

VI CONTRIBUTIONS TO A KNOWLEDGE  
OF THE TERRESTRIAL ISOPODA  
OF INDIA

PART I.—ON A COLLECTION FROM THE MADRAS  
PROVINCE AND SOUTHERN INDIA.

By WALTER E. COLLINGE, M.Sc., F.L.S., F.E.S.

(Plates IV—XII.)

The majority of the species here described were collected by Dr. Annandale and Mr. S. W. Kemp in the Ganjam district in the north-eastern corner of the Madras Presidency. Unfortunately in a number of instances there are only single or imperfect specimens, these are not described. I have reluctantly been compelled to establish two new genera, viz. *Ennurensis* for an interesting species collected at Ennur, near Madras, and also at Mandapam, Southern India; and *Hemiporcellio* for two new species allied to both *Porcellio*, Latreille, and *Porcellionides*, Miers. Of the remainder there is a new species of *Arhina*, Budde-Lund, one each of *Philoscia*, Latreille, *Periscyphis*, Gerst., and three new species of *Cubaris*, Brandt. The complete list is as follows:—

- Ennurensis hispidus*, gen. et sp. nov.
- Philoscia tenuissima*, n. sp.
- Porcellio* sp.
- Hemiporcellio carinatus*, gen. et sp. nov.
- „ *hispidus*, n. sp.
- Arhina barkulensis*, n. sp.
- Periscyphis gigas*, n. sp.
- Cubaris solidulus*, n. sp.
- „ *nacrum*, n. sp.
- „ *granulatus*, n. sp.

***Ennurensis hispidus***, gen. et sp. nov.

(Plate iv, figs. 1–10.)

Body oblong oval, convex, covered with small setae. Cephalon (figs. 1 and 2) convex, fairly long, almost smooth excepting for numerous fine setae; lateral lobes small, no median lobe or definite anterior margin; epistoma convex, smooth and setaceous.

Eyes large, dorso-lateral. Antennulae small, 3-jointed. Antennae (fig. 3), first four joints short, fifth joint long, 2nd-4th characterised by deep groove on their inner border; flagellum 2-jointed, proximal joint slightly longer than the distal one. First maxillae (fig. 4), the outer lobe terminates in four stout, slightly incurved spines and seven smaller finer ones, inner lobe thin and spoon-shaped terminally, proximally thickened. Second maxillae (fig. 5) thin, plate-like, bilobed distally and setaceous. Segments of the mesosome convex and almost sub-equal, the lateral plates well developed on the 1st segment, but small on the remaining ones, the posterior angles of segments 1-4 produced backwardly, overlapping the succeeding segments. Maxillipedes (fig. 6) with elongated palps, outer one terminating in outer multispinous process and two inner spines, inner palp with single spine. Thoracic appendages (fig. 7) rather short, fringed on the inner side with few stout spines, claws long. Uropoda (figs. 8 and 9) extending beyond the telson, basal plate convex both sides with lateral expansions, dorsally there is a lateral process with which the endopodite articulates; exopodite and endopodite small and almost sub-equal in length, setose and each terminating in a fine spine. Telson (fig. 10) small, sub-equal with basal plates of uropoda, triangular with antero-lateral portions extended, depressed in the median line, apex sub-acute. Length 7 mm. Colour (in alcohol) very variable, some a creamy white with posterior margins and lateral plates of all segments a fuscous-brown, others a light brown with darker markings laterally and in the median line.

*Habitat*.—Ennur, nr. Madras, under stones on sand, 19-x-13, No. 8671/10; Mandapam, Pamben Passage, S. India, No. 8605/10. "In both cases the specimens were on bare sand close to the sea-shore" (*N. Annandale*.)

*Type*.—In the collection of the Indian Museum.

This interesting species will, I believe, be found to have a wide distribution in India. The form of the head, antennae, telson, and uropoda at once separate it from any other genus I know of, while there are a number of minor, but pronounced characters in the mouth parts. In colour it is exceedingly variable, particularly so in specimens under 7 mm. in length. To those who attach any great importance to the mouth parts, the form of the inner lobe of the 1st maxilla should prove of interest.

### **Porcellio sp.**

*Habitat*—Marikuppam, S. India, 2500 feet, 21-x-10, No. 8588. (*R. Hodgart*.)

Two examples, both without their antennae or uropoda, I am referring to the genus *Porcellio*. In colour they are a deep blackish-brown, with the posterior angles of the lateral plates of the mesosomatic segments a yellowish-brown. The head and all the segments of the body are richly tuberculated. The lateral and median lobes of the head are well-developed, epistoma convex:

***Philoscia tenuissima*, n. sp.**

(Plate v, figs. 1-10.)

Body oblong oval, slightly convex, lateral plates of mesosome but slightly expanded; metasome abruptly narrower than mesosome. Cephalon (figs. 1 and 2) convex above, slightly rounded in front, median and lateral lobes absent; frontal margin ill-defined and bent downward laterally; epistoma flattened with transverse ridge. Eyes prominent, dorso-lateral, ocelli large. Antennulae small, 3-jointed, basal joint large. Antennae (fig. 3) long and slender, the distal joint being the longest; flagellum 3-jointed, with deep groove on the anterior border, terminating in long spinous style, setaceous. First maxillae (fig. 4), outer lobe terminates in three stout, curved spines and five smaller inner ones; inner lobe terminates in two setaceous spines. Second maxillae (fig. 5) thin, plate-like, bilobed distally, inner division terminating in fairly long setae. Segments of the mesosome almost subequal, posterior angle of lateral plates not produced backwards. Maxillipedes (fig. 6) with elongated palps, outer one terminating in multispinous process and a single long spine; inner palp somewhat cone-shaped, sunken at the apex, with tooth-like spine on the inner border and a long pointed one arising from the base of the concavity, and four small tooth-like spines on the outer border. Thoracic appendages (fig. 7) comparatively short, setaceous, 5th joint and claw elongated, 4th joint with two spines on the inner border with obtuse plumose apices. Uropoda (figs. 8 and 9) extending beyond the telson, basal plate small with deep groove on the under side which also extends along the inner border of the exopodite, the endopodite is also grooved on its ventral side. Telson (fig. 10) short and broad, produced to a blunt point in the median line posteriorly. Length 6.5 mm. Colour (in alcohol) horny-brown with light greyish markings.

*Habitat.*—Museum compound, Madras (town). No. 8668/10. (*N. Annandale.*)

*Type.*—In the collection of the Indian Museum.

***Hemiporcellio carinatus*, gen. et sp. nov.**

(Plate vi, figs. 1-10.)

Body (fig. 1) oblong oval, flattened, with irregular tuberculations, and tooth-like tubercles on the posterior margin of the metasomatic segments; metasome narrower than mesosome. Cephalon (figs. 2 and 3) narrow, tuberculated, setose, lateral lobes cup-shaped, median lobe formed by a dipping forward and downward of the anterior margin which is continuous; epistoma convex with numerous small setae. Eyes large, sub-lateral. Antennulae very small. Antennae (fig. 4) elongated, with well-marked carination on the dorsal side of 3rd, 4th and 5th joints; flagellum 2-jointed, the proximal joint being the longer. First

maxillae (fig. 5), outer palp terminating in four stout curved spines and four smaller ones with bifid terminations, inner lobe with short blunt spine on the outer side and two setaceous spines on the inner side. Second maxillae (fig. 6) thin, plate-like, bilobed, inner lobe setaceous. The segments of the mesosome somewhat depressed, lateral plates small, slightly deflected outwards, the posterior angle of 5-7 produced backwardly, as also those of the three last metasomatic segments. Maxillipedes (fig. 7), outer palp with multispinous process on the outer side and three long spines internal to this, the inner palp has two spines and four small tooth-like processes on the margins. Thoracic appendages (fig. 8) fringed with stout spines on the inner side of the three distal joints. Uropoda (fig. 9) extending beyond the telson, basal plate with lateral extensions dorsally and ventrally, with the former the slightly curved endopodite articulates, the exopodite which is cuniform articulates at the base of the basal plate. Exopodite nearly twice the length of the basal plate, and of the endopodite, both covered with fine setae. Telson (fig. 10) short, not extending beyond the basal plates of the uropoda, triangular, apex sub-acute. Length 7.5 mm. Colour (in alcohol) greyish-brown, cephalon and metasome usually darker, lateral plates of mesosome with dark patch uniformly a blackish-brown, very variable.

*Habitat*.—Under stones and dead water weeds at edge of Chilka Lake, Rambha, Ganjam, Madras Pres., 27-xii-13, No. 8692/10. "Apparently an amphibious species" (*N. Annandale*.)

*Type*.—In the collection of the Indian Museum.

This species is closely allied to *Porcellio immsi*, Cllge.,<sup>1</sup> which latter must now be referred to the genus *Hemiporcellio*; it differs, however, from *immsi* in the form of the antennae, in the anterior margin of the cephalon, which is continuous, and in the form of the uropoda.

The colour is exceedingly variable. Examples measuring 5.5 and 6 mm. invariably have the first three and last mesosomatic segments a reddish-brown colour and the whole of the metasome a deep blackish-brown. Similar variations obtain in *H. immsi* judging from an immature specimen.

### ***Hemiporcellio hispidus*, n. sp.**

(Plate vii, figs. 1-9.)

Body oblong-oval, flattened, tuberculated and covered with fine setae; metasome narrower than the mesosome. Cephalon (figs. 1 and 2) small, tuberculated, lateral lobes slightly cup-shaped, median lobe absent, anterior margin distinct and continuous, epistoma convex and covered with stellate setae. Eyes small, sub-dorsal. Antennulae small, 3-jointed, basal joint prominent. Antennae (fig. 3) elongated, with well-marked carination on the

<sup>1</sup> Ann. Mag. Nat. Hist. 1914, s. 8, vol. xiv, p. 207, pl. ix.

3rd, 4th and 5th joints; flagellum 2-jointed, the distal joint being the longer. First maxillae (fig. 4), outer lobe terminates in three long and one short stout spine on the outer side, on the inner side are four smaller ones and two fine spines; the inner lobe terminates in two setaceous spines. The lateral plates of the mesosomatic segments are small and slightly overlap one another, posterior angle slightly produced. Maxillipedes (fig. 5), outer palp with multispinous process on the outer side and three spines internal to this, inner palp has a single spine and three tooth-like marginal processes. Thoracic appendages (fig. 6) short, with the 1st and 2nd joints grooved on their outer side, the three terminal joints are fringed with stout spines with trifid terminations. The whole of the appendages are covered with fine hair-like setae. Uropoda (figs. 7 and 8) extending beyond the telson and covered with fine setae, basal plate with lateral extensions, exopodite cuniform and grooved on the outer side, endopodite triangular in section. Telson (fig. 9) short, extending beyond the basal plates of the uropoda, triangular, apex sub-acute. Length 5 mm. Colour (in alcohol) greenish-grey with few irregular blackish blotches.

*Habitat.*—Satpara, Lake Chilka, Orissa, 17-ix-13, No. 8635/10. "A terrestrial species" (*N. Annandale*).

*Type.*—In the collection of the Indian Museum.

### *Arhina barkulensis*, n. sp.

(Plate viii, figs. 1-10.)

Body oblong-oval, strongly convex, surface shiny, minutely punctate. Cephalon (figs. 1 and 2) covered with minute raised tubercles, lateral lobes well developed, median lobe small, epistoma slightly raised in median line, concave laterally with transverse ridge above the antennules. Eyes large, sub-lateral. Antennulae (fig. 3) 3-jointed, the terminal joint having a number of bristle-like setae at the apex and side. Antennae (fig. 4) characterised by the shortness of the three first joints, 3rd and 4th joints together equal in length to the 5th which is as long as the flagellum, the three joints of which are almost sub-equal; terminal stylet slender; whole of the appendage covered with short setae, those on the flagellum rather longer. First maxillae (fig. 5), the outer lobe is very solid and terminates in eight stout spines; the inner lobe is scroll-like, the inner border partly overlapping the flat outer portion, terminally there are two long setaceous spines. Second maxillae (fig. 6) a thin bilobed plate terminating in an inner dense tuft of setae and an outer tuft. The segments of the mesosome almost sub-equal, posterior margins of 1-4 almost straight, lateral angles rounded, of 5-7 slightly produced backward, sub-acute. Lateral plates of metasomatic segments greatly prolonged backwards (fig. 10). Maxillipedes (fig. 7), the outer palp terminates in a strong spine with two tufts of setae, at the base of this are two further tufts arising from a slight eminence, and a third pair still more inwardly; there are no spines on the inner palp, which

is fringed with short setae. Thoracic appendages (fig. 8) stout and comparatively short, first joints almost equal in length to the next three, stout claw with lateral spines; the 3rd, 4th and 5th joints have on their inner side a dense mass of long setae, with paired stouter spines on the outer side of the 2nd, 3rd, and 4th and on the inner side of the 5th joints. Uropoda (fig. 9) extending beyond the telson; basal plate sparsely covered with setae, there is a short, blunt spine on the outer side and a raised portion extending across the proximal end to the inner side, beneath which the endopodite articulates; exopodite somewhat conical in shape, more globose on the inner side, endopodite slender, terminating in two long setae. Telson (fig. 10) triangular, flat, sides straight, apex sub-acute. Length 11.5 mm. Colour (in alcohol) greenish-brown with yellow flecks on the head and mesosomatic segments.

*Habitat*.—Under stones at edge of lake, Barkul, Lake Chilka, Orissa, 22-vii-13, No. 8670/10. "Apparently an amphibious species" (*N Annandale*.)

*Type*.—In the collection of the Indian Museum.

The genus *Arhina* was constituted by Budde-Lund (Rev. Crust. Isop. Terr., 1904, p. 44) for a species, *A. porcellioides*, found "in a warehouse at Copenhagen, perhaps imported from East India." The genus is placed by Budde-Lund under the sub-family Spherillioninae, which includes *Pseudophiloscia*, *Suarezia*, *Scleropactes*, *Sunniva*, *Saidjahus*, *Ambounia* and *Spherillo*. Neither *Pseudophiloscia* or *Arhina* are closely related to any of the above mentioned genera, and whilst I differ strongly from Budde-Lund in his views on classification, they would, in my opinion, have found a more natural position in his Tribe Alloniscoidea, (*op. cit.*, p. 37).

The form of the antennae, 1st maxillae, maxillipedes and uropoda clearly indicate the relationship of this species to *Arhina porcellioides*.

### ***Periscyphis gigas*, n. sp.**

(Plate ix, figs. 1-10.)

Body (fig. 1) oblong oval, dorsal face strongly convex, sloping downwards posteriorly, almost smooth. Cephalon (figs. 2 and 3) small with median depression, flanked laterally by the lateral plates of the 1st segment of the mesosome, the anterior border of which extends slightly beyond the cephalon; lateral lobes well developed, median lobe absent. Ventrally there is a strong median carination. Eyes prominent, sub-dorsal. Antennulae (fig. 4) short and stout, 3-jointed. Mandibles (fig. 5), the outer cutting edge has three blunt teeth and a blunt process on the inner edge, beneath which is a tuft of setae. First maxillae (fig. 6), the outer lobe terminates in four curved spines and five finer and straighter ones on the inner side. Second maxillae (fig. 7) thin and plate-like; the inner lobe terminates in a mass of setae, whilst the outer lobe is more robust and tooth-like. The segments of the mesosome are strongly convex, excepting those of the 1st the lateral plates are only slightly produced backwards. Maxillipedes (fig.

8), inner lobe palp-like with setae on the inner side and two rows across the dorsal face, the outer palp terminates in three multi-spinous processes. Basally there is a raised portion studded with numerous small setae. Thoracic appendages (fig. 9) robust and fringed with numerous spines with trifid terminal portions (fig. 9a) and smaller spines, 2nd appendages having on the apical border of the fifth joint two with obtuse plumose apices. Uropoda (fig. 10), basal plate large, extending beyond the telson; outer margin sub-crenate; exopodite articulating on the middle inner border, endopodite slightly longer than the exopodite and articulating at the top of the inner border of the basal plate. Telson (fig. 1), dorsal face strongly convex, obtusely triangular, almost smooth. Length  $20.5 \times 13$  mm. Colour (in alcohol) horny-brown with the lateral plates of the 1st, 5th and 6th mesosomatic and the 3rd and 4th metasomatic segments yellow.

*Habitat.*—Ponmudi, Travancore, September, 1893, No. 8626/10. (H. S. Ferguson.)

*Type.*—In the collection of the Indian Museum.

This interesting species is, I believe, the largest yet described of this genus. Unfortunately there were no antennae on either of the two specimens. Owing to the strong convexity of the 1st segment of the mesosome the dorsal surface of the head is almost vertically disposed.

### ***Cubaris solidulus*, n. sp.**

(Plate x, figs. 1-12)

Body oblong oval, moderately convex, minutely punctate with lateral rugosities. Cephalon (figs. 1 and 2) small with posterior margin slightly raised, lateral lobes small, median lobe absent, epistome flat. Eyes small, situated dorso-laterally. Antennulae (fig. 3) small, 3-jointed, with numerous short setae on the terminal joint. Antennae (fig. 4) short, covered with fine setae, 2nd to 5th joints grooved on their inner side; flagellum 2-jointed, the distal joint being a little over one and a half times as long as the proximal one. First maxillae (fig. 5), outer lobe terminates in four stout incurved spines and six smaller, almost straight ones; inner lobe terminally rounded, with two setose spines. Second maxillae (fig. 6) thin and plate-like, terminating distally in two setaceous lobes, the inner of which is jointed. Segments of the mesosome with posterior angles of 1-4 produced backwards, overlapping the succeeding segments, fitting into a slight groove in segments 2-5, segments 5-7 almost straight. Segments 1 and 2 notched on their lower inner margins for reception of succeeding segments (figs. 7 and 8). Lateral plates of metasomatic segments 3-5 elongated. Maxillipedes (fig. 9), the outer palp terminates in a multispinous process on the outer side, with two small spines below it, internal to the large process are two long fine spines, the inner palp possesses five tooth-like spines and one larger one. Thoracic appendages (fig. 10) comparatively short, setaceous, with few stout spines on the inner side of the

three distal joints. Uropoda (fig. 11) not extending beyond the telson, basal plate somewhat triangular, posterior margin almost straight; exopodite small, situated on the inner lower border of the basal plate, endopodite nearly twice as long, setaceous and terminating in two long setae, situated at the top of the inner margin of the basal plate. Telson (fig. 12) slightly longer than broad, concave laterally, posterior margin straight, anteriorly with slight median depression. Length 11 mm. Colour (in alcohol) horny-brown with greyish rugosities.

*Habitat*.—Oorgaum, Kolar District, S. India, 20-x-10, No. 8598/10.

*Type*—In the collection of the Indian Museum.

The rugosities on the mesosomatic segments are more distinct in some specimens than in others. The form of the uropoda, antennae and telson serve to separate it from its allies, and minor differences are also present in the mouth parts and thoracic appendages.

### ***Cubaris nacrum*, n. sp.**

(Plate xi, figs. 1-10.)

Body oblong oval, strongly convex, smooth and shiny. Cephalon (figs. 1 and 2) small, with sloping anterior half, lateral lobes very small, median lobe absent, epistome almost flat. Eyes small, situated antero-dorsally. Antennulae (fig. 3) small, 3-jointed, with numerous short, thick setae on the terminal joint. Antennae (fig. 4) short, covered with fine setae, flagellum 2-jointed, distal joint almost twice as long as the proximal one. First maxillae (fig. 5), outer lobe terminates distally in four incurved spines and five smaller almost straight ones, short, simple, hair-like setae on the outer margin; inner lobe terminally rounded, thin, and with two setose spines, broader at the base. Second maxillae (fig. 6) thin and plate-like, terminating distally in a bi-lobed manner, the inner lobe having a row of strong setae on the inner face. The segments of the mesosome are strongly convex, with the lateral plates not expanded excepting in the 1st mesosomatic segment. Segments 1 and 2 notched on their lower inner margins for reception of succeeding segments. Lateral plates of metasomatic segments 3-5 greatly elongated. Maxillipedes (fig. 7), the outer palp terminates in a multispinous process on the outer side and two small spines inwardly, the inner palp possesses a single terminal spine and two smaller ones on the outer border. Thoracic appendages (fig. 8) comparatively short, setaceous, the three distal joints being fringed on the inner side with numerous stout spines. Uropoda (fig. 10) not extending beyond the telson, basal plate triangular in shape, posterior margin pointed, outer half raised above the flat, inner half; exopodite very small, situated towards the base of the raised outer half, endopodite large and situated at top of the inner margin of the basal plate, but not extending beyond it. Telson (fig. 9) slightly longer than broad, contracted

laterally, posterior margin almost straight. Length 16.5 mm. Colour (in alcohol) slaty-grey with lighter coloured lateral markings on the mesosome.

*Habitat.*—Under stones on hill near Rambha, Ganjam District. No. 8690/10. (*N. Annandale.*)

*Type.*—In the collection of the Indian Museum.

The form of the uropoda at once serve to separate this species from any other known form. Considerable variation was noticed in the mouth parts. In alcohol it is a slaty-grey colour, but when dry the specimens look like large pearls.

### *Cubaris granulatus*, n. sp.

(Plate xii, figs. 1-11.)

Body oblong-oval, moderately convex, finely granulated with few irregular rugosities on the cephalon. Cephalon (figs. 1 and 2) small, anterior margin slightly raised, lateral lobes small, median lobe absent, posterior margin distinct, irregularly rugose, epistome with triangular convexity, deeply sunken around base of antennae. Eyes moderately large, situated dorso-laterally. Antennulae small, 3-jointed. Antennae (fig. 3) short, covered with fine setae, 2nd to 4th joints grooved on their inner side; flagellum 2-jointed, the distal joint being nearly three times as long as the proximal one. First maxillae (fig. 4), outer lobe terminates in four stout incurved spines and six smaller, almost straight ones; inner lobe terminally rounder, with two long setose spines. Segments of the mesosome with posterior angles of 1-4 produced backwards, overlapping the succeeding segments, fitting into a slight groove in segments 2-5, lateral plates of segments 6 and 7 slightly expanded. Segments 1 and 2 notched on their inner margins for reception of succeeding segments (figs. 5 and 6). Lateral plates of metasomatic segments 3-5 elongated. Maxillipedes (fig. 7), outer palp terminates in a multispinous process on the outer side and two long inner spines, at the base of the innermost are two very small spines; the inner palp has a single spine and a small tooth-like process. Thoracic appendages (fig. 8) comparatively short, setaceous with dense mass on the inner side of the 3rd and 4th joints. Uropoda (figs. 9 and 10) not extending beyond the telson, basal plate somewhat triangular, posterior margin almost straight, plicated on the ventral side; exopodite small, situated on the inner border of the basal plate, endopodite two-and-a-half times as long as the exopodite, setaceous, situated at the top of the inner border of the basal plate. Telson (fig. 11) slightly longer than broad posteriorly, expanded anteriorly, posterior margin almost straight with concavity anteriorly in the median line. Length 5.5 mm. Colour (in alcohol) dark olive brown.

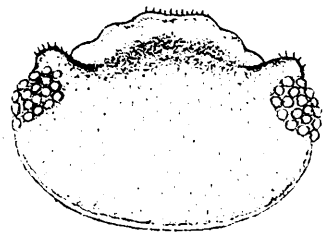
*Habitat.*—Rambha, L. Chilka, Ganjam Dist., Madras, 22-ix-13, No. 8639-10. "Probably a terrestrial species" (*N. Annandale* and *S. W. Kemp.*)

*Type.*—In the collection of the Indian Museum.

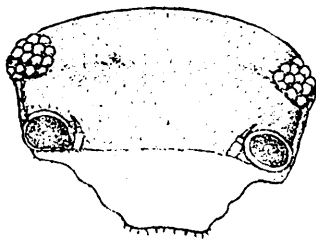
## EXPLANATION OF PLATE IV

*Ennurensis hispidus*, n. sp.

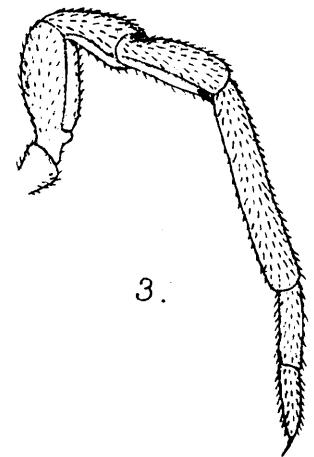
- FIG. 1.—Dorsal view of the cephalon.  
,, 2.—Anterior view of the cephalon.  
,, 3.—Antenna.  
,, 4.—First maxilla, terminal portions of inner and outer lobes  
,, 5.—Second maxilla, terminal portion.  
,, 6.—Maxillipede, terminal portion.  
,, 7.—Second thoracic appendage  
,, 8.—Left uropod, dorsal view.  
,, 9.—Left uropod, ventral view.  
,, 10.—Last abdominal segment and telson.



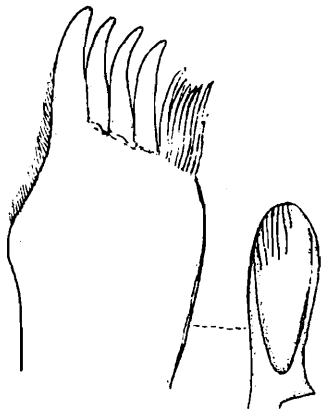
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2.



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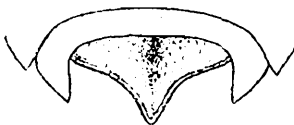
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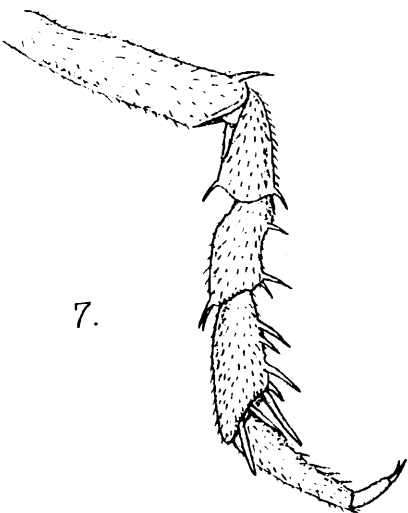
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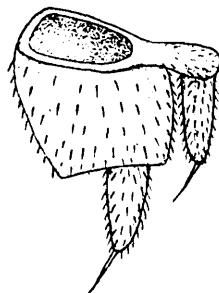
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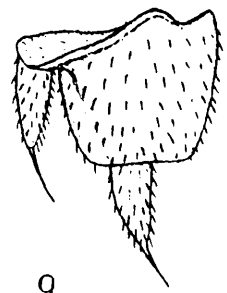
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7.



8.



9.

E. W. E. del.

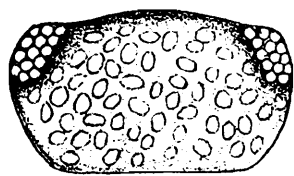
A. Chowdhery, lith.

ENNURENSIS HISPIDUS, n.sp.

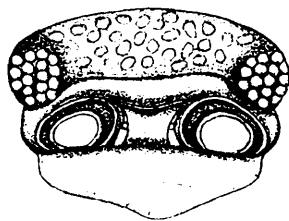
EXPLANATION OF PLATE V.

*Philoscia tenuissima*, n. sp.

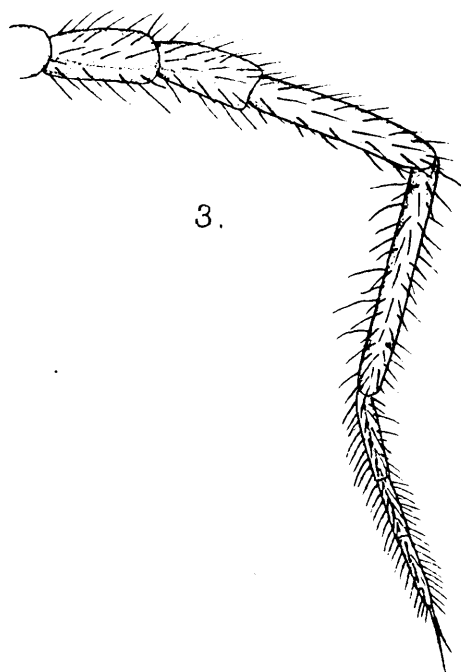
- FIG. 1.—Dorsal view of the cephalon.  
,, 2.—Anterior view of the cephalon.  
,, 3.—Antenna.  
,, 4.—First maxilla, terminal portions of inner and outer lobes.  
,, 5.—Second maxilla, terminal portion.  
,, 6.—Maxillipede, terminal portion.  
,, 7.—Second thoracic appendage.  
,, 8.—Left uropod, dorsal view.  
,, 9.—Left uropod, ventral view.  
,, 10.—Telson and last abdominal segment.



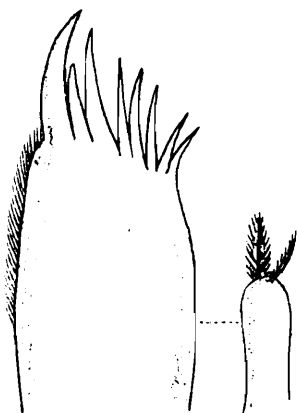
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2.



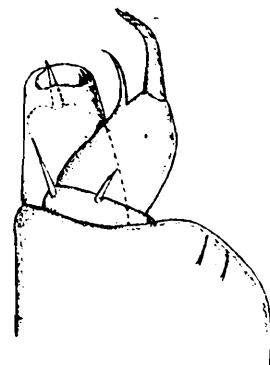
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4.



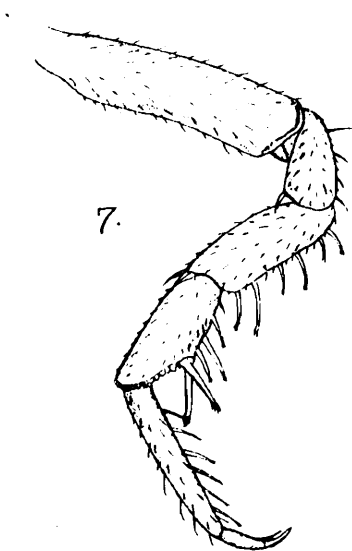
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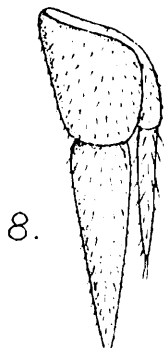
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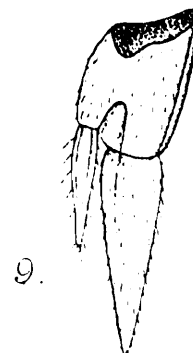
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8.



9.

E.W.E. del.

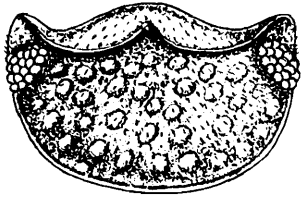
A. Chowdhary, lith.

PHILOSCIA TENUISSIMA, n.sp.

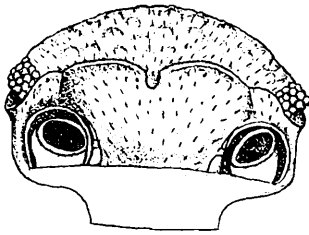
EXPLANATION OF PLATE VI.

*Hemiporcellio carinatus*, n. sp.

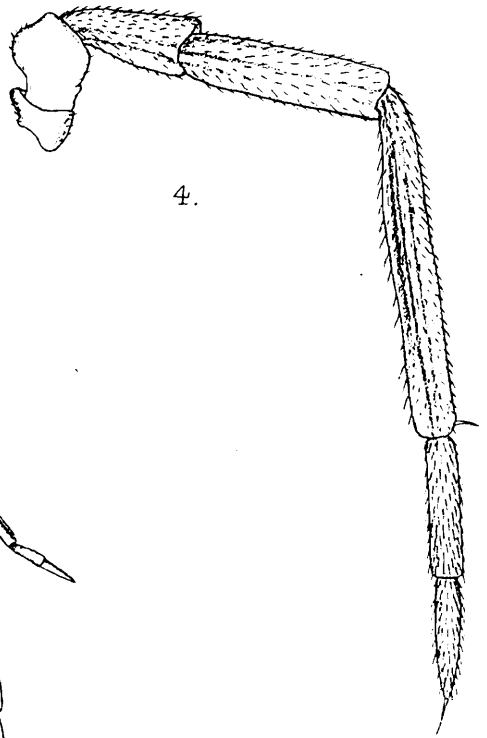
- FIG. 1.—Dorsal view,  $\times 8\frac{1}{2}$ .  
,, 2.—Dorsal view of the cephalon.  
,, 3.—Anterior view of the cephalon.  
,, 4.—Antenna.  
,, 5.—First maxilla, terminal portions of inner and outer lobes.  
,, 6.—Second maxilla.  
,, 7.—Maxillipede, terminal portion.  
,, 8.—Second thoracic appendage.  
,, 9.—Left uropod.  
,, 10.—Last abdominal segment and telson.



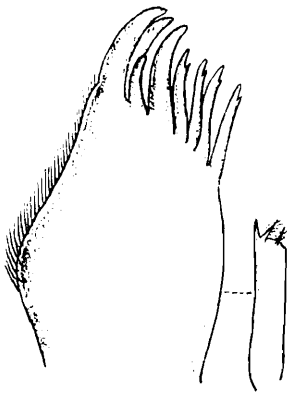
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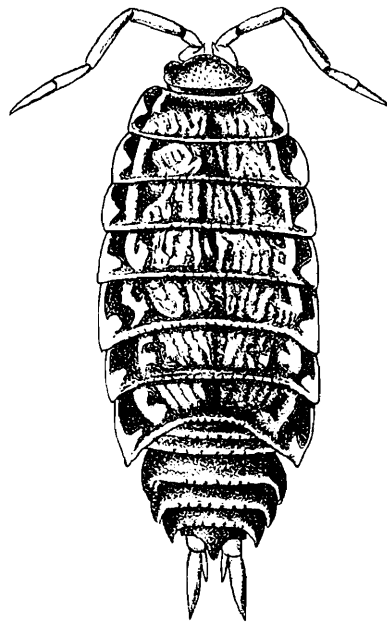
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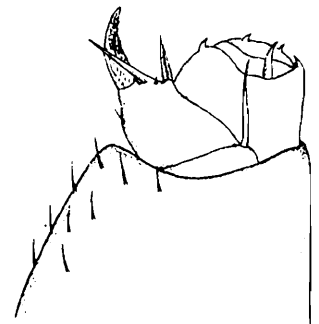
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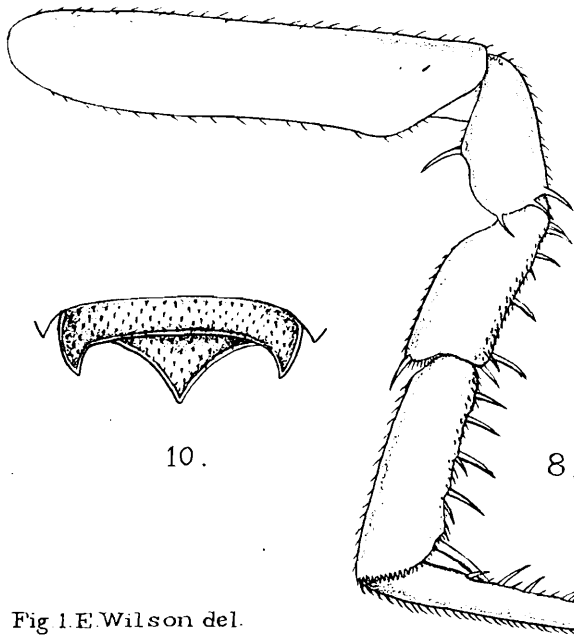
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1.



7.



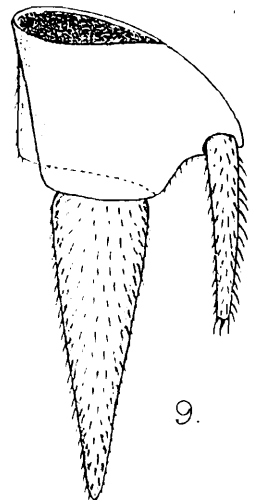
8.



6.



10.



9.

Fig 1 E. Wilson del.  
E. W. E. del.

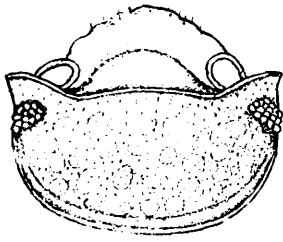
A. Chowdhary, lith.

HEMIPORCELLIO CARINATUS, n.sp.

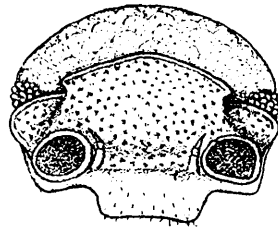
EXPLANATION OF PLATE VII.

*Hemiporcellio hispidus*, n. sp.

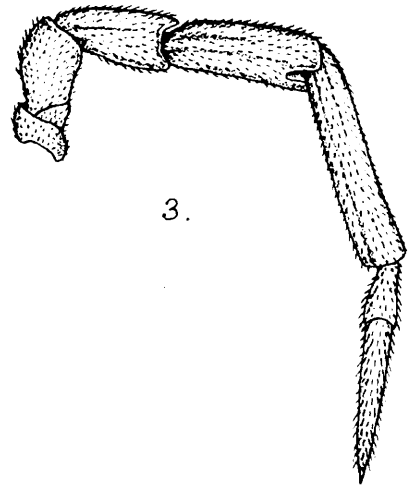
- FIG. 1.—Dorsal view of the cephalon.  
,, 2.—Anterior view of the cephalon.  
,, 3.—Antenna.  
,, 4.—First maxilla, terminal portions of inner and outer lobes.  
,, 5.—Maxillipede, terminal portion.  
,, 6.—Second thoracic appendage.  
,, 7.—Left uropod, dorsal view.  
,, 8.—Left uropod, ventral view.  
,, 9.—Telson and part of last abdominal segment.



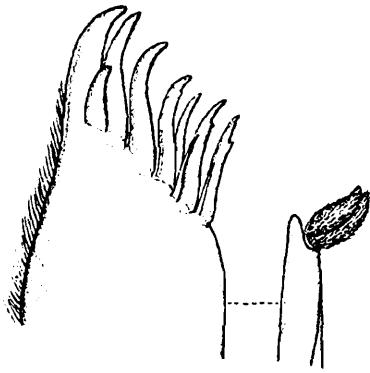
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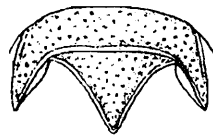
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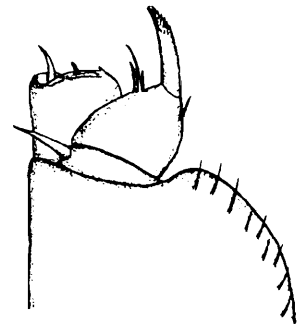
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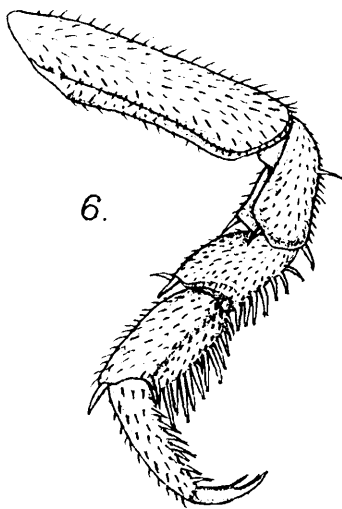
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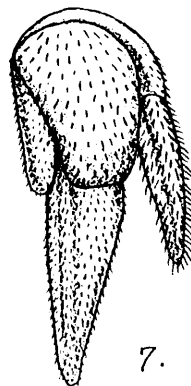
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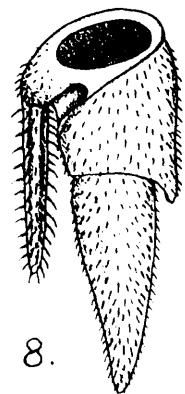
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6.



7.



8.

E.W.E. del.

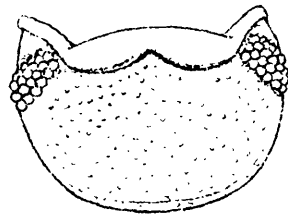
A. Chowdhary, lith.

HEMIPORCELLIO HISPIDUS, n.sp.

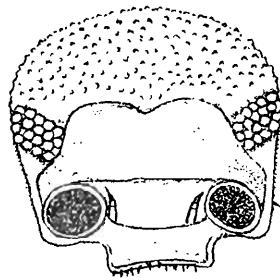
EXPLANATION OF PLATE VIII.

*Arhina barkulensis*, n. sp.

- FIG. 1.—Dorsal view of cephalon.  
,, 2.—Anterior view of cephalon.  
,, 3.—Antennule.  
,, 4.—Antenna.  
,, 5.—First maxilla, terminal portion of inner and outer lobes.  
,, 6.—Second maxilla, terminal portion.  
,, 7.—Maxillipede, terminal portion.  
,, 8.—Second thoracic appendage.  
,, 9.—Left uropod, dorsal view.  
,, 10.—Telson and part of last abdominal segment.



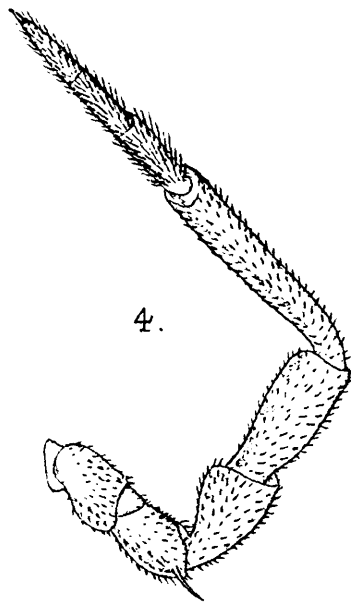
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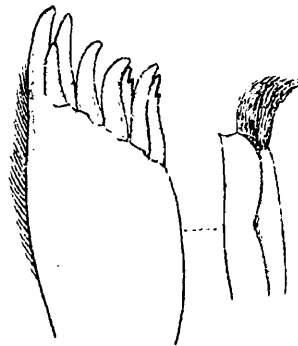
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3.



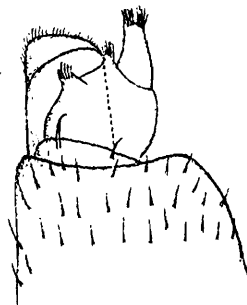
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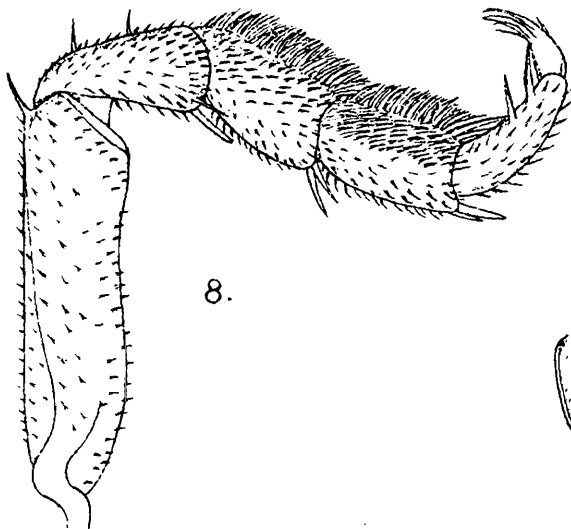
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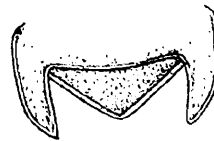
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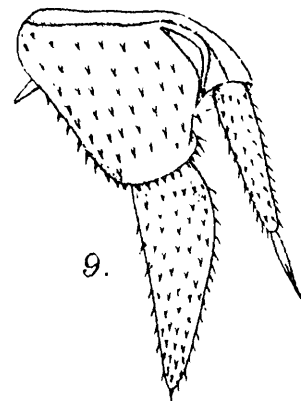
7.



8.



10.



9.

E.W.E. del.

ARHINA BARKULENSIS, n.sp.

A. Chowdhary, lith.

EXPLANATION OF PLATE IX.

*Periscyphis gigas*, n. sp.

- FIG. 1.—Dorsal view,  $\times 2\frac{1}{2}$ .  
,, 2.—Dorsal view of the cephalon.  
,, 3.—Anterior view of the cephalon.  
,, 4.—Antennule.  
,, 5.—Right mandible.  
,, 6.—Outer lobe of 1st maxilla.  
,, 7.—Second maxilla.  
,, 8.—Maxillipede.  
,, 9.—Second thoracic appendage.  
,, 9a.—Terminal portion of spine, much enlarged.  
,, 10.—Left uropod.

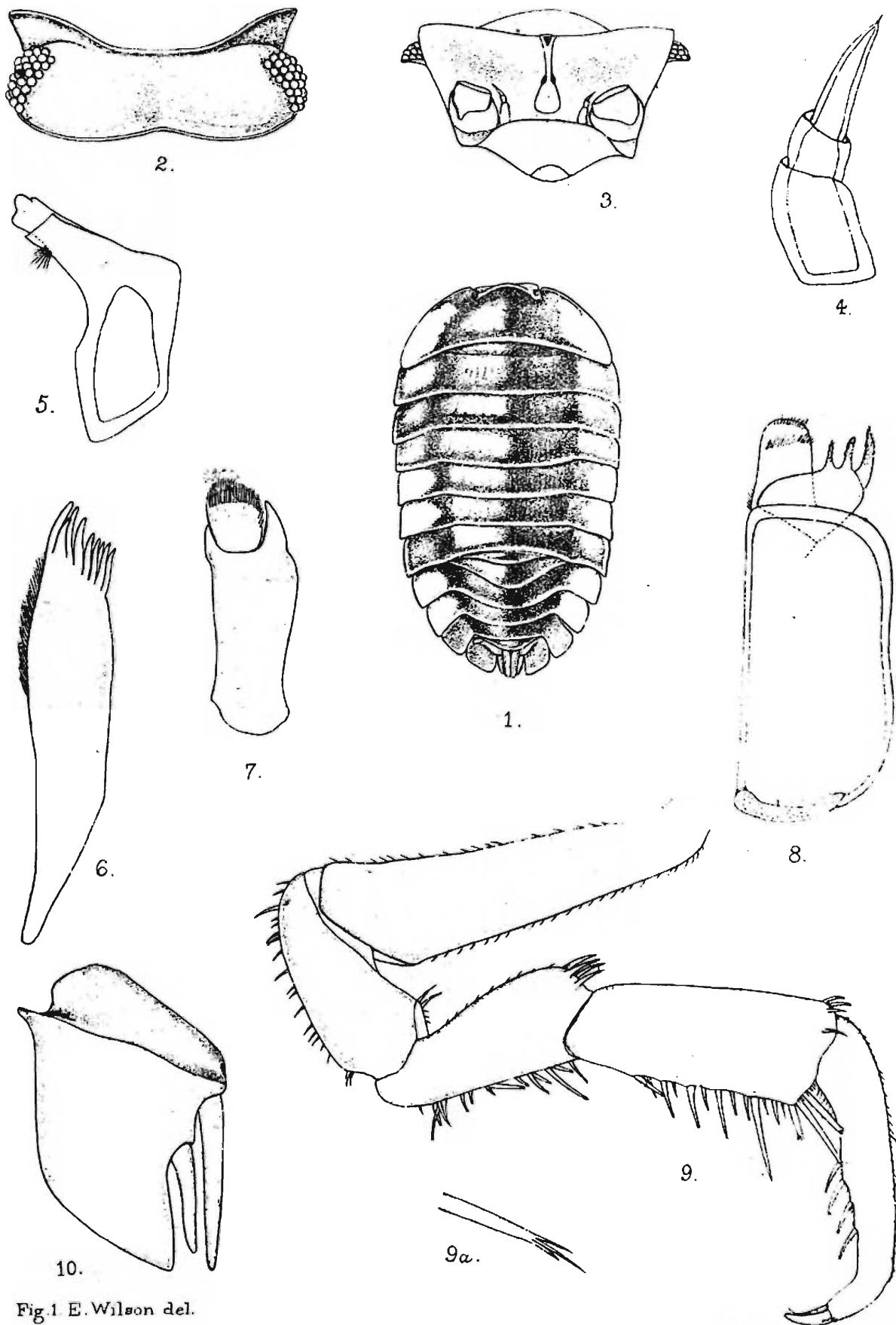


Fig.1 E. Wilson del.  
E.W.E. del.

A Chowdhury, lith

*PERISCYPHIS GIGAS*, n.sp.

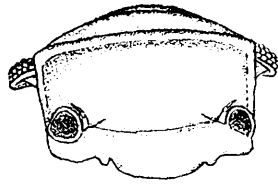
EXPLANATION OF PLATE X.

*Cubaris solidulus*, n. sp.

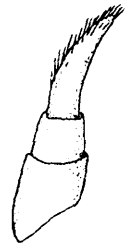
- FIG. 1.—Dorsal view of the cephalon.  
,, 2.—Anterior view of the cephalon.  
,, 3.—Antennule.  
,, 4.—Antenna.  
,, 5.—First maxilla, terminal portion of inner and outer lobes.  
,, 6.—Second maxilla, terminal portion.  
,, 7.—Lateral portion of 1st mesosomatic segment, showing notch on the under side.  
,, 8.—The same on the 2nd mesosomatic segment.  
,, 9.—Maxillipede, terminal portion.  
,, 10.—Second thoracic appendage.  
,, 11.—Right uropod.  
,, 12.—Last abdominal segment and telson.



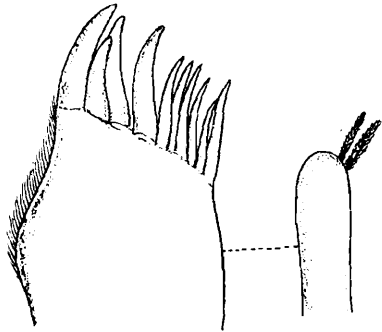
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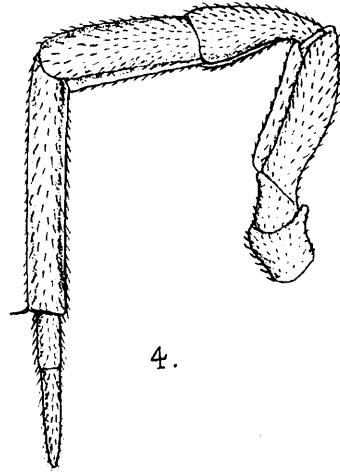
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3.



5.



4.



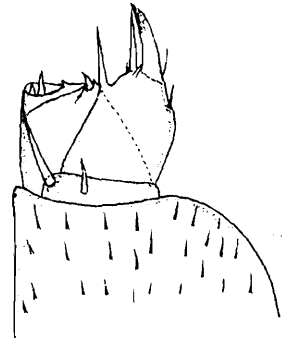
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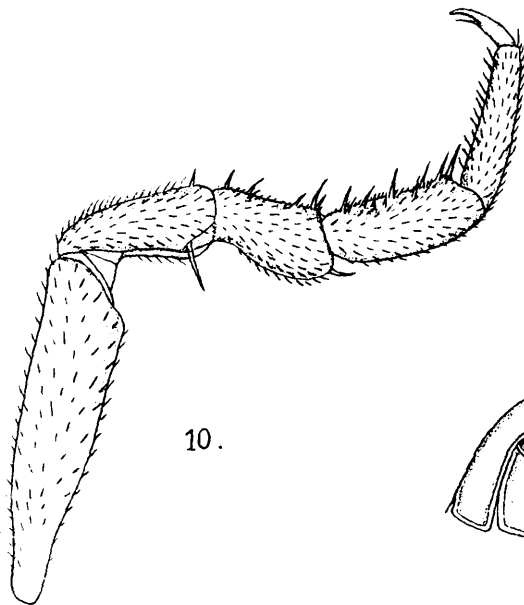
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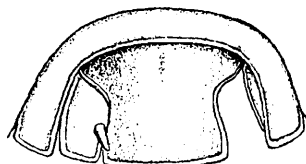
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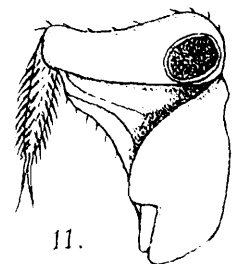
9.



10.



12.



11.

E.W.E, del.

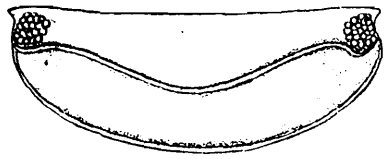
A. Chowdhary, lith.

CUBARIS SOLIDULUS, n.sp.

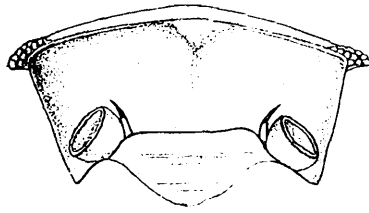
EXPLANATION OF PLATE XI.

*Cubaris nacrum*, n. sp.

- FIG. 1.—Antero-dorsal view of the cephalon.  
,, 2.—Anterior view of the cephalon.  
,, 3.—Antennule.  
,, 4.—Antenna.  
,, 5.—First maxilla, terminal portion of inner and outer lobes.  
,, 6.—Second maxilla, terminal portion.  
,, 7.—Maxillipede, terminal portion.  
,, 8.—Second thoracic appendage.  
,, 9.—Last abdominal segment and telson.  
,, 10.—Right uropod.



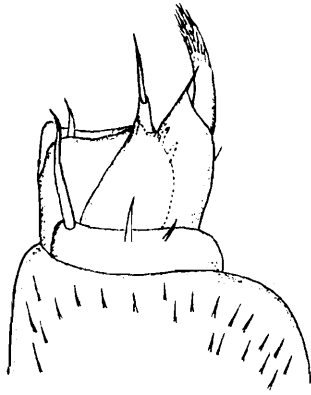
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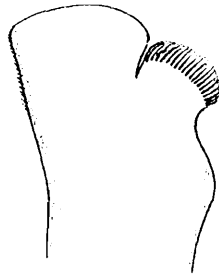
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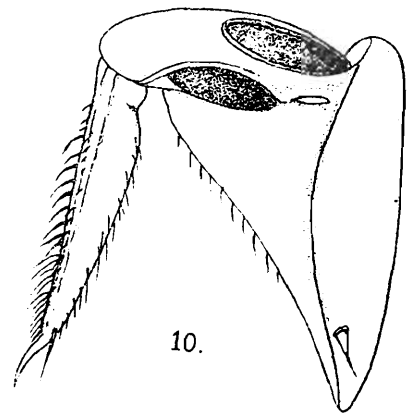
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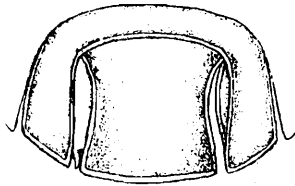
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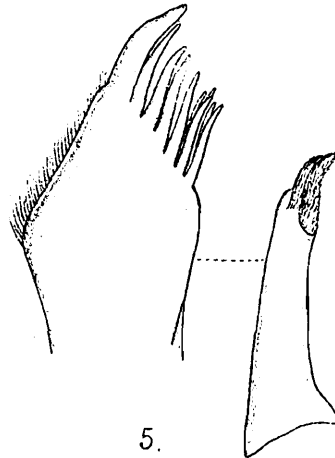
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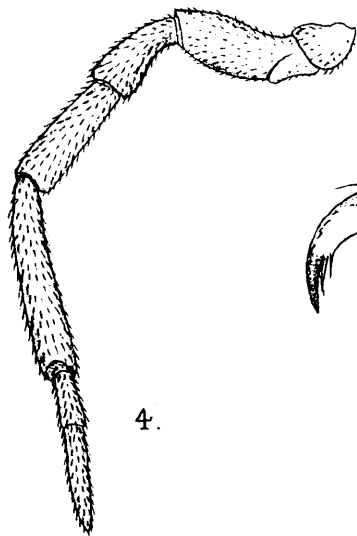
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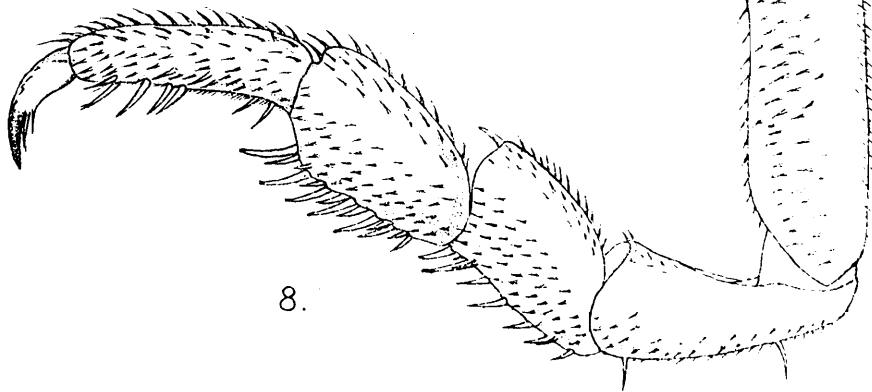
9.



5.



4.



8.

E. W. E. del.

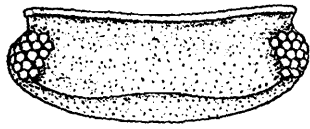
A. Chowdhary, lith.

CUBARIS NACRUM, n. sp.

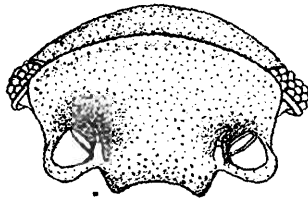
## EXPLANATION OF PLATE XII

*Cubaris granulatus*, n. sp.

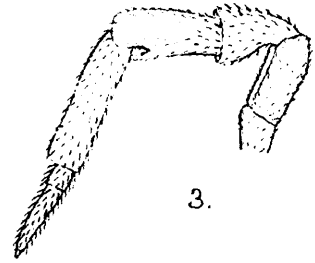
- FIG. 1.—Dorsal view of the cephalon.  
,, 2.—Anterior view of the cephalon.  
,, 3.—Antenna.  
,, 4.—First maxilla, terminal portion of inner and outer lobes.  
,, 5.—Lateral portion of the 1st mesosomatic segment, showing notch on the under side.  
,, 6.—The same on the 2nd mesosomatic segment.  
,, 7.—Maxillipede, terminal portion.  
,, 8.—Second thoracic appendage.  
,, 9.—Right uropod, dorsal view.  
,, 10.—Right uropod, ventral view.  
,, 11.—Last abdominal segment and telson.



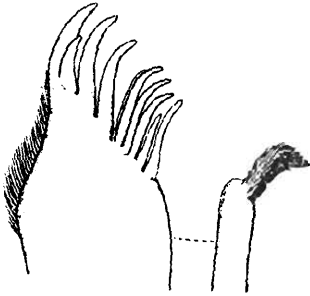
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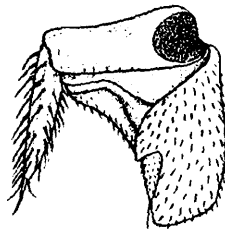
2.



3.



4.



9.



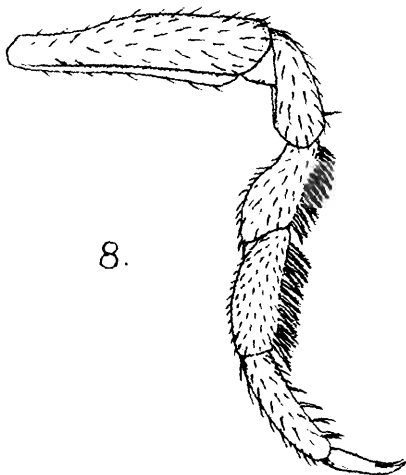
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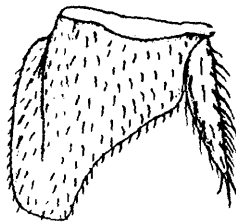
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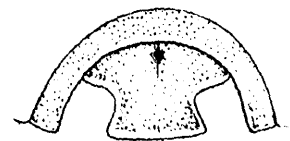
7.



8.



10.



11.

E.W.E. del.

A. Chowdhary, lith.

CUBARIS GRANULATUS, n. sp.

VII ON THE ANATOMY OF A BURMESE  
SLUG OF THE GENUS  
*ATOPOS*

By EKENDRANATH GHOSH, *M.Sc.*, Assistant Professor of  
Biology, Medical College, Calcutta.

(Plates xvi—xix.)

Two specimens of this slug were collected by Mr. F. H. Gravely, Assistant Superintendent, Indian Museum, from the base of Dawna Hills near Thingannyinaung, about 900 ft. above sea-level, on the 27th November, 1911.

They belong to the genus *Atopos*, Simroth, and are made the type of a new subgenus (*Parapodangia*) under the name of *A. (P.) gravelyi*.

Subgenus **Parapodangia**, nov.

An anterior portion of the mantle (notum) (about  $\frac{1}{6}$ th the body length) along the middle line separate from the thin dorsal wall of the body beneath. An H-shaped fold of the integument beneath the mouth between the precephalic flap and the foot. The lower tentacles fused with the precephalic flap as in *Podangia*.

**Atopos (Parapodangia) gravelyi**, n. sp.

Colour of notum sepia (with a slight brownish tint) with blotches and pinpoint dots of dark brown above, and of slaty gray (bluish) with blotches and spots of slaty black below; in the middle, a longitudinal row of pale buff blotches above and a continuous dark clove-brown band below. The anterior portion of the head (with ommatophores, lower tentacles and precephalic flaps) is slaty blue, while the posterior portion is ochraceous yellow behind. Foot sole pale yellow. Keel prominent, rounded and of dark clove-brown colour.

Length of notum (along mid-dorsal line) 14.7 cm. Height of notum 1.4 cm. Breadth 1.3 cm. Female genital aperture 1.35 cm. from male genital aperture.

ANATOMY.

*I Body wall.*

The inner surface of the thick mantle in its anterior portion where it is separate from the dorsal integument beneath, is very vascular and appears to share a prominent part in respiration.

The vessels are connected to the dorsal sinus in the mid-dorsal line of the body wall. In other respects, the body wall is quite similar to that in other species.

### II Pallial Complex.

The *pallial complex* forms a circular area extending from the right side at the junction of the inner surface of the mantle and the dorsal surface of the foot to within 6 cm. of the margin of the mantle on the left side. It lies at about 2.4 cm. distant from the anterior margin of the mantle. The *pericardium* lies in the anterior two-thirds of the pallial complex and to the right, the *kidney* occupying the remainder. There is no distinct pulmonary chamber at all. The whole pallial complex is adherent to the thick mantle and is roofed by a thin membrane which is fused with the inner surface of the latter. The ventral wall lies over the anterior end of the liver.

The *heart* is placed in the long axis of the pericardium. The auricle is placed behind the ventricle.

*Minute structure of the ventricle.*—The outer surface is lined by a single layer of cubical-cells with oval nuclei. There is no distinct epithelial lining of the cavity. The superficial layers form a thin continuous coat of transversely-arranged muscle fibres. Beneath this, the muscle fibres form thick bundles which are disposed irregularly in different directions. Just beneath the superficial layer, the thick bundles are arranged circularly in a transverse direction, being separated from the former widely in many places by thick bundles which pass inwards, some radially and others obliquely, from the superficial bundles to these circular ones with which they seem to unite. More internally the disposition of the fibres are mainly longitudinal with a few oblique ones. The cavity of the ventricle is traversed by these muscle bands which extend through the cavity in various directions.

*Minute structure of the auricle.*—The wall is lined externally by a layer of rectangular cells with their long axis parallel to the surface. The superficial muscles form a transversely circular layer. The inner bundles form a longitudinally circular layer. Between these two layers, there are a few bundles which are arranged obliquely and seem to pass from one layer to another.

### III. Digestive System.

(i) The *buccal bulb* forms a protrudable proboscis which, when retracted, is placed inside a proboscis sheath having a narrow funnel-like shape at its outer aspect. The proboscis forms the acrobolic (pleurembolic) introvert of Sir E. R. Lankester.

As seen in a longitudinal section, the proboscis, when retracted, lies in the tubular space formed inside the proboscis sheath, which is folded a little behind its middle in such a way that its posterior portion is invaginated into the anterior portion;

the morphologically inner surface of the posterior portion of the sheath now becomes external and lies in contact with the inner surface of the anterior portion. On the dorsal surface and the lateral aspects of the anterior portion of the proboscis sheath are numerous flattened muscular strands which pass upwards and backwards to be inserted into the thin dorsal integument. The presence of these strands prevents this tubular anterior portion of the proboscis sheath from being protruded with the proboscis. Again the posterior division of the sheath, which, owing to the doubling of its wall, is placed inside the anterior division, is prevented from being straightened out behind by the presence of fine strands of connective tissue, which extend from its morphologically outer side (inner side in the present condition) to the outer surface of the proboscis in a direction backwards and inwards from the wall of the sheath.

It is remarkable to note that in *A. (P.) kempii*, Ghosh, owing to the absence of special muscle strands from the outer surface of the proboscis sheath to the dorsal integument, the proboscis can be extended to its full extent so that the wall of the sheath is seen to become continuous with the anterior end of the head in the position of the mouth. A partial protrusion of the proboscis is only possible in the present case. Again a simpler condition exists in *A. (P.) sanguinolenta* (Stol. MS.). Here the proboscis is attached behind to the posterior end of the sheath surrounding it, just in front of the beginning of the oesophagus, so that after the proboscis has been fully protruded it drags from behind the sheath which then becomes gradually everted and forms a covering of the radular portion of the proboscis, so that the proboscis sheath becomes continuous with the proboscis in front.

Hence the present species shows an intermediate condition as regards the structure of its protrudable buccal bulb.

*Minute structure of the proboscis.*—The inner surface is raised into transverse folds; the ridges on the upper half fit into depressions on the lower half like the teeth on the blades of a pair of forceps. The inner surface of the organ is lined by a single layer of cubical epithelium which secretes a layer of hard homogenous cuticle, as thick as the cells themselves. On the outer side of the epithelium are placed the muscular layer, the bundles being arranged in various directions.

(ii) The *radula sac* is a club-shaped body curved somewhat like the letter **S**, the narrow end of which is attached to the posterior end of the proboscis. The sac is surrounded by a thin outer coat of muscular tissue within which is a thick muscular coat. Both these two coats are continued behind to form the retractor muscle. Beneath the thick inner coat and lying in the ventral and lateral aspect of the cavity of the sac, is a thick flap of muscular tissue which is attached to the inner surface of the muscular sheath behind and laterally, but projects anteriorly into the cavity about half the length of the sac from its posterior

end; this free anterior end of flap gives attachment to the radula. Inside the muscular sheath and lying over the flap is a bilobed hollow fibrous cushion with a thick and hard wall. This cushion is free at its round anterior end and ventral aspect, but is attached to the muscular sheath behind and laterally towards the dorsal aspect. Ventrally between the two lobes is a deep transverse fissure into which the anterior end of the ventral flap fits. The dorsal surface of the cushion is convex in the middle line, but concave at the sides, where it is continuous with the inner surface of the muscular sheath. A little anterior to the middle of its length is a transversely placed crescentic aperture leading into the radula sac proper. The *radula* is attached to the anterior end of the ventral flap and passes over the anterior rounded end of the cushion to its dorsal surface over which it is traced backwards into the radula sac proper. The portion of the radula lying over the dorsal surface of the cushion extends laterally on the concave lateral portions of the surface and the inner surface of the muscular sheath, so that in a longitudinal section a little to one side of the middle line we get two sections of the radula—one lying on the dorsal surface of the sac, and another beneath the inner surface of the inner muscular sheath at a higher level than the first.

*Minute structure of the radula and the radula sac proper.*—  
The *radula* consists of the following layers :—

- (1) A thin fibrous membrane lined beneath by a single layer of pavement epithelium. The membrane consists of white fibres alternating with single rows of connective tissue corpuscles.
- (2) A single layer of cubical epithelium over the fibrous layer.
- (3) A thick homogeneous corneous layer with fine longitudinal striation. To this are attached the bases of the teeth which are all unicuspid and are arranged in V-shaped rows.

The *radula sac* lies in the middle of the bilobed cushion in its dorsal aspect. The crescentic aperture (mentioned above) leads into the narrow cavity which is directed downwards and backwards, and which ends blindly after curving a little backwards and outwards. At the sides the cavity extends downwards and outwards and then upwards and inwards again for a short distance, where it ends blindly abutting on the wall of the hollow mass on the dorsal aspect. In a longitudinal section of the sac, a little to the side of the middle line, we get a sort of horse-shoe-shaped appearance as the cavity extends for some distance on the anterior aspect where the two portions become continuous. In a transverse section through the middle of the sac we get a reniform outline with the middle third of the convex side absent.

The sac is surrounded by a sheath of connective tissue. The ventral and the outer walls of the sac are thin; the lower

surface of the radula is applied on these surfaces. A little in front of the posterior blind end of the cavity, the lower and outer walls of the sac is lined by a single layer of large granular cells with round or oval nuclei. This layer is continuous with the cubical epithelium of the radula. At the extreme posterior end of the cavity of the sac lies a mass of cells arranged obliquely and probably in several rows. These are placed on a thin layer of connective tissue, and seem to be continuous in front with the layer of granular cells just mentioned, while the connective tissue layer is continued in front to that of the radula.

The corneous layer on which the teeth are placed becomes suddenly narrowed down, just behind the point where the cubical epithelium ends, and is continued backwards as a thin layer to the tip of the cavity where it ends above the upper tiers of cell of the cellular mass just mentioned. The dorsal and inner lining of the cavity is convex and have the teeth of the radula embedded in them. The cavity of the sac is thus so narrow as to keep the radula between its two surfaces, there being no space left between the radula and the lining of the cavity of the sac. The postero-dorsal wall of the sac is thick and projects into the cavity of the sac. The base of the projecting mass consists of a curved stratum of connective tissue in front of which lies an oval mass of large muscular fibres, arranged transversely and separated widely from each other by connective tissue fibres and cells. Still in front lies an elongated mass of connective tissue cells embedded in a gelatinous matrix traversed by a few fine fibres, on the lower aspect of this wall lies a row of much elongated obliquely-placed cells, continuous round the blind end of the cavity to the cellular mass on the upper and outer aspect of the cavity. On the lower surface of this cellular layer are seen two or three transverse rows of teeth one before another and placed flatly on the homogeneous layer. In front of these rows, the teeth are arranged obliquely on the thick homogeneous layer between rows of cells continued to the posterior and inner wall of the sac, and filling up the space between the successive rows and probably between the individual teeth of the same row. The cells are probably concerned in the secretion of the teeth of the radula.

(iii) The two *salivary glands* are fused to form a single oval mass, but there are two salivary ducts which pass to their destination as usual.

(iv) The *oesophagus* ends in the substance of the liver. Its course is exactly similar to that in other species.

(v) The *digestive gland* is elongately conical in shape and rounded in front. It ends about 1.5 cm. in front of the posterior end of the mantle. The upper surface is convex from side to side; it presents the S-shaped curve of the rectum in its anterior portion about  $\frac{1}{4}$ th the length of the gland from this end. The cavity of the liver is a C-shaped slit in transverse section.

(vi) The *intestine* forms a S-shaped curve lying partially embedded in the substance of the liver on the dorsal aspect. It begins on the left lateral aspect of the liver and, taking the curve just mentioned, emerges out of its wall from near the anterior end to the left. It then passes along the anterior border of the liver forwards and outwards to the right, being surrounded by a coil of the oviduct in its course, to end in the anus in the groove between the foot and the mantle. The portion which lies beyond the liver may be conveniently named *rectum*.

#### IV Reproductive System.

(i) The *hermaphrodite gland* is an oval mass—more or less flattened from side to side and placed on the right side of the anterior end of the liver. The organ is connected to the liver by a flat strand of fibrous tissue. The *retractor penis* muscle passes over the outer side of the gland.

*Minute structure.*—Under the low power the true glandular portion of the body lies in its distal end. It consists of a flattened mass of more or less rounded acini held together by loose connective tissue. Each acinus gives rise to a duct which unites with others to form the oviduct. The oviduct is coiled and looped in various ways as it passes on, and then emerges from the glandular mass after having received the vas deferens in the same. The vas deferens seems to arise from the centre of the glandular mass, and passes outwards nearly to its proximal end where it opens into the oviduct.

(ii) The *albumen gland* forms an elongated mass along the upper border of the hermaphrodite gland with which it is inseparably fused from the distal end.

*Minute structure*—The gland consists of numerous irregular lobules separated somewhat widely from each other by loose connective tissue. Each lobule consists of an irregular mass of acini held together by a thin layer of connective tissue. The acini open together into a short duct which ends in the main duct of the gland. The main duct passes along the upper border of the hermaphrodite gland and then turns downwards between the glandular mass and the coiled mass of oviduct to the lower border, where it seems to open into the oviduct. It also receives several ducts of lobules scattered along its course.

(iii) The *hermaphrodite duct* is a short tube which forms a V-shaped loop as it emerges from the glandular mass and coils itself round the intestine to pass outwards, downwards and a little backwards, where it ends in the external genital aperture placed just behind and internal to the anus.

(iv) The *penis* is enclosed in a penial sheath, which opens on the outer side of the base of the lower tentacles. There is one *simrothian gland*, on the right side only. The *penial sheath* as usual gives attachment to a retractor penis muscle. A fine thread-like tubule, the *flagellum*, also opens into the penis, at its distal end.

The *penial sheath* consists of two portions: (1) A stout reniform mass containing the penis when the latter is fully retracted, the wall of the penis being continuous with that of the penial sheath at their distal ends. (2) A narrow tubular portion, which ends in the external aperture with the *right simrothian gland*.

(v) The *right simrothian gland* consists of two portions: (1) A narrow tubular portion coiled in various ways in its distal two-thirds. (2) A stout portion (also looped once) ending in the external aperture. At the junction of the two, is a fine tubular blind-sac (coecum) directed towards the outer end. The base of the sac gives attachment to a few muscle fibres. These correspond to the first and fourth portions of the simrothian glands of *A. (P.) sanguinolenta*.

#### V *Nervous System.*

The general arrangement of the ganglia is similar to that in other species. As the system has not yet been studied in detail in other species, it is convenient to deal with them rather fully in the present species.

(i) *Cerebral ganglia.* Each ganglion contains numerous groups of ganglionic cells arranged correspondingly to the origin of nerves from it. Three such rows can be recognized as follows:—

- (1) An elongated row of cell-group in the inner third of the ganglion along the whole length.
- (2) A similar row in the outer third.
- (3) A narrow elongated group in the middle third in its anterior fourth.

The nerves (C 1-5) from the cerebral ganglion:—

- (1) A stout nerve on the inner side lying close to the nerve of the opposite side. It arises from the ventral aspect and supplies the ommatophore.
- (2) A stout nerve dividing into three branches immediately after its origin. These supply the cephalic flap and its retractor muscle. One of these communicate with the buccal ganglion of the same side.
- (3) A stout nerve from the antero-external corner of the ganglion; it supplies the outer side of the head.
- (4) A fine nerve on the dorsal aspect of the nerve (3) supplying the dorsal integument of the head.
- (5) Several small nerves on the outside supplying the sides of the head and the muscular strands in connection with the proboscis and proboscis-sheath.
- (6) A few fine nerves from the ventral aspect to the body wall at the base of the proboscis, one of which supplies the retractor muscle of the tentacle (C 6).

(ii) *Buccal ganglia.*—Each ganglion gives off (1) a number of nerves which spread over the proboscis and its radular portion; (2) one long nerve which passes along the oesophagus and serves

to supply this portion of the alimentary canal. It gives off a fine nerve to the salivary gland.

(iii) *Viscero-pleural ganglia*.—The nerves (VP 1-5) are:—

- (1) Two stout nerves arising side by side from the outer side. The outer one can be traced to the V-shaped process at the anterior end of the foot of the same side. The inner one seems to supply the anterior end of the foot. These two nerves arise from the oval group of ganglionic cells on the outer and anterior portion of the ganglia.
- (2) A fine nerve arising from the outer aspect of the left ganglion at its posterior end. It passes along the gullet and ends in the liver a little behind the antero-inferior surface of the liver.
- (3) A nerve from the right ganglion which supplies the female genital organs.
- (4) A fine nerve from the right ganglion to the penis, penial sheath and the simrothian gland.
- (5) Nerves to the side of the mouth above the pedal groove (VP 5).

(iv) *Pedal ganglia* (P 1-3).—The nerves are:—

- (1) A nerve to the pedal gland.
- (2) Nerves to the lateral wall of the mantle just above the groove round the foot.
- (3) The long pedal cord which passes backwards along the dorsal surface of the foot to its posterior end. It gives off numerous nerves from its outer side to supply the foot.

### VI. Eyes and Head Appendages.

The eyes are of rhipidoglossate type. Each forms a vesicle which is closed anteriorly forming a cornea composed of an external layer of epithelial cells, continuous with the tegumentary epithelium, an internal layer of epithelial cells (continuous with retina) and an intervening layer of transparent connective tissue. There is an oval crystalline lens with a surrounding layer of vitreous humour.

*Ommatophore*.—The cylindrical body of the ommatophores is hollow with a thick wall. Just behind the optic vesicle is a thin septum of connective tissue stretching transversely across the cavity. The wall consists of the following layers:—

- (1) A single layer of cubical epithelium on the outer side.
- (2) A thick layer of connective tissue with numerous cells. This layer contains some mucous glands placed at distant intervals. There are numerous pigment granules along the course of the connective tissue fibres.
- (3) A layer of circular muscle fibres with a few radial fibres from the next internal coat.
- (4) A layer of longitudinal muscle fibres.

VII. *Pedal Gland.*

(i) The *pedal gland* is a tubular body. The anterior portion is somewhat flattened from above downwards, while the posterior portion is triangular in transverse section.

*Minute structure.*—The pedal gland agrees in minute structure with that in *Atopos (Podangia) kempii*, Ghosh, except in the following points:—

(1) In the present species there is a blood-sinus on the dorsal aspect of the lumen of the gland in the middle line. Its wall consists of longitudinal muscle fibres bounded on the outer side by a layer of connective tissue.

(2) Owing to the interposition of a blood-sinus, the lumen of the gland comes to lie more or less in the centre and has become flattened out a little, instead of lying more towards the dorsal aspect and of being circular in transverse section as in *A. (P.) kempii*.

(ii) The *supra-pedal gland* is a small tongue-shaped body lying between the proboscis sheath and the pedal gland, and opening into the exterior just above the aperture of the pedal gland.

*Minute structure.*—The anterior portion forms a wide U-shaped cavity with the curve of the U continued in front to open into the exterior. The posterior two-thirds form a glandular mass, which consists of numerous lobules held together by connective tissue. Each lobule consists of a number of many-sided cells with spherical nuclei placed on one side. The ducts of these glands seem to open into the cavity of the body. On the outer aspects of the cavity, there are also numerous glands of similar structure with ordinary mucus-secreting cells in addition. The cavity of the gland is lined by a single layer of cubical cells. Immediately on the outer side of the epithelium is a thin layer of connective tissue which is prolonged outwards between the lobules.

## LITERATURE

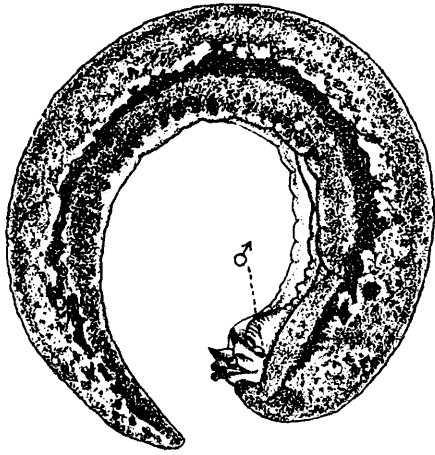
For references see my paper "Mollusca, I", in the Zoological Results of the Abor Expedition (*Records of the Indian Museum*, VIII, part III, No. 15).

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EXPLANATION OF PLATE XVI.

*Atopos (Parapodangia) gravelyi*, n. sp.

- FIG. 1.—Side view of the mature specimen (nat. size); ♂, male aperture.
- „ 1a.—Side view of the smaller specimen (nat. size); the proboscis is protruded.
- „ 1b.—Ventral view of the head.
- „ 1c.—Side view of the head.
- „ 2.—Transverse sections of the body; *a*, through the middle; *b*, about 1.4 cm. in front of the posterior end; *c*, about 6 cm. from the posterior end.
- „ 3.—Inner surface of the anterior portion of the mantle; 1, attachment of the foot; 2, line of attachment of the dorsal integument to the mantle; 3, the dorsal blood sinus.
- „ 4.—Pallial complex seen from the inner side, × 2. 1, rectum; 2, renal aperture; 3, ventricle; 4, auricle; 5, kidney; 6, pericardium.
- „ 5.—Longitudinal section of the ventricle.
- „ 6.—Longitudinal section of proboscis, diagrammatic.
- „ 7.—Longitudinal section of the radular portion of the proboscis (a little to the side of the middle line); 1, wall of proboscis sheath; 2, 3, radula; 4, radula sac; 5, salivary duct.



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1b.



1c.



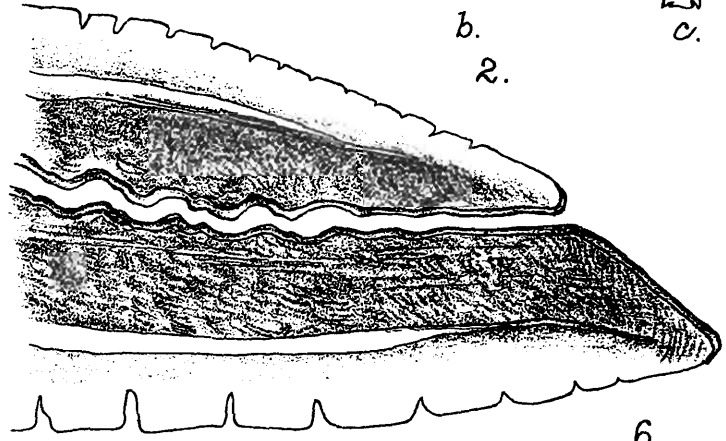
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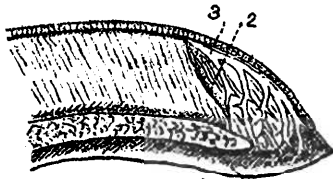
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c.

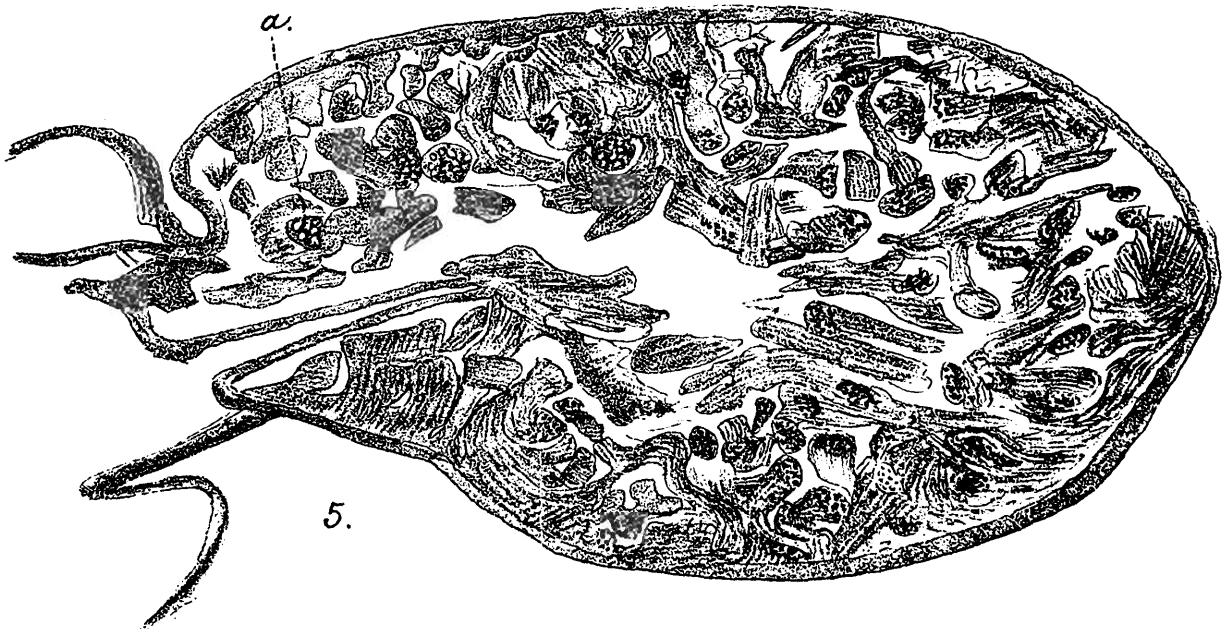


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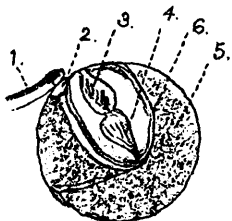


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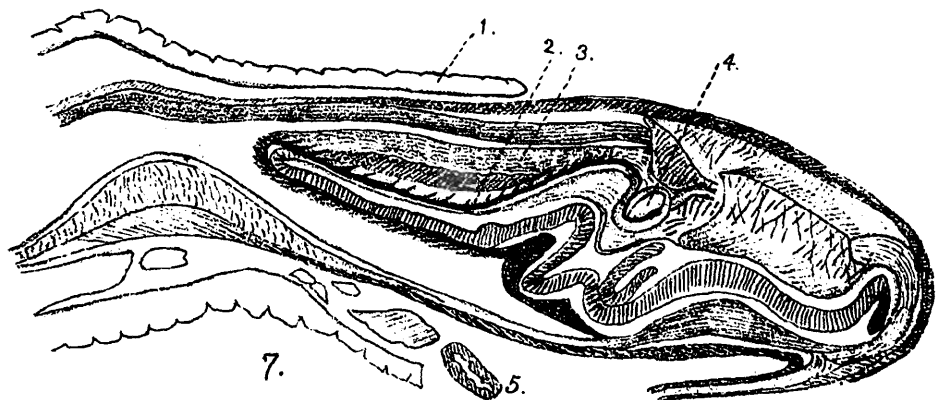
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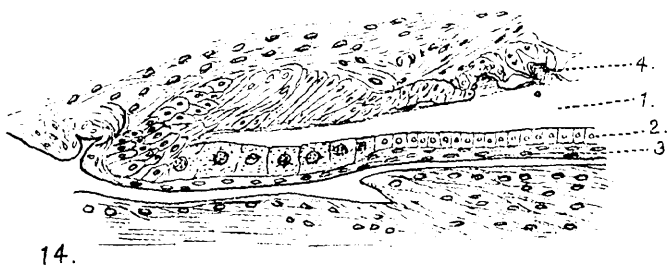
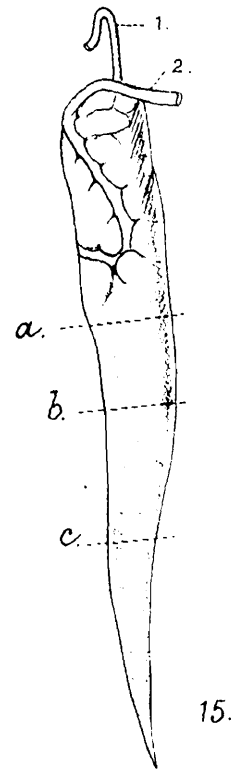
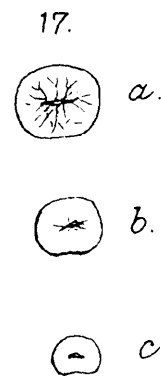
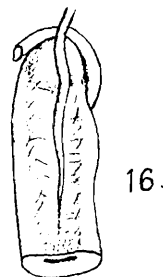
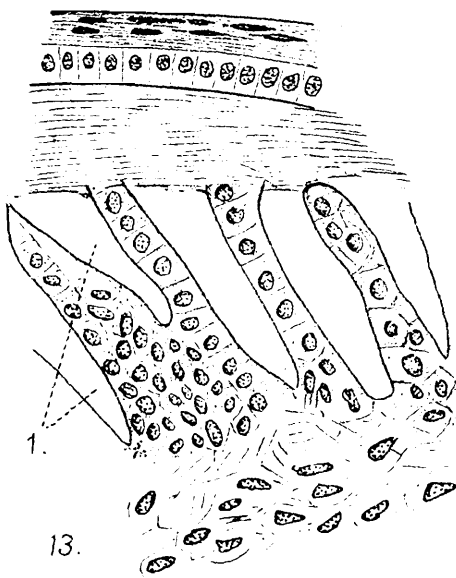
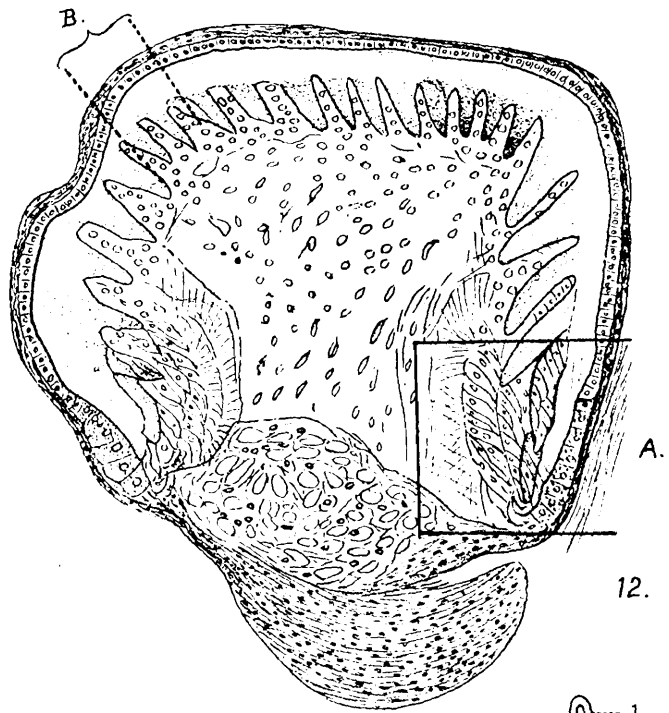
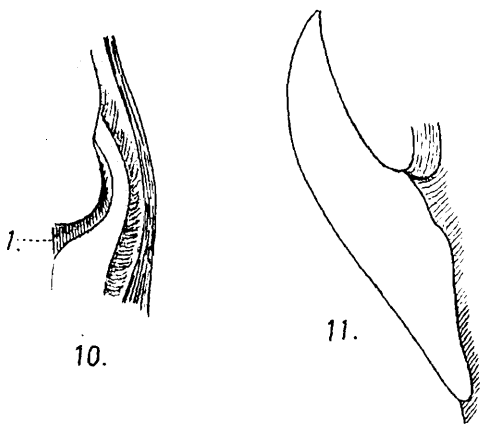
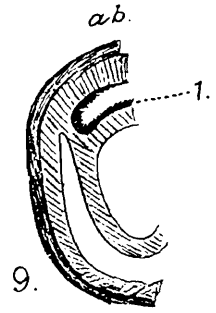
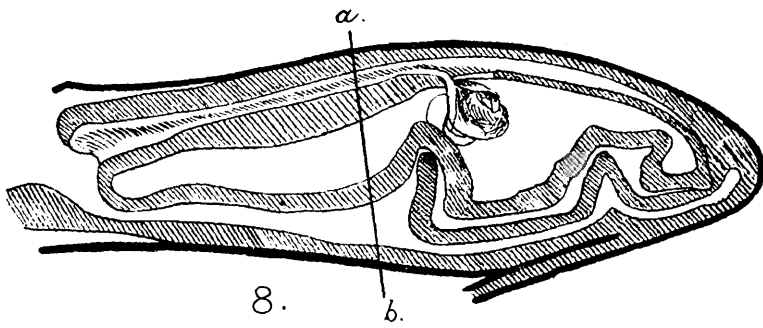


7.

EXPLANATION OF PLATE XVII.

*Atopos (Parapodangia) gravelyi*, n. sp.

- FIG. 8.—Longitudinal section of the radular portion of the proboscis (diagrammatic) in the middle line.
- „ 9.—Transverse section of the same, *a-b*.
- „ 10.—Dorsal view of the aperture of the radula sac.
- „ 11.—A tooth of radula [Zeiss ocular vi, Leitz obj. 6].
- „ 12.—Longitudinal section of radula sac. [Zeiss ocular vi, Leitz obj. 3].
- „ 13.—A portion of the same, marked B roughly in fig. 12.
- „ 14.—A portion of the same as in fig. 12, marked A.
- „ 15.—Digestive gland,  $\times$  1. 1, oesophagus; 2, rectum.
- „ 16.—Anterior portion of digestive gland, ventral view,  $\times$  1.
- „ 17.—Transverse sections of the digestive gland at various levels shown in fig 15.



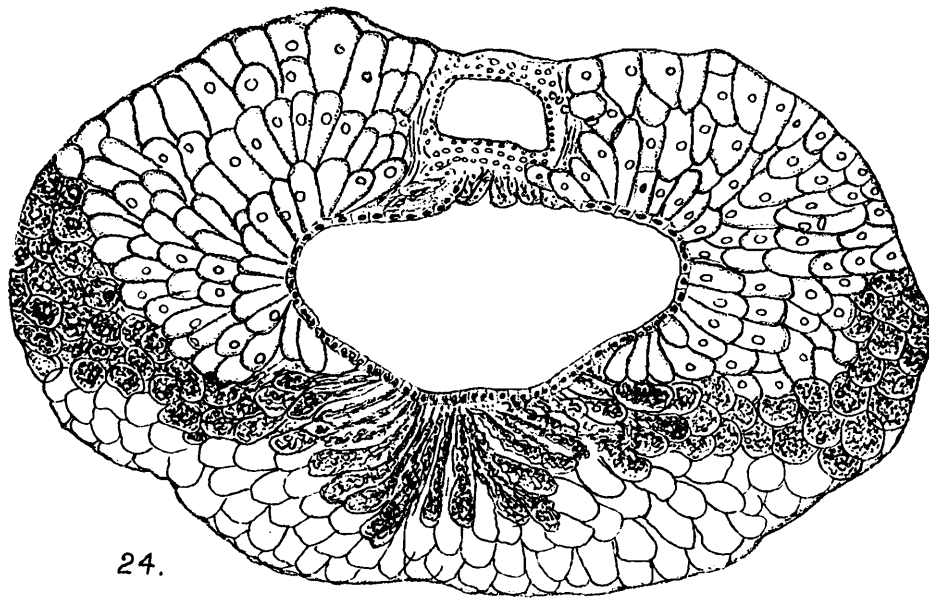
E. N. Ghosh, del.

A. Chowdhary, lith.

EXPLANATION OF PLATE XVIII.

*Itopos (Parapodangia) gravelyi*, n. sp.

- FIG. 18.—Proboscis, its radular portion (*a*), and salivary gland, (*b*),  
× 1.
- „ 18*a*.—Ventral view of the proboscis with the ends of the  
salivary ducts, × 1.
- „ 18*b*.—Longitudinal section of proboscis, × 2.
- „ 19.—Salivary gland with the two ducts (*a*), × 1.
- „ 20.—Genital organs; 1, hermaphrodite duct; 2, rectum; 3,  
hermaphrodite gland.
- „ 21.—Inner surface of the gland.
- „ 22.—Pedal gland, × 1.
- „ 23.—Suprapedal gland, × 1.
- „ 24.—Transverse section of the pedal gland, × 103.
- „ 25.—Longitudinal section of the suprapedal gland.
- „ 26.—A portion of the same marked *a-b* in fig. 25.



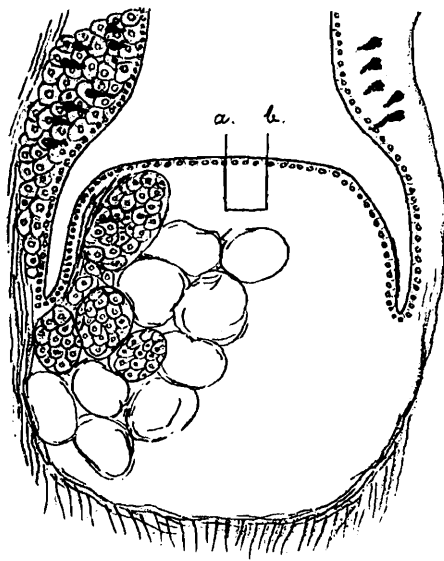
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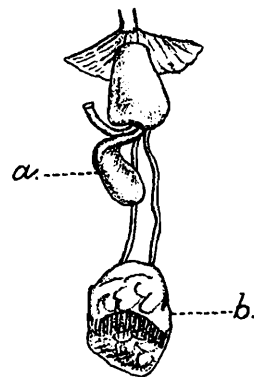
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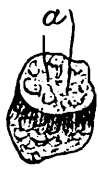
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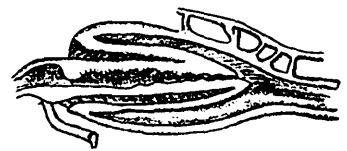
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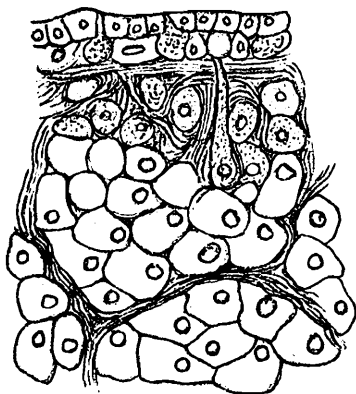
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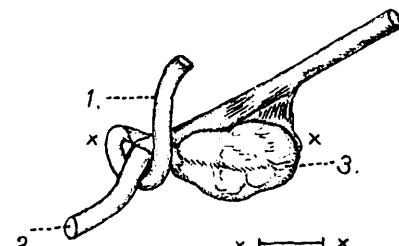
18a.



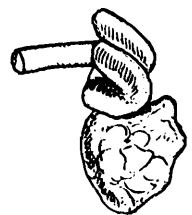
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20.

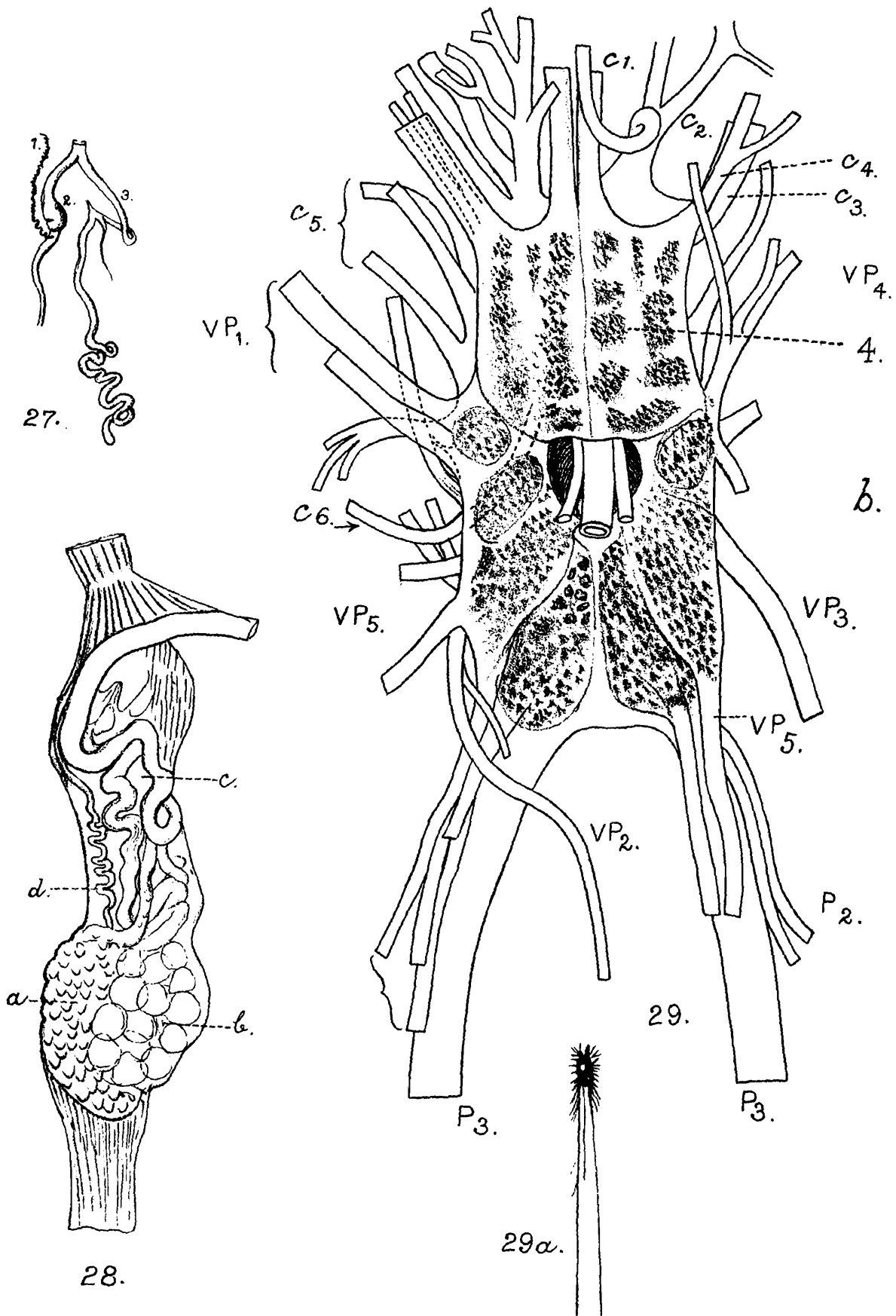


21.

EXPLANATION OF PLATE XIX.

*Atopos (Parapodangia) graveleyi*, n. sp.

- FIG. 27.—Male genital organs; 1, flagellum; 2, penis; 3, simrothian gland (right).
- „ 28.—Diagrammatic enlarged drawing of the hermaphrodite gland of the smaller specimen. *a*, Albumen gland; *b*, acini; *c*, coiled mass of oviduct; *d*, spermduct.
- „ 29.—Nervous system; *a*, nat. size; *b*, enlarged drawing.



VIII THE GENUS *AUSTRALELLA* AND  
SOME ALLIED SPECIES OF PHYLACTO-  
LAEMATOUS POLYZOA

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

(Plates II, III).

I described the genus *Australella* in 1910<sup>1</sup> in a footnote to a paper on Indian Phylactolaemata, but the type-species, which was the only one then distinguished, was an Australian form (*Lophopus lendenfeldi*, Ridley<sup>2</sup>) known from the original description only. The type-specimen is in the British Museum, whence I have been able to obtain a fragment through the kind offices of Mr. R. Kirkpatrick. This schizotype was before me when I described the genus, but the shrivelled condition of the colony rendered it necessary to rely on Ridley's diagnosis and figures rather than on direct observation. Relying, therefore, on this description, I placed *Australella* in the subfamily Lophopinae. An examination of admirably preserved material of a new species leaves no doubt now that it belongs to the Plumatellinae, as is indicated by Kraepelin's<sup>3</sup> recent note on *Lophopus jheringi*, Meissner, which he regards as a congener.

We owe the discovery of the new species to Mr. Bains Prasad, Patiala Research Scholar in the Government College, Lahore, whose keenness as a collector and observer is already beginning to cast light on obscure places in our knowledge of the aquatic fauna of the Punjab.

The genus *Australella* may now be defined as follows:—

Genus *Australella*, Annandale.

Plumatellinae in which the colonies are recumbent and dendritic but enclosed in a uniform apparently structureless jelly that fills up the interstices between individual zooecia and branches. There is no stolon; the zooecia arise directly one from another. Individually they are semirecumbent, the proximal part of each resting, when the branch to which it belongs is fully formed, on the object to which the colony is fixed, while the distal part is almost vertical. The polypide

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<sup>1</sup> *Rec. Ind. Mus.* V, p. 40 (1910).

<sup>2</sup> *Journ. Linn. Soc. London (Zool.)* XX, p. 62 (1890).

<sup>3</sup> Michaelsen's *Land und Susswasserfauna Deutsch-Sudwestafrikas* 1, Bryozoa, p. 61 (1914).

is normal; it has some 40 to 60 tentacles, which are moderately or very long. The lophophore generally resembles that of *Plumatella*. The statoblasts are large (0.4 mm. to 1 mm. long), but as a rule smaller than those of the Lophopinae. They resemble the free statoblasts of *Plumatella* in structure and have neither marginal processes nor terminal prolongations.

Apart from the synoecial jelly, the structure of the colony in this genus is very like that of *Plumatella*, but the order of branching is not quite the same. In the younger parts each zooecium normally produces a single bud, but the precise stage at which this bud is produced differs in different species and even in different parts of the same colony; in *A. lendenfeldi* it probably does not appear as a rule until the mother-zooecium is well developed, whereas in *A. indica* it develops while the latter is still small. As a rule, in both species, it arises on the left and the right side respectively of alternating zooecia, so that a zig-zag stem is produced, consisting of a linear series of zooecia pointing alternately in different directions. As the colony grows older a secondary bud is often produced on the opposite side of the mother-zooecium to that on which the primary bud was formed. These secondary buds are the mother-zooecia of lateral branches that pursue a similar course to that of the stem from which they originated, but at an acute angle to it. The figure may be further complicated by the production of secondary buds, and ultimately of secondary branches, from zooecia of the primary branches, and as a matter of fact this often takes place at an early stage in the development of the colony.

The result is the formation of a solid encrusting body closely compacted and agglutinated together by the synoecial jelly, but increasing in bulk mainly in one plane and without vertical branches.

It sometimes happens that branches or parts of branches die off or are killed by injury. In such cases the synoecial jelly remains intact. New branches may arise in vacant masses of jelly by budding from isolated fragments of the polyparium and are thus found separated from the remainder of the colony except in so far as they are united by the jelly. This fact sometimes gives the whole structure the false appearance of being a compound colony like that of *Pectinatella*.

The genus *Austrolella* has now been found in Australia, India and South America.

*Key to the species of AUSTROLELLA.*

- I. Synoecial jelly cartilaginous, scanty.  
Statoblasts oval, rounded at the ends . *A. indica*.
- II. Synoecial jelly soft, very copious.
  - A. Statoblasts oval, subtruncate . *A. lendenfeldi*.
  - B. Statoblasts subcircular or polygonal *A. jheringi*.

***Austrolella indica*, sp. nov.**

(Plate II.)

*Zoarium*.—The zoarium forms a massive, somewhat nodular structure growing round the stems of water-plants. It has an opaline gelatinous appearance and (preserved in formalin or spirit) a hard but elastic consistency. Even when the polypides are completely retracted the individual zooecia are distinctly visible, each having the appearance of being enclosed in a separate cell-like compartment. The surface, apart from the larger nodulosity, is otherwise smooth.

As is usually the case in the Plumatellinae, the precise organization of the colony is best seen in its terminal parts. There it is quite evident that the zoarium consists essentially of a main stem giving off lateral branches symmetrically in pairs, one branch at each side. The branches join the main stem at an acute angle and those that form each pair are given off almost simultaneously at the same level. The main stem is, as a whole, recumbent and adherent, but the lateral branches, although they are horizontal, at first run in the synoecial jelly, parallel to rather than in contact with the object to which the colony is attached. As they develop further, they become adherent and themselves give off lateral branches. Both the main stem and the main branches have actually a zig-zag course, because they are composed of zooecia which point alternately in two directions, this can only be seen clearly in the younger parts; for in the older parts interdigitation of the secondary branches takes place to such an extent that it is difficult to follow the course of any one branch, and the whole mass of zooecia seems to have a practically homogeneous honeycomb-like structure. Although the phase "main stem" is a convenient one, it must be understood that there are actually several or many stems of the kind in a single large colony such as the one figured on plate II, and that each is actually a unit or ray in a radiate dendritic whole.

The jelly which fills the interstices between the zooecia and between the stems and branches occupies a relatively small space. It is colourless and hyaline and, preserved in spirit or formalin, has the consistency of cartilage. I can detect no cells either in it or on its surface except, on the surface, those of unicellular algae. It is easily removed from the zooecia.

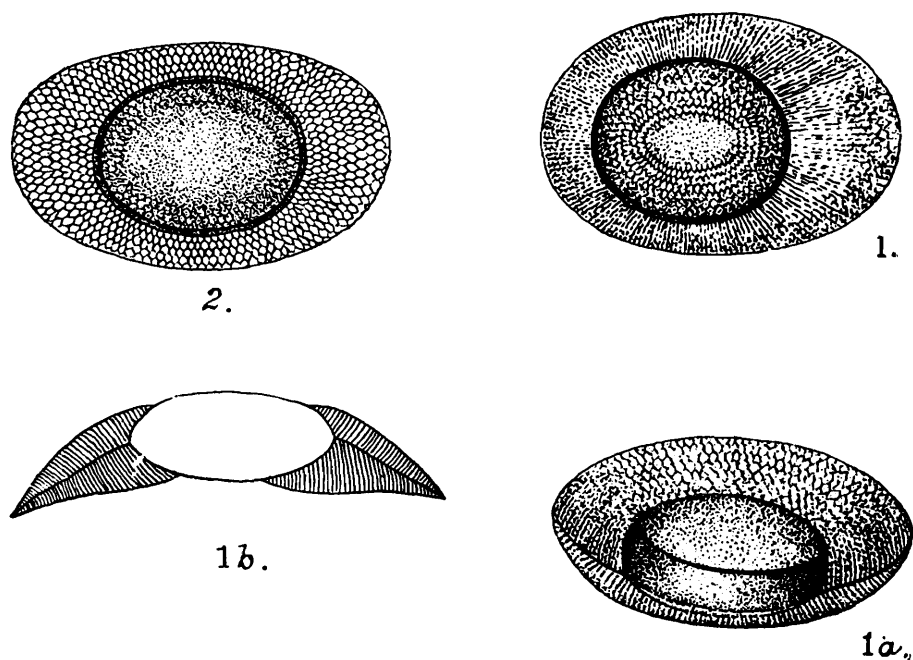
*Zooecia* —The individual zooecia are distinctly J-shaped. The horizontal arm is more slender than the vertical one, which is sometimes constricted at its base in such a way that it assumes an outline like that of an egg-cup. The soft tissues are very delicate and easily torn and there seems to be no horny or other non-cellular layer between them and the jelly, which, indeed, is itself the homologue of such a layer.

*Polypides*.—The polypides closely resemble those of *Plumatella*. The lophophore is slender and bears between 40 and 50 slender and moderately elongate tentacles which have a narrow but

distinctly festooned web at their base. The epistome is large and rather broad. The whole polypide is slender, the stomach particularly so. The colour of the latter in formalin is pale yellowish green.

*Statoblasts*.—The statoblast is of moderate size, elongate and rounded at the extremities; the capsule is broadly oval and often sometimes eccentric (fig. 1). The swim-ring is broad. It is remarkable for its vertical curvature (figs. 1a and 1b), surrounding the capsule like the rim of a dish in such a way that one surface of the statoblast is distinctly concave and the other convex, although the capsule itself is perfectly symmetrical. The convex surface is the one by which it is fastened to the funiculus.

The average length of the statoblast is about 0.46 mm. and the average breadth about 0.29 mm., the corresponding dimensions of the capsule being about 0.25 and 0.187 mm.; but owing



FIGS. 1, 1a, 1b.—Statoblast of *Austrolella indica*, sp. nov.

FIG. 2.—Statoblast of *Plumatella punctata* var. *longigemmis*, nov.

to the curvature of the rim it is difficult to obtain exact measurements.

*Type*.—No. 6629/7 Z.E.V., *Ind. Mus.* A cotype has been sent to the British Museum.

*Locality*.—Lahore, Punjab (12-x-14).

The points in which this species differs from *A. lendenfeldi* are discussed under the heading of that species.

In one of the specimens part of the colony is undergoing regeneration. The polypides have apparently been killed or injured but the jelly remains intact. New branches are arising from single polypides or pieces of polypides that have not perished. They consist of single or double rows of zooecia which have not yet produced lateral branches. The precise structure of such rows has already been discussed (p. 164).

One colony examined seems to have overwhelmed a colony of *Plumatella emarginata*. The latter, which has assumed the Alcyonelloid form, has managed to keep a small space clear for its more vigorous branches in the midst of the *Australella*.

Mr. Bains Prasad has given me the following notes on the occurrence of *A. indica* and on some species found in the same environment.

“On the occasion of a recent visit to Ferozpur I collected some material from the stagnant rainwater pools that abound on the banks of the river Sutlej mostly near the Kaiser-i-Hind railway bridge. The following representatives of the three classes, Sponges, Hydrozoa and Polyzoa were found.

#### SPONGES.

*Spongilla carteri*, Carter (Bowerbank *in litt.*).

Large masses of this sponge were found in two ponds, some measured more than a foot in length. Large dried-up masses consisting of spicules and gemmules only were found in another place where the water had quite dried up.

*Spongilla lacustris* subsp. *reticulata*, Annandale.

Large flat masses of this sponge of a bright green colour were found attached to the stems and leaves of *Potamogeton*. The pond was in an open place with no shade at all.

#### HYDROZOA.

*Hydra oligactis*, Pallas.

Only a single specimen of this form was found. It was attached to a *Potamogeton* leaf from the same pond in which *Spongilla lacustris* subsp. *reticulata* had been found. The specimen has only four tentacles and one bud, which shows the rudiments of the tentacles.

#### POLYZOA.

*Australella indica*, Annandale.

Large masses of this polyzoon were found in the same pond; these were covering the *Potamogeton* stems and leaves. Most of the individuals, however, were dead and large numbers of statoblasts had developed in them.”

*Australella lendenfeldi* (Ridley).

1890. *Lophopus lendenfeldi*, Ridley, *Journ. Linn. Soc. London* (Zool.) XX, p. 62.

So far as I can judge from the specimen before me, this species differs from *A. indica* mainly in the following characters:—

1. The synoecial jelly is much softer and more copious.
2. The colony is broken up into a number of short branches lying separated in the jelly.
3. The tentacles of the polypide are longer and more numerous.
4. The statoblast is larger and has the sides more nearly parallel and the extremities subtruncate; the swim-ring is not curved in cross-section.

Ridley's statement that the different parts of the polyparium are joined together by a stolon is due to a misunderstanding: a stolon is indeed present at the base of the jelly, but it is that of a hydroid (*Cordylophora whiteleggi*, v. Lendenfeld), of which I have found a single hydranth projecting from the surface of the colony in the schizotype of the polyzoon.

#### **Austrolella jheringhi** (Meissner).

1893. *Lophopus jheringhi*, Meissner, *Zool., Anz.*, p. 290.  
 1914. *Austrolella jheringhi*, Kraepelin, *Michaelsen's Land und Süßwasserfauna Deutsch-Südwestafrikas* 1, Bryozoa, p. 61, pl. i, fig. 9.

I have not seen this species, which is only known from Brazil. It may be readily distinguished from the other two by its nearly circular statoblasts.

#### Genus **Plumatella**, Lamarck.

##### **Plumatella punctata**, Hancock.

1887. *Plumatella punctata*, Kraepelin, *Deutsch. Süßwasserbryozoen* 1, p. 126 (numerous figures).  
 1911. *Plumatella punctata*, Annandale, *Faun. Brit. Ind., Fresw. Sponges, etc.*, p. 227, p. 213, figs. 42 G and G' and pl. iv, fig. 5.  
 1914. *Plumatella punctata*, Kraepelin, *op. cit. supra*, p. 60, pl. i, fig. 10.

Since 1911 I have found this species fairly abundant, with *Fredericella sultana indica* and *Plumatella tanganyikae bombayensis*, in the canal at Cuttack in Orissa. Kraepelin has recently recorded its occurrence in South-West Africa.

var. **longigemmis**, nov.

(Plate III, fig. 2).

A closely allied form grows luxuriantly in a small pool of practically fresh water on Barkuda Island in the Chilka Lake (Ganjam district, Madras Presidency). It agrees with *P. punctata* in every respect except that the gemmules are uniformly more elongate and have relatively smaller capsules than is usually the case (fig. 2, p. 166). They have the swim-ring slightly curved in

cross-section, in this respect somewhat resembling those of *Australella indica*, though the feature is less marked. The average length of the gemmule is 0.42 mm., the average breadth 0.25 mm., but the difficulty in exact measurement noted in the case of *A. indica* (p. 166) also occurs with reference to them, though not to the same extent. The average measurements of the capsule are about 0.24 × 0.17 mm.

The colonies of this new variety were found on stones and rushes in July, 1914. They exhibited among themselves, so far as the zoarium was concerned, a complete transition between the two seasonal phases of the species found in Europe. In several instances the freshwater sponge *Spongilla alba*, Carter had already begun to grow over them; by November of the same year it seemed to have exterminated them altogether.

Genus *Stolella*, Annandale.

*Stolella himalayana*, Annandale.

(Plate III, fig. 1).

1911. *Stolella himalayana*, Annandale, *Faun. Brit. Ind., Freshw. Sponges*, etc., p. 246, fig. 49.

For some reason all reference to this species is omitted from the *Zoological Record*. I take the opportunity to reproduce an enlarged photograph of one of the types, a young colony from Malwa Tal in the Western Himalayas.

*Stolella indica*, Annandale.

1911. *Stolella indica*, Annandale, *op. cit.*, p. 299, fig. 45, pl. v, figs. 3, 4.

Professor K. Ramunni Menon has sent me specimens of this species from the town of Madras. It thus occurs in the Main Area of the Indian Peninsula as well as in the Indo-Gangetic Plain.



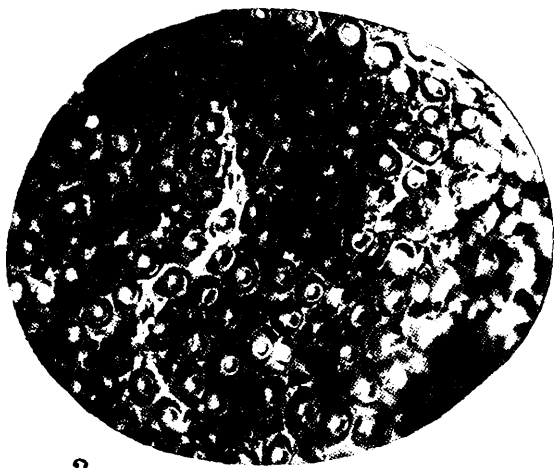
EXPLANATION OF PLATE II.

*Australella indica*, sp. nov.

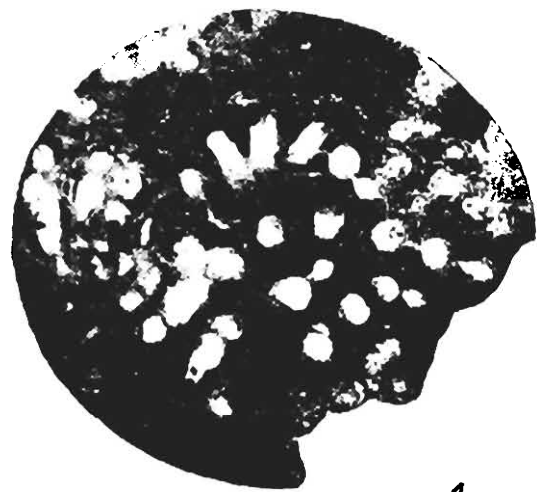
- FIG. 1.—The type-specimen,  $\times 2$ .  
,, 2.—Terminal part of the same specimen further enlarged.  
,, 3.—Surface of a piece of the central part of the colony,  
showing the honeycomb-like arrangement of the zooecia.  
,, 4.—Part of another colony in which regeneration of the  
branches is taking place in a mass of dead synoecial  
jelly.



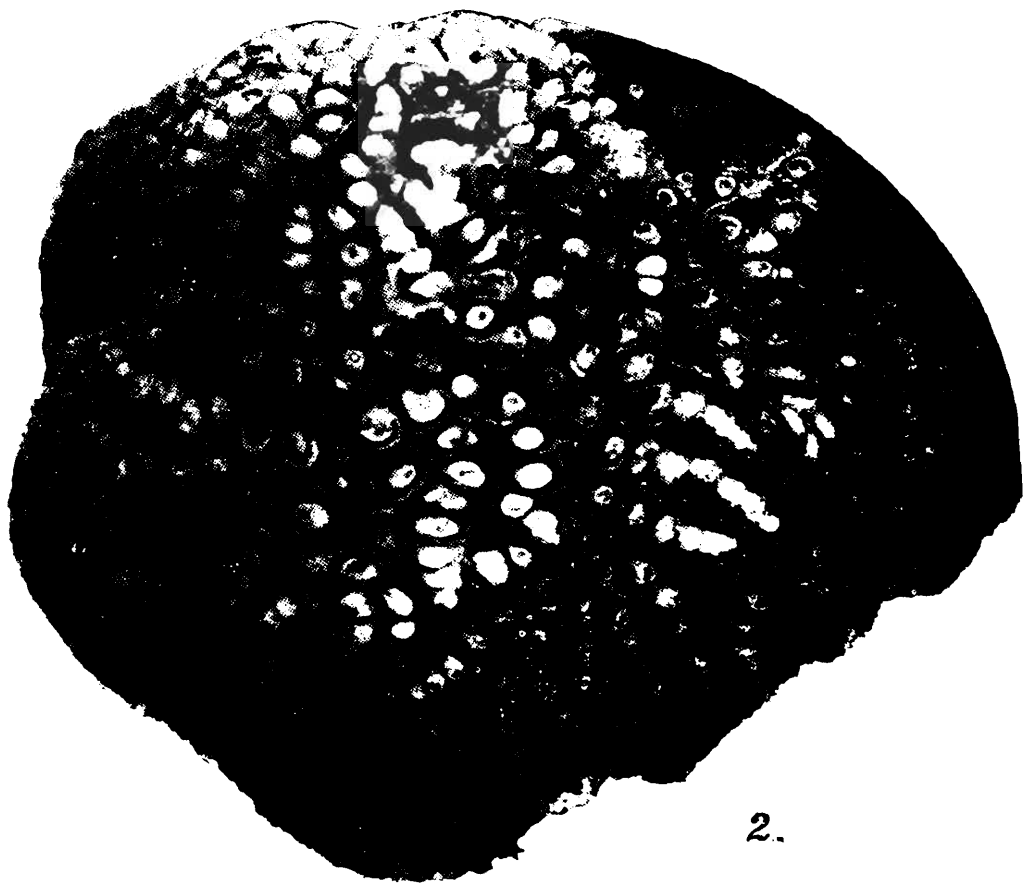
1.



3.



4.



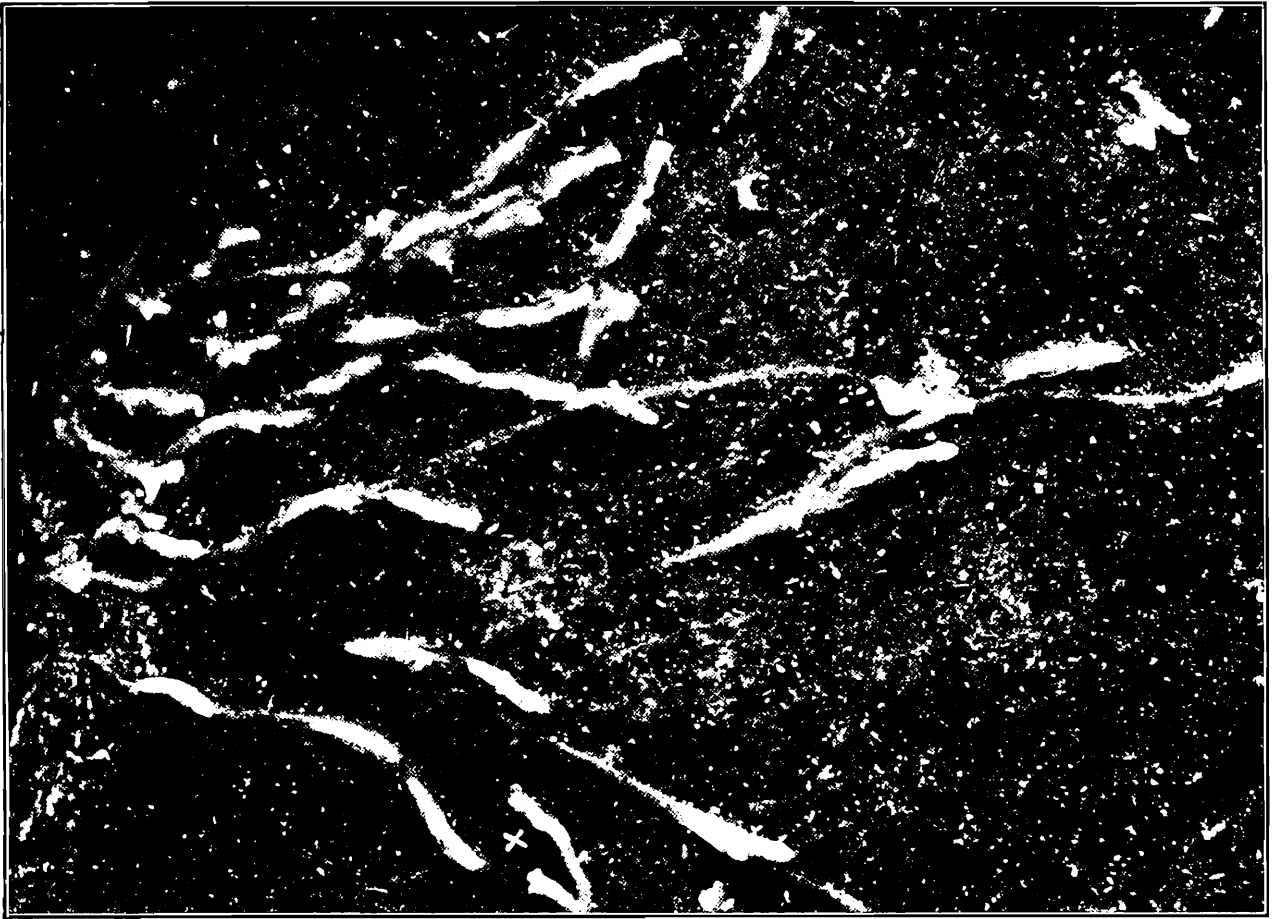
2.

EXPLANATION OF PLATE III.

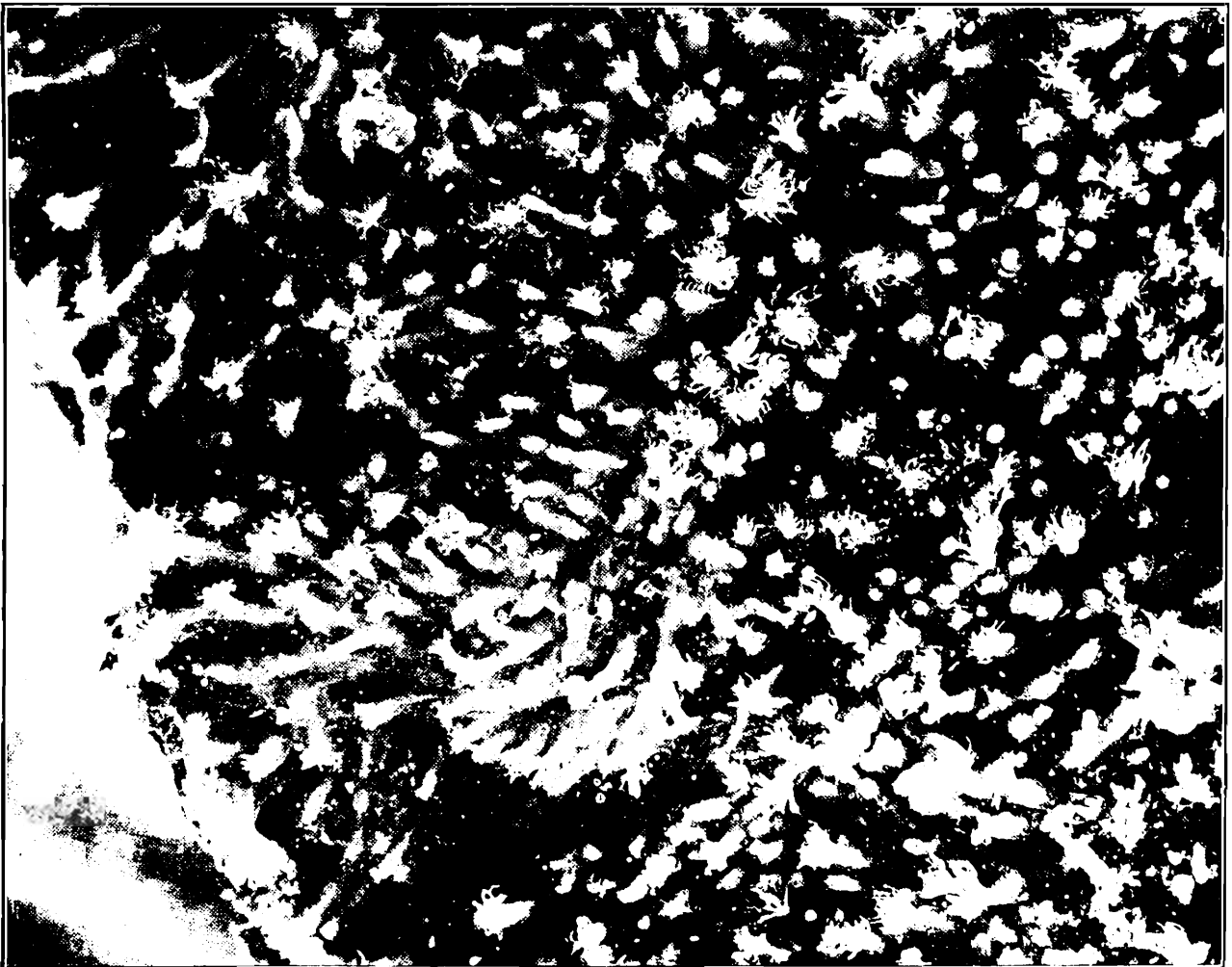
FIG. 1.—*Stolella himalayana*, Annandale.

Part of one of the type-specimens, a young colony, enlarged. × = the terminal branch of a colony of *Fredericella sultana* (Blumenbach).

„ 2.—*Plumatella punctata*, Hancock var. *longigemmis*, nov.  
Part of the type-specimen, enlarged.



1.  
1. *Stolella himalayana*.



S. C. Mondul, *Phot.*

2.  
2. *Plumatella punctata* var. *longigemmis*.

## IX NOTES ON FRESHWATER SPONGES

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

### No. XVI.—THE GENUS *Pectispongilla* AND ITS ALLIES.

The genus *Pectispongilla* was described in 1909 (*Rec. Ind. Mus.* III, p. 103) for the reception of a single species (*P. aurea*) from Travancore in the south-west of the Indian Peninsular Area; the subsequent account in the "Fauna" (*Freshwater Sponges*, etc., p. 106: 1911) added nothing to the generic diagnosis, but included the description of another form (*subspinosa*) from Cochin in the same part of India. This form was then regarded as a variety of *P. aurea*. The receipt of fresh material from Cochin has resulted in a re-examination of the original specimens and in the detection of an error in the generic diagnosis, *viz.* the statement that free microscleres were absent. It has also been found necessary to recognize at least three distinct species.

The genus may now be redefined as follows:—

Small Spongillinae of massive or encrusting habit, of soft and friable consistency, with delicate skeletons in which the vertical fibres, though well-defined and not devoid of horny substance, are always very slender. Dermal membrane aspiculous. Skeleton-spicules rough or smooth amphioxi; free microscleres present in the flesh of the sponge, often of more than one type; gemmule-spicules with the extremities flattened and expanded in the main axis, the terminal expansions bearing, on one face only, large spines arranged longitudinally in parallel comb-like rows.

*Type-species.*—*Pectispongilla aurea*, Annandale.

*Geographical Distribution.*—The plains of Travancore and Cochin in the southern part of the Malabar Zone of Peninsular India.

*Affinities.*—In the original description of the genus I suggested that the peculiar gemmule-spicule had been derived from that of *Ephydatia* by a rotation of the terminal rotules. Dr. W. Weltner wrote to me shortly afterwards expressing the opinion that this type of spicule had more probably been produced from one like that of *Spongilla* by a specialization of the extremities. A consideration of the form of the gemmule-spicules in the species of *Spongilla* most nearly related in general structure to *Pectispongilla* has induced me to accept Dr. Weltner's views. These species of *Spongilla* constitute a little group in the sub-

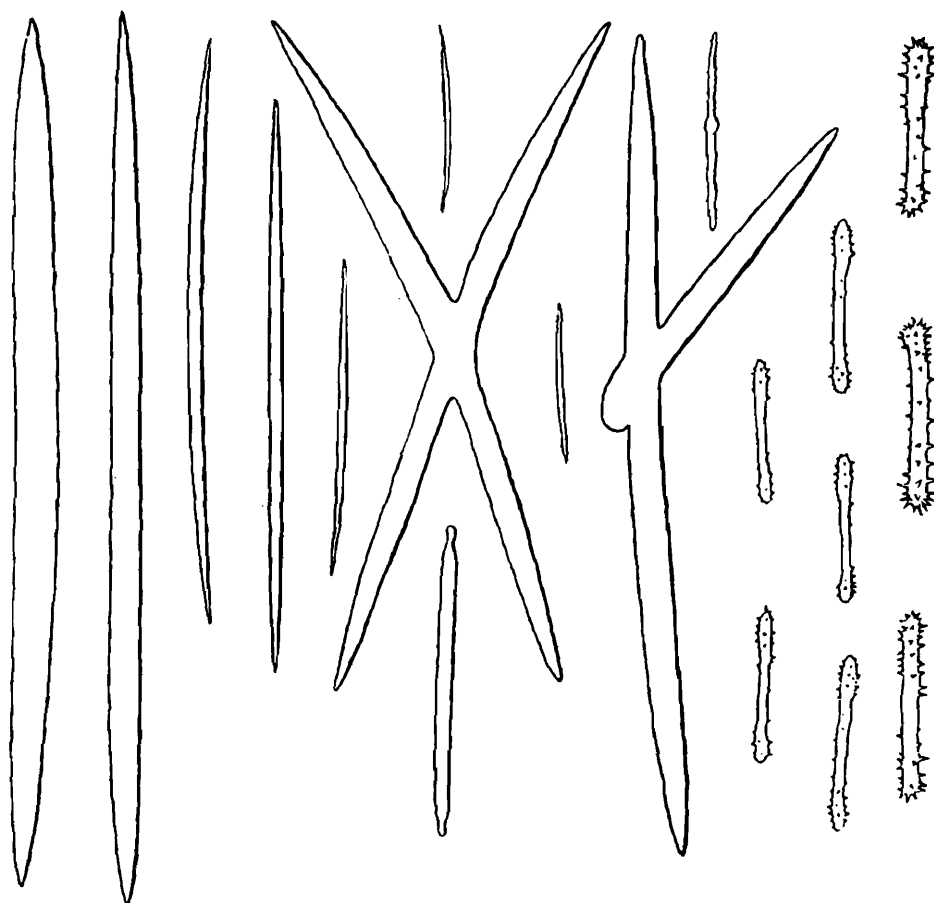


FIG. 1.—Spicules of *Spongilla hemephydatia*, Annandale.

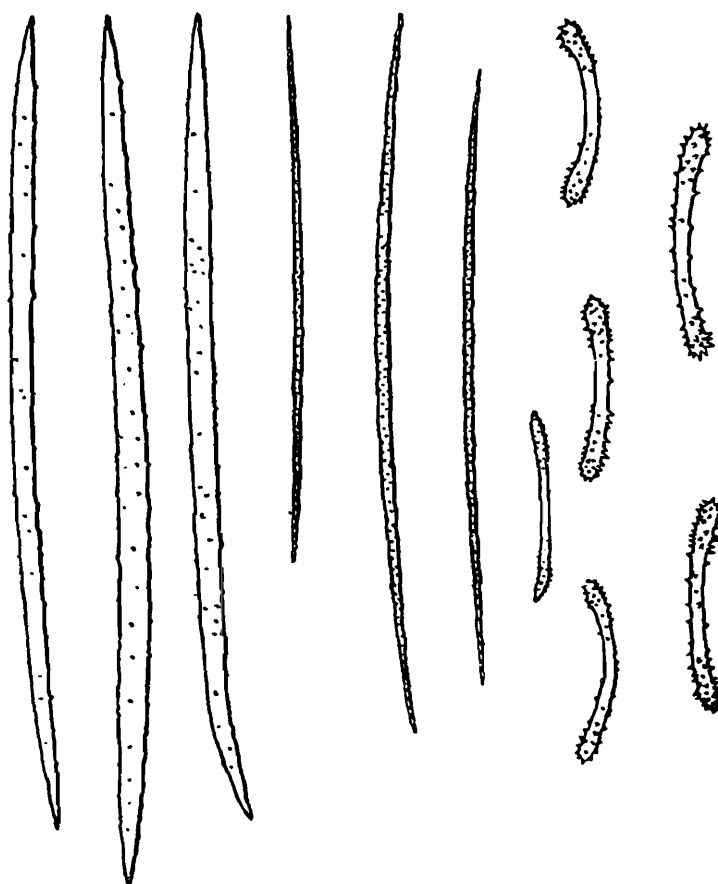


FIG. 2.—Spicules of *Spongilla sansibarica*, Weltner.

genus *Euspongilla* typified by *S. crateriformis* (Potts), and distinguished from other members of the subgenus by the erect or semi-erect posture of all or most of their gemmule-spicules and by the fact that the terminations of these spicules are clearly specialized. The specialization may, however, take one or other of two directions, for the ends of the spicule may (as in *S. crateriformis* and the closely allied *S. biseriata*, Weltner<sup>1</sup>) bear an imperfect horizontal rotule of large recurved spines, or they may (as in my own *S. hemephydatia*, in *S. sansibarica*, Weltner<sup>1</sup> and apparently in Haswell's imperfectly known *S. botryoides*) be inflated, so that the spicule is technically tornote. The group is, therefore, of particular interest as representing the ancestral form, at any rate so far as the gemmule-spicule is concerned, of both *Ephydatia* and *Pectispongilla*.

I give figures here, in both cases from the type-specimens, of *S. hemephydatia* (fig. 1) and *S. sansibarica* (fig. 2). The tetraxon spicules that occur not uncommonly among the macrocleres of the type-specimen of the former are of course abnormal, but they have some interest as possible examples of reversion of the type by no means uncommon in the Spongillidae.

The general structure of the skeleton in *Pectispongilla* is identical in the different species and does not differ in any important feature from that found as a rule in *Euspongilla*. In particular it agrees closely with that which can be readily demonstrated by the use of pyrogallic acid in *S. hemephydatia*, *S. crateriformis* and *S. sansibarica*. Weltner (*op. cit.*, p. 127), indeed, states that the skeleton of the last species corresponds precisely with that of the Chalininae, in that the fibres are enclosed in a sheath of horny substance. That this substance is present in amount much greater than can be seen in unstained preparations or might be argued from the thinness of the fibres, is certainly a fact; but its arrangement seems to me to be quite different from that I recently demonstrated in *Lubomirskia*<sup>2</sup>, for although it permeates the fibre, cementing together the component spicules and occupying the spaces between them, I can detect no external fibre-sheath. Where, as is often the case, it forms veil-like films at the nodes of the skeleton, it has the appearance of a perfectly homogeneous film.

The geographical distribution of *Pectispongilla* is peculiar. It is apparently the only genus of the Spongillinae that has so limited a range, for even *Asteromeyenia*,<sup>3</sup> which is confined, so far as we know, to the southern part of the United States of America, considerably surpasses it in this respect.

The two species of *Spongilla* most closely allied to *Pectispongilla* (*S. hemephydatia* and *S. sansibarica*) occur in the main area

<sup>1</sup> *Mitt. Naturh. Museum Hamburg* XV, pp. 121, 127, pl.—, figs. 1-5, 13-17 (1897).

<sup>2</sup> *Rec. Ind. Mus.*, X, p. 144, pl. ix, fig. 1a (1914).

<sup>3</sup> Annandale, *Proc. U.S. Nat. Mus.*, XL, p. 593 (1911).

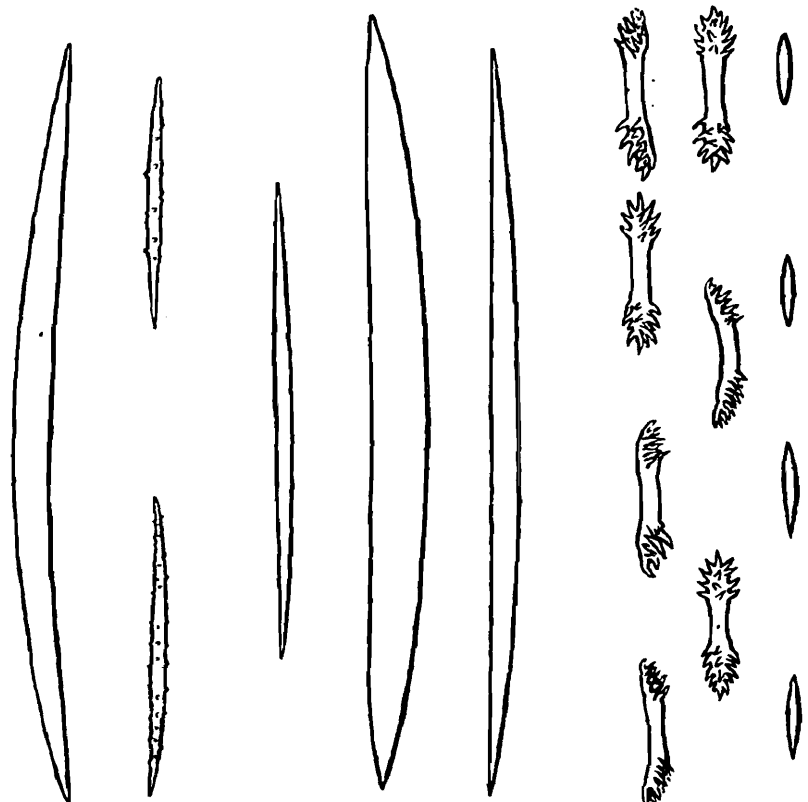


FIG. 3.—Spicules of *Pectispongilla aurea*, Annandale.

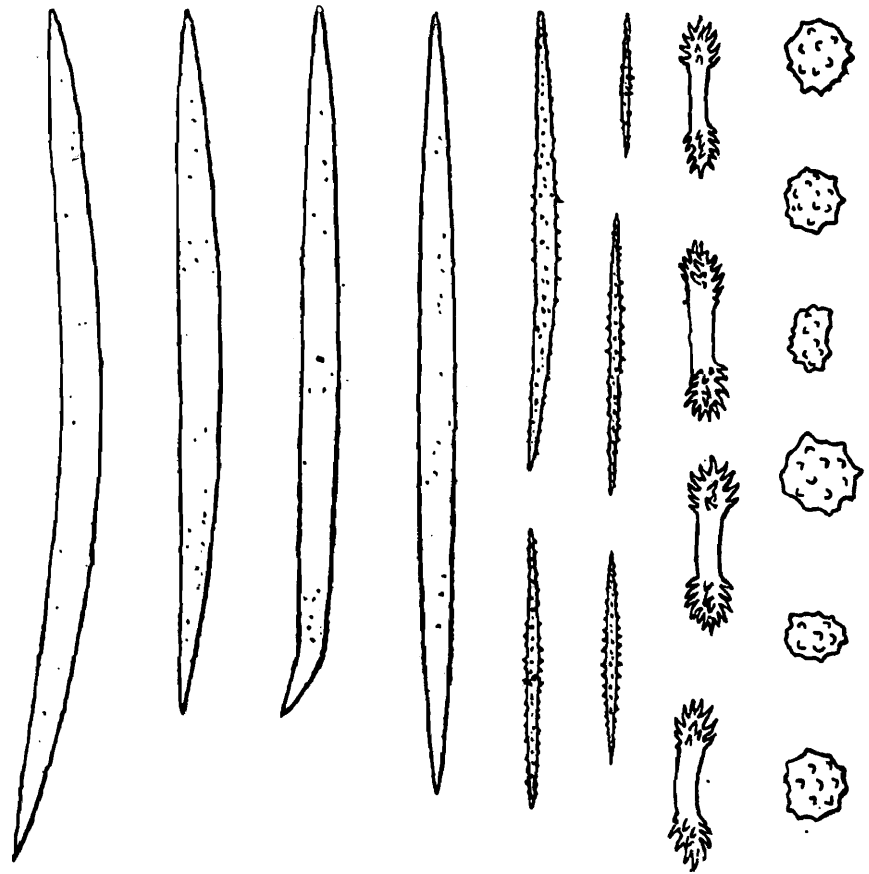


FIG. 4.—Spicules of *Pectispongilla stellifera*, sp. nov.

of the Indian Peninsula and at Zanzibar off the East Coast of Africa respectively, while *S. botryoides*, which may also be related, has been found only in New South Wales.

*Key to the known species of PECTISPONGILLA.*

1. Skeleton-spicules quite smooth.
  - Free microscleres of two types: (a) minute, smooth, rhomboidal, and (b) moderately large, slender, spindle-shaped, bearing scattered spines *P. aurea*.
2. Skeleton-spicules rough or spiny.
  - A. Free microscleres of two types: (a) amphioxious, spindle-shaped, somewhat closely spined, and (b) sub-spherical with scattered tubercles. *P. stellifera*.
  - B. Free microscleres less distinctly of two kinds, spindle-shaped or cylindrical, amphioxious or truncated, all definitely spiny *P. subspinosa*.

***Pectispongilla aurea*, Annandale.**

(Fig. 3).

1909. *Rec. Ind. Mus.*, III, p. 103, pl. xii, fig. 2.

1911. *Faun. Brit Ind.*, *Freshw. Sponges*, etc., p. 106, fig. 20.

In describing this species I neglected to observe the free microscleres, or rather confused them with immature macroscleres and with the skeletons of diatoms. The free spicules are actually of two kinds: (1) small, slender, straight or nearly straight, spindle-shaped, sparsely spiny amphioxi on an average about 0.084 mm. long, and (2) minute, smooth, relatively thick amphioxi rhomboidal in outline and on an average about 0.024 mm. long. The former (1) are extremely scarce, the latter (2) abundant. Both types of spicules are confined to the flesh of the sponge. *P. aurea* is only known from Tenmalai on the western side of the Western Ghats in Travancore.

***Pectispongilla stellifera*, sp. nov.**

(Fig. 4).

The sponge apparently forms thin films encrusting bodies such as the fibres of cocoanut-husks that have fallen or been thrown into the water, but my specimens are dry and not in very good condition. They have a brownish colour. The skeleton resembles that of *P. aurea*, but is rather stouter.

The macroscleres are slender and sharply pointed; they have minute rounded spines or tubercles scattered almost uni-

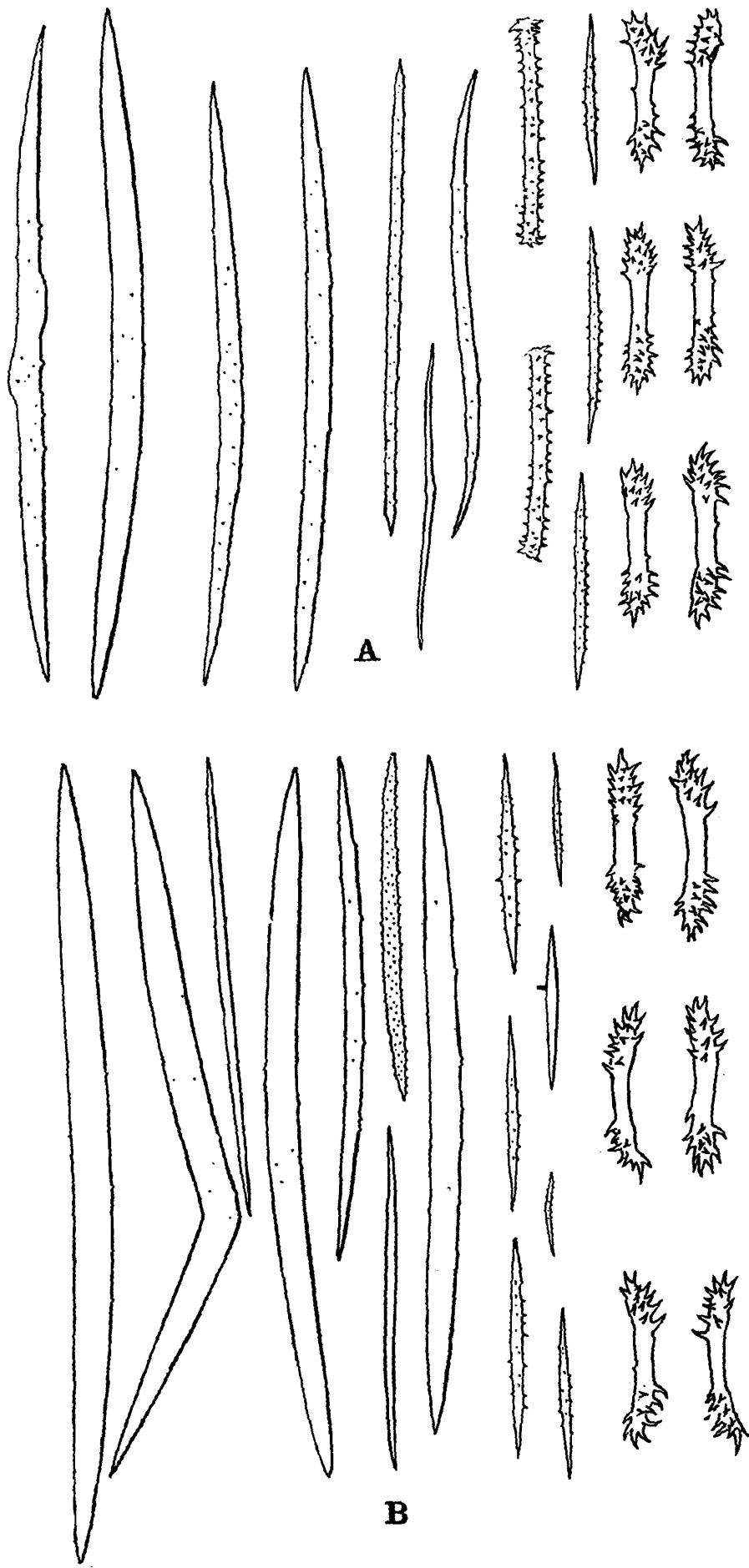


FIG. 5.—Spicules of *Pectispongilla subspinosa*, Annandale.

formly, though sparsely, over their surface, but their extremities are as a rule smooth.

The gemmule spicules resemble those of *P. aurea* but are a little stouter.

The free microscleres are of two quite distinct kinds: (1) slender, spiny, spindle-shaped, straight or nearly straight amphioxi, and (2) short, stout, cylindrical or subspherical tuberculate bodies of very characteristic form. The former vary greatly in size and proportions; their spines, which are scattered less sparsely than those of the macroscleres, are short and not very sharp. The free microscleres of the second type are, so far as I am aware, unique in the Spongillidae; their form is shown in the figure.

Diameter of gemmule	0.201 mm.
Length of macrosclere (average)	0.273 ,,
Diameter of macrosclere (greatest average)	0.0084 ,,
Length of gemmule spicule (average)	0.0336 ,,
Length of free microsclere of type 1	0.0546—0.1554 ,,
Diameter of free microsclere of type 1	0.0021—0.0063 ,,
Length of free microsclere of type 2 (average)	0.0126 ,,
Diameter of free microsclere of type 2	0.0084 ,,

*Locality*.—Trichur, Cochin State, Malabar Zone.

*Type-specimen* —Z E.V 3790/7. *Ind. Mus.*

### *Pectispongilla subspinosa*, Annandale.

(Fig. 5, A-B).

1911. *Pectispongilla aurea* var. *subspinosa*, Annandale, *Faun. Brit. Ind., Freshw Sponges.* etc., p 107.

This species is closely related to *P. stellifera*, with which it was at first confused, but lacks the aster-like microscleres characteristic of the latter.

The free microscleres are not so definitely separated in o two kinds as in the other two species of the genus but, in the type-specimen from Ernakulam at any rate (fig 5A), there are a few spicules that closely resemble the gemmule-spicules of *Spongilla crateriformis* in shape, being truncate at the extremities, and having rudimentary rotules thereat. These spicules are, however lacking in sponges recently obtained by Mr C. H. Gravely at Trichur (fig 5B) in which the amphioxious free microscleres are also more variable. The truncate spicules may possibly be adventitious and until further specimens are obtained it seems inadvisable to separate the form discovered by Mr. Gravely as a species or variety. His specimens, which were growing on rocks in a small pool connected with a sluggish stream, are (in spirit) of a dull brown colour and form an irregular crust some 2 to 5 mm. thick. The external apertures are small and inconspicuous,

the subdermal cavity is relatively small and the external surface smooth. The skeleton resembles that of *P. stellifera*.

*P. subspinosa* is known only from Trichur and Ernakulam in the plains of Cochin.



X. LAGRIIDAE UND ALLECULIDAE DES  
"INDIAN MUSEUM."

Von F. BORCHMANN, *Hamburg*.

LAGRIIDAE.

1. *Lagria ventralis*, Reitt.

Deutsche Ent. Zeitschr. 1880, p. 255.

Viele Exemplare. Sikkim, E. Himalayas; Sukna, E. Himalayas, 500 ft.; Mazbat, Mangaldai distr., Assam; Dejoo, N. Lakhimpur, Upper Assam; Wan-hsaung, near Myitkyina, N.O. Burma, 600 ft.; betw. Mongwan and Nan Tien, Yunnan.

2. *Lagria hirticollis*, Borchm.

Bull. Soc. Ent. Italiana 1909 (1910), p. 201.

Kawkareik, Amherst distr., L. Burma; Khayon, nr. Moulmein, L. Burma.

Die Art wurde von Pegu, Borneo, beschrieben.

3. *Lagria concolor*, Blanch.

Voyage au Pole Sud IV, 1853, p. 104, t. xii, f. 10.

Mazbat, Mangaldai, Assam; Assam-Bhutan Frontier, Mangaldai distr., N.E.; Burdwar, Nepal Terai.

Die Art ist sehr weit verbreitet.

4. *Lagria ruficollis*, Hope.

Gray's Zool. Misc. 1831, p. 32.

Viele Exemplare. Kurseong, 5000 ft., E. Himalayas; Bim Tal, 4500 ft., Kumaon; Pussumbing, Darjeeling, 4700 ft.; Siliguri, base of E. Himalayas; Ghumti, Darjiling distr., 4000 ft.

5. *Lagria foveifrons*, n. sp.

Länge:  $6\frac{1}{2}$ —7 mm., Schulterbreite  $2\frac{1}{2}$ —3 mm. Nach hinten schwach erweitert, mässig gewölbt, mässig glänzend, oben ziemlich dicht, unten spärlicher lang weisslich behaart; schwarz mit bronzem und violetter Metallschimmer oder dunkelblau, Vorderkörper oben dunkelblau, Flügeldecken grünlich bronzefarbig, Beine schwarzblau, Fühler schwarz; Kopf rundlich, flach und undicht punktiert, Mundteile typisch, Endglied der Maxillartaster kurz und sehr breit; Oberlippe kurz, vorn etwas ausgerandet,

Vorderrand glatt, sonst dicht, fein und tief punktiert, lang bebors-  
tet; Clypeus stark quer, nach vorn verengt, Vorderrand so breit  
wie die Oberlippe, stark ausgerandet, von der Stirn durch eine  
starke, fast gerade Querfurche geschieden; Stirn im hintern Teile  
mit einem starken, hufeisenförmigen Eindrucke; Schläfen grob  
punktiert, etwa so lang wie ein Auge; Fühler schlank, die Schul-  
tern überragend, mit Ausnahme des 2 alle Glieder länger als  
breit, 3. Glied etwas länger als das 4., Endglied so lang wie das  
10., spitz, 10. Glied wenig länger als breit; Augen stark ausge-  
randet, gewölbt, Abstand auf der Stirn gleich 1 Augendurchmesser  
von oben gesehen; Halsschild sehr wenig quer oder quadra-  
tisch, vorn etwas breiter als der Kopf mit den Augen, undicht mit  
flachen, tuberkelartigen Punkten besetzt, Vorderrand gerade,  
schmal gerandet, Hinterrand in der Mitte etwas eingezogen,  
breiter gerandet, Seiten vor der Basis eingezogen, Vorderecken  
abgerundet, Hinterecken etwas vortretend, Scheibe uneben vorn  
in der Mitte und vor der Basis beiderseits mit einem breiten, fla-  
chen Eindrucke; Schildchen kurz, rundlich dicht punktiert; Flü-  
geldecken doppelt so breit wie der Halsschild, Schultern nach  
vorn etwas vorgezogen, Scheibe dicht, grob und ziemlich stark  
querrunzlig punktiert, im 1 Viertel flach quer eingedrückt, Decken  
einzeln zugespitzt, etwas vorgezogen, Epipleuren breit, skulptiert  
wie die Flügeldecken; Unterseite sehr fein punktiert, Hinterleibs-  
ringe an den Seiten mit ringförmigen Eindrücken, Spitze des  
Analsegments rund, Intercoxalfortsatz des 1. Segments so lang wie  
breit, spitz, breit gerandet; Beine mittel, Schenkel wenig verdickt,  
Schienen schwach gebogen Schienenspitze innen dicht gelb be-  
haart, Hinterschinkel erreichen kaum den Hinterrand des 3.  
Segments, Metatarsus der Hinterfüsse so lang wie Glied 2 und 3  
zusammen.

2 ♂♂ von Dibrugarh, N.E. Assam, 17—19-xi-1911. Die  
Art ist der *Lagria concolor*, Blanch. ähnlich, unterscheidet sich  
aber leicht durch die abweichende Färbung und durch den Mangel  
des quengerunzelten Eindruckes auf dem Halsschilde.

1 ♂ von N.O. Sumatra Tebing-tinggi (gesammelt von Dr.  
Schultheiss) unterscheidet sich durch die viel schlankere Form und  
die stark abweichende Färbung: dunkelbraun mit starkem blauen  
Schleime, Basis der Oberschenkel braun, Vorderkörper grün bronze-  
farbig, Schildchen blau Flügeldecken rötlich metallisch, Naht  
schmal grün. Ich benenne die Varietät *sumatrana*, n.v.

#### 6. *Lagria nigrita*, n. sp.

Länge: 8 mm. Form wie *L. concolor*, Blanch, Flügeldecken  
hinter den Schultern etwas flachgedrückt; mässig glänzend, lang,  
abstehend, weisslich behaart; tiefschwarz, Spitze des letzten Hin-  
terleibssegmentes rot; Kopf gewöhnlich, grob, undicht unpunk-  
tiert; Oberlippe stark quer, gewölbt, ausgerandet; Clypeus eben-  
falls stark quer, nach vorn verengt, stark ausgerandet, von der  
Stirn durch eine tiefe, gerade Furche getrennt; Stirn mit hufei-

senförmigem Eindrucke, Schläfen länger als ein Auge, Hals deutlich; Augen schmal, stark ausgerandet, weit getrennt; Fühler mittel, die Schultern überragend, nach aussen etwas verdickt, Glieder kürzer werdend, Grundglied dick, 3. Glied etwas länger als das 4. Endglied so lang wie Glied 9 und 10 zusammen, stumpf zugespitzt; Mundteile gewöhnlich. Halsschild so breit wie der Kopf mit den Augen, fast quadratisch, mässig grob, nicht dicht, etwas querrunzig punktiert, in der Mitte eine rundliche Fläche mit feinerer und dichter Punktierung, Vorderrand nicht, Hinterrand deutlich gerandet, Seiten in der Mitte eingeschnürt, Vorderecken abgerundet, Hinterecken stumpf, Scheibe in der Mitte an der Seite beiderseits mit einem Quereindrucke, Schildchen gross, rundlich, fein und dicht punktiert; Flügeldecken zweimal so breit wie der Halsschild, ziemlich dicht und grob runzig punktiert, Schultern etwas eckig gefaltet, Decken einzeln zugespitzt, Epipleuren breit, skulptiert wie die Flügeldecken, vor der Spitze nach aussen gewendet; Beine schlank, Schienen wenig gebogen; Metatarsus der Hinterfüsse so lang wie die folgenden Glieder zusammen; Unterseite feiner punktiert, Seiten gröber; Fortsatz des Abdomens breit, zugespitzt, gerandet.

4 ♀♀ von Burdwar, Nepal Terai, 1-i-1910; Thamaspur, Nepal, 18—20-ii-1908; Noalpur, Nepal, 21-ii-1908; Paresnath, W. Bengal, 4000 ft., 9-iv-1909.

Die Art ist nahe verwandt mit *L. concolor*, Blanch., unterscheidet sich aber leicht durch die Farbe und die abweichende Halsschildbildung.

#### 7. *Cerogria nepalensis*, Hope.

Gray's Zool. Misc. 1831, p. 32.—Dohrn, Stett. Ent. Zeit. XLVII, 1886, p. 354.

Viele Exemplare. Kurseong, E. Himalayas, 5000 ft.; Cheerapunji, Khasi Hills, Assam.

#### 8. *Cerogria basalis*, Hope.

Gray's Zool. Misc. 1831, p. 32.—Dohrn, Stett. Ent. Zeit. XLVII, 1886, p. 353.

Kurseong, E. Himalayas, 5000 ft.; Karak, 3000 ft., 19-iii-1912.

#### 9. *Cerogria quadrimaculata*, Hope.

Gray's Zool. Misc. 1831, p. 32.

Siliguri, base of E. Himalayas; Kurseong, E. Himalayas, 4700–5000 ft.; Pussumbing, Darjiling, 4700 ft.; Mazbat, Mangaldai, Assam.

#### 10. *Cerogria flavicornis*, Borchm.

Bull. Soc. Ent. Ital. 1909 (1910), p. 210.

Shan Hills, Upp. Burma.

11. *Lagriocera cavicornis*, Fairm.

Ann. Soc. Ent. Belg. XL, 1896, p. 41.

1 Exemplar. Shan Hills, Upper Burma.

12. *Nemostira hirta*, n. sp.

Länge:  $6\frac{1}{2}$  mm. Gestreckt, nach hinten sehr wenig erweitert, mässig glänzend, undicht, sehr lang, abstehend braun behaart; glänzend schwarz, Flügeldecken mit grünlichem Metallschimmer, Fühler braunschwarz. Kopf gestreckt; Oberlippe gewölbt, quer herzförmig, fein punktiert, lang beborstet, vorn nicht ausgerandet; Clypeus nach vorn verengt, gewölbt, fast glatt, an der Basis mit wenigen Borstenpunkten, nicht ausgerandet, von der Stirn durch eine gebogene Furche getrennt, Stirn grob, zerstreut punktiert, zwischen den Augen mit einem tiefen Quereindrucke, Hinterkopf glatt, Schläfen länger als ein Auge, grob punktiert, beborstet, Hals dünn; Fühler gleich der halben Körperlänge, kräftig, alle Glieder mit Ausnahme des 2. länger als breit, Glieder gegen die Spitze etwas breiter, 3. Glied kürzer als das 4., Endglied dünn, etwas gebogen, länger als die 3 vorhergehenden Glieder zusammen; Augen schmal, stark gewölbt, vorn wenig ausgerandet, Stirnabstand bedeutend grösser als ein Augendurchmesser; Mundteile typisch. Halsschild kaum breiter als der Kopf mit den Augen, so lang wie breit, grob und ziemlich dicht punktiert, beborstet, gewölbt, Vorderrand gerade, fein gerandet, Hinterrand in der Mitte etwas eingezogen, breiter gerandet, Seiten gerundet, grösste Breite in der Mitte, vor der Basis eingezogen, Vorderecken stumpf, Hinterecken vortretend, Seitenrand geschwunden. Schildchen länglich, abgerundet, fast glatt. Flügeldecken doppelt so breit wie die Halsschildbasis, mit groben Punktreihen, Streifen wenig vertieft, Punkte gegen die Spitze flacher, Zwischenräume fast eben, Schultern vorgezogen, Spitzen abgestutzt, Nahtwinkel zähnenartig, Epipleuren schmal, verkürzt, ausgehöhlt. Unterseite lackartig glänzend, Seiten der Brust grob punktiert; Intercoxalfortsatz der Vorderbrust so hoch wie die Hüften, gerandet, in der Mitte vertieft, nicht hinter die Hüften verlängert; Beine kräftig, Schenkel keulig, Hinterschenkelspitze fast die Spitze des Hinterleibes erreichend, Seiten des glatten Abdomens mit flachen Eindrücken, Intercoxalfortsatz des 1. Segments abgerundet, schmal gerandet, die Mitte mit einer starken dreieckigen Erhebung, die einen Längskiel bildet, 2. Segment mit einer ähnlichen Bildung; Schienen schwach gebogen; Metatarsus der Hinterfüsse fast so lang wie die folgenden Glieder zusammen.

1 ♂ Silonbari, North Lakhimpur (base of hills), Upper Assam (*H. Stevens*), 31-V-1911.

Die kleine Art unterscheidet sich leicht von ihren Verwandten durch die eigentümliche Bildung der beiden ersten Abdominalsegmente.

13. *Nemostira ceylanica*, n. sp.

Länge:  $8\frac{1}{2}$ –9 mm. Form und Grösse der *N. terminata*, Fairm. und der *Casnomidea brevicollis*, Fairm.; mässig glänzend, gewölbt, nach hinten wenig erweitert, ziemlich dicht, lang, abstehend, rotgelb behaart; schwärzlich braun, Basis der Beine wenig heller, Kopf, Halsschild und Vorderbrust und die Flügeldecken bräunlich rotgelb, Flügeldecken mit schwarzen Epipleuren, schwarzer Naht und je einer grossen schwarzen Makel, die das letzte Viertel einnimmt; Kopf rundlich, zerstreut punktiert; Oberlippe quer, flach ausgerandet, fein punktiert; Clypeus quer, nach vorn verengt, von der Stirn durch eine gebogene Furche getrennt, breit und flach ausgerandet; Stirn mit 2 grösseren Punkten zwischen den Augen, Scheitel mit Grübchen; Augen gross, ausgerandet, Abstand auf der Stirn gleich  $\frac{1}{2}$  Augendurchmesser ( $\sigma$ ); Schläfen kurz, Hals sehr deutlich; Fühler gleich der halben Körperlänge, kräftig, nach aussen etwas verdickt, nicht gesägt, 3. Glied gleich dem 4., Endglied etwas kürzer als die 3 vorhergehenden Glieder zusammen ( $\sigma$ ), beim  $\varphi$  kürzer; Endglied der Kiefertaster schmal, aber nicht messerförmig; Halsschild etwas länger als breit, von typischer Form, gerstreut punktiert, etwas breiter als der Kopf mit den Augen; Schildchen klein, rundlich; Flügeldecken doppelt so breit wie die Halsschildbasis, mit starken Punktstreifen, Punkte in den Streifen gross, dicht, rund, nach hinten feiner, Zwischenräume gewölbt, mit zahlreichen feinen Borstenpunkten, Spitzen der Flügeldecken zusammen abgerundet; Unterseite feiner, die Seiten grob punktiert; Abdominalfortsatz kurz, rund, breit gerandet; Prosternalfortsatz breit, gerandet, hinter den Hüften nicht erweitert; Beine kräftig, lang behaart, ohne Geschlechtsmerkmale; Metatarsus der Hinterfüsse wenig kürzer als die folgenden Glieder zusammen.

2 Exemplare Paradeniya, Ceylon, 8-viii und 18-v-1910.

Die Art ist mit den oben genannten nahe verwandt, unterscheidet sich aber leicht schon durch die Färbung.

## ALLECULIDAE.

1. *Allecula indica*, Borchm. ?

Deutsche Ent. Zeitschr. 1909, p. 714.—Fairm., Ann. Soc. Ent. Belg., XL, 1896, p. 38 (brachydera Fairm.).

1 Exemplar. Kurseong, E. Himalayas, 4700–5000 ft.

2. *Allecula arthritica*, Fairm.

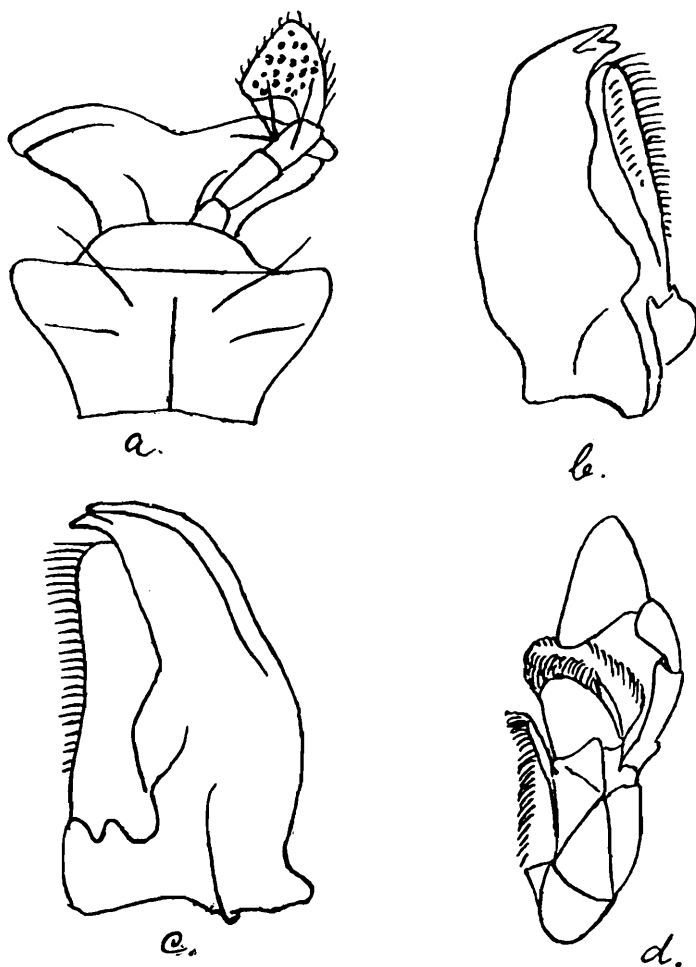
Ann. Soc. Ent. France LXII, 1893, p. 36.

Sikkim, E. Himalayas, v—vi-1912.

3. *Allecula femorata*, n. sp.

Länge:  $12\frac{1}{2}$ – $14\frac{1}{2}$  mm.; Breite:  $3\frac{1}{2}$ –4 mm. Gestreckt,  $\sigma$  schlanker als  $\varphi$ ,  $\sigma$  nach hinten verengt,  $\varphi$  nicht; dunkel pechbraun,

Mundteile rötlich, Fühler hell rötlich, gegen die Spitze dunkler, Beine gelblich, Kniee und Füsse dunkler; mässig glänzend; ziemlich dicht, anliegend, nicht sehr dicht gelblich behaart. Kopf verlängert, Mundteile vortretend; Oberlippe quer, dicht und ziemlich fein punktiert, mit langen gelben Borsten, vorn stark ausgeschnitten, Seiten gerundet, gegen die Basis verengt; Clypeus ebenso skulptiert, Vorderrand gerade, so breit wie die Basis der Oberlippe, von der Stirn durch eine gerade Furche getrennt; Stirn ebenso skulptiert wie die Oberlippe; Schläfen



*Allecula femorata*, n. sp.

a. Unterlippe und Mentum; b. Mandibel von unten;  
c. Mandibel von oben; d. Maxille.

sehr kurz, Hals durch eine scharfe Furche abgesetzt; Augen gross, gewölbt, ausgerandet, Abstand auf der Stirn  $\frac{1}{2}$  Augendurchmesser ♀, ♂ noch geringer. Mandibeln zweispitzig, schlank, mit kräftigem Sacke; innere Lade der Maxillen sehr klein, äussere gross, auf der Oberseite filzartig behaart, Endglied der Taster quer, dreieckig; Unterlippe stark quer, vorn ausgeschnitten, Vorder-ecken spitz, Seiten gegen die Basis stark verengt, Endglied der Taster dreieckig; Mentum stark quer, vorn fast gerade, Vorder-ecken scharf, Seiten zweimal gebogen verengt; Fühler wenig kürzer

als der Körper, dünn, fadenförmig, Glieder nehmen nach der Spitze an Länge ab, 3. Glied kaum länger als das 4.; Halsschild breiter als der Kopf mit den Augen, wenig kürzer als breit, wenig gewölbt dicht und ziemlich fein punktiert, nach vorn verengt, nahe der Basis oder an der Basis jederseits nahe der Ecke mit einem flachen Grübchen, zuweilen auch die Scheibe nahe der Mitte mit 2 Grübchen, Vorderrand schmal, Hinterrand etwas breiter gerandet, flach zweibuchtig, in der Mitte etwas eingedrückt, Vorderecken gerundet, Hinterecken fast rechtwinklig, Seiten etwas gerundet, Seitenrand vollständig. Schildchen klein, rundlich. Flügeldecken an den Schultern kaum breiter als der Halsschild, mit Punktstreifen, Punkte grob, gegen die Spitze schwindend, Streifen kaum flacher, Schulter schräge, Spitzen zusammen abgerundet, Zwischenräume der Streifen etwas gewölbt, sehr dicht, sehr fein punktiert; Epipleuren schmal, an der Spitze nach aussen gewendet. Abdomen ziemlich dicht und fein, die Seiten der Brust gröber punktiert, Analsegment ♂ gerundet; Fortsatz der Vorderbrust hinter den Hüften etwas vorragend, stumpf. Beine kräftig, lang, Schienen gebogen, 2-4. Glied der Vorder- und Mittelfüsse, 3. Glied der Hinterfüsse gelappt, 1. Glied der Vorderfüsse beim ♂ stark erweitert und unten ausgehöhlt.

1 ♂, 2 ♀♀ Kurseong, E. Himalayas, 4700-5000 ft., 24-vi-1910 (*Annandale*).

Die Art ist durch die Behaarung leicht kenntlich.

#### 4. *Allecula sukliensis*, n. sp.

Länge: 14 mm. Körper etwas kräftiger als bei der vorigen Art, nach hinten fast gleichmässig erweitert, mässig gewölbt, wenig glänzend, überall fein, kurz, anliegend, gelb behaart; pechbraun, Vorderkörper, Schildchen und Flügeldecken rötlich, Fühler und Beine gelb, Schenkelspitze und Tarsen gebräunt. Kopf gewöhnlich, fein und dicht punktiert; Oberlippe stark quer vorn weniger ausgerandet als bei der vorigen Art, beborstet, Clypeus quer, vorn gerade, von der Stirn durch eine breite, schlecht begrenzte Furche getrennt, Schläfen sehr kurz, Hals dick; Augen schmal, gewölbt, stark ausgerandet, Abstand auf der Stirn geringer als ein Augendurchmesser; Fühler fadenförmig, (beide beschädigt), 3. Glied kürzer als das 4.; Endglied der Lippentaster nach innen stark eckig erweitert. Halsschild bedeutend breiter als der Kopf mit den Augen, leicht quer, fein, mässig dicht punktiert, vorn und hinten fein gerandet, etwas 2 buchtig, Mitte schwach vorgezogen, Scheibe mit schwacher Mittelfurche, Vorderecken gerundet, Hinterecken fast rechteckig, Seiten nach vorn schwach gerundet verengt, Seitenrand deutlich. Schildchen kurz, rundlich. Flügeldecken nicht doppelt so breit wie die Halsschildbasis, mit Punktstreifen, Punkte ziemlich fein, nach hinten schwindend, Zwischenräume wenig gewölbt, mit sehr feinen Borstenpunkten, Schultern schräge, Spitzen einzeln abgerundet, Epipleuren erst sehr breit, dann stark verschmälert; Unterseite stark

glänzend, fein und dicht, Seiten der Brust grob punktiert, Analsegment gerundet, Intercoxalfortsatz des 1. Segments schmal, spitz, gerandet, Hinterbrust zweilappig vorgezogen, Fortsatz der Vorderbrust wie bei der vorigen Art. Beine kräftig, Schenkel keulig, Vorder- und Mittelschienen gebogen; Füße breit, an den Vorder- und Mittelfüßen Glied 1-4 gelappt (an den Mittelfüßen Glied 1 schwach), an den Hinterfüßen deutlich nur Glied 2 und 3, Metatarsus der Hinterfüße etwas kürzer als die folgenden Glieder zusammen.

1 ♂ von Sukli, Ostseite der Dawna Hills, 2100 ft., 22-29-xi-1911, gesammelt von Herrn F. H. Gravely.

Die Art unterscheidet sich von ihren Verwandten durch die Bildung der Füße, der Hinterbrust und der Lippentaster.

##### 5. *Allecula sobrina*, n. sp.

Länge: 11 mm. Form wie *Allecula femorata*, wenig gewölbt, wenig glänzend, ziemlich lang, abstehend, undicht gelblich behaart; dunkelbraun, Flügeldecken rotbraun, Beine gelb, Spitzen der Schenkel und Basis der Schienen oder die ganzen Schienen dunkelbraun, Fühler rotbraun, die einzelnen Glieder an der Spitze dunkler. Kopf gewöhnlich, ziemlich dicht, nicht grob punktiert; Oberlippe kürzer, weniger ausgerandet als bei *A. femorata*, Augen schmaler, weniger genähert, Endglied der Lippentaster weniger breit; Fühler fadenförmig, (beide beschädigt) 3. Glied so lang wie das 4.; Halsschild so lang wie breit, glanzlos; Schildchen kurz, rundlich; Flügeldecken mit stärker eingestochenen Punkten in den Streifen; Beine wie bei der genannten Art, aber an den Vorderfüßen Glied 1 erweitert, unten gekielt, Glied 1-4, an den Mittelfüßen Glied 3-4 und an Hinterfüßen Glied 2 und 3 gelappt; Metatarsus der Hinterfüße länger als Glied 2 und 3 zusammen; das Übrige wie bei *A. geniculata* m.

1 ♂ von Kurseong, Ost-Himalaya, 4700-5000 ft., 21-vi-1910, gesammelt von Annandale.

##### 6. *Borboresthes suturalis*, n. sp.

Länge: 6-7 mm. Form etwas schlanker als *B. fuliginosus*, Fairm.; Brust braun, Bauch hellbraun, Beine, Fühler und Flügeldecken hell gelbbraun, letztere mit schmaler dunkler Naht und schmalem, dunklem Seitenrande, Vorderkörper rotbraun; mässig glänzend, mässig gewölbt; fein, anliegend, wenig dicht, ziemlich kurz gelb behaart. Kopf fein punktiert; Oberlippe stark quer, vorn gerade, Clypeus ebenso, von der Stirn undeutlich geschieden; Augen gewölbt, weit getrennt, Schläfen sehr kurz; Fühler halb so lang wie der Körper, fadenförmig, 3. Glied kürzer als das 4., Endglied kürzer als das 10.; Halsschild stark quer, Vorderrand gerade, Hinterrand zweimal gebuchtet, Seitenrand scharf, Seiten gerundet verengt, Hinterecken fast rechtwinklig; Schildchen rundlich; Flügeldecken mit starken Punktstreifen, die hinten nicht

flacher werden, Punkte schwinden gegen die Spitze, Spitzen zusammen abgerundet; Epipleuren schmal, ganz, glatt. Unterseite und Beine gewöhnlich; Metatarsus der Hinterfüsse viel länger als die folgenden Glieder zusammen.

2 Ex. Kurseong, E Himalayas, 4700–5000 feet 24-vi-1910 (*Ammandale*). Unterscheidet sich durch die Färbung und die schlankere Gestalt leicht von ihren Verwandten.

#### 7. *Cistelopsis* (?) *aborensis*, n. sp.

Länge: 7 mm. Form typisch. Rotbraun; mässig glänzend; anliegend, ziemlich dicht gelblich behaart. Kopf verlängert, ziemlich fein und dicht punktiert; Oberlippe und Clypeus stark quer, vorn gerade; Clypeus von der Stirn durch eine wenig gebogene Furche getrennt; Augen stark gewölbt, ausgerandet, Abstand auf der Stirn gleich einem Augendurchmesser; Fühler typisch, so lang wie der halbe Körper, 3. Glied halb so lang wie das 4., Endglied kürzer als das 10. Glied; Endglied der Kiefertaster fast messerförmig, der Lippentaster dreieckig; Form des Halsschildes typisch, rings um scharf gerandet, dicht mit Nabelpunkten besetzt, Basis in der Mitte breit vorgezogen, Hinterecken etwas abgerundet; Schildchen breit, spitz; Flügeldecken mit feinen Punktstreifen, die an der Spitze vertieft sind, Zwischenräume flach, dicht, etwas querrissig punktiert, Epipleuren mässig breit, vollständig; Unterseite feiner, an den Seiten gröber punktiert. Prosternalfortsatz hinter den Hüften nicht verlängert; Abdominalfortsatz spitz; Hinterhüften hinten scharf gerandet. Beine gewöhnlich; das vorletzte Tarsenglied aller Füße gelappt; Metatarsus der Hinterfüsse so lang wie die folgenden Glieder zusammen.

1 Exemplar. Kobo, Abor country, 400 ft., 8-xii-1911 (gesammelt von Mr. Kemp), unter Baumrinde.

#### *Cistelopsis rufa*, n. sp.

Länge: 7 mm. Form sehr ähnlich wie *C. validicornis*, Fairm., aber etwas schlanker, die Schultern weniger gerundet; rotbraun, Hinterleib dunkel, letztes Fühlerglied gebräunt; kurz, anliegend, gelb behaart; Halsschild fein, wenig dicht, nicht runzlig punktiert, Hinterrand in der Mitte breit vorgezogen, sonst gerade, Hinterecken rechtwinklig; Schildchen dreieckig; Flügeldecken wenig erweitert, sehr fein punktiertgestreift, Streifen nicht vertieft, nur gegen die Spitze 3 vertiefte Streifen, nicht querrunzlig, Spitzen zusammen abgerundet; Epipleuren schmal; Metatarsus der Hinterfüsse so lang wie die folgenden Glieder zusammen. Alles Übrige wie bei *C. validicornis*, Fairm.

1 Ex. von Pattipola, Ceylon, 6000 ft., 13-x-1911.

#### 8. *Cistelomorpha andrewesi*, Fairm.

Ann. Soc. Ent. Belg. XL, 1896, p. 58.

Phagu, Simla Hills, 9000 ft.

**9. *Cistelomorpha alternans*, Fairm.**

Ann. Soc. Ent. Belg XXXVIII, 1894, p. 40.  
Kurseong, E. Himalayas, 4700-5000 ft.; Sikkim, E. Himalayas; Mungphu, Darjiling distr.

**10. *Cistelomorpha trabeata*, Fairm.**

Ann. Soc. Ent. Belg. XXXVIII, 1894, p. 40.  
Bangalore.



## XI NOTES ON SOME INDIAN CHELONIA

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Indian Museum.*

The majority of the specimens mentioned in these notes have been sent me by Dr J R. Henderson of the Madras Museum, who has been at great pains, in this and other respects, to assist us in the Indian Museum with specimens from the Madras Presidency.

### Family TRIONYCHIDAE.

#### *Trionyx leithii*, Gray.

1873. *Trionyx leithii*, Gray, *Proc. Zool. Soc. London*, p. 49, fig. 3 (skull).  
1873. *Trionyx gangeticus*, *id.*, *ibid.*, pl. viii.  
1889. *Trionyx leithii*, Boulenger, *Cat. Chel. Brit. Mus.*, p. 249.  
1912. *Trionyx leithii*, Annandale, *Rec. Ind. Mus.*, VII, p. 159, fig. 2 (plastron of young).

Boulenger regards this species as intermediate between *T gangeticus*, which it somewhat resembles in colouration, and *T hurum*, with which the shape of its skull is to some extent in agreement; but the structure of the skull is nearer that of *T formosus*. The only differences that I can detect are that the snout is a little less declivous and slightly longer, the horizontal groove on the palate broader, the post-cranial spine less dilated and the proximal articular part of the lower jaw more slender in *T leithii* than in the Burmese species. The former has much the same relationship to the latter as *T nigricans* has to *T phayrei*, and the existence in *T leithii* of two neural bones between the first pair of costals is a modification probably of slight importance though it serves to separate all the Indian forms from their Burmese allies. The branchial skeleton of *T leithii* also resembles that of *T formosus*, in particular in that two additional ossifications are present at the tip of the hypobranchial bone. In the adult animal the hypoplastra approach one another in the middle line of the plastron, though they do not actually meet, and the internal projections practically disappear.

The natural colouration and the external appearance of the disk do not appear to have been observed in the adult living animal. The following notes are based on two individuals which Dr. Henderson has been kind enough to send to Calcutta for examination.

The dorsal surface of the disk is greenish black obscurely vermiculated and marbled with olive-green; that of the limbs and tail is also blackish, while that of the head is variegated with dark olive-green and a much paler olivaceous brown. In one specimen<sup>1</sup> dark green predominated on the head and the paler markings were not of a very definite nature, but on that of the other (fig. 1) there was a much larger proportion of the paler shade, a dark line extended backwards and downwards from each eye and there were two distinct forwardly-directed V-shaped black bars on the temporal and occipital regions, interrupted somewhat at their apices in the middle line; the ends of the bars extended backwards more faintly on to the neck.

The cartilaginous disk is long and relatively narrow, expanding slightly behind. In front of the bony carapace there is a conspicuous projecting pad of coarsely tuberculate cartilage, and

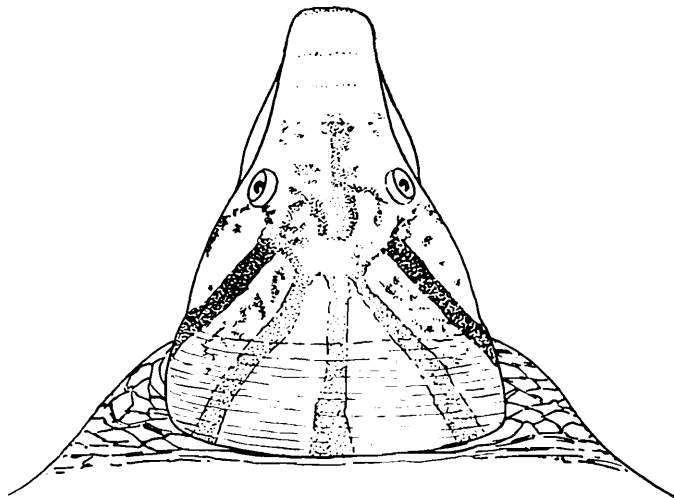


FIG. 1.—*Trionyx leithii*, Gray.

Head of a living specimen from the Kurnool district ( $\times \frac{1}{2}$ ).

behind there is a group of large tubercles in the central region. The anterior part of the carapace itself bears a prominent rounded boss; there is no middorsal ridge or groove

The disk of the larger of the two specimens is 49 cm. long and 41 cm. broad, that of the smaller one 47 cm.  $\times$  42 cm. In the former the breadth of the bony carapace, which is broadly emarginate behind, is 29 cm. and the breadth 32 cm. The length of the skull, which agrees well with Gray's figure of 1873 except that the lower jaw is not cleft at the tip, is 91 mm. and the zygomatic breadth 58 mm.

Dr. Henderson's specimens, of which the larger has been retained in the Indian Museum and the smaller returned to Madras, were taken by his assistant Mr. Sundara Raj in a small stream in

<sup>1</sup> The snout had been injured in this specimen and possibly the dark colouration was to some extent due to inflammation or congestion.

the Nallamalai range of the Eastern Ghats, where they were dug from the mud in the bed of a pool in January or February.

The evidence for the occurrence of this species in the Ganges or the Indus is not satisfactory. Murray's specimens from Sind assigned provisionally to it by Boulenger, apparently on the grounds of probability only, were almost certainly representatives of *T. gangeticus*, while those from which Hardwicke's Ms. figures (reproduced by Gray in 1873) were drawn, though said to be from "Futtegurh", may have been either introduced or ascribed to an incorrect locality. All definite records of specimens now in existence refer to places in the Indian Peninsular Area south of the Indo-Gangetic Plain.

### **Trionyx hurum, Gray.**

1912. *Trionyx hurum*, Annandale, *Rec. Ind. Mus.*, VII, pp. 160, 180, pl. v, fig. 3.

Mr. F. M. Howlett, Imperial Pathological Entomologist, has recently sent me a young specimen taken in the Little Gundak River near Pusa in Bihar. Its colouration is normal, agreeing closely with that of a young turtle from Dacca in Eastern Bengal. It is thus clear that the normal *T. hurum* has made its way in the Gangetic system far above the delta.

### Family TESTUDINIDAE.

#### **Testudo travancorica, Boulenger.**

1906. *Testudo travancorica*, Boulenger, *Journ. Bombay Nat. Hist. Soc.*, XVII, p. 560, 2 pls.

Mr. F. H. Gravely recently obtained further specimens in the forests on the western slopes of the Western Ghats in Cochin, while Mr. F. Hannington, I.C.S., has presented to the Indian Museum one from Coorg on the eastern side of the Ghats. The known range of the species may, therefore, now be stated thus:—Travancore and Cochin on the western slopes of the Western Ghats and Coorg on the eastern slopes. It is probable that the tortoise also occurs on the western side of the hills in the western districts of the Madras Presidency, and also in parts of Travancore and the adjacent districts situated on the eastern side, but no records as yet exist. The common land-tortoise over the greater part of the Presidency is certainly *T. elegans*, which, as Mr. Sundara Raj informs me, occurs in the Eastern Ghats in the Kurnool district.

#### **Geoemyda trijuga (Schweigg.)**

1913. *Geoemyda trijuga*, Annandale, *Rec. Ind. Mus.*, IX, p. 67.

It is probable that the range of the typical form of this species is confined to the east-central part of the Madras Presidency, but specimens from Mysore, the northern part of the Presidency and other parts of the Peninsular Area must be examined before

this question is settled. I have here to describe a new race from Coorg on the east side of the Western Ghats considerably east and a little south of the Madras district.

The following key to the known races may be useful:—

*Key to the races of G. trijuga.*

- I. Head with conspicuous red or yellow markings.
  - A. Temporal regions pale yellow, snout black; shell uniform black or very dark brown . . . . . *coronata.*
  - B. Whole of the head black with orange-red streaks and spots; shell dark brown plastron as a rule bordered with yellow .. *thermalis.*
- II. Head without conspicuous red or yellow markings.
  - A. Head plumbeous grey, obscurely vermiculated on the temporal regions; shell brown, the plastron with yellow borders *plumbea.*
  - B. Head olivaceous with inconspicuous yellowish or greenish spots and streaks; shell brown or blackish, the plastron as a rule with yellow borders. *forma typica (madraspatana).*
  - C. Head uniform brown or with an obscure reticulation of olive-brown and orange-yellow; shell of adult black, the plastral borders and the dorsal keels yellow . . . . . *edeniana.*

**Subsp. plumbea, nov.**

The carapace is dark brown and when wet appears to be obscurely marbled with a still darker shade; there are as a rule yellow markings on each or some of the costal shields and the dorsal ridges are for the most part tinged with yellow. The central part of the plastron is dark brown with broad yellow margins; the bridge is dark brown with yellow spots along the outer edge. In life the dorsal surface of the limbs, head and tail is leaden grey; that of the snout and of a triangle extending backwards from the eyes has a brownish tinge and is devoid of markings. The temporal region is obscurely vermiculated with a paler shade of grey and two pale lines extend backwards from the eye above the tympanum, which is somewhat darkened; the beak and the ventral surface of the head, neck and limbs are pale grey; on the chin and neck there are obscure dark horizontal lines.

After some weeks in spirit the markings on the head have become obscure and the whole has a livid greyish tinge very

different from the colour of that of specimens of the typical form of the species that have been even longer in alcohol.

The iris is pale chestnut. There are a number of small tubercles on the side of the head between the eye and the tympanum.

I can detect no constant peculiarity in the skull or in the shell, except that the dorsal keels appear to be blunter than in specimens of the same size from Madras. Possibly this is correlated with the fact that the race is a very small one and that shells of small size are therefore more worn and belong to older individuals than their dimensions would suggest. The concentric rings on the dorsal shields are, however, very distinct.

*Carapace.*

	Reg. No. 17712 (sk.)	Reg. No. 17715(sp.)
Total length with the callipers	155 mm.	162 mm.
Total length with the tape	170 ,,	175 ,,
Total breadth with the callipers	108 ,,	113 ,,
Total breadth with the tape	125 ,,	144 ,,
Depth of the shell	60 ,,	57 ,,

*Plastron.*

Total length with the callipers.	139 ,,	145 ,,
Length of the bridge	58 ,,	60 ,,

*Skull.*

Total length	38 ,,
Zygomatic breadth	23 ,,

*Types.* No. 17712 (skeleton) and No. 17715 (spirit), *Ind. Mus.*

I have examined three living specimens which Dr. Henderson has been kind enough to send me. They were collected by his assistant Mr. Sundara Raj in a pond. One has been returned to the Madras Museum, one skeletonized and one preserved in alcohol. All are apparently adult females of approximately the same size; they are very uniform as regards their racial characters.

Subsp. **coronata** (Anderson).

1913. *Geoemyda trijuga coronata*, Annandale, *op. cit.*, p. 68, pl. vi, figs. 3, 3a.

It is strange that there is no reference to this very distinct race in the "Fauna", but, to judge from the labels on specimens in the British Museum, it seems possible that it was regarded by Dr. Boulenger as the fully adult or possibly aged phase of the typical Madras form, to which Anderson gave the name *madras-patana*.

We have received from Dr. Henderson specimens of this race from Chalakudi in Cochin and from a locality about 25 miles N.E. of Calicut in the Malabar district of the Madras Presidency.

The Malabar specimen is a large female, of which the measurements are given below. The shell, dry, is practically black all over. The central dorsal keel remains distinct throughout its length, but the lateral keels are obsolescent. The colour of the head was typical though slightly less brilliant than in smaller individuals.

*Carapace.*

	Reg. No. 17437 (sk.)
Total length with the callipers ..	233 mm.
"    "    "    "    tape	260 "
Total breadth with the callipers	158 "
"    "    "    "    tape	215 "
Depth of the shell	81 "

*Plastron.*

Total length with the callipers	200 "
Total length of the bridge	85 "

Subsp. **thermalis** (Lesson).

1913. *Geoemyda trijuga thermalis*, Annandale, *op. cit.*, p. 68, pl. vi, figs. 4, 4a.

Further specimens of this race were recently obtained in the Ramnad district by Dr. Henderson and Mr Kemp.

***Geoemyda tricarinata***, Blyth

1913. *Geoemyda tricarinata*, Annandale, *op. cit.*, p. 73, pl. vi, figs. 6, 6a, 6b.

In a footnote to the paper cited ( p. 74 ) I have recorded the occurrence of this species in the Jalpaiguri district of northern Bengal. Possibly it is one of those Assamese reptiles whose western range along the base of the Himalayas has been limited or practically limited by the R. Tista. If so, its occurrence in Chota Nagpur is all the more remarkable.

***Geoemyda silvatica***, Henderson.

1912. *Geoemyda silvatica*, Henderson, *Rec. Ind. Mus.*, VII, p. 217.

The type-specimen of this species has been presented by the Madras Museum to the Indian Museum. It is now preserved in spirit and is numbered 17115 in our register of reptiles. A good watercolour sketch of the living animal was made by Babu Abhoya Charan Chowdhary and is available for reference.

***Bellia crassicollis***, (Gray).

1906. *Bellia crassicollis*, Annandale, *Journ. As. Soc. Bengal* (n.s.) II, p. 205.

The specimen said to be from Travancore and referred to in the paper cited had, it is now evident, suffered from an accidental

transposition of labels. There is, therefore, no reason to think that this Malayan species occurs in South India. The authentic in the collection of the Indian Museum are from Burma and Penang.





XII. NOTES ON ORIENTAL DRAGONFLIES  
IN THE INDIAN MUSEUM

By F. F. LAIDLAW.

NO. I. THE GENUS *OROGOMPHUS*.

Order ANISOPTERA.

*AESCHNIDAE*.

*CHLOROGOMPHINAE*.

So far as at present known only the genus *Orogomphus* occurs in the Indian area. The other genus of the family, *Chlorogomphus* is found in Sumatra, Java and Tonkin, whilst *Orogomphus* has representatives in Bengal, Burma and the Himalayas, as well as in Borneo, the Philippine Islands and Formosa. The subfamily is the only one confined to the Oriental region.

Four species of *Orogomphus* are known. They are—

- Orogomphus atkinsoni*, de Selys. Bengal, Assam.  
,, *speciosus*, de Selys. Burma, Darjiling.  
,, *splendidus*, de Selys. Philippine Islands, Borneo, Formosa.  
,, *dyak*, Laidlaw. Borneo.

For figures of *O. splendidus* see Ris in *Supplementa Entomologica*, No. 1, 1912: text-fig. 15 *a-b*; taf. iii, fig. 1-6; taf. v, fig. 5. In this paper Dr. Ris also discusses the venation and characters of the male previously unknown (*loc cit.* pp. 77-79).

The wings of a female presumed to belong to this species, collected in Borneo, are figured by myself (*Proc. Zool. Soc. London*, 1914, pl. i, fig. 8). Selys's original account of the type female from Luzon is given in his 4<sup>me</sup> additions. *Synops. Gomph Bull. Acad. Roy. Belg.* xlvii (2), 1878, pp. 681-682.

***Orogomphus atkinsoni*, de Selys.**

- O. atkinsoni*, Selys, 4<sup>me</sup> add. *Synops. Gomph.*, p. 682 (1878).  
Kirby, *Cat. Odonata*, p. 79 (1890).  
Selys, *Ann. Mus. Civ. Genova* (2) x, pp. 481-482 (1891).  
Williamson, *Proc. U.S. Nat. Mus.* xxxii, pp. 278-279, fig. 5-6 (1907).  
Laidlaw, *Proc. Zool. Soc. Lond.*, pp. 61-62 (1914).

I ♂  $\frac{5\frac{1}{2} \times 1\frac{1}{2}}{20}$  I ♀  $\frac{5\frac{1}{2} \times 1\frac{1}{2}}{20}$ . Both specimens are named; the male is without a locality, the female from Sibsagar, Assam. The specimen recorded by me (*loc. cit.*) is from Kumaon, de Selys's type is

from 'Bengal.' He was not acquainted with the male at the date of publication of the species (1878). Both the present specimens are in poor condition, but fortunately the abdomen of the male is complete. I take the opportunity of figuring the anal appendages of the male. These bear a close resemblance to the corresponding structures of *O. dyak*.

### *Orogomphus speciosus*, de Selys.

*O. speciosus*, Selys, *Ann. Mus. Civ. Genova* (2) x, pp. 481-482 (1891).  
Kirby, *Cat. Odonata*, p. 79 (1890).

1 ♂  $\frac{sc}{1170}$ . Lord Carmichael's collection, Darjiling District, 1000-3000 ft., May, 1912.

The male of this species has not been described.

The dimensions of the specimen are as follows:—

Length of abdomen 54 mm., of hind-wing 40 mm., breadth of h. w. 12.5 mm.; of the type female, length of abdomen 57 mm., of hind-wing 46 mm., breadth of h. w. 15 mm.

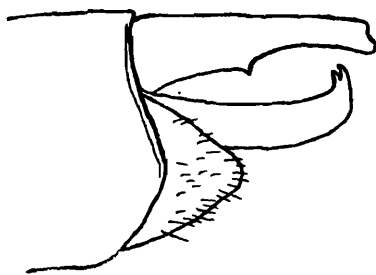


FIG. 1.—Profile of anal appendages of *O. atkinsoni* ♂.

There is thus a considerable difference in size, scarcely greater than occurs in other species of the genus.

In colouring the present example shows the following points of disagreement with the account of the type:

- i. The occiput is black not yellow.
- ii. Abdominal segment 2 is largely yellow above, with a transverse black band not touching either extremity.
- iii. Segment 8 shows no lateral yellow spot.

Venation-formula:

	Anal loop.	An. n.	Pn. n.	M.	Cu.	t. (cells)	supra. t.
basal post-costal	—	$\frac{21-22}{20-22}$	$\frac{11-12}{16-15}$	$\frac{1-1}{1-1}$	$\frac{7-7}{5-6}$	$\frac{2-2}{2-2}$	$\frac{4-3}{3-3}$
+	9-9						
} ♀ type		$\frac{23-23}{17-19}$	$\frac{13-13}{17-17}$	$\frac{2}{2}$	$\frac{7-8}{7-8}$	$\frac{2-2}{3-3}$	$\frac{4-4}{4-4}$

In other respects there is close agreement between the characters of the male here recorded and those of the female as described by de Selys, so that I have little hesitation in referring them both to the same species.

The wing of the male is colourless and is very like that of the male *O. atkinsoni*, broadly speaking.

The anal appendages differ markedly in detail from those of the allied species. The upper pair are stout, a trifle shorter than the lower appendage, and are curved inwards towards each other; bifid at the extremity, and with a very small ventro-

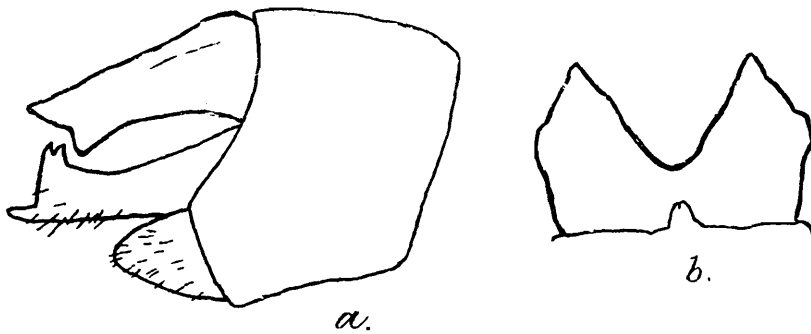


FIG. 2a.—Profile of anal appendages of *O. speciosus* ♂.  
 „ 2b.—Lower anal appendage of *O. speciosus* ♂, viewed from below.

internal tubercle on each just beyond its middle and scarcely visible in profile.

The lower appendage likewise is stout; its two limbs each carry a projection directed straight upwards. This terminates in a doubly toothed point. Beyond the projection each limb ends in a pointed, backwardly directed spur. When looked at from below the lower appendage appears as ending in a pair of triangular processes not divaricated from each other.

