dorsal line by means of a funiculus. The dotted line in the background indicates the position, in relation to the reproductive system, of the body-wall and legs, the latter being numbered (XI–XX) in roman numerals.

,, 2.—Ovary of the same specimen more highly magnified : ova are seen developing in follicles.

,, 3.—A portion of the oviducts and uteri, with receptacula seminis and ovorum, of the same specimen seen from the other side (dorsal view), showing the double ducts leading from the receptacula seminis.

,, 4.—The same portions of another specimen ; in this case an incision was made in the animal before fixation with the result that the ducts and receptacula extruded themselves from the body-cavity and in so doing became straightened. The first embryo in one uterus is shown and it will be noticed that it is well developed : the embryo found nearest the vagina in this specimen was practically the same age.

,, 5.—An early stage in the development. The blastopore is open and two primitive segments are differentiated.

,, 6.—A somewhat later stage. The blastopore is closed in the middle and the germ-bands on either side are separated by a ventral protrusion of yolk.

,, 7.—A more fully developed embryo, bent double.

,, 8.—The anterior portion of the same embryo in ventral view.

,, 9.—Another embryo, scarcely more advanced than that shown in fig. 7, but folded in a different manner.

REFERENCE LETTERS.

em., embryo.
f., funiculus.
g.a., genital aperture.
n.c., nerve cord.
o , ovary.
ovd., oviduct.
r.o., receptaculum ovorum.
r.s., receptaculum seminis.
ut., uterus.



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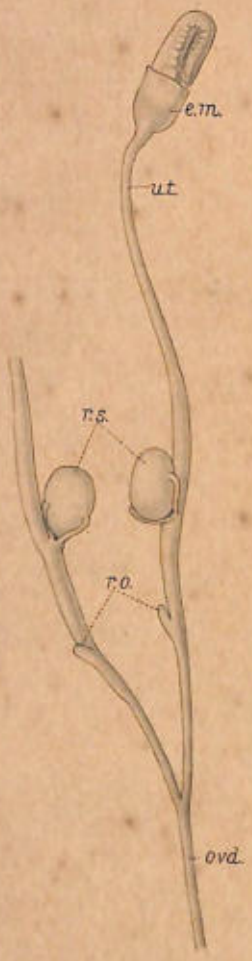
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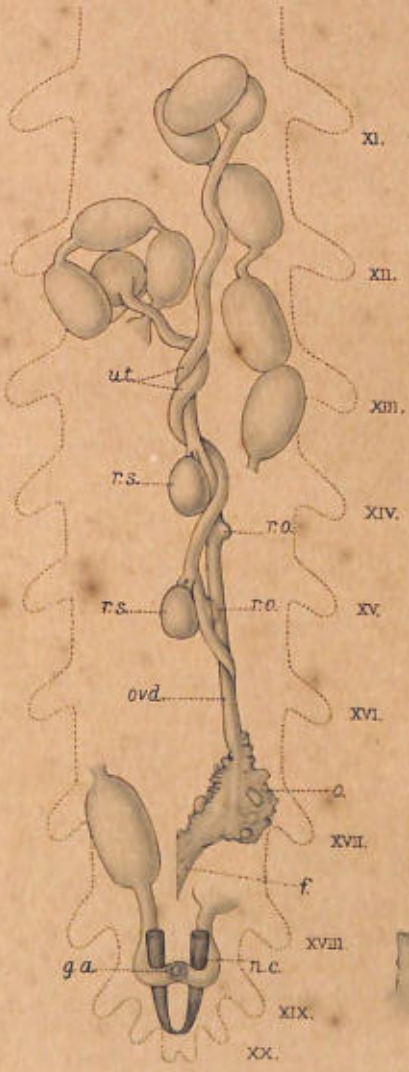
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S. W. K. & A. Chowdhary, del.

TYPHLOPERIPATUS WILLIAMSONI, KEMP.

Bemrose, Colls., Derby

XXIII. HYMENOPTERA, IV: ICHNEUMONIDAE

By CLAUDE MORLEY, *F.Z.S., F.E.S.*, &c., *Author of "Fauna of India—Ichneumonidae."*

Microgaster luteus, Cam.

Manch. Mem., 1899, p. 199, ♂.

The ♀ is undescribed. It differs from the ♂ in its much stouter antennæ and hind legs, of which the former are apically subclavate; in its cultriform hypopygium extending to the anus; in its stout terebra, which is as long as the whole body; and in having the alar apices more determinately infumate, with a distinct cloud below the broader stigma. Three small males of 6–7 mm. at Sadiya on 27th and 28th November, and a single female of 7 mm. at Kobo, 400 feet, on 3rd December, 1911.

Epirhyssa flavobalteata, Cam.

Manch. Mem., 1899, p. 129.

One small ♂ of only 10 mm. at Rotung, 1400 feet, between 6th and 13th March, 1912.

Xanthopimpla punctata, Fab.

Spp. Ins., 1781, p. 437.

Two males at Sadiya on 27th November, and one female at Dibrugarh between the 17th and 19th of the same month.

Xanthopimpla nursei, Cam.

Journ. Bombay Nat. Hist. Soc., 1907, p. 592.

A single male at Dibrugarh between the 17th and 19th November, 1911.

Apophua carinata, Morl.

Faun. Brit. India, Ichn., 1913, p. 215.

One ♀ at Sadiya on 27th November, 1911. The undescribed hind legs are testaceous, with both extremities of the tibiæ, apices of femora, and the whole tarsi, black.

Stictolissonota foveata, Cam.

The ♂ is undescribed and the ♀ unknown to me. A single male, found at Sadiya on 23rd November, 1911, differs from the female description (Tijds. v. Ent. 1907, p. 107) in having the face

entirely pale; the tenth to seventeenth flagellar joints white, with the remaining twelve apical ones ve y short and exactly filiform; the metathoracic spot, unplaced by Cameron, is here represented by a large metapleural mark and the whole petiolar area, except the centre of its apex, flavous; apices of all the segments pale and genitalia exserted; the hind legs red with trochanters, extreme base of both the white tarsi and white tibiæ, with apices of the last broadly and of their femora narrowly, and the onyches, deep black. The position of this genus with its single species in the Lissonotides rests solely upon the typical petiolar structure, for the areolet is subquadrate and parallel-sided as in the Mesostenides, though emitting its recurrent nervure from its centre; the unicalcarate front tibiæ and indiscreted clypeus are good features.

Metopius rufus, Cam.

Zeits. Hym.-Dip., 1905, p. 281.

A single female at Dibrugarh between 17th and 19th November, 1911.

Œdematopsis aborensis, Morl., sp. n.

Black with the whole legs, thorax except discally and head except vertically, stramineous; mesonotum rosy; scutellum pale. Head strongly buccate behind, though less elongate than in *Œ. apollos*, Morl. (Faun. India, Ichn. 50), and stramineous with only the vertex from scrobes to occiput, including stemmaticum and excluding orbits, deep black. Antennæ fractae, infuscate with scape whitish beneath. Thorax with pleurae finely punctate, mesonotum glabrous and strongly glittering, rosy (as in *Œ. ops*, Morl. (Ichn. Britannica, iii, 273), its lateral sutures and pronotal disc black; metanotum scabrous with areola strongly elongate, emitting strong and short costulae; basal area short and entire, petiolar area nearly as long as areola and transstrigose. Scutellum and postscutellum flavous, the former finely punctate and laterally margined nearly to its apex. Abdomen parallel-sided and very slender, punctate-rugose with the basal segment roughly aciculate and its spiracles far before the centre; ventral valvulae large, black and exserted. Legs slender, with the somewhat stout hind tibiae hardly infuscate apically and before their base. Wings normal, with the stigma and nervures stramineous. Length, 5 mm. ♂ only.

A single ♂ was captured at Sadiya in north-east Assam by Mr. S. W. Kemp of the Abor Expedition on 28th November, 1911. Type in the Indian Museum. No. $\frac{3144}{10}$.

Allocamptus sinuatus, Morl.

Revis. Ichn. Brit. Mus., 1912, p. 24.

One female was captured at artificial light below Dosing at 1400 feet on 29th January, 1912.

Trichomma decorum, Cam

Anomalon decorum, Cam., *Manch. Mem.*, 1897, p. 24, ♀.

The ♂ has not previously been found; it differs from the ♀ in having the flagellum infuscate-testaceous towards the base, the eyes apically rather less convergent, the scutellum discally less distinctly transcarinate, and the hind trochanters with their femoral and tibial base not at all black but the first tarsal joint, though distinctly spatuliform, is similarly pale. Length, ♂ 10, ♀ 12 mm.

This male was taken at Dibrugarh between 17th and 19th November, 1911; a single female is from Sadiya on 28th of the same month. I was recently enabled finally to assign this species to *Trichomma* upon the examination of another female, captured by the late Col Bingham at Kyau Klebin in Upper Burma in Nov. 1900, and now in the Berlin Museum.

Anomalon ? binghami, Cam.

Ann. Nat. Hist., xx, 1907, p. 14, ♂.

One broken and consequently doubtful male was found at Sadiya on 25th Nov. 1911. I have recently examined two of the undescribed female of this species in the Berlin Museum, which were captured in Sikkim by Bingham; it differs from the ♂ in having the inner orbits but obsoletely pale, the terebra fully half as long as the basal segment, with a length of only 18 mm. It is correctly ascribed to the present genus.

Campoplex tyrannus, Cam.

Manch. Mem., 1899, p. 116.

A single small female of 9 mm. was found at Dibrugarh between 17th and 19th November, 1911.

Dioctes apostata, Grav.

Ichn. Europ., iii, p. 510.

Kobo at 400 feet on 9th December, 1911. One female.

Angitia sp.

An indeterminable male was found at Sadiya on 23rd November, 1911.

Tarytia flavidorbitalis, Cam.

Journ. Bombay Nat. Hist. Soc., 1907, p. 589.

With the above *Angitia* was taken a female of this common species.

Thymaris clotho, Morl.

Faun. Brit. India, Ichn., 1913, p. 53.

The second known specimen of this Ceylonese species was captured at Dibrugarh between the 17th and 19th November, 1911. This ♀ differs from the type only in having the two basal segments black with the second only basally rufescent, and the third basally flavidous. The figure in Fauna India is very poor, showing the abdomen too stout, terebra too thick, wings too broad and flagellum much too short; the last is, in fact, a millimetre longer than the whole body.

Diaparsis sp.

One female belonging to this genus was met with at Dibrugarh between the 17th and 19th November, 1911. It is certainly distinct from the only known Indian kind, my *D. caudata;* but its condition precludes description.

Cnemocryptus epistomatus, Morl., sp. n.

A black and shining species with the scutellum and abdominal base white, the legs and abdominal centre red. Head transverse and as broad as thorax, obsoletely punctate with the frons glabrous and excarinate; palpi white; mandibles rufescent with the upper tooth a little the longer and clypeus apically truncate; face closely punctate and centrally tuberculiformly elevated. Antennae stout and black with a broad central white band; of ♂ subattenuate at both extremities with scape white, and flagellar base rufescent, beneath; of ♀ strongly dilato-compressed beyond their centre. Thorax convex and finely punctate, with strong notauli; pronotum and a callosity beneath radices white; mesopleurae sulcate below; metathorax subglabrous with all the areae clearly defined and petiolar area discreted; areola longer than broad, hexagonal, emitting costulae before its centre; spiracles longer than broad, apophyses wanting. Scutellum and postscutellum white, the former glabrous and convex. Abdomen subfusiform, black and slightly pilose with the sixth and following segments white; petiole also white with postpetiole and part of second segment bright red; terebra nearly as long as first segment. Legs red with the anterior of ♂ paler; hind femora and tibiae more or less infuscate or black with base of latter rufescent, and the second to fourth tarsal joints with apex of the first pure white. Wings ample and hyaline; radix white, areolet large and parallel-sided, emitting the recurrent nervure from its centre; basal nervure continuous, nervellus geniculate at its lower third. Length, 6–8 mm. ♂ ♀.

A single pair was captured at Sadiya on 27th November, 1911, by Mr. S. W. Kemp and is in the Indian Museum. No. $\frac{2157}{20}$.

Camptolynx striatus, Cam.

Berl. Ent. Zeit., iv, 1910, p. 254.

One ♀ of this common species occurred at Sadiya on 23rd November, 1911.

Camptolynx fuscipennis, Cam.

Berl. Ent. Zeit., iv, 1910, p. 253.

A male at Dibrugarh between 17th and 19th November, 1911.

Goryphus maculiceps, Cam.

Melcha maculiceps, Cam., *Spolia Zeylanica*, 1905, p. 110.

Sadiya on 27th November, 1911. One female, with unusually large apophyses.

Goryphus fuscinervis, Cam.

Ancaria fuscinervis, Cam., *Ann. Nat. Hist.*, ix, 1902, p. 205.

Two females were taken at Dibrugarh about the 18th Nov., and at Rotung at 1400 feet on 25th December, 1911; three males occurred at Sadiya on 27th and 28th Nov., and at Dibrugarh about the 18th of the same month.

Silsila fulvipes, Cam.

Manch. Mem., 1903, no. 14, p. 2.

A variety of the ♀, with face black and didymate marks on the clypeus, was taken at Dibrugarh between 17th and 19th November, 1911.

Mesostenoideus erythropus, Cam.

Fenenias erythropus, Cam., *Spolia Zeyl.*, 1905, p. 112, pl. A, fig. 14.

One female at Dibrugarh on the same date as the last species

Mesostenoideus albomaculatus, Cam. (*nec* Cress.).

Fenenias albomaculatus, Cam., *Ann. Nat. Hist.*, ix, 1902, p. 212.

One female was captured along with the last species.

Friona curvicarinata, Cam.

Trans. Ent. Soc., 1904, p. 109.

Under a leaf-stem of plantain at Upper Rotung on 8th January, 1912, was found a female of this species agreeing with others in the Berlin Museum from Sikkim and the Mepli valley during December, 1893, and in my own collection from 4000 feet at Thandaung in Tenasserim during April, 1898. All these differ from the typical form in having the whole head and thorax entirely brick-

red, which renders it superficially distinct, though close examination shows no structural modifications and it must be treated as a mere colour variety, which I here term var. *rufescens*, var. nov.

Friona didymata, Morl., sp. n.

In the Abor collection I find a ♂ of this species, which I have had for some time described in MS. and now bring forward from an examination of a dozen ♀ ♀ and one ♂, taken in Dehra Dun and near Bhowali, Kumaon, on grass and on the wing in garden, between 26th April and 26th June, 1912, in the United Provinces; and of the above ♂, taken at Dibrugarh about 18th November, 1911.

A black species with stramineous markings and the black hind tarsi centrally white. Extremely like *F. rufipes*, differing in little but size and colouration: face and clypeus black with two dots on the latter, and two dots below scrobes and the central orbits linearly of the former, stramineous; outer and genal orbits not at all pale, or ♂ with a narrow genal line stramineous; ♂ with base of both face and clypeus irregularly and transversely stramineous throughout; anteradical callosities black before tegulæ; mesopleurae immaculate black, and metapleural pale marks of ♀ very small; hind trochanters of ♀, and coxae of both sexes, not infuscate; hind tarsi black with second and third joints of ♀, and centre of first to base of fifth in ♂, pure white. Length, 9–11 mm. This differs from all Cameron's seven species of the present genus in having the face at most centrally binotated with stramineous in ♀ and apically entirely black in ♂. I have seen one ♀ with the face and clypeus immaculate black, in another the clypeus alone was immaculate and in a third the base of the face, as in the ♂, was subcontinuously stramineous.

There are also examples from Monghyr in Bihar, Mergui in Lower Burma, Calcutta and Trevandrum, in the Indian Museum.

Friona variipes, Cam.

Trans. Ent. Soc., 1904, p. 107.

A female at Kobo, 400 feet, on 3rd December, 1911.

Cryptus filicornis, Cam.

Hedycryptus filicornis, Cam., *Zeits. Hym.-Dip.*, 1903, p. 299; *C. himalayensis*, Cam., *Tr. Ent. Soc.*, 1904, p. 106.

With the last species, a female of this common one occurred at Kobo. It is a true *Cryptus* (sensu Thoms.).

XXIV. ORTHOPTERA, II: GRYLLACRIDAE and STENOPELMATIDAE.

By Dr. Achille Griffini, *Milan* (*Italy*).

[In addition to the species of Gryllacridae described below, Dr. Griffini has identified *Rhaphidophora brunneri*, Kirby (Stenopelmatidae) from Upper Rotung (2000 ft.) with certainty, attributing with some doubt specimens of the same genus from the Farm Caves near Moulmein and from jungle on the Dawna Hills to this species. The specimens from the Farm Caves were taken by Mr. Gravely in holes in the floor, while large numbers of *Diastrammena unicolor*, Brunner, occurred on the walls.]

GRYLLACRIDAE.

Gryllacris gravelyi,[1] n. sp.

♂. *Statura modica, sat robusta; corpore nitido; pallide testacea, pronoto et capite magna parte nigris, geniculis omnibus spinisque pedum posticorum nigris.*

Caput nigrum nitidum, exceptis antennis totis testaceis, clypeo et organis buccalibus ferrugineis, maculis ocellaribus flavidis optime delineatis quarum frontali rotunda, maiori, maculaque ferruginea parum bene delineata in medio marginis postici occipitis.

Pronotum nigrum nitidum, excepta macula maiuscula antica flavida, anterius cum margine antico subcontigua ibique angustiori, posterius latiori et triloba, lobo medio maiore usque ad extremum anticum sulculi longitudinalis extenso, necnon gibbulis ad latera metazonae sitis ferrugineis et maculis parvis 3 vel 4 in seriem transversam dispositis post sulculum longitudinalem ante metazonam etiam ferrugineis; lobis lateralibus totis nigris

Mesonotum, metanotum, abdomen totum cum ventre testacea.

Elytra abdomen parum et femora postica perparum superantia, testaceo-ferruginea, venis venulisque concoloribus. Alae testaceo-subhyalinae, venis venulisque pallidis, tantum angulo apicali ferrugineo-venoso.

Pedes flavido-testacei, geniculis nigris, seu apice femorum et basi tibiarum nigris; spinis femorum posticorum numerosis, nigris; spinis tibiarum posticarum nigris et basi subtus nigro cinctis.

Segmentum abdominale dorsale VIII ♂ productum, convexum, rotundatum. Segmentum IX omnino verticale, brevissimum, altum, superne subrotundatum, sed magna pro parte verticaliter concavum, excavatum, inferius in tumescentiis duabus lateralibus terminatum; his tumescentiis intus inferius spinam ferrugineam decurvam gerentibus; his spinis inter se cruciatis.

[1] See also *Atti Soc. Ital. Sci. Nat.* lii, p. 228 (1913).

Longitudo corporis	.. .. ..	mm. 28
,, *pronoti*	.. .. ..	,, 7
,, *elytrorum*	.. .. ..	,, 23
,, *femorum anticorum*	.. ..	,, 9·8
,, *femorum posticorum*	.. ..	,, 16·5

Typus: 1 ♂ (Musaei Indici), exsiccatus, indicationes sequentes gerens: Upper Rotung, Abor Exped., 5-i-12 (*Kemp*); under leaf-stem of plantain.

Descriptio: Species in divisionem 1·1; 2·2. Systematis Brunneri locanda inter congeneres valde differentes, tamen a supero visa *Gr. genuali*, Walk., sensim similis, quamvis distinctissima.

Corpus statura modica sat robusta, nitidum.

Caput robustum, ab antico visum latiuscule ôvale, pernitidum, pronoto parum latius. Occiput et vertex cum fastigio optime rotundata, hoc parum minus convexo, lateribus rotundatis, latitudinem 1½ primi articuli antennarum sensim superante, latitudinem duplam huius articuli aegre attingente. Sutura inter fastigia capitis incerte distinguenda. Maculae 3 ocellares flavae optime distinctae et delineatae; duae verticis haud parvae, ovales, inferius in angulum subacutum terminatae; frontalis maior, orbicularis. Sulci suboculares distincti, inferius lati. Frons latiuscula, superne convexiuscula, inferius concaviuscula, nitida, sed sub lente in medio transverse minute corrugata et utrinque paucis punctis impressis praedita quorum duobus lateralibus inferis maioribus. Clypeus basi fronti similis, ibique punctis duobus lateralibus impressis praeditus. Organa buccalia normalia, robusta; palpi maxillares apice minime dilatati.

Color capitis: Occiput, vertex cum fastigio, genae, fronsque, colore nigro nitidissimo, exceptis maculis ocellaribus flavidis supra descriptis, et macula occipitali postica media subtriangulari, vertice antico rotundato, ferruginea, haud bene delineata. Basis clypei transverse breviter tota nigra, hoc colore perfecte recteque terminato Reliqua maxima pars clypei cum labro, mandibulis et reliquis organis buccalibus colore ferrugineo. Antennae totae testaceo-ferrugineae.

Pronotum robustum, a supero visum sensim longius quam latius, nitidum. Margo anticus totus rotundatus et sat prominulus. Sulcus anticus valliformis bene impressus et delineatus. Sulculus longitudinalis abbreviatus in fossulas duas parum regulares fere divisus, quarum antica oblonga, angusta, parva, parum impressa, postica latior, subrotunda, anterius fere biloba, melius impressa; margines huius fossulae posticae extus et postice fere carinula delineati. Post sulcum anticum utrinque verrucula minima, parum distinguenda, ante sulculum longitudinalem adest; ad latera sulculi longitudinalis paucae impressiones parvae, fere punctiformes, anterius, et paucae convexitates gibbuliformes posterius utrinque videntur. Corrugatio minutissima sub lente fortiori ad latera ipsa sulculi aegre videtur. Sulcus posticus superne non bene delineatus, sed metazona tota superne concavi-

uscula minuteque sub lente transverse corrugata, margine postico transverso, rotundato, optime limbato, ascendente, fere reflexo. Gibbula convexa adest in utroque latere externo metazonae.

Lobi laterales pronoti longiores quam altiores, postice quam antice levissime altiores, nitidissimi, sed sub lente corrugationibus nonnullis longitudinalibus antice et inferius praediti. Angulus anticus horum loborum rotundatus; margo inferus subrectus, longus; angulus posticus truncatus, inferius rotundatus, posterius obliquus subconcavus, dein angulo obtuso in marginem posticum verticalem transeuns; hoc margine postico parum alto; sinus humeralis perparum expressus. Margo loborum lateralium totus optime limbatus. Sulci soliti valde excavati; gibbulae valde expressae.

Color pronoti niger nitidus; tamen in parte antica dorsi macula majuscula testaceo-flavida adest, optime delineata, maculam occipitis sequens; haec macula marginem anticum ipsum anguste nigrum non tangit, tamen eum subito sequitur, antice angustior, in sulcum anticum posterius dilatata, postice in medio late magis producta usque ad extremum anticum sulculi longitudinalis. Macula ipsa propterea posterius dilatata et fere triloba, lobis lateralibus extus postice versis, minoribus, subangularibus, lobo medio lato, subrotundato, posterius magis producto. Gibbulae laterales metazonae superne ferrugineae, et ante metazonam maculae minores 3 vel 4 in seriem transversam dispositae ferrugineae adsunt, quarum 2 ad latera fossulae posticae sulculi longitudinalis et una media fere **W**-formis, seu fere in duabus divisa, in fossula postica ipsa sita. Hae maculae parum perfecte delineatae. Lobi laterales toti nigerrimi.

Mesonotum, metanotum et abdomen totum cum ventre testacea.

Elytra testaceo-ferruginea venis venulisque concoloribus vel minime fuscioribus, apicem abdominis sensim, apicem femorum posticorum perparum superantia. Alae testaceo-subhyalinae, venis venulisque pallidis, tantum angulo apicali (in quiete ultra elytra prominulo) ferrugineo venoso.

Pedes robusti et sat longi, pilosuli, flavido-testacei, geniculis omnibus nigris, seu apice femorum cum basi tibiarum colore nigro, hoc colore perfecte delineato. Pars apicalis femorum nigra superne brevior, ad latera parum longior, colore nigro etiam subtus apicem femoris cingente; margo extremus articularis femorum superne anguste testaceus. Pars basalis tibiarum nigra superne longior, ad latera subtusque abbreviata; ima basis articularis tibiarum anguste ferruginea.

Tibiae anticae et intermediae subtus solito modo spinosae, spinis utrinque 4, basim versus longioribus, necnon spina apicali minori praeditae. Femora postica basi sat bene incrassata, parte apicali attenuata parum elongata et semper robusta, subtus spinulis nigris acutis in utroque margine 10–12. Tibiae posticae superne post partem basalem planiusculae, margine interno spinis

5–6, margine externo spinis 6–7, acutis, longiusculis, nigris et basi subtus nigro cincta praeditis. Tarsi maiusculi.

♂. Apex abdominis concolor, testaceus. Segmentum abdominale dorsale VIII productum, fere 4 mm. longum, convexum, margine apicali rotundato. Segmentum IX brevissimum, omnino verticale, altum, superne subrotundatum sed magna pro parte verticaliter concavum excavatum, inferius in tumescentiis duabus lateralibus terminatum, his tumescentiis intus inferius spinam ferrugineam decurvam gerentibus; his spinis inter se cruciatis. Lamina subgenitalis parum latior quam longior, apice subrotundata sed in medio leviter sinuata, lobis breviter lateque rotundatis, stylis parvis ad latera externa horum loborum insertis.

Neanias kempi,[1] n. sp.

♀. *Statura modica, parum robusta; corpore nitido; fulvus, atro et castaneo modice varius.*

Caput pronoto perparum latius, haud robustum, fronte non rugosa; colore fulvo, sed occipite in medio late, vertice toto cum fastigio, fronte in medio et basi antennarum atris vel atro castaneis; verticis fastigio latitudinem 1½ primi articuli antennarum non superante, lateribus carinulatis.

Pronotum longiusculum, fulvo-testaceum, ad medium marginis antici (late atrum, hoc colore utrinque posterius angustius producto et ante latera sulculi longitudina is terminato; sulculo longitudinali linea castanea signato, post quam lineam utrinque punctum castaneum adest.

Rudimenta elytrorum et alarum parva, lateralia, testacea.

Segmenta dorsalia reliqua margine postico irregulariter castaneo, hoc colore in medio angustiore et ad latera partis mediae magis evoluto.

Tibiae omnes annulo incompleto post-geniculari castaneo vel atro ornatae; tibiae posticae spinulis atris et basi subtus atro cinctis. Femora postica atro spinulosa, atque in latere externo seriebus duabus vel tribus longitudinalibus macularum punctiformium irregularium colore castaneo ornata.

Ovipositor femore postico brevior, basi valde falcato incurvus, dein minus curvatus, apice obtuse rotunadatus. Segmentum ventrale ultimum elongatum, apice late rotundatum et crasse marginatum.

Longitudo corporis	.	..	mm. 22·7
,,	*pronoti* ..	..	,, 5
,,	*elytrorum* ..	..	,, 1 5
,,	*femorum anticorum*	..	,, 7·1
,,	*femorum posticorum*	..	,, 12·4
,,	*ovipositoris*	..	,, 10

Typus: 1 ♀ (Musaei Indici), in alcool, indicationes sequentes gerens: Near Yembung, alt. 1100 ft., Abor Exped., 12-ii-12 (*S. W. Kemp*).

[1] See also *Atti Soc. Ital. Sci. Nat.* lii, p. 257 (1913).

Descriptio: Species apud *Nean. pupulum*, Boliv. et *Nean. jacobsoni*, Griff. locanda.

Corpus statura modica, parum robustum, nitidum.

Caput regulare, pronoto perparum latius, ab antico visum ovale, non latum. Vertex optime convexus, in fastigium declivis; fastigium verticis superne convexum, anterius minus convexum, in utroque latere crassiuscule carinulatum, latitudine circiter 1½ primi articuli antennarum. Sutura inter fastigia capitis non distinguenda. Maculae ocellares non distinctae. Frons breviuscula, transversa, nitida, punctulis paucis raris impressis praedita, inferius impressa. Organa buccalia normalia, sat longa; palpi maxillares apice incrassati; palpi labiales apice clavati. Sulci suboculares inferius visendi, ibique lati.

Color capitis fulvo et atro varius. Occiput parte media late atro-castanea, hoc colore anterius cum colore atro verticis connexo; latera occipitis posterius subtriangulariter fulva; latera verticis etiam posterius atra. Supra insertionem utriusque antennae plaga fulva parum distinguenda ad latera fastigii verticis adest. Vertex cum fastigio, fastigium frontis et magna pars media frontis colore atro et atro-castaneo. Scrobes antennarum atro-castanei. Pars media frontis subrectangulariter atro-castanea, inferius usque ad suturam clypeo-frontalem, utrinque usque sub parte media scrobum antennarum verticaliter, hoc colore in medio magis atro, utrinque leviter magis diluto quamvis bene determinato, atque utrinque inferius in suturam clypeo-frontalem sensim magis extenso. Genae cum lateribus frontis, clypeus, labrum et organa buccalia colore fulvo; basis clypei utrinque leviter et breviter castaneo tincta. Antennae fulvae, remote incerteque pallido annulatae, articulis duobus primis magna pro parte atro-castaneis, praecipue anterius.

Pronotum longius quam latius, anterius magis compressum. Margo anticus late rotundatus, minime productus; sulcus anticus valliformis amplus, parum excavatus; sulculus longitudinalis abbreviatus minime impressus; sulcus posticus non distinctus, ideoque metazona anterius non delimitata; margo posticus transversus concaviusculus, limbo leviter reflexo. Lobi laterales valde longiores quam altiores, posterius quam antice perparum altiores, angulo antico ample rotundato, margine infero longiusculo subconcavo, angulo infero rotundato parum expresso, margine postico obliquo longiusculo, parum regulari, sinu humerali nullo; sulcus V-formis bene impressus; gibbulae solitae convexae, praecipue gibbula postica supera.

Color pronoti fulvus. Pars media marginis antici latiuscule atra; hoc colore posterius usque ad medium sulci antici ampli (plus quam 1 mm. lati) extenso, ibique parum minus diluto, utrinque posterius magis producto usque ad finem sulci antici, ibique angusto sed utrinque fere transverse terminato. Utraque pars lateralis postica huius picturae atrae fere macularis, breviter 7-formis vel >-formis, optime delineata. Sulculus longitudinalis abbreviatus linea castanea signatus; post hanc lineam utrinque

punctum castaneum dilutum adest, his 2 punctis inter se approximatis.

Rudimenta elytrorum et alarum parva, lateralia, squamaeformia, venis incertis praedita, pallida.

Mesonotum et metanotum utrinque gibbula basali praedita; caeterum segmentis abdominalibus dorsalibus similia. His segmentis colore fulvo, margine postico irregulariter castaneo, hoc colore in medium marginis angusto, minus evoluto, interdum subnullo, ad latera partis mediae magis evoluto, in lateribus externis angustato. Propterea videtur pars dorsalis corporis in medio longitudinaliter magis fulva et ad latera partis mediae magis castaneo picta, fere irregulariter utrinque castaneo vittata. Venter pallidus.

Pedes pilosuli, sat longi et robustiusculi, fulvi, tibiis omnibus annulo post-geniculari castaneo vel atro superne ornatis, hoc annulo in tibiis anticis minus distincto, in intermediis et posticis optime evoluto. Femora postica in latere externo partis dilatatae seriebus longitudinalibus duabus macularum punctiformium irregularium colore castaneo ornata, his maculis interdum in quaque serie partim inter se coniunctis, semper irregularibus, primis basalibus dilutioribus; tertia series similis, supera, parallela, valde minus distinguenda, adest, macularum minimarum et valde dilutarum.

Tibiae anticae et intermediae solito modo spinosae, spinis ultimis apicalibus tibiarum intermediarum valde brevibus, reliquis regulariter longis, praecipue basalibus. Femora postica basi sat bene incrassata, parte apicali attenuata longiuscula, subtus utroque margine 7-9 spinuloso, spinulis atris, basi tamen non atro cinctis. Tibiae posticae superne longe post basim parum planiusculae, fere teretes, utrinque spinis atris et basi subtus atro cinctis armatae; his spinis in margine externo 7, in margine interno 6; spina apicalis fulva, tantum apice breviter fusca. Tarsi robusti, fulvi.

♀. Ovipositor rigidus, castaneus, nitidus, breviusculus, latiusculus, apicem versus parum attenuatus, apice obtuse rotundatus, basi valde falcato-incurvus, dein minus quamvis semper sensim incurvatus, fere erectus. Lamina subgenitalis non distinguenda. Segmentum ventrale ultimum longitudinem duplam segmenti praecedentis attingens, apice late rotundatum et crasse marginatum, margine pilosulo; ante sulcum hunc marginem praecedentem utrinque macula incerta dilute castanea transversa, parva, adest.

XXV. ODONATA.

By F. F. Laidlaw, *F.Z.S.*

(Plate xvi.)

Introduction.

Only a few of the specimens discussed below were taken actually on the Abor Expedition, but the collections combined are all from the northern and eastern frontiers of Assam and Burma, and may conveniently be considered together. In addition to those taken in the north-eastern part of Assam and the Abor foothills in 1911-12, and those collected by Mr. F. H. Gravely in the former year in the Amherst district of Tenasserim between Moulmein and the Siamese border, there are two lots of specimens, one collected by Mr. H. Stevens in the N. Lakhimpur district, Assam, and one obtained in 1911 by Capt. G. Topin in the course of an expedition to the north-east frontier of Burma With the exception of Mr. Stevens' collection, of which type specimens will be presented to the Indian Museum, the specimens are the property of that institution. Some 50 or 51 species are represented.

In all probability the numbers at present recorded from that part of Asia which includes Assam and Burma represent a bare half of the whole Odonate fauna. Available lists show these numbers to amount to about 100 species.

Accounts dealing especially with the dragonflies of further India are:

1. "Odonates de Birmanie," de Selys Longchamps. *Ann. Mus. Genov.*, (2) x (xxx), 1891, pp. 433–518.

de Selys gives a list of 88 species for Burma. His account is based chiefly on material collected by the late Signor Fea in the neighbourhood of Leitu and Bhamo.

2. "Liste des Neuropteres de l'Indo-China." Par M. René Martin. *Mission Pavie.*

Martin comments on the richness of the fauna of Tonquin. It seems likely that this fauna is tolerably distinct from that of the district under consideration here, and not improbably richer. Martin's list contains no fewer than 139 species.

3. "The Dragonflies of Burma and Lower Siam." (I) Calopteryginae. *Proc. U.S. Nat. Mus.*, xxviii, pp. 165–187. (II) Cordulegasterinae, Chlorogomphinae and Gomphinae. *Proc. U.S. Nat. Mus.*, xxxiii, pp. 267–317. By E. B. Williamson.

In these two papers Williamson gives a critical and valuable

study of these groups of Odonata, not only for Burma but of a great part of the whole Oriental Region, reviewing as he does species allied to those of Burma, but inhabiting neighbouring lands.

None the less our knowledge of the dragonflies of these countries is still so imperfect that it is of little use to discuss the geographical relationships of the area. I may briefly state my own belief on the subject is that the fauna of Burma as of other Indo-Malayan countries is the result of the intermingling of several groups—the result of several irruptions into the territory at different epochs. Such groups for want of a better term may be called 'strata.' Much field work and systematic study is necessary before it will be possible to distinguish one 'stratum' from another and to determine anything of its geological history.

Other references to literature will be found at the end of the paper.

Systematic.

LIBELLULIDAE.

LIBELLULINAE.

1. *Amphithemis vacillans*, de Selys.
   1 ♂ (immature), Assam (*H. Stevens*).
   2 ♂♂ Kachin Hills, Upper Burma (*Capt. Topin*).
   Length of abdomen 23 mm.
   ,, hind-wing 27 mm.

Both of the specimens from Upper Burma are fully adult, and both have the third abdominal segment powdered with bluish-white bloom, which gives the insect a striking appearance.

2. *Lyriothemis acigastra* (de Selys).
   2 ♂♂, 1 ♀ (1 ♂ very immature).

The adult male and the female have been examined for me by Dr. Ris, who has kindly compared them with de Selys' actual type ♂. He has found them to be identical therewith; but not with the specimens described and figured in his Monograph under the name *L. acigastra* (1909). The latter specimens, which belong to Mr. Morton, represents an undescribed species.

3. *Orthetrum sabina* (Drury).
   1 ♂ Kawkareik to Third Camp, Amherst district, Lower Burma, 21-xi-11 (*F. H. Gravely*).
   1 ♀ Kobo, 400 ft., Abor Expedition (*S. W. Kemp*).

4. *O. glaucum* (Brauer).
   4 ♂♂ adult, 1 ♂ immature, 1 ♀ Kachin Hills, Upper Burma (*Capt. Topin*).

One male has a cross-nerve in the triangles of both hind-wings, another has one triangle crossed and one free.

5. *O. pruinosum neglectum* (Ramb.).
   3 ♂♂, 1 ♀ Kachin Hills, Upper Burma (*Capt. Topin*).
   1 ♂ Moulmein, Lower Burma, 16-xi-11 (*F. H. Gravely*).
   1 ♂ Upper Assam (*H. Stevens*).

6. *O. triangulare* (de Selys).
   1 ♂, 1 ♀ Kachin Hills, Upper Burma (*Capt. Topin*).

7. *Palpopleura sexmaculata* (Fabr.).
   1 ♂, 2 ♀ ♀ North Lakhimpur, Upper Assam (*H. Stevens*).
   1 ♂, 1 ♀ Kachin Hills, Upper Burma (*Capt. Topin*).

8. *Nannophya pygmaea* (Ramb.).
   5 ♂♂, 2 ♀ ♀ Dejoo, N. Lakhimpur, Upper Assam (*H. Stevens*).

9. *Brachydiplax sobrina*, de Selys.
   1 ♂ Dejoo, N. Lakhimpur, Upper Assam (*H. Stevens*).

10. *Acisoma panorpoides*, Ramb.
    1 ♀ Kawkareik, Amherst district, Lower Burma, 19—20-xi-11 (*F. H. Gravely*).

11. *Diplacodes nebulosa*, Fabr.
    2 ♂♂ Dibrugarh, N. E. Assam, Abor Expedition, 17—21-xi-11 (*S. W. Kemp*).

12. *D. trivialis* (Ramb.).
    2 ♂♂ Kawkareik, Amherst district, Lower Burma, 19—20-xi-11 (*F. H. Gravely*).
    1 ♂ Upper Assam, 31-iii-10 (*H. Stevens*).

13. *Crocothemis servilia* (Drury).
    1 ♂ Kachin Hills, Upper Burma (*Capt. Topin*).

14. *Neurothemis tullia* (Drury).
    1 ♂ N. Lakhimpur, base of hills, Upper Assam (*H. Stevens*).

    Belongs to the typical race of the species.

15. *N. intermedia*, Ramb. race?
    2 ♂♂ Dejoo, N. Lakhimpur, Upper Assam, 13-iii-10 (*H. Stevens*).
    1 ♂ Silonibari
    Length of abdomen 18·5 mm.
    ,, hind-wing 22·5 mm.
    ,, pterostigma 3 mm.

    Slightly smaller than the typical race from Ceylon. The basal golden-brown mark on the hind-wing is less extensive also, reaching only to one cell beyond the triangle, whilst its outer border is regularly convex, thus differing from the specimen figured by Dr. Ris from Ceylon.

    Examination of a sufficient series will probably prove these specimens to represent a geographical race of the species recognizable from that inhabiting Ceylon and southern India.

16. *N. intermedia degener*, de Selys.
    1 ♂, 1 ♀ Dejoo, 13-ii-10 (*H. Stevens*).
    ♂ Length of abdomen 23 mm.
    ,, hind-wing 26 mm.
    ,, pterostigma 3·5 mm.

The male has the brown colour of a mottled appearance due to the cells of the coloured parts of the wings being pale in their centres.

There is in the collection a female specimen of a *Neurothemis* taken by Capt. Topin in the Kachin Hills. The abdomen has a length of 19 mm., the hind-wing of 26 mm. The fore-wings are suffused with golden brown along the costal margin, and at the apex of the wing; the hind-wing is similarly coloured, whilst in addition it is suffused at its basal part with a less intense colour, reaching as far as three cells beyond the nodus.

The specimen belongs to the *intermedia* group, but I cannot assign it to a more exact position.

17. *N. fulvia*, Drury.
    1 ♂ Dejoo, N. Lakhimpur, Upper Assam (*H. Stevens*).
    1 ♂, 1 ♀ Dibrugarh N. E. Assam, 17—21-xi-11, Abor Expedition (*S. W. Kemp*).

18. *Brachythemis contaminata* (Fabr.).
    1 ♀ Sadiya, N. E. Assam, Abor Expedition, 24—25-xi-11 (*S. W. Kemp*).

19. *Sympetrum orientale*, de Selys.
    1 ♂ Sadiya, N. E. Assam, Abor Expedition, 24—25-xi-11 (*S. W. Kemp*).

20. *Trithemis aurora* (Burm.).
    1 ♂, 2 ♀ ♀ Kachin Hills, Upper Burma (*Capt. Topin*).
    1 ♂ Dejoo, N Lakhimpur, Upper Assam (*H. Stevens*).
    1 ♀ Sadiya, N. E. Assam, Abor Expedition, 24—25-xi-11 (*S. W. Kemp*).

21. *T. pallidinervis* (Kirby).
    1 ♂ Dibrugarh, N. E. Assam, Abor Expedition, 17—26-x-11 (*S. W. Kemp*).

22. *T. festiva* (Ramb.).
    1 ♂ Kachin Hills Upper Burma (*Capt. Topin*).
    1 ♂ Dejoo, N. Lakhimpur, Upper Assam (*H. Stevens*).

23. *Rhyothemis variegata* (Linn.).
    1 ♂.

24. *R. plutonia*, de Selys.
    1 ♂ Dejoo, N. Lakhimpur, Upper Assam (*H. Stevens*).

25. *Rhyothemis* sp.
    1 ♂ Dejoo.

The specimen belongs to the group *R. curiosa*, de Selys. Its dimensions are as follows:—

Length of abdomen 15 mm.
,, hind-wing 22 mm.

Several 'species' belonging to this group have been described from Malacca, Borneo, Sumatra and Menado as well as from Ceylon, but no example of the group has been hitherto recorded from Burma or Assam. As I have no series for comparison I will

not attempt to refer the present specimen to any of the 'species' or 'races' of the group.

According to Krüger (1902) the distribution of these species is as follows:—

R. fulgens, de Selys. Sumatra, Banca, Borneo, Singapore.
,, *curiosa*, de Selys. Siboga, Sumatra, Borneo, Singapore.
,, *obsolescens*, Kirby. Sumatra, Borneo, Ceylon.
,, *pygmaea*, Brauer. New Guinea, Celebes.

I have compared the specimen with an individual belonging to this group from Borneo, and can find no specific difference.

26. *Tholymis tillarga*, Fabr.
1 ♂ Dejoo.

CORDULIINAE.

27 *Hemicordulia asiatica*, de Selys.
1 ♂ Dejoo, N. Lakhimpur, base of hills, Upper Assam (*H. Stevens*).

This is one of the most interesting forms in the collection. Only one other specimen of the species is known, a male in the Selys' collection, from the Khasi Hills.

Mr. Stevens' specimen is fully mature and a little damaged. It agrees well with the type, whose wings and anal appendages have been figured by Martin (1907).

This species is apparently the only representative of the Eucordulina in tropical continental Asia. It belongs to a genus whose headquarters are in Australia. An allied species is found in Celebes and Borneo, and probably elsewhere in Malaysia, as well as in Papua; whilst closely related forms occur in Madagascar and in the Seychelles. It would thus appear to belong to an ancient 'stratum' of the Odonate fauna of the Old World tropics. Possibly some of the genera allied to *Coeliccia* amongst the Agrioninae belong to the same level although these do not appear to be represented on the Australian continent, whilst they occur in Papua.

AESCHNIDAE.

AESCHNINAE.

28. *Anax guttatus*, Burm.
1 ♂ adult, 28-v-10 (*H. Stevens*).

This species is widely distributed, ranging from the Seychelle Is. to Queensland.

29. *Gynacantha khasiaca*, MacLachlan
2 ♂♂ adult (in spirit), Kobo, alt. 400 ft., 8-xii-11, Abor Exped. (*S. W. Kemp*).

Originally described from the Khasi Hills, as the name implies. These specimens have retained well their colouring, which is very brilliant. The head and eyes are green, with a black T-shaped mark on the frons above.

The thorax also is of a brilliant green, with a black median stripe, a pair of humeral bands and a lateral stripe on either side also black.

The abdomen is blackish above, with large auricles on the second segment. It is much constricted from the commencement of the third segment, and has blue-green markings.

A race of this species, *nigripes*, de Selys, has been recorded from 'Thibet,' and figured by Martin. This race would appear to be much less brightly coloured than is the typical form.

30. *Gynacantha* sp. sp.

3 ♀♀.

1 ♀, 10-viii-10. Very immature and in bad condition, is in all probability a female of *G. khasiaca*, MacLachlan. The wings are tinged with saffron at the base and apex. The length of the hind-wing is 46 mm., the upper pair of terminal abdominal appendages are short, slender and pointed, scarcely so long as the ninth segment; the thorax gives indications of having a similar colour pattern to that of the male.

The two other females referable to this genus are also in a state which makes it impossible to describe them. They are possibly referable to *G. hyalina*, de Selys, but rather small for that species, the hind-wing having a length of about 41 mm. The upper pair of terminal abdominal appendages, broken in one specimen, are in the other long, about twice the length of the ninth segment, and leaf-like.

These specimens are dated 5-vi-10 and Dejoo, 1910, respectively.

GOMPHINAE.

31. *Leptogomphus* sp.

1 ♀ N. Lakhimpur (*H. Stevens*).

The specimen belongs probably to an undescribed species, but its condition does not admit of a satisfactory description.

CALOPTERYGINAE.

32. *Neurobasis sinensis*, Linn.

2 ♂♂, 1 ♀ Thingannyinaung to Myawadi, Lower Burma, *ca.* 900 ft., 24—26-xi-11 (*F. H. Gravely*).

1 ♂ Sadiya, N.-E. Assam, Abor Expedition, 24—25-xi-11 (*S. W. Kemp*).

1 ♂ Dejoo, N. Lakhimpur, Assam (*H. Stevens*).

33. *Vestalis gracilis* (Ramb.).

2 ♂♂, 2 ♀♀ Kachin Hills, Upper Burma (*Capt. Topin*).

2 ♂♂, 1 ♀ Dejoo, Feb., June, 1910 (*H. Stevens*).

The range of this species will probably serve to delimit the Burmese region from the Malayan, the latter characterized by the closely allied *V. amoena*, de Selys.

34. *Rhinocypha quadrimaculata*, de Selys.
2 ♂♂ Dejoo, Upper Assam (*H. Stevens*).
1 ♂ Silonibari, Upper Assam (*H. Stevens*).
1 ♂ (teneral) Kawkareik (*F. H. Gravely*).

AGRIONINAE.

"Legion" *Platycnemis.*

35. *Coeliccia bimaculata*, sp. nov. (Pl. xvi, fig. 1.)
1 ♂ Dejoo, Upper Assam, 25-v-10 (*H. Stevens*).
Length of abdomen 37 mm.
,, hind-wing 22·5 mm.

M_3 proximal to the nodus, *RS* a little distal. Quadrilateral with its costal margin, scarcely shorter than the anal, the difference is less than one-fifth of the whole length of the anal margin; relatively long, so that it occupies one-half of the distance between the level of the arculus and of the nodus, the other half being occupied by a single cellule. Costal side of pterostigma about equal in length to anal side.

Head, lower lip whitish, upper lip black with a white margin, the whole of the rest of the upper surface of head black; a pair of yellow-brown post-ocular spots of a wedge-shape excepted.

Prothorax, anterior margin black, dorsal surface primrose-yellow, posterior margin black, lower surface yellowish-white.

Thorax black above, pale yellow at the sides and below. On the lower part of the dorsal surface is a pair of large oval yellow spots, they extend upwards for not quite one-half of the length of the dorsum of the thorax.

Abdomen, 1 yellow, with a fine distal, terminal ring, and a dark brown semicircular mark anteriorly; 2 to 8 dark brown above, with traces of pale distal articular rings, the lower surfaces also paler; 9, 10 bright primrose-yellow, 9 has a fine black line dorsally, covering nearly its anterior half.

Anal appendages primrose-yellow, the upper pair equal in length to 10, rather stout, tapering, with a strong median ventral tooth. The lower pair longer, rather cylindrical, curved inwards at their extremities.

The great length of the quadrilateral characterizes this handsome insect, as does the remarkable colouring of the thorax and abdomen.

The British Museum has in its unincorporated material examples of a geographical race of the species from the Island of Hainan.

36. *Copera* (*Psilocnemis*) *annulata* (de Selys) subsp. *stevensi*, nov. (Pl. xvi, fig. 2.)
1 ♂ North Lakhimpur, foot of hills, Upper Assam (*H. Stevens*).
Length of abdomen 35 mm.
,, hind-wing 22·5 mm.

Upper lip bluish-white, the rest of the head yellow, with a large central, triangular black mark; its apex on the epistome, its base extending from one eye to the other, at the level of the hinder ocelli. The back of the head is black also.

Prothorax as in the typical *P. annulata*, black with a yellow band on either side.

Thorax bronze-black as far as the first lateral suture, with yellow antehumeral band. Sides and under surfaces gray-yellow, with a fine black lateral stripe.

Abdomen, 1, 2 bronze-black above, gray-yellow at the sides and below. Distal half of 9 and all 10 yellow, the yellow colour on 9 running forward dorsally to a point nearly at the commencement of the segment. The rest of the abdomen bronze-black above, paler below.

Legs white, the lower fifth of the femora black, as are the spines and tarsi. The first pair of tibiae have a black line on their posterior surfaces, and are not dilated; the remaining pairs have a fine black mark at their bases posteriorly, and are much dilated.

Anal appendages, upper pair yellow, nearly equal in length to segment 10, cylindrical, pointed. Lower pair about twice as long, curved downwards, the basal half of each yellow, the distal half black

Sufficiently distinct from the type to deserve recognition as a geographical race of a widely distributed form.

37. *Copera* (*Psilocnemis*) *vittata*, de Selys, subsp. *assamensis*, nov.
1 ♂ 1 ♀ N. Lakhimpur, base of hills, Upper Assam (*H. Stevens*).

Length of abdomen	♂ 32 mm.	♀ 30 mm.
,, hind wing	♂ 17 mm.	♀ 17 mm.

♂ General colour russet-brown.

Head, upper lip yellowish-brown. The rest of the upper surface of the head brown, except for a black line running from eye to eye immediately in front of the antennae, and the basal joint of each antenna which is also black.

Prothorax and thorax brown. There is a broad dorsal band of a bronze-black colour on the thorax, and the sides of the prothorax and thorax have black markings, which especially on the thorax, are mottled in character. Abdomen brownish-black above, paler below, 3, 4, 5, 6 have a fine basal white ring contracted above and a narrow distal black ring not reaching quite to the end of the segment. Distal half of 9 and all 10 pale yellowish-brown.

Legs rich russet-brown with black spines, the posterior pair of tibiae show a trace of dilatation.

Anal appendages dull brown, upper pair one half the length of lower pair. Both pairs straight, tapering, cylindrical.

♀ (22-8-10). The position of this individual is uncertain. The specimen is teneral and generally resembles the male in colour.

It differs in having a broader black stripe across the front of the head, and the back of the head black instead of brown, the thorax is entirely brownish-black with numerous fine yellow spots; the whole abdomen is brown, and the legs are of a paler colour than in the male, with a dark mottled line posteriorly. The prothorax has a pair of short forwardly directed spurs projecting from the middle of its dorsal posterior margin.

This subspecies is one of several geographical races referable to the group *Copera vittata*.

The group is characterized by the anal appendages of the males and according to Förster by the occurrence of dimorphism amongst the females. The female described above is on his view to be regarded as a "virago" form. The females are also remarkable for the possession of the prothoracic spurs. The only other member of the group that I have had an opportunity of examining is *C. vittata atomaria*, de Selys, from Borneo.

This subspecies is very closely allied to *C. assamensis*, and a single female belonging to it is identical in colouring with the male.

The group includes the following:—

C. vittata vittata, de Selys. Malacca.
,, ,, *serapica*, Hagen. Nicobars.
,, ,, *imbricata*, Hagen. Sumatra.
,, ,, *atomaria*, de Selys. Borneo.
,, ,, *assamensis*, subsp. nov. Assam.

"Legion" *Agrion*.

38. *Onychargia vittigera*? de Selys.
1 ♂ Dejoo, N. Lakhimpur (*H. Stevens*).

A teneral male, unfortunately lacking the last 4 segments of the abdomen.

39. *Archibasis oscillans* (de Selys). (Pl. xvi, fig. 3.)
4 ♂♂ Dejoo, 3-iv-10 (*H. Stevens*).
Length of abdomen 36 mm.
,, hind-wing 25 mm.

I refer these specimens here with doubt. I have not been able to compare them with an authentic example.

They show certain differences from de Selys' description which I note below—

The upper lip is black, not pale. Only one of the specimens, which are all very adult, shows any sign of post-ocular spots; and these are very small.

The side of the thorax appears to be of a dark greenish-brown with broad blue stripes; but in all it is pulverulent and consequently it is not an easy matter to determine the true character of the colouring.

The first segment of the abdomen is entirely black.

The lateral view of the anal appendages agree well with de Selys' description of that of the type. Seen from above, however,

the upper pair are distinctly hatchet-shaped (the blade of the hatchet being partly visible from the side) and not cylindrical.

In spite of these differences I believe Mr. Stevens' specimens must be identified with de Selys' species; the agreement in other respects is very close, and if looked at from above obliquely, the upper anal appendages do appear to be cylindrical.

Mr. Stevens has extended the known range of this form very considerably; it has hitherto been recorded from Sumatra and Siam.

40. *Aciagrion pallidum*, de Selys. (Pl. xvi, fig. 4.)

1 ♂, 2 ♀ ♀ Dibrugarh, N. E. Assam, Abor Expedition, 17—21-xi-11 (*S. W. Kemp*).

Length of abdomen ♂ 32 mm. ♀ 29 mm.
,, hind-wing ♂ 19 mm. ♀ 19 mm.
Postnodals 10-11.

These specimens, which have been preserved in spirit, differ to some extent from those described by de Selys.

They are a little larger. The type male had the abdomen 28-29 mm. long.

The post-ocular mark is a light greenish-brown.

The thorax has in both sexes a fine antehumeral line of pale metallic green, and there is a lateral stripe of the same colour. The abdomen of the male has 1 7 metallic black above, 8–10 almost white, 10 is very short.

In the females, 6, 7 have a dorsal longitudinal dark stripe of metallic black, the rest of the abdomen is very pale brown above, and white below.

The appearance of the anal appendages seen from the side is figured for comparison with those of *A. borneensis*, Ris.

41. *Ischnura rufostigma*, de Selys. (Pl. xvi, fig. 5.)

1 ♂ Dibrugarh, N. E. Assam, Abor Expedition, 17—21-xi-11 (*S. W. Kemp*).

The specimen is a trifle smaller than the type, which I believe to be the only example of the species hitherto known.

The colouring agrees generally with that of the type. The post-ocular spots are however small, the sides of the thorax and prothorax are of a blue-green shade, not "roux jaunâtre."

The whole of the dorsal surface of segment 8 of the abdomen is black.

The difference between the pterostigmata of the fore and hind wings does not seem to me to be very marked. It is emphasized by de Selys in his description.

Unfortunately the female of the species remains unknown.

The insect is a very handsome one. It is interesting to be able to give a more precise localization for the species than the rather vague indication, India.

42. *Pseudagrion* sp.

1 ♀ Dibrugarh.

43. *Ceriagrion coromandelianum* (Fabr.) (Pl. xvi, figs. 8, 8*a*.)
1 ♂, 4 ♀ ♀ Dibrugarh, N. E. Assam, Abor Expedition, 17—21-xi-11 (*S. W. Kemp*).
Length of abdomen ♂ 35 mm. ♀ 32·5 mm.
,, hind-wing ♂ 26 mm. ♀ 21·5 mm.

Considerably larger than the type which has the abdomen 28-30 mm. long. These specimens agree in other particulars and are, I believe, rightly to be ascribed here. The male is, however, without broad light brown band on the head between the eyes. The upper pair of anal appendages is almost black. The females are of a duller colour than the male, a sandy or tawny-yellow.

44. *Ceriagrion olivaceum*, sp. nov. (Pl. xvi, fig. 9.)
2 ♂ ♂, 2 ♀ ♀ Kachin Hills, Upper Burma (*Capt. Topin*).
Length of abdomen ♂ 38·5 mm. ♀ 39 mm.
,, hind-wing ♂ 25 mm. ♀ 25 mm.

Fourteenth and fifteenth antenodal cross nerves on fore-wing. Pterostigma brown, covering rather more than one cell.

♂ Head, under surface pale yellowish-brown, upper surface entirely brown with a somewhat green shade, the brown of the upper lip of rather a warmer tinge. Second joint of antennae black at its apex, the distal parts also black.

Prothorax brown with a slight olive shade on the sides, paler below. Thorax brown above, with a darker rather green antehumeral stripe on either side not reaching the summit of the thorax. Laterally the thorax is olive-green with a brown metepisternal area. Beneath it is pale olive-green, rather pulverulent. The legs are pale brown, with the spines and articulation of the tarsal joints brownish-black.

Abdomen dull brown above, progressively darker to the end of 8; 9 and 10 a little lighter, 10 with its posterior margin embayed angularly.

Anal appendages brown, lower pair black at the apex, upper pair rather shorter than the lower pair, curved a little downwards. Lower pair ending in an upwardly directed spur.

♀ Colouring in general very similar to that of the male but duller, the pterostigma is paler; moreover this sex appears to lack the antehumeral band on the dorsum of the thorax.

This species, which appears to be quite distinct from its congeners, differs from them in its greater size; so far as I know it is certainly the largest species of the genus.

Most nearly related to it I believe is *C. coromandelianum*, Fabr. This latter species is different in general appearance, being of a pale almost lemon-yellow, judging from the spirit specimen of the male, which is also without the antehumeral stripe; whilst the anal appendages are widely different, as is the shape of the posterior dorsal margin of the tenth abdominal segment. The females of *C. coromandelianum* referred to above bear a very strong resemblance to the female specimens of *C. olivaceum*, they differ especially in size, in the lesser number of post-nodal nerves, 10–11

as opposed to 14–15 in *C. olivaceum*; in colour being much lighter than *C. olivaceum*, and in having no colour pattern on the sides of the thorax.

I have also compared these specimens with a pair of insects from N Queensland, received from Mr. Tillyard and named by him *C. glabrum*, Burm. These are possibly identical with specimens named *C coromandelianum* race *erubescens* by de Selys in his paper on the "Odonata of Burma."

Whether this be so or no Mr. Tillyard's specimens are I believe unquestionably examples of *C. glabrum*, Burm., and are totally distinct in colouring and other particulars from either of the species in the present collection. *C. melanurum*, de Selys, I am not acquainted with but it is sufficiently characterized by the black metallic mark on the terminal segments of the abdomen. Lastly *C. cerinorubellum*, Brauer, of which species I have examined a number of individuals from Borneo, is readily distinguished by its colouring in both sexes, and by the long curved inferior anal appendages of the male.

45 *Argiocnemis obscura*, sp. nov. (Pl. xvi, fig. 6.)

1 ♂ Dejoo, N. Lakhimpur, base of hills, Upper Assam 5-iv-10 (*H. Stevens*).

Length of abdomen 30 mm.
,, hind-wing 20 mm.

The wings cease to be petiolated a little before the level of the basal post-costal nerve. Arculus beyond the level of the second antenodal nerve. Upper side of quadrilateral of fore-wing two-thirds length of lower side, of hind-wing three quarters the length. Pterostigma oblique, black, covering one cell.

Head, upper lip greenish-blue; genae and a line across the frons brownish-yellow, a pair of large post-ocular spots, nearly circular, greenish-blue. The rest of the upper surface of the head black.

Prothorax entirely black above with the exception of a small yellow mark on the anterior margin.

Thorax, black above, blue at the sides. There is a pair of narrow greenish-blue antehumeral stripes, and also a black lateral band at the second lateral suture.

Abdomen, 1–7 bronze-black, 1, 2, 3 blue at the sides and below, 8, 9 yellowish-brown, with terminal black mark, 10 black.

Anal appendages, upper pair black, lower pair dark brown.

Legs, femurs dark brownish-black; tibias lighter brown with dark articulation.

The upper pair of anal appendages are about as long as segment 10, seen in profile, they are finger-shaped, rounded at their extremities. On the inner surface they are concave, and each carries very near its base a downwardly directed spur; not seen in profile.

The lower pair are not so long; each carries at its apex three small tooth-like projections, which lie at the angles of a triangle with its apex upwards and to the outside.

46. *Argiocnemis aborense*, sp. nov. (Pl. xvi, fig. 7.)

1 ♂ Dibrugarh.

Length of abdomen 24 mm.
,, hind-wing 16 mm.

Post-nodal nerves 8-9 on fore-wing.

Arculus placed well beyond the level of the second antenodal, very sharply angled. Quadrilateral rather long, its upper side in both fore and hind-wings about three-quarters the length of its lower side. Pterostigma black, moderate, oblique, covering one cell.

Head, upper surface entirely black, save for a pair of nearly circular post-ocular spots which are blue

Prothorax, black above, with a very small blue spot at the side of the posterior margin.

Thorax, black above, with a blue-green antehumeral stripe on either side; laterally bright blue, with a black line along the second lateral suture; below whitish.

Abdomen black, segments 9, 10 bright blue with fine black margins, 10 with a dorsal longitudinal black line; 1, 2 are blue at the sides, and have also a small blue dorsal mark anteriorly, and the black is contracted suddenly near the hinder end of the segment so that it has here only a fine median dorsal black line; 3 and 4 have a fine lateral blue-green stripe running along the anterior $\frac{5}{6}$ of the segment on either side, broader anteriorly; 5, 6, 7 have a small lateral mark of the same colour at their anterior ends. The lower half of the sides of 8 is bright blue.

Legs, femurs black behind, whitish-grey in front, tibias and tarsi yellow with darker articulations.

Anal appendages black, upper pair about half the length of segment 10, hooked downwards and inwards, compressed laterally; lower pair shorter, conical, tapering rapidly and directed upwards.

The first of these species of *Argiocnemis* is closely allied to *A. lunulata*, de Selys The most obvious difference is that in *A. obscura* segments 7 and 10 of the abdomen are black; further in 2 the blue at the sides of the segment forms 'lunules' but these are very small not merely separated by the dorsal ridge. The upper pair of anal appendages are longer, and less incurved at their apices than in de Selys' species, to judge by the figure of these given by Dr. Ris (1900). On the other hand *A. aborense* is very distinct from any of the described members of the genus, which will prove to be a large one. I have at present several unnamed species belonging to it awaiting description.

47. *Argiocnemis* sp.

1 ♂ Dejoo, N. Lakhimpur, base of hills, Upper Assam (*H. Stevens*).

An imperfect specimen, perhaps *A. rubeola*, de Selys.

48. *Argiocnemis lacteola*, de Selys.

3 ♂♂, 1 ♀ Dibrugarh, N. E. Assam, Abor Expedition, 17—21 x-11 (*S. W. Kemp*).

5 ♂♂ Dejoo, N. Lakhimpur, March, June, 1910 (*H. Stevens*).

One of the specimens from Dejoo has an additional antenodal nerve on the right fore-wing. It is rather remarkable to find this abnormality, which is I believe very rare, in so small an insect

Described from a specimen taken by Mr. Atkinson in Bengal.

49. *Argiocnemis nana*, sp. nov. (Pl. xvi, fig. 10.)

1 ♂ adult, Kachin Hills, Upper Burma.

Length of abdomen 18 mm.

,, hind-wing 9 mm.

Pterostigma gray, with a broad white border on its anterior and outer margins. Six post-nodal nerves on the fore-wing.

Head, lower lip white, the under surface of the eyes bright blue; upper lip blue, with a broad black line at its base, the rest of the lower half of the anterior aspect of the head blue to the level of the base of the frons, which has a black line. The rest of the upper surface black, including the upper half of the eyes. Post-ocular space blue.

Prothorax black above, blue at the sides, the posterior margin with a well-marked median lobe, slightly bifid.

Thorax, upper surface black with a narrow blue antehumeral stripe. Sides blue, with a small black spot at the base of the second pair of wings, on the second lateral suture.

Abdomen blue variegated with black; 1 has a square black mark occupying its dorsal surface; 2 a longitudinal black dorsal stripe, contracted posteriorly, and with a pair of oval blue enclosures before its middle; 3–7 each have a longitudinal dorsal stripe which widens at its posterior end, then contracting again immediately before its termination; 8 has the black mark confined to the dorsum for its first half, for the second half it expands on to the sides of the segment; 9, 10 are almost entirely black save for a small blue area on the lower parts of the sides of 9.

Anal appendages, upper pair longer than lower pair, pale blue above, black below. This pair is rather bluntly conical, a trifle longer than segment 10. On their inner side they are convex and slightly inclined to one another; from their ventral margin depends a large hook-like structure which is directed downwards, and at its apex outwards and backwards. The lower pair are thick at the base, directed upwards, bifurcated, with a crescentic posterior margin.

This species clearly belongs to the group which includes *A. pygmaea*, Ramb., and *A. minima*, de Selys.

It differs from these species in having the upper lip largely of a bright-blue colour, *not metallic*, in the colour of the pterostigma, in the absence of orange or red colouring on the terminal segments of the abdomen, and in the characters of the anal appendages.

50. *A. pygmaea* (Ramb.)

1 ♂ 26-iv-10 (*H. Stevens*).

51. *A. incisa*, Hagen.
1 ♂, 1 ♀ Dibrugarh, N. E. Assam, Abor Expedition, 17—21-xi-11 (*S. W. Kemp*).

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1902. Krüger, *Stett. entomol. Zeit.* 1902, pp. 93–94.
1907. Martin, *Cat. Coll. Selys* 1907, 17, p. 13, fig. 10.
1909. Ris, *Cat. Coll. Selys* 1909, 9, p. 118, fig. 86.

EXPLANATION OF PLATE XVI.

FIG. 1. Terminal segments of abdomen of *Coeliccia bimaculata*, sp. nov., seen from above, ♂.

,, 2. Anal appendages of *Copera annulata* subsp. *stevensi*, nov.

,, 3. *Archibasis oscillans* (de Selys), lateral view of anal appendages, ♂.

,, 4. *Aciagrion pallidum*, de Selys, lateral view of anal appendages, ♂.

,, 5. *Ischnura rufostigma*, de Selys, anal appendages, ♂.

,, 6. *Argiocnemis obscura*, sp. nov., lateral view of anal appendages, ♂.

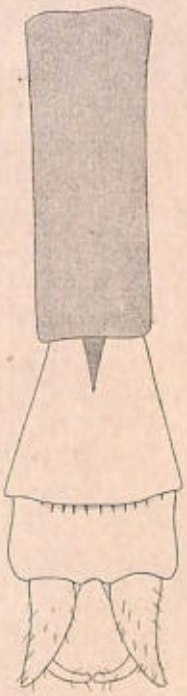
,, 7. *Argiocnemis aborense*, sp. nov., lateral view of anal appendages, ♂.

,, 8. *Ceriagrion coromandelianum* (Fabr.), lateral view of extremity of abdomen, ♂.

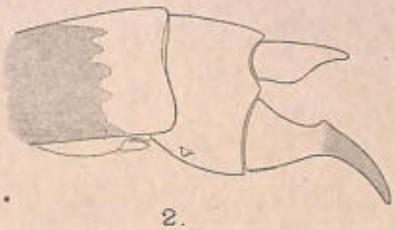
,, 8*a*. Dorsal view of the same.

,, 9. *Ceriagrion olivaceum*, sp. nov., anal appendages from side, ♂.

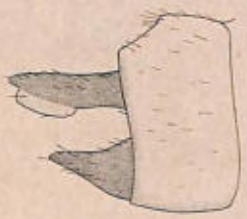
,, 10. *Argiocnemis nana*, sp. nov., lateral view of anal appendages, ♂.



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2.



3.



4.



10.



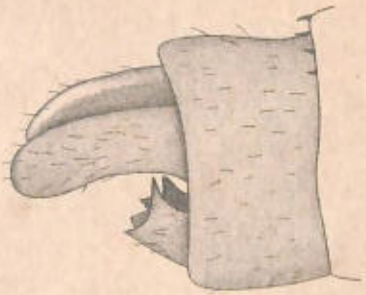
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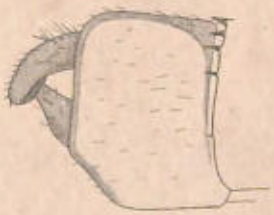
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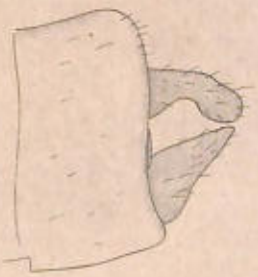
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9.

University Press Cambridge.

DRAGONFLIES FROM ASSAM.

XXVI. NEUROPTEROID INSECTS.

By NATHAN BANKS.

(Plate xxv.)

The small collection of Neuropteroid insects of the Abor Expedition and from Tenasserim contains a number of new species; nearly all the Psocidae are new, and many others, but in some forms especially Ephemeridae the specimens are not in condition for description.

The genera of the Psocidae are similar to the Ceylon fauna, which is quite well known.

The species I have been able to identify are those rather widely distributed in India. It is rather notable that the Myrmeleonid is new; but I have examined the types of all the Indian species.

Most of the species are represented by few specimens, so it is evident that this is only a very small fraction of the Neuropteroid fauna of the region.

CORRODENTIA.

PSOCIDAE.

Caecilius ceylonicus, Enderlein.

From Rotung, 25 December, 1911, 1300 ft.

One specimen has black antennae and dark spot behind eye; the venation agrees with the figure of Enderlein.

Epipsocus conspersus, n. sp.

(Pl. xxv, fig. 3.)

Pale yellowish; basal joints of antennae with red-brown marks, an oblique streak each side on face below antennae, a transverse row of spots above antennae and below eyes, and two spots on the vertex between eyes red-brown. A prominent red-brown streak along lower edge of each pleura, just at base of coxae. Wings hyaline; fore-wings with numerous dark dots, and dots at ends of veins, a cloud along median, and one partly above and partly within the areola postica. Fore-wings not very slender, outer margin rather oblique, apical veins sinuous, areola postica long and its upper edge sinuous, stigma concave on basal part from below, widened toward tip and tapering to the point.

Expanse 8 mm.

From Dibrugarh, N. E. Assam, 17-21 November, 1911.

Epipsocus costalis, n. sp.

(Pl. xxv, fig. 1.)

Pale yellowish, a red-brown band between eyes through base of antennae, latter pale yellowish, with first and second joint marked with red-brown, third joint as long as width of wing; a red-brown spot on the lower side of the prothorax and back along each pleura is a red-brown streak, continued along the sides of the abdomen; legs wholly pale, very slender, hind-tibia as long as width of fore-wing. Wings long and slender, stigma very slender, veins brownish yellow, a long narrow, brown streak along costa from base of stigma to tip of wing, and the ends of veins along the hind border each with a black spot; hind wings with black spot at end of the median vein.

Expanse 10 mm.

From Rotung, 24 December, 1911 (*Kemp*).

Kolbea punctata, n. sp.

(Pl. xxv, fig. 5.)

Pale yellowish, antennae wholly yellowish, densely hairy, a large dark brown spot in middle of each pleura, and notum of thorax more or less darkened; abdomen pale; legs pale, the claws black. Wings hyaline, broad, stigma angulate behind, basal part concave beneath, apical veins sinuous, radial sector and median vein united only for a short distance, areola postica very high, triangular, tips of all veins black, stigma milky whitish, with a dark spot, which may be expanded as a streak across wing toward the areola postica.

Expanse 12 mm.

From Upper Rotung, 4 January, 1912 (*Kemp*).

Psocus nirvanus, n. sp.

(Pl. xxv, fig. 7.)

Body pale yellowish; clypeus brownish, nasus faintly lineate with dark; first and second joints of antennae pale, rest black, third hardly as long as the greatest width of the fore wings, with very short hairs; femora yellowish, rest of legs black. Wings hyaline; veins black, most of those in the apical portion very plainly margined with black; a cloud just beyond the discal cell, two others between the radial sector and median vein toward tip of wing, one below the stigma, and one in the basal cubital cell (sometimes lacking), stigma yellowish, blackish at extreme base and along the outer margin; hind wings wholly hyaline, veins black.

In fore-wings the median vein is united to the radial sector usually only at one point, but in some cases for a short distance; the discal cell is plainly narrower below than above; the stigma is

angular behind, the outer side a little shorter than the inner side. The forking of the radial sector is hyaline, also the cross vein from the cell to the hind margin, and the lower side of the cell up a little way on outer margin, and a little away outward along the median vein.

Expanse 14 mm.

From Yembung, 15 January, 1912, 1100 ft. (*Kemp*).

Seopsis sp.

One rubbed specimen, head dull red brown; probably new, from Yembung, 17-19 February, 1912.

PLECOPTESA.

PERLIDAE.

Leuctra indica, Needham.

One from Upper Rotung, 4 January, 1912. The median ventral appendage is spatulate.

Nemoura sp.

One from Yembung, 1100 ft., 17 January, 1912; probably new as no species are recorded from India.

Chloroperla (Isopteryx) sp.

One from Yembung, 13-17 January, 1912.

Cryptoperla divergens, n. sp.

(Pl xxv, figs. 6, 8.)

Pale yellowish, or faintly brownish, no marks on head, except dark at base of antennae; sides of pronotum darker, and anterior tibia dark. Wings faintly yellowish, as also the venation. Head broad, with a high ridge connecting antennae; ocelli prominent, about four diameters apart, much closer to the eyes, latter faintly hairy Pronotum fully twice as broad as long, barely broader behind, corners nearly square, strongly irregularly rugose on the sides; setae widely separated, joints short; ventral plate of female large and broad as in the figure Wings elongate, about seven cross-veins beyond end of the subcosta, three branches to radial sector beyond anastomosis, last one close to tip, about five median cross-veins, and seven cubital cross-veins, lower branch of median forked about opposite to anastomosis, two veins between it and the cubitus.

Expanse 20 mm.

From Komsing, 2 March, 1912 (*Kemp*).

I place this in *Cryptoperla* since the labial palpi are very minute and the eyes are faintly hairy; it differs from typical *Neoperla* in that the ocelli are far apart; Needham fails to mention in his description whether the ocelli of *Cryptoperla* were far apart or as in *Neoperla* His species has a larger ventral plate than mine, and the ocelli were not as distinct.

ANISOPTERA.

EPHEMERIDAE.

Ephemera sp.

Subimago from Upper Rotung, 11 January, 1912, 2000 ft., and Yembung, 13-17 January, 1912, 1100 ft.

The subimago of three Indian species has been described, but this does not agree with any of them; three other species are known from India in the adult stage.

Thraulus sp.

Subimago from below Damda, 1 February, 1912, 1300 ft., and below Dosing, 27 January, 1912, 1400 ft.

Baetis sp.

One female from below Dosing, 29 January, 1912, 1400 ft.

Cleon sp.

Two from Dibrugarh, N. E. Assam, 17-21 November, 1911.

Chirotonetes sp.

Subimago from below Damda, 1 February, 1912, 1300 ft.

NEUROPTERA.

HEMEROBIIDAE.

Berotha insolita, Walk.

One from Misty Hollow, W. side Dawna Hills, 2200 ft., 23-30 November, 1911.

CHRYSOPIDAE.

Ankylopteryx octopunctata, Fabr.

From Kobo, 400 ft., 7 December, 1911, and Rotung, 1400 ft., 28 December, 1911.

Chrysopa alcestris, Bks.

From Upper Rotung, 7 January, 1912, 2000 ft.

Chrysopa virgestes, Bks.

From Dibrugarh, N. E. Assam, 17-21 November, 1911.

Formicaleon bivittatum, n. sp.

(Pl. xxv, figs. 2, 4.)

Face pale; a large dark interantennal band from eye to eye extending above and below antennae, above this is a narrow dark band with a stripe each side behind to the pronotum, and two spots in middle of vertex reaching toward these stripes; antennae annulate with brown, long and slender; pronotum longer than broad, with a broad dark stripe on each side, and the posterior corners dark; thorax dark with median pale stripe, extending a little way back on the abdomen, rest of abdomen brownish; pleura with two dark stripes under each fore-wing; legs pale, a dark band at extreme tip of tibia, and tibiae 1 and 2 with dark spot on outer side near base, legs slender, with long black bristles, spurs long, not much curved, about as long as four joints, last joint much longer than the first one. Wings hyaline; veins interruptedly dark and pale; stigma reddish, the forkings of veins near the outer margin and apex of wing are clouded with dark. Hind wings much longer and narrower than fore-wings, sharply acute at tip; fore-wings very broad at stigma; five cross-veins before radial sector, about 16 branches to radial sector, and with five cross-veins to cubital fork, a line bending up from end of anal and running through middle of cubital area; in hind wings the anal ends before the origin of the cubital fork. The wings are very similar to *F. verendus* but the pronotum and legs are more slender.

Expanse 70-80 mm.

From between Thingannyinaung and Myawadi, L. Burma, 24-28 November, 1911, 900 ft. (*F. H. Gravely*).

TRICHOPTERA.

HYDROPSYCHIDAE.

Stenopsyche griseipennis, McLach.

One from Siyom River, below Damda, 1300 ft., 31 January, 1912.

Philopotamus sp.

From Yembung, 1100 ft., 17 January, 1912; in alcohol, a uniform dark-winged species.

Hydropsyche sp.

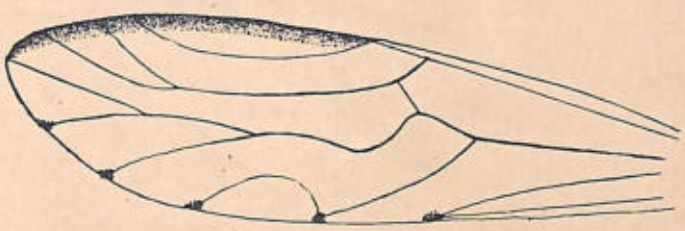
One female from Janakmukh, 600 ft., 18 December, 1911. As large as *H. asiatica*, but differs slightly in venation.

Hydropsychodes sp.

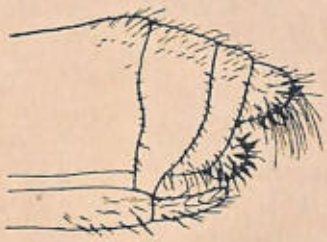
One from Egar stream between Renging and Rotung, 9 January, 1912. Probably undescribed.

EXPLANATION OF PLATE XXV.

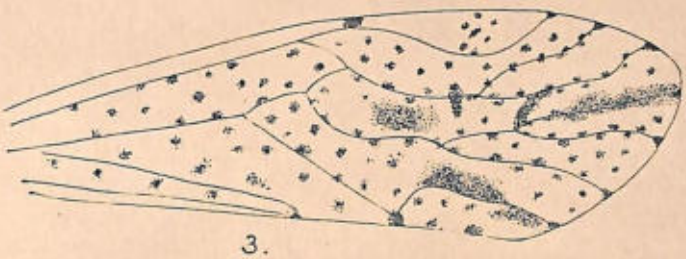
FIG. 1.—*Epipsocus costalis*, fore-wing.
,, 2.—*Formicaleon bivittatum*, tip of abdomen.
,, 3.—*Epipsocus conspersus*, fore-wing.
,, 4.—*Formicaleon bivittatum*, pronotum.
,, 5.—*Kolbea punctata*, fore-wing.
,, 6.—*Cryptoperla divergens*, head.
,, 7.—*Psocus nirvanus*, fore-wing.
,, 8.—*Cryptoperla divergens*, ventral plate.



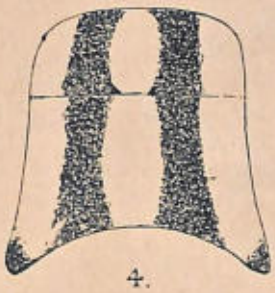
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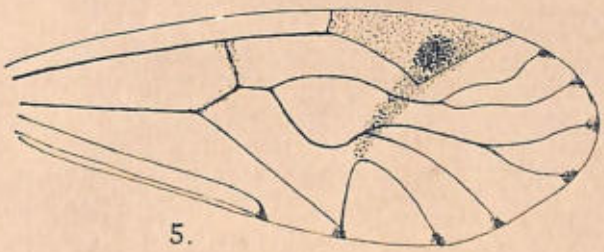
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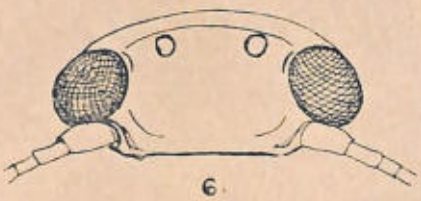
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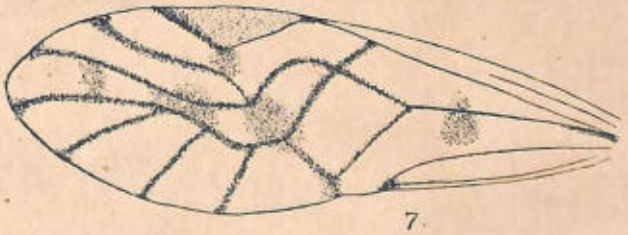
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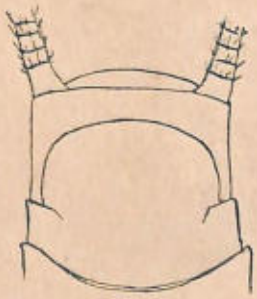
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8.

NEUROPTEROID INSECTS.

XXVII. REPTILIA (Supplement).

By N. ANNANDALE, D.Sc., F.A.S.B., *Superintendent, Indian Museum.*

In a small collection of lizards and snakes made in the Abor country after the conclusion of the main expedition by Capt. Sir George Duff-Sutherland-Dunbar, and presented by him to the Indian Museum the following species are represented :—

Lizards.	Snakes.
Japalura andersoniana, Annand.,	*Trachischium monticola* (Cant.),
Ophisaurus gracilis (Gray),	*Callophis macclellandii* (Reinh.).

These species were all taken between lat. 28° 45′ and lat. 29° N. at an altitude of about 4000 ft. By far the most interesting specimen is an adult male of the Agamid *Japalura andersoniana*. As this lizard was hitherto known only from two half-grown individuals taken in the Dafla Hills many years ago by Col. Godwin-Austen, a new description of the species has been drawn up.

Japalura andersoniana, Annandale.

Journ. As. Soc. Bengal (n. s.) I, p. 85, pl. ii, fig. 1 (1905).

Body slender, strongly compressed.

Limbs long; hind limb reaching tip of snout or beyond; digits, especially those of the hind feet, very long and slender.

Head moderate; snout in adult distinctly longer than diameter of orbit, bluntly pointed; rostral and superciliary ridges prominent, continuous, followed behind, after a slight interval, by a prominent tubercle bearing several small scales; several prominent scales scattered on the sides of the head behind the eye; dorsal surface of the head between the eyes deeply concave; dorsal and lateral surfaces of snout slightly so, with a well defined median Y-shaped ridge on the former. No gular pouch or distinct gular fold.

Dorsal crest.—Crest on neck well developed, consisting of a fold of skin as deep as the diameter of the eye, having several vertical pleats, covered with small leaf-shaped scales and bearing a row of slightly larger lanceolate ones along its upper margin; crest on back consisting of a single row of similar scales without the fold of skin at their base.

Scales on dorsal surface of snout irregular, nearly smooth, on superciliary region larger and strongly keeled. Lateral scales on body for the most part small and not very strongly keeled, in the

middle of the sides smaller than above; a well-marked lateral longitudinal row of enlarged keeled scales extending backwards from in front of the fore limb, accompanied by a fold of skin, to a point about half way between the axilla and the groin; five obliquely vertical rows of similar scales on the upper part of each side, extending downwards and forwards from the dorsal crest; scales on dorsal surface of limbs irregular, some of them strongly keeled; those on the ventral surface strongly keeled, leaf-shaped, imbricate, larger than the lateral scales; on tail small, keeled, not strongly imbricate.

Colour dark brown, obscurely marked with a paler shade; ventral surface paler, a large patch of green or blue containing a median yellow spot on the throat of the male.

Dimensions of adult male.

Total length	.. ..	235 mm.
Length of head	.. ..	23 ,,
Breadth of head	.. ..	15 ,,
Length of tail	.. ..	160 ,,
Length of fore limb.	.. ..	26 ,,
Length of hind limb.	.. ..	75 ,,

XXVIII. MOLLUSCA, II: ZONITIDAE AND HELICIDAE (in part).

By Lt.-Colonel H. H. GODWIN-AUSTEN, *F.R.S.*

(Plates xxiii–xxiv.)

The collection made by Mr. S. W. Kemp, Assistant Superintendent, Indian Museum, when attached as naturalist to the Force under Major-General Hamilton Bower, which entered the Abor country in the winter of 1911–12, is one of the finest and most interesting from the Eastern Frontier I have ever looked over, containing as it does so many genera and new species, and so many that are quite distinct from the land mollusca at present known from the most western part of Assam.

As it must be a very long time before all this material, a very large amount of which is beautifully preserved in spirit, can be examined and the anatomical details worked out, I think it well to give now a preliminary generic list of the species in the collection. The description of new genera and new species to follow at intervals. The first contribution I now submit treats of two interesting new species Added to this collection I have received from officers of the Indian Survey Department a small collection from the Miri Hills which were entered the same season of 1911–12 by a party under Lt. R. S. Wahab, R.E.

Quite recently I have received many new shells collected during 1912–13 by Lt. G. F. T. Oakes, R E., who has been extending his work in the Abor Hills of the previous year. Some of these species of *Spiraculum*, *Glessula*, *Sirella*, reached me alive and two species of *Glessula* at the time of writing (June) are still living.

To both these officers and Mr. Kemp especially I am much indebted and I sincerely thank them.

LIST OF GENERA REPRESENTED IN THE COLLECTION.

ZONITIDAE.

MACROCHLAMYINAE.

Macrochlamys (sp. nov.).
New Genus.
Sarama (*S kempi*, n. sp.).
Khasiella (sp. nov.).
Oxytes oslei, G.-A. (near *O. oxytes*, Bs.)
Taphrospira.

HELICARIONINAE.

Cryptaustenia.
Austenia (*A. rotungensis*, n. sp.).
Girasia.

DURGELLINAE.

Durgella.

HELICIDAE.

Sivella (sp. nov.).
Planispira (*P. delibrata* var. *fasciata*, G.-A.)
Plectopylis (sp. nov.).
Plectotropis.
Amphidromus.
Opeas.
Glessula.
Clausilia (sp. nov.).

Austenia rotungensis, sp. nov.

(Pl. xxiii, figs. 1-5 ; pl. xxiv, figs. 1-5).

Rotung, Abor Hills, 24-xii-11 (*S. W. Kemp*). 3 specimens. Nos. 5693-4 and 5881.

The largest specimen (5881) measures 70 mm., the one dissected (5963) 60 mm., and both are very much contracted in the spirit ; it must be quite 100 mm. when living.

Animal, as in spirit, ash-grey with a rufous tinge, darker about the head, palest on the mantle lobes. There are signs of a few distinct dark spots on the side of the foot. Sole of foot has a distinct central area, crossed by distinct V-shaped lines. Right and left shell lobes are united above the respiratory orifice and a short indistinct cicatrix can be seen where the junction takes place. The left dorsal lobe is large and expanded forwards in front over the neck, the right is small, lying between the above orifice and the hinder part of the shell. All the lobes are smooth. Foot behind is as long as the shell, as contracted, it is much compressed on the side, very sharply keeled, terminating in a vertical, linear mucous pore, and having no lobe over it, there is a slight turning over above the nearly vertical slit (pl. xxiii, fig. 5).

The peripodial margin is well marked by being much paler than the part above, and is closely streaked with fine lines. The surface of the body is very rough in the largest the rows of tubercles being conspicuous, in the specimen dissected it was less so, due probably to the different action of the spirit. The usual parallel grooves are not conspicuous, but there is a line of oblong tubercles which can be followed to the extremity of the foot, better to be understood in the drawing than it can be described, as well as the margin of the mucous gland. In these details of structure it differs considerably from its nearest known ally *A. resplendens*, Nevill, of Upper Burma ; in *resplendens* the peripodial grooves hardly show at all, *vide* Moll. India, vol. ii, p. 287. The eye tentacles are very

bulbous at the base and very close together. When the shell is removed from the animal, it is noteworthy that the apical coil of the visceral sac is present (pl. xxiii, fig. 4), a mere remnant certainly, yet a character showing a link with some more snail-like ancestor. The same minute coil occurs also in *A. resplendens*, *vide* my description and fig. 2*f*, Moll. Ind., vol. ii, p. 287. In this respect, both species differ considerably from *A. gigas* of the Khasi Hills, a species which has lost it altogether and may be considered a more recent evolution.

Generative organs.—The packing of the different parts, in other words their juxtaposition within the animal is of interest (pl. xxiv, figs. 1 and 2)—they rest directly on the sole of the foot, with the long large dull yellow coloured albumen gland at the posterior end of the body cavity. The oviduct conspicuously and much coiled occupying the anterior and resting against the ample intestine (pl. xxiv, figs 1–2). When turned and viewed from the right side, the penis is seen to have a position on the right anterior upper side, the amatorial organ below it, lying parallel and close to the spermatheca. Separated out and removed from the other parts the genitalia were beautifully seen. The penis has a long flagellum where the vas deferens joins it, thence a very long and somewhat twisted tube extends to the generative aperture. The retractor muscle attached where the tube is bent on itself.

The amatorial organ is very long and cylindrical, of much the same thickness throughout. The spermatheca is long and large, tapering to the free end: it was as full of spermatophores as it could hold, some 4 or 5, and so pressed together I had very great difficulty in getting one out, and then it was not perfect. It was quite typical of those seen in other species of the genus—other parts alluded to above do not require any detailed description. Characters are very much what is to be seen in *A. resplendens* (Moll. Ind., vol. ii, pl cxxx, 2*b*–2*e*), the flagellum is much longer and the amatorial organ more attenuate, not so large and thick.

The central tooth and admedian teeth are long and narrow with inner and outer cusps, they gradually become narrower and gradually change with about 6 transitional into bicuspid elongate curved teeth. No sharply defined line between the two, the outer marginals are very small. Formula 68 6. 27 1. 27. 6. 68 or 101-1 101. This radula differs from *A. gigas* and *resplendens* in having a greater number in the row, and not quite the same in their shape.

The jaw is very concave on the cutting edge, with a central projection, rather narrow and well arched above

Shell elongately spatulate; slightly concave on the upper margin of the peristome. Sculpture none. Smooth, lines of growth showing the form in the early stages of growth.

Colour strong ochraceous, apex white, inside dull milky white. Suture very short, deep. Whorls one, rapidly increasing.

Aperture elongately oval.

Peristome: Edge of peristome thin and membranaceous.

Size: Major diam. 23·0 ; minor diam. 13·0.

It is almost impossible to get a perfect shell. In pl. xxiii, fig. 4, there may be seen a portion of thin internal side wall of the shell (S) adherent to the visceral sac and left or rather torn off when the shell was removed.

Sarama kempi, n. sp.

(Plate xxiii, figs. 6, 7, 8 ; pl. xxiv, figs. 6, 7.)

Upper Rotung, Abor Hills.

Shell thin, glassy, depressedly globose, scarcely perforate.

Sculpture strong, regular, somewhat wavy, longitudinal striation, coarser on the base.

Colour with animal in shell very dark greenish brown, animal removed sienna brown. Spire flat convex. Suture shallow. Whorls 6, regularly increasing, apical closely wound and flat.

Aperture laterally ovate, sub-vertical.

Peristome very thin, as also on the columellar margin which is very oblique.

Size: Major diameter 18·25 ; alt. axis 7·25 mm.

This species in its anatomy is nearest to *Sarama kala*, G.-A., of Sikkim, but I do not remember seeing before shell lobes at all like these, especially the left shell lobe.

Mr. Kemp's field note of this species dated 6-1-12, is as follows :—"Common under leaf stems of plantain. When fully "extended anterior part of body very dull purplish grey with "darker grey eye-stalks. Hinder part of foot and mantle lobes "salmon-pink speckled with a paler shade ; under surface of foot "rather darker salmon-pink with a yellowish tinge along the "edges. The margin of the sole in dorso-lateral view, salmon "pink. Body of animal, seen through shell, horn-coloured, in "one case with a few large pale flecks on the outer whorl."

Animal in spirit:—Both the right and left shell lobes are peculiarly long, rounded and thickened, in typical species of the genus, these are thin and flat, in this case they do not appear to broaden out when the animal is alive; they are connected with a band which overlaps the edge of the peristome and these with the dorsal lobes are conspicuous against the dark colour of the adjacent parts. The animal in this state is so well described above by Mr. Kemp, after whom I have the pleasure of naming it, that one made from a spirit specimen would be no improvement. The gland at the extremity of the foot has an overhanging hooked lobe—the visceral sac is very blue black with 4 white spots on the periphery of the last whorl. It is this, seen through the transparent sienna brown shell, which gives it such a fine colour.

Genitalia.—The male organ is small, a short rather thick sheath from the end of which a long retractor muscle is given off, there is a very short and black epiphallus, and an equally short flagellum in which a spermatophore forming is seen, the vas

deferens joins at the base of this. The amatorial organ is present, very large and long, bent sharply on itself and held thus in this position by quite a net work of fine muscles. The spermatheca is short thus corresponding to the short spermatophore, the ovotestis and prostate together are not at all like what is seen in true *Macrochlamys*, the convolute sacs of the first are short and form a very conspicuous regular row

The radula is notable from its very dark colouration, confined to the subradula membrane on which it rests, and thus conforming to other parts of the animal, especially the visceral sac. This character constitutes it a dark race. The formula is 50. 3. 12. 1 12. 3. 50. The central and admedians are of the usual form, the marginals bicuspid, at first elongate narrow, lying close together, rather straight, with cusp far below the point, rising higher and higher, those near the margin itself shorter and evenly bicuspid.

Jaw is very solid, much arched above, nearly straight in front, only slightly concave, differing from any that I can remember having seen before.

Until I had seen the genitalia I had placed this mollusc in *Macrochlamys*; they were however a surprise to me, the penis did not present the well-known typical characters of that genus. It at once recalled that of *Sarama kala* from Damsang, Daling District of Western Bhutan, while the form of the shell although much larger and the very dark colouration of the animal are common to both. We have here in the Abor country 420 miles to the eastward a very close ally of *S. kala*, but differing in one character only, the presence of an amatorial organ or dart sac which the type of the genus does not possess. It modifies to this extent the description of the genus *Sarama*, one I felt necessary to constitute and published in the "Fauna of British India," p. 275.

The interest attaching to the distribution is very great, particularly with regard to species of *Sarama* which no doubt remain to be found in the long stretch of intermediate mountain country, linking up the two species.

EXPLANATION OF PLATE XXIII.

Austenia rotungensis, n. sp.

FIGS. 1, 1*a*.—Shell, from above and below, × 2.

FIG. 2.—Animal viewed from the right side, natural size.

,, 3.— Do. from above. Do.

,, 4.—Apical coil of the visceral sac, × 4·5.

,, 5.—Extremity of the foot.

Sarama kempi, n. sp.

FIG. 6.—Shell, × 1·5.

,, 7.—Animal, seen from right side, showing right shell lobe, and dorsal lobes, × 2.

,, 8.— Do. from left side, showing the left shell lobe, × 2.

1



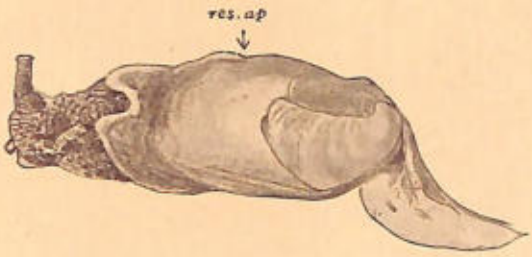
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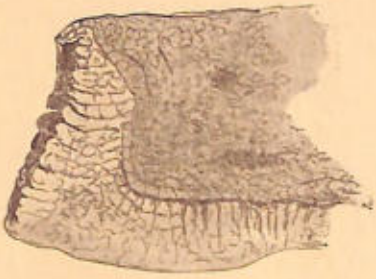
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8



H. H. Godwin Austen. del. ABOR MOLLUSCA. Watford Engraving Co.

EXPLANATION OF PLATE XXIV.

Austenia rotungensis, n. sp.

FIG. 1.—Arrangement of the generative organs, × 2. Seen from below, the sole of the foot turned back showing the internal wall.

,, 2.—The same as seen from the right side, exposing more of the internal organs, × 2.

,, 3.—The generative organs separated out, × 4·5.

,, 4.—Jaw, × 8.

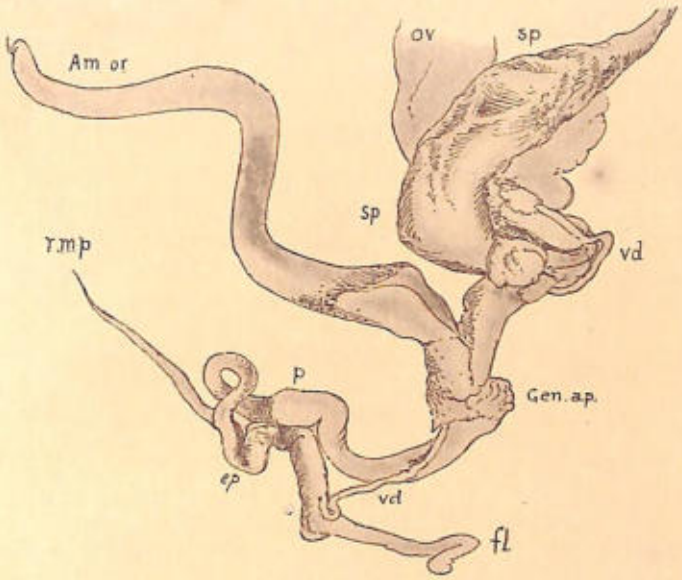
FIGS. 5, 5*a*, 5*b*, 5*c*.—Teeth of the radula at different parts of the row, × 196.

Sarama kempi, n. sp.

FIG. 6.—The generative organs separated out, × 4·5.

,, 7.—Jaw, × 24.

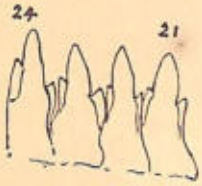
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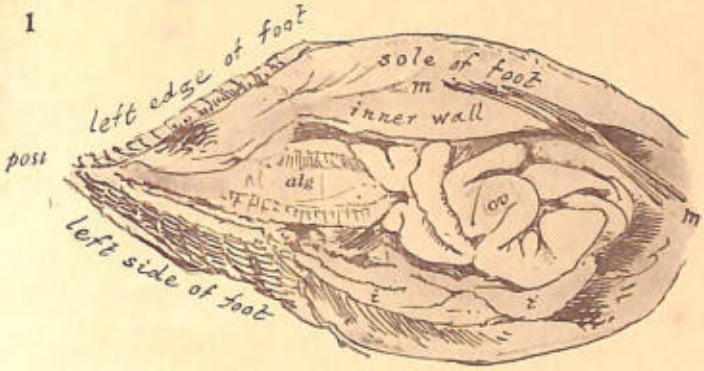
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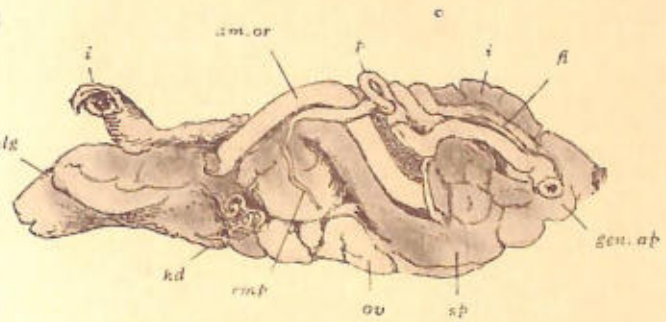
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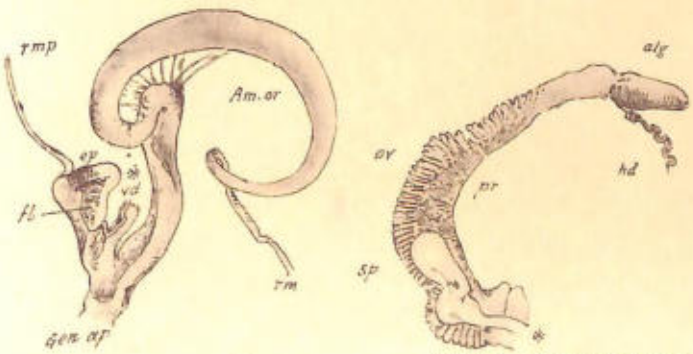
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H. H. Godwin Austen. del.

ABOR MOLLUSCA.

Watford Engraving Co.

XXIX. OLIGOCHAETA.

By J. STEPHENSON, *D.Sc., Major, I.M.S., Professor of Biology Government College, Lahore.*

(Plates xxvi–xxvii).

INTRODUCTION.

The interesting collection of earthworms here described was made in Assam and the Abor country, on the occasion of the recent Abor Expedition (1911–12), by Mr. S. W. Kemp of the Indian Museum, the naturalist with the expedition. The leading features of the collection may be briefly summarized.

Twenty-one species, and in addition one variety, are represented; of these no fewer than eighteen, and the variety just alluded to, are new. Ten of the new species are represented only by single specimens, or at any rate by single mature specimens. In addition, a few specimens were indeterminable, or determinable only as regards the genus.

The species are distributed among seven genera, *Drawida*, *Plutellus*, *Megascolides*, *Notoscolex*, *Perionyx*, *Pheretima*, and *Eutyphoeus*, all of which are known in India.

In the case of many of the species, the *habitat* presents no peculiarity; they were found in earth, under stones, while road-making, etc. The genus *Perionyx*, however, appears to choose other sites; the various species were frequently found in rotten wood, or under bark, while *P. depressus* was found at the base of the leaves of the plantain and screw-pine, ten, fifteen, or twenty feet from the ground. This peculiarity is not unknown in the genus, the name *arboricola* having already been applied by Rosa to a species from Burma. The two species of *Pheretima* were also found in rotten wood or under logs. One species of *Drawida* was found under a stone in water.

I may here draw attention to a peculiarity which occurs several times in the collection,—the forward displacement, by one segment, of the organs of the anterior part of the body. This has occurred in the single specimen of *Megascolides*, and in the specimens of both species of *Notoscolex*. With regard to the *Megascolides*, the peculiarity may be merely individual, since in the absence of other examples it is impossible to say whether it extends to the whole species or not; though, on the analogy of *Notoscolex striatus*, it may not improbably do so.

In the case of *Notoscolex* the value of the variation is also not easily to be determined. It occurs in the species *striatus* in three

different captures, and is therefore not merely an individual peculiarity; more than that, it occurs in the second species of the genus also, *N. stewarti*, and is therefore not even a specific peculiarity. The question naturally arises, whether in these circumstances the two species should not be separated from *Notoscolex* as a separate genus, to be derived from this latter by a shifting forwards of the organs to the extent of a segment. I have however adopted the more conservative course; the two species are evidently closely related, and have presumably become differentiated from an originally small stock of a few individuals which had suddenly developed the mutation in question,—a variation which would seem to be without functional importance.

From the point of view of *geographical distribution* the predominating occurrence of the genus *Perionyx* was to be expected, and so also the presence of a number of species of *Eutyphoeus*. The proper region of *Pheretima*, however, terminates, according to Michaelsen (3), in N. Burma, and in fact one of the species of this genus (*P. heterochaeta*) found in the present collection is a wanderer, and has been found in many parts of the world; the other species (*P. lignicola*) however seems to be endemic, representing perhaps with *P. anomala* from Calcutta (3, 4) outposts of this advancing and dominant genus.

The genera *Plutellus* and *Megascolides*, with their headquarters in the Australian region, occur also in S. India and (*Plutellus*) in Ceylon; they are, however, already known, by means of single species, from the E. Himalayas, and the present records serve to confirm the relationships thus indicated of the earthworm fauna of this region with that of S. India and Ceylon on the one hand, and with that of Australia on the other.

Here too the occurrence of *Notoscolex* in the present collection calls for comment. This genus is already known, by means of numerous species, from both S. India—Ceylon and Australia, and from these regions only. Hitherto it has been lacking from intermediate territories, and the present record of two species thus accentuates the above double relationship of the E. Himalayan fauna.

Finally, relationships of a similar nature are shown by the occurrence of *Drawida*, belonging to the Moniligastridae. The ancestral genus of the family, *Desmogaster*, is endemic in Lower Burma, Sumatra and Borneo; the headquarters of its descendant *Drawida* are in S. India and Ceylon; the genus has, however, been recorded a few times from other localities in India (Deccan, Central Provinces, Nepal), as well as from the Andamans, but these species are regarded by Michaelsen (3) as peregrine. It is therefore interesting to note that *Drawida* is one of the commonest worms in the present collection, and that, while one of the species is probably identical with a species of S. India (*D. pellucida*), the others are new, and in one case at least (*D. kempi*) not closely related to *D. pellucida*. The fact is here again exemplified that the relationships of the region have a double direction,—to S. India and

Ceylon on the one hand as before, and on the other in the Australian direction to Burma and the Malay Archipelago.

The spread of the above-mentioned genera (*Plutellus*, *Megascolides*, *Notoscolex*) of the Megascolecidae has been from the Australian region; the ancestral home of the Moniligastridae, to which *Drawida*, so abundant in S. India, belongs, is the Further India-Malayan region. The extension has thus been, in both families, towards India from outside. As Michaelsen (3, 4) has made abundantly clear, there must in the past have existed means of communication between Australia and India, though not necessarily by means of broad or permanent land bridges.

The view naturally first presents itself that India has been invaded by the representatives of the Megascolecidae by way of the Malay Peninsula round the head of the Bay of Bengal; and by the Moniligastridae from Burma (part of their original home) in the same way. Michaelsen however supposes a more direct means of communication, by way of a now submerged archipelago in the situation of the present Bay of Bengal (4):—"Die verschiedenen zwischen Neuseeland, Australien, dem Malayischen Archipel und Hinterindien einerseits und den verschiedenen Distrikten Vorderindiens samt Ceylon andererseits ausgespannten Landbrücken wurden gebildet durch einen Archipel (ähnlich dem Malayischen Archipel) an Stelle des jetzigen Golfes von Bengalen, dessen Teile ihre Gestalt und ihre Verbindungen mit einander mehrfach wechselten." To this he is led by a consideration of the close relationship between the earthworm faunas of Australia and Ceylon, as well as by the lack of endemic representatives of the Moniligastridae in the plains of India (4); "es ist zum mindesten unwahrscheinlich, dass die aus der hinterindisch-malayischen *Desmogaster* entsprossenen *Drawida*-Ahnen bei ihrer Ausbreitung nach Süd-Indien hin den in der Jetztzeit gangbaren Weg um den Golf von Bengalen herum eingeschlagen haben sollten. Dieser in Süd-Indien so üppig entwickelte Moniligastriden-Zweig würde in den Zwischendistrikten, in Bengalen, Orissa, etc., wohl Relikte Zurückgelassen haben; denn dies sind keine Distrikte, in denen besonders kräftige Formen wie *Pheretima* oder Lumbricidae herrschen. Es ist wahrscheinlich, dass den Moniligastriden ein anderer Weg von Hinterindien-Malakka-Sumatra nach Süd-Indien offen stand, ein weg, der jetzt vom Golf von Bengalen überflutet ist."

The fact that *Drawida* is one of the characteristic genera of the Abor country is therefore interesting, and may have some bearing on a future discussion of this question. The present records of the phyletically older genera of the Megascolecine branch of the Megascolecidae may be taken along with this occurrence of *Drawida*. On the alternative theory (invasion of India by Megascolecidae and Moniligastridae by a route round the head of the Bay of Bengal), these would represent traces, not yet obliterated by rival competitors, in the march of these invading genera from the south-east.

My best thanks are due to Dr. Annandale, Superintendent of the Natural History Department of the Indian Museum, for affording me the opportunity of examining this interesting collection.

LIST OF SPECIES REPRESENTED IN THE COLLECTION.

	Page
Drawida pellucida (Bourne)	.. 368
,, ,, ,, var. *stewarti*, var. nov.	.. 369
Drawida rotungana, sp. nov.	.. 372
Drawida decourcyi, sp. nov.	.. 373
Drawida kempi, sp. nov.	.. 376
Plutellus aborensis, sp nov.	.. 384
Megascolides oneilli, sp. nov.	.. 377
Notoscolex striatus, sp. nov.	.. 380
Notoscolex stewarti, sp. nov.	.. 382
Perionyx excavatus, Perrier.	.. 386
Perionyx annulatus, sp. nov.	.. 386
Perionyx kempi, sp. nov.	.. 389
Perionyx koboensis, sp. nov.	.. 391
Perionyx aborensis, sp. nov.	.. 392
Perionyx depressus, sp. nov.	.. 394
Perionyx foveatus, sp. nov.	.. 396
Pheretima heterochaeta (Mchlsn.)	.. 399
Pheretima lignicola, sp. nov.	.. 399
Eutyphoeus kempi, sp. nov.	.. 401
Eutyphoeus koboensis, sp. nov.	.. 404
Eutyphoeus aborianus, sp. nov.	.. 406
Eutyphoeus magnus, sp. nov.	.. 408

Drawida pellucida (Bourne).

Upper Rotung, alt. *ca.* 2000 ft., found road-making, 5-i-1912. A single specimen, not fully mature.

I give below some anatomical details of the specimen I have identified as above, since there may perhaps be some doubt as to the actual specific identity. The point is of some interest in view of the geographical distribution of the genus.

Length 3 inches; diameter 4 mm.; colour pale, non-pigmented. Segments 186.

Prostomium invisible. Clitellum not distinguishable.

Setae closely paired; $aa = 8ab = bc$ $ab = cd$, $dd = \frac{5}{8}$ of circumference; setae *a* and *b* are very minute behind segment xv, *c* and *d* are also small in the middle region of the body.

The male apertures are slits, in groove $\frac{10}{11}$, the margins of the adjacent segments bordering the apertures as slightly swollen lips; the centre of the slit is placed between the lines of setae *b* and *c*, rather nearer to *b*, and the inner end of the slit extends inwards almost as far as the line *b*.

The female apertures were not visible.

The spermathecal apertures are small, in furrow $\frac{7}{8}$, a little distance internal to the line of setae *c*.

The first distinguishable septum is $\frac{4}{5}$; this and the three following are extremely stout, the rest thin.

Five well-developed gizzards are present in segments xiv–xviii; the portion of the oesophagus in xiii, thick and muscular, might be described as a rudimentary gizzard.

The testicular sacs are subspherical, mainly situated in segment x, but slightly bulging forwards also on the other side of septum $\frac{9}{10}$, into segment ix. The duct could only be distinguished in segment x, not in ix. The prostate, perhaps not fully developed, appears as a small oval to circular elevation on the floor of segment x.

The spermathecae are small tubular or sausage-shaped sacs, attached to the posterior face of septum $\frac{7}{8}$; the curling duct bends outwards at its lower end. No trace of an atrium was visible.

Ovaries were apparently not developed. The egg-sacs, also probably incompletely developed, are small, tubular, and confined to segment xii.

The doubt that I have expressed above with regard to the identification of this specimen is caused by the fact that *D. pellucida* has hitherto only been found in Southern India (1600 miles distant from the Abor country), that the genus is rare in the intervening region, that the present specimen is immature, and that there are slight differences between it and the typical form of the species (e.g. in the setal intervals, and the presence or absence of a small atrium at the end of the spermathecal duct). But *D. pellucida* is apparently a species with a number of varieties (Michaelsen, 4), and if the present specimen does not actually belong to the typical form of the species it at least comes very near it, and can hardly be more than a variety. It does indeed, in the arrangement of the setae, the absence of the atrium at the end of the spermathecal duct, and possibly in the shape of the spermathecal ampulla, show some affinity to *D. pellucida* var. *bournei* (Mchlsn.); and it is mainly the absence of pigment that decided me against identifying it with this form, since the features of the spermathecal apparatus just referred to might perhaps be due to immaturity.

Drawida pellucida (Bourne) var. **stewarti**, var. nov.

Renging; 25-xi-1911; a single specimen, a fragment of the anterior end (*F. H. Stewart*).

Rotung, alt. 1300 ft., 24-xii-1911; a number of specimens, mostly immature (*F. H. Stewart*).

I propose first to describe the specimen from Renging and will then add a few lines on those from Rotung.

Length of fragment $1\frac{1}{2}$ inches; diameter $3\frac{1}{2}$ mm.; colour a faint olive-green throughout. Segments present 76.

Prostomium small, prolobous, under cover of segment i. There were no dorsal pores.

The setae, all of moderately large size, are closely paired; $ab = cd = \frac{1}{3}aa$; behind the genital region $aa = bc$, in front of the genital region however $aa > bc$; $dd = \frac{1}{7}$ of circumference. Setae *a* and *b* are absent on segments ix and x, present on xi.

A clitellum was doubtfully present, including segments ix, x, xi; in any case it was very indistinct.

The male apertures are on small papillae, in furrow $\frac{10}{11}$, between the setal lines *b* and *c*, and rather nearer to *b*; the papilla is bounded internally by the line *b*, while externally its limit is within the line *c*.

I cannot be absolutely certain, even after prolonged examination, of the situation of the female and spermathecal apertures; the female apertures appear to be just outside the line *b*, in furrow $\frac{11}{12}$, and the spermathecal apertures are apparently slit-like, the centre of the slit just within the line *c*, in furrow $\frac{8}{9}$.

On segment ix, immediately in front of furrow $\frac{9}{10}$, a well-marked transverse ridge extends across the mid-ventral line. The ridge is slightly dumbbell-shaped, *i.e.* narrower in its centre; it extends outwards on each side to a point slightly beyond the line *b*. The grooves $\frac{9}{10}$ and $\frac{10}{11}$ are less deep ventrally than in the other parts of their circumference. The papillae of the male apertures are surrounded each by a fairly definite circular depression, and the surface of the body in the immediate neighbourhood of the papillae is irregular, and to the outer side somewhat puckered.

Septa $\frac{7}{8}$—$\frac{5}{6}$ are thickened; in front of this are a number of septum-like sheets of muscle, convex forwards and attached centrally to the pharynx, of which they act as dilators and retractors; but these are probably not homologous with septa. The rest of the septa are thin.

There are four gizzards, in segments xvi—xix, that in xvi being smaller than the rest. There are no calcareous glands or vascular bulgings of the oesophagus.

The last heart is in segment ix.

The nephridia are attached to the posterior face of each septum, arching dorsalwards on each side to near the middle line above the alimentary canal.

The testicular sacs are suspended but not constricted by septum $\frac{9}{10}$; the shape of each sac is pyriform, the pointed end directed forwards and outwards, being in segment ix, the rounded end in x. The vas deferens originates in ix, is visible on both sides of the septum, is long and coiled; it ends by piercing the body-wall anterior and internal to the prostate.

The prostate is a comparatively small whitish hemispherical cushion-like mass on the ventral body-wall of x.

The ovaries are free, not enclosed in an ovarian chamber, conspicuous, attached beneath the arch of the nephridia to the posterior face of septum $\frac{10}{11}$. Funnels were not seen. The egg-sacs

were small, sausage-shaped, curved outwards at their hinder ends, and contained altogether in segment xii.

The spermathecal ampulla is attached to the posterior face of septum $\frac{7}{8}$, in the arch of the nephridium; it is egg-shaped, and almost meets its fellow, to which it is attached by a peritoneal band, in the middle line above the oesophagus. The duct is thin and much coiled, on the posterior face of the septum; it makes no appearance in segment vii, and on reaching the body-wall it bends outwards to end in a lateral position, without any atrial dilatation.

Of the specimens from Rotung, the longest was 2½ inches, but specimens 1½ inches long showed the male papillae distinctly; diameter 4 mm.; segments of one of the specimens about 165, very closely crowded together except the first few. The colour varies considerably; the specimen taken for dissection was pale, with an olive-green tinge in its anterior half; but in some of the smaller, immature specimens the olive colour was more pronounced and not limited to the anterior part. The prostomium was apparently zygolobous. No clitellum could be distinguished in any of the specimens.

The setae are strictly paired; $ab = \frac{1}{3} - \frac{1}{10}$ $aa = cd$; bc is slightly greater than aa; $dd = \frac{1}{7}$ of the circumference. Setae a and b are absent on segment xi, present on ix and x.

The male and spermathecal apertures are as in the previous specimen; the female apertures were not distinguishable. None of the specimens showed the genital markings described in the previous specimen.

Four well-developed gizzards are present, in segments xv—xviii, that in xv being smaller than the rest; the portion of the oesophagus in xiv may be described as a rudimentary gizzard.

In shape and position the sperm-sac shows an exact correspondence with that of the specimen first described; the duct is also exactly comparable in its course and ending. The prostate in the present example was slightly oval with its long axis transverse, cushion-like, and not much elevated.

The female organs also agree; and so too the spermathecal apparatus, except that the ampulla in the present example was very small, probably undeveloped.

The feature of the Rotung specimens which leads me to identify them with the Renging worm, is the characteristic shape of the testicular sac; and, in general, the close correspondence in the anatomy of the genital organs. It is quite possible that some of the differences are due to the Renging specimen being more fully developed; thus we may perhaps account for the absence of genital marks and of all trace of a clitellum in the examples from Rotung, as well as for the small size of the spermathecal ampulla. A difference of a segment in the position of the gizzards need cause no hesitation. There thus remains a slight difference in the ratio

deep groove all round; x and xi biannulate dorsally; and segments from xii onwards biannulate as far as the middle of the body; the rest consist of a single annulus. The posterior two inches of the body are marked by a ventral groove which includes the interval between the ventral rows of setal bundles.

The prostomium was invisible.

There are no dorsal pores.

The clitellum was not distinguishable.

The setae are closely paired; they begin on segment ii; *aa*=*bc*=approximately 10 *ab*; *ab*=*cd*; *dd*=$\frac{1}{3}$ of circumference.

The male apertures are in furrow $\frac{10}{11}$; they are of large size, and slit-like, the inner end of the slit being in the line of setae *a*, the centre of the slit a little distance outside *b*, and its outer end halfway between *b* and *c*. The slits are curved, their chief convexity being directed posteriorly and somewhat internally. The male pores lie within a deep rectangular depression, which includes more of segment x than of xi; the anterior border of xi slopes down into the hollow, the floor of which is constituted by the posterior $\frac{2}{3}$ of segment x, while the anterior of the three annuli of x forms its prominent anterior margin; laterally the depression extends to the outer ends of the male apertures.

The female pores are minute, in furrow $\frac{11}{12}$, in the line of setae *b*, or (Renging specimen) between *a* and *b*.

The spermathecal apertures are moderately conspicuous, in furrow $\frac{5}{6}$, internal to the line of setae *c*, about $\frac{1}{3}$ of the distance from *c* to *b*.

The first distinguishable septum is $\frac{4}{5}$, which, laterally a well-defined broad sheet, is however broken up mid-dorsally into two or three separate broad muscular bands; this structure may be a sheet of pharyngeal muscle only, and not morphologically a septum. Septum $\frac{5}{6}$ is thick, concave backwards, and approximated to $\frac{6}{7}$, which it joins dorsalwards. Septa $\frac{6}{7}$—$\frac{8}{9}$ are much thickened; the rest are thin. Septa $\frac{9}{10}$ and $\frac{10}{11}$ are bulged backwards, the former especially; in segment ix I noticed a distinct dorsal mesentery.

Well-developed gizzards are present, one in each segment from xviii to xxv, eight in all. Several septa behind the last gizzard are bulged far backwards by it; and the septa of segments xxi to xvi are bulged forwards, some of them considerably. In xvii the alimentary tube is rather softer than in the segments behind; its diameter is the same however, though it is divided by a constriction from the gizzard in xviii. I think that the portion of the tube in xvii should be reckoned as an additional gizzard, though in some degree rudimentary; this would bring the total number up to nine. In xvi and forwards the tube is seen to consist of well-marked longitudinal muscular bundles continuous from segment to segment, and presents no intersegmental constrictions; its diameter diminishes in xvi (working forwards), its walls become progressively less resistant, and in xiv are quite soft.

The last hearts are in ix.

The testicular sacs are of moderate size, rather rectangular in shape, in segment x, attached to and depending backwards from septum $\frac{9}{10}$. Each sperm-duct is a fine tube, which forms a relatively immense close-packed coil, larger than the testicular sac; it occupies a portion of segments ix and x, lying in front of the sac in ix, and on its outer side, to which it is applied, in x. Its great length reminds one of the description given by Bourne (1) of the duct in *D. grandis*; it must be at least as long in this species, relatively to the smaller size of the animal. The duct enters the prostate at a point which would be, in the natural condition of the parts, at the upper and posterior part of its inner surface (on its upper surface, towards its posterior end and near the outer margin, as the specimen lies pinned out).

The prostate is oval in shape, with its long axis antero-posterior, cushion-like, sessile on and firmly attached to the body-wall; its surface is shining, due to distinct bundles of longitudinal muscular fibres, and its anterior half is again covered over by a separate layer of transverse muscular bundles. It is situated in segment x (reckoning by the septa); but it corresponds externally to segment xi, overlapping furrow $\frac{10}{11}$ only by its anterior end; septum $\frac{10}{11}$ is bulged backwards by it, and is attached to the body-wall round its posterior end.

The ovaries are of considerable size, massive, not branched or folded, and are situated in an ovarian chamber which also contains the nephridia of segment xi, and out of which open the egg-sacs. The chamber arches over the alimentary canal; its limits are defined dorsally by the fusion of septa $\frac{10}{11}$ and $\frac{11}{12}$; this fusion takes place, not at the insertion of the septa into the dorsal body-wall, but along a line some distance below this, between their parietal insertion and the alimentary tube. Between this line of fusion and the dorsal body-wall the two septa are not fused, but merely adherent, and can be separated without tearing.

The egg-sacs are elongated, with irregular bulgings; they extend backwards into segment xiv, where they bend inwards and slightly overlap in the middle line. Septa $\frac{11}{12}$ and $\frac{12}{13}$ are fused together round the stem of the sac where this passes through them; the sac is narrow in xiii, swelling out just behind $\frac{12}{13}$.

The ampulla of the spermatheca is subspherical in shape, and is situated under the arch of the nephridium on the posterior face of septum $\frac{7}{8}$, to which both it and the nephridium are attached. The duct is thin and moderately coiled; it passes down the posterior face of the septum to the body-wall, and piercing the septum enters segment vii; its extreme terminal portion becomes a little stouter and firmer, and joins the atrium at its base. The atrium is an oval sac, which lies on and partly in the body-wall of segment vii, its free rounded end directed forwards; the length of the atrium is about half that of the segment in which it lies.

Drawida kempi, sp. nov.

Egar stream, between Renging and Rotung, under stone in water; 9-i-1912. A single specimen.

Length 3 inches; diameter 5 mm. Colour light olive green. Segments 125; no secondary annulation.

Prostomium small, under cover of segment i, prolobous.

No dorsal pores.

Setae closely paired; anteriorly $aa=8ab=bc=8cd$, $dd=\frac{1}{7}$ of circumference; in the posterior part of the body the ventral pairs of setae become approximated, *aa* being reduced.

No clitellum was visible on the dorsal surface; it was possibly represented ventrally by a slight apparent thickening of segments x and xi.

The male apertures are situated on small papillae in intersegmental groove $\frac{10}{11}$; the centre of each papilla is just within the line of setae *c*. Around each papilla is a slightly darker area of skin, which extends on each side in a transverse direction from the line of setae *b* outwards to beyond the line of *d*; in a longitudinal direction each area extends over the greater part of segments x and xi, being however longer (antero-posteriorly) at its outer than its inner limit. Each area is slightly depressed along its anterior and posterior borders, so as to form a couple of shallow grooves.

The female apertures are minute, in $\frac{11}{12}$, in the line of setae *b*.

The spermathecal apertures are one pair, small, in groove $\frac{7}{8}$, between the lines *c* and *d*, or perhaps rather in *c*; the setae in this region in the specimen are few, and exact estimation of the position difficult.

The first septum is $\frac{5}{6}$; in front of this the retractor muscles of the pharynx have the arrangement in successive transverse sheets which has been noticed in the previous species. Septa $\frac{6}{7}$, $\frac{7}{8}$, $\frac{8}{9}$, $\frac{9}{10}$ are thickened, the last most so. The rest of the septa are thin (or, in this specimen, softened from defective preservation).

There are no calcareous glands. There are four gizzards, in segments xvi—xix; of these the three posterior are large, round, and well-developed, while that in xvi is smaller. In xv a thickened portion of the oesophagus, with strong longitudinal muscular fibres, marked off by a slight constriction from the gizzard in xvi, might rank as a rudimentary gizzard. Even in xiv the oesophagus is still thicker than normal.

The last heart is in segment ix.

The nephridia have the same arrangement in relation to the septa as has been described in previous species.

The sperm sacs are large yellowish masses, suspended and constricted by septum $\frac{9}{10}$; approximately equal portions of the sac are situated in each segment (ix and x). The vas deferens is a fine tube, not very much coiled, running down the posterior face of the septum to the body-wall; it then enters the prostate at the lower and inner margin of the latter (in the position in

which the organs appear in the dissection), nearer its anterior than its posterior border.

The prostate is a large cuboid milky white mass of soft consistency, with a granular surface, with a narrow attachment to the body-wall.

Segment xi constitutes a large egg-chamber, with a mass of eggs lying dorsal to the alimentary canal. The funnels appear to be of unusual size, with fringed margins prolonged upwards on the anterior face of septum $\frac{11}{12}$.

The egg-sacs have a relatively narrow neck which passes through segments xii and xiii; the sacs swell out to a large size in xiv; in the present specimen that of the right side does not extend beyond xiv, while that on the left side reaches back into xv. The sacs touch each other in the mid-dorsal line, completely overlapping the intestine. Numerous brown granules, the size of a pin's head, were present in the egg-sacs and egg-chamber (cf. *Perionyx depressus*).

The spermathecae are in segment viii. Each has a considerable ovoid ampulla, which overlies the nephridium on the posterior face of septum $\frac{7}{8}$, the nephridium being between ampulla and septum, and thus not arching over the ampulla as in the previously described species. The duct is much coiled as it passes down the septum; on arriving at the ventral body-wall it runs outwards, still slightly coiling. It terminates on the left side, in the present specimen, in a small slightly dilated portion, which however is by no means marked, being only about twice the ordinary diameter of the duct; on the right side even this slight dilatation was not discoverable.

Megascolides oneilli, sp. nov.

(Pl. xxvi, figs. 1, 2.)

A single specimen, in a poor state of preservation. Janakmukh, Abor country; 13-xii-1911 (*J. S. O'Neil*).

Length $7\frac{1}{2}$ inches; greatest diameter 6 mm.; colour light olive green, darker on and in front of clitellum. Segments, *ca* 244.

Prostomium proepilobous.

Dorsal pores very obvious (due to state of preservation), first in groove $\frac{10}{11}$, present on clitellum.

Segments i–iii consist of a single annulus, iv is biannulate, v–xi more or less obviously quadriannulate; xii is triannulate. Behind the clitellum the intersegmental grooves themselves are not distinguishable (in the present specimen).

The setae are very small, difficult to see, and almost indistinguishable over the greater part of the body. They are rather widely paired: $aa = 2ab$ anteriorly, $= 2\frac{1}{2}ab$ behind clitellum and $= 3ab$ further back; $ab = \frac{2}{3}bc$; bc slightly or obviously $> cd$; $dd =$ approx. $\frac{1}{3}$ circumference. Setae are present on the clitellum; but the ventral setae of segments xvii and xviii are absent.

The clitellum extends from xiii—$\frac{2}{3}$ xvi = $3\frac{2}{3}$. The animal is thicker here, and there is no indication of intersegmental furrows; two oblique cracks are present on the ventral surface. In dissection the clitellum is very friable.

The male apertures are on segment xvii, between the lines of setae *a* and *b*, but perhaps rather nearer *a*; they are fairly close together, near the middle line; each has tumid and folded lips. The orifices are connected by a transverse groove, which is continued outwards on each side for a short distance external to the apertures, then turning at right angles and becoming longitudinal it runs backwards on each side for a distance equal about to the length of a segment; its margins are sharp-cut throughout (fig. 1).

Parallel to the longitudinal limbs of this groove, and just internal to these, is on each side a second groove; these latter become deeper in the posterior part of their extent; they are about equal in length to the longitudinal limbs of the first groove, projecting back slightly behind them, and not quite reaching the transverse groove in front. The intervening ridge between the two longitudinally running grooves on each side is cut in two by a narrow cleft (fig. 1).

Over the midventral area between these grooves is a series of wrinkles,—three distinct transverse furrows and a number of smaller and less marked longitudinal wrinkles. Anterior to the male apertures, between them and the posterior boundary of the clitellum, is an elongated depression, transverse in direction, and deepest at its ends (fig. 1).

The female apertures are moderately conspicuous, on the anterior part of the clitellum, in line with the setae of segment xiii. They are close together near the middle line, and apparently take the place of setae *a* in this segment though closer together than the setae *a* of most segments.

The spermathecal apertures are two pairs, in grooves $\frac{6}{7}$ and $\frac{7}{8}$, in the line of setae *a*.

The first septum is $\frac{4}{5}$, behind the massive pharynx; $\frac{5}{6}$ is thin, $\frac{6}{7}$–$\frac{10}{11}$ are all thickened, $\frac{11}{12}$ and $\frac{12}{13}$ are slightly thickened, and the rest are thin. Septum $\frac{8}{9}$ is very oblique, being attached to the alimentary canal at a level much posterior to its insertion into the parietes; and the same is the case, and even more markedly with $\frac{9}{10}$.

There is a large, elongated, cylindrical and very firm gizzard in segment vi.

The calciferous glands are four pairs, in segments ix–xii. Those in ix are oval in shape, situated dorso-laterally on the oesophagus, and attached to the anterior face of septum $\frac{9}{10}$ within the curve of the heart; internally their structure is lamellar. A similar pair of structures is present in x, and another in xi; the latter are rather larger, and bulge backwards into xii through a rounded aperture with a well-defined margin in septum $\frac{11}{12}$. The glands of segment xii lie posteriorly in the segment, and are hemispherical

in shape, the flat face looking forwards; they lie, and strongly bulge backwards, against septum $\frac{13}{14}$; internally their structure is lamellar. The glands of segments x and xi contained large calcareous masses.

The intestine begins in xiv.

The last heart is in xii.

In addition to numerous micronephridia on the inner surface of the body-wall, there is also in each segment in the posterior part of the body a pair of large meganephridia. A large mass of micronephridia is attached on the anterior face of septum $\frac{5}{6}$; owing to the obliquity of the septum, the mass is narrowly included between the septum on its outer and the oesophagus on its inner side; there are also a number of micronephridia on the posterior face of the same septum. A fluffy tuft of micronephridia is situated on and posterior to a softish white pad just internal to the prostatic aperture; the pad is ovoid, not much raised, and extends transversely from the prostatic duct to the ventral nerve cord.

A pair of male funnels were seen lying free in segment x; testes were not distinguished. Neither were found in xi.

The vesiculae seminales are two pairs; one in x, of moderate size, flattened, their edges cut up into lobes, and attached to the posterior face of $\frac{9}{10}$; and one in xi, attached to the posterior face of $\frac{10}{11}$. On the left side the posterior of the two seminal vesicles appeared to perforate septum $\frac{11}{12}$ and enter the anterior part of xii.

The male ducts were not distinctly seen. The prostates are lobular; that on the right extends through segments xiv–xvii, that on the left through xv–xvii. The prostatic duct is bent once or twice in its course, and narrows towards its end.

The ovary is large, in segment xii; also in this segment is a moderate-sized funnel. A minute folded structure in xiii was examined microscopically, but was found not to be ovarian in nature.

The spermathecae are two pairs, situated near the middle line in segments vi and vii. Owing to the obliquity of the septa, the anterior spermatheca is at the level of the middle of the micronephridial mass in v, and the posterior is at the level of the anterior part of the gizzard. Each spermatheca is directed backwards, is tubular in form, bent on itself several times, its inner end rather dilated; ampulla and duct are not distinguishable. A small subglobular diverticulum is attached close to its external termination (fig. 2).

No penial setae were seen.

Though the segments were difficult to count with certainty, on account of the secondary annulations being in places of equal distinctness with the primary, and the setae small or absent, I convinced myself that, for the present specimen, the above numbering of the segments is correct. The specimen is therefore evidently abnormal, and to obtain a correct idea of the species to which it belongs it is necessary to suppose the organs shifted

one segment back. The calciferous glands will thus, in a normal specimen, occupy segments x–xiii, and the intestine would begin in xv; the last heart would be in xiii, the testes in xi, vesiculae seminales in xi and xii, spermathecae in vii and viii. The gizzard seems to have the normal position for the genus.

Notoscolex striatus, sp. nov.

(Pl. xxvi, figs. 3–5.)

Rotung, alt. 1300 ft.; under stones; 21-xii-1911. Four specimens, one much smaller than the rest.

Upper Rotung, alt. *ca.* 2000 ft.; found in earth when road-making; 4-i-1912. A single specimen, the hinder end incomplete.

Same locality, 5-i-1912. Several specimens, some headless or tailless.

Three specimens were examined and dissected, one from each capture.

Length 8½ inches; diameter max. 5–6 mm.; colour pale yellowish or pale grey throughout, except clitellum which is light brown. Segments 297.

Prostomium relatively minute, prolobous, under cover of segment i. The first three segments consist of single annuli; iv and v are biannulate; vi-xii are triannulate, though there may be slightly marked subsidiary annulation in addition; and the same may be said of the post-clitellial segments.

The first dorsal pore is in furrow $\frac{9}{10}$; all are conspicuous.

The setae are all ventral; they are small, considering the size of the worm. Behind the clitellum *ab* are moderately closely paired, *cd* less closely; $ab = \frac{2}{3}$–$\frac{1}{3}$ *aa* (more posteriorly $= \frac{1}{4}$ *aa*) $= \frac{2}{5}$–$\frac{1}{2}$ *bc*; *bc* slightly $> cd$. In front of the clitellum the setae are often difficult to see; in vii the ratios were *ab* slightly $> \frac{1}{2}$ *aa*, *bc* $= cd = 1\frac{1}{3} ab$, but these latter ratios are variable; $dd = \frac{1}{7}$–$\frac{2}{3}$ circumference.

The clitellum embraces segments xiii–xv = 3; dorsal pores and setae are present.

A very characteristic genital area is present over the ventral portions of segments xvi, xvii and xviii (fig. 3). In shape it is rectangular, extending longitudinally from the level of the setae of xvi to those of xviii, and transversely embracing the region between the lines of setae *c* of each side. In colour it is brown, the pigmentation being best marked all round the borders of the area and over a longitudinal midventral tract. The centre of the area,- the midventral portion of segment xvii,—is depressed.

Next to the pigmentation, the most conspicuous feature of the area is the presence of a pair of longitudinal grooves. They are narrow, with definite margins and a rather wavy course; they traverse segment xvii in the line of setae *a*, or between *a* and *b*, and at or just beyond both the anterior and posterior limits of the segment they bend outwards, thus taking an oblique course,—more transverse than longitudinal,—for a short distance before terminating near the border of the pigmented area.

A third characteristic feature of the area is the presence of four small papillae, or nodular wart-like projections immediately lateral to the anterior and posterior limits of the longitudinal portion (not the oblique portion) of each of the grooves. Comparing what was said above as to the extent of the grooves, it will be seen that these wart-like projections occupy approximately the situation of furrows $\frac{6}{7}$ and $\frac{11}{12}$, in the position *ab*. A number of setae are absent on segments xvii and xviii.

The above description of the genital area is taken from the specimen first examined (Upper Rotung, 5-i-1912). A few differences in detail characterized the specimen selected for examination from Rotung, 21-xii-1911 (fig. 4); the oblique portions of the grooves were shorter and more directly transverse in direction; the warts were larger, and might indeed be described as 'tags', i.e. they were more or less rounded bodies attached by a narrow base; and the pigmentation was less intense; only setae *a* and *b* of xvii were missing.

The male apertures were not discoverable in the first specimen; in that last referred to they were minute pores, in the course of the grooves and in the situation of the missing setae *a* of segment xvii.

The female apertures appeared to be paired, and situated in minute grooves just in front of setae *a* of xiii; but this was only made out in one specimen, and is doubtful.

The spermathecal apertures are very minute, in furrows $\frac{8}{9}$ and $\frac{9}{10}$, in or (Rotung, 21-xii-1911) well internal to the line of setae *a*.

In front of the first definite septum is a series of muscular layers and bands extending between the body-wall and pharynx, of which latter they act as dilators and retractors. Septa $\frac{8}{9}$–$\frac{10}{11}$ are all much thickened; $\frac{8}{9}$ and the succeeding two or three are attached to the alimentary canal at a level much posterior to their parietal insertion. After $\frac{10}{11}$ the next few septa are slightly and diminishingly thickened, and the rest are thin.

The gizzard is large, barrel-shaped, in front of septum $\frac{8}{9}$, but corresponding externally to segments vii, viii and ix; thus septum $\frac{8}{9}$ is attached to the oesophagus at the level of furrow $\frac{8}{10}$.

Calcareous glands are present in segments ix, x, xi and xii (absent in x in one specimen); they are transversely elongated, somewhat sausage-shaped, and attached to the anterior faces of the septa $\frac{9}{10}$–$\frac{12}{13}$ within the curve of the hearts. The intestine begins in xiv.

The last heart is in segment xii.

The excretory organs are micronephridia; these are very small, and are best seen in the anterior part of the body as tufts in and in front of segment vi. They are scattered irregularly on the body-wall; apparently few occur between segments vii and the clitellum. There are no meganephridia in the posterior part of the body.

There are two pairs of testes, situated in segments ix and x; these are placed deeply in the segment, and each consists of a

number of fine, relatively long thread-like processes, arising from a common base on the posterior face of the septum ($\frac{8}{9}$ and $\frac{9}{10}$). The funnels, in the same segments, are small, not fringed, and somewhat iridescent.

The vesiculae seminales are paired, in segments x, xi and xii; each is a lobulated mass, flattened antero-posteriorly, lying on the posterior face of the corresponding septum, to which it is attached by a broad base.

The vas deferens was not distinguishable in any of the specimens dissected. The prostate is a small lobed organ, confined to segment xvii or extending also into xviii, and lying flat on the body-wall; the duct leaves the inner side of the gland, and forms a single U-shaped loop, the bend of the U being internal.

There are no penial setae.

The ovaries, of moderate size, are in segment xii; each consists of a number of finger-like processes. The funnels are small, the outer edge of each being much produced laterally, so that each funnel constitutes a transversely situated groove bordered by upper and lower lips.

The spermathecae (fig. 5) are two pairs, situated by the side of the nerve cord in segments vii and viii. Each is a small simple ovoid sac, with a short duct, not sharply marked off from the ampulla, opening near the middle line in grooves $\frac{6}{7}$ and $\frac{7}{8}$ respectively. Each has a single tubular diverticulum, slightly dilated at its free end, and as long as or slightly longer than the ampulla; the diverticulum is on the anterior side of the ampulla, against which and on the upper surface of which it reposes. A peculiarity of the diverticulum is that it arises from the duct within the body-wall. In one of the specimens examined a spermatheca was found without diverticulum.

Notoscolex stewarti, sp. nov.

(Pl. xxvi, figs. 6–8.)

Rotung, alt. 1300 ft.; 24-xii-1911. Two specimens, of which one was small and immature (*F. H. Stewart*).

Length 3½ inches; diameter maximum 3½ mm.; colour pale olive green, first few segments colourless. Segments 216.

Prostomium small, prolobous. Segments i–iii consist of single annuli; iv is faintly triannulate, v–xii fully so.

The first dorsal pore was in furrow $\frac{6}{7}$ in the small specimen, in $\frac{10}{11}$ in the larger; the pores are not visible on the clitellum.

The setae are paired, and behind the clitellum the pairs are situated on small white transverse ridges. Behind the clitellum $ab = \frac{1}{3}aa$ (more posteriorly $\frac{1}{4}aa$) $= \frac{1}{2}bc = cd$; in front of the clitellum the ratios are the same, except that $ab = \frac{1}{2}aa$; dd is very slightly less than $\frac{1}{3}$ of the circumference.

The clitellum is white in colour, ring-like, with well-defined margins, extending over segments xiii–xv = 3. The body is

wider in this region; grooves, secondary annulations, and dorsal pores are absent, but setae are present.

The genital field (fig. 6) is reminiscent of that of *N. striata* as regards the longitudinal grooves and wart-like papillae; though at first glance the appearances seem markedly different. Thus there is no yellow or brown pigmentation; the whole ventral surface of segments xvi–xviii, from the line of setae *d* on one side to the same line on the other, is whitish in colour and appears thickened, thus resembling the clitellum; the intersegmental furrows are obliterated, and a number of short transverse fissures or grooves make their appearance. The longitudinal grooves, bent outwards at their ends, have very much the position described in *N. striata*. The four wart-like projections are also present, but not quite so close to the grooves. In addition, a couple of transverse shallow groove-like depressions, without definite margins, join the longitudinal grooves of opposite sides across the middle line, between the situations of the bends, near their extremities. Seta *a* is present, but not *b*, on both sides in segments xvi and xviii; both *a* and *b* are absent in xvii.

The male aperture, minute, was seen on the right side within the longitudinal groove, at the middle of its length; it was not certainly distinguished on the left side.

The female apertures are paired, small and not easy to see, on segment xiii just in front of and internal to setae *a*.

The spermathecal apertures were also difficult to distinguish; they are small, slit-like, in furrows $\frac{8}{9}$ and $\frac{9}{10}$, approximately in the line of setae *a*; though as the setae have fallen out or are indistinguishable in this region, the exact location is impossible.

The first septum is $\frac{6}{7}$, which, as in the previous species, is strongly concave forwards. It and the two following septa are considerably thickened, though much less so than in *N. striata*; septa $\frac{8}{9}$, $\frac{10}{11}$ and $\frac{11}{12}$ are only slightly thickened.

The gizzard is barrel-shaped, and situated in front of septum $\frac{6}{7}$: its walls are of moderate thickness, though rather soft. Calcareous glands are present in segments x, xi and xii. The intestine begins in xiv.

There are numerous micronephridia attached to the body-wall; at the sides of the anterior part of the gizzard they constitute large tufts of fairly long tubes.

The last heart is in segment xii.

The testes are in segments ix and x; they lie deeply, close to the ventral nerve cord, and each consists, as in the previous species, of numerous fine thread-like processes, arising close together from a circumscribed base. The funnels, in the same segments, are relatively large and iridescent.

The vesiculae seminales are two pairs, in segments x and xi; they are flattened antero-posteriorly, elongated in shape and arching up from below so as nearly to meet dorsally above the oesophagus; their edges are slightly lobulated; each is attached to the posterior face of the respective septum for a considerable length.

The prostate (fig. 7) is large and conspicuous. It occupies two segments, xvii and xviii, and is almost cut into two by a deep indentation in the situation of septum $\frac{17}{18}$; each of these two principal lobes forms a compact mass with its surface somewhat indented into secondary lobes. The two chief lobes are connected ventrally by a narrow junction from which arises the duct. The vas deferens joins the anterior of the two chief lobes not far from the origin of the prostatic duct. The latter is short, consists of a single U-shaped bend, and ends in segment xvii.

The ovaries are situated in segment xii; they are large, and consist of a number of finger like processes. The funnels are small.

The spermathecae (fig. 8) are two pairs, in segments vi and vii, opening in furrows $\frac{6}{7}$ and $\frac{7}{8}$, i.e. in the furrow behind the segment in which they lie; they are situated in the middle of large tufts of micronephridia. Each is a subspherical or rather pyriform sac, of moderate size, narrowing to be implanted on the body-wall, with scarcely anything that can be called a duct. There is a single diverticulum situated on the anterior side of the ampulla, to which it is about equal in length; the diverticulum is club-shaped, being rather wider at its inner than at its outer end, and arises from the duct of the main sac in the substance of the body-wall.

The presence of the same grooves, and the same wart-like projections, on the genital area, as well as the similarity of the spermathecal apparatus, indicate a near relationship between the two species just described. On the other hand the considerable difference in size, the presence of only three pairs of calcareous glands and two pairs of seminal vesicles, and the characters of the prostate in the second form, appear to justify the distinction of the two forms as separate species.

Plutellus aborensis, sp. nov.

(Pl. xxvi, figs. 9, 10.)

Rotung, alt. 1300 ft., on path; 26-xii-1911. A single specimen.

Length 4 inches; diameter relatively small, at anterior end 3 mm., posteriorly only 1½ mm. Colour pale throughout. Segments 385.

Prostomium small, prolobous, under cover of segment i. Segments i–iv consist of single annuli, v of two annuli; and the rest of three; this secondary annulation however is lost towards the posterior end.

The dorsal pores are large and conspicuous; the first is in furrow $\frac{5}{6}$.

The setae are in general very small and inconspicuous, and in front of segment xi it is very difficult and for the most part impossible to distinguish them; those most easily visible are between segments xiv and xxi. The following ratios were estab-

lished:—$aa = 4ab = \frac{8}{4}bc$; $ab = \frac{3}{3}cd$; $dd = \frac{1}{2}$ circumference. Setae *a* and *b* are absent on segment xviii.

The body is rather constricted from segment xiii to xix, but there is no other sign of a clitellum.

The male apertures are situated on small papillae on the middle annulus of xviii. The papillae embrace the interval *ab*; the interannular grooves, which bound the papillae in front and behind, are rather more marked at this place than elsewhere. Around and for a small distance internal to the papillae the skin is coloured a faint yellowish brown; and between the papillae the ventral surface of the segment is gently hollowed.

The female apertures were not seen.

The spermathecal apertures are small, in furrows $\frac{7}{8}$ and $\frac{8}{9}$, between the lines of setae *a* and *b*.

The first septum is $\frac{5}{6}$; it forms a deep cup, concave forwards, in which the gizzard lies. Septa $\frac{8}{9}$–$\frac{9}{10}$ are all thick, the rest thin.

The gizzard is in front of the first septum; it is short, and square in outline. There are no calcareous glands.

The excretory system is meganephric.

The last heart is in segment xiii.

Two pairs of small seminal funnels were found free in segments x and xi; testes were not distinguishable in x, and not certainly in xi. The seminal vesicles are two pairs, in xi and xii, attached to the anterior faces of the septa ($\frac{11}{12}$ and $\frac{12}{13}$); they are of moderate size, rather flattened in an antero-posterior direction, their surface incised (deeply in the case of the posterior pair) so as to present a number of small lobes.

The prostate is a coiled tubular structure, of small size though extending through several segments. In segment xviii is scarcely more than the duct; the gland itself reaches back into xxi. The duct is a muscular shining tube, forming a single rather elongated loop in segment xviii, thicker at its termination than elsewhere.

No female organs were identified, except possibly an ovarian funnel on the left side of segment xiii.

The spermathecae (fig. 9) are situated in segments viii and ix. The ampulla forms a straight or bent cylinder, lying on the body-wall, to which it is rather adherent, in an oblique position, its anterior end being also internal. There is a small finger-shaped or club-shaped diverticulum at its internal end. The duct is very short, almost absent, and is situated on the under surface of the ampulla nearer the inner than the outer end of the latter. The situation of the diverticulum is thus some distance removed from the duct.

The penial setae (fig. 10) are ·88 mm. long, 11 μ broad, and without ornamentation; they are almost straight for the greater part of their length, but show a gentle wavy curve at their distal extremity, the point of which is sharp.

Perionyx excavatus, Perrier.

Dibrugarh, N.E. Assam, in rotten wood; 20-xi-1911. A number of specimens, many of small size and immature.
Sadiya N.E. Assam, under logs; 25-xi-1911. Ten specimens, a number mature.
Same place and date, under logs; two other specimens.
Again same place and date, under logs; two other specimens.
Rotung, alt. 1300 ft., in rotten wood; 28-xii-1911. Numerous immature specimens, probably of this species.
Renging, Abor country, under bark; 19-xii-1911. Six specimens.
Upper Rotung, alt. *ca.* 2000 ft., under bark; 9-i-1912. Numerous specimens, a young brood probably of this species.

The Renging specimens were extraordinarily small, their maximum length being one inch, and maximum breadth 2 mm.; male apertures and genital setae were however present. Compare Michaelsen's remarks on variability in size (3, p. 175).

The clitellum in the Dibrugarh specimens was only distinguishable by its rather lighter colour; it extended over segments xiv–xvi = 3. In the specimens from Sadiya and Renging it was absent altogether.

The midventral break in the setal ring varies in different specimens; it may be absent altogether, or may be well-marked (*aa* = 2*ab*).

In the specimen which I dissected (one from Dibrugarh), I found that the nephridia pierced the body-wall at approximately, but not quite equal distances from the mid-ventral line. The prostates were compact, and sessile on the body-wall. The spermathecae were large ovoid sacs, with short and narrow ducts, and without diverticula.

Perionyx annulatus, sp. nov.

South of Yembung, Abor country; 11-ii-1912. A single sexually mature specimen.
Rotung, Abor country, alt. 1300 feet, under stones; 8-iii-1912. Several specimens, but only one mature.

The specimens show many individual differences. The single example from the first locality, though mature, was abnormal in many respects; the mature specimen from the second locality was much softened and broke in two before the examination was completed. Though the male apertures were indicated in a third specimen, their position here too was abnormal, and internally sexual organs were found not to have developed Of three other immature specimens, one was much softened, one was mutilated in the anterior part of its body, and one had its hinder end regenerated. The description which follows applies to the mature specimen from the second locality, supplemented, on account of its bad preservation, by the examination of the abnormal specimen from the first locality (with the necessary allowances for the extra segments in the latter).

Length 4–6 inches; diameter 4–6 mm. Ventral surface pale; dorsal surface in general a dusky purple, but when examined more

minutely, the intersegmental grooves are seen to be pale, as are also the crests of the ridges along which the setae are set, while the intervening areas, constituted mainly by the slopes of the setal ridges, are a deep purple; a cross-striped or annulated appearance is thus produced. Segments 198–230; no secondary annulation, except, behind the clitellum, that constituted by the keel-like ridges bearing the setae.

Prostomium large, broad, epilobous $\frac{3}{4}$.

First dorsal pore in furrow $\frac{1}{2}$; all very distinct.

Clitellum xiii-xvii = 5; segment xii slightly modified also. Intersegmental grooves not obliterated, and circles of setae present. The characteristic colouring maintained over the clitellum, only rather paler than elsewhere.

The setal rings are continuous or nearly continuous ventrally behind the clitellum; and in front of the clitellum also, though there is some irregularity with occasional gaps here and there, there is no regular midventral interval. Dorsally the median interval is more constant ($zz = 1\frac{1}{2}$–$2yz$); but the arrangement is not absolutely regular. The intersetal distances are on the whole a little greater dorsally than ventrally, but the difference is not marked. Numbers of setae:—55/iv, 74/ix, 82/xiii, 70/xix, 70/xxvi.

Male apertures moderately close together, distant from each other about $\frac{1}{8}$ of the circumference (about $\frac{1}{6}$ in the softened specimen, where the ventral depression has become flattened out), at the middle of the lateral boundaries of a mid-ventral rectangular depression on segment xviii. The depression extends the whole length of the segment, from the anterior to the posterior limiting groove, and is about $1\frac{1}{4}$ times as broad as long. The floor of the rectangle, and the lateral walls of the depression, are wrinkled by small fissures, mainly longitudinal and transverse in direction. No genital setae were visible, and there were no setae on the floor or the lateral walls of the depression.

The female pore or pores were not visible.

The spermathecal apertures are three pairs, minute and difficult to see, in furrows $\frac{6}{7}$, $\frac{7}{8}$ and $\frac{8}{9}$; they are distant from each other about $\frac{3}{11}$ of the circumference, and the posterior pair were opposite the ninth seta from the midventral line.

There are no other genital marks.

A large number of septa in the anterior part of the body are more or less thickened, as compared with the very delicate dissepiments of the post-clitellar region. The septa from the anterior end as far as $\frac{9}{10}$, and $\frac{11}{12}$–$\frac{15}{16}$, may be called slightly thickened, and $\frac{13}{14}$–$\frac{16}{17}$ moderately thickened. After the first few segments none are missing.

A gizzard is present in segment vii; it is soft, and flattened dorso-ventrally, thus differing from the firm ovoid or barrel-shaped mass seen in allied genera; and, though of some size, it must be called rudimentary. The oesophagus is much bulged in segments xiii, xiv and xv; the anterior of these bulgings have

their walls strongly ridged internally. The oesophagus is narrow between the prostates. The intestine begins in xix. The intestinal walls are very delicate and transparent; there are no caeca, nor lymph-glands on the intestine.

The last heart is in segment xiii.

Meganephridia exist in all segments as far forwards as ii; in addition, in the post-genital segments, there are a number of minute micronephridia in regular transverse lines on the body-wall, especially ventrally, in the neighbourhood of the meganephridia. In the softened specimen the micronephridia are barely indicated, through disintegration.

The testes are two pairs, in x and xi; the funnels, in the same segments, are large, iridescent and much folded rosettes. The vasa deferentia were not traceable

The vesiculae seminales are two pairs, in xi and xii, depending from the anterior septa of their respective segments. They are large, and fill up the whole length of the segment, those in xii causing a backward bulging of septum $\frac{12}{13}$. Those in xi are completely fused in this situation.

The prostates take up segment xviii; each is a hemispherical mass, the flat surfaces facing inwards and apposed to each other. Each gland is made up of a large number of small lobules; the appearance of the whole is thus roughly granular. The gland is of considerable size; hence the septa in front and behind are bulged forwards and backwards respectively, and the segment containing the prostates encroaches on its neighbours. The duct is long and coiled, the coils closely applied to each other on the inner face of the gland; the last portion of the duct is thicker, and has a vertical position in the segment, running downwards to the external opening not far from the middle line.

The ovaries are of moderate size, in segment xiii. The funnels are small; I could not trace the oviducts.

The spermathecae are three pairs, in segments vii, viii and ix. They are large, sausage-shaped, and immediately obvious on opening the specimen, since they fill up the greater part of their segments at the side of the oesophagus, and, being placed with their long axes vertically, each almost or quite meets its fellow of the opposite side dorsally to the alimentary tube. The duct is short and moderately stout. Two or more very small diverticula spring from the lower part of the ampulla, on which they are sessile, above the duct; these small diverticula may or may not be themselves divided into minute lobes.

The abnormal specimen already referred to showed the following peculiarities. The dorsal process of the prostomium was limited posteriorly by a transverse groove; the first dorsal pore was in furrow $\frac{5}{6}$, the gizzard in segments vii and viii, and the last heart in xvi. The male apertures were on segment xx; there were three pairs of testes and of large folded funnels, in segments xii, xiii and xiv; and two pairs of well-developed

ovaries, with funnels, in xv and xvi. The spermathecae were four pairs, in segments viii–xi, and their apertures were, correspondingly, in grooves $\frac{7}{8}$–$\frac{10}{11}$.

The third specimen which was examined, though it showed the male pores, was however quite immature. The male pores were near the ends of a transverse groove on the ventral surface of segment xix; the groove took up more than one-third of the length of the segment (antero-posteriorly), and also rather more than one-third of its breadth (transversely) as seen from the ventral surface. There were no setae in the groove, nor, curiously, any in the middle of the ventral surface of segment xx, over an interval nearly equal to the length of the groove on xix. Internally no sexual organs had been developed; the gizzard was mostly contained in segment viii, but extended into ix; the last heart was in xv. Segment xvii, as seen externally from the dorsal side, was abnormal in being partly double; there was an extra dorsal pore in the middle of the segment; the complete ring of setae was situated in front of the pore, while behind and to the right of the supernumerary pore was a short, rather obliquely placed additional row of setae.

The remarkable features of this worm appear to be (1) its variability in regard to the position of the organs of the anterior part of the body, and in the number of the reproductive organs including the spermathecae; that the variability in position of the organs does not depend merely on the intercalation of one or two additional segments is seen from the situation of the gizzard and of the last heart in the three specimens dissected; (2) the association of micro- and meganephridia, as in the genus *Lampito*; between which and the bulk of the species of *Perionyx* the present may be regarded as a connecting form.

Perionyx kempi sp. nov.

(Pl. xxvi, fig. 11.)

Five specimens, in tube along with *P. koboensis*; in rotten wood; Kobo, Abor country, alt. 400 ft.; 30-xi-1911 and 8-xii-1911.

Length 3 inches; breadth nearly 3 mm; colour light brown, paler ventrally and at anterior end. Dorsal vessel appears as a dark stripe; the specimens are flattened dorso-ventrally, especially behind the clitellum, the ventral surface appearing as a shallow longitudinal groove. Segments 164; except the first two and the clitellar segments, each is 3-annulate (indistinctly so posteriorly).

Prostomium epilobous $\frac{1}{2}$; a transverse groove at the hinder end of the tongue-like process of the prostomium cuts off this latter altogether from the first segment. A longitudinal mid-dorsal groove extends from the tip of the prostomium to some distance behind the clitellum; it is well marked as far as the clitellum, and also on the first and last segments of the clitellum itself; it is faint, over the middle segments of the clitellum, and towards the posterior limit of its extent.

The clitellum embraces segments xii–$\frac{1}{3}$xix = $7\frac{1}{3}$; the region is swollen, but the intersegmental furrows are not obliterated. In dissection this portion of the body-wall is very thick and friable.

The first dorsal pore is in furrow $\frac{5}{6}$; no pores are however visible on the clitellum.

The setal rings are unbroken ventrally; the setae are very close together in the mid-ventral region; the intervals become wider towards the sides, and laterally and dorsally are three times as wide as mid-ventrally, or even more. The ring is broken in the mid-dorsal line ($zz = 2\frac{1}{2}$–$3yz$); but the dorsal setae are extremely difficult to see, and are so small that I was at first uncertain whether or not any existed posterior to the clitellum. There are no setae between the male pores on the ventral surface of segment xviii; otherwise the setae of the clitellar segments have the usual distribution. The number of setae per segment is about 50. There are no penial setae.

The male pores are situated on the lateral margins of a square depression which occupies the mid-ventral portion of segment xviii. The size of the depression is such that it occupies the length of the segment from the anterior to the posterior limiting groove. The margins of the pores themselves are puckered or nodular.

The female pore is single, and minute, situated in the middle of a slightly depressed whitish patch mid-ventrally in the anterior part of segment xiv.

The spermathecal apertures are two pairs, inconspicuous, in grooves $\frac{6}{7}$ and $\frac{7}{8}$, about $\frac{1}{7}$ of the circumference apart.

There are no other genital papillae or markings.

No septa are specially thickened.

There is not even a rudimentary gizzard. The oesophagus is rather dilated in segment x; the intestine begins in xix; there are no intestinal caeca.

The last hearts are in xiii, the first, which are small, in vii.

The nephridial system is purely meganephric; all the organs on each side are in the same line.

The sperm-funnels are large and iridescent, free in segments x and xi. The vesiculae seminales are paired, in xi and xii, depending backwards from the anterior septum of their segments; they are large, compact masses, only indistinctly cut up into lobes. The vas deferens, thin and fine, joins the prostate gland on the lower part of its inner face, close to where the ejaculatory duct leaves it. The prostate occupies segments xvii and xviii, and septum $\frac{17}{18}$ is bulged backwards by the gland; it is a solid-looking massive compact body, elongated antero-posteriorly, not distinctly lobulated on the surface; its duct is thick, short, and **S**-shaped.

The ovaries are large, like bunches of grapes.

The spermathecae are in segments vii and viii, their apertures in grooves $\frac{6}{7}$ and $\frac{7}{8}$. The shape of the ampulla is very irregular, and not quite the same in all (fig 11); on the whole it is triangular.

The duct is equal or nearly equal in length to the ampulla, and is swollen at its upper end, where it is delimited from the ampulla by a deep constriction. The dilated portion of the duct contains spermatozoa, and may thus be considered as a rudimentary diverticulum.

Perionyx koboensis, sp. nov.

(Pl. xxvi, fig. 12.)

Numerous specimens; in rotten wood, Kobo, Abor country, alt. 400 ft., 30-xi-1911 and 8-xiii-1911.

Length 4 inches; breadth 4 mm.; colour, on the dorsal surface dark purple anteriorly, more pinkish posteriorly, on the ventral surface light grey; markedly iridescent on the dorsal surface anteriorly. Segments 144.

Prostomium epilobous $\frac{1}{2}$. The rows of setae are implanted on circular ridges, but there is no other secondary annulation.

The setal rings are almost complete, the mid-dorsal and mid-ventral intervals corresponding to the omission of a single seta in each case. The intervals between neighbouring setae are a little wider on the dorsal than on the ventral surface. No setae are specially enlarged. Numbers of setae: about 51/vii, about 49/xvii, about 53/xxv, and 54 more posteriorly.

The first dorsal pore is in furrow $\frac{5}{6}$.

The clitellum is represented only by a deeper shade of colour on the dorsal surface of segments $\frac{1}{2}$ xiii-xvi $= 3\frac{1}{2}$.

The male pores are on xviii, near together, in the line of the setae. They appear as small transversely situated slits, in a transversely elongated whitish field; this field is not raised beyond the level of the setal ridge, of which it is a slight broadening, and with which it is continuous at each side. There are no setae between the male pores, which are separated by a distance equal to about four intersetal intervals; immediately lateral to the male pores there is a space, equal to about three such intervals, which is also destitute of setae The penial setae are described below.

The female pore is a minute transverse slit near the anterior border of segment xiv.

The spermathecal apertures are two pairs, in furrows $\frac{7}{8}$ and $\frac{8}{9}$; they are minute pores, near the middle line, the distance between the apertures of a pair being about equal to that between the male pores.

There is a slight thickening, of a whitish appearance, along the anterior border of segment xix in the mid-ventral region; I found no other genital markings.

Septa $\frac{6}{7}$, $\frac{7}{8}$, $\frac{8}{9}$, are slightly thickened.

A gizzard is present in segment vi; though its walls are somewhat thickened it is nevertheless a distinctly rudimentary structure. The oesophagus is narrow in vii, considerably bulged

in viii; also bulged in xiv, and more slightly in xv, xvi and xvii; folds project into the cavity as longitudinally placed lamellae in xiv, and similar folds are present in xv, as well as, though less abundantly, in xvi and xvii. The intestine has neither caeca nor typhlosole.

The last heart is in segment xii.

The nephridial system is meganephric. The tubes pierce the body-wall at varying distances from the mid-ventral line; since all intermediate positions are found between the extremes, the organs cannot be arranged in two series, as for example in *P. sansibaricus*. The tubes present no terminal vesicle.

The testes and funnels, in x and xi, are both fairly large organs, free in the coelomic cavity. The vesiculae seminales are contained in x, xi and xii, those in x and xi being attached respectively to the anterior and posterior faces of septum $\frac{10}{11}$, that in xii to the posterior face of $\frac{11}{12}$; each is a single mass, continuous from side to side dorsally over the alimentary canal The prostates, in xviii, are solid-looking, somewhat rectangular masses, not cut up into lobes, with a stout straight duct coming off from the middle of the inner face.

The ovaries and their funnels have the usual situation; the ovaries are large, the funnels comparatively small structures.

The spermathecae lie in segments viii and ix, and open to the exterior in furrows $\frac{7}{8}$ and $\frac{8}{9}$, near the middle line. They are oval in shape, with a broad duct, as long as and nearly as broad as the ampulla itself, and not marked off from the ampulla; there are no diverticula.

The penial setae (fig. 12) are present in a group of four or more at each male aperture. They measure up to 880 μ in length, and 22 μ in thickness; they have a slight sabre curve, and end distally in a point. The distal fourth of the shaft is ornamented by about 20 rings of extremely fine teeth.

Perionyx aborensis, sp. nov.

(Pl. xxvii, fig. 13.)

Renging, in rotten wood; 19-xii-1911. Two specimens.

Length 3 inches; diameter 4 mm. Colour, dorsally brown with a purplish tinge, ventrally light brown. There is a slight mid-dorsal groove from the prostomium to the clitellum; the ventral surface is flattened, with a shallow mid-ventral groove for the greater part of its extent. Segments 125.

Prostomium epilobous $\frac{2}{3}$.

Dorsal pores begin from furrow $\frac{8}{9}$; they are present on the clitellum.

The setae are rather larger in the anterior part of the body; behind segment xvii they are very small; they are largest in segment viii and the few segments immediately in front of and

behind this. Dorsally the ring is not quite complete, $zz = 2yz$; mid ventrally the ring may be unbroken, and the interval *aa* is in any case very small. The setae are closer together ventrally, the distances increasing towards the lateral margin; dorsally the intervals are about twice as large as on the ventral surface. In number they were counted as ix/63, xx/65.

The clitellum apparently embraces segments xi--xiii = 3. It is indistinct dorsally, and is not visible ventrally; the furrows are not obliterated, and setae and dorsal pores are present.

The male apertures are not far apart, on segment xviii. The whole length (antero-posteriorly) of this segment is depressed in the mid-ventral region, the depressed area being limited in front and behind by the neighbouring segments, and laterally by conspicuous lips (fig. 13). Just internal to these lateral lips is, on each side, the deepest part of the depression, and here can be seen a small transverse groove, in the outer part of which is situated the male aperture, distant from its fellow about $\frac{3}{11}$ of the circumference. The setae end on the lip-like margin; none are present in the depression, and no genital setae were discovered.

The female aperture is indicated by a slight depression, pale in colour, in the mid-ventral line on the anterior portion of segment xiv, between the setal ring and the intersegmental furrow.

The spermathecal apertures are conspicuous, in furrows $\frac{6}{7}$ and $\frac{7}{8}$, about $\frac{2}{7}$ of the circumference apart.

The first distinguishable septum is $\frac{4}{5}$; none are markedly thickened.

The gizzard is rudimentary, in segment v; its diameter is slightly greater than that of the succeeding part of the canal. The oesophagus is marked by transverse vascular rings (recognized by their dark colour) in segments viii, ix and x. The intestine begins in xiv.

The last heart is in xii.

The excretory system is meganephric; the terminations of the nephridia are in the same longitudinal line.

The testes were not certainly identified. The seminal funnels are free, in segments x and xi. The vesiculae seminales are two pairs, in segments xi and xii; they are attached to the anterior septum, and appear as flocculent masses, filling up the length of the segment and nearly meeting dorsally over the gut. The prostate is confined to segment xviii; it is a small lobed mass, with a duct which is moderately long relatively to the size of the gland, several times bent on itself, and wider towards its termination.

The ovaries are in segment xiii; funnels were not identified.

The spermathecae lie in segments vii and viii; they are small and of simple form, short, stumpy and rounded, with a short, very broad duct, not sharply marked off from the ampulla, and without diverticulum.

Perionyx depressus, sp. nov.

(Pl. xxvii, fig. 14.)

Rotung, alt. 1300 ft.; from wet earth at base of plantain leaves ten feet from the ground; 28-xii-1911. Three specimens.
Same place and date; from dry earth at base of screw pine leaves 16 feet from the ground. Six specimens, some quite small and immature.
Same place; from base of leaves of screw pine 15 feet from the ground; i-i-1912. Three mature specimens, two small and immature, and a few fragments.
Same place; in bamboo; Jan., 1912. A single specimen.
Upper Rotung, alt. *ca.* 2000 feet; at base of plantain leaves 20 feet from the ground; 5-i-1912. Two complete specimens and six fragments.

Length, average 3–4 inches, max. 4½–5 inches; diameter 3 mm. Colour a uniform dusky purple dorsally, rather lighter ventrally; clitellum rather lighter than the rest, and of a pink tinge. Segments 156.

The body is flattened dorso-ventrally. The ventral surface is hollowed so as to present the appearance of a shallow groove along the whole or the greater part of its length. A mid-dorsal groove is also present but variable; it may be narrow and visible throughout the length of the animal, or narrow on the prostomium and segment i, shallow and ill-defined for some distance behind this, and absent posteriorly.

Prostomium epilobous ½.

First dorsal pore in furrow $\frac{8}{9}$, in the specimem first examined; in another, the first pore, smaller than the rest, was in furrow $\frac{4}{5}$.

The setae are arranged in rings with a regular small middorsal interval (zz = a little more than $2yz$), but unbroken ventrally. They are set rather closer together ventrally than dorsally: in number (counted in segments ix and xiii) they are about 70 per segment.

The clitellum extends over ½ xii–⅓ xviii = 6 nearly (estimated by the pink colouration). The body is slightly swollen in this region. The setae are present, the dorsal pores doubtfully so; the slight ridge on which the setae are placed is less obvious or absent here.

The male apertures are on segment xviii, distant apart about ⅓ of the circumference. Each is situated in a depression which occupies the whole length of the segment antero-posteriorly, and which is about equal in transverse extent to the non-depressed area between the two (fig. 14). The depressions and intervening area are pale in colour. The male aperture at the bottom of the depression is accompanied by a couple of narrow grooves, one in front and one behind it, which extend transversely across the whole breadth of the depression. The aperture, represented in the figure as a rounded pore, has in some specimens rather the form of a slit. There are no setae in or between the depressions.

The female aperture is minute, in the centre of a small slightly darkened area near the anterior border of segment xiv.

The spermathecal apertures are two pairs, in grooves $\frac{6}{7}$ and $\frac{7}{8}$, near the lateral borders of the animal and distant from each other about $\frac{1}{3}$ of the circumference. They are conspicuous round pits, each surrounded by a paler lip.

No septa are notably thickened; the first is $\frac{4}{5}$. A number of small brown particles, spherical in shape, were found attached to the body-wall and to the organs in the anterior part of the body. On breaking one up it was found to consist of granular yellow matter with an entire seta embedded in it; they are thus similar to the brown bodies found in the coelom in many Lumbricidae.

The gizzard is very rudimentary; it is situated in front of septum $\frac{6}{7}$, and is hardly broader than the preceding part of the oesophagus. The oesophagus is swollen and darker in colour in segment ix, and its walls are here rather hard and brittle; internally a number of ridges are seen, but no well-developed lamellae. The intestine swells out in xvii.

The last heart is in segment xii.

The excretory system is meganephric; the nephridia pierce the body-wall in approximately the same longitudinal line.

The testes, in segments x and xi, were in one of the two specimens dissected comparatively very large and folded. The funnels are in the same segments.

The vesiculae seminales when fully developed are large white masses occupying segments x, xi and xii; all are continuous from side to side dorsally over the alimentary canal. That in x is not lobed, is free or at least easily separable from septum $\frac{10}{11}$, but is more intimately attached to $\frac{9}{10}$. That in xi is slightly lobed, and is attached to septum $\frac{10}{11}$. That in xii is the largest, and is lobed; it is attached to septum $\frac{11}{12}$, and, by bulging back septum $\frac{12}{13}$, it appears to occupy segment xiii also, and even extends to the level of $\frac{13}{14}$. In a specimen at a younger stage of maturity (the one in which the testes were notably large), seminal vesicles were only present in xi and xii; those in xi were united to a single sac, as above, while those in xii were still separate.

The prostates are massive, rather rectangular blocks, not much cut up into lobes, occupying segment xviii; they bulge forwards septum $\frac{17}{18}$ so as apparently to occupy xvii also. The duct, on the under surface of the gland, is bent a few times so as to have a sinuous course; it is broader towards its end. The female organs have the usual situation.

The spermathecae are ovoid sacs in segments vii and viii, situated with their long axis transversely. They appear prominently at the sides of the alimentary canal when the specimen is opened; they are without diverticulum, and the short duct is extremely wide,—a half or three quarters of the diameter of the ampulla itself. The sac has a transparent appearance, due to its containing a hard ovoid yellowish glassy mass, which under the microscope shows no structure.

The genital setae are present as a considerable bunch, contained in a sac between prostate and intestine. In length they are 2 mm., in breadth 18 μ. They are straight except for a slight curve towards the tip; the extremity is pointed, and the distal part of the shaft shows a number, 20 or more, of circlets of small spines; the circlets are closer together near the distal end. They thus closely resemble those of *P. koboensis*.

Perionyx foveatus, sp. nov.

(Pl. xxvii, figs. 15, 16.)

Renging, in rotten wood; 19-xii-1911. One complete specimen and two fragments together composing a second specimen.
Same place and date. Four specimens.
Rotung, alt. 1300 ft., in rotten wood; 28-xii-1911. A single specimen.
Upper Rotung, found road-making; 5-i-1912. A single specimen.

Length max. 2 inches; diameter max. 3 mm. Colour, dorsally dark brown to dark purple, ventrally paler. The ventral surface behind the clitellar region is concave in transverse section. Segments 112.

Prostomium epilobous $\frac{1}{2}$; it shows a slight median longitudinal groove. There is no intersegmental furrow between segments i and ii.

The first dorsal pore is either in furrow $\frac{1}{2}$ or $\frac{2}{3}$.

The setae are disposed in rings which are unbroken ventrally. Dorsally there is an interval, *zz* averaging 2–2$\frac{1}{2}$*yz*, but it is irregular, its limits being about 1$\frac{1}{2}$–3*yz*. Ventrally the setae are set much closer than dorsally. In number about 48 were counted in segment x, about 45 in xx; they are difficult to distinguish dorsally owing to the dark colour of the worm.

The clitellum includes segments xiii–xvii or $\frac{1}{2}$xviii = 5–5$\frac{1}{2}$; the body was constricted here in most specimens, but swollen in one of the batches from Renging. Setae are present but dorsal pores absent. In the Renging specimens just mentioned the clitellum showed a secondary annulation, due to the appearance of a groove round the middle of each segment in the situation of the setal ring.

The male pores are on segment xviii, rather posterior to the line of the setal ring. They are rounded apertures of some size, with indistinct circular lips, and distant from each other about $\frac{1}{3}$ of the circumference. In furrow $\frac{17}{18}$, in front of and slightly internal to the male apertures, are situated a pair of rather irregular somewhat puckered depressions, or pits, connected with each other across the middle line by a groove which is convex backwards (fig. 15). The mid-ventral region between the pits and apertures of each side is depressed. Complete rings of setae are present on segments xvii and xix; the ring is interrupted on xviii by the male pores; mid-ventrally

however, in the depressed area between the pores, there is a row of about eight setae.

Variations in the appearance of the pits are found; thus they vary in depth, being occasionally quite shallow, and in the amount of puckering of their sides; they may appear, with the furrow connecting them, as a transverse groove occupying a position between the setal rings of xvii and xviii. The condition shown in fig. 16 is to be derived from that first described by lengthening the posterior angles of the puckered pits till they reach the male pores; in the specimen there figured, the pores thus come to lie at the posterior angles of a rectangular depression with irregular lateral walls, a smooth anterior wall, and no posterior wall; i.e. the depression here shades off into the concave ventral surface of the body. It will be seen from the figure that the pores are well behind the setae in the floor of the depression.

The female pores appear to be paired, close together (separated only by an interval less than *2aa*) and just behind groove $\frac{11}{12}$.

The spermathecal apertures are prominent, round, and laterally placed, near the margins of the flattened ventral surface. They are three pairs, in furrows $\frac{6}{7}$, $\frac{7}{8}$ and $\frac{8}{9}$. Most of the apertures in the various specimens are occupied by a yellow glutinous mass, which projects from them.

The first septum is $\frac{5}{6}$. The extremely rudimentary gizzard is in front of this, i.e. in segment v; it manifests itself as a slightly wider portion of the oesophagus, but its walls are quite soft and not thickened. There are no calcareous glands.

The last hearts are in segment xiii.

The nephridia form a regular line on each side.

Testes were not seen; there are two pairs of funnels, in segments x and xi, free, large and markedly iridescent, and much elongated transversely

In one of the two specimens dissected (from Rotung) the vesiculae seminales were a single pair only, in segment xii, attached to the posterior face of septum $\frac{11}{12}$; they were small, lobulated, and dorsally placed, abutting on the dorsal vessel and on each other in the middle line. In the other (from the batch of four from Renging) there were two pairs, in segments xi and xii, on septa $\frac{10}{11}$ and $\frac{11}{12}$ respectively; those in xi were small, and flattened on the septum, those in xii were larger; the appearance of both pairs was peculiar,—they were glancing and iridescent like the funnels, and the lobules of which they were composed were small, close-set and hemispherical, so that the surface might be described as mammillated, or better shot-like or beady.

The prostates vary in size, occupying segments xvii–xx (right side of Rotung specimen), xviii–xx (left side of same), xvii–xix (Renging specimen). Each forms a compact firm mass of large size, bulging forwards or backwards the limiting septa; the surface is slightly indented into lobes. The duct is stout

and straight, of considerable length, running (in the natural condition of the parts) in a transverse direction outwards, or outwards and forwards, to its termination; it begins in xix and ends in xviii.

The ovaries, in xiii, are relatively very large; the funnels also are of moderately large size.

The spermathecae are three pairs, appearing in the Rotung specimen as very large rectangular blocks, hard, yellow, and semi-transparent, in segments vii, viii and ix. The rectangular shape is due to their mutual pressure, since they fill up all the available space in their segments The duct is very stout (half the diameter of the ampulla), of some length (as long as the ampulla) and contains in its lumen a cord of white glancing material, continuous with the yellowish translucent material which fills the ampulla, and the similar material which plugs the external aperture A diverticulum is present as an extremely minute chamber, on the anterior side, connected with the uppermost part of the duct immediately below its junction with the ampulla: its contents are iridescent. The diverticulum was absent from one of the organs.

The above describes the specimen from Rotung which was dissected; in that from Renging the spermathecae were white, not yellowish, and were not quite as bulky or as closely pressed together.

There are no penial setae.

I have no doubt as to the specific identity of three out of the four batches of specimens, i.e. of all except the batch of four from Renging. The fact that the clitellum was broader than the rest of the body, and that each clitellar segment was more or less distinctly and completely divided into two annuli by a secondary groove, caused me to make a more thorough examination, and a dissection of one of these specimens. Besides the differences just mentioned, the clitellum was slightly less extensive (5 segments exactly), the first dorsal pore was in furrow $\frac{8}{9}$, the dorsal break in the setal ring was rather more widely variable ($zz = 1\frac{1}{2}$-$3yz$), the two pits on the ventral surface of segment xvii were confluent across the middle line and so appeared as a transverse groove, while internally the prostates were smaller, and there were two pairs of seminal vesicles With the exception of the last feature the differences do not appear to be important; and the similarity in the proportions and relations of the duct and diverticulum of the spermathecae, and in the rather characteristic male funnels, justify the union of these specimens with the others.

In addition to the above species of *Perionyx*, a single specimen, evidently belonging to the genus, but indeterminable on account of its immaturity, was taken at Rotung, alt. 1300 ft., in rotten wood; 26-xii-1911. Similarly indeterminable

was a batch of three specimens with a fragment of a fourth, taken at Upper Rotung, alt *ca.* 1000 ft., 11-i-1912.

Pheretima heterochaeta (Mchlsn.).

Kobo, Abor country, alt. 400 ft., in rotten wood; 30-xi-1911 and 8-xii-1911. Two specimens, in a tube with *Perionyx koboensis* and *Perionyx kempi*.

Sadiya, N. E. Assam, under logs; 25-xi-1911. A single specimen, in a tube with *Perionyx excavatus*.

This species appears to be variable. In one of the two specimens from Kobo the typical characters and arrangement of the setae were easily recognizable; in the other these were by no means evident, and all that could be said was that the ventral setae of segments iii--viii were enlarged and rather irregularly arranged. In this second specimen the setae of segments x and xi were much smaller than those of neighbouring segments; in the first the setae of x were perhaps rather smaller than those of ix, but not smaller than those of the following segments. In the Sadiya specimen, the arrangement of the setae on the ventral surface of the preclitellial segments was very irregular,—due possibly in some cases to setae having fallen out; where they were sufficiently regular to permit of description, the arrangement approximated to that of typical specimens.

In the Sadiya specimen, the clitellum encroached slightly on segments xiii and xvii ($=3\frac{1}{3}$). Genital papillae, small, nearer together than the spermathecal apertures, and situated about midway between the setal ring and the anterior limiting groove of the segment, were found on segment viii in one of the specimens from Kobo, on vii and viii in the other, and on vii, viii and ix in the specimen from Sadiya.

Prostates were entirely absent in the specimen from Kobo which I dissected, and in the one from Sadiya; the terminal part of the duct was strongly curved in the shape of the letter S.

As further variations from the condition described by Michaelsen (2) may be mentioned the beginning of the dorsal pores from furrow $\frac{11}{12}$, their absence on the clitellum in the Kobo specimens (but not in the other), and the origin of the intestinal caeca in segment xxvii.

Pheretima lignicola, sp. nov.

(Pl. xxvii, fig. 17.)

A single specimen, in a tube with *Perionyx excavatus*. In rotten wood; Dibrugarh, N.E. Assam; 20-xi-1911.

Length $4\frac{1}{4}$ inches; breadth 4–5 mm.; colour olive-green, slightly darker dorsally in the anterior region. Segments 90. Body tense, as if distended; intersegmental furrows absent as grooves behind the clitellum, present in front of clitellum. Setae implanted on circular ridges, especially prominent in front of clitellum; no other secondary annulation.

Prostomium epilobous, almost tanylobous, marked by a longitudinal median groove running its whole length. The first segment shows numerous longitudinal grooves; surrounding the mouth opening are a number of papillae, from the intervals between which the grooves on the first segment are continued backwards; the grooves do not quite reach the furrow $\frac{1}{2}$ (? some part of the appearances due to commencing eversion of the buccal cavity).

The setal ring is unbroken ventrally, and almost unbroken dorsally ($zz = 1\frac{1}{2}yz$). On v and vi, however, a much wider interval exists mid-dorsally. The setae of the preclitellar segments are larger than those behind the clitellum, especially than those towards the posterior end. On the clitellum can be seen faint whitish lines indicating the position of the setal rings, but these do not project as ridges, and are not to be distinguished on the dorsal surface; a few minute setae appear to be imbedded in the clitellum ventrally in xiv, but I could not definitely say that they were present on the other segments. Number of setae: 22/vi, 44/ix, 47/xii 65/xxiii.

Clitellum xiv--xvi = 3; almost without setae, though showing whitish lines ventrally in the situation where setal rings would be (v. sup.). The clitellar area is smooth, without a trace of annulation.

The first dorsal pore is in furrow $\frac{12}{13}$, slit-like. There are no pores on the clitellum, though they are present on the anterior and posterior limiting furrows.

The male apertures are in the line of the setae of xviii. They are situated in large conspicuous circular depressions; these depressions are surrounded anteriorly, posteriorly, and especially externally by a prominent semicircular lip or ridge, which is absent on the inner side. Including the lips, the whole area extends nearly over the interval between the setal ring of xvii and that of xix. The apertures are distant from each other about $\frac{2}{3}$ of the circumference; 12 setae intervene. There are no genital setae.

The female aperture is single, in a shallow depression in the line of the setae of xiv. I at first thought that the aperture was paired, since the specimen shows a second, rather smaller, depression by the side of the first. But this second depression has no pore in its centre; and dissection confirms this.

The spermathecal apertures are scarcely visible; internal examination shows that they are four pairs, in $\frac{6}{7}$, $\frac{7}{8}$, $\frac{8}{9}$ and $\frac{9}{10}$. Those of the same pair are separated by an interval equal to $\frac{1}{3}$ the circumference.

There are no other genital marks.

The body-wall is very thin, except in a few of the anterior segments.

Septum $\frac{4}{5}$ is thickened, septa $\frac{5}{6}$ and $\frac{6}{7}$ much thickened, $\frac{7}{8}$ and $\frac{8}{9}$ absent, $\frac{9}{10}$ and all succeeding septa are thin.

The oesophagus is narrow in vi, bulged but thin-walled in vii; the cask-shaped gizzard occupies viii; and between the gizzard and septum $\frac{10}{11}$. the oesophagus is soft-walled though voluminous. The intestine begins in xiv. The caeca originate in xxvi, and extend forwards to the anterior limit of xxiii; their ends are folded under the intestine, and when pulled out the caeca, now appearing much elongated, extend forwards so as to overlap the hinder end of the prostate There are no lymph-glands on the intestine.

The last heart is in xiii.

The nephridial system is micronephridial; the innumerable minute nephridia occur on the body-wall especially in the neighbourhood of the septa. Large tufts of similar tubes, blackish in colour, occur on the anterior face of septum $\frac{8}{9}$, and also, yellowish-grey in colour, on the anterior face of $\frac{9}{10}$.

The specimen being single, the organs were disturbed as little as possible, and the presence of two pairs of testes and funnels, in segments x and xi, is inferred from the vasa deferentia coming from these segments, and joining in xiii. The vesiculae seminales are paired, in xi and xii, comparatively small, and of a yellowish colour. The vasa deferentia become rather thicker towards their posterior ends, and bend outwards to join the prostates. Each prostate is a large gland, extending forwards into xvi, and backwards so as to occupy the whole extent of xx; it is much cut up into lobes. The prostatic duct leaves the gland at the point where the vas deferens joins it, in xviii, and after many windings reaches the exterior at a point not far from its origin; it becomes thicker and more muscular as it proceeds towards its end, its last coil being very stout, smooth and shining.

Both ovaries and funnels, in xiii, are conspicuous; the latter are much elongated, owing to a remarkable drawing out of the margin of the funnel on its outer side.

The spermathecae are four pairs, opening in the grooves $\frac{5}{6}$–$\frac{8}{9}$. The ampulla is oval; the duct, of about equal length, is shining, very stout and muscular, rather broader in its distal two-thirds than near the ampulla. The diverticulum is long, narrow, sometimes rather twisted, and lies flat on the body-wall; its external portion (distal) is shining and muscular, like the duct of the ampulla; in the greater part of its extent its walls are thin and marked by numerous and close-set small sacculi (fig. 17).

Eutyphoeus kempi, sp. nov.

(Pl. xxvii, figs. 18, 19.)

A single specimen. Kobo, Abor country, alt. 400 ft.; in earth; 2-xii-1911.

Length approx. 10 inches (the specimen was much coiled); breadth 6 mm. Colour light olive-green ventrally, a dusky bluish-grey (slate-colour) dorsally. Segments 254.

No prostomium was visible. Segments i–iii consist of a single annulus; iv–v are biannulate, with the setae on the anterior annulus; vi is triannulate, the setae on the middle one; vii–viii have four annuli, the setae on the second; ix has three principal annuli, each slightly subdivided into two; the remainder are fundamentally triannulate, the posterior annulus being sub-divided in the segments in front of the clitellum, but not in those behind it.

The first dorsal pore is in furrow $\frac{11}{12}$.

The setae are paired, but not very closely. In general they are larger in the anterior part of the body than in the posterior, but they become progressively smaller from segment vii forwards, and no ventral setae could be seen in the first four segments. In front of the clitellum $aa = 2ab$, on the clitellum $= 2\frac{1}{2}ab$, posteriorly $= 3ab$ (just behind the clitellum however $= 4ab$); cd is rather greater than ab; aa is rather greater than bc; dd is more than half the circumference.

The clitellum extends over $\frac{1}{2}$ xiii–xvii $= 4\frac{1}{2}$, and includes the whole circumference. Its dorsal surface is marked out by a series of parallel oblique lines into a number of rectangular areas. Grooves and annuli are obliterated, except towards its posterior limits; setae are present, and also the dorsal pores; the latter however are indistinct.

The male apertures are a pair of deep pits on segment xvii, the centre of the pit in line of setae b, the inner margin of the pit in a. Deeply within the pit can be seen an upwardly (in this position) directed tube, with an aperture at its summit from which project one or two genital setae; the tube and its aperture are compressed antero-posteriorly, and thus have their greatest diameter in the transverse plane. Between the two pits, on the ventral surface of segment xvii, are a few transverse groovings.

The spermathecal apertures are one pair, conspicuous, in furrow $\frac{7}{8}$, the centre of the aperture is outside the line b, but not half-way between b and c (nearly as far beyond b on the outside as a is on the inside).

For a dozen segments or so behind the male apertures the ventral surface is flattened, and in the anterior part of this region depressed, so as to form a wide ventral groove between the ventral setal bundles. Lying within the margins of this depressed region, in furrow $\frac{17}{18}$, are a pair of horseshoe-shaped depressions, their outer margins convex outwards; the inner, open portion of the horseshoe is prolonged inwards to meet its fellow in the middle line, and a dumbbell-shaped area is thus produced, shallow in the middle, deeper at its extremities; the lateral limits of the area are between the lines a and b; antero-posteriorly it takes up about half the posterior annulus of xxii and half the anterior annulus of xxiii (fig. 18). There is a similar horseshoe-shaped depression in furrow $\frac{21}{22}$, but on the left side only.

Septum $\frac{4}{5}$ is thick, $\frac{5}{6}$ is very thick, produced backwards as a much elongated muscular cone, so that its insertion into the alimentary tube is far posterior to its parietal attachment. Septa

$\frac{6}{7}$ and $\frac{7}{8}$ are absent; $\frac{8}{9}$, $\frac{9}{10}$, and $\frac{10}{11}$ are stout, the last especially so. Septum $\frac{11}{12}$ is apparently represented only by a sheet of connective tissue which attaches the inner surface of the seminal vesicle to the alimentary tube, i.e. it does not exist between the seminal vesicle and the body-wall; this is liable to cause a temporary confusion in estimating the sequence of the segments and the organs contained in each; the number and position of the hearts in this region however will indicate the true numbering. Behind this the septa are thin.

The firm globular gizzard is situated in the space between septa $\frac{7}{8}$ and $\frac{8}{9}$.

The last heart is in segment xiii.

The nephridial system is micronephric. There are numerous small nephridia on the body-wall; large bunches of nephridial tubes are attached to the dorsal body wall in segment iii.

The testes and funnel of each side are enclosed in a sac, which apparently communicates with the one of the other side beneath the gut. The sac is situated in segment xi, and is attached to the posterior face of the very stout and muscular dissepiment $\frac{10}{11}$, deeply ventral in the segment. The testis is small, the funnel large and iridescent; the vas deferens is of moderate thickness, and passes back on and attached to the ventral body-wall, swelling out to form a small sac at its termination in segment xvii.

The vesiculae seminales are granular-looking elongated laterally compressed bodies, lying one on each side of the gut in segments xii and xiii. They are limited behind by septum $\frac{12}{13}$, which is bulged back by them; they almost meet each other along the mid-dorsal line, the dorsal vessel intervening. They are connected with the side of the gut by a broad connective tissue stalk towards their anterior end.

The prostate has the form of a long thick coiled tube; it is of large size, occupying segments xvii–xxi. In the last portion of its course it is, with many windings, directed inwards, its terminal portion being rather smaller in diameter than the main part of the tube; it ends close to the end of the male duct, in front of and internal to the latter, which passes underneath the prostatic tube just before its termination.

The ovary is of moderate size, with numerous branches, and is attached to the posterior face of septum $\frac{12}{13}$. The funnel lies internal to the male duct.

The spermathecae are irregularly massive in shape, firm and solid, lying against the body-wall in a region which corresponds externally to segment viii; the anterior part gets into the region of vii. The longer axis of the ampulla is antero-posterior; the duct is short and broad, terminating in furrow $\frac{7}{8}$. At the junction of ampulla and duct, between ampulla and body-wall, is the lobed iridescent semi-circular diverticulum; the appearance may be described by saying that it appears to be constituted by a semi-circular row of small diverticula, close together and fused marginally with their neighbours.

The genital setae appear to be variable in size and form. In length they measure from 2·3 to 3·9 mm., in breadth 34 μ. The shaft is gently curved in an S-shape, and its distalmost portion is ornamented with numerous short rows of dots, placed transversely to the long axis of the shaft. The point is always somewhat spoon-shaped, but the degree of curvature of the extremity varies (fig. 19).

Eutyphoeus koboensis, sp. nov.

(Pl. xxvii, figs. 20, 21.)

A single specimen. Kobo, Abor country, alt. 400 ft.; in earth; 2-xii-1911. A whitish flocculent mass adhered to the ventral and lateral surfaces of the animal a short distance behind the clitellum; on microscopic examination this was found to consist of sperm-morulae (not developed spermatozoa).

Length 10 inches; diam. maximum 7 mm.; colour slaty-blue dorsally, light olive-green ventrally and laterally. Segments *ca.* 195.

Prostomium retracted under first segment, apparently prolobous.

The first three segments consist of a single annulus, iv–v are biannulate; vi also biannulate, with however indications of other rings also; vii–viii are 4-annulate, ix–x 5-annulate, xi–xiii 4-annulate; behind the clitellum the segments are triannulate.

The first dorsal pore is in furrow $\frac{10}{11}$; pores are present on the clitellum.

The setae are small, and fairly closely paired. In front of the clitellum *aa* averages about $2\frac{1}{3}ab$; aa = or slightly > bc; $ab = cd$; $dd = \frac{1}{2}$ circumference. Behind the clitellum $aa = 4ab$ nearly; $aa > bc$, $ab = cd$.

The clitellum includes $\frac{1}{3}$xiii–xvii = $4\frac{1}{3}$; furrows and annuli are obliterated; setae and dorsal pores are present.

The male apertures are a pair of conspicuous deep pits in the line of the setae of xvii; setae *a* and *b* are absent. The middle of the pit corresponds with seta *b*, but it is of such a size as to overlap the line of setae *a* internally. Between the pits the surface is depressed.

The female apertures are a pair of transversely elongated slits bordered by lip-like margins, the whole sunk in a common transversely extended depression, with well-defined margins; this common depression is rather narrower (antero-posteriorly) in the middle line, i.e. in the interval between the slit-like apertures. The whole is situated in the position of the (absent) groove $\frac{12}{13}$. Each slit has its centre between lines *a* and *b*, and overlaps these lines considerably (fig. 20).

The spermathecal apertures are small and slit-like, in furrow $\frac{7}{8}$, outside the line of setae *b*, but nearer to *b* than to *c*.

Genital markings are present in furrows $\frac{10}{11}$ and $\frac{11}{12}$ (fig. 20). In the latter groove is situated a narrow white ridge, slightly broader at its ends than in the middle, and not projecting beyond

the level of the neighbouring annuli; it extends across the middle line from just outside the line *b* to a corresponding point on the other side. In $\frac{10}{11}$, on the left side only, is a small ridge of apparently the same character, its centre just internal to the line *a*, its length a little greater than the distance *ab*.

On the dorsal surface of the clitellum and the anteclitellial region there are a number of minute black dots, simulating setae; they are sometimes arranged in rows, with fairly regular intervals, round the middle of the segment; they are also found numerously and irregularly scattered quite out of any possible position of setae.

Septum $\frac{4}{5}$ is much thickened, of conical form with apex backwards; $\frac{5}{6}$ is extremely thick, and is also elongated to form a cone, so that its attachment to the oesophagus is at the level of the spermathecal apertures, i.e. furrow $\frac{7}{8}$. Septa $\frac{6}{7}$ and $\frac{7}{8}$ are absent; $\frac{8}{9}$–$\frac{10}{11}$ are much thickened; $\frac{11}{12}$ is not a definite septum, and is represented probably by the connective tissue between the testis sac and vesicula seminalis. Behind this the septa are all thin.

The oesophagus is thick and muscular. A hard, almost globular gizzard lies in the interval between septa $\frac{7}{8}$ and $\frac{8}{9}$, behind the level of the spermathecae. A pair of large dark-brown lateral swellings of the oesophagus occur in segment xii; their transverse striation denotes their vascularity during life. The intestine begins in xvi, but it is at first compressed between the prostates.

The last heart is in xiii. That in xi is deeper in position and smaller, or at least less conspicuous, than those of neighbouring segments; and as it has to be searched for, may cause temporary confusion in the numbering of the segments, especially as the corresponding septum is absent.

The excretory system consists of micronephridia, very numerous and of moderate size, scattered over the body-wall.

The testis sacs are in segment xi, attached fairly firmly to septum $\frac{10}{11}$, but capable of being separated without injury. Each is apparently separate from its fellow, but is attached to the corresponding vesicula seminalis. When opened, the sac is seen to contain a large, tightly packed and iridescent funnel. The vas deferens leaves the testis sac posteriorly, and can be traced for some distance; it disappears on or in the body-wall, but becomes distinct again posteriorly, where, slightly thickening, it passes to the outer side of the terminal portion of the prostatic duct, just behind which it ends, after finally swelling to form a sac-like dilatation.

The vesiculae seminales are a pair of granular-looking, yellowish, laterally compressed masses, at the sides of the alimentary canal in segments xii–xiv. They are attached to the sides of the alimentary canal in xii; their margins are lobed, and the anterior end of each is covered with numerous minute white (nephridial?) loops.

The prostates are tubular, much coiled, in segments xvii–xx; they become more shining and muscular towards their outer end.

The sac of the penial setae, in length about 2 mm., of loose texture and not very definite shape, projects inwards on each side between prostate and intestine; its outer termination is situated mesially to the end of the prostatic duct.

Ovaries and ovarian funnels are situated in xiii.

The spermathecae are compact, firm, subspherical in shape, with short thick duct. On the posterior aspect, at the junction of ampulla and duct, is a series of six small iridescent diverticular chambers; the individual chambers being fused on each side with their neighbours form together a semi-circular rosette.

The penial setae (fig. 21) are several in each bundle, about three fully formed and three immature. Their length is 3·5 mm., diameter 31 μ. The shaft is gently curved, with a sharply marked hook at its free extremity; the shaft itself is slightly swollen just proximal to the hook, the hook itself is narrower. The distal portion of the shaft is ornamented with numerous rows of minute dots, which may extend across the visible surface of the shaft, or may be shorter, and convex distalwards. In an older seta the hook was not so sharp nor so narrow; in one of two setae that had not yet escaped from their sheath, the hook was small, but well marked, in the other very faintly marked.

Eutyphoeus aborianus, sp. nov.

(Pl. xxvii, fig. 22.)

A single specimen, in a rather poor state of preservation, in a tube with *E. koboensis*. Kobo, Abor country, alt. 400 ft.; in earth, 2-xii-1911.

Length 9 inches, diameter, max. 6 mm. Colour pale, with greyish patches mainly on dorsal surface.

Prostomium minute, just visible, withdrawn under cover of the first segment. Segments i–iii consist of single annuli, iv–v of two, vi of three with slight indications of two others, vii–viii of five, ix of five principal annuli, each divided, giving ten in all; x–xii have five annuli, and behind the clitellum the segments are triannulate, but of the three annuli the first and last may be more or less distinctly sub-divided, giving four or five in all. All annulation and segmentation was lost over the middle region of the body owing to the state of preservation.

The first dorsal pore was at the posterior border of the clitellum, i e. in groove $\frac{12}{13}$.

The setae are small, and paired, —rather widely in the case of the lateral couples. In front of the clitellum $aa = 1\frac{1}{3}ab$; bc slightly $> aa$, $= 1\frac{1}{2}ab$; cd about $= aa$. Behind the clitellum $aa = 2ab$, or further back $= 3ab$; $bc = 1\frac{2}{3}ab$; $cd = 1\frac{1}{3}ab$. No setae were discoverable on segments ii, iii and iv.

The clitellum includes $\frac{5}{6}$ xiii–xvii $= 4\frac{5}{6}$; setae are present, but there is no external annulation.

The male apertures are a pair of deep pits, oval in superficial outline, with one or two curved genital setae projecting from them. The centre of each pit is in the line of setae *b*; from this the pit extends inwards as far as the line *a*, and outwards for an equal extent.

The female aperture (?) of the right side was possibly represented by a shallow perfectly circular depression with a clearly cut margin, in the situation of groove $\frac{12}{13}$ on the anterior part of the clitellum. The size of the depression, which was present on the right side only, was such that while its centre corresponded to the middle of the interval *ab*, it overlapped the lines *a* and *b* by its inner and outer margins respectively.

The spermathecal apertures are a single pair, small, in furrow $\frac{7}{8}$, the centre of each midway between the lines *b* and *c*.

Under the head of genital marks may be mentioned a pair of small oval depressions, their long axis transverse, which occur in the course of groove $\frac{9}{10}$. On the left side the depression extends accurately between the lines *a* and *b*; on the right it reaches a little further outwards, passing the line *b*.

Septum $\frac{4}{5}$ is stout, $\frac{5}{6}$ very stout and conical, with apex posterior; the next septum is $\frac{6}{7}$, and this, $\frac{9}{10}$, and $\frac{10}{11}$ are all stout, and situated close together; $\frac{11}{12}$ is apparently absent, the condition being the same as in *E. koboensis*; the rest of the septa are thin, $\frac{12}{13}$ being especially delicate and fenestrated. The three thick septa behind the gizzard ($\frac{8}{9}$–$\frac{10}{11}$) are closely connected together; they have their separate insertions into the body-wall, but are united to each other by a thick muscular sheet placed longitudinally.

Behind the buccal cavity is a slight constriction of the alimentary canal at the insertion of septum $\frac{4}{5}$; then succeeds a dilatation (pharynx), which with a narrower but still firm and muscular portion of the tube is contained within the cone of septum $\frac{5}{6}$. The gizzard is ovoid, in the interval between $\frac{7}{8}$ and $\frac{8}{9}$; the oesophagus enters it on its upper surface; i.e. the gizzard projects forwards underneath the oesophagus. The tube is narrow in segments ix, x and xi; in xii it presents a pair of lateral swellings which have a lamellar structure internally. The intestine begins in xv; the canal is however again narrowed between the prostates, finally swelling out in segment xxi.

The last heart is in segment xiii; that in xi is small, and the corresponding septum is represented only by a sheet of connective tissue between testis sac and vesicula seminalis.

The excretory system is micronephridial; there is a row of numerous micronephridia along the body-wall in each segment, and a large tuft anteriorly on each side, by the side of the buccal cavity in segment iii.

The testis sac of each side, in segment xi, is large, and unconnected with its fellow; it bulges forwards the septum in front of it ($\frac{10}{11}$), which is rather thinner over the anterior end of the sac; this anterior end can thus be shelled out of a recess in the substance of the septum.

The vesiculae seminales are one pair, in appearance resembling those of the other species of the genus described above. They occupy segments xii and xiii, overlap the testis sacs anteriorly, and bulge back septum $\frac{12}{13}$ posteriorly. They are attached internally to the alimentary canal near their anterior ends; their margin is slightly lobed.

The prostates, occupying segments xvii–xx, are tubular and much coiled; the prostatic tube becomes narrower and more glistening towards its end. The vas deferens, passing to the outer side of the termination of the prostate, curves inwards round it and ends behind it in a sac-like widening. A long setal sac is present between the prostate and the gut.

The ovaries were not seen. The ovarian funnels are in xiii.

The spermathecae are a pair of compact white masses, somewhat ovoid in general outline, with the long axis antero-posterior, and margin slightly lobed. They are placed in front of the gizzard, opposite the posterior portion of the conical septum $\frac{9}{10}$. The duct is very short and moderately stout, passing to the exterior from the under surface of the ampulla. From the posterior side of the junction of duct and ampulla arises the fan-shaped iridescent diverticulum, consisting of seven or eight lobes arranged in two or three groups; the groups are tolerably well separated from each other.

The genital setae were found to be numerous, but mostly immature; one or two were fully formed and projecting. In length these measured 3·3 mm., in breadth 32 μ. The shaft has a gentle S-shaped curvature, the distal end is bluntly pointed, and flattened and slightly excavated on one face, so as to give a spoon-shaped appearance (fig. 22*a*); in the bowl of the spoon were seen small longitudinally directed ridges. The immature setae differ considerably from this description (fig. 22*b*).

Eutyphoeus magnus, sp. nov.

(Pl. xxvii, figs. 23, 24.)

Upper Rotung, alt. ca. 2000 ft., found in earth when road-making; 4-i-1912. A single specimen.

Length 11 inches; diameter 8 mm. Colour light slaty-grey dorsally, rather darker in anterior third of body; pale ventrally; clitellum a dark grey. Segments 263.

Prostomium small, prolobous, under cover of segment i. The first three segments consist of single annuli, segments iv–v of two, vi of four, vii of five, viii–x of six, xi of five, and xii of three, behind the clitellum the segments are triannulate.

The first dorsal pore is in groove $\frac{11}{12}$.

The setae are paired, the intervals being expressed by the following ratios:—$ab = \frac{1}{3}aa = \frac{1}{2}$–$\frac{3}{5}bc = \frac{3}{5}cd$; $dd = \frac{1}{7}$ of the circumference.

The clitellum extends over $\frac{1}{2}$ xiii–$\frac{3}{4}$ xvii = $4\frac{1}{4}$. The secondary annulation is obliterated, but the intersegmental furrows are dis-

tinct, except $\frac{16}{17}$ ventrally. Dorsal pores are absent, but the setae are present, except the ventral pairs of segment xvii. The body is slightly constricted in the clitellar region.

The male apertures are a pair of conspicuous transverse slits, situated in a slight depression on segment xvii. The depression is lighter in colour than the neighbouring clitellum, and the surface around and between the apertures is wrinkled by a number of small cracks. The slits extend internally beyond the line of setae *a*, and externally beyond that of *b*, the centre of the slit being between the two lines.

The female apertures were doubtfully represented, on the left side only, by an ovoid depression anteriorly on segment xiv, immediately in front and with its centre in the line of setae *a*.

The spermathecal apertures are minute, in furrow $\frac{7}{8}$, in (on the right) or just external to (on the left) the line of setae *b*.

Septum $\frac{4}{5}$ (?) is exceptionally thick, even for this genus; it is conical in shape, with the small end backwards. After a considerable interval follow septa $\frac{5}{6}$, $\frac{9}{10}$, and $\frac{10}{11}$, all of which are also thick. Septum $\frac{11}{12}$ is missing, as in some of the species previously described; its position is indicated by a pair of hearts only.

The gizzard, subspherical in shape, occupies the anterior part of the space between septa $\frac{8}{9}$ and $\frac{9}{10}$. A pair of large calcareous glands occupy the whole of the elongated twelfth segment; these are dark, hard and brittle, with internally a lamellated structure.

The last heart is in segment xiii.

The micronephridia behind the clitellum are arranged in regular rows on the body-wall; in segments xi–xvi they are irregularly scattered, though numerous; they are few in front of xi, till the anterior end of the body is reached, when they occur again as numerous close tufts in segments iii and iv.

The testes and funnels are enclosed in a pair of testicular sacs, which are apparently not connected with each other; the parts were very stiff, and the point was not definitely cleared up. The sacs are in segment xi, attached to the posterior face of septum $\frac{10}{11}$; the contained funnels are large and iridescent; the vas deferens leaves the sac posteriorly.

The vesiculae seminales are a pair of flattened structures, with a granular surface, lying between the body-wall and gut, and occupying segments xii and xiii. With regard to their extent, they are not bounded anteriorly by any septum, $\frac{11}{12}$ being absent; and posteriorly they cause a backward bulging of $\frac{13}{14}$, thus appearing at first to occupy segment xiv as well. They are attached closely to the alimentary canal, and, in the specimen examined were hard and brittle, especially the anterior portion.

The vas deferens is fairly easily followed on the body-wall; posteriorly it passes beneath the S-shaped part of the prostatic duct, to be described immediately; it ends posterior to the termination of this latter, after dilating and taking an inward turn.

The prostate is tubular, and occupies three segments, xvii–xix. The duct is not of greater diameter than the rest; it has an

S-shaped course. The setal sac of the penial setae lies between the gland and the intestine.

The female organs were not identified, owing to the stiffness of the parts.

The spermathecal ampullae (fig. 23) are pear-shaped, with the small end directed forwards; they are situated at the level of the attachment of the first septum ($\frac{5}{6}$) to the oesophagus. The small end of the pear-shaped ampulla is not continued into the duct,—indeed a duct can hardly be described; if described, it would be said to be very short and broad. The ampulla is, in fact, attached to the parietes on its under surface, the site of attachment constituting the duct.

On each side of this area of attachment are two or three small diverticula, sessile at the base of the ampulla; those on the outer side are closely connected together, and similarly those on the inner side.

The penial setae (fig. 24) have a maximum length of 2·35 mm., and a diameter of 33 μ. Each when fully developed is gently curved in the form of an S; the extreme tip, which is blunt, varies somewhat in its curvature, either merely continuing the very gentle curvature of the shaft, or being bent into a rather sharper curve; while still in the sheath, the tip is sharply bent into a hook. An extremely fine pattern of dots, in close-set short rows, is present towards the distal extremity; but the extreme tip is free from the ornamentation, which extends only a short distance along the shaft.

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3. ,, ,, —The Oligochaeta of India, Nepal, Ceylon, Burma and the Andaman Islands. Mem. Ind. Mus., vol. i, No. 3, 1909.
4. ,, ,, —Die Oligochätenfauna der vorderindisch-ceylonischen Region. Abh. Ver. Hamburg, Bd. xix, 1910.

EXPLANATION OF PLATE XXVI.

FIG. 1.—Genital area of *Megascolides oneilli*, sp. nov. *c.*, clitellum; *t.*, transverse depression; ♂, male aperture. The only setae seen in this region are indicated.

,, 2.—Spermatheca of the same, of segm. vi, left side; *a.*, *in situ*; *b.*, main portion turned backwards.

,, 3.—Genital area of *Notoscolex striatus*, sp. nov. The shading on the ventral surface of the three segments indicated shows the extent and intensity of the brown pigmentation. Male apertures not seen; *n.*, small nodular elevations at bend of grooves.

,, 4.—The same, another specimen; *n.*, nodular or tag-like projection; ♂, male aperture.

,, 5.—Spermatheca of the same.

,, 6.—Genital area of *Notoscolex stewarti*, sp. nov. *n.*, nodular projection; *t.*, transverse depressions; ♂, male aperture.

,, 7.—Prostate of the same. *d.*, prostatic duct; *v.d.*, vas deferens.

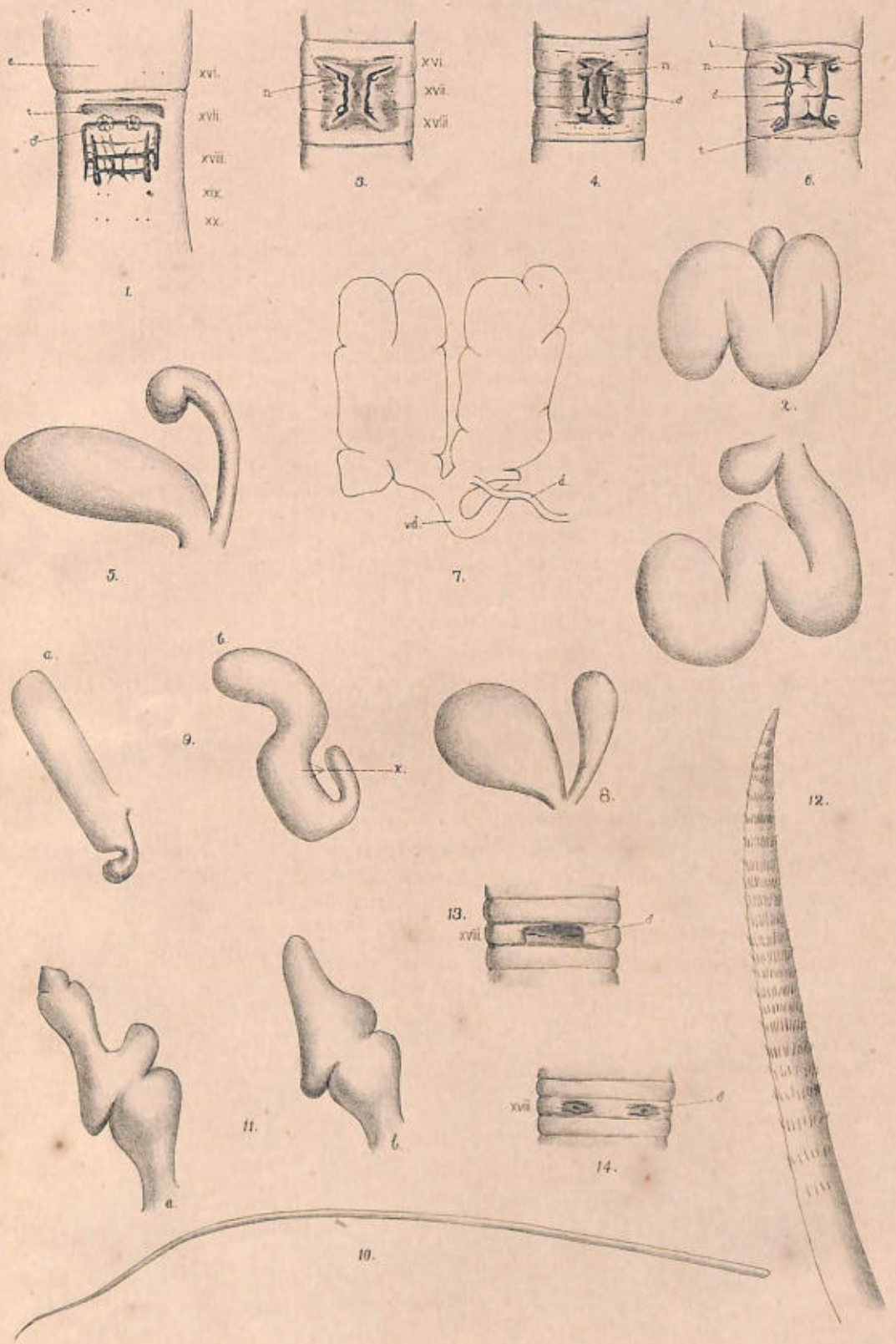
,, 8.—Spermatheca of the same.

,, 9.—Spermathecae of *Plutellus aborensis*, sp. nov. *a.*, segm. ix, right side; *b.*, segm. viii, right side. *x* indicates position of duct, not visible from above.

,, 10.—Genital seta of the same, × 132.

,, 11.—Spermathecae of *Perionyx kempi*, sp. nov. *a.*, segm. vii, right side; *b.*, segm. viii, right side.

,, 12.—Distal end of genital seta of *Perionyx koboensis*, sp. nov., × *ca.* 400.



J. Stephenson, del. D. Bagchi, lith

ABOR EARTHWORMS.

EXPLANATION OF PLATE XXVII.

FIG. 13.—Genital area of *Perionyx aborensis*, sp. nov. Setae not indicated; ♂, male aperture.

,, 14.—Genital area of *Perionyx depressus*, sp. nov. Setae of segm. xviii indicated; ♂, male aperture.

,, 15.—Genital area of *Perionyx foveatus*, sp. nov. Setae not indicated; ♂, male aperture.

,, 16.—The same, another specimen; setae indicated.

,, 17.—Spermatheca of *Pheretima lignicola*, sp. nov. The ampulla was relatively more elongated in the other spermathecae of the same side.

,, 18.—Segments xxi–xxiii of *Eutyphoeus kempi*, sp. nov; ventral surface, showing depressions in the course of the intersegmental grooves.

,, 19.—Genital setae of the same; × *ca.* 175.

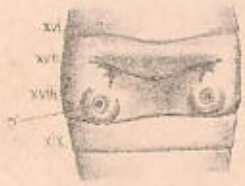
,, 20.—Genital area of *Eutyphoeus koboensis*, sp. nov. (diagrammatic). *c.*, clitellum; *g.*, genital ridges; *x.*, posterior limit of clitellum; ♂, male aperture; ♀, female aperture.

,, 21.—Genital seta of the same; × *ca.* 175.

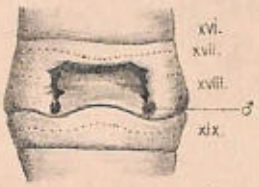
,, 22.—Genital setae of *Eutyphoeus aborianus* sp. nov. *a.*, fully formed; *b.*, still within the sac; × *ca.* 200.

,, 23.—Spermatheca of *Eutyphoeus magnus*, sp. nov. *d.*, diverticula on one side of duct, the others being underneath; *v. n. c.*, ventral nerve cord; *x* is not the duct, which is hidden from view beneath the ampulla, but a strand attaching ampulla to body-wall.

,, 24.—Genital seta of the same. *a.*, whole seta, to show its shape, × 25; *b*, distal end, × *ca.* 150.



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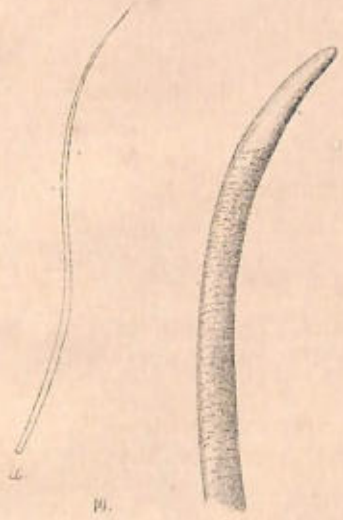
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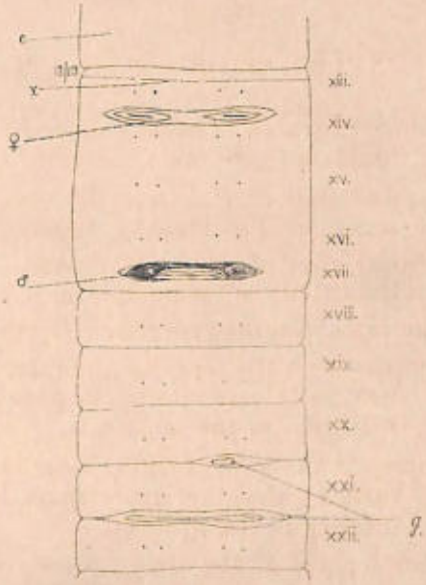
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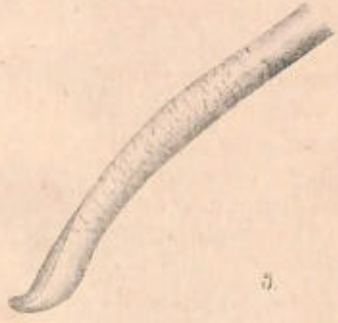
4a. 4b. 5.



6.



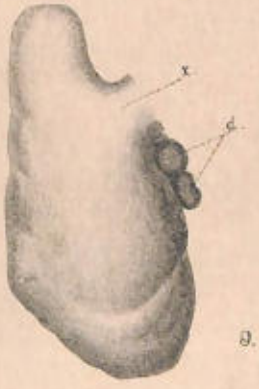
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J. Stephenson, del. D. Bagchi, lith.

ABOR EARTHWORMS.

XXXIX. MOLLUSCA, III:

CYCLOPHORIDAE (*In part*).

By LT.-COLONEL H. H. GODWIN-AUSTEN, *F.R.S.*

(Plates xxxviii-xl).

I now continue the descriptions of species recently collected in the Abor Hills by Mr. Kemp, commenced in this Journal in March, 1914.

The list of interesting new species has been much increased, for during the cold weather of 1913-14 Lt. G. F. T. Oakes, R.E. has again been conducting survey operations in the Tsanspu Valley, and has added largely to the collection of land-shells. He reached a point on the Great River about Lat. 29°15′ and Long. 95°15′; and I have here to thank him for finding time to add to our knowledge of the molluscan fauna of this portion of the Eastern Himalayan Range.

In the Helicidae I submit the descriptions of the seven species of *Plectopylis* that have come to hand, a most interesting set in many respects and all new. Two species were found by Mr. Stanley Kemp, the rest by Lt. G. F. T. Oakes, R.E. These I have entrusted to our best authority on the group, Mr. G. K. Gude, well known by his past work on the genus in "Science Gossip", 1898-99. The remainder of this second contribution I devote to the Prosobranchia or operculated land-shells; the collection contains a most interesting series. It is quite apparent we have as yet only a foretaste of what lies hidden in the depths of the valleys and on the forest-clad ridges and peaks many thousand feet above them, and what a harvest awaits the man knowing how to look for and how to deal with the material that would come to hand. I envy that man who may have the good fortune to go there.

LIST OF GENERA IN THE COLLECTION.

PROSOBRANCHIA.

Fam. CYCLOPHORIDÆ.

Sub-fam. *CYCLOPHORINAE.*

Cyclophorus.

Myxostoma.

Pterocyclos.
Spiraculum.
Raphaulus.
Lagocheilus.

Sub-fam. *ALYCEINAE.*

Alycaeus.
Dioryx.
Cycloryx.

Sub-fam. *DIPLOMMATININAE.*

Diplommatina.

Sub-fam. *POMATIASINAE.*

Pomatias.

Cyclophorus aborensis, n. sp.

(Pl. xxxviii, figs 1, 1*a*, 1*b*, 1*c*).

Locality: Rotung, 2000 ft., near Egar stream (*S. W. Kemp*); Kalek and Renging, 2000 ft. (*Oakes*).

Shell globosely turbinate, openly umbilicated, solid. Sculpture, carinate spiral, lirae wide apart, 5 conspicuous, the last peripheral, with much finer intermediate liration, not distinctly seen in old specimens. Colour (specimen from Renging) a rich ruddy brown over most of the surface, beneath pale ochraceous, a few splashings of same colour next the suture; in the type and in most old shells much bleaching takes place. Spire fairly high, conic, apex fine. Suture impressed.

Whorls 5, rather rapidly increasing, rounded.

Aperture circular, suboblique.

Peristome white, solid, continuous, very slightly reflected. Columellar margin sub-vertically curving.

Size: major diam. 5·60; alt. axis 24·0; alt. aperture 28·0 mm.

Type No. $\frac{6013\cdot0}{1}$ (figs 1*b*-1*c*) in *Ind. Mus*; No. $\frac{6009}{1}$ I.M.

Mr. Oakes sent specimens from Kalek No. 3048 B.M. and Renging No. 3051 B.M. (figs. 1, 1*a*), and from Rami Lambang two specimens of a dwarf variety only 33 mm. in major diameter No. 3049 B.M.

Cyclophorus (Glossostylus) bapuensis, n. sp.

(Pl. xxxviii, figs. 2, 2*a*, 2*b*, 2*c*).

Locality: Abor Hills, vicinity of Bapu, 4-i-13 (*Oakes*).

The description of this species follows that of *sidiensis* in many particulars, but it is not nearly so keeled. It has a distinct peripheral band. The umbilicus is more open and not so con-

cealed. The spire is lower, sides less flat, and first 3 whorls much smaller. Suture more impressed. Whorls, aperture and peristome the same.

Size: major diam. 33·0; alt. axis 16·0 mm.

Type No. 3108 *Brit. Mus.*

Cyclophorus (Glossostylus) sidiensis, n. sp.

(Pl. xxxviii, figs. 3, 3*a*, 3*b*, 3*c*).

Locality: On Sidi River, Abor Hills (*I. H. Burkill*).

Shell conoidly turbinate, sharply keeled, umbilicus narrow and much concealed by the peristome. Sculpture, 3 distinct spiral lirae above the keel, distant with finer liration intermediate, underside lirae fine and close together. Colour madder brown. Splashings and spotting near the suture, giving a beautiful mottled pattern. Spire high, conical, sides flat, apex pointed. Suture moderately impressed. Whorls 5, side flatly convex. Aperture circular, suboblique. Peristome white, not much thickened, reflected and expanded. Columellar margin curving vertically.

No. 6002. Size: major diam. 25·0; alt. axis 14·0 mm.

No. 6001 Rotung (*Kemp*). Bleached, older, major diam. 30·0; alt. axis 14·5 mm.

Type No. 6002 *Ind. Mus.*

Mr. Oakes also found one specimen of this species (3095 B.M.) in the Tsanspu Valley.

The Sidi River is in the outer hills north of the Trigonometrical Station " Nari " (Siwalik) 2490.

Cyclophorus (Glossostylus) koboensis, n. sp.

(Pl. xxxviii, figs, 4, 4*a*, 4*b*, 4*c*, 4*d*).

Locality: Abor Hills, Kobo, on right bank of Tsanspu or Brahmaputra (*Kemp*).

Shell turbinate, keeled, umbilicus open, not concealed by the peristome. Sculpture carinate, as described, splashes and zig-zags of darker tint, giving a mottled appearance. Colour madder brown, with a distinct dark brown band below the keel, ochraceous white beneath. Spire conic, depressed, apex very fine. Suture impressed. Whorls nearly 6. Aperture circular. Peristome double, inner lip continuous, together thick and reflected. Columellar margin vertically rounded. Operculum flat, multispiral, the whorls about 6, defined by a raised thread-like spiral.

Type No. 6015 (fig. 4) *Ind. Mus.* Size: major diam. 30·0; alt. axis 12·0 mm.; Rotung (*Kemp*) No. 6019-20 Ind. Mus.

No. 3579 B.M. (figs. 4*a*, 4*b*, 4*c*, 4*d*), Rotung (*Oakes*). Size: major diam. 32·5; alt. axis 12·25 mm.

No. 3117 B.M. Yamne Valley and 3045 B.M. Ponging.

No. 3581 B.M., between N. 28° 15′—29° 15′ L. 94° 50′—95° 10′, is not so solid a shell, smoother and higher in the spire. It comes very close to this spices. Major diam. 33·0; alt. axis 15 mm.

Spiraculum oakesi, n. sp.

(Pl. xxxix, figs. 3, 3*a*).

Locality: Abor Hills, 4-i-13 (*Oakes*).

Shell depressedly discoid, widely umbilicated. Sculpture close, fine transverse lines of growth in the epidermis, no spiral ribbing. Colour: ground, grey white, crossed by regular bands of brown, zigzag below, merging into a narrow dark peripheral band, from which zigzag lines are given off on the basal side. Spire scarcely raised above the last whorl. Suture well impressed, the sutural tube very long, 7 mm., narrow, set obliquely backward, nearly reaching to the apical whorl. Whorls 5, regularly increasing. Aperture circular. Peristome continuous, thickened, reflected at the upper inner angle, expanded forward from above and below, horizontally upon the median line of the penultimate whorl forming a narrow slit. Columellar margin rounded. Operculum multispiral, slightly concave, smooth at centre, edges of the outer whorls distinct and slightly raised.

Operculum multispiral, edges of suture slightly raised, concave in centre.

Size: major diam. 26·0; alt. axis 5·5 mm.

Five specimens of this beautiful species came to hand; it does not recall any species as yet found in Assam or Burma.

Type No. 3081 *Brit. Mus.*

Two specimens to Indian Museum.

Spiraculum kempi, n. sp.

(Pl. xxxix, figs. 4, 4*a* and 5, 5*a*).

Locality: Abor Hills, 4-i-13 (*Oakes*).

Shell flatly discoid, widely umbilicated. Sculpture close, epidermal lines of transverse growth both above and below, conspicuous close spiral lirae with every 2nd or 3rd somewhat stronger—in the type 2nd much more conspicuous on the central line of the last whorl, producing an angulate upper surface. Colour rich umber brown, very indistinct transverse colouring, and a broad peripheral band. Spire very low, only just raised above the last whorl. Suture deeply impressed; the sutural tube is 9 mm. behind the peristome, extremely short, and does not appear to grow longer, it is of small diameter. Whorls 5, rounded on periphery. Aperture circular. Peristome white, thickened, double, reflected, the outer lip above forming a low ridge behind the expanded inner lip, thus forming the short open descending wing. Columellar margin rounded. Operculum roundly convex, the whorl in double filaments distantly raised, close and smooth at centre.

Size: major diam. 26·5; alt. axis 7 mm. (Largest 30·0 Ponging).

This is very close to the next species *Sp. planum* found by Mr. Kemp, but which in a few minor characters differs too much to be considered the same; unfortunately there are only two very old bleached specimens of it.

Type No. 3105 (figs. 4, 4*a*) *Brit. Mus.*; No. 3047 B.M. from Ponging (figs. 5, 5*a*).

Two specimens to Indian Museum.

Spiraculum planum, n. sp.

(Pl. xxxix, figs. 6, 6*a*, 6*b*).

Locality: Upper Rotung, Abor Hills; No. 5992, Upper Rotung; No. 5992*a*, Yembung (*Kemp*).

Shell similar to *S. kempi*. Sculpture, rather coarser spiral ribbings. Colour bleached. Spire very low, the apex scarcely showing above the last whorl. Suture deeper. Sutural tube only 6·5 from the peristome, it is 4 mm. long and sharply recurved backward. Whorls 5. Aperture circular. Peristome double, thickened, outer lip expanding into a somewhat lengthened open wing, ascending on the whorl next it, not descending as in previous species.

Size: major diam. 30·0; alt. axis 6·0 mm.

A single small variety, bleached, only 28 mm. in major diameter, was sent to me from the Miri Hills. No. 3596 B.M.

Type No 5992 *Ind. Mus.*

Spiraculum nevilli, G.-A. var.

Locality: Luyor, Abor Hills, 21-vii-13 (*Oakes*).

The wing or spout is not so long in typical *nevilli* from the Dafla Hills, and the last whorl near the aperture descends much more than in this Abor shell, otherwise they are very close in form. The Abor shells are not so very much mottled, but have a distinct band, and they are much smaller.

Size: major diam. 23·25; alt. axis 4·8 mm.

Type No. 3531 *Brit. Mus.*

Spiraculum nevilli, G.-A. var. (large).

Locality: Abor Hills, 3 young specimens and one fully grown put up alive, 4-i-13.

Shell very openly umbilicated, discoid. Sculpture, close spiral liration, accentuated at the middle half of the whorl looking at it from above. Colour dark madder brown, mottled or rather streaked closely with ochre bands which, as they approach the apex, are closely zig-zagged, beneath plain. A distinct black band on the periphery. Spire very flat. Suture impressed. Whorls 5, regularly increasing. Aperture circular, oblique. Peristome double, thickened, much reflected, expanding forward near suture into a spout-like shape, which continues as a raised, pronounced

narrow ridge on the reflected whorl, the epidermis being peculiarly shining. A little further development would constitute this a tube, such is its appearance. Operculum multispiral, about 10 whorls, the edges slightly raised and furred on outer margin.

Size: major diam. 21·5; alt. axis 5·0 mm. (Type immature, 1st received). Major diam. 22·5; alt. axis 9·5 mm. (full-grown example).

Type No. 3089 *Brit. Mus.*

Pterocyclos aborensis, n. sp.

(Pl. xxxix, figs. 1, 1*a*).

Locality: Abor Hills, No. 3104 B.M. Type; 3046 B.M. Ponging; 3050 B.M. Rami Lambang, 4-i-13 (*Oakes*).

Shell subdepressedly turbinate, very openly umbilicated. Sculpture, epidermal lines of growth strong. Well raised distant spiral lirae, both on upper and lower side. The one next the suture the most conspicuous, with two less pronounced intervening, about 14 altogether. Colour a rich umber brown. Spire subconoid, apex small. Suture deep. Whorls 5, regularly increasing, angulately rounded on periphery. Aperture circular. Peristome double, not thickened, slightly reflected, inner lip continuous, the outer expanded forward at inner angle into a half closed spout-shaped wing. Columellar margin sub-vertically curved. Operculum not seen.

Size: major diam. 26·0; alt. axis 10·0 mm.

Type No. 3104 *Brit. Mus.*

Pterocyclos miriensis, n. sp.

(Pl xxxix, figs. 2, 2*a*, 2*b*, 2*c*).

Locality: Miri Hills. Four specimens obtained.

Shell depressedly discoid, very widely umbilicated. Sculpture very strong, regular spiral lirae, above and below. Colour rich burnt sienna brown. Spire very flatly conic. Suture well impressed. Whorls 5, subangularly rounded on the periphery. Aperture circular, sub-vertical, just shows above the last whorl. Peristome double, not thickened, slightly reflected, inner lip thin, continuous, the outer expanded into a wing, openly spout shaped. Columellar margin well rounded.

Size: major diam. 30·0; alt. axis 8·0 mm.

Type No. 3580 *Brit. Mus.*

Three specimens to Indian Museum.

Pterocyclos spiramentum, n. sp.

(Pl. xl, figs. 4, 4*a*, 4*b*).

Locality: Abor Hills, only one specimen obtained but that is in perfect condition (*Oakes*).

Shell (fig. 4*a*) openly umbilicated, depressedly orbiculate, somewhat globose. Sculpture, only fine epidermal lines of growth. Colour dark sienna brown, crossed by dark bands, running from the suture to the narrow black periphery band. Spire slightly raised, very depressedly conoid. Suture deep. Whorls 4, the last rapidly increasing. Aperture circular, sub-vertical. Peristome slightly reflected, not much thickened, the outer lip is expanded near the suture, with sides turned in forming a spout-like projection. Close behind this and adjacent to the suture is an apparent tube (fig. 4), but it is rather of gutter form, semi-circular in section, and is given off from a cleft on the columellar side just within the aperture (fig. 4*b*), which is not an orifice—if it were so the gutter would be a true tube and the shell a *Spiraculum*. It illustrates how the sutural tube in that genus has originated. This species is on the borderland of the two genera *Pterocyclos* and *Spiraculum*. It must be put in *Pterocyclos*, because the tube is close to the aperture, almost a part of the peristome. In *Spiraculum* the tube is remote from the aperture. Operculum concave



TEXT-FIG. 1.—*Pterocyclos brahmakundensis*, n. sp.

in centre, multispiral, suture not raised.

Size: major diam. 15·0; alt. axis 4·75 mm.

Type No. 3082 *Brit. Mus.*

Pterocyclos brahmakundensis, n. sp.

Locality: Brahmakund, Eastern Assam (*M. T. Ogle*). Three specimens were found.

Shell very depressedly discoid, smooth throughout, very widely umbilicated; sculpture fine and close, transverse lines of growth on the epidermis; colour sienna brown, more ochraceous below, indistinctly mottled, passing into zig-zag markings on the apical whorls, a narrow black peripheral band; spire very flat, scarcely raised above the last whorl; suture well impressed; whorls 5, rounded on periphery, narrowing rapidly, rather closely wound, the last descending; aperture circular, oblique; peristome double, fairly strong, reflected, inner lip continuous, shallowly sinuous on the upper inner margin next the wing, this is spout shaped,

directed upwards; columellar margin rounded; operculum not seen.

Size: maj. diam. 2·1; alt. axis 1·4 mm.

Type No. 713 B.M.

I have had this species for many years; it was given me by Mr. Ogle, collected when he was surveying in Eastern Assam. The opportunity now occurs of bringing it to notice, with the fine series from the contiguous Abor Country. It is interesting to compare its form with *Pterocyclos miriensis*, and to note the differences, particularly in the sculpture of the latter.

Pterocyclos magnus, G.-A. var.

A single specimen, with peristome not quite perfect and surface in poor condition, was sent me by officers of the Survey with the Miri Mission. It comes nearest to the above Dafla Hill shell in general form, the markings differ considerably. Major diameter 24·75. It should be looked for again. No. 3599 B.M.

? Spiraculum luyorensis, n. sp.

(Pl. xl, figs. 5, 5*a*, 5*b*).

Locality: Luyor, Abor Hills (*Oakes*).

Shell openly umbilicated, orbiculate, very depressed. Sculpture, a smooth epidermis, lines of growth very fine and close. Colour a very rich dark madder brown, broad dark bands close set, cross the third whorl transversely. There is a narrow peripheral band. Spire very low, apex just showing above the plane of the last whorl. Suture impressed, the sutural tube close behind the aperture, 3 mm. distant, 3 mm. in length and curving backwards. Whorls 4, the last expanding rapidly. Aperture circular, sub-vertical. Peristome double, not very thickened, slightly reflected, at the suture, the outer lip is extended forward into a long spout resting on the periphery.

Size: major diam. 18·75; alt. axis 4·8 mm.

Type No. 3530 *Brit. Mus.*

This is close to *Pterocyclos spiramentum*, but is distinct in its much flatter apex, and far wider umbilicus. The peristome presents a stage further towards, and has reached the development of *Spiraculum*, rendering it a more than usually interesting species.

Spiraculum putaoensis, n. sp.

(Pl. xl, figs. 3, 3*a*, 3*b*).

Locality: Putao, Upper Burma, May 1914, 3 specimens (*Capt. C. E. Morris*).

Shell widely umbilicated, orbicularly depressed. Sculpture, fine regular transverse striae of growth. Colour, bleached, and epidermis gone; zig-zag streakings at regular intervals cross the

whorls from the suture outwards. Spire scarcely raised above the last whorl. Suture impressed, the tube 4½ mm., behind the aperture, a mere orifice, but in the perfect shell there may be a tube. Whorls 4, increasing regularly. Aperture circular, oblique. Peristome double, inner and outer lips continuous, the inner with a slight notch near sutural margin, the outer expanded into a wing or spout.

Size: major diam. 14·0; alt. axis 4·0 mm.

The habitat of this species at the head of the Irrawady valley (not a very far distant one from the Tsanspu) is interesting and I have introduced it here because in the sutural tube it approaches a species found in the Abor Hills, which I next describe as *Spiraculum minimum*, and is much smaller. It also recalls *Spiraculum andersoni*, Blf., from Bhamao, but this is more openly umbilicated, the wing similar. My best thanks are due to Capt. C. E. Morris.

Spiraculum minimum, n. sp.

(Pl. xl, figs. 2, 2*a*, 2*b*, 2*c*).

Locality: Jeku, Abor Hills, two specimens (*J. Coggin Brown*).

Shell orbiculate, depressed, widely umbilicated. Sculpture, fine transverse lines of growth on the epidermis. Colour dull ochraceous, with a green tinge, 3rd and last whorls crossed by irregular broadish brown bands, indication of a band just below the periphery. Spire depressed, but apex well above last whorl. Suture impressed, the tube short, close behind the aperture, only 2 mm. distant. Whorls 4, regularly increasing. Aperture circular, with very slight angulation at sutural margin. Peristome double, both inner and outer lips continuous, moderately thickened and slightly reflected.

Size: major diam. 9·2; alt. axis 3·25 mm.

Type No. 6142-43 *Ind. Mus.*

Lt. G. F. T. Oakes, R.E. has sent me seven examples of this species from Sibbum, far finer in size; four are bleached. The largest measures 10 mm. in major diameter, No. 3147 B.M. Three are perfect (No. 3145 B.M.), with strong epidermis. Colour sienna brown in tint with ochraceous mottling, with an indistinct peripheral band. Major diam. 11·5 mm.

This is a close ally of *Spiraculum kempi*, but the closely mottled zig-zag pattern and black peripheral band is not seen in that species; in this respect it is similar to *Spiraculum nevilli* of the Dafla Hills; it is smaller and rather flatter than that shell.

It is hardly possible to find better examples showing the development of the sutural tube in *Spiraculum* than in the species figured on Plate xl. Although it is not from the Tsanspu Valley but from the source of the Irrawady, *Spiraculum putaoensis* has been introduced in order to show how close is the relationship and how beautiful evolutionary stages have been. In having a tube on the suture behind the peristome and a simple peristome, both

belong to the genus *Spiraculum*. In figures 2*c* and 3*b*, within the aperture may be seen the little orifice having a connection with the branchial sac. In *Spiraculum minimum* this is very close to the aperture, in *Spiraculum putaoensis* it is more remote. In the first the inner and outer lips of the peristome are united and thickened at the upper inner margin next the suture, while in the second there is further development; a clear separation of the lips has taken place, the inner has a slight nick on the line of the suture, shown by a sort of cicatrice up to the branchial orifice, and the outer lip is expanded forward into a short scoop-like process corresponding to the wing, as it has been called, of *Pterocyclos*. The next species (fig. 4) might be placed in this genus and is a true link with it. The tube is so far forward, it still forms a part of the peristome, a complete isolated orifice has not yet been formed—it is a slit; the process of its further development would be the growing more forward of the whorl itself. In fig. 5, *Spiraculum luyorensis*, we find this stage reached, and in fig. 5*b* the internal orifice has been left behind, and externally a perfect tube is seen on the suture (fig. 5*a*) behind the aperture and completely separate from it. While this evolution has been in progress, another change has taken place· the scoop in fig. 4 has grown forward considerably into the elongated gutter of fig. 5, with its edges growing inwards and nearly touching, corresponding in life, in all probability, with a sharp fold of the mantle edge, which with further growth might become more and more tube-like.

Cyclophorus oakesi, n. sp.

(Pl. xl, figs. 1, 1*a*).

Locality: Tsanspu Valley, Abor Hills, 2 specimens (*Oakes*).

Shell globosely conoid, umbilicated, not widely. Sculpture, a strong epidermis, fine lines of growth. Colour strong sienna brown, mottled, broadish splashes of black. No peripheral band. Spire somewhat depressed, apex broad and blunt. Suture impressed. Whorls 4¼, well rounded. Aperture circular, suboblique. Peristome simple, not thickened, very slightly expanded, in the best specimen it is not fully formed. Operculum horny multispiral, smooth in front and concave.

Size: major diam. 9·4; alt. axis 4·8 mm.

Type No. 3083 *Brit. Mus.*

The subgeneric position of this species is very doubtful; the animal has not been seen.

Genus Alycaeus.

Lieutenant, now Captain Oakes, R.E. was most fortunate to secure some very interesting species of this genus. They all proved to be new, one representing a new subgenus *Raptomphalus*.

When these species were received, I was compiling a Monograph of the Indian Alycaei for "Land and Freshwater Mollusca

of India" Part XII, published in December 1914, thus the Abor species will be found described and figured in that work as follows:—

ABOR HILLS AND TSANSPU VALLEY.

aborensis, n. sp., p. 364, pl. CXLIX, fig. 9.
chanjukensis, n. sp., p. 364, pl. CLVII, figs. 5, 5*a*.
(*Cycloryx*) sp. near *costatus*, p. 369.
duoculmen, n. sp., p. 365, pl. CLVII, figs. 2, 2*a*.
(*Dioryx*) *globulosus*, n. sp., p. 368, pl. CLVII, figs. 1, 1*a*.
luyorensis, n. sp., p. 365, pl. CLVII, figs. 6, 6*a*.
(*Raptomphalus*) *magnificus*, n. sp., p. 366, pl CLVI, figs. 1, 1*a*, 1*b*.
oakesi, n. sp., p. 366, pl. CLVII, figs. 4, 4*a*.
panggiana, n. sp., p. 367, pl. CLVI, figs. 3, 3*a*.
sibbumensis, n. sp., p. 367, pl. CLVI, figs. 4, 4*a*.
(*Dioryx*) *urceolus*, n. sp., p. 369, pl. CLIII, figs. 9, 9*a*.
vesica, n. sp., p. 368, pl. CXLIX, fig. 10.
yamneyensis, n. sp., p. 368, pl. CLVI, fig. 2.

I also give a list of Alycaei known to me, from Eastern Assam, which includes Sadiya and the Lohit River to the eastward. This may be useful to those interested in the Molluscan fauna of this part of India.

EASTERN ASSAM.

brahma, G.-A., p. 363, pl. XLVIII, fig. 3.
brahma, G.-A., var., p. 363.
distinctus, G.-A., p. 363, pl. CXXXVII, figs. 2, 2*a*, 2*b*.
(*Diaryx*) *globosus*, n. sp., p. 363, pl. CLIII, fig. 8.
(*Cycloryx*) *granum*, G.-A., p. 364, pl. LXIII, fig. 6.
graphicus, var. *dihingensis*, n. s. s., p. 363, pl. CXLVI, figs. 6, 6*a*.
lohitensis, n. sp., p. 362, pl. CXXXVII, figs. 1, 1*a*.
oglei, n. sp., p. 362, pl. CXLVIII, fig. 2.

EXPLANATION OF PLATE XXXVIII.

FIGS.	1, 1*a*.—	*Cyclophorus aborensis*, n. sp.	Renging.
,,	1*b*, 1*c*.—	,, ,,	Type, Rotung (*Kemp*).
,,	2, 2*a*, 2*b*, 2*c*.—	,, *bapuensis*, n. sp.	Type.
,,	3, 3*a*, 3*b*, 3*c*.—	,, *sidiensis*, n. sp.	Type.
,,	4*a*, 4*b*.—	,, *koboensis*, n. sp.	1st specimen, Rotung (*Oakes*).
,,	4*c*, 4*d*.—	,,	2nd specimen.
,,	4.—	,, ,,	Type, Kobo (*Kemp*).



J. Green, Photo. del.

Bemrose, Colls., Derby.

ABOR MOLLUSCA.

EXPLANATION OF PLATE XXXIX.

FIGS. 1, 1*a*.—*Pterocyclos aborensis*, n. sp. Type.

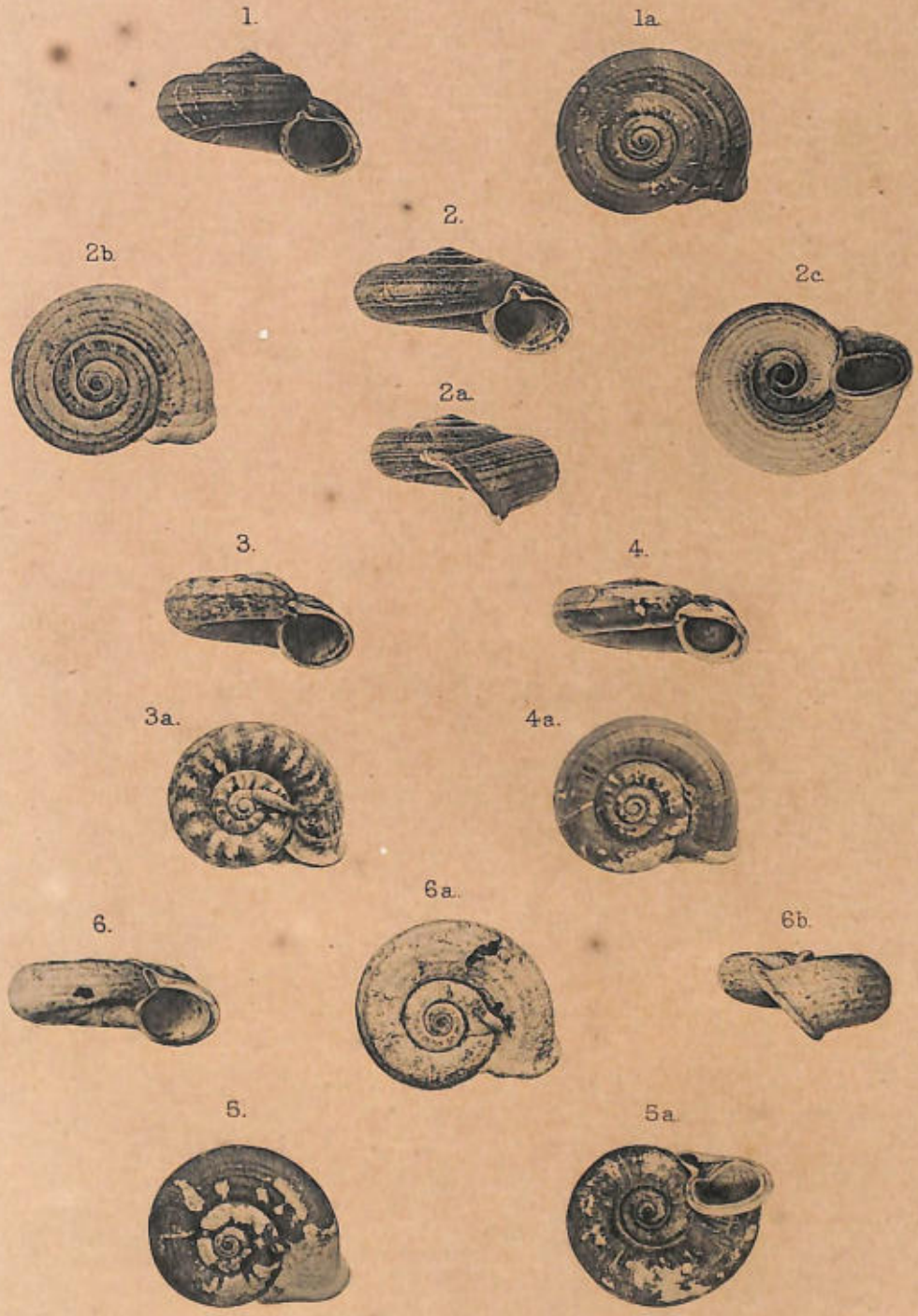
,, 2, 2*a* 2*b*, 2*c*.— ,, *miriensis*, n. sp. Type.

,, 3, 3*a*.—*Spiraculum oakesi*, n. sp. Type.

,, 4, 4*a*.— ,, *kempi*, n. sp. Type.

,, 5, 5*a*.— ,, ,, large. Ponging.

,, 6, 6*a*, 6*b*.— ,, *planum*, n. sp. Type, Upper Rotung.



J. Green, Photo. del.

Bemrose, Colls., Derby

ABOR MOLLUSCA.

EXPLANATION OF PLATE XL.

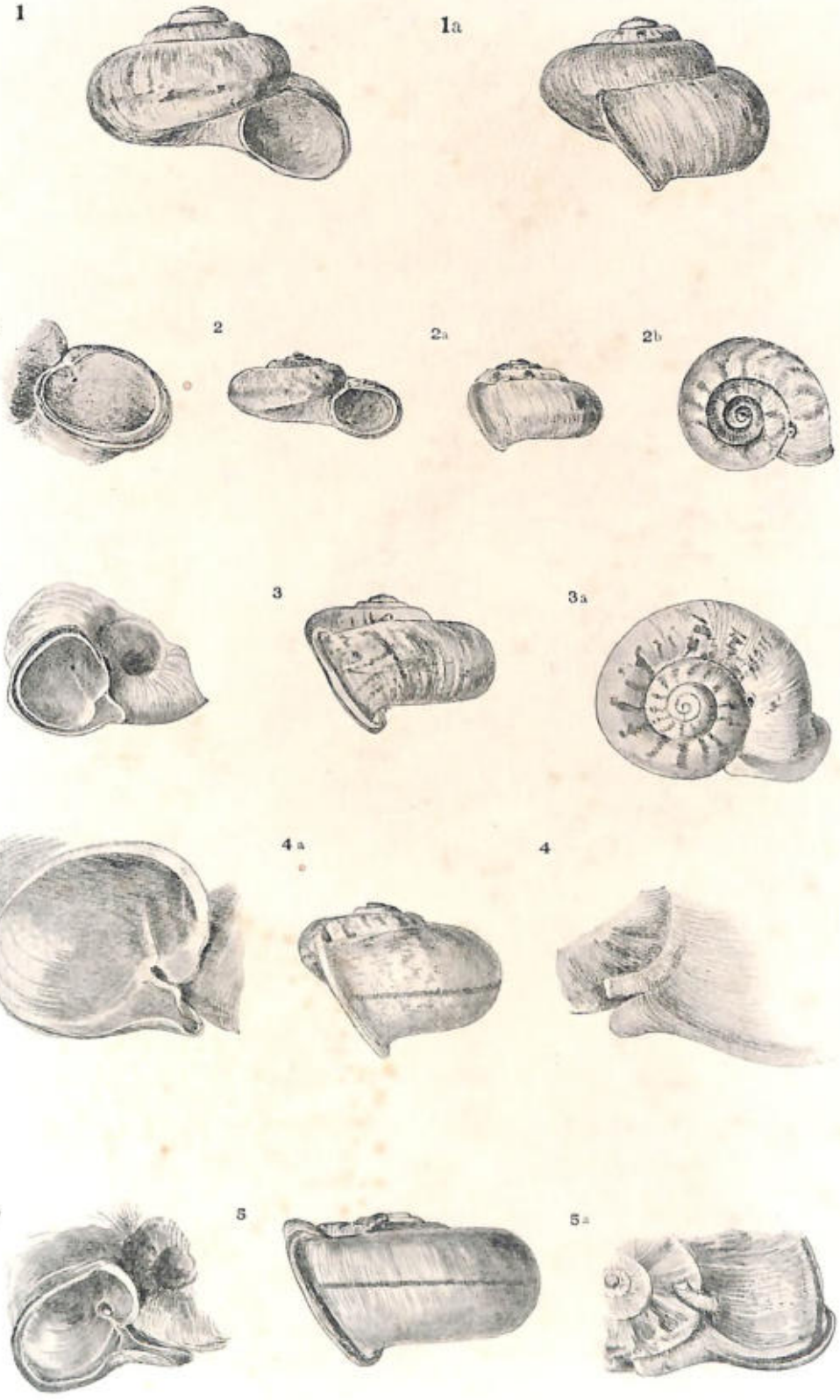
FIGS. 1, 1*a*.—*Cyclophorus oakesi*, n. sp. × 4·5. Type.

,, 2, 2*a*, 2*b*, 2*c*.—*Spiraculum minimum*, n. sp. × 3·4. Type.

,, 3, 3*a*, 3*b*.— ,, *putaoensis*, n. sp. × 3·4. Type.

,, 4, 4*a*, 4*b*.—*Pterocyclos spiramentum*, n. sp. × 3·4. Type.

,, 5, 5*a*, 5*b*.—? *Spiraculum luyorensis*, n. sp. × 3·4. Type.



H. H. Godwin Austen, del

ABOR MOLLUSCA.

Watford Engraving Co.

XL. MOLLUSCA, IV: HELICIDAE.

GENUS PLECTOPYLIS.

By G. K. GUDE.

(Plates xli, xlii).

A small number of shells of the genus *Plectopylis* from the Abor country has been kindly entrusted to me for examination. They were collected for Lt.-Col. Godwin-Austen by Lieut. G. F. T. Oakes, R.E., who accompanied the Abor Expedition as officer in charge of the Survey Party, and all proved to be new to science. Although the number of shells is small, they comprise no less than seven species, two of them, unfortunately, being represented by unique specimens. One species is of special interest owing to the fact that it is a member of the section *Sinicola*, not previously known to occur within the limits of the Indian region.

Plectopylis, Benson (1860).

Plectopylis (Endothyra) oakesi, sp. n.

(Pl. xli, figs. 1, 1*a*, 1*b*, 1*c*, 1*d*).

Shell sinistral, discoid, corneous, widely umbilicated, finely and regularly ribbed, the ribs decussated by raised spiral lines. Whorls 7, increasing slowly and regularly, the last not dilated towards the mouth, slightly constricted behind the peristome, shortly and rather suddenly deflexed in front, angulated above and around the umbilicus, rounded at the periphery. Suture linear, apex slightly raised. Aperture oblique, subrotundate; peristome slightly thickened and reflexed, the margins united by a slightly raised sinuous ridge, which has a slight notch at the junctions with the peristome above and below.

The parietal armature consists of a single strong, slightly oblique transverse plate which gives off a short horizontal ridge posteriorly above, the lower extremity is somewhat dilated and notched, and gives off posteriorly a short ridge and anteriorly a long thin fold, which runs parallel with and close to the lower suture, joining the parietal ridge at the aperture. The palatal armature is very complicated and consists of: 1°, a short slight horizontal sinuous fold close to the upper suture; 2°, a short stout transverse fold with posteriorly a slight denticle and anteriorly an elongated slender horizontal fold, raised in the middle; 3°, a stout transverse fold, concave posteriorly and giving off

anteriorly from the upper extremity a thin horizontal fold, which is provided below its anterior extremity with an elongate sinuous denticle; 4°, a similar transverse concave fold with an anterior horizontal fold, notched at the junction and curving upwards, the denticle more distant from the anterior extremity; 5°, a sinuous transverse fold, its upper extremity deflexed posteriorly and its lower extremity deflexed anteriorly, with a short horizontally elongated denticle close to the lower extremity and provided on the anterior side, in a line with its upper extremity, with an elongated denticle, slightly curved downwards anteriorly, below the latter occurs a short curved fold, its anterior end descending, and below this again another horizontally elongated denticle in a line with the denticle below the lower extremity of the transverse fold; 6°, a slight sinuous horizontal fold close to the lower suture, its posterior extremity slightly ascending.

Major diam. 12·5, minor 11 mm.; alt. 5 mm.

Hab.—Yamne Valley, Abor Hills and Sibbum (*Oakes*).

Type No. 3125 *Brit. Mus.*; Nos. 6128 and 6130 Renging and Rotung (*Kemp*) in *Ind. Mus.*

This new species greatly resembles *P. pinacis*, but the last whorl of the latter is more sloping towards the umbilicus and does not descend in front, while the umbilicus is also more perspective. In the armature considerable difference exists, more especially in the palatal barriers, which are very complicated in the new species. Five specimens, bleached and much worn, were collected. A single specimen taken between Riu and Singging, on the Dihang River, I refer to the same species. It is in much better condition and is larger than the Yamne Valley shells, measuring 14·5: 12·75: 5·5 mm. The species is named after Lieutenant G. F. T. Oakes, the officer in charge of the Survey Party, who collected the shells.

Plectopylis (Endothyra) gregorsoni, sp. n.

(Pl. xli, figs. 2, 2*a*, 2*b*, 2*c*, 2*d*).

Shell sinistral, depressed conoid, almost discoid, dark corneous, polished below, widely and perspectively umbilicated, the last quarter of the last whorl receding still further below, exposing half the width of the penultimate whorl; finely and regularly ribbed, the ribs decussated by spiral ribs, giving the shell a reticulated appearance on the upper side, the spirals being less distinct at the side and disappearing at the periphery, below which the transverse ribs also begin almost to disappear. Whorls 5, increasing slowly and regularly, flattened above, a little convex at the side, steeply sloping towards the base, the last whorl scarcely dilated at the mouth, very shortly and slightly deflexed in front, angulated above, subangulated around the umbilicus, the portion between the upper angulation and the periphery encircled by three, about equidistant spirals. Spire depressed, suture linear, apex a little raised. Aperture oblique, subhastate, peristome white, thickened, and slightly reflexed; margins approximat-

ing, the upper horizontal and slightly arched, the outer straight and obliquely descending, basal curved, columellar straight, ascending.

The parietal armature consists of a single, slightly oblique, transverse plate, truncate below, where it is also slightly dilated anteriorly, with a very slight anterior support at its upper extremity, and posteriorly with two slight very low ridges, one each near its two extremities, the upper obliquely descending and the lower obliquely ascending towards the transverse plate. Below the latter occurs a very short, slight, horizontal fold with a second, still shorter fold posteriorly to it. The palatal armature consists of six spiral folds; the first short and slight, horizontal, near the upper suture; the next four stouter and more elevated, the second obliquely descending backwards, its posterior extremity bifurcate; the third nearly horizontal, its anterior extremity slightly bifurcate; the fourth and fifth obliquely descending backwards, their anterior extremity also slightly bifurcate; the sixth short, slight, horizontal, near the lower suture.

Major diam. 7·25, minor 8·5 mm.; alt. 3·5 mm.

Hab.—Yamne Valley, Abor Hills (*Oakes*).

Type No. 3124 *Brit. Mus.*

Its nearest relative is *P. macromphalus*, but it differs from, that species in having the palatal barriers in one series, instead of two, and it therefore stands in the same relation to its ally as does *P. sowerbyi* to *P. plectostoma*. It is also considerably larger. The new species is named in commemoration of Dr. Gregorson, Medical Officer, with Mr. Noel Williamson, who were both murdered in 1911 in the Abor country.

Plectopylis (Endothyra) miriensis (G.-A. MS.), sp. n.

(Pl. xli, figs. 3, 3*a*, 3*b*, 3*c*, 3*d*).

Shell sinistral, discoid, pale yellowish-corneous, widely umbilicated, the 3 nepionic whorls nearly smooth and shining, the remainder covered with raised spiral lyrae, the interstices finely and closely transversely striated. Whorls 6½, increasing slowly and regularly, the last slightly dilated towards the mouth, not constricted behind the peristome, slightly descending and shortly deflexed in front, angulated above, slightly compressed below the angulation, the underside convex. Spire almost plane, apex projecting, suture channelled. Aperture oblique, rhomboid-auriculate; peristome white, thickened and reflexed, the margins united by a thin callus on the parietal wall, without a ridge, but with the edge crenulated, owing to the prominent spiral lyrae; slightly notched at the lower junction with the peristome.

The parietal armature consists of a short transverse plate, its lower extremity a little obliquely deflexed towards the mouth, provided anteriorly with a short, almost horizontal ridge below, and an obliquely descending ridge above, a little stouter and longer than the lower; below the plate occurs a short thin bilobed

fold, close to, and parallel with the lower suture and continued posteriorly and anteriorly into a very slender fold, the posterior portion about 3 mm. in length, but the anterior part running as far as the edge of the parietal callus. On the posterior side of the plate occur two denticles, one in a line with the upper, and the other even with the lower extremity.

The palatal armature consists of: 1°, a short, low, horizontal fold near to and parallel with the upper suture; 2°, a longer, stouter fold, its anterior portion horizontal, next curving downwards in a semicircle, and its posterior portion again horizontal, terminating in a bifurcation; between the first and second folds occurs a slight denticle, elongated horizontally; 3° and 4°, two similar folds, but only their anterior portion nearly horizontal, their posterior portion deflexed obliquely downwards, with an obtuse angle; 5°, a fold similar to the preceding two, but shorter; and 6°, a short, slight, nearly horizontal fold, close to the lower suture; a low, transverse, callous ridge connects these folds.

Major diam. 12, minor 11 mm.; alt. 5 mm.

Hab.—Miri Hills, Upper Assam (*Officers, Miri Mission*).

Type No. 3205 *Brit. Mus.*

The raised lyrae differentiate *Plectopylis miriensis* from all other known species of the genus. These appear only on the post-embryonic $3\frac{1}{2}$ whorls, the earlier ones of which are furnished on the upper side with 4 lyrae, but about the beginning of the last half of the penultimate whorl their number gradually increases to 5. Owing to the fact that the inner one of these is at some distance from the suture, the latter appears channelled, the same condition obtaining as regards the suture in the umbilicus. On the outer and the lower side of the whorls—from the upper angulation to the umbilical suture—I have counted 21 such lyrae, making 26 in all.

The species has its nearest ally in *P. pinacis* from Darjeeling, but the latter is dark brown and larger and is only striated spirally, the spirals being also more crowded, while at the sides they are almost obsolete. *P. pinacis*, moreover, is angulated around the umbilicus, which is more open and perspective than in its ally. In their barriers the two species are also closely related, but the parietal transverse plate in *P. miriensis* has no posterior support at its upper extremity, and the anterior support is obliquely deflexed downwards at an acute angle, while in *P. pinacis* this support is much shorter and directed upwards. In the palatal armature likewise considerable differences are met with, the second fold in *pinacis* being straight, instead of curving downwards in the middle. The latter species, moreover, does not possess the transverse callous ridge connecting the horizontal and oblique folds in *P. miriensis*, a feature it shares with *P. muspratti*, and a few other species which, however, belong to a different section. Finally, the additional median denticle between the first and the second fold is lacking in *pinacis*, it is, in fact, a character which I have not observed in any other species of *Plectopylis*.

Plectopylis (Chersaecia) williamsoni, sp. n.

(Pl. xlii, figs. 1, 1*a*, 1*b*, 1*c*, 1*d*).

Shell sinistral, depressed conoid, dark corneous, the earlier whorls lighter and shining, moderately umbilicated, closely plicate-striate. Whorls 6, closely coiled, increasing slowly and regularly, flattened above, convex at the side, tumid below, the last slightly dilated at the mouth, slowly descending for some distance in front, angulated above and around the umbilicus, subangulate at the periphery. Spire depressed, suture linear, apex obtuse. Aperture oblique, crescent-shaped, peristome white, slightly thickened, scarcely reflexed, the margins united by a raised flexuous ridge on the parietal wall, slightly notched at the junctions with the peristome above and below.

Parietal armature consisting of a low vertical plate, both extremities giving off a slight support posteriorly with a slight denticle behind the upper support; above the vertical plate occurs a short slender horizontal fold and on the anterior side are two stout horizontal folds, one very short, in a line with the upper extremity, the other nearly median in position and much longer, terminating at about 1 mm. from the parietal ridge at the aperture; below the vertical plate rises a filiform fold running parallel with the lower suture and united to the parietal ridge at the aperture. The palatal armature may be said to be in two series; the anterior set consisting of six horizontal folds, the first short and slender, near the upper suture, the next three longer and stouter, bilobed; the fifth still stouter, and almost bisected, its posterior portion deflexed; the sixth short and slight, near the lower suture; the posterior series consists of a vertical row of five minute denticles, one each between the second, third, fourth, and fifth folds, and two below the latter; with the exception of the sixth fold, which is placed further forward, all the folds terminate posteriorly in a line with the denticles.

Major diam. 6, minor 5·5 mm.; alt. 3·25 mm.

Hab.—Abor Hills, exact part not indicated (*Oakes*).

Type No. 3087 *Brit. Mus.*

This new species, of which 8 specimens were collected, resembles a small *P. sowerbyi* or *P. plectostoma* in outward appearance, but it is related to *P. brahma*. That species, however, besides being larger, may be readily separated by the fact that the parietal vertical plate gives off anteriorly from its lower extremity a short horizontal fold, while the palatal barriers consist of only four horizontal folds, as against six in the new species; on the other hand, in the posterior series it possesses 13 or 14 denticles and *P. williamsoni* only 6.

With this new species is associated the name of Mr. Noel Willamson of the Indian Civil Service, an active explorer on the far Assam Frontier, whose murder in 1911 led to the expedition against the hill tribes.

Plectopylis (Chersaecia) bedfordi, sp. n.

(Pl. xlii, figs. 2, 2*a*, 2*b*, 2*c*, 2*d*).

Shell sinistral, depressed conoid, almost discoid, dark corneous, moderately umbilicated, finely and closely plicate-striate, decussated on the upper side with very close raised spirals, giving it a closely and finely reticulated appearance; in addition there are at more or less regular, distant intervals, coarser transverse ribs; at the sides the reticulated appearance is less distinct, and there the shell is encircled by four distant fimbriae of cuticular processes, resembling coarse hairs, and a similar fringe of cuticular processes occurs at the top near the outer edge of the whorls; these processes are readily rubbed off. Whorls $6\frac{1}{2}$, closely coiled, increasing slowly and regularly, flattened above and at the side, becoming convex towards the base, tumid below, the last not dilated at the mouth, shortly and rather deeply deflexed in front, angulated above. Spire depressed, suture linear, apex prominent. Aperture oblique, auriculated; peristome white, slightly thickened and shortly reflexed, the margins approximating and united by a raised flexuous ridge on the parietal wall, notched at the junctions with the peristome above and below.

The parietal armature consists of a simple curved transverse plate, giving off posteriorly above a short support and rather strongly deflexed backwards at its lower extremity, where it gives off anteriorly a filiform fold running parallel with and close to the lower suture and joining the flexuous ridges at the aperture. The palatal armature is very complicated, being in two series; the anterior set consisting of six more or less horizontal folds; the first rather thin and short, parallel with and close to the upper suture; the next four stouter and longer, the second slightly curved, the third curving downwards in the middle and bifurcated at the posterior extremity; the fourth at first curves upwards and then downwards; the fifth similar to the fourth but, like the third, bifurcate at the posterior extremity; the sixth is parallel with and near the lower suture. The posterior series consists of a large number of more or less elongated denticles, all more or less in a line with the posterior terminations of the folds; three of these between the first and second folds, the centre one shortest; one, moderately long, between the second and third folds; three between the third and fourth folds, the middle one longest; one short one between the fourth and fifth folds; two, the upper one short and the lower one triangular, posteriorly to the fifth fold; two short ones between the last triangular denticle and the sixth fold, with a short denticle anteriorly and close to the posterior termination of the fifth fold; and lastly a minute denticle below the sixth fold.

Major diam. 9, minor 8 mm.; alt. 4·5 mm.

Hab.—Abor country, Tsanspu Valley, on the Dihang, about 50 miles above the junction of the Sigon River, alt. 2800 ft.

Type No. 3584 *Brit. Mus.*

This new species is evidently related by its palatal armature to *P. brahma*, these barriers being even more complicated than in the latter form. In its simple parietal armature, however, it stands rather isolated in the group, coming nearest to *P. oglei*, but that shell is much larger and is dextral. The species is associated with the name of Captain Bedford, who appears to have been the first officer to go into that part of Assam, *viz.* in 1826.

Plectopylis (Endoplon) aborensis (G.A. MS.), sp. n.

(Pl. xlii, figs. 3, 3*a*, 3*b*, 3*c*, 3*d*).

Shell sinistral, solid, stoutly discoid, ochraceous, with a deciduous cuticle, widely openly umbilicated, finely and rather regularly striated, dull, the protoconch glossy and rather distantly faintly ribbed. Whorls 6½, closely coiled, increasing slowly and regularly, the last a little dilated towards the mouth, deeply descending in front, the upper side flattened, bluntly keeled above, the keel disappearing near the aperture, convex at the side, angulated around the umbilicus, spire sunken, but the upper side of the whorls horizontal, not sloping, so that the whorls are terraced; suture impressed above, but channelled in the umbilicus; apex a little raised, being about on a level with the outer whorl. Aperture nearly horizontal, broadly lunate; peristome thickened and reflexed, the margins united by a slight raised ridge on the parietal wall, notched at the junctions with the peristome above and below; upper margin slightly ascending, outer depressed at first, basal arcuate, columellar ascending and slightly impinging upon the umbilicus.

Parietal armature consisting of: 1°, a transverse plate, obliquley curving downwards and backwards, with a short posterior support at the upper extremity, where it gives off anteriorly a horizontal fold, running parallel with the upper suture; 2°, a much shorter vertical plate, placed anteriorly to the first, its lower extremity having a short support on either side, its upper extremity simple and terminating about the periphery; a very slender fold rises some distance behind the first plate, running close to and parallel with the lower suture, joining the parietal ridge at the aperture. The palatal armature consists of five folds; the first, near the upper suture, slight and obliquely descending backwards; the next three transverse, very stout, short, elevated, and rather square in outline, the second having a short obliquely ascending support at its upper, and an obliquely descending one at its lower extremity; the third and fourth with a short support anteriorly above and below, giving that side a concave appearance, and posteriorly with a short obliquely descending support at its lower extremity; the fifth is near the lower suture, slight and horizontal, a little stouter and more elevated than the first.

Major diam. 14, minor 11·5 mm.; alt 6·5 mm.

Hab.—Between Renging and Rotung, 2200 ft., Abor country. *Type* No. 5998 *Ind. Mus.*; also No. 6135 I.M.

This new species is a very interesting addition to the Indian fauna, a single full-grown specimen and one immature of which were collected by I. H. Burkill and sent home by Mr. Kemp, who accompanied the expedition. It is the first sinistral form of the section *Endoplon* I have seen. In its parietal armature it is nearest to *P. brachyplecta*, but lacks the median horizontal fold of that species, while the anterior vertical plate is only about half the length of that in its ally; in addition it possesses a short horizontal fold proceeding from the upper extremity of the posterior plate, while the horizontal fold below the two plates—which in *P. brachyplecta* is very short and rather stout—is here very slender and, running parallel with the lower suture, reaches the aperture. In its palatal armature it differs in having only five folds—against six in *brachyplecta*—the median ones, moreover, being placed more vertically, and the third and fourth having the anterior side concave, instead of sloping backwards as in *brachyplecta*. In outward appearance it strikingly differs from all other known species of *Plectopylis*, the terraced upper sides of the narrow whorls and the channelled sutures in the umbilicus being features I have not observed in any other species, and which, without previous examination of the armature, enabled me at a glance to recognize this as an undescribed form.

Fig. 3*a* shows the parietal armature, fig. 3*b* the palatal folds as they would appear from the inside if the outer wall were removed, while fig. 3*c* gives the posterior aspect of both parietal and palatal barriers, only the posterior plate of course being visible in this view.

Plectopylis (Sinicola) babbagei, sp. n.

(Pl. xlii, figs. 4, 4*a*, 4*b*, 4*c*, 4*d*).

Shell dextral, discoid, dark brown above, olivaceous corneous below, widely and perspectively umbilicated, closely and rather coarsely plicate-striate, the striae decussated by raised spiral lines. Whorls 6, increasing slowly at first, then more rapidly, the upper side a little flattened and sloping towards the suture, slightly convex at the side, tumid below, encircled by three fimbriae of deciduous cuticular processes, like coarse hairs, the first near the upper side, the second at the periphery, the third around the umbilicus; the last whorl dilated towards the mouth, not constricted behind the peristome, shortly descending in front. Suture impressed, spire slightly sunken, apex a little raised. Aperture oblique, elliptic-subovate, the margins distant; peristome white, thickened and reflexed, the margins united by a slightly raised, flexuous ridge on the parietal wall; the upper margin shortly ascending, curved, outer margin straight, basal margin widely curved, columellar margin ascending, slightly impinging upon the umbilicus.

Parietal armature consisting of a simple, stout, curved, obliquely ascending, transverse plate. The palatal armature is composed of six spiral folds: the first short, horizontal, near the upper suture; the next four longer and stouter, their posterior terminations notched; the second horizontal; the third, fourth and fifth obliquely descending backwards; the sixth short, horizontal, near the lower suture; between the posterior ends of the fifth and sixth folds occurs a slight denticle.

Major diam. 14, minor 12 mm.; alt. 6 mm.

Hab.—Luyor Peak, Abor Hills, alt. 7200 ft. Lat. 28°45′: Long. 95°45′.

Type No. 3529 *Brit. Mus.*

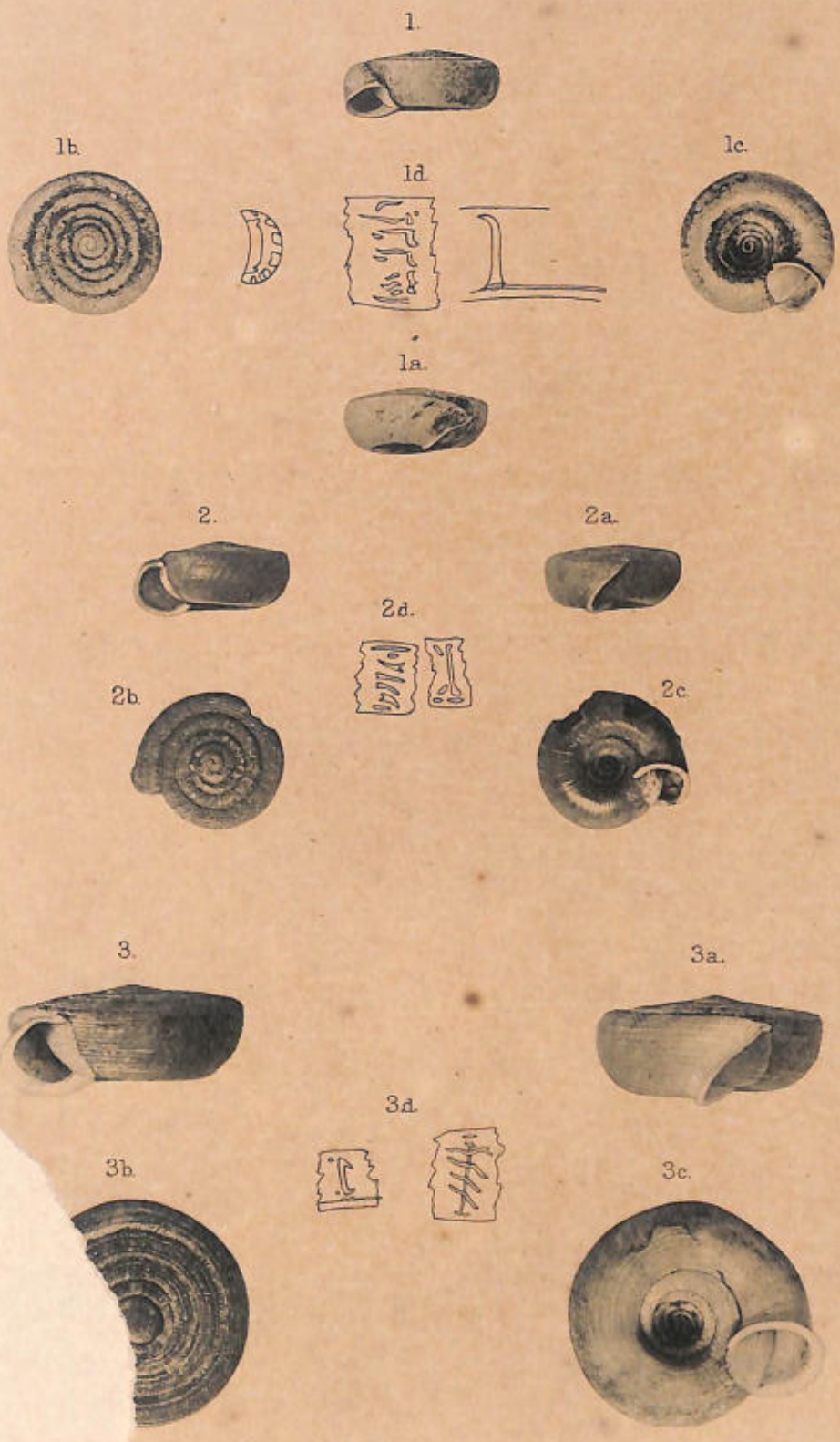
When in 1899 the writer established the section *Sinicola* (Science Gossip, new series, VI, p. 148) it was believed to be confined within the limits of the Chinese Empire. Two species belonging to this group were subsequently discovered in Tonkin (*P. emigrans* and *P. fruhstorferi*), while a third (*P. hirasei*) was taken in the Loo Choo Group, but, until the present species was found, no member of the section was known to occur to the south of the Himalayas. *P. babbagei*, therefore, constitutes a very interesting and important addition to the Indian fauna. It appears to be nearest in affinity to *P. pulvinaris*, which, however, possesses 7 palatal folds and is not, like the present species, decussated by spirals. The name of Major-General Babbage, who led an expedition against the Abor tribes in 1847, suggested by Lt.-Col. Godwin-Austen, is associated with this new species.

EXPLANATION OF PLATE XLI.

FIGS. 1, 1*a*, 1*b*, 1*c*, 1*d*.—*Plectopylis* (*Endothyra*) *oakesi*, sp. n.

,, 2, 2*a*, 2*b*, 2*c*, 2*d*.— ,, ,, *gregorsoni*, sp. n.

,, 3, 3*a*, 3*b*, 3*c*, 3*d*.— ,, ,, *miriensis*, sp. n.



Bemrose, Colls., Derby.

ABOR MOLLUSCA. (PLECTOPYLIS).

EXPLANATION OF PLATE XLII.

FIGS. 1, 1*a*, 1*b*, 1*c*, 1*d*.—*Plectopylis* (*Chersaecia*) *williamsoni*, sp. n.
,, 2, 2*a*, 2*b*, 2*c*, 2*d*.— ,, ,, *bedfordi*, sp. n.
,, 3, 3*a*, 3*b*, 3*c*, 3*d*.— ,, (*Endoplon*) *aborensis*, sp. n.
,, 4, 4*a*, 4*b*, 4*c*, 4*d*.— ,, (*Sinicola*) *babbagei*, sp. n.



reen, Photo. del.

Bemrose, Colls., Derby

ABOR MOLLUSCA. (PLECTOPYLIS).

XLI. COLEOPTERA, VIII:

PASSALIDAE AND LUCANIDAE.

By F. H. GRAVELY, *M.Sc., Assistant Superintendent, Indian Museum.*

PASSALIDAE.

The Passalidae collected during the Abor Expedition of 1911-12 were mostly found either in trees felled by troops at Kobo, where they could not have been on the ground for more than a few months, or in trees felled by Abors when preparing land for cultivation.

Five of the species found—*Taeniocerus bicuspis*, *Aceraius grandis*, *Macrolinus sikkimensis*, *Leptaulax dentatus*, and *Leptaulax bicolor*—have a wide distribution round the Abor country. It is, however, uncertain how far beyond the Abor country the typical Himalayan form of *Macrolinus sikkimensis* extends, this form being replaced in a great part at least of Burma by a local race of the same species.

All the remaining species are Himalayan, except *Leptaulax roepstorfi*, which is only known outside the Abor country from Burma and the Andamans. Of the Himalayan species *Tiberioides austeni* is only known, outside the Abor country, from the Dafla Hills; *Aceraius himalayensis* extends into the Naga Hills and *Leptaulax cyclotaenius* subsp. *himalayae* extends into Tonkin. The typical form of the last named species is Malaysian, and no form is known between the Himalayas and Tonkin on the one hand, and Perak in the Malay Peninsula on the other.

The collection, which has already been referred to in my "Account of the Oriental Passalidae" (*Mem. Ind. Mus.* III, 1914, pp. 177-353, pl. xi-xiii), is as follows:—

Genus **TAENIOCERUS**, Kaup.

This genus includes species found in all parts of the Oriental Region except the Indian Peninsula and Ceylon.

Taeniocerus bicuspis, Kaup.

Kobo, 400 ft., 1-xii-11—4-ii-12.
Rotung, 1400 ft., 1-i-12.
Upper Rotung, 2000 ft., 5-i-12.
Renging, 2150 ft., 19-xii-11.

This is the only species of the genus found north of the Malay Peninsula. It is recorded from the Malay Peninsula, Siam,

Cachar and the whole length of the E. Himalayas, so probably occurs throughout the hill ranges of Burma and Assam.

Genus **TIBERIOIDES**, Gravely.

Confined to the E. Himalayas, Assam, and Burma (probably Upper Burma).

Tiberioides austeni, Gravely.

Kalek, 3800 ft., 29-xii-11.

Previously known only from specimens collected in the Dafla Hills.

Genus **ACERAIUS**, Kaup.

This genus is recorded from the Philippines, Sunda Islands, Malay Peninsula, Burma, Assam, E. Himalayas, Southern China, and Formosa but not from the Indian Peninsula or Ceylon.

Aceraius grandis (Burmeister), subsp. **hirsutus**, Kuwert.

Kobo, 400 ft., 31-xi-11—8-xii-11.
Janakmukh, 600 ft., 18-xii-11.
Rotung, 1400 ft., 26-xii-11 and 1-i-12.
Upper Rotung, 2000 ft., 5-i-12.
Renging, 2150 ft., 4-xi-11.
Kalek, 3800 ft., 29-xii-11.

Aceraius grandis is found over the whole range of the genus. Its subspecies *hirsutus* is the form characteristic of continental Asia (excluding the Malay Peninsula), the Philippines and Formosa.

Aceraius himalayensis, Gravely.

Sirpo River nr. Renging, March 1912.

Although the species apparently occurs throughout the Eastern Himalayas and southwards into the Naga Hills, it does not seem to be very common. Only a single specimen was obtained during the Abor Expedition; this was collected by M. de Courcy.

Genus **MACROLINUS**, Kaup.

The section of this genus to which the Abor species belongs is known only from the Andamans, Nicobars, Burma and the Eastern Himalayas.

Macrolinus sikkimensis, Stoliczka.

Kobo, 400 ft., 30-xi-11—9-xii-11.
Janakmukh, 600 ft., 15-xi-11.
Rotung, 1400 ft., 25-xii-11—1-i-12.

This species occurs throughout the Eastern Himalayas, and a local race of it is known from Burma. One of the specimens from Kobo approaches this race somewhat in character.

Genus **LEPTAULAX**, Kaup.

Widely distributed over the Indo-Australian Region.

Leptaulax dentatus (Fabr.) *s. str.*

Kobo, 400 ft., 2-xii-11 and 8-xii-11.
Janakmukh, 600 ft., 18-x-11.
Rotung, 1400 ft., 28-xii-11.
Upper Rotung, 2000 ft., 9-i-12.
Renging to Rotung, 2600 ft., 20-xii-11.
Kalek, 3800 ft., 29-xii-11.

A very variable and widely distributed species. Its range appears to coincide with that of the genus.

L. cyclotaenius, Kuwert, subsp. **himalayae**, Kuwert.

Renging, 2150 ft., 19-xii-11.

This form is only known in addition from the Dafla Hills and Tonkin. *L. cyclotaenius*, s. str., the only other known form of the species, is a Malaysian insect and is not known to occur north of Perak.

Leptaulax bicolor, Fabr., *s. str.*

Janakmukh, 600 ft., 18-xii-11.

This species, like *L. dentatus*, is very variable, and has the same zoogeographical range as the genus.

Leptaulax roepstorfi, Kuwert.

Yembung, 1100 ft., 8-ii-12.
Rotung, 1400 ft., 24-xii-11.

This remarkably flat insect was originally described from the Andamans, and has since been described from Tenasserim. This record extends its known range northward very considerably.

LUCANIDAE.

Very few Lucanids were collected. They are as follows :—

Metapodontus impressus, Waterhouse.

Kobo, 400 ft., 6-xii-11, under log (♂).

The Indian Museum possesses a female from the Darjeeling District. No other precise records appear to have been made.

Eurytrachelus sp. ♀.

Janakmukh, 600 ft., 18-xii-11, in rotten wood.

Gnapholoryx velutinus, Thomson.

Kobo, 400 ft., 30-xi-11, in rotten wood (♂).

The Indian Museum possesses a female from Darjeeling, 7000 ft., and one from 1000-3000 ft. in the Darjeeling District. No other precise records appear to have been made.

Aegus labills, Westwood.

Upper Rotung, 4-i-12, under leaf-stem of plantain (♀).

The Indian Museum possesses specimens from the Dafla Hills, Southern Shan States, and Andaman Islands. The species has also been recorded from Darjeeling.

? **Cardanus** sp.

Rotung, 1400 ft., 23-xii-11, in rotten wood.

XLII. COLEOPTERA, IX: TENEBRIONIDAE.

By F. H. GRAVELY, *M.Sc., Assistant Superintendent, Indian Museum.*

(Plates XLIII—XLIV.)

The Tenebrionidae collected by the Abor Expedition were for the most part found under bark or in rotten wood. Many Tenebrionids live in such situations, where they may be found even in the cold season. It is therefore not surprising that their species are more numerous than those of many other groups which are more readily met with in the open, but chiefly during the hot weather and rains.

Insects of such retiring habits as these Tenebrionids have been less collected everywhere than those which are more readily found; and the large proportion of new species in the Abor collection is probably as much due to the way in which they were collected as to zoogeographical causes.

The most unexpected insects in the collection are perhaps the two new species of *Leptoscopha*, a genus hitherto recorded only from Madagascar; but it is at present impossible, in view of the imperfect state of our knowledge of Indian Tenebrionidae, to attach any special significance even to these.

The present, like a number of other papers in this series, contains records not only of species obtained by the Abor Expedition, but also of species collected by Mr. H. Stevens in north-east Assam and the Darjeeling District, and by myself in the Amherst District of Tenasserim.

All the species enumerated below were determined for me by Herr Hans Gebien, when I visited Hamburg about two years ago. Several of the known species with which new forms are compared were lent to me by him for that purpose, and were still with me when the war deprived me of his continued help. Other work prevented my taking up the writing of this paper till after the commencement of the war, and I have omitted from it descriptions of several new species for an adequate description of which I have felt my own knowledge to be insufficient, and concerning which I have wished to consult him again. I cannot thank him too deeply for his constant kindness to me in Hamburg, and for the assistance with which he was ever ready, so long as he was able to communicate with me. Information given below as to the distribution of known species has been obtained from his Catalogue (Junk's "Coleopterorum Catalogus") where references to previous literature will be found, from his private collection and notes, and from the Indian Museum collection.

Pseudoblaps javana, Wied.

Several specimens were collected under the bark of a fallen tree-trunk in Kawkareik, one between Kawkareik and Third Camp, and one at Dhammathat—all in the Amherst District of Tenasserim. The species is recorded in Gebien's catalogue from Further India and the Sunda Islands. His collection includes specimens from Rangoon, Annam, Cambodia, Sumbava, and Tenimber in Larat Island near New Guinea. There are a few specimens in the Indian Museum collection from Victoria Point.

Scleron ferrugineum, Fabr.

A single specimen was found in the Thaungyin Valley, at Myawadi, *ca.* 500 ft., on the Burmo-Siamese frontier. Gebien's collection includes specimens from Borneo, the Philippines and Formosa, which localities, together with those previously recorded, show that the species occurs throughout the Oriental Region, to which it appears to be confined.

Gonocephalum depressum, Fabr.

This species, recorded from India by Gebien, was found at Kawkareik, and on both eastern and western slopes of the Dawna Hills in Tenasserim.

Gonocephalum pubens, Mars.

Mr. Kemp obtained a single specimen of this Japanese species at Dibrugarh, N.-E. Assam. It has recently been recorded by Gebien from Formosa.

Gonocephalum ruficornis, Geb.

This species was found at Yembung, 1100 ft., and Rotung, 1400 ft. in the Abor Country. It appears to have been described since the publication of Gebien's "Catalogue," but I have been unable to discover where.

Gonocephalum subspinosum, Fairm.

Originally described from Kurseong. Mr. Kemp found it at Kobo, 400 ft., in rotten wood; at Rotung, 1400 ft., under bark; between Rotung and Kalek, 2000-3500 ft.; near Parong, 3300 ft., under stones; and above Panji, 4000 ft., under bark.

Dichraeosis capucinus, n. sp.

(Plate xliii, fig. 1.)

Gopaldhara, Rungbong Valley, Darjeeling District. One specimen, collected by Mr. W. K. Webb, from whom it passed into Mr. Stevens' collection.

A slender almost cylindrical insect whose general russet brown colour is produced by golden scale-like hairs—much coarser than in *D. bacillus*—overlaying the dark brown integument, which is further obscured between its numerous coarse tubercles by a paler dull brown secretion. *Length* 8 mm. Maximum width of pronotum 2·2 mm. Maximum width of elytra 2·8 mm.

The *head* is transverse, very coarsely and closely punctured behind, less so near the anterior margin which is scarcely emarginate. The dorsal surface is transversely depressed between the eyes, and slightly elevated on either side in front of them. There is a very distinct membrane between the anterior margin of the head and the labrum, but the head and all parts belonging to it are particularly deeply embedded in secretion, which must be removed before any of their features can be seen. The labrum is transversely oval, with a transverse elevation about half way between the anterior and posterior margins; behind this elevation it is smooth and polished; in front, it bears a few fine punctures and hairs, the latter forming a dense fringe on the margin.

The *pronotum* is inflated in front of its narrowest part, which is very near the raised posterior margin. Its middle line is depressed throughout, especially in front and behind. The depression in front is much deeper than in *D. bacillus*. A pair of stout conical processes project laterally beside the base of the head from the ventral part of the anterior margin.

The *elytra* are almost parallel-sided, slightly widest at a distance of about two-thirds of their length from their anterior end, gradually tapering behind. They are marked throughout by parallel lines of tubercles; of these the two innermost are discontinuous, the next five are much coarser, with their tubercles united to form more or less continuous ridges, and the last two, though coarse and distinct behind, are obsolete in front.

The *lower surface of the head* is marked centrally by a series of transverse grooves; laterally it is coarsely and closely punctured.

The *prosternum* is marked with irregular, coarse, shallow punctures. In front of the coxae it is T-shaped, with all its edges slightly raised; behind them it is hour-glass shaped.

The *mesosternum* is depressed in front, where it is coarsely roughened except in the middle line which is strongly keeled and highly polished. Behind it is elevated to the level of the metasternum and is rough throughout.

The *metasternum* and *abdominal sterna* are covered with golden scale-like hairs such as occur on the upper surface. A depression borders the smooth and hairless rims of the posterior coxal cavities.

The *antennae* are 11-jointed. The two basal joints are subspherical, a little longer than broad, the first a little larger than the second which is inserted at an obtuse angle. The third joint is slender, about three times as long as broad, distinctly thickened distally. The next three joints are alike, scarcely longer than broad. The seventh joint is similar, but more distinctly thickened

distally. The eighth joint is fully as broad as long, the ninth and tenth successively broader. The eleventh is larger and subspherical.

The right *mandible* is compressed distally, and has one large terminal tooth with a smaller dorsal tooth above it. The outer margin is ventrally elevated. The whole space between the terminal tooth and the broad molar tooth is occupied by a mandible-sac. The left mandible is missing.

The lacina of the *maxilla* is about half as large as the galea; both are expanded and clothed with stout curved hairs distally. The palp is 4-jointed. The first joint is small and parallel-sided; the second is fully twice as long as the first, somewhat broader at the base and fully twice as broad distally; the third joint resembles the second in form, but is only about two-thirds as long; the fourth joint is large and triangular, about as long as the first and second together and about as broad as long.

The *labial palps* are 3-jointed; the second joint is somewhat larger than the first, and the third than the first and second together.

The *mentum* is trapezoidal.

The *legs* are moderately slender, and present no special features.

Byrsax tuberculatus, n. sp.

(Plate xliii, fig. 2.)

Kobo, 400 ft., Abor Country, 30-xi-11. One specimen.

A small brown, parallel-sided, oval beetle about twice as long as broad, covered with strong tubercles none of which form massive elevations as is the case in *B. excisicollis*, Gebien, from Borneo.[1] *Length* 4·3-5·0 mm.

The *head* is shaped as in *B. excisicollis*, but is smoother between the eyes and bears a pair of erect horns of variable length, directed somewhat backwards and bowed a little outwards, obliquely truncate and spiny postero-laterally at the end.

The *pronotum* and *elytra* are punctured and tubercular (see pl. xliii, fig. 2). The posterior margin of the former is shaped as in *B. excisicollis*.

The *lower surface of the head* is closely and coarsely punctured, as is also the *prosternum* which is strongly keeled between the coxae. The *mesosternum* is more finely and sparsely punctured, with the space between the punctures highly polished. The *metasternum* is grooved in the middle line; both it and the *abdominal sterna* are closely and coarsely punctured.

The *antennae* are 11-jointed. The first joint is about as long as the second and third together, the third is longer than the fourth which is fully as long as the second, the fifth to tenth joints are enlarged in front, the fifth slightly, the others more and

[1] Described in *Sarawak Museum Journal* II, pp. 9-11, pl. i, fig. 6, since the publication of the "Catalogue."

more in series. The terminal joint is about equal to the ninth in width, is evenly rounded, and slightly longer than broad.

The right *mandible* is terminated by a single large pointed tooth, with a slightly smaller tooth above and a little behind it. The mandible-sac fills the space between these teeth and the broad molar tooth. The left mandible is stout, and horizontally cleft at the tip; the lower external margin of the dorsal of the two teeth so formed is finely and evenly serrate. There is a mandible-sac and a large molar tooth.

Dysantes elongatus, Redt.

Hitherto recorded only from Java. A specimen was obtained at Sukli on the eastern side of the Dawna Hills (Tenasserim), at an altitude of about 2000 feet.

Platydema aurimaculata, n. sp.

(Plate xliii, fig. 3.)

Kobo, 4000 ft., Abor Country, 30-xi-11. A number of specimens found in *Polyporus*.

A convex elyptical, smoothly shining insect whose black colour is varied with orange on the elytra. *Length* 3·8-4·5 mm.

The *head* is rather sparsely punctured, transversely grooved between the inner angles of the eyes, black behind this, black fading to reddish-brown in front. The anterior margin of the clypeus is straight or lightly concave, making a widely rounded angle with the anterior margin of the canthus on each side. The labrum is reddish-brown, with a number of short hairs in front. In males a dorso-ventrally depressed horn of variable size projects from the middle line between the posterior margins of the eyes. It is black at the base, but when well developed is reddish at the tip.

The *pronotum* is black, occasionally tinged with reddish-brown; it is punctured like the head.

The *scutellum* is small; it is black or reddish. The *elytra* are black with four irregular patches of orange, they are marked with eight complete longitudinal rows of fine punctures (excluding the marginal groove), and a short additional one near the scutellum.

The *under side* of the head is black, that of the rest of the body reddish-brown; the former is somewhat coarsely roughened, the latter somewhat more finely punctured. The *prosternum* and *metasternum* are not grooved or keeled in the middle line. The *mesosternum* is hidden.

The *antennae* are 11-jointed. The first joint is longer and stouter than the second; the third is also longer than the second, and is slightly thickened distally, but it is much smaller than the first. The remaining joints are uniformly thicker than the third but are of about the same length, except the last which is about twice as long.

The right *mandible* is moderately stout, bifid at the tip, and grooved externally. The dorsal tooth in front of the mandible-sac is low and broadly truncate. The left mandible is similar, its dorsal tooth is very small.

Both the lacina and galea of the *maxilla* are tipped with stout hairs; the last joint of the palp is barrel-shaped, with obliquely truncate extremity.

The *mentum* is trapezoidal, with lightly convex sides.

The femora of all the *legs* are slightly swollen. The tibiae are broader distally than proximally. The tarsi are bordered by fine spines.

Platydema subfascia, Walk.

This species is known from India, the Sunda Islands, S. China, etc. I obtained one specimen at Kawkareik in Tenasserim.

Platydema annamitum, Fairm.

Hitherto known only from Indo-China. Mr. Kemp obtained specimens from under bark at Yembung, 1100 ft., 8-ii-12, and at Rotung, 1400 ft., 28-xii-11. Both of these places are in the Abor Country.

Platydema nigroaeneum, Motsch.

Hitherto only recorded from Japan. Mr. Kemp obtained it in the Abor Country from rotten wood at Kobo, 400 ft., 1-xii-11, and there is a specimen in Gebien's collection from Phuc Son in Annam.

Platydema alticornis, n. sp.

(Plate xliii, figs. 4, 4*a*.)

Moulmein (Tenasserim), 16-xi-11. One specimen.

A somewhat flatter insect than *P. aurimaculata*, black throughout, and distinguished from all known species of the genus by the erect horn above the left eye. *Length* 5·5 mm.

The *head* is roughly semicircular, but is slightly angular in the middle line in front. It is polished and punctured throughout. Its margin is raised; the area between the eyes is depressed, and from this depression a pair of arched grooves extends forwards on either side of a slightly higher circular area. Behind the depression the surface is elevated to about the level of the pronotum, and on either side of it is a tubercle—a low one with approximately rectangular apex on the right side, and a tall erect one, ending in a tuft of hair, on the left.

The *pronotum* is closely punctured but less highly polished than the head. It bears a very indistinct median groove, with a pair of depressions on either side of it against the posterior margin.

The *elytra* are also somewhat dull; they bear rows of punctures arranged as in *P. aurimaculata* but much more deeply impressed.

The *lower surface of the head* is rugose in front and punctured behind.

The *prosternum* is keeled in the middle line and coarsely punctured in front of the coxae. The *mesosternum* is hidden. The *metasternum* is strongly grooved in the middle-line, smooth, with a few punctures laterally. The *abdominal sterna* are punctured.

The third joint of the *antenna* is long and slender, the fourth is shorter and thicker; from the fifth onwards the joints are of equal breadth.

The femora of all the *legs* are more or less swollen; the tibiae are broader distally than at the base. The tarsi are finely spinulose.

Ceropria induta, Wied.

This species is recorded from "India and the Malay Archipelago." Gebien's collection and ours show that its range extends from Japan and the eastern limits of the Oriental Region to Nepal in the Himalayas; but in neither of these collections are there specimens from the Indian Peninsula.

Mr. Kemp found the species in rotten wood and under bark in the Abor Country at Kobo, 400 ft. (5-xii-11); at Janakmukh, 600 ft. (17-xii-11); at Yembung, 1100 ft. (Jan. and Feb., 1912); at Rotung, 1400 ft. (28-xii-11); at Kalek, 3800 ft. (29-xii-11); and above Pangi, 4000 ft. (16-i-12); he also found it at Sadiya in N.-E. Assam (25—26-xi-11), and Mr. Coggin Brown found it at Puging, 3000 ft. in the Abor Country (Feb., 1912). I found specimens of an unusually pale violet colour at Moulmein, Lower Burma, 16-xi-11. We have others of this colour from Mungphu in the Darjeeling District.

Ceropria subocellata, Cast. and Brll.

Gebien tells me that this species and *C. laticollis*, Fairm. are identical. It is recorded from Java, Japan and Tonkin. Gebien has it also from Annam and "Sikkim"; and we have specimens from Buxa and Cachar as well as those obtained by Mr. Kemp in the Abor Country at Rotung, 1400 ft. (23-xii-11) and from rotten wood at Yembung, 1100 ft. (14-i-12).

Uloma javana, Gebien.[1]

Hitherto recorded only from Java. Mr. Kemp found it under stones and logs of wood at Kobo, 400 ft. (7-xii-11), and at Rotung 1400 ft. (21-xii-11) in the Abor Country.

Uloma orientalis, Cast. var. **minor**, Gebien.[2]

Uloma orientalis, Cast., *s. str.*, is recorded only from Java. Its variety *minor* is recorded only from Borneo, but Gebien

[1] Described in *Wiesbaden Jahrb. Ver. Natk.* LXV, 1912, p. 234, since the publication of the "Catalogue."

[2] Described in *Sarawak Museum Journal* II, p. 28, since the publication of the "Catalogue."

has specimens from Pengalengan, 4000 ft. in Java. Mr. Kemp obtained it from under bark at Upper Rotung in the Abor Country (6-i-12), and I obtained it at Sukli, 2100 ft., on the eastern slope of the Dawna Hills in Tenasserim in Nov. 1911.

Alphitobius (Diaclina) quadrimaculatus, Gebien.[1]

Hitherto recorded from Formosa, the Philippines, Madura, and E. Java. Mr. Kemp found it in rotten wood and under bark at Kobo, 400 ft. (1—2-xii-11), and at Rotung, 1400 ft. (7—8-iii-12) in the Abor Country.

Eutochia lateralis, Bot.

The known range of this species extends from India to the Philippines. I found one specimen at Kawkareik in Tennasserim.

Setenis laevis, Fairm.

This species is recorded from "Sikkim." Gebien's collection and ours include specimens from the Darjeeling District, Assam, Burma and Tonkin. Mr. Kemp found specimens under bark in the Abor Country above Pangi, 4000 ft. (16-i-12) as well as at Sadiya in N.-E. Assam (26-xi-11).

Setenis indosinica, Fairm.

This species is only recorded from Indo-China. Our collection shows that it occurs in the Darjeeling District, Assam (Sibsagar and Cachar) and Burma (Tavoy) as well. Mr. Kemp found it under bark at Sadiya in N.-E. Assam (26-xi-11), and at Kobo, 400 ft. (8-xii-11) and Rotung 1400 ft. (28-xii-11) in the Abor Country.

Setenis crenatostriata, Motsch.

This species is recorded from Burma. I obtained it at Moulmein in that country. The Indian Museum collection also contains a specimen from Sibsagar in Assam, and Gebien's collection one from "Sikkim."

Setenis kempi, n. sp.

(Plate xliii, fig. 6.)

Described from specimens collected by Mr. Kemp from rotten wood at Janakmukh, Abor Country, 600 ft., and from specimens collected by Mr. S. E. Peal and the Indian Museum collector in Sibsagar, Assam.

[1] The distribution of this species is indicated by Gebien in his paper on the Tenebrionidae of Formosa, *Arch. Naturg.* LXXIX (A), p. 26, 1913. I have been unable to trace the original description.

Length 23·0-28·5 mm. Like *S. dentipes*,[1] Gebien, above and below, but with less distinctly striate *elytra*.

The *appendages* also resemble those of *S. dentipes*, except that the tooth on the posterior femur, which is perhaps hardly as strong in the male, is absent in the female.

Tonkinius striatipennis, n. sp.

(Plate xliii, fig. 8.)

Above Pangi, 4000 ft., Abor Country, 16-i-12. One specimen found under bark.

A dull black insect, not unlike *T. sculptilis*, Fairm., in general appearance. *Length* 17 mm.

The *head* resembles that of *T. sculptilis*.

The *pronotum* is slightly broader than in that species, and has more evenly rounded sides. The median groove is complete and very pronounced. On either side of this groove the pronotum is thrown into four distinct longitudinal ridges of which the outermost does not reach the posterior margin.

The *scutellum* resembles that of *T. sculptilis*.

The grooves of the *elytra* are very broad and dull, with large shallow punctures; all the ridges between them are keeled, the third and fourth being polished and somewhat more pronounced than the others.

The *lower surface of the body*, the *antennae* and the *legs* resemble those of *T. sculptilis*.

Encyalesthus exularis, Geb.

Gebien based his description of this species (*Arch. Naturg.* LXXIX (A), 1913, pp. 31-32) on specimens collected by Dr. Sauter in Formosa, and on those collected by Mr. Kemp from under bark at Sadiya in N.-E. Assam (21-xi-11) and at Rotung, 1400 ft., in the Abor Country (28-xii-11).

Encyalesthus stevensi, n. sp.

(Plate xliii, fig. 5.)

Dejoo, base of hills, North Lakhimpur. One specimen, collected by Mr. Stevens.

A black *Setenis*-like insect. *Length* 18·2 mm.

The *head* is longer in front of the eyes than is that of *E. exularis*, and is lightly concave in front of the canthus. Its surface is more finely punctured, and the eyes do not extend so far back.

The *pronotum* is somewhat flatter and more coarsely punctured than is that of *E. exularis* which it resembles in other respects.

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1 Described in *Sarawak Museum Journal* II, pp. 35-37, pl. i, fig. 9, since the publication of the "Catalogue."

The *scutellum* is triangular as in *E. exularis*. The *elytra* lack the metallic sheen found in that species, and the punctures in the striae are finer.

The *sterna* resemble those of *E. exularis*.

The *antennae* are somewhat slenderer than are those of *E. exularis*, all joints being at least as long as broad.

The femora of all the *legs* are stouter at the base, and less distinctly swollen distally than in that species. Otherwise the legs are much the same.

Derosphaerus rugosus, n. sp.

(Plate xliii, fig. 7.)

Sibsagar; Dejoo, base of hills, North Lakhimpur; Rotung, Abor Country, 1400 ft., 24-xii-11, in rotten wood. Numerous specimens from each of the two last-named localities.

An elongate, polished, black insect, very like *Derosphaerus* (*?Encyalesthus*) *impressus*, Walker, in general appearance, but smaller and more strongly rugose. *Length* 10·8-15·0 mm.

The *head* resembles that of *D. impressus*, except that it is not more coarsely punctured between and behind the eyes than it is in front of them.

The *pronotum* is somewhat broader in proportion to its length than in that species, being distinctly broader than long. Its punctures are finer near the middle, and the whole surface is rugose laterally. The anterior angles are somewhat more prominent. The median groove is distinct in front but is often absent behind; on either side of it, and about twice as far from it as from the lateral margin, is another groove parallel to it. The marginal groove is complete, except across the middle in front; it is further from the posterior than from the lateral and anterior margins.

The *scutellum* and *elytra* resemble those of *D. impressus*, except that the lines of punctures on the elytra are more sharply defined and laterally are even larger.

The *pro-* and *mesosterna* resemble those of *D. impressus* in form; they are somewhat variable in texture. The *metasternum* is very finely rugose. The first *abdominal segment* is somewhat more distinctly rugose laterally, the second throughout, and the third in its anterior half. Behind this the sterna are finely punctured.

The *antennae* are relatively shorter than in *D. impressus*, the central joints of the club being only about half as long as broad.

The *legs* resemble those of that species.

Catapiestus indicus, Fairmaire.

This species was first described from Kanara, and was recorded in the same paper as occurring in Sikkim also. We have it from the Abor Country (Kobo, 400 ft., 1-xii-11 and 30-iii-12; Rotung, 1400 ft., 8-iii-12); N.-E. Burma (Pum-pa-taung, 3600 ft.); Tenasserim (Misty Hollow, Dawna Hills, *ca.* 2200 ft.; Third Camp, W.

base of Dawna Hills; and Tavoy); and from Cochin (Parambikulam, *ca.* 1700 ft.). Specimens were found in all stages under the bark of a fallen tree-trunk at the last-named locality (see *Rec. Ind. Mus.* XI, p. 363, 1915).

Menephilus aborensis, n. sp.

(Plate xliii, fig. 9.)

Rotung, Abor Country, 1400 ft., 23-xii-11; three specimens from rotten wood.

A black, slender beetle not unlike *M. medius*, Mars., but much smaller. *Length* 10-11 mm.

The *head* is somewhat longer in front of the eyes than in *M. medius*, and is punctured all over; otherwise it is very similar.

The *pronotum* resembles that of *M. medius* in form, but is punctured all over like the head. The striae of the *elytra* are somewhat deeper than in that species.

The *lower surface of the body* differs from that of *M. medius* only in being somewhat more strongly punctured.

The *antennae* are slightly shorter and stouter than in *M. medius*.

The tibiae of all the *legs* are practically straight.

Toxicum assamense, Pic.

(Plate xliv, figs. 10, 10*a*.)

This species was first described [1] from Assam. Gebien has it from "Sikkim". We have it from the Dafla Hills (Dikrang Valley); Assam (Sibsagar and Sadiya); the Abor Country (Janakmukh, 600 ft., 18-xii-11; above Pangi, 4000 ft., 16-i-12; Yembung, 1100 ft., 14-i-12; below Dosing, 1400 ft., 29-i-12; Rotung, 1400 ft., 28-xii-11—under bark and in rotten wood), and the Chinese frontier of North East Burma (Sansi Gorge, 6000-8000 ft.); and there are specimens in the Pusa collection from the Khasi Hills (1000-3000 ft.) and the Bengal Duars (Buxa). The description is not a satisfying one and is not accompanied by figures. Gebien has, however, examined the type, and assures me that the specimens referred to above are correctly named. I therefore take this opportunity of figuring the species.

Anthracias fairmairei, Gebien.

Mr. Kemp found this species under bark at Rotung, Abor Country, 1400 ft., 28-xii-11. It is represented in Gebien's collection by specimens from Batavia and from North Borneo.

Anthracias punctipennis, n. sp.

(Plate xliv, figs. 11, 11*a*.)

Abor Country (Rotung, 1400 ft., 28–29-xii-11; above Pangi, 4000 ft., 16-i-12). Numerous specimens found under bark.

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[1] *Mélanges Exotico-Entomologiques*, fasc. 6, Moulins, July 12, 1913.

A slender, dull black insect allied to *A*[1]. *fairmairei*, Gebien, and *A*[1]. *tenuis*, Fairmaire, but differing from both in that the head is usually, like the rest of the body, unpolished. *Length*, ♂ 8·3-9·9, ♀ 9·8-11·0 mm.

The *head* in all forms resembles that of *A. fairmairei*, but is somewhat more rounded in front, is not or only slightly polished, and is perhaps even more closely punctured. The horns, too, are somewhat stouter than in that species.

The anterior angles of the *pronotum* are less prominent than in *A. fairmairei*, and the whole upper surface of the pronotum is more closely punctured.

The *scutellum* is punctured and about as long as broad.

The *elytra* are marked with numerous punctures arranged somewhat irregularly in double or treble rows. In this respect they resemble *A. tenuis* rather than *A. fairmairei*.

The *lower surface* resembles that of *A. fairmairei*, but is somewhat more strongly punctured.

The *antennae* and *legs* resemble those of *A. fairmairei*, but the first joint of the antennal club is transversely rectangular rather than triangular.

Leptoscapha[2] **pulchra**, n. sp.

(Plate xliv, fig. 13.)

Kalek, Abor Country, 3800 ft., 29-xii-11, several specimens found under bark. This is the first record of the occurrence of the genus outside Madagascar.

A slender, parallel-sided, almost Erotylid-like beetle, with reddish head and pronotum, and yellow-tipped dark metallic green or violet elytra, each crossed by a somewhat irregular yellow band. *Length* 3·5-4·7 mm.

The *head* is very like that of *L. spissicornis* in form, but does not bear such distinct sutures. The *pronotum* is also very like that of *L. spissicornis*, but its sides are somewhat more nearly parallel.

The sides of the *elytra* are straight, not lightly convex as in *L. spissicornis*.

The *mesothoracic episterna* and *metathoracic sternum* and *episterna* are closely and strongly, the *abdominal sterna* very finely punctured. In other respects the lower surface resembles that of *L. spissicornis*.

The *antennae* are black, more or less tipped with red at either end. They are 11-jointed. The first joint is a little longer and thicker than the second, which is the shortest of all. The next three or four joints are gradually thickened, the rest are uniformly thick. The terminal joint is oval and about twice as long as broad.

[1] *Toxicum* in Gebien's "Catalogue."

[2] Gebien has pointed out to me that this genus belongs not to the Ulominae, as he supposed (following Fairmaire) when his catalogue was prepared, but to the Tenebrioninae.

The right *mandible* is laminar in front of the molar tooth. It is faintly bifid at the tip, and has a well-marked dorsal tooth above the hairy and ventrally directed anterior end of the mandible-sac. The left mandible resembles the right in shape, but is perhaps a little more distinctly bifid at the apex and has the dorsal tooth less distinct.

The lacina of the *maxilla* is slender; the galea is about 2½ times as broad and extends somewhat further forwards; the terminal bristles are scarcely as stout on the former as on the latter; both bear a dorsal row of long hairs, the former almost along the inner edge, the latter obliquely across the surface. The three proximal joints of the palp are rather short and are together about equal in length to the broader terminal joint, which is more or less barrel-shaped but is obliquely truncate distally.

The *labrum* is short and very broad; its palps resemble those of the maxilla, but have one joint less and have the terminal joint somewhat slenderer and vertically truncate.

The *mentum* is transverse, with a pair of lateral horns directed obliquely forwards.

The *legs* are yellowish; all the femora are somewhat swollen. The tibiae are broader at their distal than at their proximal ends. The tarsi are finely spinulose beneath.

Leptoscapha lignicola, n. sp.

(Plate xliv, fig. 12.)

Kobo, Abor Country, 400 ft., 8-xii-11. One specimen found in rotten wood.

A somewhat more elliptical and more uniformly coloured insect than the last; head and pronotum reddish, the posterior margin of the latter tinged with black; elytra blackish with a reddish tinge in the position of the yellow band of the preceding species and less definitely behind this. *Length* 4·0 mm.

The *head* and *pronotum* somewhat resemble those of the preceding species, but the latter is broader in proportion to its length, especially behind, and there are some differences in detail as will be seen on comparing figures 12 and 13 (pl. xliv).

The *elytra* are almost parallel sided—more so than in *L. spissicornis*, but less so than in *L. pulchra*; they are distinctly broader than in *L. pulchra*.

The *lower surface* of the body is very finely and almost uniformly punctured; otherwise it resembles that of *L. spissicornis* and *L. pulchra*.

The *antennae* and *legs* resemble those of *L. pulchella* in structure, but are uniformly brownish in colour.

Lyprops curticollis, Fairm.

One specimen was collected by Mr. W. K. Webb at Gopaldhara, Rungbong Valley, Darjeeling District, who passed it on to Mr. Stevens. It is recorded in Gebien's Catalogue from "India."

Eucyrtus splendens, Lacord.

This Himalayo-Malaysian species was found in the Abor Country in rotten wood at Yembung, 1100 ft., 14-i-12, and under bark at Rotung, 1400 ft., 28-xii-11.

Tearchus annulipes, Kraatz.

Specimens were found under bark in the Abor Country at Rotung, 1400 ft., 28 xii-11, and near Kalek, 2500 ft., 15-iii-12. We have others from the Dikrang Valley in the Dafla Hills, and from Pum-pa-taung, 3600 ft., in north-east Burma.

Amarygmus pilipes, Gebien:[1]

Gebien recently described this species from specimens in his collection from Annam (Phuc Son) and Pegu, from specimens in our collection from the Amherst District of Tenasserim (Third Camp, Western base of Dawna Hills), and the Abor Country (Kobo, 400 ft., 6-xii-11; Yembung, 1100 ft., 14-i-12; and Rotung, 1400 ft., 24-xii-11), and from specimens collected by Sauter in Formosa (Kosempo, Taihorin, Fuhosho). We have additional specimens from Tavoy, Harmutti at the base of the Dafla Hills, and the Dikrang Valley in the Dafla Hills.

Dietysus filicornis, n. sp.

(Plate xliv, fig. 14.)

Three specimens were collected in the Abor Country—one from under bark at Rotung, 1400 ft., 28-xii-11, and one from under bark and one from rotten wood at Kobo, 400 ft., 1-8-xii-11.

A compact, ovate, black beetle with slender legs and antennae. *Length* 9·4-10·6 mm.

The *head* is more or less obscurely punctured, scarcely if at all convex between the eyes, slightly depressed behind the rectangular clypeus which is about twice as broad as long. The canthus is more or less elevated over the base of each antenna, which is distinctly dorsal in position. The clypeus and labrum are separated by a transverse band of pale brown chitin. The labrum, which is somewhat hairy, is nearly as wide as the clypeus and less than half as long; its anterior margin is scarcely convex, its angles are strongly rounded. The suture between the clypeus and the frons is partly or entirely obsolete.

The somewhat obscurely punctured *pronotum* is a little broader than long in front, nearly twice as broad as long behind. Its sides are convex. Its convex dorsal surface is limited in all directions by a fine marginal groove.

The *scutellum* is equilaterally triangular.

[1] Described in *Arch. Naturg.* LXXIX (A), 1913, pp. 42-44, text-fig. 11, since the publication of the "Catalogue."

The *elytra* are striate but not punctate. The ridges between the grooves are narrowed behind, all extending right back into the posterior angles of their respective elytra.

The *prosternum* is bluntly but very strongly transversely keeled in front of the anterior coxae; it is longitudinally grooved in the middle between them. On either side of the groove it is somewhat angular above the abrupt posterior declivity. Both prosternum and *mesosternum* are strongly punctured. *The metasternum* is unpunctured, but is longitudinally grooved in the middle line.

The *abdominal sterna* are somewhat sparsely punctured or finely and indistinctly rugose.

The *antennae* are 11-jointed. The first joint is pear-shaped and about as long as the third joint, which is slender and almost cylindrical. The second joint is only about as long as wide. The fourth, fifth and sixth joints are slender and are about equal in length; any two of them would be together about equal to the second and third joints together. The remaining joints are of about the same length as these, but are thicker distally.

The *legs* are all slender. The femora and tibiae are uniformly black; the tarsi are somewhat reddish.

Dietysus nodicornis, n. sp.

(Plate xliv, fig. 15.)

One specimen was found under bark at Rotung, 1400 ft., in the Abor Country, 23-xii-11.

Very like the preceding in general appearance, but much larger. Its antennae, too, are stouter and moniliform. *Length* 14·3 mm.

The *head* resembles that of *D. filicornis*, but the band between the clypeus and labrum is black, not brown, and the suture between the clypeus and frons is clearly defined. Both head and *pronotum* are very distinctly punctured. The latter resembles that of *D. filicornis* in form.

The *scutellum* and the plates of the *lower surface* also resemble those of *D. filicornis*.

The *elytra* are somewhat more parallel-sided in front than in that species. They are similarly grooved, but the ridges between the grooves appear slightly more convex.

The first joint of the *antenna* resembles that of *D. filicornis*; the second is somewhat stouter than in that species; the third is somewhat abruptly swollen at the distal end. The fourth joint is about half as long as the third; its proximal end is somewhat thinner and its distal end somewhat thicker than are the corresponding ends of the third joint. The fifth joint resembles the fourth, but is only about two-thirds of its size. The sixth joint is about equal to the fourth in length, but is almost cylindrical in its proximal half, swelling out to resemble the fifth joint distally. The next four joints are about equally long, but enlarge gradually from base to apex. The terminal joint is similar, but is obliquely

truncate distally, the lower surface being long, the dorsal shorter and about equal in length to the truncation which meets the lower surface in an acute angle forming the apex of the antenna.

The *legs* resemble those of *D. filicornis*.

Dietysus latifrons, n. sp.

(Plate xliv, fig. 16.)

A single specimen was found under bark at Kobo, 400 ft., in the Abor Country, 8-xii-11.

A somewhat more glossy insect than the two preceding, with somewhat slender antennae, and ringed femora. *Length* 10·3 mm.

The *head* resembles that of *D. filicornis* except that it is much broader and perhaps a little smoother.

The *pronotum* is somewhat broader in front than in that species, and is obscurely grooved in the middle line.

The *scutellum* is shorter than in the two preceding species, and its sides are lightly convex.

The *elytra* resemble those of *D. nodicornis* in shape but their grooves are punctate and more lightly impressed. The areas between the grooves are flattened. The central (5th) of these areas on each elytron extends only about two-thirds of the way from the base to the tip; there is no crowding in the posterior angle as in the two preceding species.

The transverse keel of the *prosternum* in front of the anterior coxae, and the median groove between them, are less pronounced than in the preceding species. The keel sends back a median process into the groove, and the sides of the latter are not angulate.

Both *prosternum* and *mesosternum* are smooth and polished.

The *metasternum* and *abdominal sterna* resemble those of the two preceding species.

The *antennae* resemble those of *D. filicornis*, but are uniformly stouter, the penultimate joints being a little less, instead of a little more, than twice as long as broad.

The *legs* differ from those of the *D. filicornis* and *D. nodicornis* in that the femora are more distinctly swollen distally, and are banded with yellow below the apex.

Strongylium stevensi, n. sp.

(Plate xliv, fig. 17.)

Two specimens were found by Mr. Stevens at Dejoo, base of hills, N. Lakhimpur, 29-vi-10.

A glossy, hard-shelled, dark green insect, not unlike *S. sobrinum* in general appearance, but much larger. *Length* 18-19 mm.

The *head* resembles that of *S. sobrinum*. The width between the eyes is variable as in that species.

The *pronotum* also resembles that of *S. sobrinum*; but its anterior marginal rim is scarcely at all enlarged in the middle.

The *scutellum* is scarcely as long as in that species. The *elytra* are less coarsely punctured and less distinctly undulated.

The *prosternum* is narrower between the coxae than in *S. sobrinum*. The *remaining plates of the lower surface* are similar to those of that species.

The *antennae* are filiform, the third and fourth joints distinctly longer than the rest.

The *legs* of both specimens resemble those of the female of *S. sobrinum*, but are more strongly punctured.

Strongylium sobrinum, Dohrn.

A number of specimens of this Himalayan species were collected by Mr. Stevens at Dejoo, base of hills, North Lakhimpur, Assam, in June and July, 1910. Another specimen in Mr. Stevens' collection was obtained by Mr. W. K. Webb at Gopaldhara, Rungbong Valley, Darjeeling District. The Museum collection includes specimens collected by Peal in Sibsagar.

Strongylium cultellatum, Mäkl.

Two specimens were collected by Mr. Stevens at Silonbari, base of hills, North Lakhimpur, in May and June, 1911.

Strongylium westermanni, Mäkl.

Mr. Stevens collected a specimen at Dejoo, base of hills, North Lakhimpur, in July, 1910. The Indian Museum has one from Sibsagar.

Strongylium curvicomis, n. sp.

(Plate xliv, figs. 18, 18*a*.)

Four specimens were collected by Mr. Stevens at Dejoo, base of hills, North Lakhimpur, in June and July, 1910.

A glossy, olivaceous insect, covered with decumbent yellowish-white hairs which are grouped in small patches on the elytra. *Length* 16·0–17·5 mm.

The *head* differs structurally from that of *C. westermanni* only in its more swollen clypeus and larger, rounder and less transverse eyes accompanied by a longer canthus; it is perhaps a little more coarsely punctured The hairs both upon the head and upon other parts of the body differ from those of *C. westermanni* in being decumbent and more or less curved.

The *pronotum* is a little more coarsely punctured than in *C. westermanni*, and its anterior marginal rim is not enlarged in the middle as in that species. Its proportions vary from scarcely as broad as long, to a little broader than long.

The *scutellum* is triangular as in *C. westermanni*.

The *elytra* are a little more prominent at the shoulders than in *C. westermanni*; their rows of punctures are much more pro-

nounced, the punctures themselves being coarser, and the fine hair-bearing punctures on the intervening ridges confined to numerous small scattered patches.

The *plates of the lower surface* are more strongly punctured and hairy than in *C. westermanni*, as well as being greener in colour like the dorsal surface. Otherwise they are alike in the two species.

The *antennae* of the female are very broad and flat distally. The widening commences at the fifth joint, which is nearly half as wide distally as it is long. The sixth and seventh joints are successively shorter and broader; the eighth, ninth and tenth, which are shorter and broader still, are each about as wide distally as they are long. The apical joint is of about the same length but is a little narrower and is pointed at the apex.

The antennae of the male are broken, but the basal joints are slenderer, and the widening is scarcely recognizable before the sixth joint.

The *legs* resemble those of *S. westermanni* except in their greener colour, stronger puncturing, and decumbent hair, and in the fact that the anterior tibiae of the male are somewhat less strongly curved and are slightly swollen below the middle.

EXPLANATION OF PLATE XLIII.

FIG. 1. *Dichraeosis capucinus*, n. sp. × 6.

,, 2. *Byrsax tuberculatus*, n. sp. × 8.

,, 3. *Platydema aurimaculata*, n. sp. × 8.

,, 4. ,, *alticornis*, n. sp. × 9; *a*, head and prothorax of same.

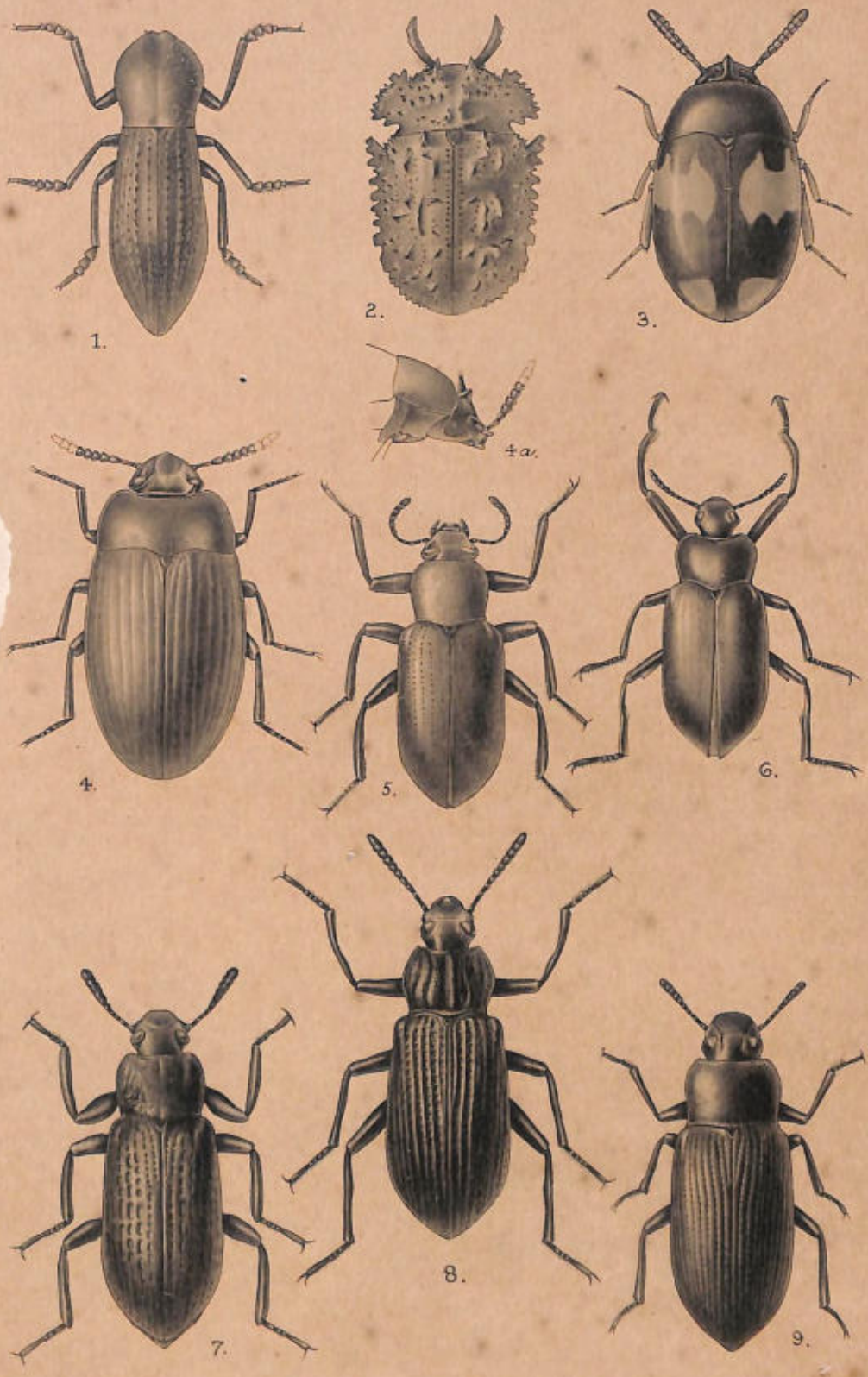
,, 5. *Encyalesthus stevensi*, n. sp. × 2·5.

,, 6. *Setenis kempi*, n. sp. ♂ × 1·5.

,, 7. *Derosphaerus rugosus*, n. sp. × 4.

,, 8. *Tonkinius striatipennis*, n. sp. × 3.

,, 9. *Menephilus aborensis*, n. sp. × 5.



D. N. Bagchi, del.

Bemrose, Colls., Derby

ABOR TENEBRIONIDAE.

EXPLANATION OF PLATE XLIV.

FIG. 10. *Toxicum assamense*, Pic, ♀ × 3; *a*, head of ♂.

,, 11. *Anthracias punctipennis*, n. sp. ♀ × 4·5; *a*, head of ♂.

,, 12. *Leptoscapha lignicola*, n. sp. × 12·5.

,, 13. ,, *pulchra*, n. sp. × 11.

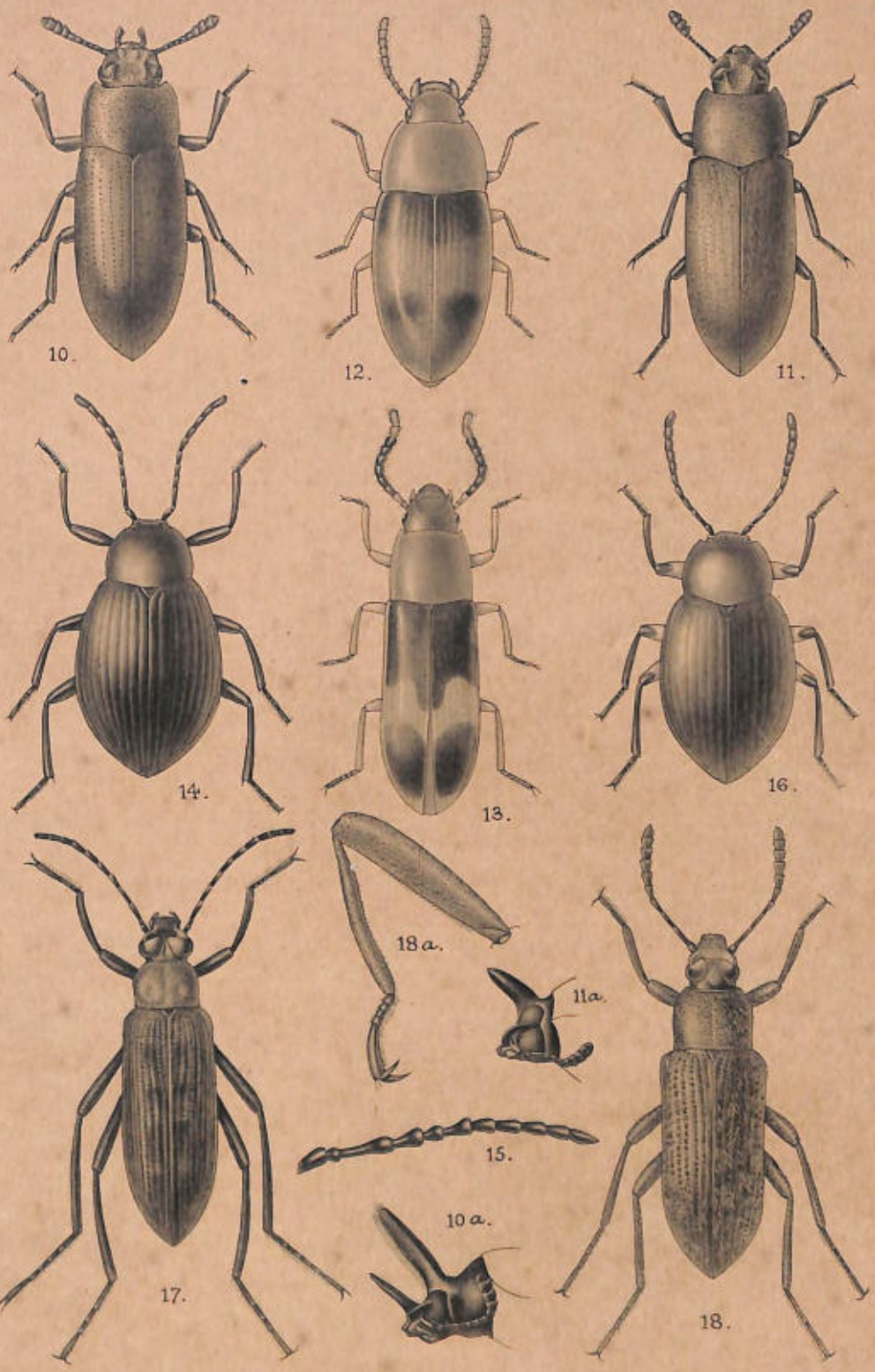
,, 14. *Dietysus filicornis*, n. sp. × 3·5.

,, 15. ,, *nodicornis*, n. sp. antenna × 6.

,, 16. ,, *latifrons*, n. sp. × 3·5.

,, 17. *Strongylium stevensi*, n. sp. × 2·5.

,, 18. ,, *curvicomis*, n. sp. × 3; *a*, front leg of ♂.



D. N. Bagchi, del.

Bemrose, Colln., Derby

ABOR TENEBRIONIDAE.

XLIII. MOLLUSCA, V.

By H. B. PRESTON, *F.Z.S.*

The specimens upon which the present short paper is written form part of the collections made during the late punitive expedition to the Abor country, and by Mr. F. H. Gravely in Lower Burma; though, with the exception of the five new species, there is nothing to call for especial notice, the majority being merely included in order to record their presence in the districts through which the expedition passed. Of the new species, the two which are the most noticeable are *Paludomus rotungensis* and *Diplommatina perobesa*, the former as being by far the smallest true *Paludomus* to have yet been diagnosed, and the latter for its somewhat peculiar pagodiform appearance.

Class **GASTROPODA.**

Order *PULMONATA.*

Family ZONITIDAE.

Sarika consepta (Benson).

(*Helix*), *Ann. Mag. Nat. Hist.*, (3) VI, 1860, p. 190; XI, 1863, p. 320.

Kobo, at an altitude of 400 ft., in rotten wood (*S. W. Kemp*).

Holkeion anceps (Gld.).

(*Caracolla*), *Boston Journ. Nat. Hist.*, IV, 1844, p. 454, pl. xxiv, fig. 4.

Moulmein, Lower Burma (*F. H. Gravely*).

Family HELICIDAE.

Chloritis gabata (Gld.) var. **merguiensis** (Philippi).

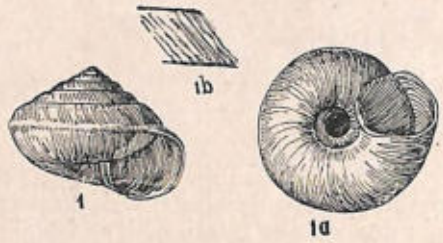
(*Helix merguiensis*), *Zeits. Malak.*, III, 1846, p. 192.

Myawadi, Burmo-Siamese Frontier, Amherst district, Lower Burma (*F. H. Gravely*).

Plectotropis austeni, sp. n.

Shell conically turbinate, light reddish-brown, whorls $6\frac{1}{2}$, regularly increasing, the last descending a little in front and broadly

and roundedly carinate at the periphery, the first two polished, shining, sculptured with fine, raised, spiral striae, the remainder of a roughish texture, marked with irregular, fine, oblique, transverse striae; suture impressed; base of shell somewhat convex, sculptured as on the lower whorls; umbilicus deep, moderately wide, occupying rather more than one-fourth of the total diameter of the shell; columella margin reflexed, vertically descending in a curve; labrum simple; aperture ovate.



FIGS. 1, 1*a*.—*Plectotropis austeni*, sp. n., × 2.
,, 1*b*.— *do.*, sculpture, × 4.

Alt. 8·5 (nearly), diam. maj. 12, diam. min 11 mm.

Aperture: alt. 5, diam. 5·25 mm.

Hab.—Upper Rotung.

Named in honour of my friend Lieut.-Colonel H. H. Godwin-Austen who, by his untiring labours, has so greatly enriched our knowledge of the Indian Molluscan fauna.

Family CLAUSILIIDAE.

Clausilia (Phaedusa) insignis (Gld.).

Proc. Boston Soc. Nat. Hist., I, 1844, p. 140; *ibid.*, *Boston Journ. Nat. Hist.*, IV, 1844, p. 458, pl. xxiv, fig. 8.

Kobo at an altitude of 400 ft., in rotten wood (*S. W. Kemp*).

Clausilia (Phaedusa) annandalei, sp. n.

Shell cylindrically subulate, solid, yellowish-white; whorls 12, the first three submammillary, flattish, sculptured with closely set transverse costulae which become slightly oblique on the later whorls; suture rather lightly impressed; labrum continuous, white, outwardly reflexed; aperture obliquely ovate, bearing an erect, oblique entering lamella above and broad lamella entering in an upward direction on the columella margin.

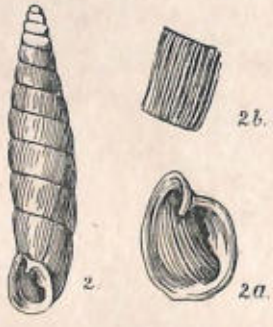


FIG. 2.—*Clausilia* (*Phaedusa*) *annandalei*, sp. n., × 2.
,, 2*a*.— *do.*, aperture, × 4.
,, 2*b*.— *do.*, sculpture, × 4.

Alt. 19, diam. maj. 3·75 mm.

Aperture: alt. 3·25, diam. 3 mm.

Hab.—Upper Rotung, at an altitude of 2000 ft., under stems of plantain trees (*S. W. Kemp*).

Clausilia (Oospira) philippiana (Pfr.).

Pfeiffer, *Zeits. Malak.*, IV, 1847, p. 69.

Kawkareik to 3rd Camp, Amherst district, Lower Burma (*F. H. Gravely*).

Family FÉRUSSACIDAE.

Glessula botellus (Benson).

Ann. Mag. Nat. Hist., (3) V, 1860, p. 465.

Rotung.

Suborder *HYGROPHILA*.

Family LIMNAEIDAE.

Limnaea (Limnaea) acuminata (Lk.).

Anim. s. Vert., VI, pt. 2, p. 160.

Dibrugarh, N.-E. Assam, in small ponds; ditto, Brahmaputra River (*S. W. Kemp*).

Planorbis exustus, Desh.

Bélang., *Voy. Ind. Orient., Zool.*, 1834, p. 417, pl. i, figs. 11-13.

Dibrugarh, N.-E Assam, in small ponds; ditto, Brahmaputra River (*S. W. Kemp*).

Planorbis (Gyraulus) himalayanus (Hutton).

Clessin, *Conch. Cab.*, 1884, p. 141, pl. xx, fig. 8.

Dibrugarh, N.-E. Assam, Brahmaputra River (*S. W. Kemp*).

Order *PECTINIBRANCHIA*.

Suborder *TAENIOGLOSSA*.

Family TIARIDAE.

Tiara (Melanoides) variabilis (Benson).

J. As. Soc. Bengal, V, 1836, pp. 746-747.

Dibrugarh, N.-E. Assam, Brahmaputra River; young specimens only (*S. W. Kemp*).

Tiara (Tarebia) lineata (Gray).

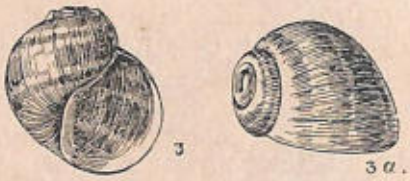
Wood, *Index Test. Supp.* (1828), *Helix*, fig. 68.

Dibrugarh, N.-E. Assam, Brahmaputra River (*S. W Kemp*).

Paludomus rotungensis, sp. n.

Shell imperforate, ovate, olive-brown, painted with spiral, blackish bands of varying breadth; remaining whorls 3, sculptured

with indistinct, fine, spiral striae; suture impressed, margined below; columella margin livid, obliquely descending in a slight curve diffused above into a thick, well defined, restricted, parietal callus which joins the upper margin of the labrum; labrum simple, somewhat dilated, especially below, where it is also rather thickened; aperture large, ovate.



FIGS. 3, 3*a*.—*Paludomus rotungensis*, sp. n., × 3.

Alt. 4·25, diam. maj. 8·25, diam. min. 5·5 mm.

Aperture: alt. 4·75, diam. 4 mm.

Hab.—Upper Rotung (*Type*); Upper Rotung, at an altitude of 1300 ft., in a small stream; young specimens only (*S. W. Kemp*).

Family PALUDESTRINIDAE.

Bithynia pulchella (Benson).

(*Paludina*), *J. As. Soc. Bengal*, V, 1836, p. 746.

Dibrugarh, N.-E. Assam, Brahmaputra River (*S. W. Kemp*).

Bithynia dibrugarhensis, sp. n.

(Fig. 4, p. 541.)

Shell imperforate, ovate, pale straw colour; whorls 4, smooth, the first three regularly increasing, the last large, convex, rapidly descending; suture impressed; columella margin vertically descending in a slight curve; labrum continuous, very slightly reflexed, of a brownish colour; aperture ovate; operculum whitish, slightly concave, finely laminiferous, with central nucleus.

Alt. 5·25, diam. maj. 3·5, diam. min. 3 mm.

Aperture: alt. 3, diam. 2·25 mm.

Hab.—Dibrugarh, N.-E. Assam, Brahmaputra River (*S. W. Kemp*).

Family VIVIPARIDAE.

Vivipara (Idiopoma) heliciformis (Frauenfeld).

(*Paludina*), *Verhandl. Zool-bot. Ges. Wien*, XV, 1865, p. 582, pl. xxii.

Thingannyinaung, E. base of Dawna Hills, at an altitude of 900 ft. (*F. H. Gravely*); Dibrugarh, N.-E. Assam, Brahmaputra River (*S. W. Kemp*).

Family CYCLOPHORIDAE.

Diplommatina perobesa, sp. n.

Shell obliquely ovate with exserted spire, pale flesh colour, solid, opaque; whorls 7, the first two submammillary, the third

fourth and fifth regularly increasing, the sixth large, tumid, the last contracted and abandoning the direction of the axis of the shell, sculptured with coarse, obsolete, oblique, transverse costulae; suture well impressed; columella margin vertically descending, bearing a strong, downwardly bent, entering lamella above, sharply angled at the base, diffused above into a thick, outwardly expanded, well-defined, parietal callus which joins the upper margin of the labrum and gives to it a continuous appearance; labrum consisting of an outwardly expanded and slightly reflexed, shelf-like projection from which springs an erect, rather thick rim; aperture subcircular



FIG. 4.—*Bithynia dibrugarhensis*, sp. n., × 4.
,, 5.—*Diplommatina perobesa*, sp. n., × 6.
,, 5*a*.— *do.*, sculpture, × 12.

Alt. 4·5, diam. maj. 2·5 mm.

Aperture: alt. 1·25, diam. 1·5 (nearly) mm.

Hab.—Upper Rotung, at an altitude of 2000 ft., under stems of plantain trees (*S. W. Kemp*).

Raphaulus assamicus, G. Austen.

L. & F. W. Moll. India, I, p. 201, pl. xlvii, figs. 3-3*a*.

Rotung, at an altitude of 1300 ft., in rotten wood: Upper Rotung (*S. W. Kemp*).

Appears to vary somewhat in size among individual specimens.

XLIV. TERRESTRIAL ISOPODA, II.

By WALTER E. COLLINGE, *D.Sc., F.L.S., etc.,*
Research Fellow of the University of St. Andrews.

(Plates XLIX, L.)

The specimens here described were found in a tube containing a number of small land shells. One of them is a new species referred to the genus *Cubaris*, Brandt; the other I am unable to place in any known genus. I am, therefore, describing a new genus to which I have given the name *Rotungus*.

Gen. **Rotungus**, gen. nov.

Body oblong oval, strongly convex, smooth. Cephalon small, convex, lateral and median lobes prominent; epistoma with median vertical ridge. Eyes large, situated dorsally. Antennae slender, 4th and 5th joints elongated, setae short and thick; flagellum two-jointed, 1st joint short, expanded distally, 2nd joint much longer, terminating in a style. First maxillae with outer lobe terminating in a series of curved spines, inner lobe narrow, flat, with two setaceous spines on the inner border. Segments of the mesosome strongly convex, 1st broadly expanded laterally and partly surrounding the cephalon, lateral plates of 2nd to 5th segments excavate, 6th and 7th almost truncate, posterior angles produced backwards. Maxillipedes with small terminal lobes. Thoracic appendages stout and of medium length, setose, 1st appendage with numerous tridentate setae. The lateral plates of the metasome are somewhat flattened and turned inwards, the median portion of the segments being strongly convex. Uropoda extending beyond the telson, basal plate broader anteriorly than posteriorly; exopodite cuneiform, articulating at the posterior margin of the basal plate, endopodite longer than exopodite, articulating at the inner anterior border. Telson elongated, roughly triangular, posterior margin truncate, anteriorly broader than the length.

This genus is distantly related to *Mesarmadillo*, Dollf.[1], and *Saidjahus*, Budde-Lund[2], it also exhibits a remote relationship to *Gelsana*, Budde-Lund[3], and *Sumniva*, Budde-Lund[4], but

[1] *Ann. Soc. ent. France*, 1892, p. 385.
[2] *Rev. Crust. Isop. Terr.*, 1904, p. 49.
[3] Sjöstedts *Kilimandjaro-Meru Exped.* 21 Crustacea, 2 Isopoda, 1910, p. 6, t. i.
[4] *Rev. Crust. Isop. Terr.*, 1904, p. 48, and Isopoda von Madagaskar und Ostafrika in "*Voeltzkow Reiseergebnisse*", Bd. iii. *Abhandl. Senckenberg. Gesellschaft*, 1908, Bd. xxvii, p. 267.

differs from all of these in the form of the cephalon, maxillipedes, and uropoda. The undersides of the inner margins of the 1st and 2nd segments of the mesosome are devoid of teeth or grooves, a character present in many genera the species of which are capable of rolling themselves up into a ball.

Rotungus pictus, n. sp.

(Pl. xlix, figs. 1—10).

Body oblong oval, strongly convex, smooth. Cephalon (figs. 1 and 2) small, convex, partly surrounded by 1st mesosomatic segment, lateral and median lobes well developed; epistoma with median vertical ridge. Eyes large, situated dorsally. Antennae (fig. 3) slender, 4th and 5th joints elongated, setae short and thick; flagellum 2-jointed, 1st joint short, expanded distally, 2nd nearly three times as long, terminating in a style. First maxillae (fig. 4) with outer lobe terminating in four strong curved spines, and five smaller ones, inner lobe narrow, flat, with two setaceous spines on the inner border. Segments of the mesosome strongly convex, 1st broadly expanded laterally and partly surrounding the cephalon (fig. 5), lateral plates of 2nd to 5th segments excavate, 6th and 7th almost truncate, posterior angles produced backwards. Maxillipedes (fig. 6) with small lobes, outer lobe terminates in a multispinous process and five fine curved spines, the inner lobe has two very small spines at each side and two larger ones on the ventral surface. Uropoda (fig. 9) extending beyond the telson, basal plate convex dorsally and flattened ventrally, broader anteriorly than posteriorly; exopodite cuniform, sparsely setaceous, articulating at the posterior margin of the basal plate, endopodite larger than exopodite, rudder-shaped, setae long and prominent. Telson (fig. 10) elongated, roughly triangular, posterior margin truncate, anteriorly broader than the length. Length 5·5 mm. Colour (in alcohol) horny yellow anteriorly, mottled brown posteriorly.

Habitat.—Kobo, Abor country, 400 ft., 30-xi—8-xii-1911. Under bark. No. 8084/10 (*S. W. Kemp*).

Type.—In the collection of the Indian Museum.

At present this interesting species stands out alone, separated from any known Indian genus by many striking characters. In the form of the cephalon and mesosomatic segments there is a slight resemblance to certain species of *Mesarmadillo*, Dollf. In only one specimen was there an antennule, which unfortunately was lost, the proximal joint of which was very broad. The flagellum of the antenna is very distinct in form. Apart from the small lobes of the maxillipedes the mouth-parts present no points of special interest. The thoracic appendages are stoutly built and setaceous; the setae on the 2nd appendage are of four kinds, *viz.* short stout spines (fig. 8*a*), longer curved spines (*b*), still longer curved spines with a spinous collar about two-thirds from the base, and then a plain curved spine terminally (*c*), and much

shorter and broader spines with a tridentate terminal portion set in a spinous bifurcation (*d*).

Cubaris marmoratus, n. sp.

(Pl. 1, figs. 1—8).

Body oblong oval, convex, smooth. Cephalon (figs. 1 and 2) small, anterior margin well defined, lateral lobes small, median lobe absent; epistoma dorsally sloping backwards, laterally concave. Eyes prominent, situated dorso-laterally. Antennae (fig. 3) small, slender and sparsely setaceous, 2nd to 5th joints grooved on their outer sides, 3rd joint elongated; flagellum 2-jointed, the distal joint being the longer and terminating in a long style. Segments of the mesosome convex, lateral plates of 2nd to 4th segments excavate, remainder truncate or nearly so, posterior angles slightly produced backwards. Segments 1 and 2 with notch and groove on their inner margins for reception of succeeding segments (figs. 4 and 5). Maxillipedes (fig. 6) small, lobes elongated, outer one terminating in a multispinous process with two small spines at its base and two longer ones on the inner margin, inner lobe has a single, comparatively large spine. Uropoda (fig. 7) not extending beyond the telson, basal plate narrow posteriorly, thickened and strongly raised, convex dorso-laterally, antero-dorsal surface expanded, ventral side almost flat; exopodite fairly large, truncate terminally with short style, articulating about the middle of the basal plate in deep concavity, endopodite twice the length of the exopodite, setaceous, terminally with two long whip-like setae, in section triangular. Telson (fig. 8) longer than breadth of the posterior margin, which is very slightly curved, as also the sides, expanded anteriorly, convex and smooth. Length 6·5 mm. Colour (in alcohol) dark grey with yellowish mottling.

Habitat.—Kobo, Abor country, 400 ft. Under bark. No. 8084A/10 (*S. W. Kemp*).

Type.—In the collection of the Indian Museum.

This species is characterised by the small and narrow lobes of the maxillipedes and by the form of the uropoda. In these latter the exopodites articulate in a deep groove in the middle of the dorsal face of the basal plate and extend inwards to the inner margin.

EXPLANATION OF PLATE XLIX.

Rotungus pictus, gen. et sp. n.

FIG. 1.—Dorsal view of the cephalon.

,, 2.—Anterior view of the cephalon.

,, 3.—Right antenna.

,, 4.—First maxilla, terminal portions of the outer and inner lobes.

,, 5.—First mesosomatic segment and cephalon.

,, 6.—Left maxillipede, terminal portion.

,, 7.—First left thoracic appendage.

,, 8.—Types of setae present on the 4th joint of the 2nd thoracic appendage.

,, 9.—Left uropod, dorsal view.

,, 10.—Last metasomatic segment, telson and uropoda.



H.G.K. del. A.Chowdhury, lith.

ROTUNGUS PICTUS, gen. et sp. nov.

EXPLANATION OF PLATE L

Cubaris marmoratus, n. sp.

FIG. 1.—Dorsal view of the cephalon.

,, 2.—Anterior view of the cephalon.

,, 3.—Right antenna.

,, 4.—Lateral portion of 1st and 2nd mesosomatic segments showing notch and groove on the inner border of the under side.

,, 5.—Border of the 1st mesosomatic segment seen from the under side.

,, 6.—Maxillipede, terminal portion.

,, 7.—Right uropod, dorsal view.

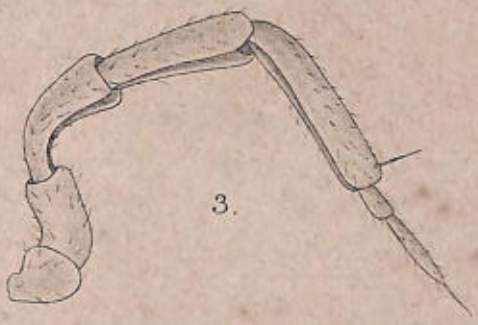
,, 8.—Last metasomatic segment, uropoda and telson.



1.



2.



3.



4.



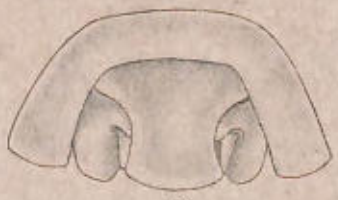
5.



6.



7.



8.

H. G. K. del. A. Chowdhary, lith.

CUBARIS MARMORATUS, n. sp.

XLV. MOLLUSCA, VI.

By LT.-COLONEL H. H. GODWIN-AUSTEN, *F.R.S.*

(Plates XLV—XLVIII).

From the malacological point of view this contribution to the Land Molluscan fauna of the Abor country is perhaps the most interesting one as the result of Mr. Stanley Kemp's collecting when attached as naturalist to the punitive force which entered the country in 1911–12. I much regret the delay in its publication, that expedition having almost become ancient history. So much of what he discovered was preserved in spirit, that the details of anatomy have absorbed much time, and could only be taken up in the intervals of other work.

This part treats of the slug-like forms and among them it is surprising how many discovered in this far-off corner of Assam and the Eastern Himalaya prove to be new. I have taken the opportunity of including one species from the Singpho country south of the Brahmaputra. The species are fully figured, and comparison has been made with the genera and species previously known from the mountain ranges on the west. The photographs of the animals have been made by my friend and neighbour Mr. J. S. Gladstone, and I think it can be said are beautifully done, the epidermal detail is shewn to perfection and in a way these creatures have seldom been illustrated before; much beautiful detail has however been lost in reproduction. I am much indebted to him for the pains and interest he took over the plates, and I am sure all those interested in this group of the Mollusca will feel that they greatly add to the value of the contribution

There remain to be figured some species of *Macrochlamys* and *Oxytes* with Micro-Helices that are very difficult to locate generically. The virgin forests of this part of the world are full of them and they have not yet been properly looked for—they have generally been taken accidentally, often inside the empty shells of the larger species.

The very large number of species is remarkable, and as a series they differ very much from what has been hitherto collected on the south face of the Eastern Himalayas. This can be partly accounted for by the thorough systematic way Mr. Stanley Kemp worked. His method of searching behind the overlapping leaves of the Plantain may be mentioned, and was quite an original idea. Some of the species he obtained may therefore be looked for in this rather restricted resort, further to the west of the Abor Hills, and also south of the Brahmaputra valley.

Family ZONITIDAE.

Subfamily *HELICARIONINAE.*

Genus **Cryptaustenia,** Cockerell.

Cryptaustenia bicolor, n. sp.

(Plate xlv, figs. 12—14).

Locality.—Sadiya, Eastern Assam, No. 5982 (*S. W. Kemp*).

This being a single specimen the shell has not been removed. Shell (fig. 14) very globose and depressed, thin, transparent and membranaceous, the black markings on the visceral sac are seen through it; sculpture none, surface glassy, colour ochraceous green; spire low, apex flatly rounded; suture very shallow; whorls 2½, rapidly increasing; aperture not to be seen with animal in the shell; peristome thin.

Size: major diameter 9·5, minor diameter 7·0, alt. axis 5·0 mm.

The animal (figs. 12, 13) in spirit is 16 mm. in length, ground colour pale blue grey with black mottling on the side of the foot, this is in strong contrast to the ochraceous ground of both the right and left shell lobes, which are ornamented with distant spots and lines and a well papillated surface. Neither of these lobes are very large, and they would apparently leave a good deal of the shell showing in life. The left shell lobe lies well on the left side, it is narrow for some distance and just overlapping the edge of the peristome up to where the broad lobe is developed.

Foot narrow, sole divided; the central area quite pale in colour, the outer margins grey. The mucous gland is narrow, vertically oval, no defined overhanging lobe. Edge of foot with narrow fringed margin and the usual two peripodial grooves.

Genus **Austenia,** Nevill.

Austenia aborense, n. sp.

(Plate xlvi, figs. 2, 2*a*).

Locality.—Rotung, Abor Hills, 31-xii-11 (*S. W. Kemp*).

Shell chesnut brown, with white apex, spatulate, smooth shining, lines of growth indistinct. Whorls 2, the first very small, the last expanding rapidly.

Size: major diameter 23, minor diameter 16 mm.

This shell is very like *A. tigris* of Preston from the Naga Hills, and probably from the Eastern Naga.

Mr. Kemp described it as follows: "Slug C," 31-xii-11. Granulation of anterior part dull yellow with black interspaces. Mantle area dull brown, rather pale. Posterior portions pale dull brown with obscure or indistinct large brown or black flecks; interspaces of rugae black. Shell olive-green, a good deal exposed. Eyestalks very dark brown. Sole pale brown, its dorso-lateral margin vertically barred with pale brown and black. Common under bark, under stones and behind the leaf-stems of plantain."

The specimen sent home (No. 5928) is 46 mm. in length, very much contracted in the spirit and very hard, so that I have refrained from removing it or opening the body to view the genitalia. Colour darkish grey brown with indistinct mottling. Foot divided, the oblique grooving rising from the peripodial grooves is parallel and very closely arranged. The right shell lobe is small, dark grey, the left is very narrow, even in width all round the edges of the shell, which it overlaps, the absence of any expansion into a flap or lobe is noticeable to be seen in *Austenia*. The extremity of the foot is square, compressed at the side, with a narrow nearly vertical linear mucous gland. The dorsal lobe is rather small to the left and behind the respiratory orifice, the left is ample, covering the neck and extending round to the left side.

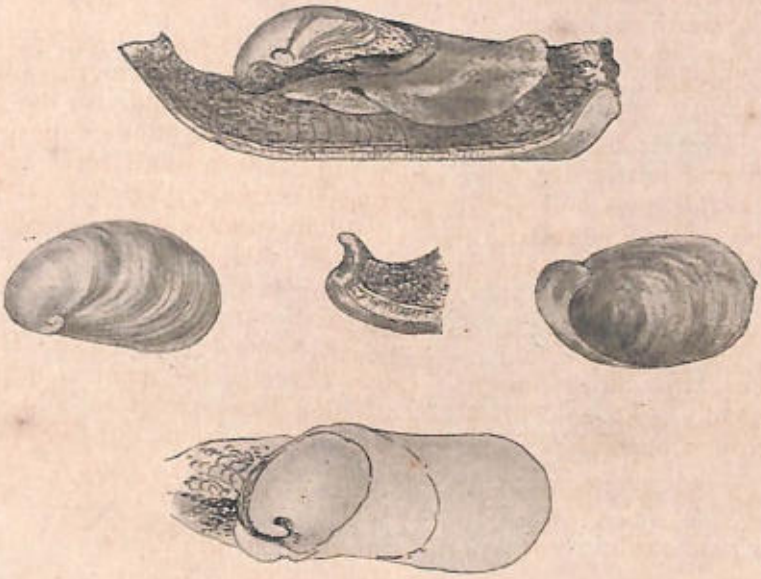


FIG. 1.—*Austenia alba*, n. sp.

Animal view of right side; extremity of foot; shell from above and below; shell removed showing the visceral sac.

Austenia alba, n. sp.

(Text-fig. 1).

Locality.—Rotung 1,300 feet, Abor Hills, No. 5866 (*S. W. Kemp*).

Shell ovate, spatulate, rather solid, apex much rounded, then arched; colour white, streaked transversely, strong lines of growth, right margin straight.

Size: major diameter 6·5, minor diameter 4·0 mm.

Animal only about 20 mm. in length, dark grey with a vinous tinge on the mantle lobes, some distant spotting on side of the foot behind. Foot white below, indistinctly divided, extremity

square, mucous gland linear with a short overhanging lobe. The right and left shell lobes united cover the edge of the shell for a certain distance right round to the left posterior side, in life they probably conceal the whole shell. Foot keeled near the extremity for a short distance up to the depression in which the hinder part of the visceral sac rests. The peripodial margin grooves are narrow. The visceral sac exposed when the shell is removed has a small hook-like coil which occupies the apex of the shell.

The genitalia were not seen complete, they were very small and undeveloped.

The radula formula is 30.2.12.1.12.2.30 or 44.1.44. The centre and admedian teeth of usual shape in the allied genera of *Austenia* and *Girasia*, but fewer than usual, the marginals curved

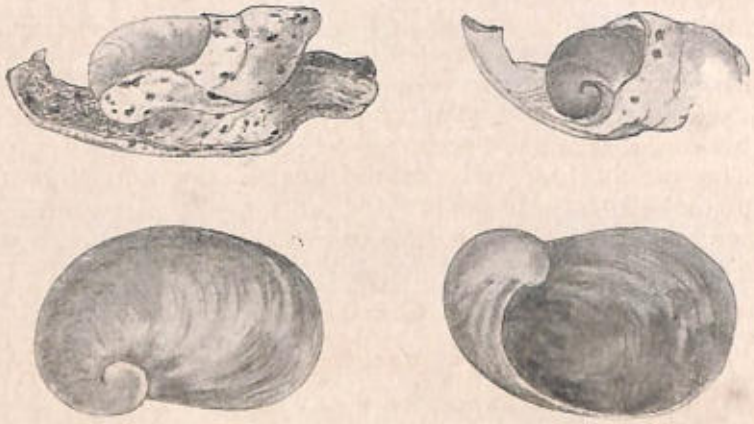


FIG. 2.—*Austenia siyomensis*, n. sp.

Animal view of right side; shell removed showing the visceral sac; shell from above and below.

and bicuspid. Jaw rather straight in front with a small central projection.

Only three specimens were sent home of this species, the shell of which is very different from any I have seen before. One specimen had lost the shell. The animal of the type shell removed and figured was dissected. They will go back to the Indian Museum, Calcutta.

Austenia siyomensis, n. sp.

(Text-fig. 2).

Locality.—Damda, Siyom Valley, Abor Hills (*S. W. Kemp*).

Shell broadly ovate, spatulate, bright and shiny; sculpture none, surface smooth with fine lines of growth; colour rich ochraceous; spire flat, apex large, white and round; suture impressed;

whorls 1½, the first small, then rapidly increasing. Major diameter 8·5, minor 6 mm.

Only one specimen (No. 5868) found, with other species under stones. The shell recalls *A. rotunda* from Cachar but is much smaller and rounder. The colouration of the animal of this species is very similar to that of *Girasia cacharica*, G. A. (*Moll. Ind.*, vol. i, p. 240, pl. lix, fig. 4), but the shell is very different.

The animal is about 25 mm. long in spirit, very pale grey distantly and strongly spotted throughout, except on the head which is dark in colour. Sole of foot very pale and very indistinctly divided; the extremity square, mucous slit linear with a painted lobe above it. The right shell lobe oval, covering the apex of the shell, an indistinct cicatrix between it and the left shell lobe, which overlaps the edge of the shell considerably leaving a good deal of the surface uncovered. In life it would probably cover it entirely.

Although a single specimen I had to remove the shell in order to figure it and then extract the buccal mass and generative organs. The visceral sac terminates in a complete whorl filling the apex of the shell. The genitalia were scarcely developed. The amatorial organ was seen.

The radula has well pointed centre and admedian teeth, marginals unevenly bicuspid; the outermost are minute. The formula 40.3.13.1.13.3.40 or 56.1.56.

Genus **Girasia**, Gray.

Girasia maculosa, n. sp.

(Plate xlvi, figs. 1, 1*a*).

Locality.—Diyung Valley, Singpho Hills (*M. T. Ogle*).

A comparison of this animal (figs. 1, 1*a*), of which two specimens were secured, with *G. hookeri* of about the same size from Cachar, shows it to be distinct, although the differences are superficial, such as the mottling, the peripodial margin and grooves, papillation of the surface and the segmentation of the sole of the foot, this last is much stronger and very close together in the Diyung valley specimens.

The larger animal measures 50 mm. in length, the smaller 25 mm.; in colour it is ochraceous with close dusky spots on the side of the foot with larger spots on the mantle.

The shell removed from the smaller animal is very rudimentary, a mere epidermis, ruddy ochraceous in colour, covering a thin brittle calcareous layer which broke up on handling. Major diam. 14, breadth 5 mm., elongately oval, very thin on the outer margin. It has no defined apex and in this respect it differs from *Girasia hookeri*, as well as in not being so elongate and narrow. Differences sufficient even in the shell to constitute it a good species. The visceral sac shows no sign of a coil.

Girasia gladstonei, n. sp.

(Plate xlv, figs. 7—11).

Locality.—Sadiya, Assam, 25-xi-11, No. 5869 (*S. W. Kemp*).

Shell extremely rudimentary, thin and membranaceous, the apical portion only slightly thickened, very difficult to remove without tearing it. It has been left in the single specimen received. Colour rich ochraceous with a green tint.

Size: major diameter 13, minor diameter 9 mm.

The animal (figs. 7—10) much contracted in spirit, measures 48 mm. in length. The hinder part of the mantle rests in a deep V-shaped depression. The foot is well keeled and terminates in a nearly vertical narrow mucous gland (figs. 7 and 8). The peripodial margin is well fringed, and from the usual two grooves above it emanate many close grooves directed obliquely upwards. The shell is completely hidden by the mantle, only exposed at the very small oval hole situated where the right and left shell lobes reach (fig. 11). From this opening a cicatrical line marks the uniting of these lobes, and it extends to the respiratory orifice. The sole of the foot is indistinctly divided. The dividing line of the left shell lobe and left dorsal lobe is also well seen. The mouth or oral aperture is beautifully displayed in this specimen (fig. 10). It slightly protrudes, a semicircle of over 20 lobulate organs lie above and on both sides of the jaw, while two large palps with a slit between them came in below and form the anterior portion of the odontophore. I name this species after Mr. J. S. Gladstone who has helped me so much in the illustrating of this paper.

Genus Dihangia, nov.

Dihangia koboensis, n. sp.

(Plate xlv, figs. 1—6*a*; pl. xlvi, figs. 4—4*b*; pl. xlviii, figs. 1—5).

Locality.—Kobo, Assam (No. 5867) animal figured, and Sadiya (No. 5874-5) dissected (*S. W. Kemp*).

Shell (figs. 6, 6*a*) ovately spatulate, broad, very flat, smooth, shiny as viewed from above, angular towards the apex; sculpture striation of growth only; colour umber brown; apex white; small, rounded; whorls one, large and ample; peristome thin.

Size: maj. diam. 12·5; alt. axis 5·5 mm.

The shell recalls that of *Girasia cacharica*, G.-A., *Moll. Ind.*, pl. lix, figs. 4*a*, 4*b*, also *G. (Ibycus) sikimensis*, G.-A., fig. 2*b*, but in both these it is much narrower in minor diameter. When the shell is removed the apical portion of the visceral sac (pl. xlviii, fig. 5) shows only a very slight remnant of the first whorl, and under the area which the shell covers are found the most vital organs, such as the heart, hermaphrodite gland and the branchial cavity. The visceral sac fills the whole of the foot up to within

10 mm. of the extremity ; pl. xlviii, fig. 1 shows the packing of the alimentary and generative organs viewed from the right side. The penis is seen extruded from the generative aperture, this took place probably when the animal was put alive into the spirit. I have attempted to show its relative position to the rest of the genitalia when it is thus extended externally. The amatorial organ is present, not seen in fig. 1, being below and on the other side, but in pl. xlviii, figs. 2 and 3 of the generative organs removed and more spread out, it is long and cylindrical. The spermatheca is an elongate sac, better seen in pl. xlviii, fig. 3 than it is in fig. 1. The heart, branchial cavity and the hermaphrodite gland and duct lie immediately under the shell, separated from the rest of the internal organs by a thin diaphram (pl. xlviii, fig. 4).

Comparing the anatomy of *Dihangia koboensis* with that of *Girasia hookeri*, of the Khasi Hills, very distinctive, considerable and interesting differences are found, *vide Moll. India*, plate lxxxviii, figs. 2—2*i*, particularly noticeable in the position of the liver and intestines. These in the first genus are situated near the extremity of the foot, in the second they are underneath the shell and mantle.

Another specimen was obtained at Sadiya (No. 5906), it is figured on plate xlvi, figs. 4, 4*a*, 4*b*, the shell has been removed and the contraction of the animal differs much from the figures on plate xlv.

Kobo is not in the mountainous Abor country but on the north bank of the Brahmaputra, 20 miles west of Sadiya.

Genus **Galongia**, nov.

Galongia kempi, n. sp.

(Plate xlvi, figs. 3, 3*a* ; pl. xlviii, figs. 6—10).

Locality.—Rotung, 31-xii-11, common under stones (*S. W. Kemp*).

Shell (pl. xlviii, figs. 7, 7*a*) minute, flat, spatulate, embryonic, seen from below it is solid not concave, and this represents, it seems to me, the protoconch ; sculpture smooth, lines of growth only ; colour pale ochraceous, white on apex ; whorls only one ; aperture very large and expanding, thin.

Size : maj. diam. 2·7 mm.

Description of animal when alive, by Mr. S. Kemp of his Slug D.

" General tone almost black, a very dark warm livid brown with very obscure black mottling. Margin of sole, in dorso-lateral view, indistinctly barred vertically with warm brown and black. When fully extended the anterior part of the body, immediately in front of the mantle, rather pale brown."

The animal (pl. xlviii, fig. 6), preserved in spirit, which was drawn measures 20 mm. but is much contracted, it is probably when fully extended 40 mm., the largest sent is 24 mm. and was

mixed up with another species. In colour it is mostly blue-black, paling towards the sole of the foot, darkest on the mantle. This is oval, a simple shield with a very small opening at the extreme posterior end, through which the white apex of the shell protrudes a very short distance. The mantle is very finely papillate, and so is the side of the foot posteriorly, the surface is more rugose towards the head. There is a deep well-marked groove above the peripodial margin, having an indistinct one above it, the strip between being indistinctly segmented, the peripodial margin itself is not very broad, and is fringed, what Mr. Kemp noted in the living animal, much has disappeared in the spirit. It is however streaked sparsely with black, for its whole length, somewhat larger spotting occurs scattered over the side of the foot, in some of the five specimens sent there is much spotting. The extremity of the foot (pl. xlviii, fig. 6*a*) is square to the sole, the mucous gland vertical and small, with a raised border extending to the keel of the foot, but there is no overhanging lobe. The respiratory orifice lies in the middle of the mantle on the right side, beneath a short slit in the edge, a distinct line of separation, shown by a cicatrice, can be seen between what is usually known as the right and left shell lobes. The sole of the foot is most distinctly divided, the central area broad.

The visceral sac extends to the extremity of the foot, the liver filling this part of the animal.

Generative organs. Taken in mid-winter these are not in full development, the hermaphrodite gland is unusually large, situated far back near the extremity of the foot, and lying half buried in the liver lobes, it is an elongate oval mass, with a smooth surface. The hermaphrodite duct is very long and straight with no convolutions except just near the attachment to the albumen gland. The organ is very small, with a curious short, pointed protuberance. The oviduct was not developed. An amatorial organ is present, long and straight. The spermatheca is elongately pear-shaped, short. The retractor muscle of the penis is short, and has its attachment below the anterior margin of the mantle zone, other muscle attachments are on the posterior side. The sheath is long and bent into an **S**-shape; it bends sharply where the retractor muscle is given off, and continues as a long epiphallus, terminating in a short kalk sac, or blunt flagellum.

The jaw (pl. xlviii, fig. 10) is somewhat straight in front with a small central projection.

The radula formula is + 50.3.14.1.14.3.50 + or + 67.1.67 +, the laterals may be ten more.

The central tooth and admedian are well pointed, of the usual form in *Austenia* and *Girasia*, at the transitional teeth 15th, 16th and 17th, the plate narrows considerably, and there is a small cusp below the point on the outer side, the succeeding teeth are long, narrow and curved, the outer cusp well below the point, gradually becoming smaller and the marginals at last very minute, simple and aculeate.

Subfamily *DURGELLINAE*, Godwin-Austen, 1888.

Genus **Durgella**, Blf.

Durgella aborense, n. sp.

(Plate xlvii, figs. 1—1*d*).

Locality.—Upper Rotung, Abor Hills, 7 specimens, No. 5907–13 (*S. Kemp*).

Shell (fig. 1*b*) ovately globose, thin, transparent, shining, membranaceous; sculpture none, very indistinct close lines of growth on the last whorl; colour very palest ochre, apex white; spire flatly convex; suture very slightly impressed; whorls 3, rapidly increasing, tumid; aperture widely lunate; peristome thin, membranaceous; columella margin oblique, not thickened.

Size: maj. diam. 7·0, alt. axis 3·0 mm.

This is "Gastropod D", 7—8-i-12, of Mr. Stanley Kemp described by him as follows: "Common under leaf stems of plantain. Shell largely covered by mantle-lobes when the animal is fully extended. Anterior part of foot very pale and semitranslucent with two broad dorsal dark grey stripes which are continued to the base of the eyestalks. Eyestalks entirely dark grey. Hind part of foot pale brown and semitranslucent, sometimes flecked with white. Mantle-lobes pale brown with flecks of white and red brown, with minute pimples. Body in shell horn-coloured with black marbling. Sole of foot pale and translucent, its dorso-lateral margins with small white flecks. This snail, when disturbed, withdraws the anterior part of its body into the shell and lashes about with the posterior part which it extends to an unusual length, twisting, turning and jumping by this means."

The animal (pl. xlvii, figs. 1, 1*a*) preserved in spirit is about 22 mm. in length, pale in colour throughout, two grey stripes on neck extend to the eye-tentacles. The living animal is well described above by Mr. Kemp. The foot is narrow, well divided, indistinctly segmented, the mucous gland has a conspicuous long overhanging lobe; the right and left shell lobes, which are both ample, are much contracted and the edges rolled in, as shown in the drawing, but it is easy to imagine how they would spread over the shell in life from the mantle edge, the dorsal lobes are not so affected, and the left is narrow and long. The peripodial margin is broad, and the side of the foot above it well segmented.

In the genitalia (fig. 1*c*), the male organ consists of a long sheath tapering upwards to the bend at the retractor muscle, the epiphallus is very long, the spermatheca short, wide at base, tapering to a blunt point. There is no amatorial organ and it is therefore interesting to compare this with the same organs in *Durgella assamica*, G.-A., *Moll. Ind.*, plate lxxvii, fig. 6. In *Durgella christianoe* and *rogersi* of the Andaman Islands, and in *Durgella dekhanensis* of Southern India, the amatorial organ is also absent.

The radula (pl. xlvii, fig. 1*d*) is quite typical of the genus, the number of teeth in the row being exceedingly numerous, over 600. There is a slight departure in the centre tooth and the three admedians, they are larger than usual, on broader plates, well formed and pointed and the third showing signs of a cusp on the outer margin. The teeth that follow are all alike, evenly bicuspid, much curved, on narrow plates, becoming very small on the margin. These teeth are a departure again from the usual serrated teeth of typical *D. levicula* of Tenasserim.

The jaw was broken, but sufficient of it was seen to show it was straight in front.

Subgenus **Minyongai**,[1] nov.

Shell quite rudimentary, situated on the anterior border of the mantle above the respiratory orifice, completely hidden by the mantle, minute, discoid. The foot long and narrow. The visceral sac rests in a deep **V**-shaped depression on the keel of the foot, distinctly different to its position in *Austenia* and *Girasia*, where it rests in a cavity of the foot itself. Mucous gland small, with a short overhanging lobe. Generative organs simple, vas deferens very short, as also the spermatheca. No amatorial organ.

Minyongia kempi, n. sp.

(Plate xlvii, figs. 2—2*g*).

No. 5988 is thus described by Mr. S. Kemp.—"Slug B", 3i-xii-11. "Common behind leaf-stems of plantain. When disturbed this species twists, turns and wriggles in a state of frantic excitement. General colour dull straw yellow. Anteriorly, behind the tentacles, are three very obscure median and sub-dorsal grey stripes. Posterior parts with whitish granulations and darker interspaces. Sole almost white with a pale yellow margin."

Locality.—Rotung, No. 5919; Kobo, one specimen, No. 5867 (*S. W. Kemp*).

The shell is reduced to a very small oval thin disk, opaque white, granulate in structure.

It is situated on the anterior side of the mantle, just in front of the respiratory orifice (fig. 2*d*), quite internal and covering the heart, kidney and the branchial sac.

Size: major diameter 2·8 mm., minor diam. 1·75 mm.

The animal (pl xlvii, fig. 2) is pale coloured with a grey streak on the neck. It has a narrow foot, divided, and from the look of the spirit specimens it reaches a considerable length when extended, probably to about 55 mm. The extremity of the foot (fig. 2*a*) is pointed with a very minute indistinct mucus pore. The peripodial margin has a narrow fringe with the usual two parallel grooves above (fig. 2*c*). The foot is slightly keeled above, dividing into a

[1] The name is derived from the Tribe of Minyongs, who inhabit the mountain country adjacent and west of the Abors.

deep V-shaped depression, in which the posterior part of the animal rests. The mantle is quite abnormal, it is quite smooth and skin-like, very thin ; on the right side, rather forward in position, is the respiratory orifice, with small dorsal lobes on either side, the left produced forwards forms the anterior dorsal part of the mantle, and only this portion is minutely papillate and speckled, distinct from the smooth cuticle covering the internal shell and visceral sac. With the gradual reduction of the shell and its anterior position, this appears to have been the course of development ; the shell lobes have disappeared and their place has been taken by the very thin skin of the visceral sac, through which the dark intestine can be discerned. When this thin membrane is cut and turned back, a lobe of the liver is exposed covering the extreme posterior end of the visceral mass, other lobes in which the intestine lies buried, succeed anteriorily. Just behind the respiratory orifice (fig. 2*e*) the branchial sac comes in, long and narrow, stretching diagonally across to the left side, the kidney and heart lie alongside it on the anterior side ; covering these organs is the minute, oval, thin calcareous shell (fig. 2*b*).

Genitalia.—The male organ is a bulbous, short, solid mass, at the apex of which is the retractor muscle ; just below this there is a very small pear-shaped accessory organ. The vas deferens is at first large, convoluted, short, rapidly decreasing in size up to the oviduct. This and the prostate are short. The spermatheca is very short, pear-shaped. The amatorial organ is absent.

The radula (fig. 2*g*) of this remarkable mollusk is very interesting, and at once settles its subgeneric position in the Durgellinae. It is of considerable breadth, the number of teeth in the row being very great, 300.1.300, or over 600. The centre tooth is elongate, with a blunt, rounded point, the teeth following are more pointed, long and narrow. Throughout the teeth are of the same form and about the same size, elongate, curved, rising from an oblong plate, bicuspid, finely serrate on the outer edge, the teeth often appear single pointed, due to a slight twist and to the position they are viewed from, one point thus becomes hidden behind the other.

The jaw is thin, narrow, straight in front.

This is a very interesting animal, and an equally interesting discovery. It goes far to clear up our knowledge of these Eastern slug-like forms.

In 1873, when surveying the Aughami Naga Hills, I found near Kohima a small slug under stones on the hill slopes under the village, of which I made drawings at the time. It was eventually described in the *Journal Asiatic Society of Bengal*, vol. xliv, pt. 2, 1875, as *Parmarion? rubrum*, plate ii, figs. 4—4*e* ; republished by me in "*Mollusca of India*," 1887, vol. i. p. 228, pl. lxi, figs. 4—4*d*, and placed in *Girasia* with a query and with this remark : "The exceedingly small rudimental shell, so completely enveloped by the mantle, almost entitles this form to sub-generic rank ; but as only one specimen has been obtained and was not fully examined

as to its internal anatomy, I place it for the present at the end of the series of *Girasia*."

Parmarion ? rubrum, n. sp., plate ii, fig. 4.

Original description.—" Animal of a fine orange pink, grey on under side of the foot; tentacles short, mantle entirely covering the shell, with only a slight trace of a longitudinal opening running back from the anterior left side, three parallel bands of greenish grey along the back of the neck, the eye-tentacles being of the same colour. The gland at extremity of foot with a long, overhanging lobe.

" Extremity of foot to posterior end of mantle ..	0·9 in.
Mantle	.. 0·8 ,,
Anterior side mantle to head ..	.. 0·4 ,,
Total length when moving ..	.. 0·8 ,,

" Shell quite rudimentary, minute, granular (fig. 4*b*). Major diam. 0·14 in.

" Hab.—Kohima, Naga Hills, in brushwood, under stones on the hill slopes.

" The mucous gland in this species differs considerably from that of *Helicarion gigas* and its allies, the upper lobe projecting and hanging over so as to present, when viewed sideways, a narrow horizontal slit."

In the *Annals and Magazine of Natural History*, Jan., 1891, Mr. T. D. A. Cockerell published a paper "Notes on Slugs"; on p. 99 he gives a classification of the sub-family Helicarioninae, in which several new sub-genera are intoduced. Section C is defined by shell characters only as follows:—" shell slug-like, hardly or not at all whorled," sub-sec. 2, " shell exposed by a hole in the mantle only or entirely covered."

a. Shell horny, exposed by a rather large aperture. Asiatic.
XV. *Girasia*, Gray (*G. hookeri*, Gray).

b. Shell oval, rudimentary, covered, animal like *Girasia*.
XVI. *Girasia*, sect. Cryptogirasiae (*G. rubrum*, G.A.).

With regard to sub-sec. 2*a*. In life no hole is visible, its size therefore is not a true character. The form of the shell lobes is what should be described. Taking these combined with the other external and internal characters, *Girasia* is a well-established genus.

Sub-sec. 2*b*. *Cryptogirasia* was founded on the drawings made from life, referred to above by me, and out of the dried-up animal I obtained by soaking, the small rudimentary shell. The animal externally is not very like *Girasia*.

No further specimens coming to hand, Cockerell's genus was recorded in the *Fauna of British India*, 1908, Mollusca I, p. 203. I said then (p. 204) after the description of *G. rubra*, G.-A., " the generic relations of this animal are doubtful."

In my Presidential address to the Conchological Society of Great Britain and Ireland, 16th Oct. 1909, " The Importance of

the animal in the Land Mollusca shown by certain evolutionary stages in some genera of the Zonitidae," I again referred to *Cryptogirasia*, and gave a figure of the animal and its shell.

There are so many points of resemblance between this Naga mollusc and *Minyongia kempi*, that I feel very confident the former belongs to the same subfamily, the Durgellinae. This would remove *Cryptogirasia rubra* far from the position given it by Cockerell. It has no relationship whatever to *Girasia*, and his genus cannot therefore be retained. Until the Naga slug *C. rubra* is collected again and examined thoroughly, it may safely be placed in *Minyongia* with a query, only some 200 miles separating the respective habitats.

EXPLANATION OF PLATE XLV.

Dihangia koboensis, n. sp.

FIG. 1.—Animal as seen from the right side, × 1·2.
,, 2.— Do. left side, × 1·2.
,, 3.— Do. above, × 1·2.
,, 4.— Do. dorsal view showing mucous gland, × 1·7.
,, 5.— Do. anterior view of the head, × 1·1.
FIGS. 6, 6*a*.—The shell, upper and under sides, × 4·5.

Girasia gladstonei, n. sp.

FIG. 7.—Animal as seen from the right side, nat. size.
,, 8.— Do. left side, × 1·4.
,, 9.— Do. above, nat. size.
,, 10.— Do. front view of head, × 2.
,, 11.— Do. the mantle, seen from above, showing the areas of the shell and dorsal lobes, × 2.

Cryptaustenia bicolor, n. sp.

FIG. 12.—Animal viewed from the right side, × 3·8.
,, 13.— Do. left side, × 3·8.
,, 14.—The shell seen from above, × 2.


1


2


4


5


3


6


6a


7


8


10


11


9

14



12



13



J. S. Gladstone, photo: 1-5, 7-10, 12, 13.
H. H. Godwin Austen, del., 6, 6a, 11-14.

ABOR MOLLUSCA.

Watford Engraving Co.

EXPLANATION OF PLATE XLV.

Dihangia koboensis, n. sp.

FIG. 1.—Animal as seen from the right side, × 1·2.
,, 2.— Do. left side, × 1·2.
,, 3.— Do. above, × 1·2.
,, 4.— Do. dorsal view showing mucous gland, × 1·7.
,, 5.— Do. anterior view of the head, × 1·1.
FIGS. 6, 6*a*.—The shell, upper and under sides, × 4·5.

Girasia gladstonei, n. sp.

FIG. 7.—Animal as seen from the right side, nat. size.
,, 8.— Do. left side, × 1·4.
,, 9.— Do. above, nat. size.
,, 10.— Do. front view of head, × 2.
,, 11.— Do. the mantle, seen from above, showing the areas of the shell and dorsal lobes, × 2.

Cryptaustenia bicolor, n. sp.

FIG. 12.—Animal viewed from the right side, × 3·8.
,, 13.— Do. left side, × 3·8.
,, 14.—The shell seen from above, × 2.



J. S. Gladstone, photo: 1-5, 7-10, 12, 13.
H. H. Godwin Austen, del., 6, 6a, 11-14.

ABOR MOLLUSCA.

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EXPLANATION OF PLATE XLVI.

Girasia maculosa, n. sp.

FIG. 1.—Animal, view of right side, nat. size.
,, 1*a*.— Do. dorsal side.

Austenia aborense, n. sp.

FIG. 2.—Animal, view of right side, nat. size.
,, 2*a*.— Do. dorsal side.

Galongia kempi, n. sp.

FIG. 3.—Animal, view of right side, nat. size.
,, 3*a*.— Do. dorsal side.

Dihangia koboensis, n. sp.

FIG 4.—Animal, view of right side, nat. size.
,, 4*a*.— Do. dorsal side
,, 4*b*.— Do. left side.

1



1a



2



2a



3



3a



4



4a



4b



J. S. Gladstone, photo.

ABOR MOLLUSCA.

Watford Engraving Co., collotype.

EXPLANATION OF PLATE XLVII.

Durgella aborense, n. sp.

FIG. 1.—Animal viewed from the right side, × 4·5.

,, 1*a*.— Do. left side, × 4·5.

,, 1*b*.—Shell, × 4·5.

,, 1*c*.—Part of the generative organs, × 8.

,, 1*d*.—Portion of the radula, centre and admedian teeth and the 30th to 34th, × 630.

Minyongia kempi, n. sp.

FIG. 2.—Animal viewed from the right side, × 2.

,, 2*a*.—Mucous pore at extremity of the foot, × 12·4.

,, 2*b*.—Shell, × 12.

,, 2*c*.—Extremity of foot from right side, × 9·25.

,, 2*d*.—Visceral sac, mantle removed, showing position of shell (S), br. branchial sac, and res. ap. respiratory aperture, × 6.

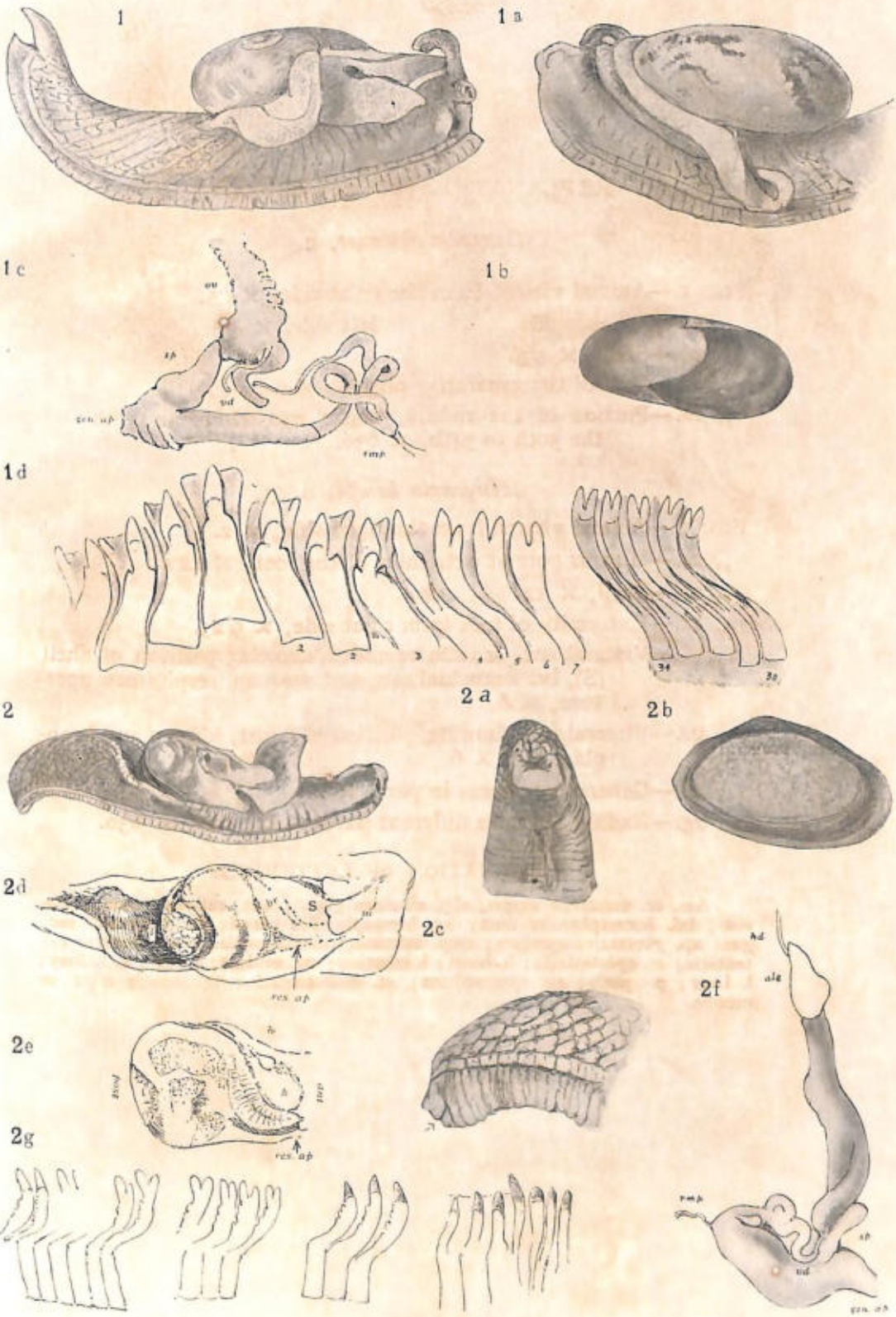
,, 2*e*.—Visceral sac, showing position of heart, kidney and branchial sac, × 6.

,, 2*f*.—Generative organs in part, × 6.

,, 2*g*.—Radula, teeth in different parts of the row, × 630.

EXPLANATION OF LETTERING.

Am. or. amatorial organ; alg. albumen gland; ant. anterior; post. posterior; hd. hermaphrodite duct; hg. hermaphrodite gland; br. branchial sac; gen. ap. generative aperture; rmp. retractor muscle penis; rme. retractor eye tentacle; et. eye-tentacle; h. heart; i. intestine; ov. oviduct; f. foot; k. kidney; l. liver; p. penis; sp. spermatheca; ot. oral tentacle; m. mantle edge or muscle.



H. H. Godwin Austen, del.

ABOR MOLLUSCA.

Watford Engraving Co.

EXPLANATION OF PLATE XLVII.

Durgella aborense, n. sp.

FIG. 1.—Animal viewed from the right side, × 4·5.

,, 1*a*.— Do. left side, × 4·5.

,, 1*b*.—Shell, × 4·5.

,, 1*c*.—Part of the generative organs, × 8.

,, 1*d*.—Portion of the radula, centre and admedian teeth and the 30th to 34th, × 630.

Minyongia kempi, n. sp.

FIG. 2.—Animal viewed from the right side, × 2.

,, 2*a*.—Mucous pore at extremity of the foot, × 12·4.

,, 2*b*.—Shell, × 12.

,, 2*c*.—Extremity of foot from right side, × 9·25.

,, 2*d*.—Visceral sac, mantle removed, showing position of shell (S), br. branchial sac, and res. ap. respiratory aperture, × 6.

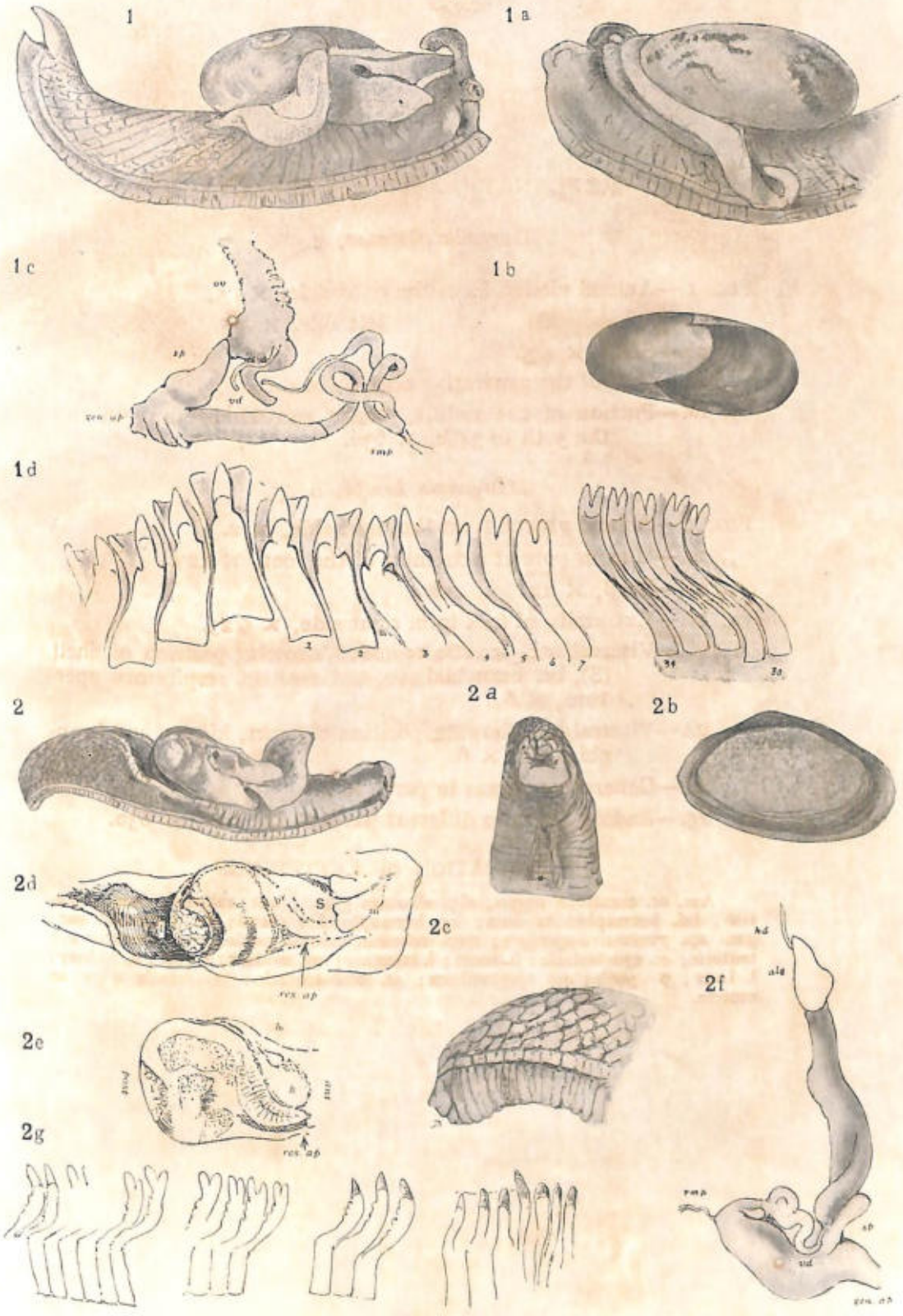
,, 2*e*.—Visceral sac, showing position of heart, kidney and branchial sac, × 6.

,, 2*f*.—Generative organs in part, × 6.

,, 2*g*.—Radula, teeth in different parts of the row, × 630.

EXPLANATION OF LETTERING.

Am. or. amatorial organ; alg. albumen gland; ant. anterior; post. posterior; hd. hermaphrodite duct; hg. hermaphrodite gland; br. branchial sac; gen. ap. generative aperture; rmp. retractor muscle penis; rme. retractor eye tentacle; et. eye-tentacle; h. heart; i. intestine; ov. oviduct; f. foot; k. kidney; l. liver; p. penis; sp. spermatheca; ot. oral tentacle; m. mantle edge or muscle.



H. H. Godwin Austen, del.

ABOR MOLLUSCA.

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EXPLANATION OF PLATE XLVIII.

Dihangia koboensis, n. sp.

FIG. 1.—Animal from the underside, opened along the sole of the foot and turned back to show the packing of the internal organs, the extruded penis and generative aperture is shown and the approximate position of the retractor muscle penis attachment, × 3·4.

,, 1*a*.—Posterior lobe of the liver.

,, 2.—Part of the genitalia. The penis extruded close to the right eye-tentacle, showing internally the retractor muscles of both, × 3·4.

,, 3.—Part of the genitalia. External: The penis on the right side showing the generative aperture leading to the spermatheca; the right eye tentacle and right oral tentacle adjacent. Internal: The amatorial organ, the spermatheca, ovotestis, etc., up to the albumen gland and hermaphrodite duct, × 3·4.

,, 4.—View of branchial sac, heart, kidney and hermaphrodite gland lying beneath the shell, seen from the ventral side, opposite the floor of the foot, × 3·4.

,, 4*a*.—Same area on another plane showing the lobes of the hermaphrodite duct, × 3·4.

,, 5.—Mantle lobes and shell removed, dorsal view of 4 and 4*a* with the very slightest remnant of the first whorl of the visceral sac, × 3·4.

Galongia kempi, n. sp.

FIG. 6.—Animal, right side, note apex of shell (S), × 2·25.

,, 6*a*.—Extremity of foot and mucous gland, × 6.

FIGS. 7, 7*a*.—Shell from above and below, × 6.

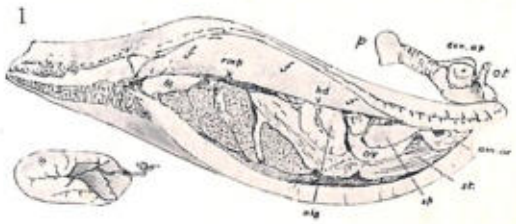
FIG. 8.—Generative organs, complete, × 3·4.

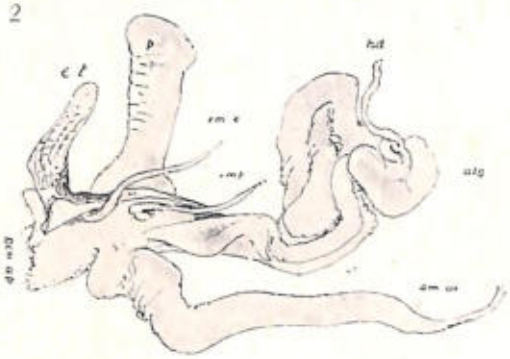
,, 9.—Teeth of the radula, at different parts of the row, × 368.

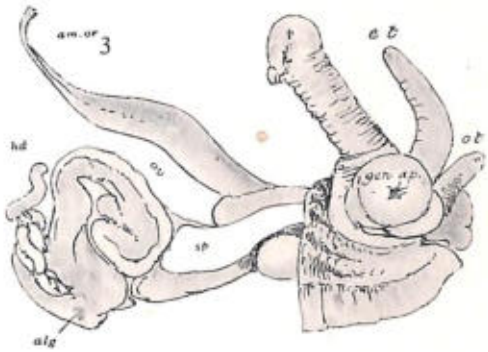
,, 10.—Jaw, × 18.

EXPLANATION OF LETTERING.

Am. or. amatorial organ; alg. albumen gland; ant. anterior; post. posterior; hd. hermaphrodite duct; hg. hermaphrodite gland; br. branchial sac; gen. ap. generative aperture; rmp. retractor muscle penis; rme. retractor eye tentacle; et. eye-tentacle; h. heart; i. intestine; ov. oviduct; f. foot; k. kidney; l. liver; p. penis; sp. spermatheca; ot. oral tentacle; m. mantle edge or muscle.



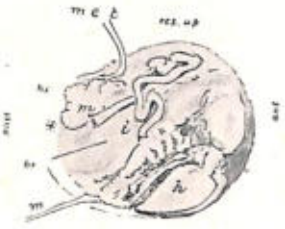




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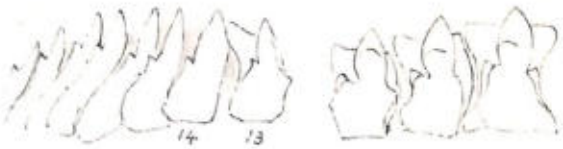
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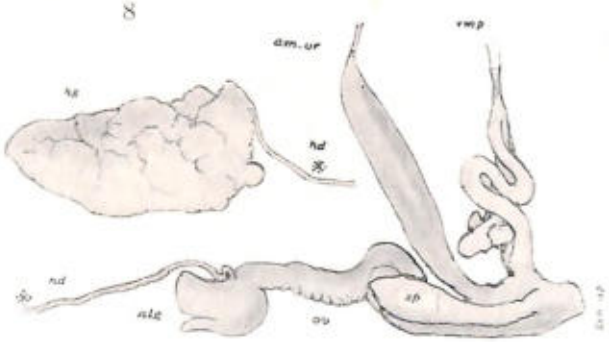
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8



H. H. Godwin Austen, del. ABOR MOLLUSCA. Watford Engraving Co.

ERRATA.

P. 561, line 18 from top of page, for "*Paronela*" read "*Paronella*".

P. 563, line 9 from bottom of page, *for* "top of middle" *read* "tip of middle" and *for* "base and top" *read* "base and tip".

P. 564, last line of page, *for* "a genus of which" *read* "a genus which".

P. 565, line 8 from top of page, *for* "gales" *read* "galea", and line 21 from bottom of page, *for* "segments black-tipped" *read* "segments black".

XLVI. COLLEMBOLA.

(Plates LV—LVII).

By GEORGE H. CARPENTER, *M.Sc., M.R.I.A., Professor of Zoology in the Royal College of Science, Dublin.*

Through the courtesy of Dr. Nelson Annandale, Director, Zoological Survey of India, I have been entrusted with the few specimens of spring-tails collected by Mr. S. W. Kemp on the Abor Expedition, and with some other insects of the same order from Lower Burma, in the Indian Museum collections. The result of work on these Collembola is now given. Seven species are enumerated: six of these are described as new, one (from Rotung in the Abor Hills) being made the type of an interesting new genus resembling *Cyphoderus*, but showing certain primitive and annectant characters. The remaining species is a *Cyphoderus* already described in Imms' paper (1912) on Collembola from India, Burma and Ceylon, to which the present brief contribution may be regarded as supplementary. Excepting the Rotung specimen just mentioned, all the spring-tails now described belong to well-known genera with a wide distribution, one being referable to the family Poduridae and the rest to the Entomobryidae. I have taken advantage of the material at my disposal to give some details of the jaws of *Protanura* and *Parvnela*, as the structure of these appendages in Collembola is of high interest to students of insect morphology.

PODURIDAE.

NEANURINAE.

All the Poduridae in the collection belong to a single species referable to the sub-family Neanurinae, whose members are easily recognized as a rule by their spine-bearing tubercles.

Protanura, Börner, 1906.

This genus was established by Börner (1906, pp. 167-9) for those Neanurinae in which the mandibles and maxillae have toothed apices, whereas in *Neanura* (*Achorutes* as Börner calls it)[1] the maxillae are simple, terminating in a single sharp point.

[1] I have already (1916, p. 29) given reasons for refusing to follow Börner in this highly inconvenient change of nomenclature.

Protanura spinifera, sp. nov.

(Plate lv, figs. 1-9).

Three ocelli, a smooth post-antennal area, and two spinose tubercles on each side of the head (fig. 1). Mandible (figs. 3, 4) with three apical teeth, a sharp crescentic molar tooth, and a delicate dorsal toothed lamella. Maxillary lacinia (fig. 6) with three apical teeth, a long delicate external "comb" bearing bifid teeth and terminating in a "brush," and an internal two-toothed process; no basal process. Foot (fig. 8) with strongly toothed claw and small empodial appendage. Dorsal tubercles wanting on abdominal segments; intermediate and dorso-lateral tubercles rounded, the former very small; each tubercle bearing a sensory bristle.

Length 2·5 mm. Colour yellow; eyes on black spots.

Localities.—N.E. Assam: Sadiya, five specimens, Abor Expedition (*S. W. Kemp*), Indian Museum $\frac{6156}{10}$. Lower Burma: Farm Caves near Moulmein, two specimens (*F. H. G.*), Nov. 17 - Dec. 11, 1911, Indian Museum $\frac{1946}{19}$.

This species is nearly related to *P. kraepelini*, Börner (1906, pp. 169-70), from Java, with which it seems to agree rather closely in the arrangement of the abdominal tubercles and in the structure of the jaws. That species, however, has the three ocelli almost in a straight line, while in *P. spinifera* they form an elongated triangle. The specimen from the Farm Caves, Moulmein, might have been regarded as referable to *Neanura pudibunda*, Imms (1912, pp. 86-7), the types of which came from an adjacent and similar locality, and agree with the insect now described in the arrangement of the eyes, but that the disposition of the abdominal tubercles in the present species differs altogether from that shown in Imms' figure (*loc. cit.*, pl. vi, fig. 12). As Imms does not mention the nature of the jaws, it is impossible to know whether his species is referable to *Neanura* or to *Protanura*.

The third and fourth segments of the feeler in *P. spinifera* are imperfectly distinguished from one another; the arrangement of the spines and retractile sense-organ at the apex is shown in fig. 2. The mandibles are of much interest on account of the delicate dorsal lamella beset with fine teeth (fig. 4, *la*). This structure is mentioned by Börner in his description of *P. kraepelini*, and the Hawaian species *P. citronella* (Carp.) has a somewhat similar appendage (Carpenter, 1904, pl. ix, fig. 25, *d*). The maxillulae (fig. 5, *Mxl.*) are simple chitinous plates with outer and inner ridges, covering most of the dorsal aspect of the tongue (fig. 5, *Hy*). The maxillary lacinia in *Protanura* is—as Börner has pointed out—like that of *Anurida*, and differs very markedly from the simple lancet-like maxilla of *Neanura*. The outer comb-appendage (fig. 6, *a*) is a very beautiful structure with its inner row of bifid teeth and terminal spreading whorl of bristles forming a "brush." It evidently corresponds to the outer lamella in the maxillary lacinia of *Anurida*. The labium (fig. 7) consists of paired sclerites with

their inner (sutural) edges ridged and toothed at the apex. Each carries a number of strong bristles, three of which are especially prominent.

The foot-claw (fig. 8) and the arrangement of the abdominal tubercles (see fig. 1) have been sufficiently described. The fourth abdominal sternum (fig. 9, iv) bears a pair of short conical processes which represent the spring (fig. 9, *d*); just behind these the paired sternal plates of the fifth abdominal segment (fig. 9, v) guard the reproductive aperture. Willem has figured a very similar arrangement of the ventral abdominal surface in *Neanura muscorum* (1900, pl. viii, fig. 3).

ENTOMOBRYIDAE.

Six species of this large family are included in the collection. All belong to the sub-family Entomobryinae, and are distributed among three of its tribes. One species—a *Lepidocyrtus* of somewhat aberrant form—is a member of the Entomobryini; there are three remarkable Paronellini, all of which can be referred to the type genus *Paronella*; finally there are two Cyphoderini; one a species, *Cyphoderus simulans*, described by Imms, and the other the type of an interesting new genus.

ENTOMOBRYINI.

Lepidocyrtus, Bourlet.

Lepidocyrtus caudatus, sp. nov.

(Plate lv, figs. 10-12).

Mesonotum slightly prominent, half as long again as metanotum. Fourth abdominal segment six times as long as third, sixth abdominal tergum prolonged into a slender cerciform process (fig. 10). Feeler two and a half times as long as head, proportion of its segment as 4 : 8 : 6 : 9. Leg with distinct joint differentiating tarsus from tibia in second and third pairs. Foot-claw with prominent internal teeth, empodium long, acuminate, tenent hair thick and clubbed (fig. 11). Spring more than half as long as body; dentes $1\frac{1}{3}$ times length of manubrium; mucro (fig. 12) with strong procurved terminal and dorsal teeth and a slender dorsal spine.

Length 2·5 mm. Colour pale yellow with violet patches on the antennal segments, a violet streak along each side of the head, violet spots on edge of mesonotum, third, fourth and fifth abdominal segments, top of middle and third thighs, base and top of middle and on hind shins (fig. 10).

Locality.—Moulmein, Lower Burma (one specimen), 16th Nov., 1911. Ind. Mus $\frac{1914}{10}$.

The elongate cerciform tergum of the sixth abdominal segment seems to be the most distinctive feature of this species. It comes rather near to *L. imperialis*, Carpenter (1916, p. 41) from the Seychelles, *L. maximus*, Schött (1893, pp. 11-13) from Cameroon, West Africa, and *L. pictus*, Schäffer (1898, pp. 415-16) from

Ralum, Bismarck Archipelago, but it differs from all of them in its relatively shorter and less prominent mesonotum.

PARONELLINI.

Paronella, Schött, 1893.

Trichorypha, Schött, 1893.

The comprehensive genus *Paronella*, as now understood, has a wide range over the eastern tropics from West Africa to Malaya. It comprises scaled entomobryine spring-tails with rigid dentes and broadly toothed mucrones, the feeler showing great variety in appearance and length, and the thoracic segments being of normal form. Five Indian species of *Paronella* have already been described by Imms (1912).

Paronella crassicornis, sp. nov.

(Plate lvi, figs. 13-23).

Feelers robust, as long as head and body; relative length of their segments as 9 : 10 : 10 : 12; first segment with long bristles and thick terminal whorls of hairs, second segment with dense rows of bristles beneath, third with some strong long bristles. Fourth abdominal segment with tergum imperfectly divided, eight times as long as third (fig. 13). Legs with definite joint between shin and foot. Foot-claw (fig. 22) with paired basal lateral and internal teeth and an internal distal tooth; empodium elongate lanceolate with minute external tooth. Spring nearly as long as body; manubrium five-sixths as long as dens (fig. 13); mucro with two terminal and two dorsal teeth (fig. 23).

Length 4 mm. Colour rich brown with dark patches on the prothorax, the base and tip of the first and second and the tip of the fourth antennal segment. The haunches and thighs and most of the three hinder abdominal segments almost black, only a dorsal area on the fourth somewhat paler.

Localities.—Lower Burma: Dawna Hills, 400-2400 ft., Third Camp to Misty Hollow (*F. H. Gravely*), four specimens, 22-30 Nov., 1911, Ind. Mus. $\frac{1918}{19}$. Sukli, east side of Dawna Hills, 2100 ft. (*F. H. Gravely*), one specimen, 22-29 Nov., 1911, Ind. Mus. $\frac{1917}{19}$.

This handsome spring-tail may be readily distinguished from other species of *Paronella* by its rich brown colouration, and the thickness of the feelers which have a dense hairy clothing, especially on the second segment. The specimen figured (pl. lvi, fig. 13) has the right feeler with three segments only, the terminal combining the characters of the third and fourth in a normal feeler. There are eight ocelli on each side of the head (fig. 14), the two hind inner ones being much smaller than the others.

A study of the jaws has been made, and it will be seen that they resemble rather closely those of a species of *Cremastocephalus* (Carpenter, 1916, p. 46, pl. xviii, figs. 78-81), a genus of which

belongs to the same tribe. The mandible (fig. 15) offers no remarkable feature. The maxillulae (fig. 16, *Mxl*) have prominent apical lobes and strong external ridges; the tongue (fig. 16, *Hy*) is markedly widened distally and has a narrow median groove. The maxilla (fig. 16), has—like that of *Cremastocephalus*—a lacinia subcircular in outline with short, even teeth, and a lamella with very numerous radially arranged bristles (figs. 17, 18) some of which are elegantly plumose (fig. 19). The end of the gales—like that of *Cremastocephalus*—is delicately lamelliform (figs. 20, 21, *ga*), surrounding the small conical bristle-bearing palp (figs. 20, 21, *p*). Study of the jaws in other genera of the Paronellini will show if these characters are distinctive of the tribe as a whole.

Paronella flava, sp. nov.

(Plate lvi, figs. 24-27).

Feelers slender, somewhat shorter than body, relative lengths of their segments as 13 : 18 : 13 : 25. Fourth abdominal segment with tergum imperfectly divided, seven times as long as third. Legs with definite joint between shin and foot; foot-claw (fig. 26) with paired basal lateral and internal teeth and an internal distal tooth; empodial appendage long and slender. Spring three-quarters as long as body, dens half as long again as manubrium; mucro (fig. 27) with two terminal and two dorsal teeth.

Length 3 mm. Colour yellow with blackish transverse bands on the terga of the metathorax and the first abdominal segment; tips of antennal segments black-tipped.

Locality.—Lower Burma: Dawna Hills, 400-2400 ft., Third Camp to Misty Hollow (*F. H. Gravely*), two specimens, 22-30 Nov., 1911. Ind. Mus. $\frac{1045}{10}$.

This species is clearly related to the preceding which it resembles in the structure of foot-claw and mucro, in the absence of a scale-appendage near the base of the latter, in the arrangement and relative size of the ocelli (fig. 25), and in the curious imperfect jointing of the fourth abdominal segment. In build and colour the two insects are of course most readily distinguishable.

Paronella elongata, sp. nov.

(Plate lvii, figs. 28-33).

Feelers (imperfect) much longer than body. Eight ocelli on each side of head, the two anterior small and two inner posterior very small (fig. 29). Fourth abdominal segment eight times as long as third. Legs very long with definite tibio-tarsal joint. Foot-claw (figs. 30, 31) with paired basal lateral and internal teeth, and an internal distal tooth. Spring nearly three-quarters as long as body; dens a fifth as long again as manubrium, with scale-appendage at base of mucro; mucro (figs. 32, 33) with a small ventral, two terminal and two dorsal teeth.

Length 4 mm. Colour yellow, with a dark violet longitudinal streak along each side of the body and head; dark markings at the base and tip of first antennal segment, on hind thighs and on all the feet.

Locality.—Burmo-Siamese frontier: Myawadi, Amherst District, 900 ft. (*F. H. Gravely*), one specimen, 24-26 Nov., 1911. Ind. Mus. $\frac{1044}{19}$.

This species is related to *Paronella börneri*, Imms (1912, pp. 106-8), from Nepal, which it resembles in its very elongate feelers and in the form of the mucro. It differs in the relative lengths of the antennal segments and in the details of colouration. *P. börneri* is also yellow with violet markings, but these do not form continuous lateral bands along the body. *P. dahlii*, Schäffer (1898, pp. 409-10), from Ralum, Bismarck Archipelago, belongs to the same group.

CYPHODERINI.

These are blind, pale, scaled spring-tails living in underground situations such as caves and ants' nests, or beneath stones. The spring has rigid dentes and, as a rule, elongate mucrones.

Cyphoderus, Nicolet.

Cyphoderus simulans, Imms.

Locality.—Lower Burma: Kawkareik, Amherst District (*F. H. Gravely*), three specimens, 19-20 Nov. 1911. Ind. Mus. $\frac{1040}{19}$.

The types of this species were described by Imms (1912, pp. 115-16, pl. xii, figs. 90, 91) from specimens taken in the Khayon Caves, near Moulmein, Lower Burma.

Cyphoderopsis, gen. nov.

Body scaled, resembling *Cyphoderus* in aspect, eyes absent. Feet with normal toothed claw and simple empodial appendage (figs. 36, 37). Dens rigid, tapering, with a double row of strong spines and a delicate distal scale-appendage; mucro elongate and narrow with terminal and dorsal teeth (fig. 38). Type *C. kempi*, sp. nov.

This remarkable genus seems to be clearly referable to the Cyphoderini, most members of which it resembles in its general appearance, and in the structure of the feelers and mucro. The foot-claws and empodial appendages are, however, of the simple type usual among the Entomobryini and Paronellini, while the dentes, with their series of teeth and their scale-appendages, recall strikingly those of the latter tribe. *Cyphoderopsis* may be regarded therefore as in many respects a connecting link between the typical Cyphoderini and the Paronellini. The features of *Cyphoderus* and allied genera have been recently well set forth by Börner (1913).

Cyphoderopsis kempi, sp. nov.

(Plate lvii, figs. 34-38).

Feelers one and a quarter times as long as head; proportional lengths of their segments as 5 : 8 : 6 : 14. Feet of second and third pairs with feebly clubbed hairs; claws with strong internal basal teeth and two internal distal teeth, lateral teeth wanting; empodial appendage simple, narrowly lanceolate (figs. 36, 37). Fourth abdominal segment four times as long as third. Spring two-thirds as long as body, manubrium longer than dens and mucro together, dens three and a half times as long as mucro (fig. 34); mucro with blunt terminal tooth and a strong proximal dorsal tooth with minute serrations at its base, and a feeble distal dorsal tooth (fig. 38).

Length 1·5 mm. Colour white with feeble brown mottlings, especially noticeable on the head at the area usually occupied by the eyes (fig. 35).

Locality.—N.E. Assam: Rotung, 1400 ft., under stones (*S. W. Kemp*), one specimen, 26 Nov. 1911. Abor Expedition. Ind. Mus. $\frac{a\,1\,5\,7}{19}$.

I have pleasure in associating this interesting little spring-tail with the name of its discoverer Mr. Stanley W. Kemp.

It is to be hoped that further specimens will be found so that a fuller knowledge of the structure may be obtained. The obvious features are, however, so striking that I have ventured without scruple to establish the new genus and species on a single insect.

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EXPLANATION OF PLATE LV.

Protanura spinifera, sp. nov.

FIG. 1.—Dorsal view. × 40.

,, 2.—Tip of left feeler, dorsal view. × 330.

,, 3.—Left mandible, dorsal view. × 85.

,, 4.—Right mandible, ventral view. (*la*) lamella. × 620.

,, 5.—Left maxillula (*Mxl.*); right maxilla, and tongue (*Hy.*); (*c*) cardo; (*st*) stipes; (*i*) lacinia of maxilla. × 85.

,, 6.—Lacinia of maxilla, (*a*) outer comb appendage; (*b*) inner toothed process. × 430.

,, 7.—Labium. × 85.

,, 8.—Foot of hind-leg. (*emp*) empodial appendage. × 310.

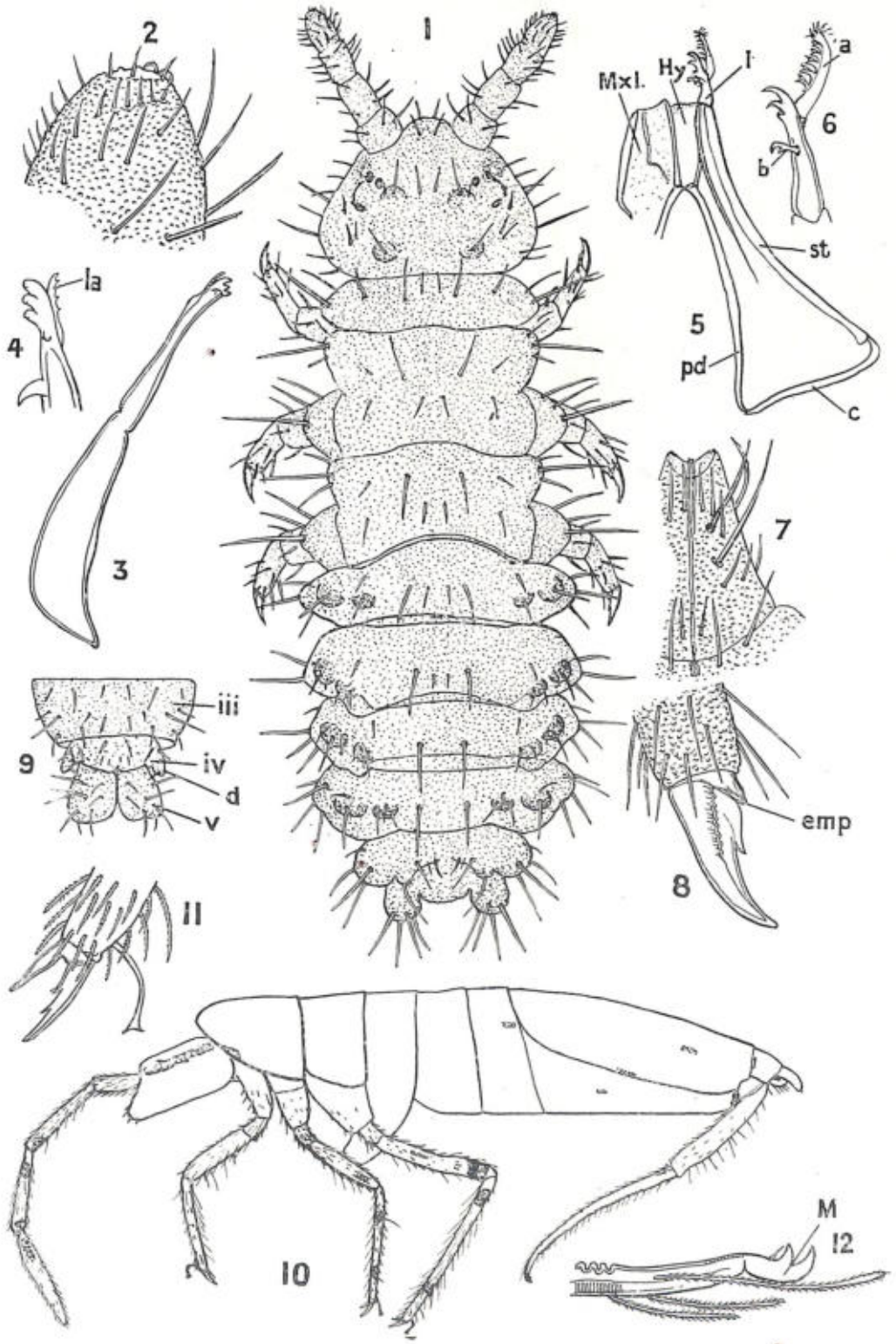
,, 9.—Third (iii), fourth (iv), and fifth (v) abdominal segments, ventral view, (*d*) vestigial dens of spring. × 40.

Lepidocyrtus caudatus, sp. nov.

FIG. 10.—Lateral view. × 40.

,, 11.—Foot of hind-leg. × 310.

,, 12.—End of dens, and mucro of spring. × 620.



ABOR COLLEMBOLA.

EXPLANATION OF PLATE LVI.

Paronella crassicornis, sp. nov.

FIG. 13.—Lateral view. × 20.

,, 14.—Ocelli of right side. × 120.

,, 15.—Left mandible, dorsal view. × 160.

,, 16.—Left maxillula (*Mxl*); tongue (*Hy*) and right maxilla, dorsal view; (*c*) cardo; (*st*) stipes; (*g*) galea; (*p*) palp of maxilla; (*pd*) foot of tongue. × 160.

,, 17.—Lacinia of left maxilla, dorsal view. × 310.

,, 18.—Lacinia of right maxilla, ventral view. × 240.

,, 19.—Tips of plumose bristles from lacinial lamella. × 870.

,, 20.—Extremity of maxillary galea (*ga*) and palp (*p*), lateral view. × 240.

,, 21.—The same, dorsal view. × 240.

,, 22.—Foot of third leg. × 240.

,, 23.—End of dens, and mucro of spring, lateral view. × 240.

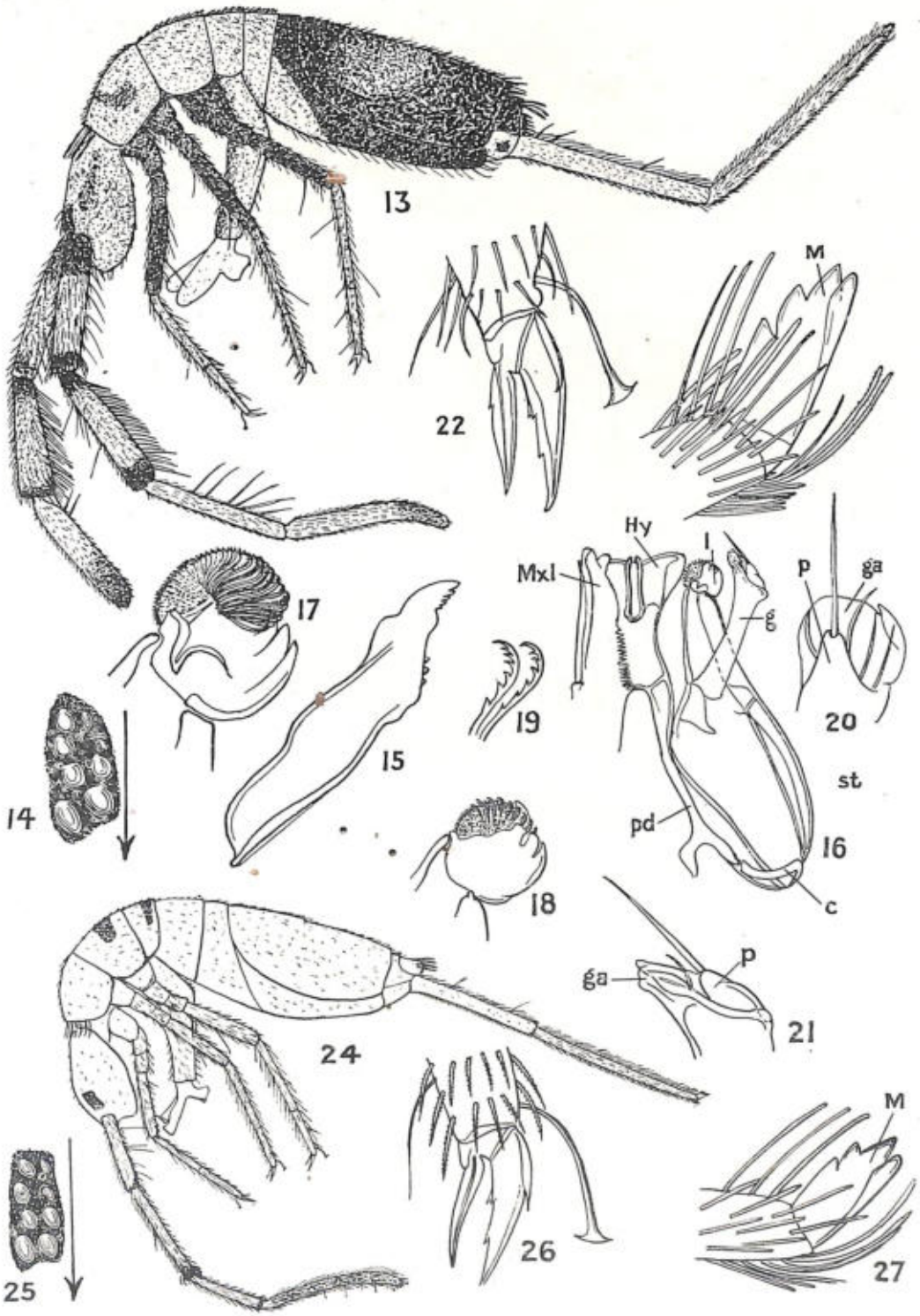
Paronella flava, sp. nov.

FIG. 24.—Lateral view. × 20.

,, 25.—Ocelli of right side. × 120.

,, 26.—Foot of third leg. × 240.

,, 27.—End of dens and mucro of spring. × 240.



ABOR COLLEMBOLA.

EXPLANATION OF PLATE LVII.

Paronella elongata, sp. nov.

FIG. 28.—Lateral view. × 20.

,, 29.—Ocelli of left side and base of feeler. × 120.

,, 30.—Foot of third leg, dorsal view. × 240.

,, 31.—The same, lateral view. × 240.

,, 32.—End of left dens, and mucro of spring, dorsal view, (*s*) scale-appendage. × 240.

,, 33.—The same, lateral view. × 240.

Cyphoderopsis kempi, sp. nov.

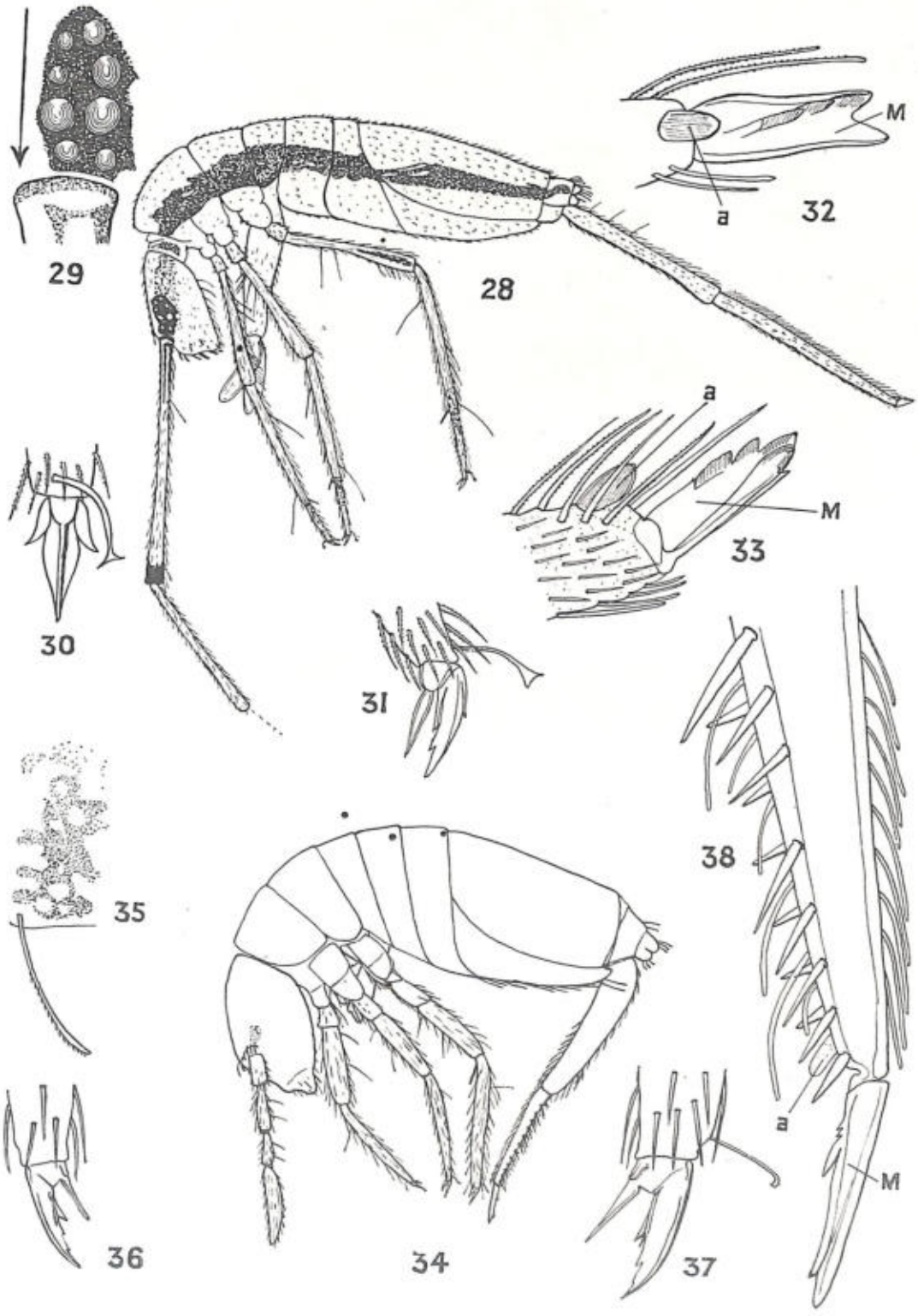
FIG 34.—Lateral view. × 35.

,, 35.—Left ocellar area. × 620.

,, 36.—Foot of fore leg. × 620.

,, 37.—Foot of hind-leg. × 620.

,, 38.—Distal portion of dens with rows of spines, and scale appendage (*a*), and mucro (*M*) of spring. × 620.



ABOR COLLEMBOLA.

XLVII. MOLLUSCA, VII.

CYCLOPHORIDAE (*In part*).

By LT.-COLONEL H. H. GODWIN-AUSTEN, *F.R.S.*

This contribution completes two species of operculated land shells, collected in the Abor Hills, belonging to genera of Cyclophoridae as noted in the *Records of the Indian Museum*, vol. viii, pt. vii, p. 493.

In the subfamily Cyclophorinae will be found the species of *Raphaulus* and *Lagocheilus*; those of Alyceinae were given on p. 503. Diplommatininae and Pomatiasinae are now treated of.

In *Lagocheilus* and *Pomatias*, before anything could be done with species from the Tsanspu valley, it was necessary to go through collections made by me when in charge of Survey operations in the Assam Hill Ranges, in Sikhim and the Eastern Himalaya. Some of these had scarcely been looked at since the day they were found. Several new species have been figured and will be described elsewhere. This preliminary work somewhat delayed the publication of results, but it has added much to our knowledge of distribution and it has also shown that in the Abor portion of the Eastern Himalayan Range new forms of the operculate land mollusca are quite as numerous as they are in the Helicidae and Zonitidae.

The number of species in the Cyclophoridae now recorded belong to the following genera and subgenera: *Cyclophorus* 2 (*Myxostoma* did not occur), *Glossostylus* 2, *Spiraculum* 6, *Pterocyclos* 5, *Alycaeus* 2, *Cycloryx* 2, *Dioryx* 5, *Raptomphalus* 4, *Raphaulus* 5, *Streptaulus* 2, *Lagocheilus* 2, *Diplommatina* 4, *Pseudopomatias* 2, *Eupomatias* 2, making a total of 45.

For about half of these I am indebted to Captain Oakes and the officers of the Survey with the Miri Political Mission, for the rest to Mr. S. W. Kemp and those with the Abor Expeditionary Force who assisted him. Officers and Civil Assistants of the Indian Survey have done much in the past for Natural History, especially in Conchology, and an expression of gratitude from workers in this branch of Natural History is due to those whose names appear in these contributions for the valuable help they have rendered.

The distribution of the land mollusca is so interesting and important in connection with the geography of India in Tertiary and even earlier times. The great main valleys of the Eastern Himalayas have each a markedly different molluscan fauna, but unfortunately our knowledge of them is very incomplete. The

Teesta, the Dikrang and now the Tsanspu have been well collected in and we have a small contribution from the Subansiri. Nothing, however, is known from the large valleys of Bhutan, such as the Wangchu and Mochu, the Ryduk and Sankos of the plains, the Monass and Barowli in the Aka Hills. The expedition there in 1913-14 brought us no knowledge of the land mollusca, and such opportunities have been so often lost that years go by before they come again. Surveyors have splendid opportunities for collecting in every branch of Natural History, and when employed at the hardest work there are hours I know which can be profitably spent on wet days, when clearing mountain tops. The native establishment and the people of the country are always available. All hill men, especially Ghurkas, Lepchas and Khasis, can be made keen collectors.

Subfamily *CYCLOPHORINAE.*

Genus **Raphaulus**, Pfr., 1856.

In 1886 the only species of this genus from Eastern Assam was *R. assamica*, G.-A., from Brahmakund, figured in *Mollusca of India*, plate xlvii, figs. 2, 2*a*, 2*b*. The Dihang valley, close by, has now yielded no less than 6 species, together with 2 species of the closely allied genus *Streptaulus* of Benson (1857), represented by a single very variable species *S. blanfordi*, a most abundant shell in Sikhim and extending to the Dafla Hills on the Eastward.

When writing on the genus *Raphaulus* in 1886 (*l. c.*, p. 196), taking this into consideration and the fact that the animal of *Streptaulus* proved similar to that of *Raphaulus*, I was not inclined to adopt Benson's genus. With two more species, however, presenting the same character of sutural tube as found in the Sikhim form, there are better grounds now for reconsidering and distinguishing the two forms and giving *Streptaulus* at least subgeneric rank. There is quite as much difference between them, moreover, as is to be found between *Pterocyclos* and *Spiraculum* and in *Alycaeus* and *Dioryx*. The range of *Streptaulus*, so far to the Eastward, will lead in all probability to other species turning up before long on the head waters of the Irrawaddy, the N'mai Hka and the Hkamti Long.

Raphaulus assamica, G.-A.

(Text-fig. 1 A.)

Locality.—Miri Hills, two specimens (*Lt. C. G. Lewis, R.E.*).

Shell elongately cylindrical, very solid, rather closely rimate; sculpture very fine and close costulation; colour, both shells bleached; spire high, sides flatly convex, apex pointed, slightly inclining to the right; suture moderately impressed; whorls 6, one above aperture flattened in front; aperture circular; peristome much thickened, upper margin horizontal; sutural tube well developed, directed obliquely downwards, 3 mm. in length.

Size: major diameter 8·75, minor 7·75, alt. 17·0 mm.

It is closely allied to *R. aborensis* and *yamneyensis*.

In 1911 Lieut. Lewis carried the survey a long distance into the Miri Country and did some good work there in spite of the hostile attitude of the Miris. I am much indebted to him and Lieut. Wahab for the shells they collected and am here able to thank them for this contribution to the molluscan fauna of the country.

Raphaulus yamneyensis, n. sp.

(Text-fig. 1 B.)

Locality.—Yamne Valley, only one specimen (*Capt. G. F. T. Oakes, R.E.*).



FIG. 1 A.—*Raphaulus assamica*, G.-A.
,, 1 B.— ,, *yamneyensis*, n. sp.

Shell shape similar to *aborensis*; penultimate whorl flattened in front and more openly rimate; sculpture fine close costulation; colour, specimen bleached; spire high; apex pointed; whorls 6; aperture circular; peristome thickened, wide on upper margin; sutural tube broken off, it was directed obliquely upwards.

Size: major diameter 8·5, minor 7·75, alt. axis 15 mm.

Raphaulus aborensis, n. sp.

(Text-fig. 2 C.)

Locality.—Abor Hills (*Capt. G. F T. Oakes, R.E.*).

Shell elongately cylindrical, solid, not flattened in front, closely rimate; sculpture regularly and very closely costulate; colour bleached; spire high, rather inclined to the right, apex

pointed; suture moderately impressed; whorls 6, swollen, sides convex; aperture circular; peristome thickened, continuous, the sutural tube turns obliquely downward from the upper outer margin and widens out gradually; in two specimens out of four it is horizontal.

Size: major diameter 7·25, minor 7·0, alt. axis 14·0 mm.

Four specimens from Rotung are smaller and more tumid, the largest measuring 12·5×6·5 mm.

A single large example was sent me from the Miri Hills by Officers of the Survey, Lieuts. R. S. Wahab and C. G. Lewis, R.E.

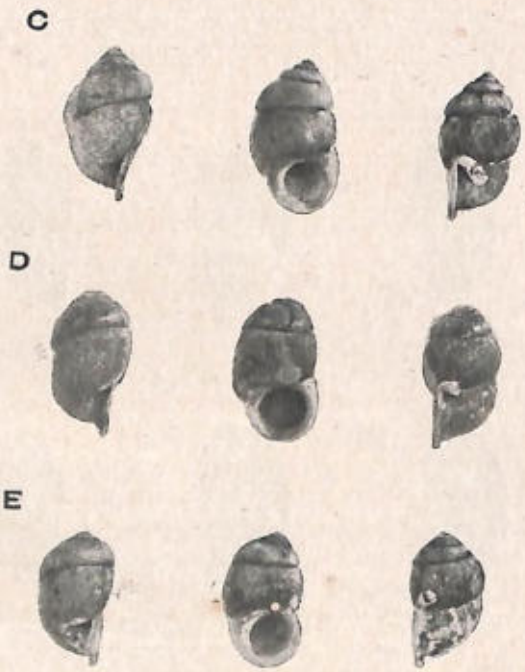


FIG. 2 C.—*Raphaulus aborensis*, n. sp.
,, 2 D.— ,, *oakesi*, n. sp.
,, 2 E.— ,, *shimangensis*, n. sp.

Raphaulus oakesi, n. sp.

(Text-fig. 2 D.)

Locality.—Abor Hills (*Capt. G. F. T. Oakes, R.E.*).

Shell cylindrical, rimate, solid; sculpture very fine and regular costulation; colour dark ochraceous; spire moderately high, apex blunt; whorls 5, penultimate somewhat flattened in front; sutural tube horizontal; operculum horny, flat in front of about 6 whorls.

Size: major diameter 7·0, minor 6·5, alt axis 13·0 mm.

This single species was secured with *R. aborensis*.

Raphaulus shimangensis, n. sp.

(Text-fig. 2 E.)

Locality.—Shimang Valley (*Capt. G. F. T. Oakes, R.E.*).

Shell tumidly cylindrical, solid, openly rimate; sculpture very fine and regular costulation; colour bleached; spire moderately high, apex pointed, inclining to the right; suture moderately impressed; whorls 5; aperture circular; peristome thickened, horizontal on upper margin; sutural tube ascending obliquely.

Size: major diameter 7·0. minor 6·5, alt. axis 12·0 mm.

Approaches *R. aborensis*, but is smaller.

The Shimang River is a large tributary of the Tsanspu from the West, about 36 miles above Pasighat at the base of the mountains.

Genus **Streptaulus**, Benson, 1857.

Streptaulus miriensis, n. sp.

Locality.—Miri Hills, only one specimen, since broken (*Lieut. C. G. Lewis, R.E.*).

Shell cylindrical, pupiform, strongly excavated and keeled on umbilical region; sculpture very fine transverse regular striation; colour bleached; spire high, apex conic; whorls 6, the 4th with the greatest diameter, sides flatly convex, the aperture circular; peristome thickened, not continuous on upper margin.

Size: major diameter 5·0, minor 5·0, alt. axis 9·4 mm.

After getting as far as writing the above description I left my work room for lunch, leaving the shell on a slide resting on plasticine. On taking up work again I found it crushed. Thus one of the most interesting shells found recently on the Eastern Frontier has to be rediscovered. It was interesting because the sutural tube was exactly like that of *Raphaulus blanfordi* of Sikhim, *viz.* a narrow flat band running back along the suture with here and there minute perforations (vide *Mollusca of India*, plate xlvii, fig. 4*a*). Very fortunately I had compared the two species and noted that the Miri shell was quite distinct, that the antepenultimate whorl was the largest and the sculpture was very much finer, the deep excavation at the umbilicus was another very remarkable character.

Streptaulus luyorensis, n. sp.

Locality.—Luyor Valley, 2 specimens (*Capt. G. F. T. Oakes, R.E.*).

Shell umbilicated, *Pupina*-like, solid, shining; sculpture fine close shallow striation; colour pale ochraceous; spire fairly high, apex blunt and rounded; suture impressed; whorls 6, 4th and 5th the largest and nearly equal in diameter; aperture circular; peristome thickened, reflected, with a callous on the body whorl; the sutural tube flattened, follows the suture and is perforated finely at intervals.

Size: major diameter 4·75, alt. axis 8·0 mm.

This is a close ally of *R. blanfordi*, but can be distinguished at once by its much more tumid form and blunt apex. It is far nearer to the Sikhim shell than the one which was unfortunately broken but which had been described as *R. miriensis.*

Lagocheilus oakesi, n. sp.

(Text-fig. 3 A.)

Locality.—Abor Hills, exact locality not stated (*Capt. G. F. T. Oakes, R E.*).

Shell turbinate, rather flattened on base, rather openly umbilicated; sculpture very fine close liration, crossed with oblique lines of growth; colour umber brown with a greenish tint, grey inside the aperture; spire high, conic, apex fine; suture impressed;

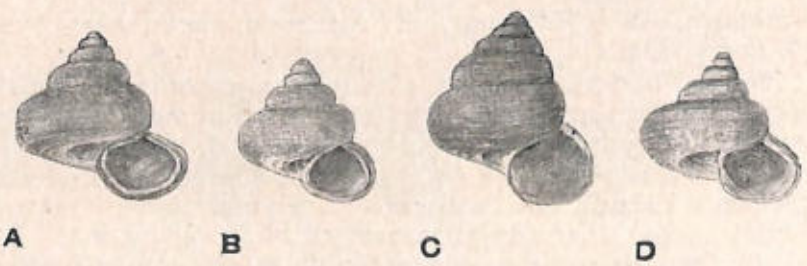


FIG. 3 A.—*Lagocheilus oakesi*, n. sp. × 4.
,, 3 B.— ,, ,, var. × 4.
,, 3 C.— ,, *daflaensis*, n. sp. × 4.
,, 3 D.— ,, *sikhimensis*, n. sp. × 4.

whorls 5½, rounded, the last rather flattened on the periphery; aperture ovate, obtusely angulate above, oblique; peristome double, continuous; columella margin rather flat above, then suboblique, subangulate in outline.

Size: major diameter 4·75, alt. axis 4·0 mm.

Only one specimen was received, which is in a fine state of preservation and the first of this genus to be received from the Abor Hills.

Lagocheilus oakesi, n. sp., var.

(Text-fig. 3 B.)

Locality.—Abor Hills, exact locality not stated (*Capt. G. F. T. Oakes, R.E.*).

Shell turbinate, umbilicated; sculpture about 8 very fine lirae, crossed by very fine sinuous close striae, shell somewhat worn; colour umber brown, but bleached; spire high, apex fine, pointed; suture impressed; whorls 5½, sides rounded; aperture oblique,

oval angulate above, well rounded below; peristome double; columella margin curved.

Size: major diameter 4·0, alt. axis 3·5 mm.

Two specimens put up together from some other locality are much smaller, with the last whorl more rounded, and not quite so widely umbilicated. The differences are not sufficient to separate them and more examples are wanted.

Lagocheilus daflaensis, n. sp.

(Text-fig. 3 C.)

Locality.—Toruputu, Dafla Hills, 7000 ft. (*Godwin-Austen*).

Shell elongately conoid, umbilicated; sculpture about ten fine lirae, regularly disposed, crossed by fine epidermal striae of growth; colour dark brown; spire, sides nearly flat, apex fine; suture moderately impressed; whorls 6, sides rounded, evenly increasing; aperture circular, obtusely angulate above; peristome double, continuous, sinuate on outer margin, with a small nick at the suture.

Size (largest): major diameter 5·2, alt. axis 4·0 mm.

Lagocheilus sikhimensis, n. sp.

(Text-fig. 3 D.)

Locality.—Rishetchu, Sikhim (*W. Robert*).

Shell openly umbilicated, turbinate, subturreted; sculpture, about 7 lirae on the peripheral part of the whorl, about 3 below, 5 can be seen within the umbilicus, none on the flatter part next the suture; colour umber brown; spire fairly high, apex small; suture open; whorls 5½, tumid; aperture circular, obtusely angulate above; peristome double, narrow, continuous; columella margin subvertical.

Size: major diameter 5·0, alt. axis 3·0 mm.

I introduce this species here, as it completes our knowledge of the genus as distributed on the N.E. Himalaya. There are some undescribed species from the Assam Range which I hope soon to describe and figure.

In my paper on the Cyclostomacea of the Dafla Hills, Assam (*Journ. As. Soc. Bengal*, vol. XLV, 1876, p. 174), I give *Lagocheilus tomotrema*, Bs., as found on the Tanir Ridge and Toruputu Peak, "not common." Nevill, to whom I gave specimens, records in his *Hand List of Shells in the Indian Museum* (p. 282) 4 sp. from the Dafla Hills. I have before me 4 specimens from Toruputu and on examination under the microscope placed side by side with *L. tomotrema* from the Garo Hills, which is not far from the typical locality the Khasi Hills, the Dafla shell is certainly distinct.

Subfamily *DIPLOMMATININAE.*

Diplommatina perobesa, Preston.

(Text-fig. 4 A.)

Diplommatina perobesa, Preston, *Rec. Ind. Mus.,* VIII, p. 540, fig. 5 (1915).

Locality.—Upper Rotung, Abor Expedition, M $\frac{5227}{1}$ Ind. Mus. (*S. W. Kemp*); no. 3139, Brit. Mus., same locality (*Capt. Oakes, R.E.*).

Original description.—"Shell obliquely ovate with exserted "spire, pale flesh colour, solid, opaque; whorls 7, the first two "submammillary, the third, fourth and fifth regularly increasing, "the sixth large, tumid, the last contracted and abandoning the "direction of the axis of the shell, sculptured with coarse, obso-"lete, oblique, transverse costulae; suture well impressed; colu-"mella margin vertically descending, bearing a strong, down-

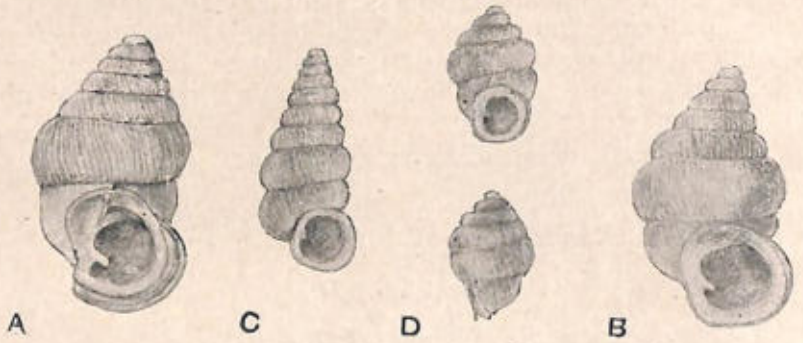


FIG. 4 A.—*Diplommatina perobesa,* Preston. × 8.
" 4 B.— " *mucronatus,* n. sp. × 8.
" 4 C.— " *acutulus,* n. sp. × 8.
" 4 D.— " *mirieusis,* n. sp. × 8.

"wardly bent, entering lamella above, sharply angled at the base, "diffused above into a thick, outwardly expanded, well defined, "parietal callus which joins the upper margin of the labrum and "gives to it a continuous appearance; labrum consisting of an out-"wardly expanded and slightly reflexed, shelf-like projection from "which springs an erect, rather thick rim; aperture subcircular.

"Alt. 4·5, diam. maj. 2·5 mm. Aperture alt. 1·25, diam. 1·5 "(nearly) mm.

"Hab.—Upper Rotung, at an altitude of 2000 ft., under "stems of plantain trees (*S. W. Kemp*)."

Diplommatina mucronatus, n. sp.

(Text-fig. 4 B.)

Locality.—Chanjuk La, Tsanspu Valley, λ 29°-15′, L. 95° 20′ (*Capt. G. F. T. Oakes, R.E.*).

Shell ovately acuminate, rimate; sculpture regular, some-what distant costulation on the 4th and 5th whorls, becoming

finer and closer on the two last, the first 2 whorls smooth; colour white; spire pyramidal, becoming rapidly attenuate, apex fine, blunt; suture well impressed; whorls 7, penultimate the largest, sides well rounded, tumid; aperture oval, subvertical; peristome well thickened, distinctly double.

Size: major diam. 2·5, alt. axis. 4·75 mm.

Seven specimens of this species were sent home. As only two species of this genus are known from this great valley of the N.E. Himalaya, it is evident that many more remain to be discovered.

Diplommatina acutulus, n. sp.

(Text-fig. 4 C.)

Locality.—Miri Hills (Officers of Miri Mission, 1911-12).

Shell dextral, very elongate and slender; sculpture fine regular rather close costulation; colour white, with a very pale ochraceous tint; spire turreted; suture impressed; whorls 9, regularly increasing from the apex to the 7th, which is the largest, sides convex; aperture ovate, vertical; peristome circular, double; columella margin subvertical; tooth small, blunt.

Size: major diam. 1·0, total length 2·4 mm.

This species recalls *D. exilis*, W. Blf., from Ava, but it is far more attenuate and smaller It is a beautiful shell, and fortunately 2 examples were found in the earth which had fallen out of empty shells of *Cyclophorus*, showing what a rich and interesting molluscan fauna awaits a collector in these mountains.

Diplommatina miriensis, n. sp.

(Text-fig. 4 D.)

Locality.—Miri Hills (Officers, Miri Mission, 1911-1912).

Shell dextral, tumidly fusiform; sculpture regular, strong, fairly distant costulation; colour pale, with an ochre tinge; spire tapering rapidly, apex blunt; suture impressed; whorls 5, tumid, constriction above the aperture; aperture vertical, oval; peristome double, strong, broadly ovate; columella margin nearly vertical, with a strong tooth.

Size: major diam. 0·9, alt. axis 1·5 mm.

Only a single example of this minute shell was found in the earth that had fallen out of empty shells of the larger species, which covered the tray in which the specimens sent home were unpacked. Searching it over with a lens I was rewarded by its discovery and that of a second minute species.

Subfamily *POMATIASINAE.*

Pseudopomatias, von Möllendorff, 1885.

I adopt this generic title. It is of interest to note that William Blanford writing so long ago as 1864 in the *Annals and*

Magazine of Natural History on the classification of the Cyclostomacea of Eastern Asia (p. 463) says, "These species (referring to "*P. himalayae* and *pleurophorus* of Benson) agree well in general "form and in sculpture with the European members of the genus. "Some slight differences, however, in the characters of the peri-"stome and of the operculum may be sufficient to entitle the "Indian forms to sectional or even subgeneric distinction."

Pseudopomatias siyomensis, n. sp.

(Text-figs. 5 A and 6 C.)

Locality.—Siyom, Abor Hills. λ 28·31. L. 94·40 (*Capt. G. F. T. Oakes*).

Shell perforate, elongately turreted, attenuate, solid; sculpture well defined strong costulation, more pronounced and distant on



FIG. 5 A.—*Pseudopomatias siyomensis*, n. sp.
,, 5 B.— ,, *luyorensis*, n. sp.
,, 5 C.—*Eupomatias sibbumensis*, n. sp.
,, 5 D.— ,, *oakesi*, n. sp.
(All multiplied 1·5.)

last whorl; colour white; an old well grown shell; spire long, sides flatly convex, fining to the apex which is sharp; suture impressed; whorls 9, flatly convex; aperture circular, vertical; peristome double, inner thickened, a slight nick on the upper sutural margin.

Size: major diameter 4·4, alt. axis 12·2 mm.

Only one specimen was found, but this is fully grown. It has much the shape of *P. grandis* of the Dafla Hills, but has much stronger costulation. I give a figure (fig. 6 D.) of the basal side of *P. himalayae* to show how *it differs from* this species.

Pseudopomatias luyorensis, n. sp.

(Text-fig. 5 B.)

Locality.—Luyor, Abor Hills (*Capt. G. F. T. Oakes*).

Shell perforate, elongately fusiform, turreted, somewhat tumid, solid; sculpture fine close and regular costulation; colour pale umber brown; spire high, sides flatly convex, apex pointed; suture impressed; whorls 7, sides convex; aperture circular, verti-

cal; peristome closely double, continuous, the outer much expanded on the lower columellar side.

Size: major diameter 4·75, alt. axis 11·25 mm.

Only one specimen of this species was received; the form and sculpture at once show its distinctness from the other species from the valley of the Tsanspu.

The next two species differ so much from *Pseudopomatias* in the form of the last whorl that they require generic distinction.

Eupomatias, n. gen.

Shell in all respects similar to *Pseudopomatias*, with similar costulation; peristome double, well developed, perforate, the costulation on the left side of the last whorl terminates upon a strong raised keel bounding the umbilical region; this keel extends up to the peristome on the lower basal side of the aperture.

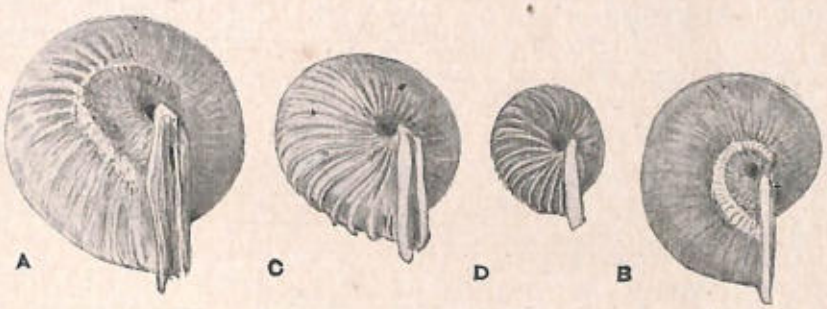


Fig. 6 A.—*Eupomatias sibbumensis*, n. sp.
,, 6 B.— ,, *oakesi*, n. sp.
,, 6 C.—*Pseudopomatias siyomensis*, n. sp.
,, 6 D.— ,, *himalayae*, Bs.
(All multiplied 6 times.)

Type: *Eupomatias sibbumensis*, n. sp.

The keel has a knotted or beaded appearance, and it would seem that the mantle edge must develop a close fold, the costulation causing an irregular thickening of the peristome as it is added to. I give figures (text-fig. 6 C and D) of the basal side of *Pseudopomatias himalayae*, Bs., and *siyomensis*, to show how *Eupomatias* differs from them.

Eupomatias sibbumensis, n. sp.

(Text-figs. 5 C and 6 A.)

Locality.—Sibbum, Yamne Valley, Abor Hills (*Capt. G. F. T. Oakes, R.E.*).

Shell scarcely perforate, elongately turreted, solid; sculpture strong regular close costulation, which on last whorl terminates at the umbilical keel (text-fig. 6 A); colour not seen, shells bleached;

spire elongate, sides nearly flat, apex pointed; suture shallow; whorls 9, sides flatly convex; aperture nearly circular, vertical; peristome double, continuous, the inner expanded and slightly reflected on the left side; a well marked umbilical keel commences on the lower side of the last whorl in front and curving to the left extends to the lower margin behind the aperture.

Size: major diameter 5·8, alt. axis. 14·5 mm

This species is represented by three specimens, two are unfortunately old and imperfect.

Eupomatias oakesi, n. sp.

(Text-figs. 5 D and 6 B.)

Locality.—Abor Hills (*Capt. G. F. T. Oakes, R.E.*).

Shell narrowly perforate, elongately turreted, solid, shiney; sculpture close regular fine ribbing, on the last whorl in front only seen near suture, then becoming quite smooth; colour ruddy umber brown in type, pale ochraceous in two others; spire elongate, sides slightly convex, apex rather blunt; suture impressed; whorls 7, flatly convex; aperture circular, angulate above; peristome thickened, closely double, continuous just behind on the columella margin, high up there is a very strong umbilical keel much curved, which terminates just behind the peristome on the lower left margin; it shows white against the brown colour of the shell, and is quite bead-like and raised (text-fig. 6 B); operculum horny, flat in front, multispiral, nucleus central.

Size: major diameter 3·75, alt. axis 11·0 mm.

From Shimang in the Abor Hills I have a single specimen of a *Pomatias*, not fully grown, with sculpture far coarser than any of the species now described from those hills; it has seven whorls, and is evidently a new species, but not in a state to describe.

XLVIII. MOLLUSCA, VIII.

MACROCHLAMYINAE (*In part*).

By LT.-COLONEL H. H. GODWIN-AUSTEN, *F.R.S.*

(Plates LI—LIV.)

This contribution to the Abor land-mollusca collected by Mr. S. W. Kemp and Capt. G. F. T. Oakes, R E., treats of species belonging to the subfamily Macrochlamyinae, of which only one species, *Sarama kempi*, was described in my first short paper.[1] The very large number of species collected on the expedition, and the majority of them proving new, has been the chief reason that publication of the results has been so slow; I have also been occupied in other work. I have considered it as well to deal with the larger shells first leaving the very minute species (appertaining to *Macrochlamys*) from the Abor Hills, Brahmakund and the neighbourhood of Sadiya for future examination. The latter are very difficult to determine; they often prove to be young shells and their generic position is always very doubtful.

Where we are to look for a molluscan fauna allied to that of the Abor Hills and the eastern end of the Assam Valley has considerable interest. The Mali Hka and N'mai Hka head tributaries of the Irrawady as well as to the Salween looks to be the most likely direction. At present we know nothing of the land shells in that northern area, only a *Spiraculum* from Putao has been received—*S. putaoensis*, which is very close to one from the Abor Hills—*S. minimum*. For further knowledge of the anatomy and range of the new genera described in this contribution specimens in spirit are much wanted, and I trust before long they may be collected.

In the sub-family Macrochlamyinae, it is curious to say that from Pegu and the Shan States, although a good number of species are known by shell character, we are in complete ignorance of the animal, until we reach Tenasserim where Stoliczka and Theobald collected years ago and the former began his anatomical researches.

From Pegu many species occur to me of which the generic position assigned is not at all certain.

In the *Fauna of British India*, 1908, p. 115, there is *M.? consepta*, Bs. This should be transferred to p. 279, to the genus

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1 *Rec. Ind. Mus.*, VIII, pp. 362-363, pl. xxiii, figs. 6-8; pl. xxiv, fig. 6-7 (1914).

Sarika. *Hemiplecta theodori*, Phil. from Mergui, by dissection, also belongs to this same genus, and very probably *Hemiplecta textrina*, Bs. also. p. 292. I consider *auriettae*, Tapp. Canefri., p. 293, should be included. The following:—*chaos*, W. Blf.; *causia*, Bs.; *salweenensis*, G.A.; *noxia*, W. Blf.; *nebulosa*, W. Blf.; *notha*, W. Blf., and *hypoleuca*, W. Blf., with a number of smaller species, all require examination. From the Shan States I have a number of undescribed species in this sub-family collected long ago by my active assistant in the Survey Department, Colonel R. Woodthorpe, R.E. This collection I have delayed taking in hand in the hope of getting material preserved in spirit from Burma; now that the Abor Mollusca are nearly all worked out these become of greater interest, and will be taken in hand.

Macrochlamys hardwickei, G.-A. var. **politulus**, G.-A.

(Plate li, figs. 9, 9*a*; pl. liii, figs. 6-7.)

Locality.—Kobo, on north bank of Brahmaputra, Eastern Assam, No 5914 (*S. W. Kemp*). Two specimens also from Rotung, Abor Hills, No. 5967 (*S. W. Kemp*).

Shell flatly globose, closely umbilicated, smooth; sculpture extremely fine close regular longitudinal striation, the specimens from Rotung with regular rather strong longitudinal striation; colour very pale ochraceous; spire depressedly conoid, apex rounded; suture moderately impressed; whorls 5, well rounded on the periphery; aperture broadly lunate, nearly vertical; peristome thin; columellar margin sub-oblique and very slightly reflected near the umbilicus.

Size: major diameter 16·25, minor 14·0, alt. axis 6·0 mm. The larger specimen from Rotung: major diam. 18·0, minor 16·0, alt. axis 9·0 mm.

There were only two specimens in the collection preserved in spirit, one I dissected, the other I took out. It is interesting to see the animal of this variety of *M. hardwickei* and to be able to compare it with the Calcutta typical form. I have shells in my collection (now in the Natural History Museum) from a near locality to Kobo, namely Brahmakund, and other places in Eastern Assam (see *Land and Freshwater Mollusca of India*, Vol. I, p. 107), but I never found the animal alive.

The visceral sac is white with a pale grey tinge, a bar of black follows the mantle edge, not continuous, sparsely spotted along the side of the rectum up to near the heart, this becoming closer continuous towards the apex; the first apical whorls are pale ochre; the black markings show through the shell. Foot divided, the peripodial margin broad, closely segmented, mucous gland with a hooked projection over it. The animal is very similar to *M. indica*, G.-A. (*Faun. Brit. Ind., Moll.*, p. 95).

The right shell lobe is short, its length equal to the breadth of the right dorsal lobe; the left shell lobe is very small, short

and triangular, just overlapping the peristome; the left dorsal lobes are quite separate one from the other.

The generative organs are comparable to those of *M. hardwickei* of Calcutta; the penis with the short retractor muscle, the coiled caecum and the kalc-sac or flagellum are all exactly similar.

The radula is like that of the Calcutta species, 40.2.13.1.13. 2.40 or 55.1.55.

The general similarity of structure in the animals of the Calcutta species of *M. hardwickei* and its variety *politulus* of Eastern Assam is notable; it is an extended range of some 750 miles from the delta of the Ganges in one direction keeping to the valley of the Brahmaputra, and up into the gorge of the Tsanspu one feeder, up the Lohit to Brahmakund another.

It may be also noted that neither *M. hardwickei* nor its variety have as yet been recorded from the Teesta Valley, nor from the Gangetic side, nor from Sylhet and Cachar that is on the Surma tributary of the Brahmaputra. There we can follow another species common in Calcutta, *M. indica*.

We may take it for granted that the course of distribution has been from the north eastward, with the flow of the rivers to the delta; that long after *M. h. politulus* was developed the waves of the Indian Ocean were beating on the beach line where Calcutta now stands, and may be even far further up the delta. This carries us a step further back to the development of *M. hardwickei* in the North-Eastern Himalayan Range, where so many great rivers marking ancient valleys all unite to form the Brahmaputra, and from whence it spread along the base of the mountains, on the north to the Miri and Dafla and Bhutan, on the south to the Singpho and Naga.

Macrochlamys bapuensis, n. sp.

(Plate li, figs. 1, 1*a*.)

Locality.—Abor Hills, near Bapu, H.S. (*Capt. G. F. T. Oakes*). Shimang, Abor Hills, young shells (*Capt. G. F. T. Oakes*). Abor Hills, in spirit (*Capt. G. F. T. Oakes*).

Shell depressedly conoid, rather flat below, perforate, a strong epidermis; sculpture coarse regular well-defined striation, in the Shimang specimen sculpture rather strong and very regular striation, in the Abor Hills specimen in spirit sculpture coarse wavy regular parallel striation; colour umber brown; spire depressed, apex flatly rounded; suture shallow; whorls 5, well rounded on the periphery, flattened above; aperture widely lunate, subvertical; peristome thin; columellar margin short, reflection near umbilicus, very oblique.

Size: major diameter 23·0, minor 20·0, alt. axis 8·0 mm. The young shells from Shimang have the following dimensions: maj. diam. 17·0, minor 14·0, alt. axis 6·0 mm.

Macrochlamys shimangensis, n. sp.

(Plate li, figs. 2, 2*a*).

Locality.—Abor country (*Captain G. F. T. Oakes*).

Shell globosely conoid, perforate, with an epidermis; sculpture none; colour dull umber brown; spire subconoid, apex bluntly rounded; suture shallow; whorls 5, rather rapidly increasing, the last ample; aperture oval, subvertical; peristome thin; columellar margin subvertical, just reflected at umbilicus.

Size: major diameter 20·25, minor 17·25, alt. axis 8·0 mm.

This is a close ally of *M. bapuensis*, but is a much more globose shell, and I have four examples of it.

Macrochlamys hippocastaneum, n. sp.

(Plate li, figs. 3, 3*a*.)

Locality.—Luyor, Abor country (*Capt. G. F. T. Oakes, R.E.*).

Shell globosely conoid, finely perforate, polished; sculpture none, quite smooth and glassy; colour rich dark chestnut; spire conic; apex blunt; suture impressed; whorls 5, rather rapidly increasing, rounded on the periphery; aperture broadly lunate, nearly vertical; peristome thin; columellar margin thin, scarcely reflected near umbilicus.

Size: major diameter 20·0, minor 17·75, alt. axis 9·25 mm.

Only one specimen of this beautiful shell was sent home, it is unlike any I have as yet seen from either Assam or from Burma. It was put up alive, but arrived in a state I could only make out a well-developed right shell lobe and a small left shell lobe.

Macrochlamys psittacinus, n. sp.

(Plate li, figs. 6, 6*a*.)

Locality.—Abor Hills, only one specimen (*Capt. G. F. T. Oakes R.E.*).

Shell globosely conoid, perforation concealed, smooth, shining; sculpture fine regular longitudinal striation, stronger near and below the suture; colour dark olive green; spire flatly conic; apex blunt and rounded; suture impressed; whorls 5, the last rounded on the periphery, increasing rather rapidly; aperture widely lunate, oblique; peristome thin; columellar margin oblique, with scarcely any reflection above.

Size: major diameter 14·5, minor 12·5, alt. axis 5·75 mm.

I have placed this in *Macrochlamys* as the most likely genus, from the look of the shell. The animal may prove to differ nevertheless.

Macrochlamys? rotungensis, n. sp.

(Plate li, figs. 7, 7*a*; pl. liv, figs. 6, 7.)

Locality.—Rotung, Abor Hills, spirit specimen, No. 5991 (*S. W. Kemp*).

Shell very depressedly conoid, flat on the base; sculpture none, very glassy; colour with animal inside dark umber brown; spire low; apex flatly rounded; suture rather shallow; whorls 5, closely wound; aperture rather narrowly lunate; peristome thin; columellar margin very oblique.

Size: major diameter 11·75, minor 11·25, alt. axis 5·0 mm.

The animal has a short right shell lobe and a very minute left shell lobe, black in colour. The foot is divided, the central area narrow, a broad peripodial margin, a hooked-like lobe over the mucous gland. The visceral sac from the mantle edge backward very darkly mottled grey black. The buccal mass very globose.

Jaw very straight, narrow, with a slight central projection. Central and admedian teeth as usual, the marginals unevenly bicuspid, the longest point much exceeding the short one.

In a spirit specimen collected by Capt. Oakes the teeth are arranged 18.2.9.1.9.2.18 or 29.1.29.

The generative organs of No. 5991 (pl. liv, fig. 6) were well extracted and mounted. The close wound shell leads them to be much drawn out and elongate, particularly the penis as well as the spermatheca, which contained several broken spermatophores. These were mixed together and rather broken, having very long flumes, with a single hook on the basal end (pl. liv, fig. 7). The retractor muscle is given off from the junction of the long penis sheath and the long epiphallus where there is an indication of a coiled caecum, the retractor muscle is very short, given off not direct from the circumference of the coil as is usually the case, but from the end of a short appendage attached to it.

The following is the description of another example from Rotung, Abor Hills, No. 5996 (*S. W. Kemp*).

Shell depressedly conoid, narrowly perforate, base flat, glassy; sculpture none; colour ochraceous, brown on peristome; spire low, conic, flatly convex, apex rounded; suture shallow; whorls 6, closely wound; aperture narrowly lunate, oblique; peristome thin; columellar margin oblique.

Size: major diameter 12·0, minor 11·0, alt. axis 5·0 mm.

Only two specimens were obtained, but they are in excellent condition and fully grown. The species also occurred among the shells collected by Captain Oakes at the same place (No. 3156 B.M.).

Macrochlamys? rotungensis, n. sp., var.

(Plate liv, fig. 10).

Locality.—Abor Hills, near the foot (*G. F. T. Oakes, R.E.*).

The shell is similar to No. 5991, but the spire is higher and more conic, being 5·5 mm. high. On first seeing this species I thought it would prove to be a true *Macrochlamys*. Mr. Oakes had very kindly packed some shells in a "bamboo chunga" or tube (as I had suggested to him), and several, including a *Sivella*, three *Glessulas* and two of *Cyclophorus*, were found to be living after being put in wet moss near the fire. Five other specimens had

succumbed. I put these last in spirit at once and examined the anatomy. It was somewhat surprising to find that the genitalia were not exactly like those of true *Macrochlamys*, the jaw and radula also differing.

Animal: foot dark coloured with a distinct overhanging small lobe above the mucous gland; close black mottling on the mantle zone and wall of the branchial cavity, paler on the line of the rectum.

Right shell lobe small, dark coloured; left shell lobe very small. No amatorial organ and only an indication of the coiled caecum to the penis. One spermatophore was found in this first specimen examined, only the long flume, with numerous bifid spines on one side.

Radula (pl. liv, fig. 10). The median and admedian teeth very elongate, the laterals curved with outer notch much below the point, the outermost minute, narrow and aculeate. Formula: 50.2.13.1.13.2.50, it may be noted this differs from No. 3156. Jaw (fig. 10) narrow with a slight curve, no central projection.

Macrochlamys burkilli, n. sp.

(Plate li, figs. 13, 13*a*; pl. liv, figs. 8, 9.)

Locality.—Sadiya, Eastern Assam, No. 6125. No. 5917, Kobo, in spirit (*S. W. Kemp*).

Shell globosely conoid, flat on base, imperforate; sculpture none, smooth, glassy: colour very pale ochraceous; spire high; apex rounded; whorls 5, closely wound; aperture semilunate; columellar margin very oblique.

Size: major diameter 7·25, minor 7·0, alt. axis 3·5 mm. The largest specimen in spirit (No. 5917) measures maj. diam. 9·0, minor 8·75, alt. axis 4·25.

I have named this after Mr. Burkill, who was Botanist with the expedition, and who I note collected some shells for Mr. Kemp.

The animal, removed from the shell, has a band of black extending from the rectum backwards, and on the mantle margin the apical whorls pale ochraceous. There is a very small right shell lobe, situated low on the right side of the right dorsal lobe; the left shell lobe was not made out, it is probably very small as in *M. rotungensis* and easily broken off.

In the generative organs (pl. liv, fig. 8), the retractor muscle is very short, attached to the circumference of the coiled caecum, the epiphallus is long as is also the kalc-sac or flagellum, the sheath of the penis is also much lengthened. The spermatheca and amatorial organ greatly developed, the first bulbous towards the free end; it contained a single spermatophore with a long flume.

The radula central tooth and admedians of typical shape, the marginal long narrow unevenly bicuspid, outermost very minute, also bicuspid. Formula: 24.2.9.1.9.2.24 or 35.1.35.

Jaw (pl. liv, fig. 9) very straight in front, narrow, slightly convex above.

Macrochlamys albulus, n. sp.

(Plate liii, figs. 8, 9.)

Locality.—Abor Hills (*S. W. Kemp*).

Shell narrowly umbilicated, depressedly globose, smooth shiny; sculpture microscopic longitudinal striation, stronger near the suture; colour dull ochre with animal inside, colourless otherwise; spire low; suture shallow; whorls 5, rather rapidly increasing; aperture lunate; peristome thin; columellar margin suboblique.

Size: major diameter 5·5, minor 4·0 mm.

There were two specimens, the shell of one was broken extracting the animal, the second shell is in spirit, animal not removed.

Animal (pl. liii, fig. 8) in spirit about 10 mm. long, quite white, no markings of any kind, elongate; right shell lobe very long on side of shell, the left also long and tapering from a broad base. A long lobe over the mucous gland. The generative organs were hardly developed, there appeared to be an amatorial organ.

I managed to get the radula in a very complete state. The centre and admedian teeth have blunt rounded points with a small outer basal cusp, the marginals nearly evenly bicuspid. Formula: 60.3.9.1.9 3.60 or 72.1.72, it was almost impossible to count the marginals they are so minute.

Jaw (pl. liii, fig. 9) strongly convex on the cutting edge, very narrow, with a very small central projection.

Macrochlamys murdochi, n. sp.

Locality.—Renging, Abor country, No. 6131; No. 6125*a*, Sadiya (*S. W. Kemp*).

Shell perforate, almost discoid, base flat, smooth; sculpture none; colour pale ochraceous; spire flat, the apex just raised above the last whorl; suture impressed; whorls 5, rather closely wound and regularly increasing; aperture lunate horizontally, oblique; peristome thin.

Size: major diameter 8, minor 7·5, alt. axis 3·0 mm.

A distinct species, unfortunately represented by only two immature shells, easily recognizable again.

Macrochlamys ? luyorensis, n. sp.

(Plate li, figs. 11, 11*a*.)

Locality.—Luyor, Abor country (*Capt. G. F. T. Oakes, R.E.*).

Shell globosely, depressedly conoid, narrowly perforate, smooth; sculpture no striation of any kind; colour umber brown with ruddy tinge; spire rather high, flat, apex rounded; suture very slightly impressed; whorls 5, close wound, regularly increas-

ing, last well rounded; aperture narrowly lunate, vertical; peristome thin; columellar margin oblique.

Size: major diameter 11·0, minor 9·5, alt. axis 5·0 mm.

Unfortunately there is only one example of this species and that is not fully grown, the shell is new to me and of peculiar form, and would readily be recognized when found again.

Tadunia, gen. nov.

Shell globosely conoid, whorls numerous, narrow, closely wound and regularly increasing.

Animal: foot with broad peripodial margin, a small lobe above the mucous gland. In the generative organs, no amatorial organ, no caecum to the penis, spermatheca very long.

Tadunia oakesi, n. sp.

(Plate li, figs. 10, 10*a*.)

Locality.—Abor Hills, Assam (*G. F. T. Oakes, R.E.*).

Shell globosely conoid, scarcely perforate, rather flat on base; sculpture very fine longitudinal striation only to be seen with a high power, this is divided up at very regular intervals by stronger striae, this is also seen on the base; colour pale umber brown; spire high, rather flatly conoid, apex rounded; suture very impressed; whorls 7, narrow, closely wound and regularly increasing; aperture semilunate, nearly vertical; peristome thin; columellar margin suboblique.

Size: major diameter 9·0, minor 8·5, alt. axis 5·0 mm.

Three specimens were found by Capt. Oakes and put up alive, but they died *en route*. One was put to soak and the radula was secured and mounted but much broken. The centre tooth and admedians are rather small on nearly square plates, the laterals are curved with a minute cusp some way below the point. The formula is +20.7.1.7.20+.

The foot showed a very broad peripodial fringe, and an overhanging lobe above the mucous pore. The genitalia are preserved, but not in a very good state. The penis is simple, no caecum, the spermatheca very long and containing a single spermatophore, which is very elongate with many bifid spines on the flume.

Although belonging in all probability to the Macrochlamyinae, the shell of this species differs so very much in every way from typical *Macrochlamys*, on conchological grounds it cannot be placed in that genus, and I am obliged to create yet another one for its reception, naming it *Tadunia* after one of the Abor Tribes of the outer hills. What has been seen of the animal bears this out also.

Tadunia? muspratti, n. sp.

Locality.—Eastern Naga Hills, a single specimen, Beddome collection, B.M. (*Muspratt*).

Shell finely perforate, turbinately conoid, flat on base; sculpture none, a glassy surface; colour pale greenish ochre; spire raised, flatly conic, apex rounded; suture impressed; whorls 6, closely wound, regularly increasing; aperture narrow and widely lunate, subvertical; peristome thin, thickening to the umbilicus; columellar margin oblique.

Size: major diameter 8·0, minor 8·5, alt. axis 4·3 mm.

This species comes very close to *Tadunia oakesi* of the Abor Hills, but is more conical in form and flatter on the base. For this reason I take the opportunity of describing it here. It is No. 392 of the Beddome collection, and was collected for Colonel Beddome by Mr. Muspratt who was in the Assam Police, after whom it is named and who discovered many interesting new species principally in the Eastern Naga Hills.

Bapuia, gen. nov.

Shell globose, thin. Animal with both right and left shell lobes and short lobe above the mucous gland; peripodial margin broad. Amatorial organ present in the genitalia, no coiled caecum at the retractor muscle of the penis; spermatheca short, globose. In radula the marginals are curved and aculeate. Jaw straight in front with a central projection.

The name is derived from the Peak of Bapu, 6290 ft. in height, and a trigonometrical station which dominates Rotung and Renging lying on the banks of the Tsanspu River on the North.

Type: B. rengingensis, n. sp.

Bapuia rengingensis, n. sp.

(Plate li, figs. 8, 8*a*; pl. liv, figs. 4, 5.)

Locality.—Renging, No. 6134 (*S. W. Kemp*).

Shell flatly globose, flat on base, perforate; sculpture strong regular striation, stronger below the suture; colour dark ochraceous; spire low, apex flatly convex; suture shallow; whorls 5, rapidly increasing; aperture broadly lunate, subvertical; peristome thin; columellar margin subvertical.

Size: major diameter 12·25, minor 11·0, alt. axis 3·5 mm.

There are two specimens, one in spirit with no number, which I used for dissection, neither are quite mature. The species closely resembles *M. rotungensis*, but the shell is not so closely wound.

Animal (pl. liv, fig. 5): foot indistinctly divided, lobe over the mucous gland well developed; a good-sized right shell lobe low down below the periphery, and a long narrow left shell lobe. The animal is pale coloured with a black band from rectum on edge of mantle, which gradually merges into fine black spots. I was unfortunate with the genitalia, particularly as this was the only specimen. The penis was broken and could not be put together with certainty. The amatorial organ was clearly made out, also the spermatheca which is short and globose.

The jaw is straight in front with a central projection not very convex above, and not unlike that of *Khasiella dinoensis*, n. sp. Central tooth and admedians of usual form, but the marginals are noticeable, being long, curved and scimitar-shaped, an important character. The dental formula is 22.7.1.7.22 or 29.1.29 No transitional teeth, the seventh admedian is followed by a curved unicuspid tooth.

This radula in the form of the teeth is similar to that of *M.? beata*, G.-A., from the Dafla Hills (shell figured in *Moll. Ind.*, plate cviii, figs. 1, 1*a*, 1*b*). This locality is interesting being not far distant, 150 miles to the west. The shell lobes also are similar (vide *Moll. Ind.*, p. 263, plate cxxv, figs. 6*b*, 6*c*), and the jaw is of the same type, not arched but straight in front. Neither in *beata* were the generative organs seen entire, only the amatorial organ. There is consequently a doubt regarding the male organ, judging from the broken parts of it, of which I made careful drawings, there was no sign of the coiled caecum, a typical character and always present in true *Macrochlamys*. In consideration of this and the teeth of the radula it cannot be placed in that genus. If anatomy is to prevail in classification and the great variation in more than one internal organ be considered of greater weight than mere shell form, a new sub-genus is a necessity.

Rotungia, gen. nov.

Shell globose, thin and membranaceous, last whorl ample, subangulate on the periphery, much flattened above and excavated, whorls rapidly increasing. Animal: linear mucous gland, right and left shell lobes present. Extremity of foot on the dorsal side much flattened and leaf-like, a central groove with lobes on right and left.

Radula like *Macrochlamys*.

Generative organs: penis simple with short flagellum, spermatheca short, amatorial organ large.

Type: R. williamsoni, n. sp.

Rotungia williamsoni, n. sp.

(Plate li, figs. 5, 5*a*; pl. liii, figs. 1-5.)

Locality.—Upper Rotung, Abor Hills, 6-i-12, No. 5934-37 (*S. Kemp*).

Shell very thin, horny, smooth and shining, imperforate, flatly globose; sculpture: on the flat large whorl above are indistinct transverse regular lines of growth; colour ochraceous brown with a golden sheen when animal fills the shell; spire very flat, apex scarcely raised above the last whorl; suture deeply depressed, excavated; whorls 5, apex closely wound, increasing rapidly, periphery sinuately rounded, flattened next the keel above it, which commences on the 3rd whorl; aperture broadly ovate, sub-

vertical; peristome thin; columellar margin nearly vertical, then suddenly oblique, not reflected.

Size: major diam. 15·0 mm. (specimen dissected and also of typical spirit specimen).
,, ,, ,, 12·8 mm. (No. 5999, 7-i-12, small).

Mr. Kemp thus describes the living animal.

"Gastropod C" 7—9-i-12. "Shell with upper part of each "whorl flattened. Under leaf-stems of plantain, very scarce. Shell, "when animal is extended, beautifully marbled, owing to the "body-colouring showing through. For the most part black with "large flecks of pale buff and maroon, some of the flecks on the "inner whorl having a yellowish tinge. Anterior part of the "animal of a colour similar to B (described as *Sarama kempi* G.-A.), "with similar arrangement of granules, but the ground colour is "greyish and not so pale as in that species. Eye-stalks dark grey "with a bluish tone. Mantle lobes dark rich sepia closely flecked "with pale buff. Hind part of foot much flattened, square in "section; beneath the shell pale with minute orange-brown flecks. "Further back the colouring is a curious mixture of orange-brown "flecks and dull dark purple. In general effect the hind-body is "dull purple with pale dull orange, brown in the median line and "a tinge of the same colour at the sides. Under surface of foot "dull maroon, greyish in front and more crimson behind. Dorso-"lateral margin of the sole of the same colour as the sole with in "addition very minute white flecks; a dark grey dividing line be-"tween this margin and the upper part of the body."

This is certainly the most interesting species discovered by Mr. Kemp in the Abor Hills, both as regards the animal and the shell, and it is the type of a new genus. I name this species in honour and in memory of Mr. Noel Williamson of the Indian Civil Service, who lost his life (30th March, 1911) penetrating into wilds of the Abor country, keen on their exploration and the desire of getting on friendly relations with the tribesmen. Williamson had already distinguished himself as a pioneer on the frontier in this way further to the East on the Lohit or Zellu River towards Rema in 1907-08, when he made a good plane table survey of the country, and wrote an interesting account published in the "Geographical Journal," Octr. 1909. I was in correspondence with but never had the pleasure of meeting him. His murder led to the expedition up the Tsanspu, to the subjection of the Abors, and the accurate mapping by the officers of the Indian Survey of a vast area of unknown country in this part of the Eastern Himalaya, while the zoological collections have proved of extraordinary value and interest. I have named the new genus "*Rotungia*" after the village in which it was found, also because the men of Rotung had a large share with the men of Kebang in the massacre of the Civil Officer and all the party.

Animal: foot elongate, narrow when extended, with an indistinct central area on the sole. A long overhanging or curved

lobe above the mucous gland having a vertical narrow slit. The peripodial margin is well marked with the usual two parallel grooves above it, from which 5 lateral distant grooves run upwards to the dorsal ridge of the foot and meet in a central main groove. The extremity of the foot is bluntly keeled but only for a short distance, it then flattens out very broadly from the central groove above mentioned, the posterior part of the shell resting upon it. This wing-like expansion is bordered on both sides by four, well developed, contiguous, fleshy, pale coloured protuberances (plate liii, figs. 2 and 4), a very conspicuous and novel character in this subfamily and one intimately connected with the segmental divisions of the foot, which usually meet on the keel for its whole length.

The right shell lobe (plate liii, fig. 3) is fairly large, broad at its base and narrowing to a fine point and lays up on the under side of the body whorl. The left shell lobe (pl. liii, fig. 2) is narrow and long; the right dorsal lobe fairly large, the left in two distinct parts and the anterior the shortest.

Generative organs. A large amatorial organ is present, thickened considerably at the distal end, the dart is muscular. The penis is a simple tube terminating in an oval mass which is indistinctly spiral and on the side of which the retractor muscle is attached. The flagellum is short and somewhat thick. The spermatheca is also short and elongatelv oval in form. The radula is quite like that of *Macrochlamys*, with a formula 52.14.3.1.3.14.52 or 69.1.69.

The central tooth and admedians elongate and sharp-pointed, the marginals all bicuspid.

The shell of this species is of striking and unusual shape, but the character possessing the greatest interest is the wonderful development of the foot. Looking for similar evolution in this part of the animal in terrestrial molluscs, we find in true *Helicarion helenae* from Sydney introduced there from Queensland something similar. The dorsal side of the foot is flattened out, with a central groove running down it (vide *Moll India*, vol I, pl. xli, fig. 4).

In *Pseudaustenia ater*, G.-A., of Southern India (*Moll. Ind.*, vol. I, pl. lvii, figs. 1, 1*b*), the hinder part of the shell rests between fleshy wings, with, in this case, straight and sharp, not a serrate edge, a bifurcation of the keel. This particular development of the hinder part of the foot may be termed "the segmental lateral processes," in contradistinction to "segmental central processes," as seen in the foot of *Helicarion idae* of Drs. Paul and Fritz Sarasin in their fine work: "Die Land Mollusken Von Celebes," p. 121, plate xvii, fig. 151; in this case the spiked edge is produced by the elongation of epidermal granules.

The genus *Eurypus* of Semper is distinguished by its peculiar foot (*Reisen Archi. d. Philippinen*, pl. i, figs. 16 and 17), shown respectively in *E. cascus* of Viti, and *E. similis* of Fiji. Unfortunately the figures are so small, it is difficult to make out the exact form. Interesting modification of foot structure in the mollusca

is met with in other and very distinct families, for instance in *Streptostele* (*Elma*) *nevilli* var. *dubia*, Von Martens and Wiegmann in *Mitt. Zoolog. Samml. Berlin*, 1898. They describe and figure the foot, flattened out above in a manner somewhat similar but not quite the same as in the Abor mollusc, a form of foot they designate as "*fuss wulst.*"

Recently Mr. Guy C. Robson has described and figured an interesting shell from Madagascar (*Jour. Linn. Soc.* vol. XXXII, p. 382, pl. xxxv, figs. 11, 12, 13), for which he has created a new genus *Bathia*, type *madagascariensis*, Robson. It has a remarkable resemblance to this Abor shell in the flat apex, particularly when viewed from above, but a great difference is seen when looked at in front in the far larger aperture of the Abor mollusc, an indication of a very different animal to the one which would occupy the narrow whorls of *Bathia*. Mr. Robson associates the Mauritian species *praetumida* with *Bathia*.

Khasiella? dinoensis, n. sp.

(Plate li, figs. 12, 12*a*; pl. liv, figs. 1-3.)

Locality.—Dino, Abor Hills (*Capt. G. F. T. Oakes, R.E.*).

Shell imperforate, flatly conoid, shiny on base, membranaceous; sculpture fine transverse striation above, with irregular wavy ridges of growth under a high power; colour dark ochraceous; spire depressedly conic, sides flat, apex blunt; suture shallow; whorls 5, subangular on the periphery, regularly increasing; aperture lunate, subvertical; columellar margin scarcely reflected.

Size: major diameter 9, alt. axis 4·5 mm.

There were three specimens, the largest about 10 mm. in major diameter was dissected and was an immature shell. It is difficult to say what genus this species should be placed in. "*Khasiella*" seems the most appropriate, looking at the shell characters. More specimens are required to settle this.

Animal. The visceral sac quite plain, a pale ash colour, only some short and long black streaks, in the second specimen these took the form of regular dots on the branchial cavity with a black line along the side of the rectum. *Shell lobes are absent*, the dorsal lobes and all up to the mantle edge a very dark brown, in sharp contrast to the pale colour of the visceral sac The foot (pl. liv, fig. 3) is short, pointed, folded along the centre of the sole (pl. liv, fig. 2) and segmented. The mucous gland is small and much hidden by the contraction of the animal and might be considered absent at a cursory glance, but the drawings I give will show it is present.

The radula has the central and admedian teeth with a cusp low down on the outer side as usual, the marginals are nearly evenly bicuspid, arranged thus 25.2.12.1.12.2.25 or 39.1.39.

Jaw (pl. liv, fig. 1) solid, rather straight in front with a prominent central projection.

Oxytes oglei, n. sp.

(Plate lii, figs. 1, 1*a*, 1*b*.)

Locality.—Upper Assam, near Sadiya (*M. T. Ogle*).

Shell lenticular depressed, very openly umbilicated, solid; sculpture close rather coarse ribbing, more distant on base and much smoother; colour dull ochraceous; spire flatly conoid, sides flatly convex, apex rounded; suture linear; whorls 5, regularly increasing, flat; aperture subquadrately lunate, oblique; peristome well thickened below together with the columellar margin which is suboblique.

Size: major diameter 41·0, minor 34·0, alt. axis 12·75 mm.

This species was found and sent to me by Mr. M. Ogle when he was surveying in the neighbourhood of Sadiya and towards Brahmakund. Compared with typical *Oxytes oxytes* from the S.W. Khasi Hills it can be distinguished at once by the more open and excavated umbilicus. When compared with *O. oxytes* of the Dafla Hills this difference in the umbilical region is still more marked.

It may be distinguished from *O. cycloplax*, Bs., from Darjiling, with which I have compared it with specimens in the Blanford collection, in the open umbilicus and general shape. It is however larger, darker coloured, higher in the spire, more sharply keeled and there is absence of the peripheral band, visible both externally and internally in *O. cycloplax*. It is also deeper below the keel, making the aperture larger.

Oxytes oglei, n. sp., var.

(Plate lii, figs. 4, 4*a*, 4*b*.)

This variety was found by Mr. S. Kemp at Kobo on the Brahmaputra. The specimens are rather small, maj. diam. 39·0 mm. Finer specimens were sent me by Captain Oakes, from the foot of the hills near Bapu, H.S. The largest measures major diameter 43·5, minor 37·5, alt. axis 14·8 mm. The variation lies in the sculpture which is finely decussate both above and below, fine solid shells.

Young shells of this species are very difficult to determine for they have such a different shape to those fully grown. The following is a description of one collected by Captain Oakes with three others, and put up together.

Locality.—Abor Hills (*Capt. G. F. T. Oakes, R.E.*).

Shell openly umbilicated, very depressedly conoid, sharply keeled; sculpture strongly decussate; colour dark umber brown; spire low, flatly conoid, apex obtuse; suture somewhat shallow; whorls 5, flat above; aperture semiovate, oblique; peristome thin; columellar margin oblique.

Size: major diameter 20·0, minor 17·5, alt. axis 7·0 mm.

Oxytes aborensis, n. sp.

(Plate lii, figs. 2, 2*a*, 2*b*.)

Locality.—Between Silli and Dukku, Yamne Valley, 2000 ft.; Rotung, No. 3121 B.M. coll., young, with 5 whorls (*Capt. G. F. T. Oakes, R.E.*).

Shell very depressedly lenticular, more convex below than above, openly umbilicated, fragile, very sharply keeled; sculpture very finely and closely decussate, oblique to the whorl; colour rich ochraceous; spire very flatly conoid, apex flatly rounded; suture linear; whorls 6, regularly increasing; aperture oblique, semilunate, upper margin sinuate and descending; peristome thin; columellar margin subvertical.

Size: maj. diam. 31·25, minor 27·0, alt. axis 7·0 mm.

,, ,, ,, 24·0, ,, 20·75 ,, ,, 6·0 ,, (small var. of 5 whorls).

This species (all immature) was also collected by Captain Oakes at the furthest point he reached on the Dihang R. (Siang of the Abors) near where the Sigon R. joins it, and between Long. 94°55′ and 95°15′ and Lat. 29° and 29°15′. The keel is slightly compressed on both sides and the shell is duller in colour.

This species recalls *O. blanfordi*, Th. from Darjiling, but the umbilicus is much wider and open and the sculpture is finer in the Abor shells.

In general form it is similar to *O. pollux* of the Khasi Hills, but openly umbilicated. It is very close to *O. shanensis*, G.-A., of the Shan States, types in the Blanford collection (36.06.3.3 B.M. coll.), collected by Mr. Feddon of the Geological Society. The Abor shell is more openly umbilicated, sharper keeled and the sinuate margin of the peristome between suture and keel is very distinctive.

Oxytes siyomensis, n. sp.

(Plate lii, figs. 3, 3*a*, 3*b*.)

Locality.—Siyom Valley, Abor Hills (Long. 94° 40′ and Lat. 28° 30′) high up (*Capt. Oakes, R.E.*).

Shell openly perspectively umbilicated, rather solid, lenticular depressed, sharply keeled; sculpture fine close transverse striation, on base close pitting; colour bleached in type, pale umber in a second specimen; spire fairly high, apex rounded, sides flatly convex; suture linear; whorls 5, regularly increasing; aperture semilunate, subvertical; peristome: upper margin sinuate, compressed towards keel so as to be concave, lower margin oblique.

Size: major diameter 25·0, minor 21·5, alt. axis 7·0 mm.

This differs from *O. aborensis*, a close ally, in being more solid and not so extremely flat. A smaller specimen from the same valley has the peristome much thickened. Major diam. 24·0, alt. axis 6·8 mm.

Bensonia? aborensis, n. sp.

(Text-fig. 1.)

Locality.—Yamne Valley, Abor Hills (*Capt. G. F. T. Oakes, R.E.*).

Shell perforate, depressedly conoid, flattened both above and below; sculpture rather close transverse lines of growth; colour rich dark umber brown, narrowly black on peristome, internally very white, with a callous on the inner side of the body whorl; spire much flattened, apex showing just above the last whorl; suture well impressed; whorls 6, regularly increasing, well rounded on the periphery, seasonal arrest of growth and hybernation is shown by black transverse stripes of old apertures; aperture subvertical, semilunate; peristome moderately thickened; columellar margin oblique.

Size: major diameter 40·05, minor 36·0, alt. axis 14·5 mm.

The generic position of this shell, a single specimen, is very doubtful; its form and colouration is very noticeable. I had asked Captain Oakes to put up living specimens he came across in bamboo tubes, "choongas" as they are called in Assam. They must be cut green and are easily made. A bamboo of suitable diameter being selected 5 or 6 inches in length is simply cut off at a knot and plugged. Specimens alive travel better in this than in any box. In this instance many specimens were living when the tube reached me by post. Unfortunately not enough moss had been put in and the prisoners had suffered in consequence, the helicoids most and among them this single shell of which the animal had recently died and was unfortunately not in a state to see anything of its anatomy, not even the radula. I place it in *Bensonia* with considerable doubt, but it is the nearest genus I can think of. It is such a remarkable shell, it will not be long before it is found again by the first naturalist who may visit the valley of the Tsanspu.

Pseudokaliella annandalei, n. sp.

(Plate lii, figs. 5, 5*a*, 5*b*.)

Locality.—Abor Hills, exact locality not stated (*Capt. G. F. T. Oakes*).

Shell lenticular, fragile, very openly umbilicated, fringed on the sharp keel, each fringe is a triangular sharply pointed layer of epidermis; sculpture finely decussate, irregular transverse, fine ribbing, crossed by fine close-set longitudinal striae, this is finer on the lower side; colour ochraceous; spire flatly convex, low; suture linear; whorls 6, very regularly increasing, flat above, the last arcuate above at aperture; aperture widely lunate, oblique; peristome thin, sinuate on upper margin, reflected slightly but decidedly on the lower; columellar margin oblique.

Size: major diameter 17·0, minor 15·25, alt. axis 4·75 mm.

Only two specimens of this very beautiful species were found, and one is immature. I name it in honour of Dr. N. Annandale, Director of the Zoological Survey of India, to whom I am very much indebted for valuable assistance in procuring species of Mollusca from many parts of India, and who since he has been in charge of the collections has raised the zoological work in India both in Vertebrates and Invertebrates to a high standard of excellence.

We do not know at all the position of this genus founded on shell characters. This particular species except for the very open umbilicus is very similar, especially in the aperture, to *Oxytes aborensis*. Now that the number of species is increasing in this genus, it is a desideratum to obtain and examine the animal of one so large as this. Although *P. nevilli* was quite abundant among material from Sikhim preserved in spirit, in no single instance could I find one that still contained the animal.

Pseudokaliella ? sadiyaensis, n. sp.

Locality.—Sadiya (*M. Ogle*).

Shell scarcely perforate, flatly turbinate, sharply keeled; sculpture fine, close regular costulation above, decussate below; colour dull ochraceous; spire flatly conic, apex subacute; suture shallow; whorls 5, regularly increasing, not fully grown; aperture semilunate, rather large for size of shell; peristome thin; columellar margin oblique.

Size: major diameter 7·0, alt. axis 3·25 mm.

There is only one example of this shell, its generic position is very doubtful. As it comes from Sadiya, a large and easily accessible station, it will I trust sooner or later be found again.

Rahula aborensis, n. sp.

(Text-figs. 2 A, B.)

Locality.—Sibbum, Yamne Valley, Abor Hills, 3 specimens (*Lt. G. F. T. Oakes, R.E.*).

Shell deeply umbilicated, border sharply defined, trochiform, base flat; sculpture quite strongly and distantly costulated, smooth on base, angular on periphery, with a well marked lirate edge; colour pale ochraceous; spire high, sides slightly convex, apex blunt; suture impressed; whorls 6, sides convex; aperture small, narrowly quadrate; peristome thin, angulate on the lower outer margin.

Size: major diameter 3·5, alt. axis 2·5 mm.

The strong costulation, convex sides, and small aperture distinguishes this from all forms at present known. From Sibbum there was also a single specimen more globose than *R. aborensis*, with no keel but with the costulation extending to the basal side somewhat as is seen in *R. dihingensis*. Most unfortunately this shell was broken after being photographed and can only be thus briefly recorded.

Rahula dihingensis, n. sp.

(Text-fig. 2 D)

Locality.—Dihing Valley, Eastern Assam (*M. Ogle*).

Shell globosely conoid, openly perforate, rounded on the periphery; sculpture regular costulation, well marked, extending to the under side; colour very pale ochraceous; spire conoidal, apex rounded; suture impressed; whorls 6, regularly increasing; aperture semilunate; peristome slightly thickened, columellar margin suboblique.

Size: major diameter 4·0, alt. axis 2·3 mm.

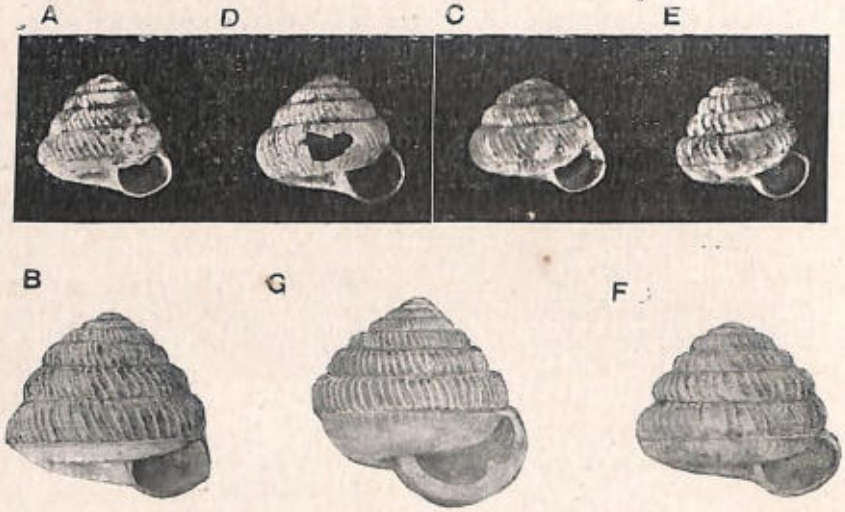


FIG. 2 A.—*Rahula aborensis*, n. sp. × 5.
,, 2 B.— ,, ,, × 8.
,, 2 C.— ,, *koboensis*, n. sp. × 5.
,, 2 D.— ,, *dihingensis*, n. sp. × 5.
,, 2 E.— ,, *burrailensis*, n. sp. × 5.
,, 2 F.— ,, ,, × 7.
,, 2 G.—*Sesara globosa*, n. sp. ♀ × 4.

Two specimens were obtained. I take the opportunity of describing and figuring this species, as the habitat is contiguous to the Abor Hills, although south of the Brahmaputra Valley.

Rahula burrailensis, n. sp.

(Text-figs. 2 E, F.)

Locality.—Yemai, Lahupa Naga, N. E. Manipur (*Godwin-Austen*).

Shell globosely turbinate, openly perforated; sculpture strong distant costulation, extending to the basal side; colour stony white; spire moderately high, apex blunt, sides very slightly converse; suture impressed; whorls 6, sides convex, rounded on the

periphery which is marked by a raised fine line; aperture semilunate, vertical; peristome simple, very slightly inflected on the columellar margin; collumellar margin oblique, thickened.

Size: major diameter 3·4, alt. axis 2·4 mm.

This a single specimen is very close to *R. munipurensis*, but it is not so broad and the base is more conoid and flatter on the apex Being also close to the Abor *Rahula* I introduce it here.

Rahula koboensis, n. sp.

(Text-figs. 2 C; 3 A-C.)

Locality.—Kobo, on the north bank of the Brahmaputra River, December, 1911; 2 specimens only in spirit found broken (*S. W. Kemp*). No. 5930, *Ind. Mus.*

Shell (fig. 3 A) globose, apical whorls not seen; sculpture: costulation on last whorl distant, strong, sinuous, oblique, terminating on the periphery, which has no keel, on basal side costulation also occurs equally strong; colour pale ochraceous; whorls: the last well rounded at the periphery.

Major diameter 2·5 mm.

This species is distinguished at once from *R. aborensis* by the well rounded last whorl, and the absence of the lirate keel, shown in the photograph made of it. It is one of the most interesting molluscs obtained by Mr. Kemp. The animal of this genus had never been preserved before. Of the two specimens the first examined was imperfect, the head had been destroyed apparently by some predaceous insect, with the second I was more fortunate.

Animal white, spotted and banded distantly with black on the visceral sac (fig. 3 C). In the second specimen this was much closer together. Foot short, mucous pore at extremity of foot distinct, and a broad peripodial margin.

Generative organs were not got out satisfactorily. More than two specimens are required for an animal so small as this

Radula (fig. 3 B), centre tooth on a narrow elongate plate, tricuspid, the centre one well developed; admedian also elongate with a single small cusp on the outer side; marginals noticeable by being tricuspid, the shortest cusp on the outer margin, the centre the longest. The formula is 30.1.7.1.7.1.30, or 38.1.38. The number of marginals is only approximate, they are on the outer side very minute and clustered together; being a unique specimen it was not safe to try and spread them.

Jaw (fig. 3 B) rather straight in front with a subdued central projection.

Sesara globosa, n. sp.

(Text-fig. 2 G.)

Locality.—Between Renging and Rotung (*S. W. Kemp*). No. 6129, *Ind. Mus.*

Shell imperforate, globosely conoid, solid; sculpture smooth below, very strongly costulated above, but not on the apex; colour pale ochraceous; spire high conic, side flat; suture impressed; whorls 8, very closely wound, convex; aperture narrowly lunate; peristome strongly thickened, with a single strong tooth on the lower outer margin; columellar margin very oblique.

Size: major diameter 7·0, alt. axis 5·0 mm.

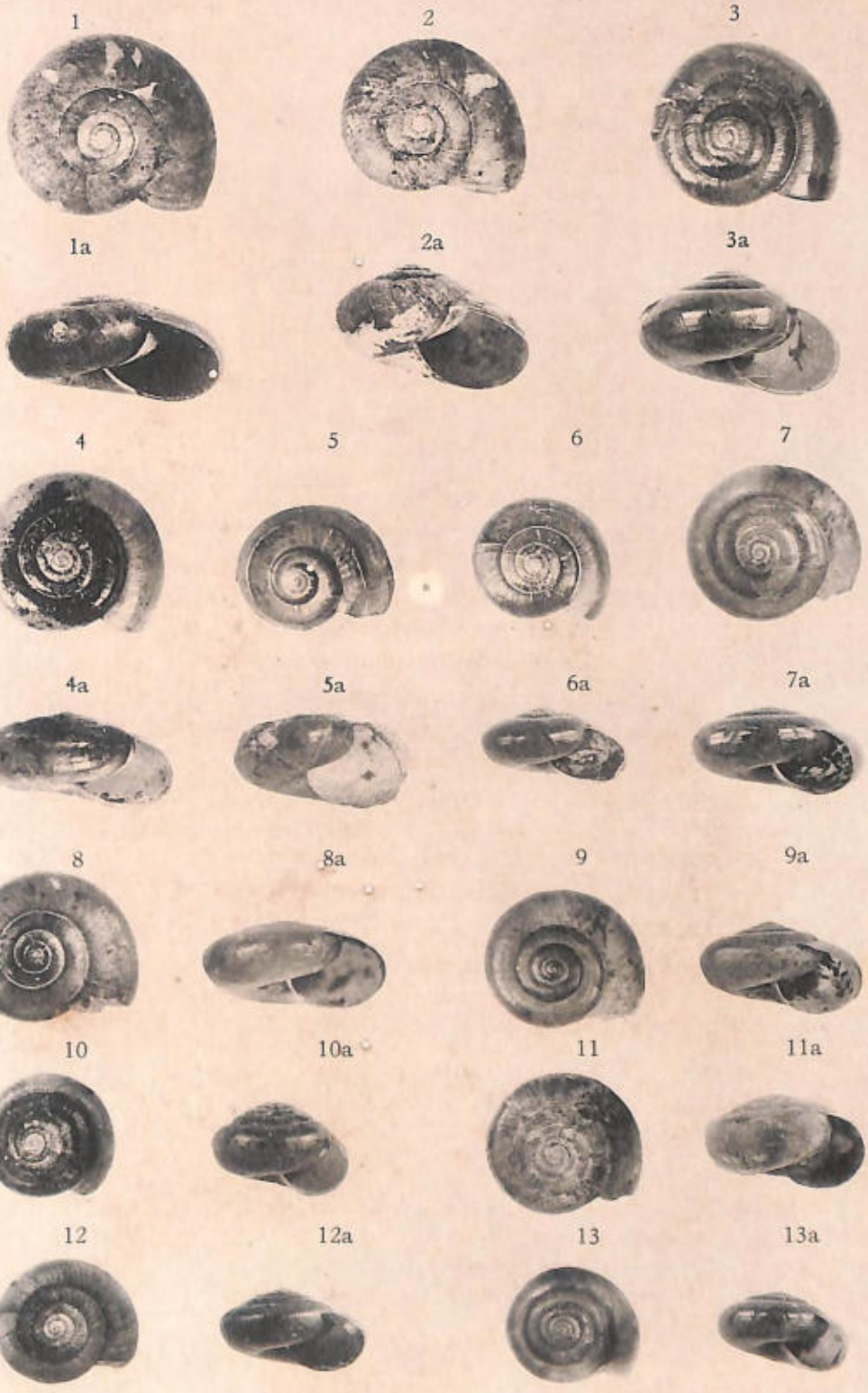
The single specimen found by Mr. Kemp has been figured and is the type; three other examples were sent me by Captain Oakes of this very beautiful species.

It would be very interesting to see the animal of this species.

[The blocks for figs. 1 and 3 (of *Bensonia aborensis* and *Rahula koboensis* respectively) have apparently been lost in transit and cannot therefore be utilized in the present instalment of Col. Godwin-Austen's account of the Abor Molluscs. It is hoped that arrangements may be made for their reproduction in a later instalment.—*Ed.*]

EXPLANATION OF PLATE LI.

FIGS. 1, 1*a*.—*Macrochlamys bapuensis*, n. sp. × 1·5.
,, 2, 2*a*.— ,, *shimangensis*, n. sp. × 1·5.
,, 3, 3*a*.— ,, *hippocastaneum*, n. sp. × 1·5.
,, 4, 4*a*.—*Sarama kempi*, G.-A. (described *Rec. Ind. Mus.* Vol. VIII, pp. 362-63, 1914). × 1·5.
,, 5, 5*a*.—*Rotungia williamsoni*, n. sp. × 2.
,, 6, 6*a*.—*Macrochlamys psittacinus*, n. sp. × 1·5.
,, 7, 7*a*.— ,, *rotungensis*, n. sp. × 2.
,, 8, 8*a*.—*Bapuia rengingensis*, n. sp. × 2.
,, 9, 9*a*.—*Macrochlamys hardwickei*, G.-A. var. *politulus*, G.-A. × 1·5.
,, 10, 10*a*.—*Tadunia oakesi*, n. sp × 2.
,, 11, 11*a*.—*Macrochlamys? luyorensis*, n. sp. × 2.
,, 12, 12*a*.—*Khasiella? dinoensis*, n. sp. × 2.
,, 13, 13*a*.—*Macrochlamys burkilli*, n. sp. × 2.



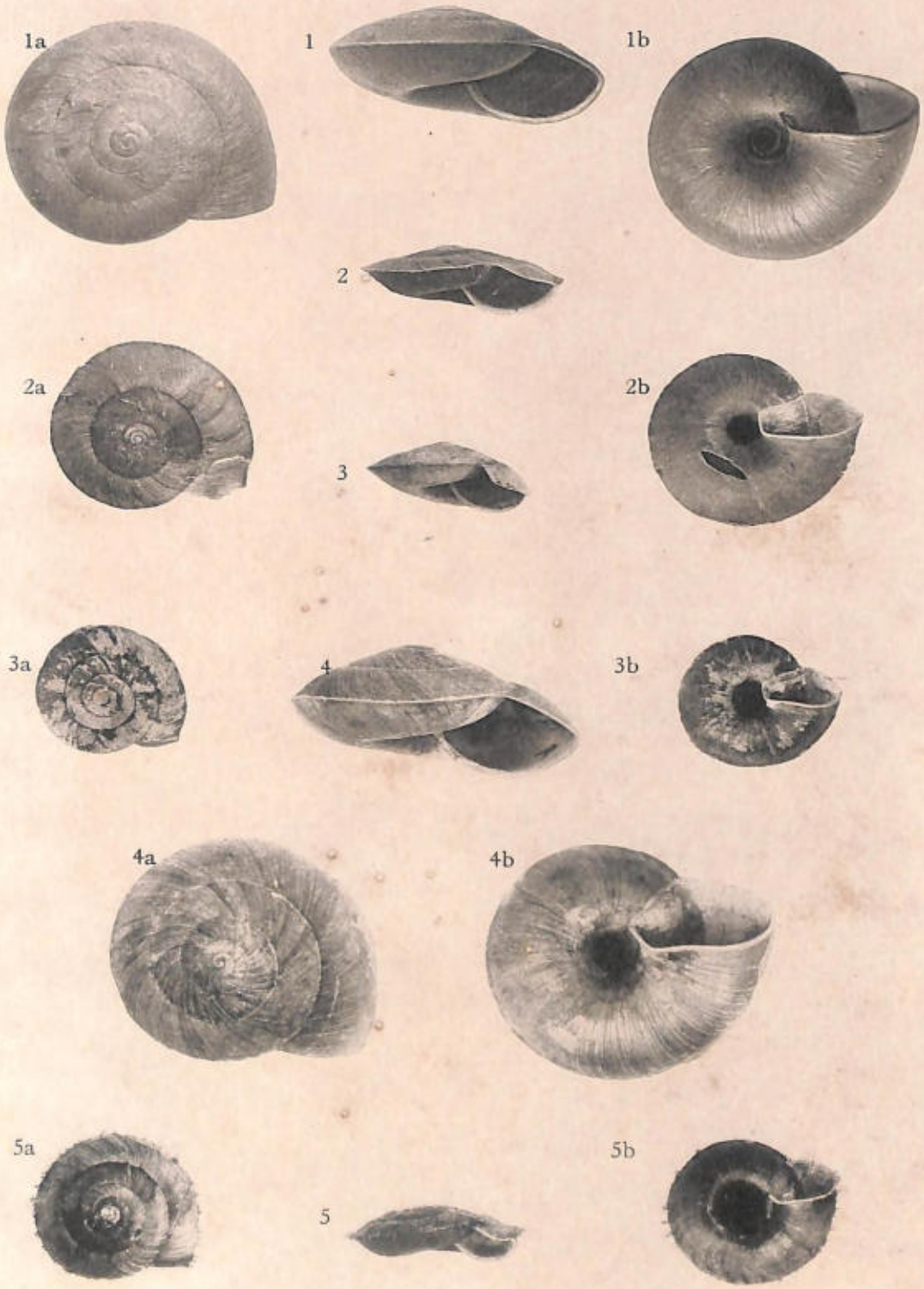
J. S. Gladstone. Photo.

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ABOR MOLLUSCA.

EXPLANATION OF PLATE LII.

FIGS. 1, 1*a*, 1*b*.—*Oxytes oglei*, n. sp., nat. size.
,, 2, 2*a*, 2*b*.— ,, *aborensis*, n. sp., nat. size.
,, 3, 3*a*, 3*b*.— ,, *siyomensis*, n. sp., nat. size.
,, 4, 4*a*, 4*b*.— ,, *oglei*, n. sp., var., nat. size.
,, 5, 5*a*, 5*b*.— *Pseudokaliella annandalei*, n. sp. × 1·5.



J. S. Gladstone. Photo.

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ABOR MOLLUSCA.

EXPLANATION OF PLATE LIII.

Rotungia williamsoni, n. sp.

FIG. 1.—Shell, front view. × 4·5.

,, 2.—Animal, the left side, showing protuberances on keel of the foot. × 2.

,, 3.—Animal, view of right front side, showing the right shell lobe and dorsal lobes. × 2.

,, 4.—Dorsal view of extremity of the foot. × 4·5.

,, 5.—Generative organs. × 6.

Macrochlamys hardwickei, G.-A. var. *politulus*, G.-A.

FIG. 6.—Generative organs, the penis is drawn twice to show the flagellum. × 4·5.

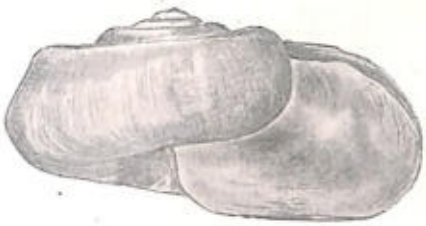
,, 7.—The edge of the visceral sac, right and left sides, showing the shell and dorsal lobes. × 4·5.

Macrochlamys albulus, n. sp.

FIG. 8.—Animal, right and left sides, showing shell lobes. × 4·5.

,, 9.—Jaw. × 30.

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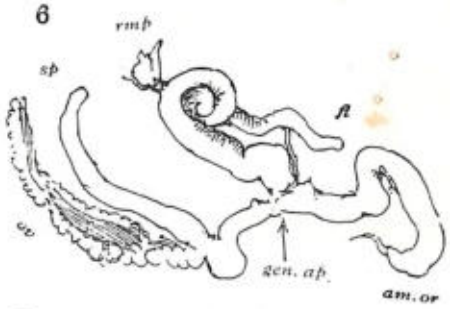
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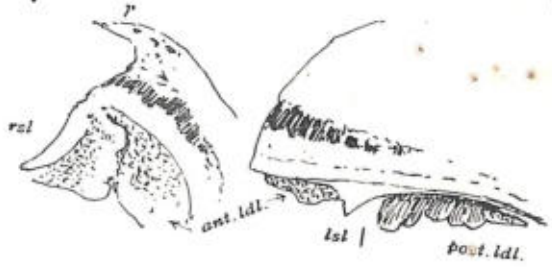
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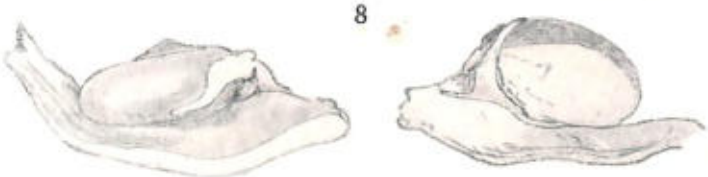
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ABOR MOLLUSCA.

EXPLANATION OF PLATE LIV.

Khasiella ? dinoensis, n. sp.

FIG. 1.—Jaw. × 30.

,, 2.—Sole of foot, contracted in spirit specimen. × 4·5.

,, 3.—Extremity of the foot. × 12.

Bapuia rengingensis, n. sp.

FIG. 4.—Jaw. × 24.

,, 5.—Edge of mantle with left shell lobe and extremity of foot. × 4·5.

Macrochlamys rotungensis, n. sp.

FIG. 6.—Generative organs. × 8.

,, 7.—Portion of spermatophore.

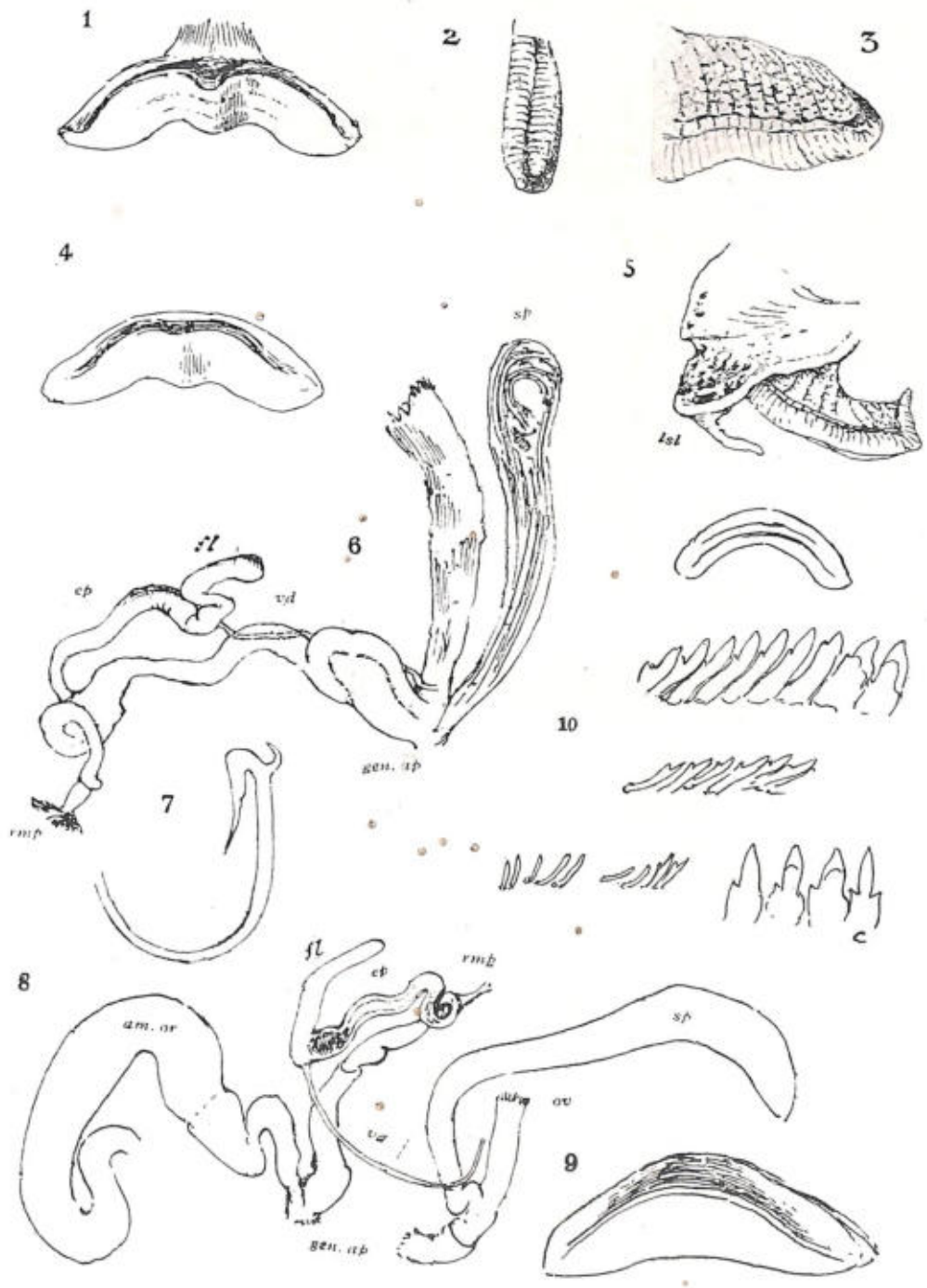
Macrochlamys burkilli, n. sp.

FIG. 8.—Generative organs. × 8.

,, 9.—Jaw. × 58.

Macrochlamys rotungensis, n. sp., var.

FIG. 10.—Jaw, × 24, and teeth of radula in different parts of the row, × 360.



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ABOR MOLLUSCA.

XLIX. MOLLUSCA, IX.

By Lt.-Colonel H. H. Godwin-Austen, *F.R.S.*

I commenced the study of the Genera *Glessula*, *Plectotropis*, *Hapalus*, *Clausilia*, etc., now many years ago, when (associated with William Blanford) the first Molluscan volume of the "Fauna of British India" was in preparation.

With considerable trouble specimens preserved in spirit have been got together and the animals examined. The final results I hope to bring out in "Land and Freshwater Mollusca of India," Vol. III, but the war has greatly delayed publication.[1]

As Helices of the section generally known as *Plectotropis* have been received from the Abor Hills and Eastern Assam, I take this opportunity of making known some of the results, which include the description of a new species from Sikhim, another from the Burrail Range; what is known of *P. huttoni* of the N.-W. Himalaya and of *P. radleyi* of Ceylon; and of a large species allied to *Helix catostoma*, as these are of much interest from the generic point of view. Although this will increase the pages of the "Zoological Results of the Abor Expedition," it will, I trust, add to their value.

Much of what I now communicate would have appeared in Vol. II (1914) of the "Fauna of British India," on which I commenced work in 1912 with Mr. G. K. Gude, vide Preface to that volume. This requires, if only in justice to myself, some explanation. I gave up the task in 1913, for the following reasons. It entailed constant visits to town, and much trouble, as well as correspondence which took up so much time when at my age I did not feel equal to it and when also I had a great deal of other work to do. I tried hard with the Editor, with the India Office, and printers but could not obtain the printed sheets in galley form as they had been supplied by the printers to Dr. W. T. Blanford, at the time I was engaged completing and bringing out Vol. I. Those who have ever been engaged on work of this nature will understand how important this is in the final arrangement of the sheets, especially when perhaps at the last moment the receipt of material from India might upset all previous conclusions as to the generic position of a species.

Having been able to bring together from various sources and to examine a considerable amount of material, I am induced to venture on some changes in classification following p. 200 of the

[1] Should I be unable to publish these results the manuscript will be placed with the described species in the drawers of the Blanford and Godwin-Austen collections in the Shell Gallery of the British Museum (Natural History).

"Manual of Conchology" under *Eulota*. In this excellent work of Mr. H. A. Pilsbry, 2nd Series (Pulmonata), p. 208, under section *Plectotropis*, commenting on Prof. Wiegmann's work and figures of *P. sumatrana* and *P. rotatoria*, Pilsbry very truly says: "Until adult examples are examined I do not venture to "transfer this species especially since a vast majority of the "forms of both groups are still anatomically unknown, and their "systematic position consequently is only arbitrarily fixed by "slight and obscure shell features." Thus *Thysonota* (p. 207) may be removed, vide *L. and F. W. Moll. India* (1907), p. 189, which no doubt Mr. Pilsbry has already done.

In this section of the Helicidae, there is a general similarity in the radula, vide *Man. Conch.* pl. 65, fig. 14 (*Plectopylis vulvivaga*), and pl. 65, fig. 3 (*Eulotella similaris*), but great differences are found in the generative organs, and the dart-sac is a conspicuous feature, vide pl. 66, figs. 33, 34 for the first, and pl. 66, fig. 20 for the second.

Among the long list of species of the section *Plectotropis* given by Pilsbry, I note the following from India and Burma and Borneo.

akoutongensis, Theob. Pegu.
emensus, G.A. Burma. *P.Z.S.* 1888, p. 242.
mitanensis, G.A. Tenasserim. *A.M.N.H.* 1869, p. 108.
grumulus, G.A. Borneo. *P.Z.S.* 1891, p. 43, pl. v, fig. 2.
pudica, G.A. Labuan. *P.Z.S.* 1891, p. 43, pl. ii, figs. 7, 7*a*.
huttoni, Pfr. N.-W. Himalaya. *Symb. Hist. Helic.* 1842, p. 82.
=*orbicula*, Hutt. *J.A.S.B.* 1838, p. 271.
v. *savadiensis*, Nev. Sawady, Upper Burma. *Hand-list*, p. 73, 1878. Type in Indian Museum.
clarus, G.A. Burma. *P.Z.S.* 1888, p. 242.
catostoma, W. Blf. *P.Z.S.* 1869, p. 447.
oldhami, Bens. Burma. *A.M.N.H.* 1859, p. 185.
tapeina, Bens. Khasi Hills. *J.A.S.B.* 1836, p. 352.
rotatoria, Busch. Java.

Of these I have examined the animal of *P. huttoni* and am able to give a description of it, and some other species from Sikhim and the Eastern Frontier.

Many years ago I had noticed how very much the shell of this species differed from very similar looking species from other parts of India and Burma, species which had received very casual attention and had come to be considered alike. I compared all I had, and provisionally named those species I considered distinct. More recently, to obtain some idea of the generic position, I have paid attention to the anatomy of the animals of those I had in spirit, and been able to continue the work, thus verifying their distinctness.

William Theobald in his "Catalogue of the Land and Fresh-water Shells of British India" (1876) was the first to give this species a very wide distribution; he records "Himalayas, Simla to Sikkim; Nilghiri Hills; Iravadi Valley."

In the most recent publication "The Fauna of British India," Vol. II, Mollusca, p. 211, 1914, the range of *H. huttoni* is to say the least very remarkable, it is apparently copied from Nevill's "Hand List" of 1878, then 36 years old and thus with no further advance in our knowledge. These habitats are India (Simla and Landour); Darjiling; Kashmir; Naga Hills; Dafla Hills; Shevroy Hills; Burma, Upper Salween Valley; Puppa Hills near Ava; China; and Ponsee, Yunnan. With the exception of Kashmir, I fortunately have examples of most of these.

Family ZONITIDAE.

Sivella castra, Bs.

(Text-fig. 1).

Locality.—Sikhim.

Animal. The visceral sac is white, with black splashes at regular intervals as far back as the commencement of the liver

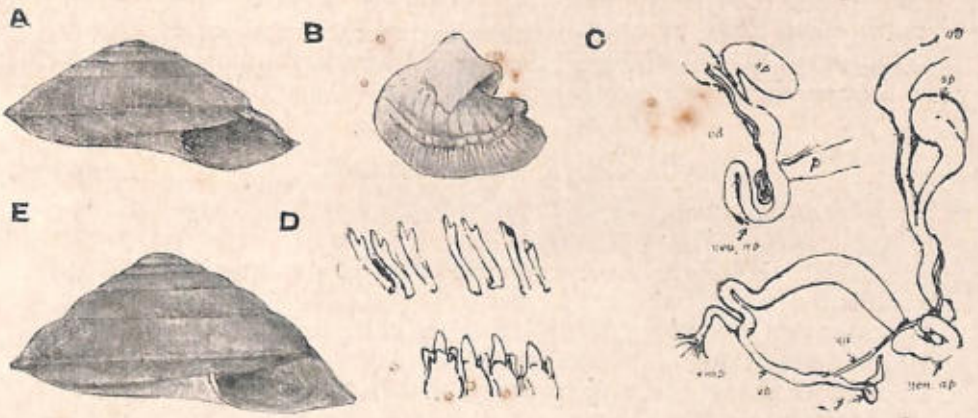


FIG. 1.—*Sivella castra*, Bs.

A.—Shell, × 4. Abor Hills.
B.—Extremity of foot of animal to show the mucous gland, × 9.
C.—Generative organs, × 9.
D.—Teeth of the radula from different parts of the row, × 800.
E.—Shell, × 4. Rarhichu, Sikhim.

lobes, and thus it resembles the animal of *Rahula*. The extremity of the foot has a small lobe above the small slit of the mucous gland (text-fig. 1, B), the peripodial margin is very broad with two grooves above well defined. The genitalia (text-fig. 1, C) were well got out, the penis (*p*) consists of a long sheath, the retractor muscle strong and short at the end, a long epiphallus (*ep*) follows and where the vas deferens joins there is a well-developed flagellum. The spermatheca (*sp*) rises about half way up the free oviduct and has a globose termination. This does not agree with Stoliczka's figure, plate ii, fig. 7, *J.A.S.B.* 1873, described on p. 21, and

there is no flagellum shown and the spermatheca rises at the generative aperture.

Stoliczka, however, does not give the habitat of the animal he dissected, but as the paper is on the land shells of Penang Island, *castra* from that place was at the time he wrote before him, thus the difference. It is very doubtful if typical *castra* from Sikhim is the same, and has such an extended range.

In the radula (text-fig. 1, D) the central and admedian teeth are small, the latter having a small cusp on the outer side, the marginals are slightly longer, narrow and bicuspid.

Formula ? ? 1.9.1.9.1. ?, there may be about 20 to 25 marginals, but they were so crowded together I could not count them. Jaw not seen.

I have no hesitation in removing this species from the Family Trochomorphidae to the Zonitidae. Pilsbry defines the anatomical characters of the former "without a mucous gland," "spermatheca on a short duct," the opposite is found in *castra* from the Eastern Himalaya, besides which there is a flagellum in the penis. I have figured (*Proceedings Malacological Society*, vol. i, pt. 6, 1895, p. 281, pl. xix) the generative organs of *Videna trilineatus* of Great Nicobar, *bicolor* of Borneo, and *conicoides*; it will be seen they differ altogether from *Sivella castra*.

Sivella castra var. **kobonensis**, nov.

Locality.—Kobo, Abor Hills. No. 6013, Ind. Mus. (*S. W. Kemp*).

Shell very depressedly pyramidal, flat on base, keel sharp, sculpture irregular rather distant transverse folds, fewer on base, where rather close concentric striae are conspicuous, colour umber brown, spire moderately high, sides flat, apex rounded, suture linear. Whorls 5, very flat, regularly increasing, aperture oblique, quadrate, peristome thin, columellar margin suboblique.

Size: major diameter 8·9, alt. axis 3·25 mm.

Only two specimens were received and one is small compared with the Dafla Hill form, the nearest locality on the west, it is flatter on the side of the spire and rather more tumid below the keel, but not nearly so flat on the base as in *Sivella castra* of Sikhim. More specimens are required and in a fuller stage of growth to show the variation.

Family HELICIDAE.

Landouria, gen. nov.

Type: H. huttoni, Pfr.

A dart-sac with accessory glands is not present. The penis is short with short epiphallus, flagellum and vas deferens, the spermatheca swollen at the base of a thin duct terminating in a globose sac.

Jaw with many plates. Radula with simple median teeth, a side cusp or ectocone coming in, the marginal have the mesocone lengthened and finally in the outermost marginals this becomes bifid and the ectocone also.

Shell small orbiculate, about 10 mm. in major diameter, openly umbilicate. Whorls closely wound.

This genus includes also *damsangensis* of Sikhim, *hengdanensis* of North Cachar, *aborensis* of the Abor country and *radleyi* of Ceylon (by dissection).

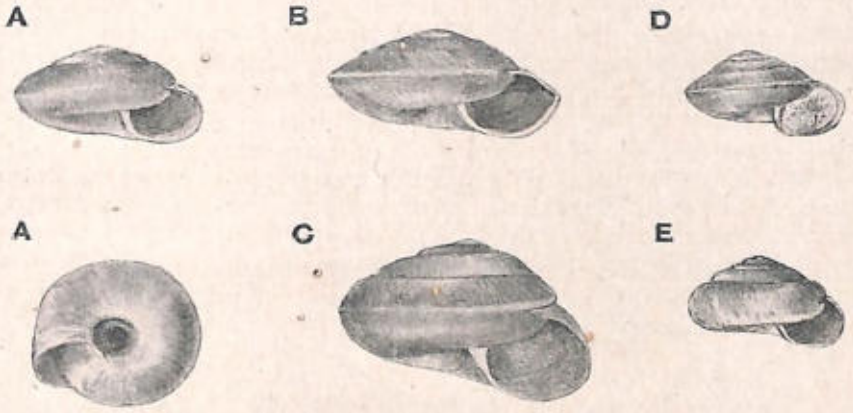


FIG. 2 A.—*Landouria huttoni* (Pfr.), × 2·2.
,, 2 A'.— ,, ,, basal side, × 2·2.
,, 2 B.— ,, *damsangensis*, n. sp., × 2·2.
,, 2 C.— ,, *aborensis*, n. sp., × 4.
,, 2 D.— ,, ,, × 2·2.
,, 2 E.— ,, *hengdanensis*, n. sp., × 2·2.

Landouria huttoni (Pfr.)

(Text figs. 2 A, A' and text-fig. 3).

Helix huttoni, Pfr., *Symb.* II, p. 82.
Helix orbicula, Hutton, *Jour. A.S.B.* VII, p. 217.

Habitat.—Himalaya near Simla, Mahasu (*Hutton*); Landour (*Benson*).

I take this species first, having seen the animal.

Description: "Testa orbiculato-convexa, fuscescente, epider-"mide scabra; anfractibus sex convexiusculis; periphaeria sub-"angulate; umbilico profundo latiusculo; peritremate subrotun-"dato, acuto. Diam. 0·4 (B.)."

From Mussoorie, N.-W. Himalaya. I give the following description of a specimen found there by myself.

Shell perspectively umbilicated, orbiculate, slightly convex, sculpture in the young shell, the epidermis when wetted appears rough and spotted, spots in relief and irregular, colour pale corneous; whorls 6, slightly convex, the last angulate and scarcely descending. Aperture oblique, roundly lunate; peristome simple

columellar margin slightly reflected. Major diameter 10·0, alt. axis 3·5 mm.

Original description: "T. umbilicata, orbiculato-convexiuscula, sub-diaphana, pallide cornea, epidermide scabra induta, aufr. 6, convexiuscula, ultimus angulatus, antice vix descendeus; umbilicus latiusculus, perspectivus; apertura obliqua, lunato-rotundata, perist simplex marginibus."

Among some shells collected alive by my brother-in-law Major S. W. Robinson, R.A., were a few immature examples of this species. The animal has the visceral sac white, with a green tinge, crossed and splashed distantly with black and a few intervening spots of same colour towards the apex. From one I have been able to extract the jaw and radula, but not in so perfect a state as I could wish, still the number of the central and admedian teeth on broad plates can be counted and comparison made with species from other and distant localities, this character shows far more decided and more reliable variation than is to be found in the shells. The radula (text-fig. 3) of *H. huttoni* is a very beautiful

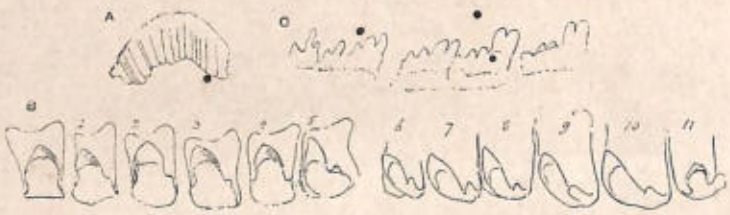


FIG. 3.—*Landouria huttoni* (Pfr.)

A.—Jaw, × 30.
B.—Teeth of the radula, from the central to the 11th.
C.— ,, the outermost marginals, much enlarged.

one. The first four admedian teeth are short and broad, have no cusp on the outer side, only a sort of flange or shoulder, with the 5th tooth the mesocone becomes longer and narrower and an ectocone is present which continues to the 11th tooth, the plates still being broad, these then begin to get narrower with the ectocone bicuspid, and at about the 14th tooth the mesocone becomes bicuspid also.

The jaw (text-fig. 3, A) was slightly broken on one side, but some 15 or 16 narrow plates could be counted.

Since Hutton and Benson dealt with *Helix huttoni* some 80 years ago, coming down to more recent times it has been placed in *Fruticola* by Theobald 1876, in *Plectotropis* by Nevill 1878, Pilsbry 1895, Gude 1914.

In "Die Preussische Expedition nach Ost-Asien", p. 267. Von Martens records *H. orbicula*, Hutton, from Zollinger in Java, this I expect will prove to be another species, the shell no doubt is very close in form, but if the animal could be seen it is not likely to be the same as the Landour species.

The following species is one of which I had the animal in spirits. It is No. 82. *Helix* (*Plectotropis*) *huttoni*, Pfr., Nevill's Hand List (1878), p. 73, from Darjeeling (F. Stoliczka and Col. G. Mainwaring). Quoted by Mr. G. K. Gude in the *Fauna of British India*, vol. II (1914), p. 211, under same title.

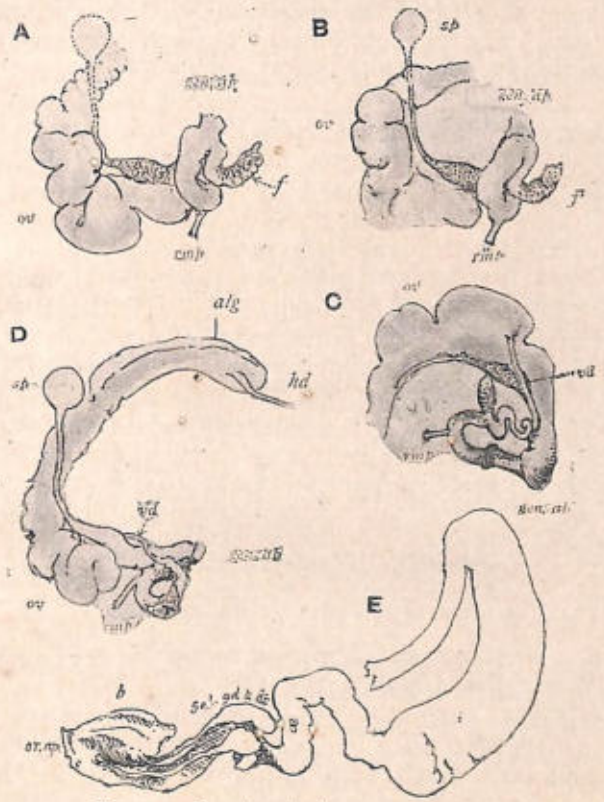


FIG. 4.—*Landouria damsangensis*, n. sp.

A.—Portion of generative organs, 1st specimen dissected, × 7.
B.— ,, ,, 3rd specimen dissected, × 7.
C.— ,, ,,
D.— ,, ,, 2nd specimen dissected, × 7.
E.—Buccal mass, salivary glands and intestine, × 7.

Landouria damsangensis, n. sp.

(Text-figs. 2 B and text-figs. 4 and 5 D).

Locality.—Damsang, Sikhim.

Shell widely and perspectively umbilicate, flatly orbiculate, well keeled; colour ruddy brown. Spire low, apex rounded, sides flatly convex, suture shallow. Whorls 6, closely wound, sides flat; aperture oblique, semi-lunate, peristome slightly thickened. Columellar subvertical not thickened, slightly dilated.

Largest sp. .. major diameter 13·0, alt. axis 5·5 mm.
Ordinary size .. ,, 10·0 ,, 4·8 ,,

Animal. In the spirit specimens the very much darker colour of the visceral sac, much speckled and mottled throughout at once showed this to be a different species to the first I dissected from the Naga Hills. The mantle edge has a broad band of black. The visceral sac as far back as the region of the heart is blue black with a narrow pale ochre band on the line of the rectum, which on closer inspection is made up of closely set double V-shaped markings.

In the generative organs (text-fig. 4, A, B, C, D), the penis is very small in comparison to the length of the free oviduct and albumen gland. It is bent on itself where the short retractor muscle is given off, the epiphallus is short up to where a short thick ovoid sac, which represents the flagellum, occurs, the vas deferens joins this at its base, takes a few twists and continues to the oviduct. The spermatheca is a long thin duct with a fairly large globose termination (fig. 4, D), which is generally broken off in the process of dissection. The salivary glands were well seen with the buccal mass, two separate masses on long fine ducts (fig. 4, E).

The jaw (text-fig. 5, D) is composed of some 24 plates closely set together. Radula formula 15.1.15.

The 16th tooth is bicuspid and the next four are similar.

Landouria hengdanensis, n. sp.

(Text-figs. 2 E and text-fig. 5 A, B, C).

Locality.—Hengdan Peak, Burrail Range, on the North Cachar and Munipur Frontier (*Godwin-Austen*).

Shell globosely conic, very flat on the base, openly umbilicated, sculpture smooth, fine lines of growth, indistinct spiral striation near the umbilicus; colour pale brown. Spire rather high, sides slightly convex, suture shallow. Whorls 5, the last rounded, sides slightly convex, aperture semilunate, columellar margin oblique.

Size: major diameter 10·0, alt. axis 4·5 mm.

This shell is more openly umbilicated than *H. huttoni*.

Animal. The branchial sac is very long, pale ochre, a dark line borders the mantle edge, and on the line of the rectum there are 8 or 9 conspicuous spots of black. The generative organs were not in a state to see very much, or to figure.

The jaw is highly arched with about 24 close set plates. The central teeth are simple and straight sided, at the 6th tooth a small cusp begins to show and continues to the 17th, becoming larger, at the 18th the mesocone is bifid and this is the shape with an outer single cusp up to the margin, where three or four of the outermost laterals have double cusps on the outer side of the bifid mesocone.

Radula formula 14.12.1.12.14 or 26.1.26.

Other species of the genus are numerous on the North-East Frontier of India and Burma, but space does not admit of their introduction in this contribution. They have been described and figured and await publication in "Land and Freshwater Mollusca of India." To give an idea of the range of this new genus, I include the following Ceylon species.

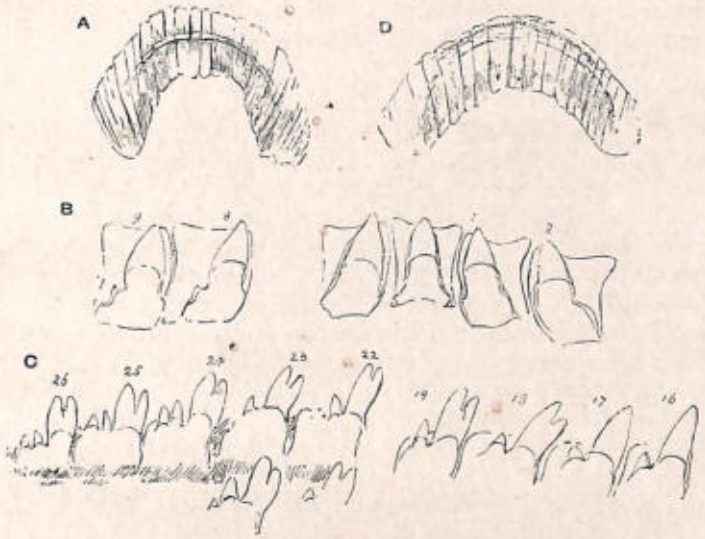


FIG. 5.—*Landouria hengdanensis*, n. sp.
A.—Jaw, × 40.
B.—Centre and admedian teeth } × 630.
C.—Laterals and outermost teeth. }
D.—*L. damsangensis*, n. sp. Jaw, × 40.

Landouria radleyi, Jousseaume.

(Text-fig. 6).

Memoirs Soc. Zool. France, VII, pp. 284, 285, pl. iv, fig. 6 (1894).
Helix huttoni var. *radleyi*, Sykes, *Proc. Malac. Soc. London*, III, p. 161 (1898), as var. of *huttoni*, Pfr.; G. K. Gude, *Faun. Br. India, Mollusca*, II, p. 212 (1914).

Locality.—Harputtalle, Ceylon, 4,000 feet.

These shells were sent to me by Mr. O. Collett, who did so much to advance our knowledge of Ceylon land mollusca and sent home many valuable species preserved in spirit. Malacology suffered great loss in his early death, his labour now enables me to give the following description:—

Animal. Two were extracted from the shells, of course not complete, but enough to show important characters. The foot (text-fig. 6, A) is short and pointed at the extremity with a very indistinct pale line above the peripodial margin. In one specimen this was seen to be broken up by close grooves running upwards

from the margin, in the other there was no indication of this, due no doubt to destruction of surface in the alcohol.

The generative orifice was very conspicuous, a vertical slit with a pale border. Head and neck pale grey with a rugous surface, the rugosities having a single dark spot. The mouth (text-fig. 6, B), as viewed from the front, is seen to have thick crescentric sides, somewhat projecting and pale in colour than the surrounding integuments. The visceral sac is very closely and finely streaked black giving it a dark tinge.

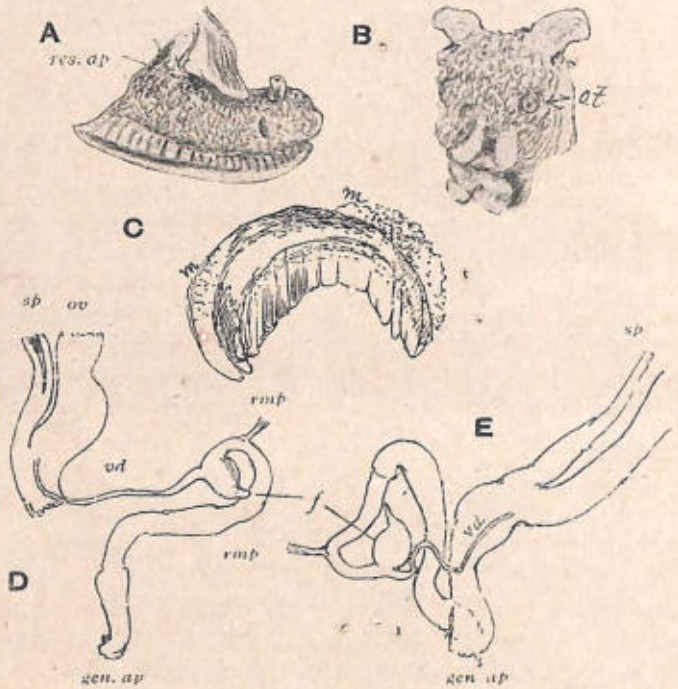


Fig. 6.—*Landouria radleyi*, Jousseaume.
A.—Anterior part of animal, × 4·5.
B.—Head as viewed from the front, × 8.
C.—Jaw, × 30.
D.—Part of generative organs, × 8.
E.— ,, ,, ,, × 8.

Generative organs. The penis (text-fig. 6, D, E) is a long tube bent where the short retractor muscle is given off, a very short epiphallus, followed by an oval-shaped flagellum which terminates in a short distinct point, at the base of this ovate sac the vas deferens joins it. The lower portion of the spermatheca was seen, but the terminal (probably globose) was broken. So far the genitalia agrees with that of *H. damsangensis* of Sikhim and they are co-generic, which is of interest to record. The radula was extracted, the formula being 15.15.1.15.15 or 30.1.30. The teeth correspond in form with those I have figured of *hengdanensis* from

the Burrail Range (text-fig. 5, B, C). The jaw (text-fig. 6, C) is well arched and made up of some 12 broadish plates.

Landouria aborensis, n. sp.

(Text-fig. 2 C, D).

Locality.—Kobo, Abor Hills (*Captain G. F. T. Oakes, R. E.* and 5918, *S. W. Kemp*).

Shell narrowly and perspectively umbilicated, globosely conoid, bluntly keeled; sculpture close irregular striae of growth; colour umber brown in fresh shells; spire depressedly conoid, apex rounded; suture linear. Whorls 5, flatly convex, aperture roundly lunate, subvertical.

Size: major diameter 8·4, alt. axis 3·8 mm.

The shells differ much in height of spire, one specimen out of five sent me is much higher than the type and measures 8×4·8 mm. The two specimens in spirit collected by Mr. S. W. Kemp at Kobo are small only 8×4, one of these has been dissected, and is described below, the other shell is figured.

The animal is white with some transverse bars behind the mantle-edge. Male organ as in *L. damsangensis* (text-fig. 4, A, B, C), the rest of the genitalia was not in a state to see much and I did not like to destroy the shell of the only other specimen.

The radula was obtained, the formula being 12.9.1.9.12 or 21.1.21. The teeth are similar in shape to those of *L. hengdanensis* from the Burrail Range (text-fig. 5, B, C).

Mikiria, gen. nov.

Type: M. diyungensis, G.-A., n. sp.

Named from the Mikir tribe, inhabiting the hills of the Nowgong District, Assam.

The penis is very long from the generative aperture to the retractor muscle. Epiphallus short, no flagellum, vas deferens long, spermatheca bulbous with a retractor muscle.

Shell similar to but larger than in *Landouria*, about 15 mm. in major diameter.

Mikiria diyungensis, n. sp.

(Text-fig. 7.)

Locality.—Diyung Valley, Singpho Hills (*M. T. Ogle*).

Shell perspectively umbilicated to the apex, conoid, base flat keeled on the periphery, thin, covered with an epidermis; sculpture irregular rather close transverse folds of growth; colour pale ochraceous; spire moderately high, conic, apex blunt; suture moderately impressed. Whorls 6, closely wound, the last only very slightly descending below the keel; aperture lunate; peristome very slightly thickened and reflected.

Size: major diameter 16·0, alt. axis 7·0 mm.

The largest major diameter 16·25.

This species, looking at it from above, recalls and is very closely allied to *H. catostoma*, W. Blf., of the same valley the Diyung in the Naga Hills. It is larger than that species, is higher in the spire, is not nearly so openly umbilicated and the aperture distinguishes it at once, it is also very close to *tapeina* from Teria Ghat.

Animal. The foot is not divided below, there is no peripodial groove or border to the margin and the extremity of the foot is

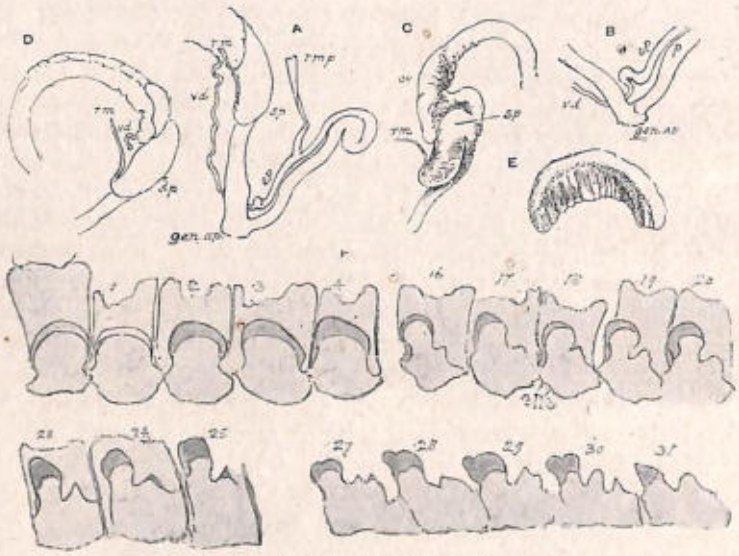


FIG. 7.—*Mikiria diyungensis*, n. sp.

A.—Portion of the generative organs, × 2.
C.— ,, showing the spermatheca, × 2.
B.— ,, to show enlargement of the vas deferens, × 2.
D.— ,, oviduct and vas deferens, × 2.
E.—Jaw, × 15.
F.—Teeth of the radula at different parts of the row, very largely magnified.

ep. epiphallus, *gen. ap.* generative aperture, *ov.* oviduct, *p.* penis, *rm.* retractor muscle, *rmp.* retractor muscle of penis, *sp.* spermatheca, *vd.* vas deferens.

rounded in the spirit specimen. The visceral sac is sparsely mottled with black on the branchial cavity, closer and in larger streaks near the mantle margin and line of the rectum. A triangular small right dorsal lobe, the left reflected over the peristome, single elongate and narrow posteriorly.

From the form of the shell so openly and closely wound, the principal retractor muscles extend far back nearly to the apex and the visceral sac is very long, every organ of the animal is thus drawn out and closely packed within it. The kidney takes this form from above the heart in an anterior direction and is situated between it and the line of the rectum.

Genitalia. The shaft of the penis (fig. 7, A) is very long, attenuate, sharply folded and bent on itself; the retractor muscle is given off on the side, as it lies folded up; the epiphallus (*ep*) is a thinner tube with a small enlargement or sharp bend, indicating where the spermatophore is developed and here the vas deferens joins it, its position being close and opposite to the male generative aperture and junction of the free oviduct.

This free oviduct is very long, and just below the commencement of the vas deferens there is a short solid bulbous spermatheca (fig. 7, D and C) with quite a strong retractor muscle, which extends a long way backwards. The walls of this sac are very thick and on the inside surface have many parallel fine wavy raised ridges. The oviduct and prostate are much drawn out and so is the albumen gland, all lie parallel to the muscles from the buccal mass and eye tentacles, and last of all lying between two of these the hermaphrodite duct may be followed towards the apex of the shell.

The jaw (fig. 7, E) is very solid with about 16-18 smooth, parallel plates.

The radula (fig. 7, F) was extracted nearly complete. The centre tooth and admedians up to the 13th are short, blunt and rounded, on ample somewhat elongate plates, becoming more pointed externally. At the 14th a slight shoulder is apparent which gradually enlarges into a basal cusp, while the mesocone has also lengthened at the 23rd and 25th tooth. Another change then takes place, both points become double as in the 27th and 30th; these outermost teeth are very irregular in their outline and being very thin are often broken.

Helix catostoma, W. Blf.

An extract from my field-book may be of interest here, now that I am describing a species so closely allied. Shell subconoidal, openly umbilicated, whorls 7, close wound, covered with an epidermis having a rough surface as if hairs had been shaved off it. The aperture turns suddenly down close behind the peristome and is slightly reflected at the margin.

The animal is a true *Helix* with no gland, foot painted behind. Body of a pale pink grey, under surface and margin of the foot of a green tint. Tentacles short, dark coloured. Wooded hills east of the Kopili River, particularly abundant in the Diyung Valley.

The absence of a dart-sac with accessory organs in all the preceding Indian species of this group of the Mollusca, combined with other characters, appears quite sufficient to separate them generically from species inhabiting Europe (*Eulota*), and China and Japan (*Plectotropis*) including *Œgista* in which some have been placed—notably *catostoma*. This removes both these genera from the Indian region. I am induced also from a knowledge of the animals of six species to divide the Indian, for they fall into two very well-marked sections, shown not only by the shell but in the internal anatomy, as represented by *H. huttoni* of the N.-W.

Himalaya and *H. damsangensis* of Sikhim on one side, and *diyungensis* of Assam a very close ally of *H. catostoma* on the other. In these three species there is not a sign of a dart-sac, but the genitalia however show marked differences. In *H. damsangensis* the spermatheca is very long, with a globose termination carrying no retractor muscle, and is bound to the oviduct. In the larger Assam species (*diyungensis*) the same organ is solid, bulbous, almost sessile, with a remarkably strong and lengthened retractor muscle. The penis again of these two species could hardly be more unlike. Compare text-fig. 4 C with text-fig. 7 A, in the first there is a well-developed flagellum, in the second there is none at all, while the retractor muscles are different in form and position.

In the formula of the respective radulas very considerable diversity is found, the greatest departure being in that of *diyungensis*, the total number being far the highest.

Landouria	*huttoni*	.. 8 . 10 . 1 . 10 . 8	or 18 . 1 . 18
	damsangensis	.. 10 . 9 . 1 . 9 . 10	,, 19 . 1 . 19
	hengdanensis	.. 17 . 9 . 1 . 9 . 17	,, 26 . 1 . 26
	aborensis	.. 12 . 9 . 1 . 9 . 12	,, 21 . 1 . 21
	dawnaensis	.. 11 . 2 . 9 . 1 . 9 . 2 . 11	,, 22 . 1 . 22
	radleyi	.. 15 . 15 . 1 . 15 . 15	,, 30 . 1 . 30
Mikiria	*diyungensis*	.. 20 . 8 . 13 . 1 . 13 . 8 . 20	,, 41 . 1 . 41

In the "*Records of the Indian Museum*," Vol. VIII, Part VIII (1915), p. 537, Mr. H. B. Preston describes and figures *Plectotropis austeni*, as from Upper Rotung, Abor Hills (*S. W. Kemp*). I have seen nothing so large as 12 mm. major diameter from that part or of such a high spired form. *L. aborensis* which I describe is only 8 mm. in major diameter. It is not stated how many specimens were sent home nor is the museum number given or I could with this have traced it to the tube it was in. The locality requires verification —*Clausilia insignis* is recorded in this same contribution from Kobo. In the interest of geographical distribution I must allude to this for it certainly came from the Dawna Hills, and I have it among species sent at the same time from the Amherst District of Burma. *Sarika concepta* is also stated to be from Kobo, it was I feel certain in the Dawna collection. Unfortunately shells from the Abor Hills and Dawna Hills were packed in the same box. Mr. Preston was with me at the time it was unpacked, when 3 or 4 glass tubes were found broken in transit, the scattered shells were picked out as carefully as possible, but some mixing of specimens was certain to result.

Trachia? delibrata, Benson, var. **fasciata**, G.-A.

Locality.—Kobo (*S. W. Kemp*).

Shell with five bands below the broader supra-peripheral band and one very fine one above that.

Size: major diameter 21, minor 17, alt. axis 7½ mm.

This species is placed in *Chloritis* by Mr. Gude (*Faun. Br. India*, p. 172), its generic position is very unsettled, I leave it with doubt where Stoliczka placed it, he describes under *delibrata* the animal of a Moulmein shell in *J.A.S.B.*, 1871, p. 225. The shell Benson described came from Bengal, and it is the animal of this which now requires examination. The generic position of *delibrata* would then be better understood particularly if other closely allied species were dissected and compared with it.

Trochomorphoides acris, (Bs.), var.

Locality.—Abor Hills (*Captain G. F. T. Oakes, R.E.*)

Shell narrowly umbilicated, trochiform, flat on base, sharply keeled; sculpture oblique fine striation, transverse; colour bleeched. Spire high, conoid, sides distinctly concave, apex blunt, suture linear. Whorls 7, flat; aperture very oblique, narrowly ovate; peristome expanded and slightly reflected below; columellar margin oblique.

Size: major diameter 11·0, alt. axis 9·0 mm.

Two specimens were received, one young and broken, the other fortunately fully grown. The slight convexity of the side of the spire distinguishes this from *T. acris*, the finest specimens of which I have from South Sylhet, the largest measures major diameter 11, alt. axis 10 mm.

Curvella ?

A single specimen was received from Captain Oakes, but is too immature for description, it is not allied to *C. sikkimensis*, the apex being much more acute. It is unfortunate that *Hapalus* cannot stand for this eastern section of shells approaching *Opeas* having been used for a genus of Coleoptera. Mr. Gude in *Faun. Br. India*, p. 348, following Pilsbry, adopts *Curvella*, the type of which is an East and South African species, *sulcata*. From a zoo-geographical point of view, it does not appear to me likely that a genus adapted to a country comparatively dry and of no great attitude, like East Africa, will possess characters similar to one ranging to 10,000 feet and more in an extremely wet, forest-clad country. I have examined the animal of *C. sikkimensis*, only a comparison of its anatomy with that of the African species can settle the question.

Glessula oakesi, n. sp.

(Text-fig. 8).

Locality.—Abor Hills (*Captain G. F. T. Oakes, R.E.*)

Shell oblong turreted, shining surface; sculpture regular somewhat distant incised lines; colour ochraceous, one umber brown; spire high, sides very flatly convex; suture impressed; whorls 7, flatly convex, proportion of body whorl to length 100: 62·5; aperture rather narrowly oval, peristome outer lip thickened, columellar margin slightly convex.

Size: major diameter 7·0, alt. axis 16·5 mm.

Two specimens of this species, though rather smaller in size and not fully grown, were sent to me from Brahmakund by Mr. M. Ogle, No. 3578 B.M. coll. The largest measures 11×5 mm. The species was received alive in 1913, from Captain Oakes with other species and dissected.

Animal of *Glessula oakesi* from Rotung (Oakes). The sole of the foot is crossed by coarse ridges, there is a very distinct peripodial margin (text-fig. 8 A). The genitalia (figs. 8 B, C, D) was fairly well seen in one specimen but more material was sadly wanted. The hermaphrodite duct is conspicuous from its size and close convolution, bound closely together at its junction with the albumen gland. The penis is very short with a short stout flagellum terminating in three blunt knots, it thus differs from what I have been able to see in other species. The vas deferens is given off from near the head of the penis, the spermatheca was not seen.

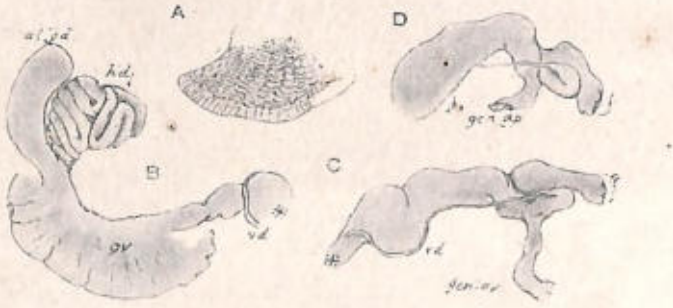


FIG. 8.—*Glessula oakesi*, n. sp.

A.—Side of foot.
B.—Albumen gland, hermaphrodite duct and oviduct to vas deferens.
C.—Vas deferens to penis.
D.— ,, ,, another view. All × 6.

Referring to the form of the flagellum I take the opportunity of giving here (text-fig. 9), in anticipation of a lengthy contribution to the Mollusca of India on the Glessulae of the North-East Frontier and Burma, a figure of the generative organs (fig. 9 C) of *Glessula ochracea*, G.-A., (a new species) from Sikhim in which the penis is of the form of *G. orophila* as figured by Prof. C. Semper (*Reis, Philippinen*), the flagellum is much flattened with a serrated edge on one side, indicative of the form of the spermatophore.

This species (*G. oakesi*) is the same as the one recorded from Rotung as *G. botellus*, Bs., of Southern India by Mr. H. B. Preston in the "*Records of the Indian Museum*," Vol. VIII, Nov. 1915, p. 539; it is a bare record, in any case remarkable as regards range. As I had not noticed this South Indian species among the large series sent me from the Abor Hills, I was anxious to see the shells which

had gone to Calcutta. Dr. Annandale very kindly sent these to me (October 1916) and I have compared them with specimens of *G. botellus* in the Henry Blanford collection from the Nilgiris, with the result that I cannot confirm Mr. Preston's determination. This Abor *Glessula* (*oakesi*) is decidedly smaller than *G. botellus*, and not so tumid, the whorls are closer wound, the outer lip is much more thickened than in *botellus*, the larger shell. I have compared the embryonic whorls and made enlarged drawings of *botellus*, of Mr. Preston's specimen, and of the type specimen of *oakesi*, the difference between the first and the two last is very marked, it is unmistakable.

Some explanation from me is necessary here. The shells

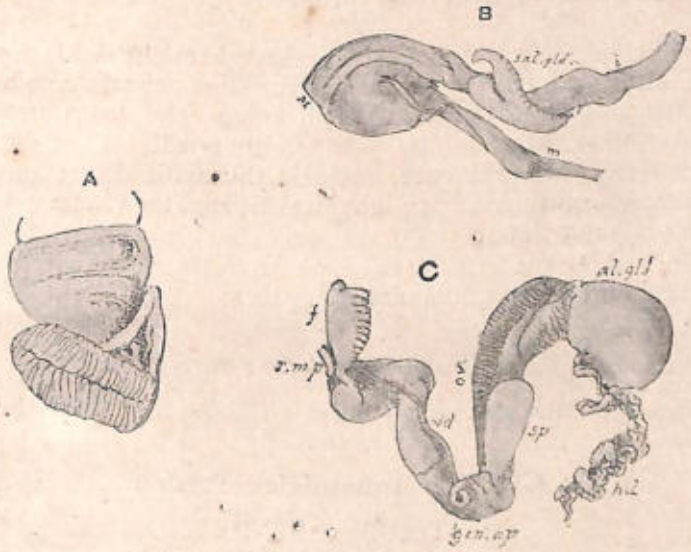


FIG. 9.—*Glessula ochracea*, G. A.

A.—Sole of foot, extruding from the aperture, × 3.
B.—Buccal mass, retractor muscle and salivary gland, × 6.
C.—Genitalia, × 3.

treated of in Mr. Preston's contribution form a small part of the collection made by Mr. Kemp, sent to me by Dr. Annandale with instructions (January, 1914) to hand to Mr. Preston those I did not propose to work on myself, the museum numbers were only noted of those so handed over. It was also unfortunate as mentioned before that in one box sent home shells in glass tubes collected in Lower Burma were packed with others from the Abor Hills, two or three tubes were found broken and the contents at the bottom of the box, these were taken over by Mr. Preston. This accounts for errors in locality, for which Mr. Preston cannot be blamed. Collections from different areas should never be put up together and sent through the post.

Under the circumstances it would have been more satisfactory, had I seen Mr. Preston's contribution before it was sent to Calcutta, for I should have certainly noticed the range of *G. botellus* and the cases of wrong habitat, viz. *Sarika consepta* and *Clausilia insignis* stated to be found at Kobo on the Brahmaputra River when they came from the Dawna Hills. I have them in spirit from that range. Both are typical Tenasserim species.

Record such as this is to be regretted, it goes out to the whole world, and before it can be corrected no end of misconception may be created, upsetting and vitiating all deductions based on geographical distribution.

Glessula aborensis, n. sp.

Locality.—Abor Hills, five specimens (*Captain G. F. T. Oakes, R.E.*)

Shell elongately turreted, sides nearly straight, sculpture very regular striation, less apparent on the last whorl, colour dark chesnut brown in the typical shell, more ochraceous in others, spire attenuate, apex blunt, suture impressed. Whorls 8, sides flatly convex, aperture ovate, outer lip thin with strong convexity, columellar margin nearly straight, feeble, slightly truncated.

Size: major diameter 5·0, alt. axis 16·25 mm.

The species varies in form, some being less attenuate, but all have the blunt apex and similar sculpture.

Clausilia ios, Bs., var.

One specimen received similar to those found in the Dafla Hills.

Clausilia annandalei, Preston.

(Text-figs. 10 C-D).

This was described by Mr. H. B. Preston from Upper Rotung in the "*Records of the Indian Museum*," Vol. VIII, Pt. VIII, Nov. 1915, p. 538. I did not know until I received the part that any species of the genus were in his hands or how many examples he had to deal with, the type I find has gone back to Calcutta. I have two also from "Upper Rotung" (No. 6000) collected by Mr. Kemp, one of which is figured (text-fig. 10 D, side view) another single specimen (No. 5951) from Rotung, fig. 10 C. Among Captain Oake's shells was one specimen from Shimang. Fig. 10 D which though not so attenuate as 5951 is no doubt this species.

Clausilia aborensis, n. sp.

(Text-figs. 10 A, E, E1, E11).

Locality.—Abor Hills (*Captain G. F. T. Oakes, R.E.*)

Shell rimate, elongately fusiform, rather solid; sculpture close regular well-developed costulation; colour pale ochraceous in type,

pale ash in others; spire, sides convex, attenuate towards apex, somewhat tumid on the 3 last whorls; suture shallow; whorls 11, flatly convex; aperture ovate; peristome thickened, slightly reflected; palatal plicae are not visible externally, only one long plica below the suture. The clausilium I did not see in its true position, it fell out. It is very small, only 2·5 mm. in length, thickened, smooth, milky white, oblong, rounded at one end, subangulate at the other with a slight cleft. The side view (fig. 10 E1) shows it to be considerably curved elongately to fit into its place. Parietal folds fine and close together.

Size: major diameter 5·2, alt. axis 19·8 mm.

This is a variable species, one example having a much finer

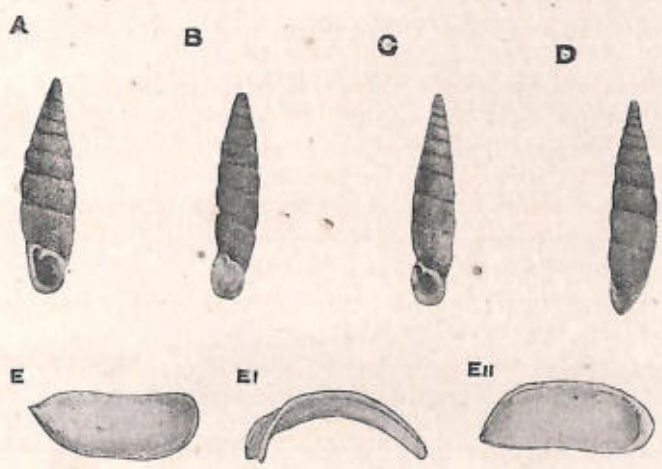


FIG. 10 A.—*Clausilia aborensis*, n. sp. × 1·5.
,, 10 B.— ,, *shimangensis*, n. sp. × 1·5.
,, 10 C.— ,, *annandalei*, Preston. × 1·5.
,, 10 D.— ,, ,, ,, × 1·5.
,, 10 E.—Clausilium of *C. aborensis*, convex side. × 9.
,, 10 E1— ,, ,, side view.
,, 10 EII— ,, ,, concave side.

attenuate spire and twelve whorls, reaching 22 25 mm. in length, while the smallest is 17·8 only.

Clausilia shimangensis, n. sp.

(Text-fig. 10 B.)

Locality.—Shimang, Abor Hills (*Captain G. F. T. Oakes, R.E.*)

Shell rimate, fusiform, turreted, sculpture regular close, strong costulation, colour pale ochraceous. Spire attenuate, with sides slightly convex. Whorls 9, really near twelve, apical lost, sides flat; aperture piriform, very slightly oblique, peristome very strong and reflected.

Size: major diameter 4·0, alt. axis 20 mm. (length allowed for tip of apex broken off).

Only two specimens obtained, one in the area lat. 28° 15′—29° 15′ and long. 94° 20′—95° 10′. There are other species yet to be collected and described judging from the immature shells received.

Paludomus aborensis, ? n. sp.

Locality.—Streams near Rotung, only one specimen recorded and that may not be a fully grown shell (*S. W. Kemp.*)

Shell elongately conical; sculpture fine, smooth surface with distant lines of growth; colour pale greenish-yellow with 3 strong bands below periphery of equal breadth in the largest specimen, in a smaller specimen three broad bands of dark madder, the centre one the broadest, on the three apicals they become blended together; spire high, tapering, apex acute; suture shallow; whorls 6, regularly increasing; aperture ovate; peristome thin; columellar margin slightly convex, not much thickened, operculum not preserved.

Size: major diameter 7·0, alt. axis 11·5 mm.

Said to be common in above locality.

This concludes the record of what is known up to the present of the landshells of the valley of the Brahmaputra both above its debouchement into the plain of Assam and the adjacent country. I have to thank Dr. N. Annandale for placing the museum collection in my hands, and again I have to thank all who were instrumental in bringing the collections together. Finally, the saddest task comes now of recording the death of Captain G. F. T. Oakes, R E., of the Indian Survey, on whom falls the credit of collecting a very large number of species. He died a soldier's death on the Western Front at Ovilliers de Boiselle when gallantly urging on his men to complete a communication trench. Captain Oakes was a most promising officer in the Survey Department and when employed for two field seasons in the Abor Hills, triangulated and mapped a very large area, carrying his survey some 100 miles up the course of the Brahmaputra, together with its great tributaries the Siyom, Shimang and Yamne.

His helping hand towards the Zoology of the North-East Frontier as far as the Mollusca is concerned was greater than I ever expected, and given with an earnest desire to help, shown in the many letters I received from him. My great and lasting regret is we never met, the war affecting the coming and going of everybody.

In bringing the record of the Abor land shells to an end it is satisfactory to feel that the expedition into that part of the Eastern Himalaya had added so very largly to the Molluscan Fauna of India. At the same time it has greatly increased the interest attaching to the distribution of Indian genera and species, as well as to what extent this is bound up with the Geographical and Geological features of the country. My survey work in the Assam Range and in the Eastern Himalaya has given me intimate know-

ledge of it as to make such investigation a task of intense interest. I have a map in preparation, for it is impossible without one to show all the subject brings with it.

[In reference to the note on page 600 of this volume the opportunity is taken to reproduce here the figures of *Bensonia aborensis* and *Rahula koboensis* described in the previous instalment (pp. 596 and 599) of Col. Godwin-Austen's account of the Abor Molluscs.—*Ed.*]

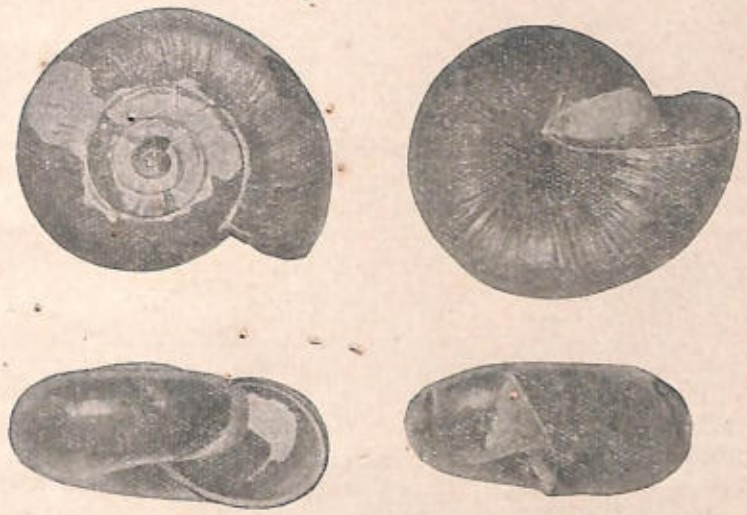


FIG. 1.—*Bensonia? aborensis*, n. sp., nat.-size (p. 596). (From photograph by Mr. J. Green).

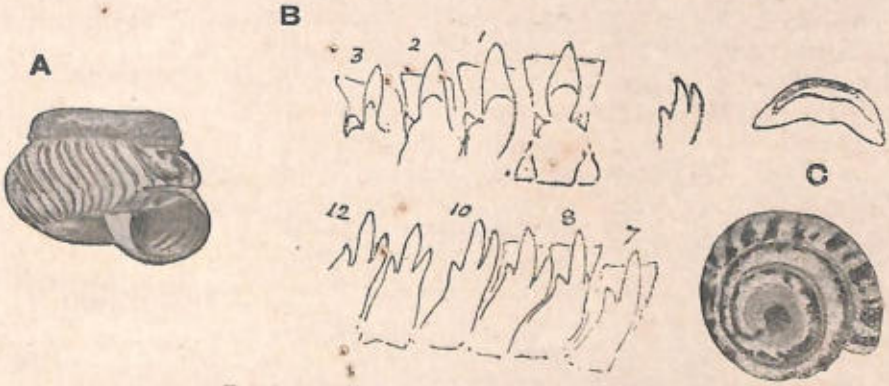


FIG. 3.—*Rahula koboensis*, n. sp. (p. 499).
A. Part of shell of animal dissected, × 12.
B. Portion of radula, × 1100; jaw, × 58.
C. The visceral sac, × 9.

L. COLEOPTERA, X: HYDROPHILIDAE.

By A. D'ORCHYMONT.

Dr. Kemp's collection of Hydrophilidae from the Abor country and the frontiers of Assam comprises 47 specimens and a dozen species, of which three are new to science. The determination of some of these has been attended with great difficulties, especially in the case of *Amphiops mirabilis* Sharp, which was first thought to be the same as Illiger's *Hydrophilus gibbus*. Some of the specimens under examination were sent in 1914 to Mr. Kolbe, Director of the Berlin Museum, for comparison with the unique type of that beetle, described in 1801. Owing to the war I have, however, only recently succeeded in obtaining the opinion of that entomologist.

Hydraena (s. str.) **dimorpha**, sp. nov.

H. oblongo-ovalis, parum convexa, supra sordide brunnea, palpis tarsisque pallidioribus, pronoto anteriore et posteriore, elytrorum marginibus rufescentibus; capite rugose punctato; pronoto rectangulato, longitudine latiore, antice attenuato, post medium sat abrupte excisis, margine anteriore sat profunde excisis vel sinuatis, lateribus pertenuissime crenulatis; elytris separatim rotundatis, angulis suturalibus dentatis, dense punctato-seriatis, punctis approximatis et quadratis, intervallis planis, margine (praeter ad apicem) leviter depresso. ♂: palporum maxillaribus articulis secundo tertioque (2° praecipue) ad apicem incrassatis et infuscatis, 4° interne obscure angulato.

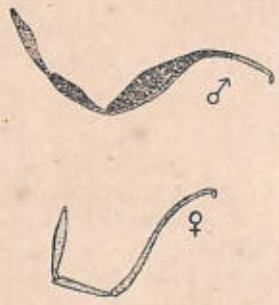
Type: Indian Museum, No. 2546/19, ♂, 1·5 mm., Dibrugarh, N.-E. Assam, Abor Expedition, 17–19·xi·1911 (*Kemp*). Found in small tanks.

The insect for which this name is proposed is in a decayed condition, which did not enable me to examine the underside; but I have no doubt of its being a male, on account of its thickened maxillary palpi.

Head not very distinctly punctured, of a rugulose and obscure sculpture, nearly black. Labrum deeply excised anteriorly, the two lobes slightly curled up in front. Maxillary palpi long, second joint very long and curved, third very much shorter (less than half), last joint a little longer than the third, acuminate.

Pronotum testaceous with a transverse blackened band in the middle going nearly from side to side, less attenuated before than behind, the sides without angulation, only rounded in the middle, but emarginate just before the nearly rectangular angles. Sides microscopically serrate. Punctuation very coarse even on the

sides. Lateral foveae conspicuous and joined together by a longitudinal impression. Anterior and especially posterior transverse impressions nearly effaced.



TEXT-FIG. 1.—*Hydraena dimorpha*, sp. nov. Maxillary palpi.

Elytra elongate with numerous coarse series of nearly quadrate punctures and an intercalate short sutural series, the series still indicated on the apex, intervals very narrow and not carinate; pubescence very short; sides explanate and lighter in colour, the apex separately rounded with the sutural angle produced to a microscopic tooth.

Male (fig. 1) with the second joint of the maxillary palpi very incrassate and infuscate on its second half, third joint also thickened towards the apex but to a lesser degree, last joint faintly angulate beyond middle on the inner side; the anterior border of the pronotum seems also more deeply emarginate in the male.

I have seen a cotype (♀) of this new species, No. 2990/19, from the same locality, taken on the same date also by Dr. Kemp. This form is very distinct from my newly described *H. indica* and from G. C. Champion's *H. bihamata*, *cirrata* and *maculicollis*, also from India.

Hydrochus annamita, Régimbart.

Eight specimens from Dibrugarh, N.-E. Assam, 17–19·xi·1911, in small tanks (Nos. 2547/19 and 2549/19), have been so labelled on comparison with Régimbart's description. According to this author the species is somewhat variable; in the beetles before me the punctures of the elytra appear to be less polyhedric and the interspaces less narrow, as noticed in the typical specimens from Annam.

Hydrochus ? binodosus, Motschulsky.

On account of the general form and of the hind tubercle on the 5th interspace, I should refer to this name one specimen (No. 2548/19) captured in small tanks at Dibrugarh, N.-E. Assam, Abor Expedition, 17–19·xi·1911 (*Kemp*). But the femora are of a light colour, infuscated on the knees, instead of "presque noires," as Motschulsky says of his species. Motschulsky's forms (*violaceomicans*, *opacus* and *binodosus*) are from the "East Indies" without other indication; no author has met with them since the time they were too briefly described in 1860 and they are therefore insufficiently known. As to the two first species (*H. violaceomicans* and *opacus*) they must be closely allied, if not identical, with Nietner's *H. lacustris* of 1897. Judging from the description, the same may be said of Fairmaire's *latitans* (1888) from Tonkin.

Coelostoma stultum, Walker.

One specimen (No. 4145/19) measuring $4\frac{1}{2} \times 2\frac{3}{4}$ mm. from Dibrugarh, N.-E. Assam, 17–19·xi·1911 (*Kemp*), differs from the normal *C. stultum* from India, Indo-China, Java and Borneo, in the punctuation of the upper surface being finer and less dense and in the femora and epipleura being rather black and not as usual of a very obscure red. The ventral segments are conspicuously red-spotted on the sides. Otherwise it has the narrow scutellum and long tarsi of *C. stultum* and the first joint of the intermediate tarsi is also much more elongate than the second. It is perhaps a slight variety of that wide-spread species.

Coelostoma horni, Régimbart.

Under stones on the bank of the Dihang River, Janakmukh, 17·xii·1911 (600 feet), one specimen was found (No. 4152/19) with the sides of the elytra more coarsely punctured than is usually the case in individuals examined from Ceylon.

I have ascertained myself by comparison with the type in the Paris Museum that the species is a good one, at least not the same as *C. orbiculare* F. It belongs to an aberrant and hitherto unnoticed series, of which there are more, with the intermediate femora very densely and closely clothed beneath with silky hairs (not disjoined setae and brilliant interspaces as in *C. orbiculare*), first ventral segment carinate and prosternal process toothed anteriorly. The claws of the tarsi have a tooth-like process on the base. Neither of these important characters were noted in the original description, the specimen having apparently not been examined from the ventral side, as it was glued to cardboard. Otherwise, and superficially, *C. horni* is very like *C. stultum*, but smaller, having also the maxillary palpi of a clear yellow colour.

Dactylosternum hydrophiloides, MacLeay.

Dr. Kemp has obtained a good series of this pretty common Indo-Malayan species at Rotung (1400 feet), 28·xii·1911, under bark (Nos. 2592-2605/19), and one example (No. 2606/19) at Sadiya, N.-E. Assam, 27·xi·1911, under a dead plantain tree.

Paromicrus annandalei, d'Orchymont.

Ann. Soc. Ent. Fr. LXXXVIII, p. 130 (1919).

Oblongo-ovalis, postice sat angustatus, sat convexus, nitidus, rubro-ferrugineus, haud infuscatus; capite prothoraceque sat dense perminutissime punctulatis, hoc lateribus vix et angustissime explanatis; elytris postice stria suturali tenui munitis, lateribus undique angustissime explanatis, decem seriatim punctatis, seriebus posterioribus parum impressis, intervallis fere planis, secundo primo tertioque haud latiore, intervallo quoque serie punctulorum minutorum munito; mesostiti parte elevata aream rhomboidalem, elevatione longitudinali tectiformi instructam, formante.

Type: Indian Museum, No. 3273/19, 1× 0·7 mm., Rotung, Abor Expedition, 26·xii·1911, 1400 feet (*de Courcy*), unique.

This species, the very smallest known, was included by me in the table of the genus I published in 1919. It is of a reddish ferrugineous colour and can be distinguished from all the forms described, not only by the very small size, but also by the mesosternal process being longitudinally and highly tectiform throughout its whole length. The elytra are narrowly laminate and dilated on their sides, also the sides of the pronotum, the lamination being here, however, still more narrow. The 10 elytral series of tolerably coarse punctures are not impressed, the inner one being only a trifle deeper towards the apex, near the very shortened sutural stria or rather sutural impression. The punctuation of the interstices is nearly as coarse as the principal one, forming a single row on each interstice (secundar series).

Form oblong-oval, narrowed behind and moderately convex. The head and pronotum are devoid of the transversely impressed scratches found in other species and the interstices between the very microscopic punctures are shining (69 diameters).

Helochares (Hydrobaticus) lentus, Sharp.

One specimen of this common species was met with by Dr. Kemp in small tanks at Dibrugarh, N.-E. Assam, 17–19·xi·1911 (No. 4141/19).

A second individual of smaller size and with the punctuation of the pronotum coarser and more densely distributed seems to belong to a variety of it. A similar specimen in my collection (Cochinchine) has been seen by Régimbart and named by him *H. lentus* var?

Helochares (s. str.) kempi, sp. nov.

Parvissimus, subdepressus, obscure niger, limbo elytrorum anguste prothoracisque aliquantum latius rufo, capite utrinque ante oculos translucide ac rufescenter maculato; palpis mediocribus cumque genibus, tibiis et tarsis rufis; palporum maxillaris ultimo articulo penultimo aliquantum longioribus; supra subtiliter punctatus. Elytra sine striae. Mentum evidenter excavatum. Subtus niger; segmenti ultimi marginis posterioris perparvule excisis.

Type: Indian Museum, No. 4148/19, 2 mm., Yembung, Abor Expedition, 1100 feet, 19·i·1912 (*Kemp*).

Three specimens of this very interesting species were secured at Yembung, on the banks of a stream, under stones. It is the smallest insect of the genus, having the appearance of a *Limnebius*, readily distinguished by the deep black colour, much polished surface, lack of striae and of mesosternal carina and also by the very minute and ciliated notch on the extremity of the 5th ventral segment. The last joint of the maxillary palpi is, however, a little longer than the preceding one, this character being generally the

opposite in the genus *Helochares*. I believe this species to be not closely allied to any other of the group.

Head with closer and deeper punctuation than on the pronotum, distinct impressed antenno-frontal and backwards disappearing sagittal sutures. Gular sutures broadly separated. Prefrons red on each side, with slightly emarginate and microscopically striolate anterior margin, a group of a few coarser antero-external systematic punctures and any dispersed intraocular ones along the antenno-frontal suture. Labrum very broadly transverse, slightly emarginate, with microscopically striolate surface and very irregularly placed punctures. First joint of antennae not very long, 2nd pyriform, a little shorter, 3rd to 5th becoming regularly broader, 4th very small, 6th subhemispherical, supporting the three-jointed pubescent club, 7th and 8th of equal size, 9th ovoid and much larger. Maxillary palpi of moderate length, a little longer than the antennae, not darkened at the apex, length of joints in the proportion of 1/12, 1, 9/12, 10/12; 2nd joint thickened on the apex, straight on the anterior convex on the posterior margin, 3rd obconic, 4th thickened in the middle, cut off at the apex and slightly 'longer' than the preceding one. Mentum polished, with dispersed and irregularly disposed punctures, much excavated in front.

Pronotum of a deep black colour, with both sides red-margined, anterior angles rounded, posterior more angular. Antero-external systematic series of coarser punctures placed near the anterior margin, straightened obliquely to the anterior angle and then abruptly turned backwards along the external margin so as to reach the little medio-external group. Scutellum a little longer than wide with curved sides and very faint punctures. Elytra not enlarged behind, punctured like the pronotum without sutural or transparent striae, deep black, only very narrowly red-margined. There are three regular discal series of very largely separated and anteriorly effaced systematic punctures, also an exterior one more prolonged on the front margin and a little more furnished with punctures. Exterior margin provided with irregularly placed coarser punctures.

Underside black, finely pubescent on the whole surface except an unpunctured and shining oblong spot on the metasternum, just before the posterior coxae. Thighs all pubescent except on the knees, which are of the same red colour as the trochanters, tibiae and tarsi. Claws with a faintly toothed process on the base.

Helochares (s. str.) **minutissimus** (? Kuwert, 1890).

Régimbart, *Ann. Soc. Ent. Fr.* LXXII, pp. 27, 94, 339 (1903).

A single ♂ of the species taken by Dr. Kemp in small tanks at Dibrugarh, N.-E. Assam, 17–19·xi·1911 (No. 4147/19).

I have compared this beetle with a large series in my cabinet —Pondichery and Genji, viii·1901—and am not able to point out differences. This series was named by Régimbart who referred the

examples to *H. minutissimus* Kuwert. I am, however, not quite sure that he was correct in his identification for I do not detect traces of the nitid and oblong hairless spot alluded to by Kuwert on the metasternum just before the hind coxae. This character is, I believe, not a sexual one for I have examined the underside of several of my specimens and of those from the Abor collection also, both males and females; all have this part of the body densely pubescent. *H. minutissimus* Kuw was captured in Arabia or Syria and is said to have the head "piceo-nigro" and the scutellum oblong. The species known by Régimbart, widely spread over Hindustan and Indo-China, has a rather rufescent head with a faint obscure tinge and a triangular scutellum. The prostitum and the mesosternellum show a very flat swelling in the middle, before the coxae, and the last abdominal ventral plate is provided with the usual little ciliate emargination on its posterior margin. Assuming Kuwert was right in his description, the Indian species would perhaps be undescribed. Unfortunately I cannot elucidate the question as I have not seen typical specimens, nor have I been able to compare Indian and Syrian specimens.

The ♂ is of a narrower shape than the ♀, with elytra not so strongly dilated behind the middle.

Sternolophus (Neosternolophus) tenebricosus, Blackburn.

One specimen captured by Dr. Kemp at Dosing, 1400 feet, on the Shimang River, 25·i·1912 (No. 4153/19)

Amphiops mirabilis, Sharp.

Several individuals taken at Dibrugarh, N.-E. Assam, on the 17–19·xi·1911, by Dr. Kemp are referred to this species. They were first thought to belong to *A. gibbus* Illiger, but Mr. Kolbe to whom I sent specimens for comparison with the unique type, has written me that the Dibrugarh specimens are not the same. The type of *A. mirabilis* (Ceylon), being unique also, has not been accessible; but a specimen (No. 10678) from Ceylon (typical country) sent by Mr. Kolbe seems to belong to it. And, indeed, the punctuation of the upper surface is coarser than in the cotype I have seen of *A. pedestris* Sharp, the most nearly allied species; the punctures of the interstices are as coarse as the serial ones and mixed on the sides with numerous finer and smaller punctures. This occurs also in the Dibrugarh material, in a specimen from Tonkin (Dap Can) and another from Sumatra (Palembang). The finer punctures are absent in the variety *variolosus* Régimbart (cotype in my cabinet) and most of the *mirabilis* specimens seen (India: Mandar, Konbir, Belgaum; Tonkin: Dap Can; China: Tsing tau; Java: Malang). *A. variolosus* is said to be differentiated by the very coarse punctuation of the elytra, serial and interstitial punctures being of one size, very large and deep. Nevertheless, I think *variolosus* must not be separated from *mirabilis*. The

latter has the same short form as *A. pedestris* and will perhaps in future prove to be only a variety of *A. gibbus* Illiger. A specimen from Burma (*coll. Andrewes*) of great size ($3\frac{1}{2} \times 2\frac{3}{10}$ mm.), seen by Régimbart ("*amphiops* sp. prope *mirabilis*") has been also compared by Mr. Kolbe who reports: "dem *Amphiops gibbus* sehr ähnlich." I also think it may be *gibbus*. The punctuation of the pronotum is more obsolete (perhaps because of the greater size), the interstices of the elytra very shining, on the apex without the finer punctuation of *pedestris*. I could not detect other differences. It is impossible, however, not to feel some doubt in the determination of these difficult insects and a thorough revision with access to all typical material would be desirable.

I take this opportunity of describing a form which has come to light in my study of the Dibrugarh material.

Amphiops pedestris var. **varians**, nov.

Type: a specimen in my cabinet, from Pondichéry, Coromandel, June, 1901 (*M. Maindron*). Determined by Régimbart as *A. mirabilis*.

Differs from typical *A. pedestris* in the shorter, more highly convex body, the punctuation of the sides of the elytra, the serial and interstitial punctures being nearly of one size, but less distinctly mixed together with very fine smaller punctures, the disc of the elytra round the scutellum rather more obsoletely punctured, more shining and smoother, the series of large punctures more effaced before the base, even at a distance from the scutellum. The interstice between the 1st and 2nd internal (visible) series of larger punctures is nearly as wide on the base as the sutural interstice (because of the obliteration of a series and of the interstitial punctures) and the size is generally smaller. Colour more rufescent. The variety seems to be common: there is a long series in the Brussels Museum from Mandar (Bengal) and Konbir (*R. P. Cardon*).

This is most probably the form named *pedestris* in *Ann. Soc. Ent. Fr.* 1903, p. 62, by Régimbart, who seems not to have correctly known Sharp's *A. pedestris* and *mirabilis*.