

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-aeneis, 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 labeling 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. *Anthrribus 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.

Étroit, 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 ♀, subparallèles, 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. ECACANTHOTHIRIPIDAE, 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 (Mentawai) 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 ($\frac{2118}{19}$). 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 decom-
 posing 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 kemp*i, 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: RATHOUIIIDAE.

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 aborensis*.

### ***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 :—

|                                                                                                            | I    | 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.

##### *I 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 unstriated 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 Gieson'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 Gieson'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 mulberry-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 retractor 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 visceropleural 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.

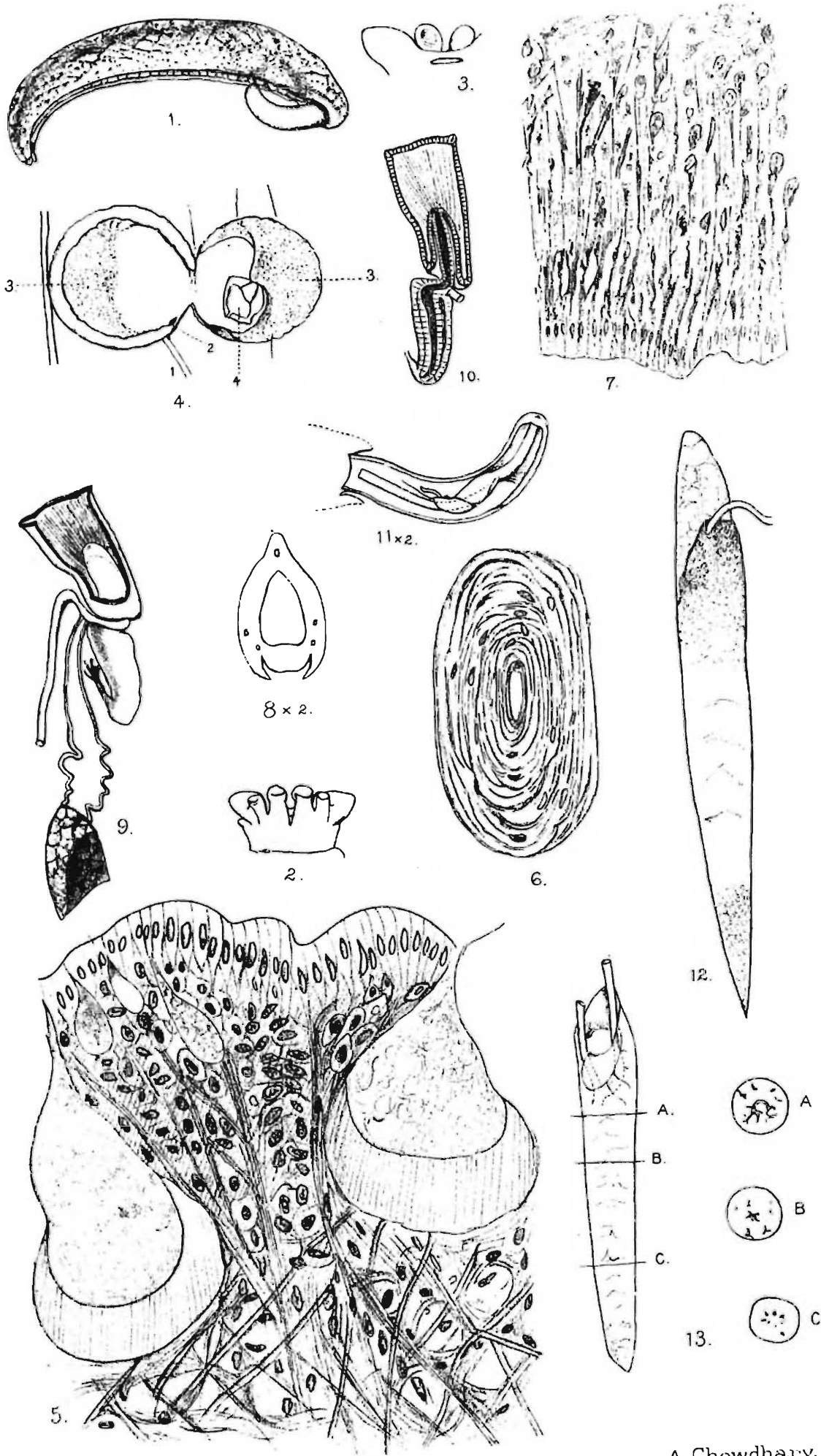
In addition to the literature mentioned in my last paper "On the Anatomy of *Atopos (Podangia) sanguinolenta* (Stol. MS.), the following papers were also consulted:—

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., "Über das Vaginuliden genus *Atopos* n.g." Zeit. f. Wiss. Zool., 1891, Bd. iii, pp. 593—616.

## EXPLANATION OF PLATE X.

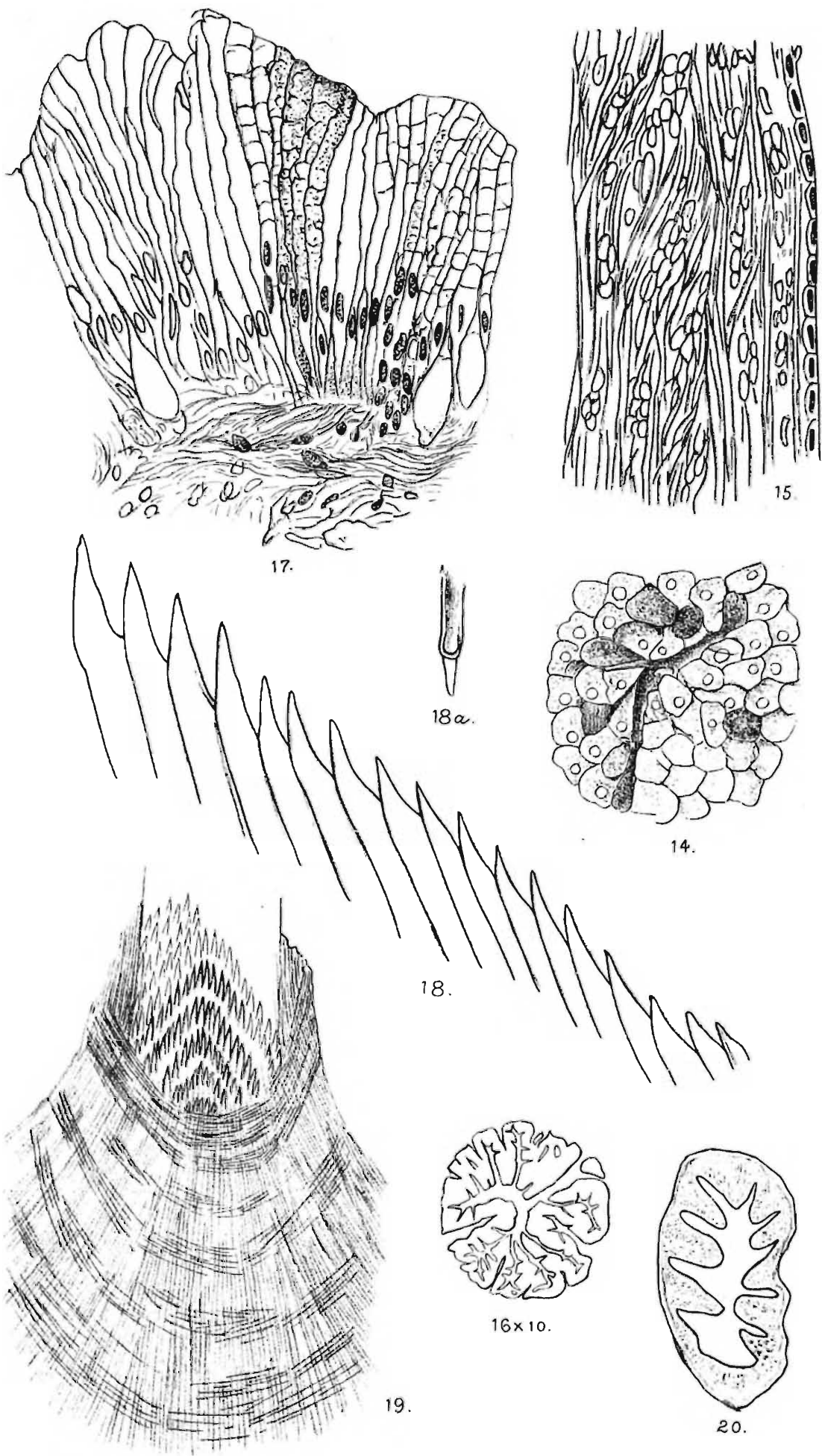
- FIG. 1.—*Atopos (Podangia) kempii* (nat. size).  
,, 2.—Head of the animal, dorsal view,  $\times 2$ .  
,, 3.—Head of the animal, ventral view,  $\times$  about 4.  
,, 4.—Pallial complex,  $\times 2$ ; the right half of the figure is shown to be reflected outwards with the mantle wall 1, rectum; 2, pulmonary aperture; 3, kidney; 4, ventricle.  
,, 5.—Transverse section of a portion of body-wall,  $\times 230$ .  
,, 6.—Transverse section of the blood sinus under the keel,  $\times 51$ .  
,, 7.—Transverse section of a portion of foot,  $\times 103$ .  
,, 8.—Transverse section of the body through the middle,  $\times 2$ .  
,, 9.—Proboscis, proboscis sheath and radular sac with salivary glands and their ducts,  $\times$  about 10.  
,, 10.—Diagrammatic longitudinal section of the proboscis and its sheath,  $\times$  about 10.  
,, 11.—Longitudinal section of the protruded proboscis,  $\times 2$ .  
,, 12.—Liver and salivary glands, dorsal view,  $\times 2$ .  
,, 13.—Liver, ventral view (of the smaller specimen),  $\times 2$ : *a*, *b* and *c* are transverse sections at different parts of the organ, shown by lines in the same.



## EXPLANATION OF PLATE XI.

### *Atopos (Podangia) kempii.*

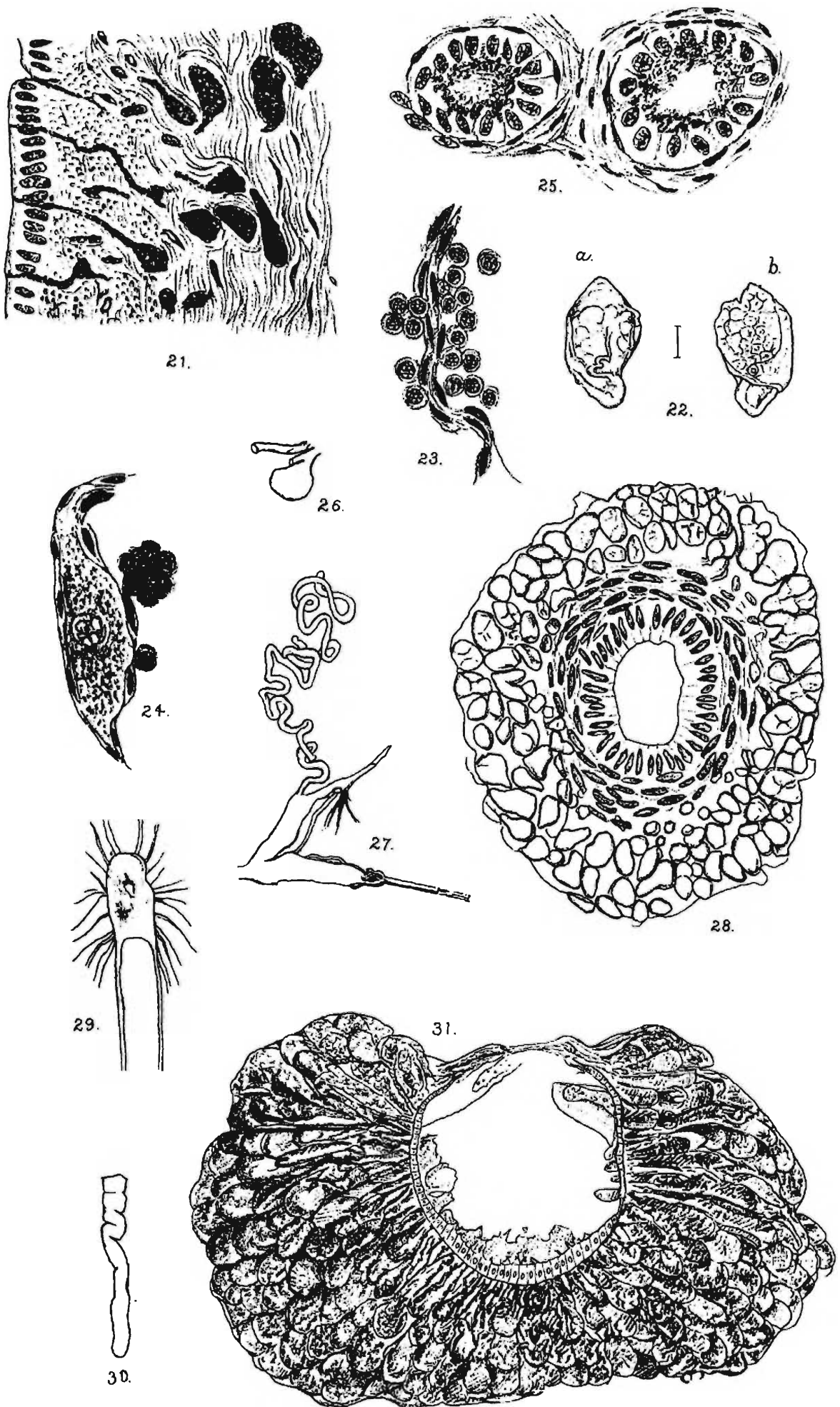
- FIG. 14.—Section of a portion of salivary gland,  $\times 103$ ; the figure shows the formation of the primary lobular duct.
- „ 15.—Transverse section of the wall of the proboscis,  $\times 103$ .
- „ 16.—Transverse section of the liver,  $\times 10$ .
- „ 17.—Transverse section of a portion of liver,  $\times 460$ .
- „ 18.—Teeth of radula (of one side),  $\times 460$ .
- „ 18a.—A tooth of radula,  $\times 230$ .
- „ 19.—Anterior portion of the radula.
- „ 20.—Transverse section of intestine,  $\times 15$ .



## EXPLANATION OF PLATE XII.

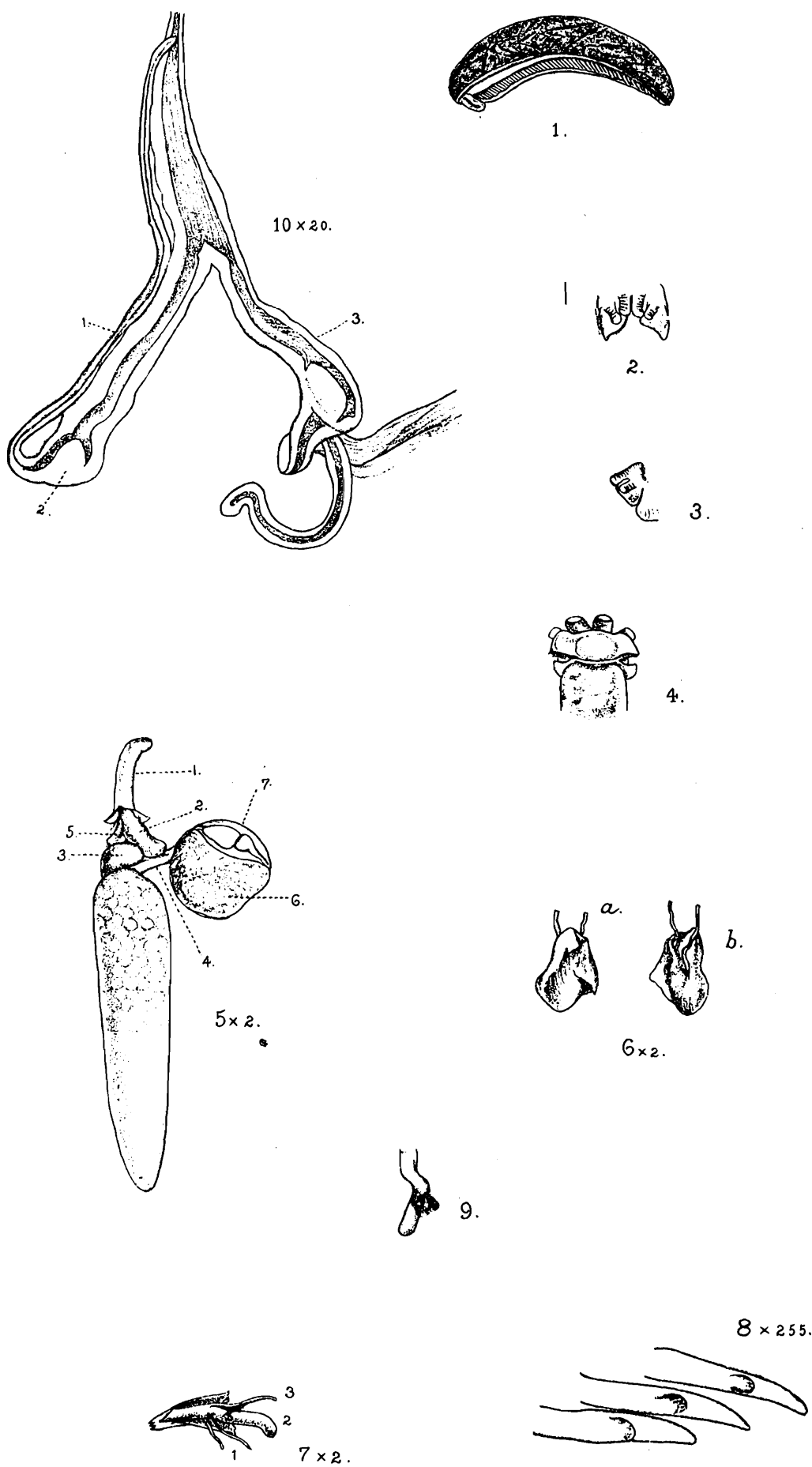
### *Atopos (Podangia) kempii.*

- 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.



### 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,  $\times 2$ : *a*, dorsal view; *b*, ventral view.  
,, 7. Pharynx (side view),  $\times 2$ : 1, salivary ducts; 2, radular portion of the pharynx; 3, oesophagus.  
,, 8. Three teeth of radula,  $\times$  about 255.  
,, 9. Pedal gland,  $\times 2$ .  
,, 10. Male genital organ,  $\times$  about 20: 1, flagellum; 2, penis; 3, right Simrothian gland.



## 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*"<sup>1</sup> spp. in Sumatra,<sup>2</sup> 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 collection 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*,<sup>3</sup> 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.

---

<sup>1</sup> i.e. *Potamon* of recent monographs.

<sup>2</sup> 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.

<sup>3</sup> A new species shortly to be described by Mr. Kemp in this volume.

Sukli, eastern side of hills, ca. 2100 ft., 22—29-  
XI-II.

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.

## LIST OF LITERATURE REFERRED TO.

1870. Philippi, R. A.—“Ueber *Temnocephala chilensis*”  
*Archiv f. Naturg.* XXXVI, 1870, pp. 35-40, pl. i.
1872. Semper, C.—“Zoologische Aphorismen. II, Ueber die  
Gattung *Temnocephala* Blanchard.” *Zeitschr. wiss  
Zool.* XXII, 1872, pp. 307-310, pl. xxiii.
1875. Wood-Mason, J.—“Note on the Geographical Distri-  
bution of the *Temnocephala chilensis* of Blanchard.”  
*Ann. Mag. Nat. Hist.* (4) XIV, 1875, pp. 336-7.
1887. Haswell, W. A.—“On *Temnocephala*, an Aberrant  
Monogenetic Trematode.” *Q. J. M. S.* (n. s.) CIX,  
1887-8 (1888), pp. 279-302, pl. xx-xxii.
1890. Weber, M.—“Über *Temnocephala* Blanchard.” *Zoolo-  
gische Ergebnisse eines Reise in Niederlandisch Ost-  
Indien* I, Leiden 1890-1, pp. 1-29, pl. i-iii.
1891. Vayssiere A.—“Étude sur le *Temnocephala*, parasite  
de l'*Astacoides madagascariensis*.” *Ann. Faculte  
Sci. Marseille* II, 1891, pp. 77-99, pl. i.
1912. Annandale, N. “Fauna Symbiotica Indica, IV, *Cari-  
dinicola*, a new type of *Temnocephaloidea*.” *Rec.  
Ind. Mus.* VII, 1912, pp. 243-252, 2 text-figs.
1913. Merton, H.—“Die weiblichen Geschlechtsorgane von  
*Temnocephala*.” *Zool. Anz.* XLI, 1913, pp. 413-  
421, text fig.



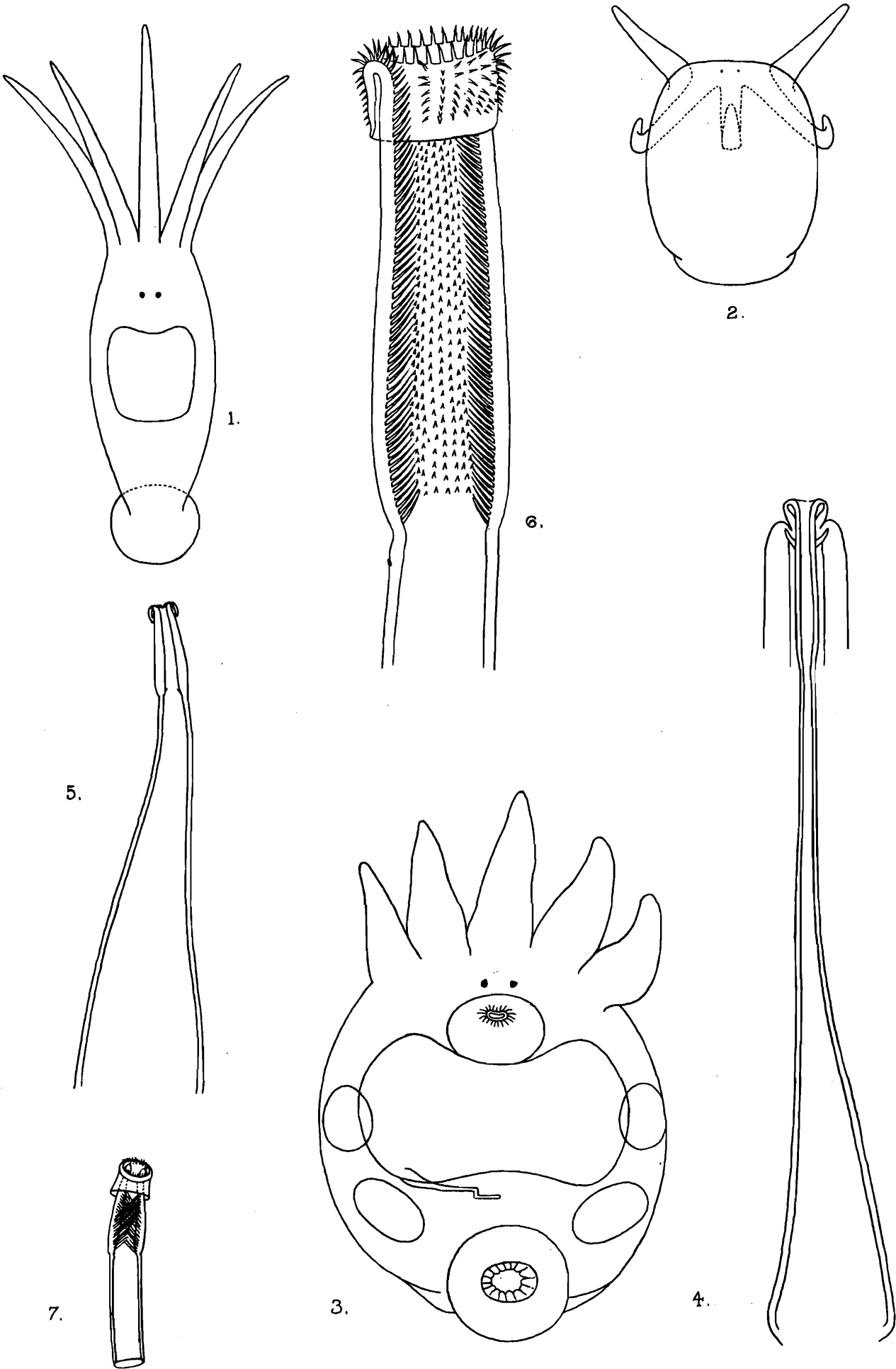
## EXPLANATION OF PLATE XIV.

### *Temnocephala semperi.*

- FIG. 1.<sup>1</sup>— A specimen fully expanded, from above, much magnified.
- „ 2.<sup>1</sup>— 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,  $\times 30$ .
- „ 4. — Penis of a similar specimen,  $\times 210$ .
- „ 5. — Penis of a normal full-grown specimen,  $\times 210$ .
- „ 6. — Distal portion of penis of the same specimen,  $\times 1080$ .
- „ 7. — Penis of a very young specimen,  $\times 210$ .

---

<sup>1</sup> I am indebted to Mr. Kemp for these two figures.



D. Bagchi, 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  $\frac{1}{4}$  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  $1\frac{1}{4}$  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 antennae 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 the 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 long as broad) and in the darker colouration.

#### Subfamily MYRMICINAE.

##### 11. *Sima rujonigra*, 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 *Analeus* (*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 lacvissima*, 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. lenuicornis* 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

By B. L. CHAUDHURI, B.A., B.Sc. (Edin.), F.R.S.E., F.L.S.,  
Assistant Superintendent, Indian Museum.

(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 lumta* (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. *Cirrhhina 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. *Saccobranhus 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 fontanelle 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 kempī*, sp. nov.**

(Pl. vii, figs. 1, 1a, 1b.)

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 side 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, 2a, 2b.)

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,  $\frac{21}{24}$  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.  $\frac{77.42}{1}$ ); in the other, barbels are present as usual.

***Labeo dyochilus* (McClell.).**

Yembung.

***Cirrhinus 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, 1a, 1b.)

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, 2a, 2b.)

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, 1a, 1b.)

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 17, 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, 2a, 2b.)

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, 3a, 3b.)

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.**

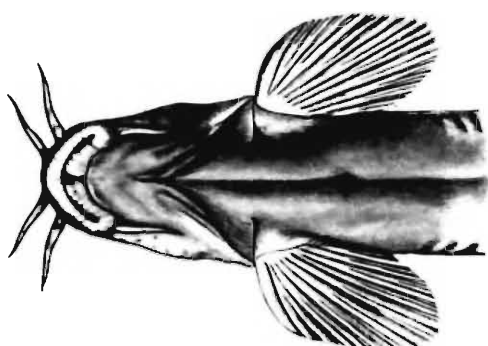
Dibrugarh.



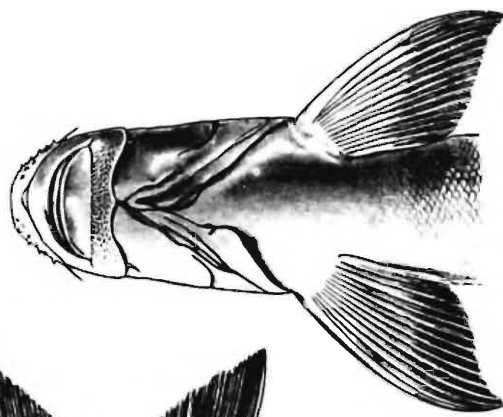
EXPLANATION OF PLATE VII.

FIG. 1.—*Aborichthys kempi*, gen. et sp. nov.

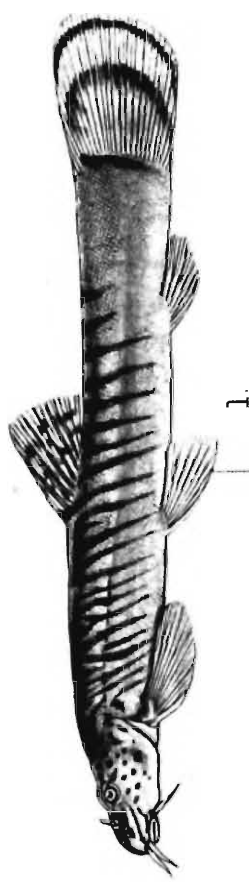
- |   |      |                                                               |   |                                               |
|---|------|---------------------------------------------------------------|---|-----------------------------------------------|
| „ | 1a.— | „                                                             | „ | dorsal view of head, $\times 1\frac{1}{2}$ .  |
| „ | 1b.— | „                                                             | „ | ventral view of head, $\times 1\frac{1}{2}$ . |
| „ | 2.—  | <i>Oreinus molesworthi</i> , sp. nov., $\times \frac{2}{3}$ . |   |                                               |
| „ | 2a.— | „                                                             | „ | dorsal view of head, $\times \frac{2}{3}$ .   |
| „ | 2b.— | „                                                             | „ | ventral view of head, $\times \frac{2}{3}$ .  |



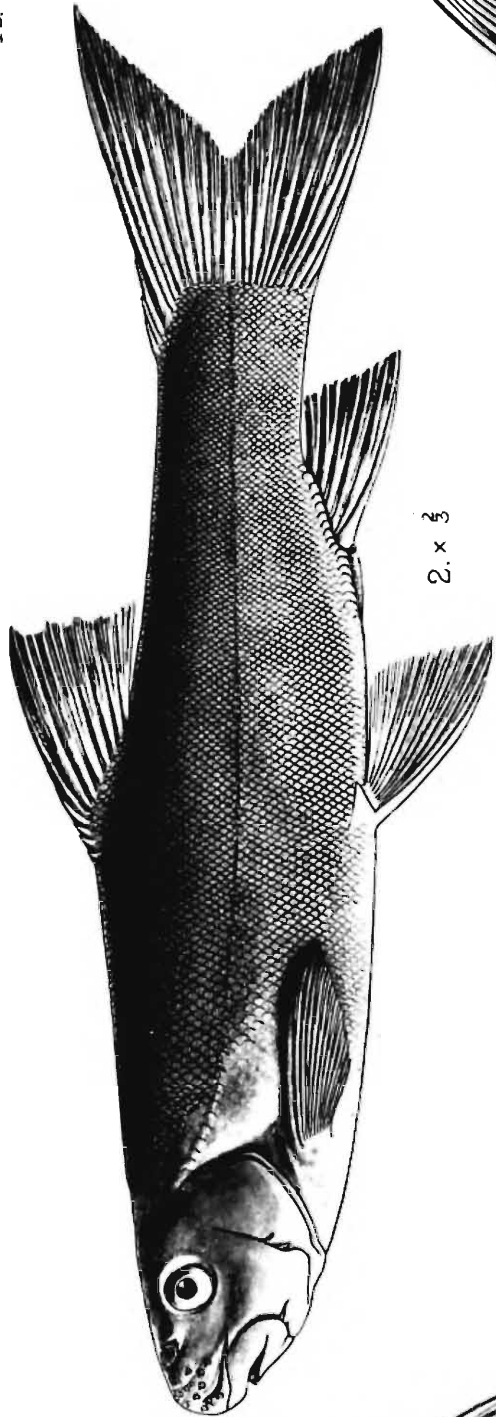
1b x 1 1/2



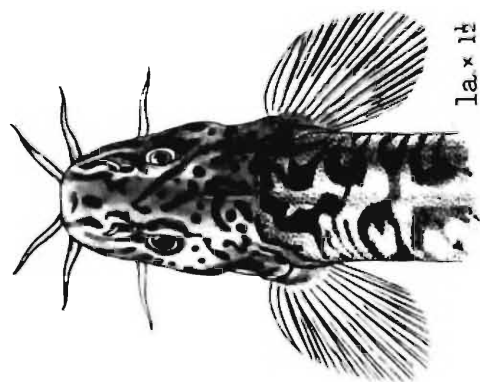
2b x 3



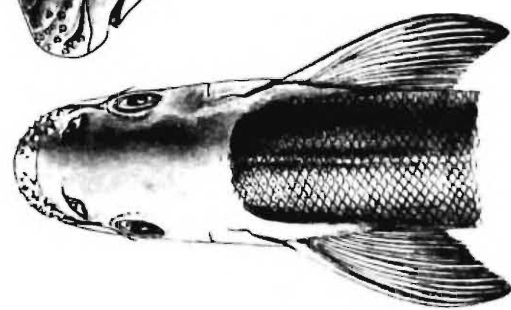
1.



2. x 3



1a x 1 1/2

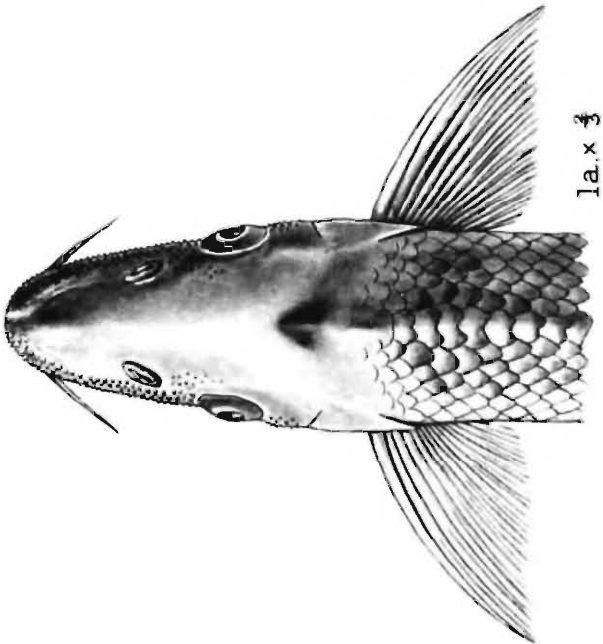
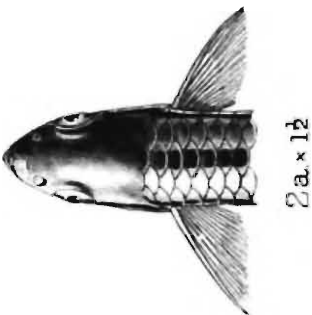
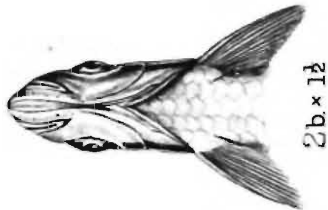
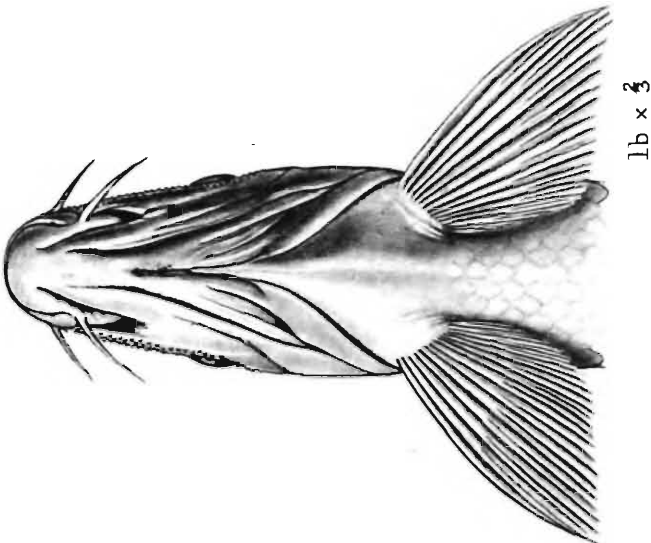
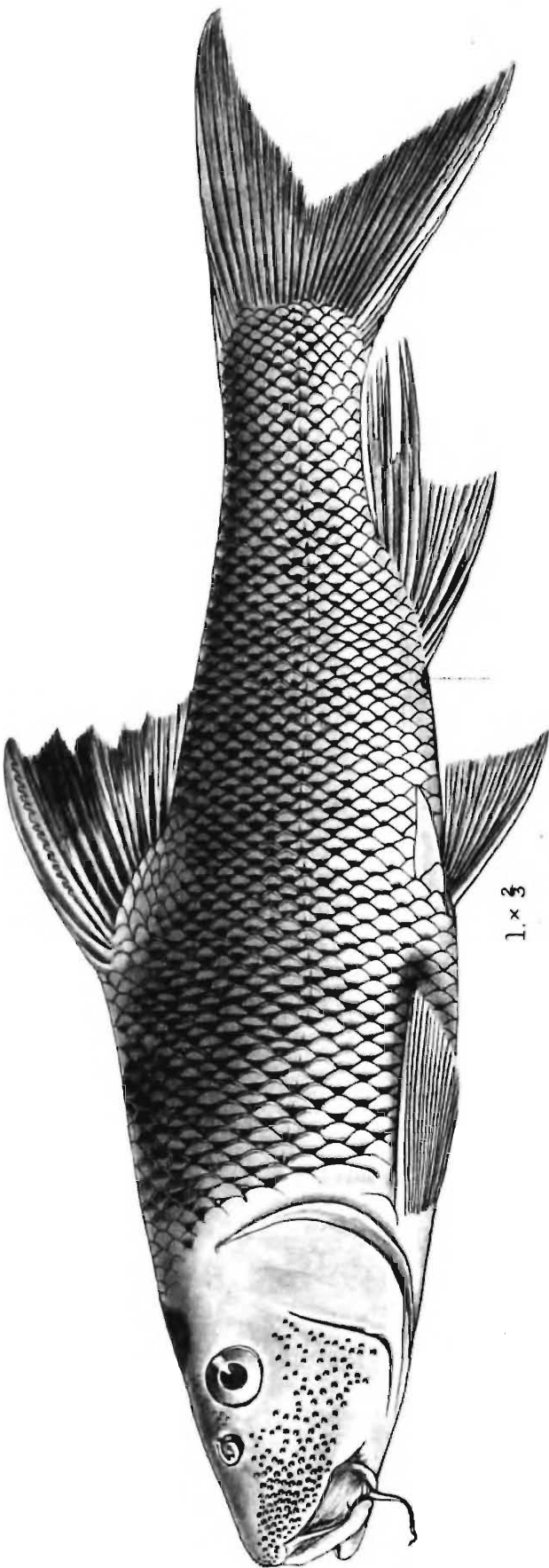


2a x 3

ABOR FISH.

EXPLANATION OF PLATE' VIII.

- FIG. 1.—*Barbus spilopholus*, McClell.,  $\times \frac{2}{3}$ .  
,, 1a.—,, ,, dorsal view of head,  $\times \frac{2}{3}$ .  
,, 1b.—,, ,, ventral view of head,  $\times \frac{2}{3}$ .  
,, 2.—*Rasbora rasbora* (H. B.) var. *kobonensis*, nov.  
,, 2a.—,, ,, ,, dorsal view of head,  $\times 1\frac{1}{2}$ .  
,, 2b.—,, ,, ,, ventral view of head,  $\times 1\frac{1}{2}$ .

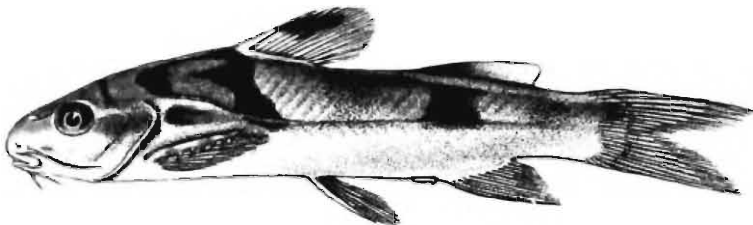


ABOR FISH.

EXPLANATION OF PLATE IX.

FIG. 1. —*Macrones merianiensis*, sp. nov.

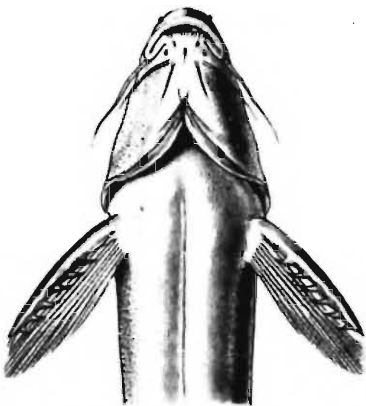
- „ 1a.— „ „ dorsal view of head,  $\times 1\frac{1}{2}$ .  
„ 1b.— „ „ ventral view of head,  $\times 1\frac{1}{2}$ .  
„ 2.—*Macrones montanus* var. *dibrugarensis*, nov.  
„ 2a.— „ „ „ dorsal view of head,  $\times 1\frac{1}{2}$ .  
„ 2b.— „ „ „ ventral view of head,  $\times 1\frac{1}{2}$ .  
„ 3.—*Moringua hodgarti*, sp. nov.  
„ 3a.— „ „ upper jaw,  $\times 3$ .  
„ 3b.— „ „ lower jaw,  $\times 3$ .



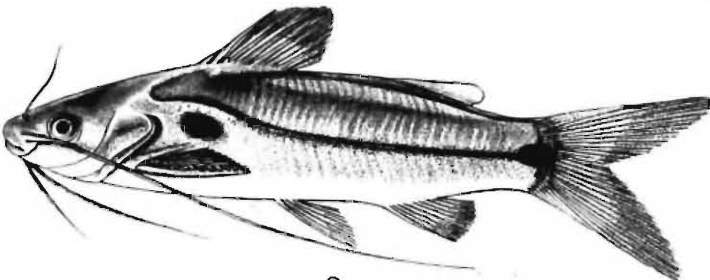
1.



1a. x 1½.



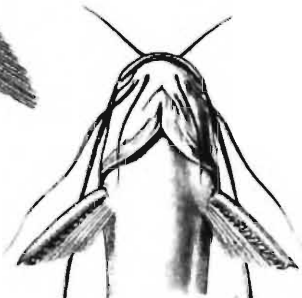
1b. x 1½.



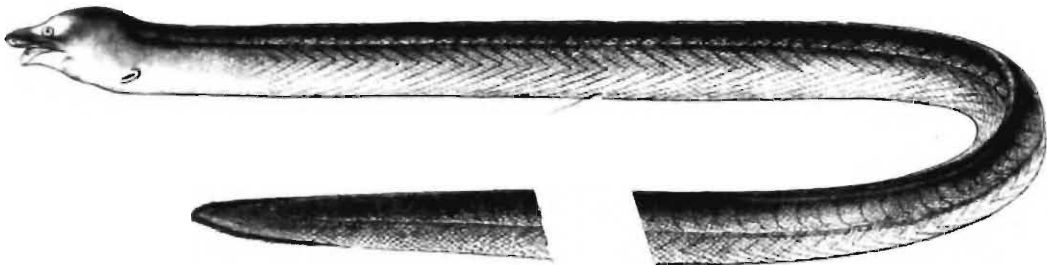
2.



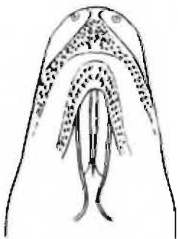
2a.



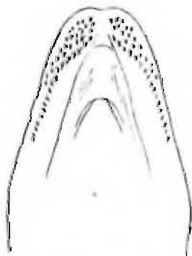
2b.



3.



3a. x 3.



3b. x 3.

## 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 cinnamomeoventris* which shows an approach to *S. neglecta*.

The specimens obtained of the genera *Megalaema* and *Cyanops*, *Pitta*, *Myophonus* 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. vii, p. 454.

(a) Not 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, 18-1-12. 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 Pyajo, 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 CETHIIDÆ.

39. *Certhia discolor* (Blyth).

O. and B., vol. i, p. 331.

(a) ♀, Upper Rotung, 6-i-12. I.M. No. 25324.

## Family SYLVIIDÆ.

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 trailii* (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 kempí*, 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 aurea 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. *Cittocinclla 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. *Uroloncha 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 Bharno. 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 con-colourous 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. 25284.

(b) ♀, Yembung, 1100 ft., 19-ii-12. I.M. No. 25294.

(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.*III. **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.

~~~~~

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 Daffa 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 paper¹ 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 maxilliped 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:—

I. 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

aboreense, 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*) aborens, 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. oblitteratum*, 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 epigastriac 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 hill-side; 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, 9a.)

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. oblitteratum* 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. 9a); 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. 8147).

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 fresh-water 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. supercili- osum* 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. *Paratetphusa 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 anterolateral 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 *Paratelpusa*, Milne-Edwards.

Sub-genus *Barytelpusa*, Alcock.

Paratelpusa (*Barytelpusa*) *harpax*, Alcock.

1910. *Paratelpusa* (*Barytelpusa*) *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.					Merus.	Carpus.	Dactylus.
			Length of merus.	Length of carpus.	Length of propodus.	Length of 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. $\frac{8139-41}{10}$, $\frac{8143-4}{10}$), and in the Egar stream between Renging and Rotung ($\frac{8142}{10}$, $\frac{8145-6}{10}$).

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 ($\frac{8165-6}{10}$), 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. $\times$.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. $\frac{8159}{10}$), 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.

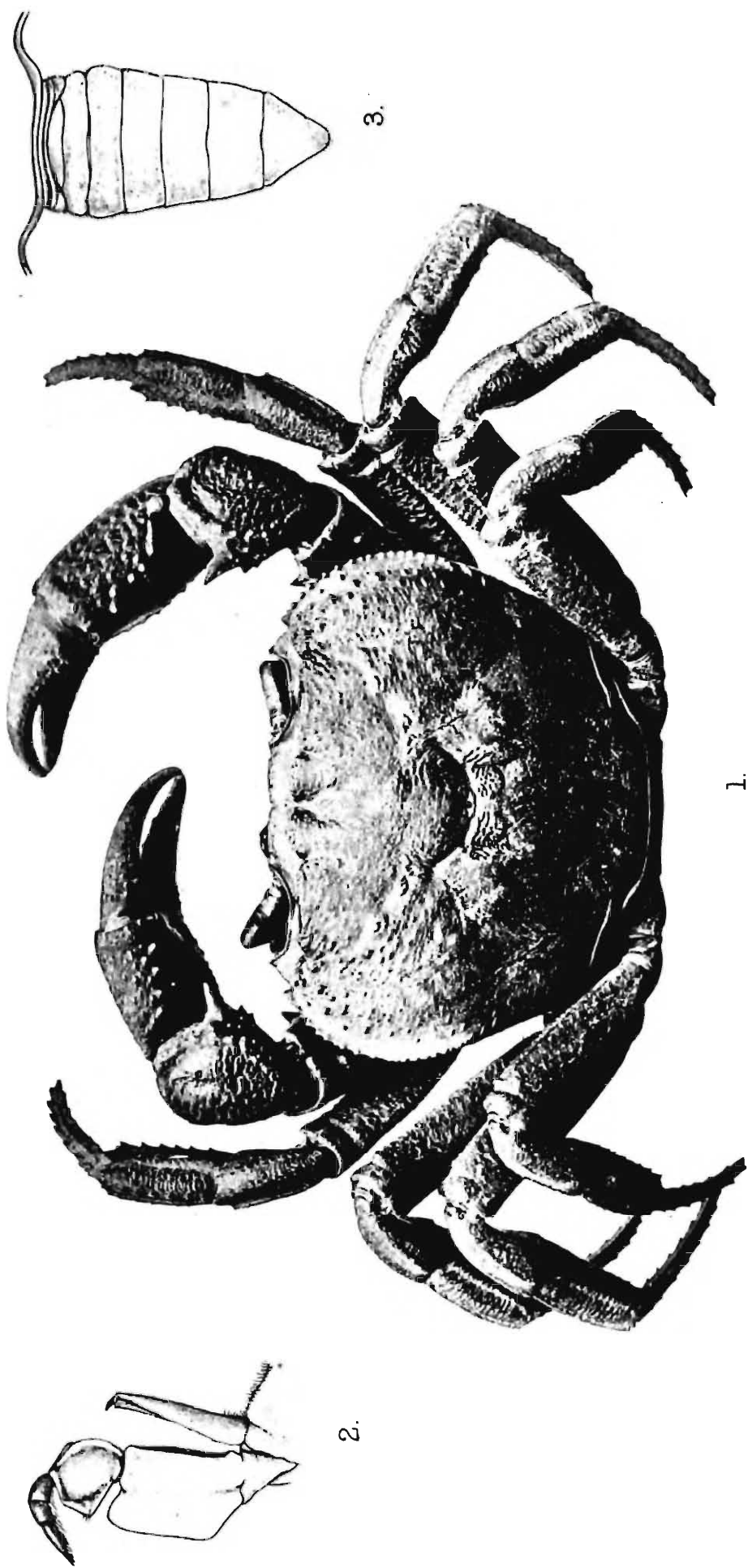
The peraeopods of the second pair (fig. 30) reach a little beyond the eyes. The carpus is about three times as long as broad and is about equal in length to the chela. The palm is scarcely longer than broad and is a little shorter than the dactylus.

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

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.



Barnard, Coll. Derby

POTAMON (POTAMISCUS) DECOURCYI, sp. nov.

S. K. Photo.
A.C. Chowdhury, del

EXPLANATION OF PLATE XVIII.

Potamon (Potamiscus) aborense, sp. nov.

- FIG. 4.—Right half of the carapace in dorsal view, $\times 2\frac{1}{2}$.
,, 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, $\times 3$.

Potamon (Potamiscus) oblitteratum, sp. nov.

- ,, 9.—Right half of the carapace in dorsal view, $\times 2$.
,, 9a.—Third maxillipede.

Potamon (Geotelphusa) adiatretum, Alcock.

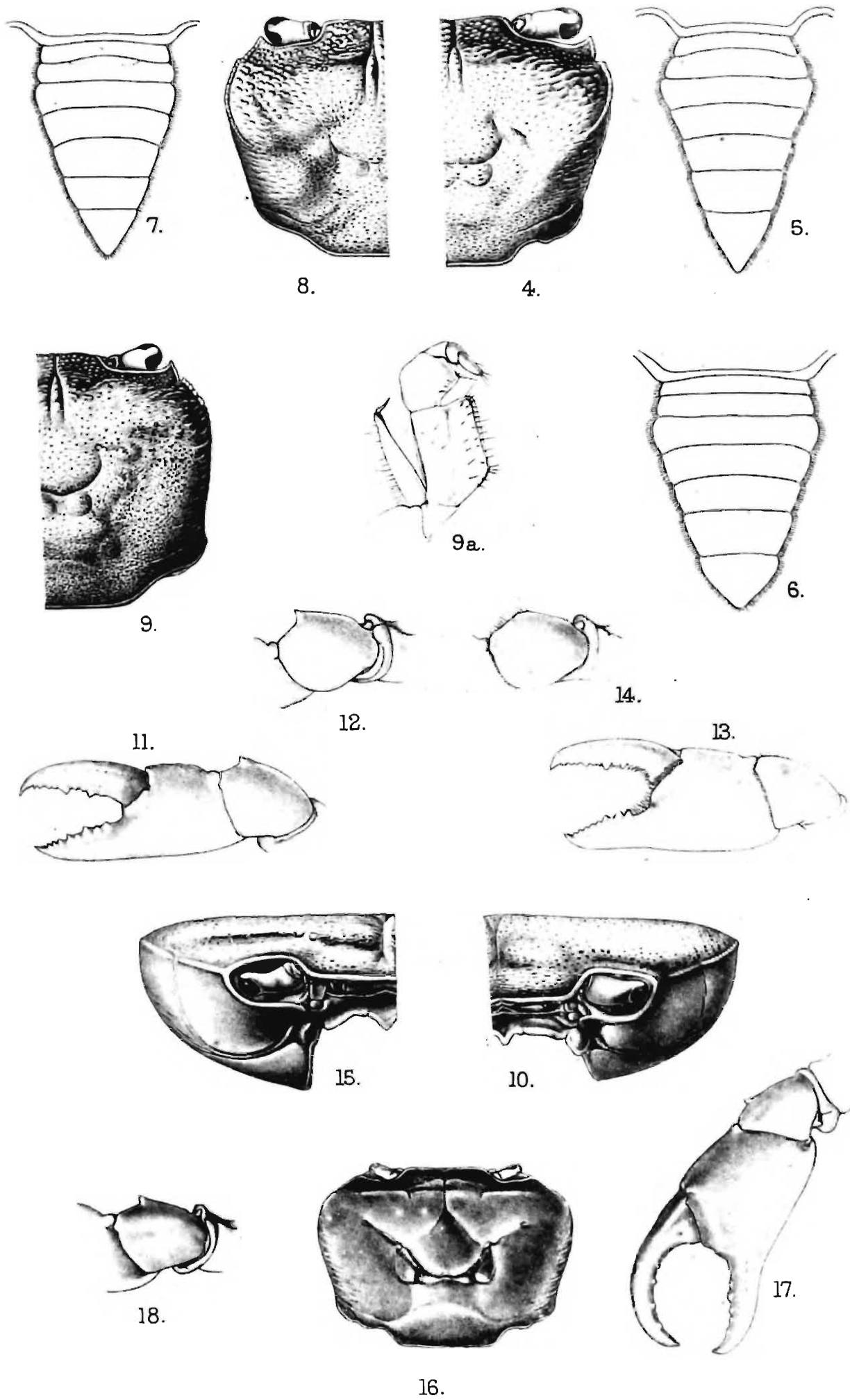
- ,, 10.—Left half of the carapace in front view, $\times 4$.
,, 11.—Chela and carpus in lateral view.
,, 12.—Carpus viewed dorso-laterally.

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, $\times 2$.
,, 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.



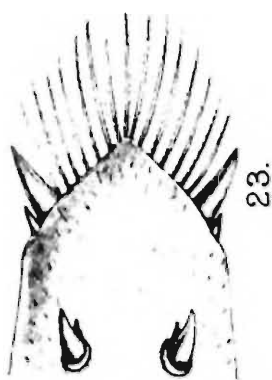
EXPLANATION OF PLATE XIX.

Palaemon hendersoni, de Man.

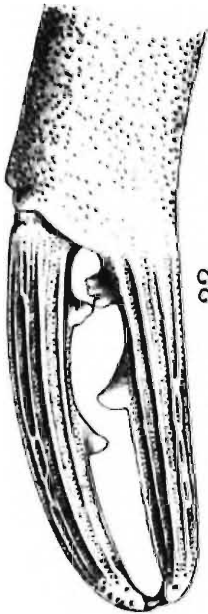
- FIG. 19.—Anterior part of carapace, etc., in lateral view, $\times 2\frac{1}{2}$.
,, 20.—Anterior part of carapace, etc., of another specimen, dorsal view, $\times 2$.
,, 21.—Second peraeopod of adult male, $\times 1\frac{1}{2}$.
,, 22.—Denuded fingers of the same limb, further enlarged.
,, 23.—Apex of telson.

Caridina weberi, de Man, var.

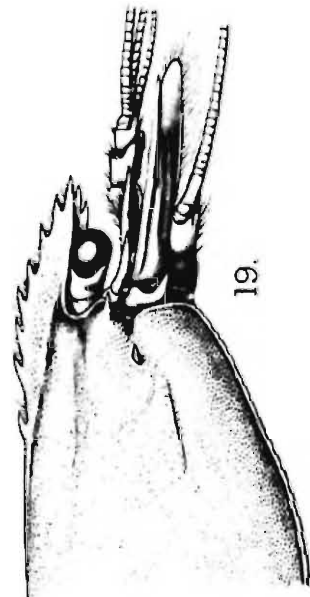
- ,, 24.—Lateral view of a specimen of the race inhabiting the Brahmaputra river system.
,, 25.—Anterior part of carapace, etc., of the same specimen.



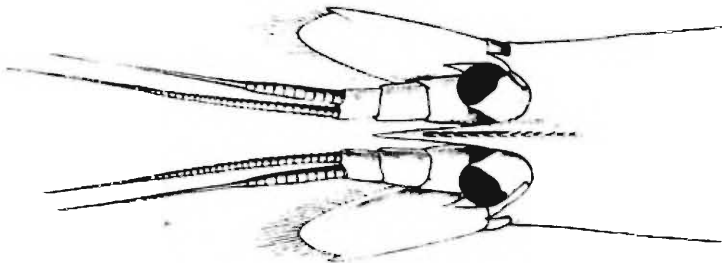
23.



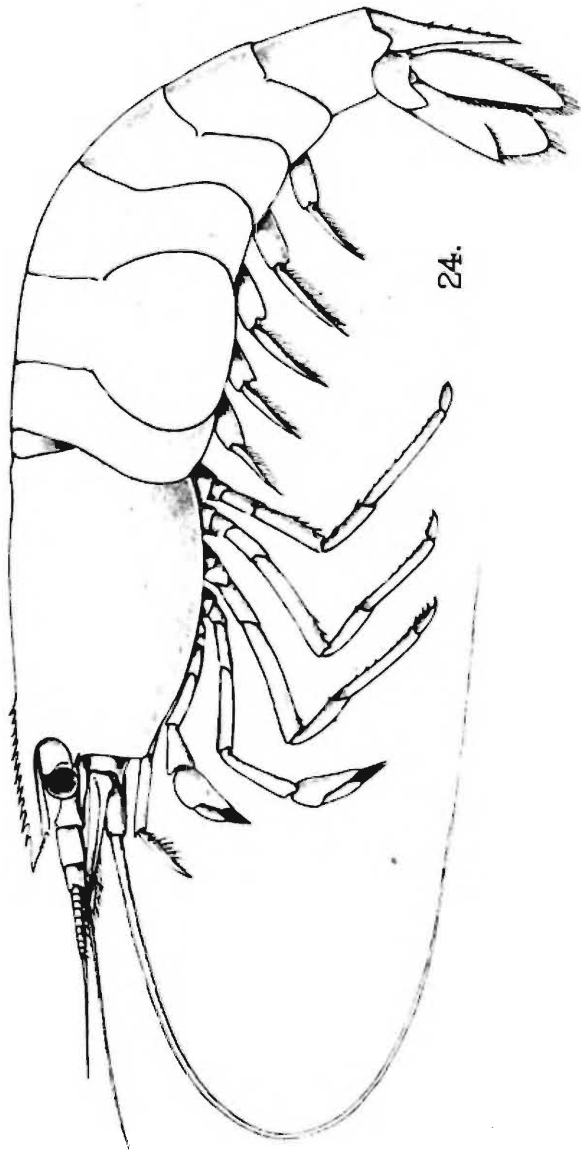
22.



19.



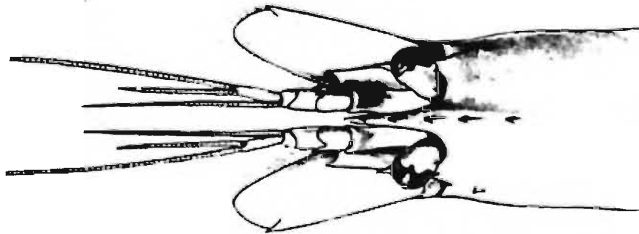
25.



24.



21.



20.

Bemrose, Colls. Derby

S. C. Moncul, 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.

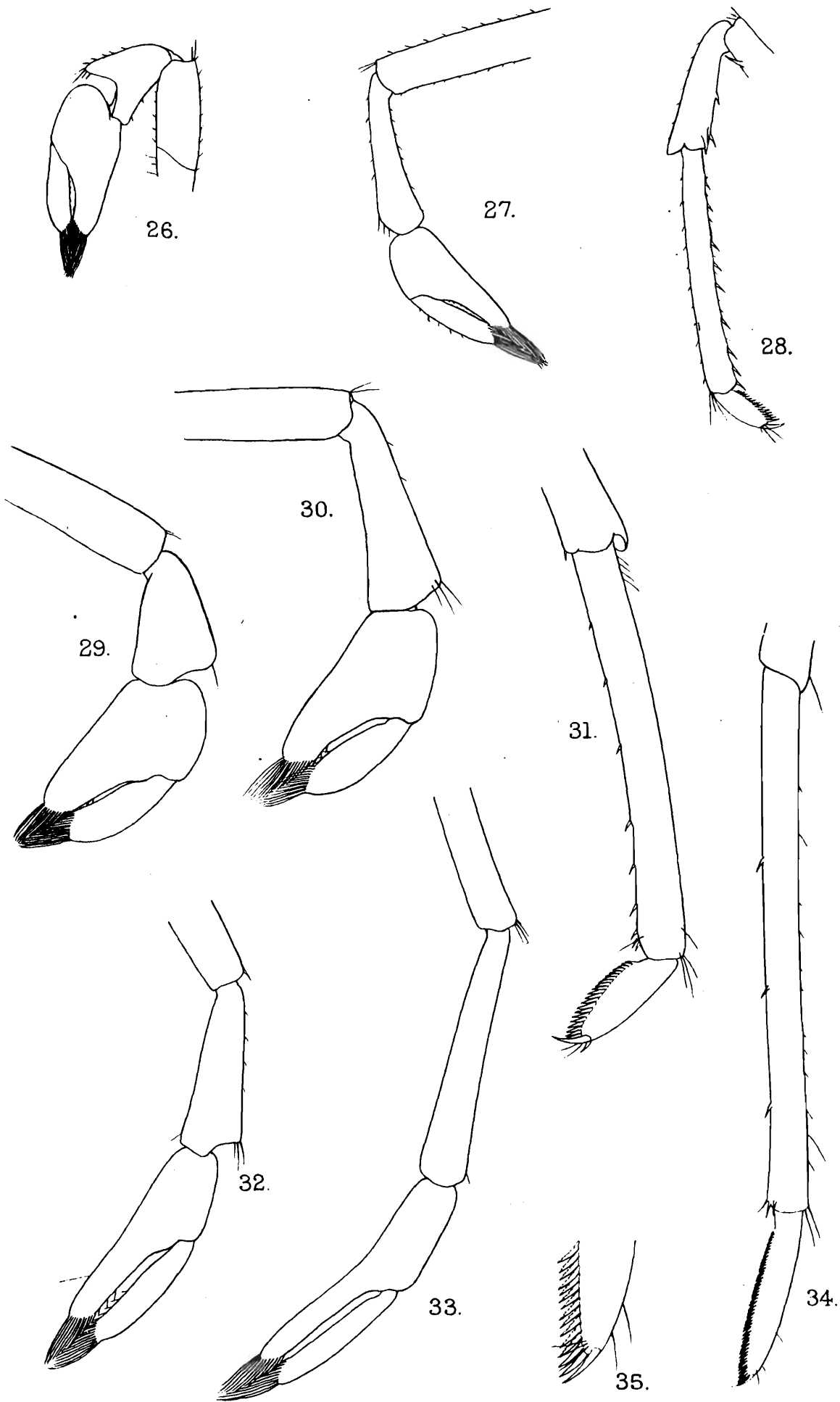
Caridina excavata, sp. nov.

„ 32.—Part of first peraeopod.

„ 33.—Part of second peraeopod.

„ 34.—Part of fifth peraeopod.

„ 35.—Apex of dactylus of fifth peraeopod, further enlarged.



A.C. Chowdhary, del.

Bemrose, Colla, Derby

APPENDAGES OF CARIDINA.

EXPLANATION OF PLATE XXI.

Caridina excavata, sp. nov.

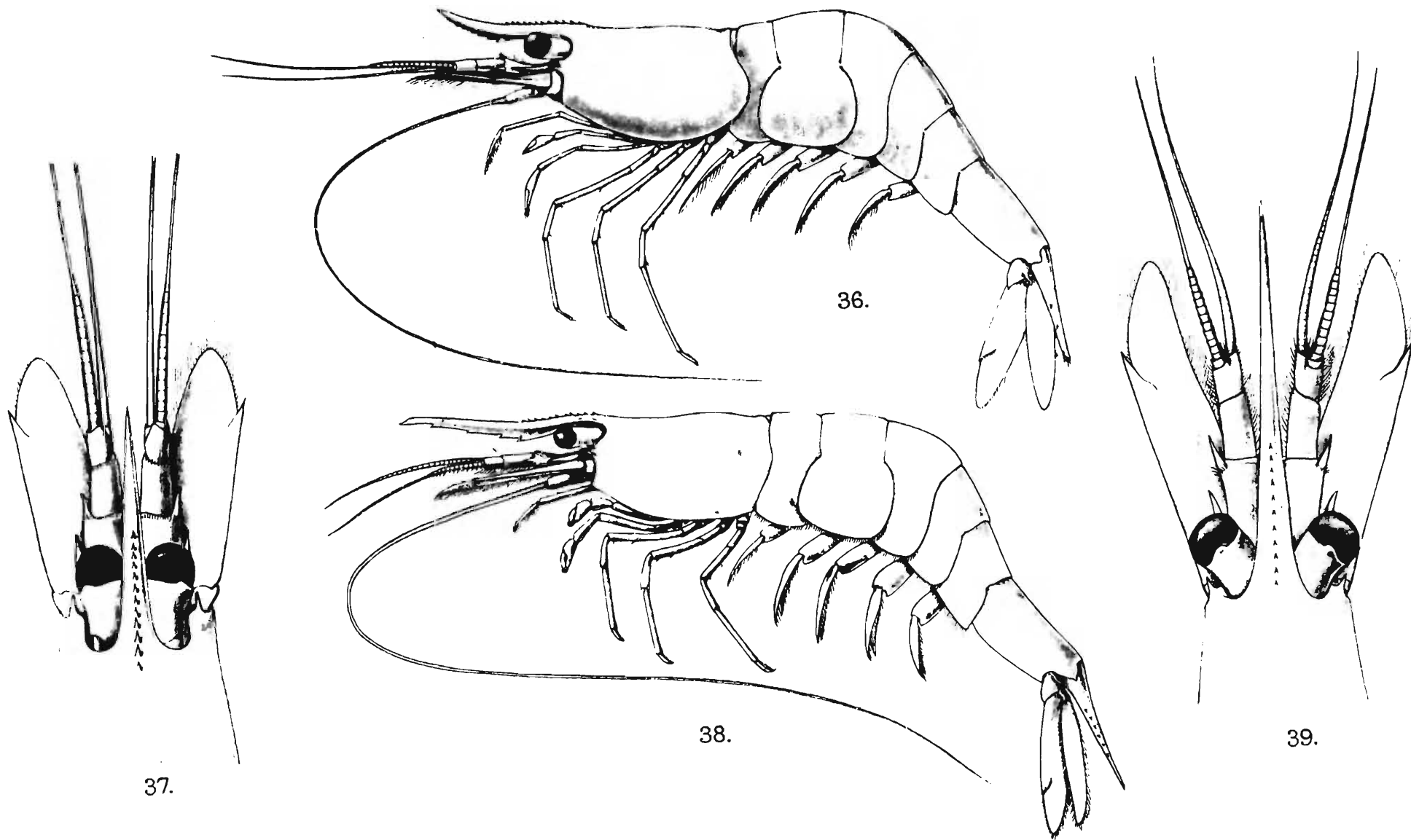
FIG. 36.—Lateral view of one of the type specimens.

„ 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.



Bemrose, Coll. Derby.

A.C. Chowdhary, del.

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 type¹, 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, 1a.)

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, 4a.)

Body not so large as the preceding, coloured greyish-cinereous. 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 | <i>C. indicus</i> , Hanc. |
| 2. (1) Wings not visible; pronotal process abbreviated. | |
| 3. (4) Body minute; apex of pronotal process truncate | <i>C. parvulus</i> , Hanc. |
| 4. (3) Body crassate, more or less tumid. | |
| 5. (6) Elytra wanting | <i>C. nullipennis</i> ,
sp. nov. |
| 6 (5) Elytra present | <i>C. tumidus</i> , 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, 3a.)

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, Dibrugarh, 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, 2a.)

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.

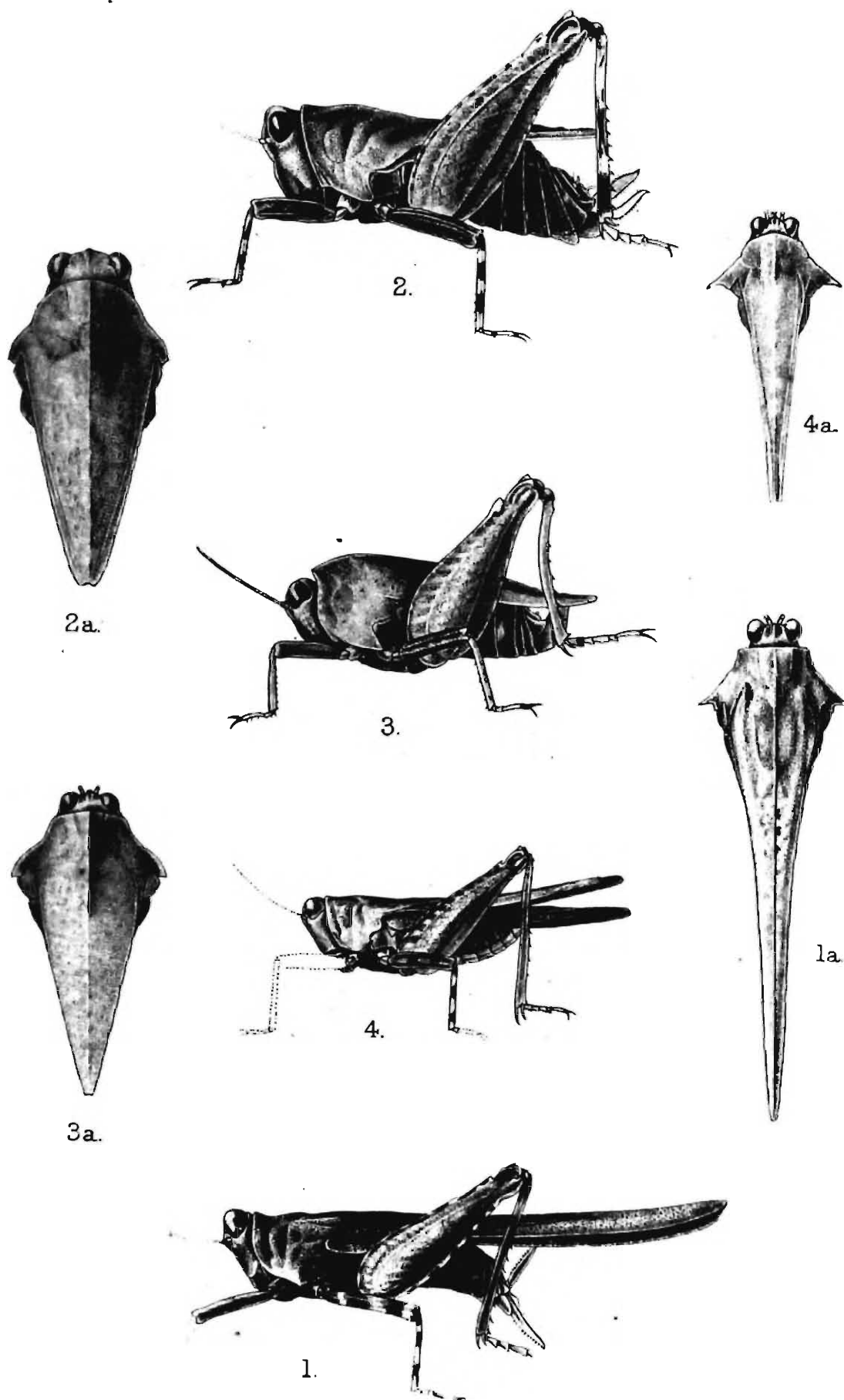
Hancock, *Mem. Dept. Agricult. India*, iv, p. 151—2, 1912.

One specimen from Dibrugarh, N.-E. Assam, Nov. 17—19, 1911 (*Kemp*).



EXPLANATION OF PLATE XV.

- Figs. 1, 1a.—*Criotettix maximus*, sp. nov., $\times 3$.
,, 2, 2a.—*Coptotettix nullipennis* sp. nov., $\times 4$.
,, 3, 3a.—*Coptotettix tumidus*, sp. nov., $\times 3\frac{2}{3}$.
,, 4, 4a.—*Criotettix orientalis*, sp. nov., $\times 4$.



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 scheint, 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 naissance" (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 kempí*, 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.

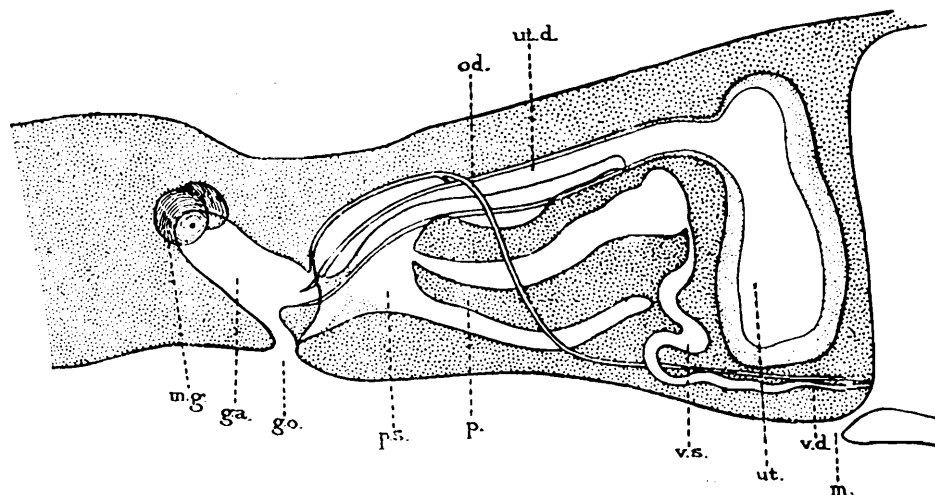


FIG. 1.—Genital apparatus of *P. kempí* (semi-diagrammatic and drawn by reconstruction from serial sections). g.a. genital atrium; g.o. genital opening; m. mouth; m.g. muscular mucous glands; od. oviduct; p. penis; p.s. penis sheath; ut. "uterus" or shell gland; ut.d. "uterine duct"; v.d. vas deferens; 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.

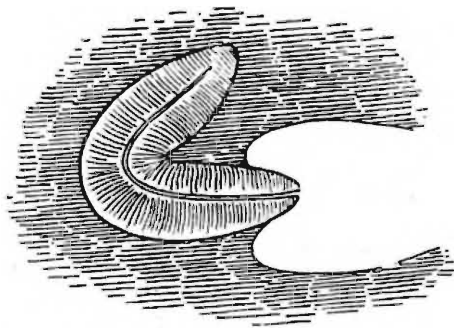


FIG. 2.—Diagram of the muscular mucous gland of *P. kempi* (purely diagrammatic) opening into the posterior part of the genital atrium. The two parts do not lie in quite the same plane.

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 vesiculæ seminales before entering the cavity of the penis or ductus ejaculatorius. There is no appreciable differentiation of the penis into bulbus, etc.

LITERATURE.

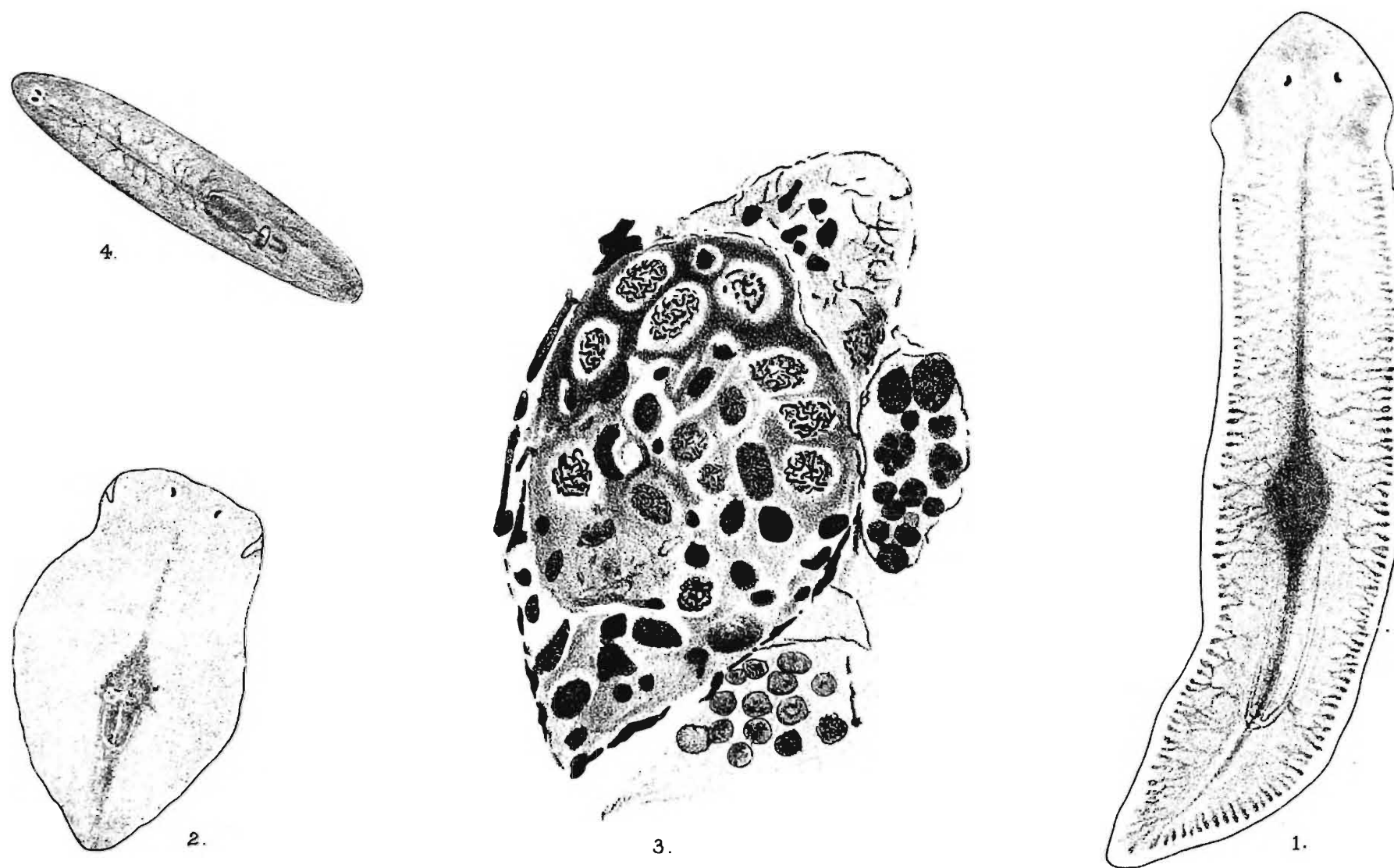
1. Böhmig, L., Die Thierwelt Deutsch-Ost-Afrikas, Bd. IV
Die Turbellarien Ost-Afrikas, II, Tricladidea.
2. „ Brauer's "Die Süßwasserfauna Deutschlands." Heft 19, 1909.
3. Dugès, A., Recherches sur l'organisation et les moeurs
des Planariés. *Ann. Soc. Nat.* I sér.,
Tom. XV, 1828.
4. Zacharias, O., Über Fortpflanzung durch spontane Quer-
theilung bei Süßwasserplanarien. *Zeit. f.*
wiss. Zool. Bd. 43, 1886.



EXPLANATION OF PLATE XXII.

- FIG. 1. *Planaria aborensis*, n. sp., $\times 14$. As seen when cleared in cedar-wood oil.
- „ 2. *P. aborensis*. Young animal newly budded off, $\times 14$.
As seen when cleared in cedar-wood oil.
- „ 3. Ovary of *P. aborensis*, $\times 620$.
- „ 4. *Planaria kempi*, n. sp., $\times 5$.

All the figures were drawn with the aid of the camera lucida.



R.H. Whitehouse, del.

A. Chowdhary, lith.

Figs. 1-3. *PLANARIA ABORENSIS*, sp. nov. Fig. 4. *PLANARIA KEMPI*, sp. nov.