FAUNA OF THE CHILKA LAKE.

TANAIDACEA AND ISOPODA.

By CHARLES CHILTON, *M.A., M.B., C.M., D.Sc., LL.D., F.L.S., C.M.Z.S., Professor of Biology, Canterbury College, New Zealand.*

(Plate LX.)

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TANAIDACEA AND ISOPODA.

By CHARLES CHILTON.

INTRODUCTION.

It is convenient to include the Tanaidacea in the same report as the Isopoda for they have often been considered a sub-order of the Isopoda and are represented by a single species in the fauna of the Chilka Lake. The differences between the two groups are, however, very great and more important than those between the Isopoda and the Amphipoda and I agree with Calman (1909, p. 190) that the Tanaidacea should be ranked as a separate order.

The four terrestrial Isopods from the shore of the lake have already been reported on (Chilton, 1916, p. 461), but the names are included in the list below in order to make it complete, and some additional information is given with regard to two of the species.

The total number of species is small, *viz.* :—

Tanaidacea 1, Isopoda 14 but the Isopoda represent nine families, *viz.* :— Anthuridae. 2 species ; Cirolanidae, 3 ; Aegidae, 1 ; Cymothoidae, 1 Sphaeromidae. 2 ; Idoteidae, 1 ; Oniscidae, 2 ; Armadillididae, 1 ; Ligiidae, 1.

These families differ so much from one another that the work of identifying species is out of proportion to their number, and is rendered more difficult because the literature is very scattered and no general revision of the whole Isopoda is available. Sars' account of the Isopoda of Norway and Harriet Richardson's Monograph of the Isopoda of North America are, however, very useful.

It will be seem from the list of species with the distribution given below that four are described as new species, the rest being referred to species already described from India, the East Indies, etc., and that the geographical distribution of the species will be useful in checking results arrived at from other groups.

I have given only those references which seem necessary for the purpose, others can readily be obtained from those here quoted.

For the fine figures illustrating the paper I have to thank Miss E. M. Herriott, assistant in the Biological Laboratory of Canterbury College, and Miss Beryl Parlane, one of my students.

I desire also to express my grateful thanks to Dr. Annandale for the privilege of reporting on the Isopoda collected under his direction in Chilka Lake.

LIST OF SPECIES WITH DISTRIBUTION.

TANAIDACEA.

1. *Apseudes chilkensis* Chilton, sp. nov. Chilka Lake.

ISOPODA.

1. *Apanthura sandalensis* Stebbing. Chilka Lake ; Loyalty Is.
2. *Calathura borradailei* Stebbing. Chilka Lake ; Maldive and Laccadive Archipelagoes.
3. *Cirolana pleonastica* Stebbing. Chilka Lake ; New Britain.
4. *Cirolana parva* Hansen. Chilka Lake ; Ceylon ; Florida ; Gulf of Mexico ; W. India Is. ; Bahamas, etc.
5. *Cirolana nigra* Chilton, sp. nov. Chilka Lake.
6. *Rocinela orientalis* Sch. & M. Chilka Lake ; Ceylon ; Philippine Is. ; etc.
7. *Cymothoa indica* Sch. & M. Chilka Lake ; Bangkok.
8. *Cassidina pulchra* Chilton, sp. nov. Chilka Lake.
9. *Exosphaeroma parva* Chilton, sp. nov. Chilka Lake.
10. *Synidotea variegata* Collinge. Chilka Lake ; Gulf of Manaar.
11. *Alloniscus pigmentatus* Budde-Lund. Chilka Lake ; Madagascar, East Indies.
12. *Hemiporcellio carinatus* Collinge. Chilka Lake.
13. *Cubaris granulatus* Collinge. Chilka Lake.
14. *Ligia exotica* Roux. Chilka Lake ; widely distributed on warmer shores of the Atlantic, Pacific and Indian Oceans.

Order TANAIDACEA.

Tanaidacea, Calman, 1909, p. 190.
Tanaidacea, Tattersall, 1921, p. 197.
Isopoda Anomala, Tribe Chelifera, Stebbing, 1905, p. 2, and 1910, p. 85.
Isopoda Chelifera, Sars, 1899, p. 4.
Isopoda Chelifera, Niestrasz, 1913, p. 1.

It will be seen from the references given above that there is a difference of opinion as to whether this group should be ranked under the Isopoda or as a separate order. While it may be convenient to place them under the Isopoda their characters are, I think, sufficiently different to entitle them to rank as an Order of equal systematic importance with the Isopoda.

Niestrasz (1913) discusses the homologies of the various appendages and the names which should be used for them.

The Order contains two families, the Apseudidae and the Tanaidaceae but only the first is represented in the Chilka Lake fauna.

Family APSEUDIDAE.

Apseudidae, Norman and Stebbing, 1886, p. 79.
Apseudidae, Sars, 1899, p. 5.
Apseudidae, H. Richardson, 1905, p. 37.

Genus **APSEUDES** Leach.

A description of the genus is given in each of the works quoted under the family.

Apseudes chilkensis, sp. nov.

(Plate LX, fig. 1.)

Localities.

1—3 miles S. E. by E. ½ E. of Patsahanipur. Three specimens.

1 mile E. by N. of Patsahanipur. Many specimens.

2—6 miles E. by S. ½ S. of Patsahanipur. Several specimens.

Nalbano Island, Chilka Lake. Several specimens. "Stomach of *Trygon imbricata.*"

Station 158. "Chief food of *Trygon imbricata.*" Several specimens.

Off Barkul, Chilka Lake. Three specimens.

Off Samal Island, 8—15 feet. One specimen.

[This crustacean is very abundant in the Chilka Lake on a bottom of fine mud, in which it probably buries itself. The stomach of the little sting-ray *Trygon imbricata* usually contains large numbers of individuals. *N.A.*]

Specific Diagnosis.—Body rather slender, narrowing posteriorly. Rostrum triangular, rounded anteriorly, sides arched. Free segments of mid-body defined by deep constrictions, without lateral teeth; coxal plates small, rounded; posterior margin of last segment of mid-body bearing a fringe of setae; pleon narrow, epimera of five anterior segments produced downwards into small acutely pointed spiniform projections not visible in dorsal view. Ocular lobes not distinct, eyes apparently absent. Superior antennae elongated, first joint of peduncle as long as the next two together, bearing on the inner side four tufts of long hairs and on the outer a row of long hairs; flagella subequal, each with about 12 to 15 joints. Inferior antennae with the peduncular joints short, exopod oval, fringed with long setae. Cheliped elongated, basal joint widening distally, inner margins without teeth; propod greatly elongated, rather longer than basis; margins without teeth; a row of small hairs on the inner margin; fixed finger with wide emargination at the base, followed by a well defined tooth; movable finger arched, with dentiform projection at base. Second trunk legs nearly as long as the chelipeds, the last three joints flattened and fringed with very long hairs in addition to the usual spinules. Uropods elongated, basal joint short, inner ramus composed of about 24 joints, outer ramus of 8 joints.

Length.—About 7 mm.

Colour.—Whitish.

Remarks.—This species appears to be a true *Apseudes* agreeing with the characters of the genus as set out by Sars. It differs markedly from other species in the second pair of trunk limbs which are not fossorial, but apparently adapted for swimming. The usual spinules are present, but are small and largely obscured by the greatly elongated hairs fringing the last three joints. The optic lobes are barely discernible and apparently fused with the head and there is no sign of the eyes. The absence of eyes in this form which seems to live in surface or shallow waters is rather remarkable; it may be mentioned, however, that the amphipod, *Niphargus chilkensis,* found in Chilka Lake also has imperfect eyes; probably the blind condition of these two species was developed in some locality occupied by them before they came to live in Chilka Lake.

The mouth parts, as far as observed, appear to present no marked peculiarity. The structure of the trunk limbs and the arrangement of the setae thereon can be best learnt from the figures given.

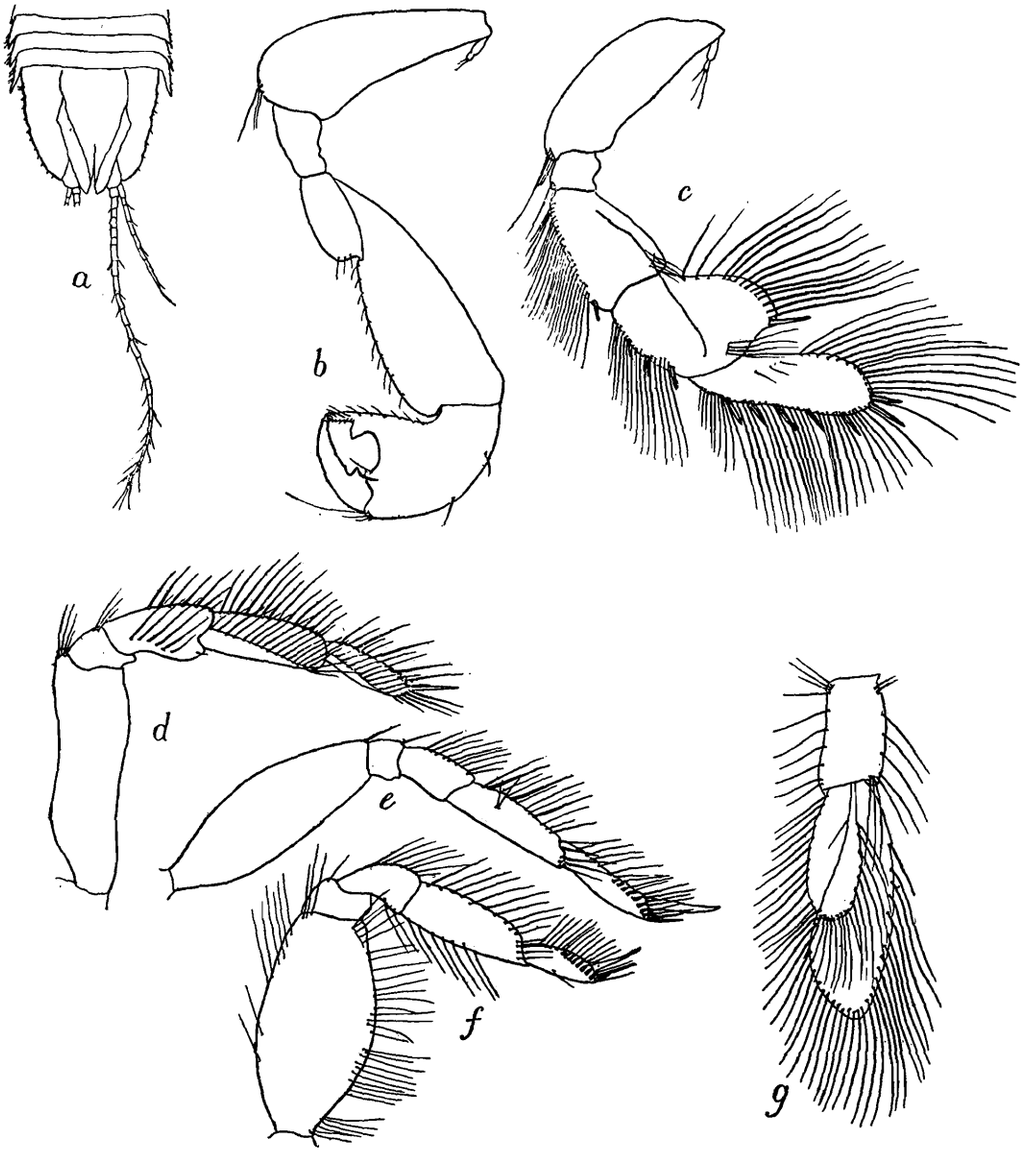


FIG. 1.—*Apseudes chilkensis*, sp. nov.

a. Terminal portion of body with uropoda.
b. Cheliped
c. Second trunk limb.
d. Third trunk limb.
e. Fifth trunk limb.
f. Seventh trunk limb.
g. Pleopod.

Order ISOPODA.

Family ANTHURIDAE.

Anthunidae, Harriet Richardson, 1905, p. 62.

Genus **APANTHURA** Stebbing.

Apanthura, Stebbing, 1900 C, p. 621.

This genus, which was established for the species given below, is characterised by the mouth parts and by the last four pairs of peraeopods in which the fifth joint under-rides the sixth.

Apanthura sandalensis Stebbing.

Apanthura sandalensis, Stebbing, 1900 C, p. 621, pl. lxv A.

Localities.

Main Channel, W. of Satpara Island. One specimen.
Station 157. Several specimens.
Kalupara Ghat, near shore. Two specimens, one an ovigerous female.
Between Barnikuda and Nalbano Island, depth 10 feet. One specimen.
1—5 miles N. by E. of Kalidai. One specimen.
On swamp inside bar, N. of Barhampore Island. One specimen.

This genus and species were established by Stebbing for specimens obtained by Dr. A. Willey at Sandal Bay, Lifu, Loyalty Islands.

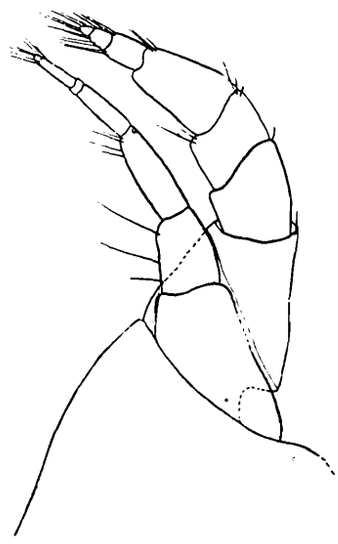


FIG. 2.—*Apanthura sandalensis* Stebbing, antennae, seen from above.

The Chilka Lake specimens agree well with the description given. I give a figure of the antennae showing that the first or upper antennae lie in a groove running obliquely across the large basal joint of the lower antenna just as it does in the form I described in 1883 under the name *Anthura affinis* (1883, p. 72, pl. i, fig. 4a).

Genus **CALATHURA** Norman and Stebbing.

Calathura, Norman and Stebbing, 1886, p. 131.

Calathura borradailei Stebbing.

Calathura borradailei, Stebbing, 1904, p. 700, pl. xlix A.

Localities.

Station 157. One ovigerous female.
2—8 miles N. E. ½E. of Kalidai. Several specimens.
Off Nalbano; 4—5 miles S. E. by E. of Patsahanipur. One specimen.
1—9 miles N. E. by E. of Kalidai. One specimen.
8 miles S. S. W. of Kalidai. One specimen.
Off Samal Island, 8—15 feet. One specimen.

This species has been fully described and figured by Stebbing from a single male specimen collected at Fadifolu Atoll in the Maldive-Laccadive Archipelagos. The Chilka Lake specimens agree well with his description in all important characters. I give a figure of the head and antennae of a male and also one of the mandible to show the structure of the palp which was not clearly seen in Stebbing's specimen.

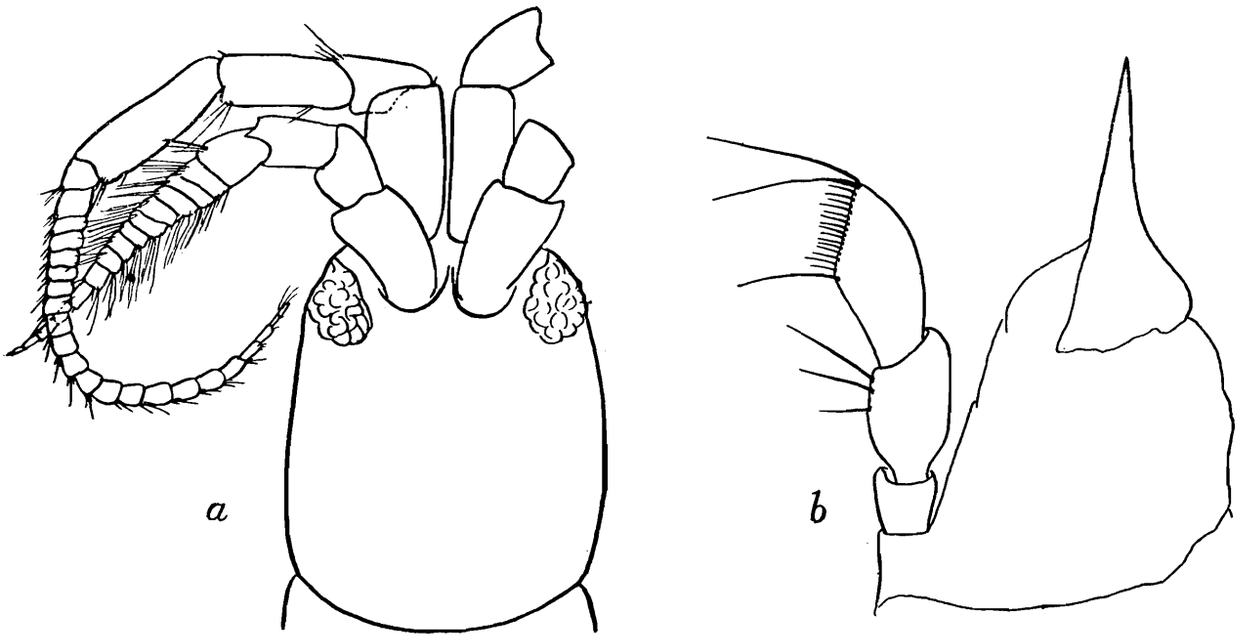


FIG. 3.—*Calathura borradailei* Stebbing.

a. Head and antennae of male, seen from above. *b*. Mandible of male.

Family CIROLANIDAE.

Cirolanidae, Harriet Richardson, 1905, p. 81, (with the characters of the genus and an analytica key to the genera).

Genus **CIROLANA** Leach.

Cirolana, Harriet Richardson, 1905, p. 82.

Cirolana, Stebbing, 1900 C, p. 629.

Harriet Richardson gives an analytical key to the North American species.

Cirolana pleonastica Stebbing.

(Plate LX, fig. 2.)

Cirolana pleonastica, Stebbing, 1900 C, p. 629, pl. lxvii A.

Localities.

Off Samal Island, 8-15 ft., Chilka Lake. Many specimens of varying sizes up to 10 mm. in length.

North side of Chirriya Island. One specimen.

Barkul Point. Two specimens.

Manikpatna, Chilka Lake, from crevices in oyster shells. Five specimens.
Eight miles W by S. of Breakfast Island.
Six miles S. S. W. of Kalidai.
Ennur Backwater, near Madras, 45 feet. One specimen.

This species was taken in abundance at Samal Island and I have no hesitation in identifying it with Stebbing's species, owing to the close resemblance of the spinous tubercles on the dorsal surface to the description given by him. It will be seen from plate XL, figure 2, that on each of the three posterior segments there is a transverse row of small pointed tubercles near the posterior margin. On the third, fourth and fifth segments of the pleon the tubercles are fewer in number but larger and more conspicuous. On the terminal segment there is a pair of fairly large tubercles near the anterior border and further back three smaller ones diminishing in size posteriorly ; the whole being so arranged that they form two small ridges with a furrow between them. The size of the larger specimens is about 10 mm. In these the tubercles are more easily seen than in specimens of the same size as Stebbing's, *viz.*, 8·5 mm. In smaller specimens the tubercles are much less conspicuous.

In the male the fine hairs on the uropods are far more numerous than in the female, see fig. 4 C.

Distribution.—Chilka Lake ; New Britain.

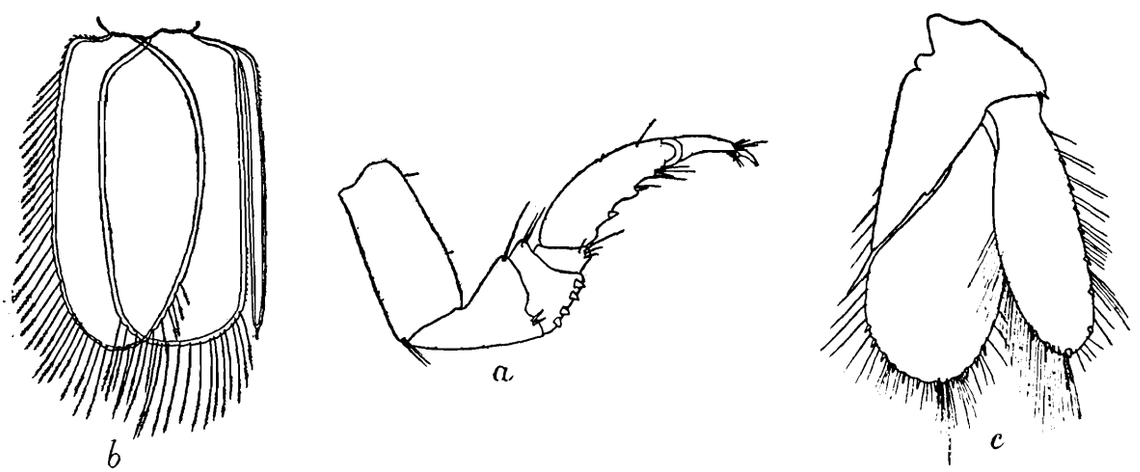


FIG. 4.—*Cirolana pleonastica* Stebbing.

a. First peraeopod. *b*. Second pleopod of male. *c*. Uropod of male

Cirolana parva Hansen.

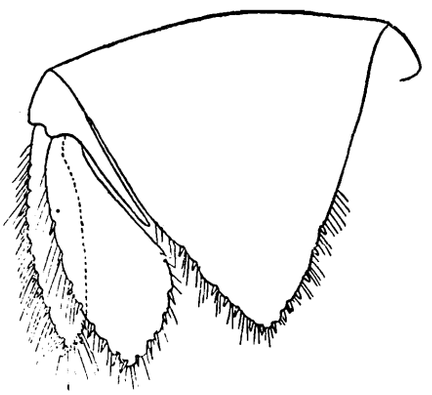
Cirolana parva, Stebbing, 1905, p. 12.
Cirolana parva, Richardson, 1905, p. 111.

Localities.

One mile N. N. E. of Breakfast Island. One specimen.
Off north shore of Samal Island. One specimen.
Six miles S. S. W. of Kalidai. Several specimens.
Main channel, W. of Satpara Island. Several specimens.

Main channel, between Satpara and Barnikuda. Four specimens.
Off Barkul, Chilka Lake. One specimen.
Eight miles W. by S. of Breakfast Island. Two specimens.
Four to seven miles E. ½ S. of Barkul bungalow. One specimen.

I refer these specimens to *C. parva* with considerable hesitation but that species has been already recorded from Ceylon by Stebbing, who says that it is probably somewhat variable, and on the whole my specimens agree fairly well with the description given by Hansen. The dorsal surface of the whole body smooth, the terminal segment (*see* fig. 5) is not so rounded as in Stebbing's specimens, and bears about 14 stout setules as well as fine hairs; the outer ramus of the uropod is slightly shorter and much narrower than the inner. In the antennae the joints of the flagella are more numerous but in the mouth parts and other appendages I can find no distinct point of difference between them and Stebbing's descriptions. This species appears to come quite close to *C. harfordi* Lockington (=*C. californica* Hansen) but in that species, of which I have been able to examine specimens from California, the terminal segment has the extremity more rounded and bears numerous setae placed close together, with few or no long hairs.



5.—*Cirolana parva* Hansen, terminal segment and uropod.

Distribution.—Chilka Lake; Ceylon; Gulf of Mexico; West Indies, &c.

Cirolana nigra, sp. nov.

(Plate LX, fig. 3.)

Localities.

Chirriya Island. Two specimens.
Maludai Kuda Island. Several.
Barkul Point. Four specimens. Found along with the terrestrial Isopod, *Alloniscus pigmentatus*, B. L., under stones at the edge of the lake.

Specific diagnosis.—Body oblong ovate, about two and a half times longer than wide, rather convex. General surface of the body smooth but with some small tubercles on the pleon segments, forming a transverse row along the posterior margin, poorly marked on the second and third segments, on the fourth the median tubercle is moderately large with two smaller ones on each side, on the fifth the median tubercle is larger and more prominent, with one on each side only, less well marked; terminal segment triangular with rounded extremity, fringed with nine setules and numerous fine hairs. Its surface bears two slightly raised ridges with a groove between them, this structure being fairly well marked on the anterior part of the segment. Eyes moderately large. The first antenna rather elongated, peduncle longer than flagellum, apparently composed of three joints, the third being much longer and more slender than the second; flagellum of about nine joints, with sensory setae on those

towards the end. The second antenna about twice as long as the first, last joint of peduncle rather longer than the preceding, flagellum longer than peduncle, about 25 jointed. First pair of trunk limbs stout, with six stout setules on the merus and two towards the end of the propod. Second and third legs similar, fourth, fifth, sixth and seventh progressively longer, the seventh having the basal joint rather expanded ; propod longer than the carpus, the joints bearing setae as shown in fig. 6 d.

Uropoda with base produced acutely to about the middle of the last segment, outer branch shorter and narrower than the inner, both obscurely serrate and bearing stout setules and numerous fine hairs.

Length.—5 mm.

Breadth.—2 mm.

Colour.—Almost black, the dorsal surface thickly covered with dark pigmented areas of varying pattern with lighter areas between them.

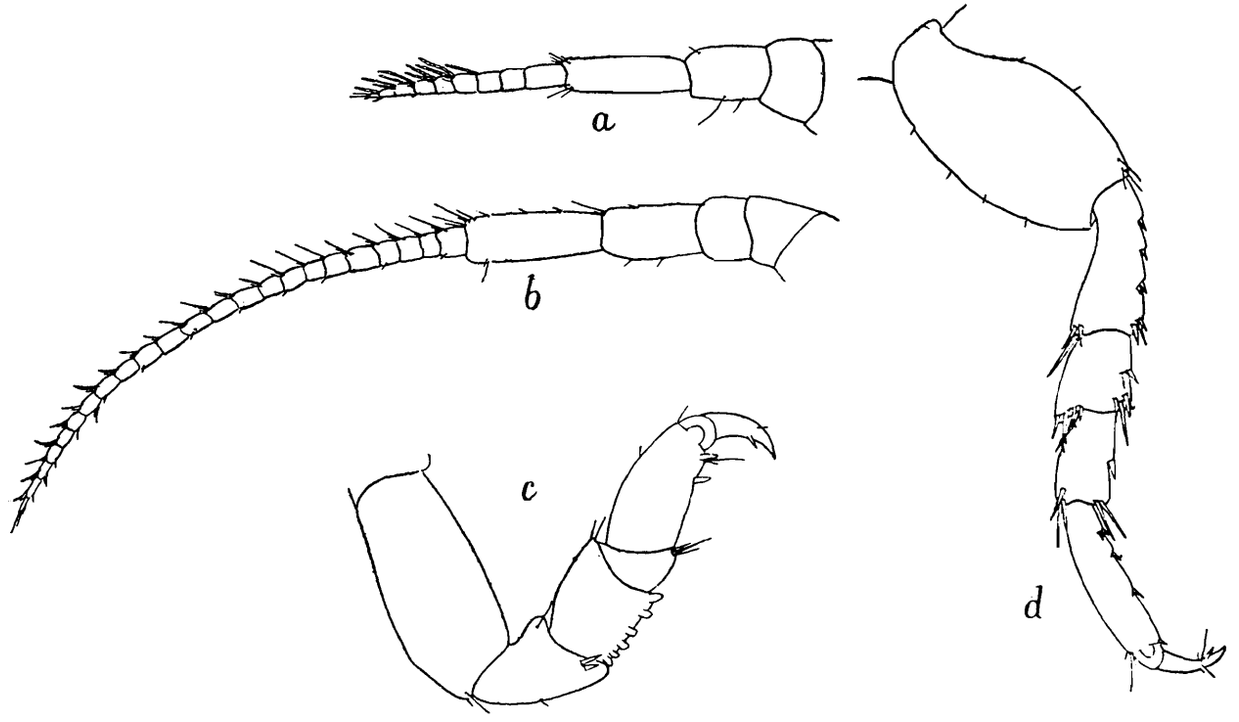


FIG. 6.—*Cirolana nigra*, sp. nov.

a. First antenna.
b. Second antenna.
c. First peraeopod.
d. Seventh peraeopod.

Family AEGIDAE.

Aegidae, Harriet Richardson, 1905, p. 166, (with characters of the family and analytical key to the genera).

Aegidae, Stebbing, 1910, p. 422.

Genus **ROCINELA** Leach.

Rocinela, Harriet Richardson, 1905, p. 190, (with analytical key to the North American species).

Rocinela orientalis Sch. & M.

Rocinela orientalis, Stebbing, 1905, p. 24, pl. vi (C).

Locality.

Station 84. Main Channel, W. of Satpara Island. One specimen, 9 mm. long.

This specimen is small and immature, the seventh pair of thoracic legs being only about half the length of the sixth and not fully developed, but I have little doubt that it belong to this species. The antennae, maxillipeds, the terminal segments and uropods agree closely with the description and figures given by Stebbing. The trunk limbs also agree with the description except that in the first three the propod is armed with only one or two very small spinules instead of three or four spines, this being doubtless due to the immaturity of the specimen.

Rocinela orientalis appears to be pretty close to *R. australis*, of which I have New Zealand specimens, but in that species the propod of the anterior limbs is said by Schiodte and Meinert to bear 5 or 6 spines, and in one specimen examined by me there are actually 9 spines. In

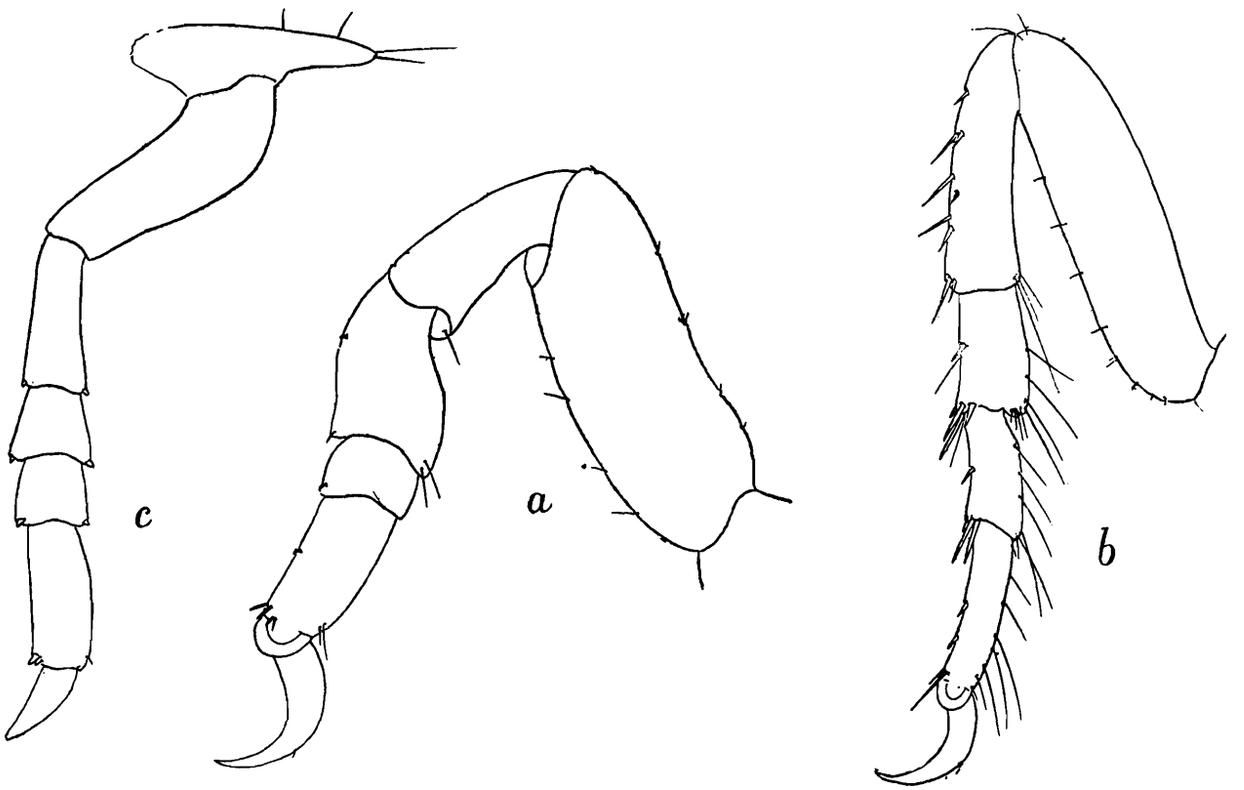


FIG. 7.—*Rocinela orientalis* Sch. & M.

a First peraeopod of immature specimen. *b*. Sixth peraeopod of immature specimen.
c. Seventh peraeopod of immature specimen.

other respects there is close resemblance between the Chilka Lake specimens of *R. orientalis* and New Zealand specimens of *R. australis*.

Distribution.—Chilka Lake ; Ceylon ; Philippine Islands, etc.

Family Cymothoidae.

Cymothoidae, Stebbing, 1900 A, p. 55, and 1900 C, p. 639.
Cymothoidae, Harriet Richardson, 1905, p. 214.

The characters of the family and its synonymy are discussed by Stebbing (1900 A, p. 55) and an analytical key to the genera is given by Harriet Richardson.

Genus **CYMOTHOA** Fabricius.

Cymothoa, Richardson, 1905, p. 247, with analytical key to the North American species.
Cymothoa, Thielemann, 1910, p. 39.

Cymothoa indica Sch. & M.

Cymothoa indica, Schiodte and Meinert, 1884, p. 250, pl. viii, figs. 1-4.

Localities.

Chilka Lake. Sta. 47, Barkul Point. "From the mouth of *Glossogobius giuris*" 21-7-13. Several specimens of different ages; the largest 15 mm. long.
Barkul Point. One ovigerous female; about 20 mm. long.

[Not uncommon in the mouth of the large goby *G. giuris* in which it causes a deformation of the tongue. *N. A.*]

I have little hesitation in referring these specimens to the species named above, the type specimens of which were collected in waters connected with the Indian Ocean at Bangkok[1] and are in the Berlin Museum. The Chilka Lake specimens agree closely with the description of the ovigerous female and adult male given by Schiodte and Meinert; in some of the young specimens the eyes are quite distinct, but in the adults they are scarcely or not at all distinguishable. In general appearance, and in the structure of the appendages the species is very similar to *Meinertia imbricata*, but the first antennae are not greatly flattened, being only slightly compressed, and are rather widely separated at their bases as stated in the description of the genus *Cymothoa*.

Cymothoa borbonica Sch. & M. probably occurs in the Maldive and Laccadive Islands, for Stebbing assigns to this species with some hesitation two small males obtained from Hulule, at the same time mentioning some points in which they differ slightly from the description given. His specimens were not more than 10 mm. long and were probably not fully mature.

C. amurensis Gerstfeldt, a species which according to its author is nearly related to *C. oestrum* Linn., has been recorded from the Amur River, occurring on a freshwater fish *Cyprinus lacustris* (see Thielemann, 1910, p. 41).

Family Sphaeromidae.

Genus **CASSIDINA** Milne-Edwards.

Cassidina, Milne-Edwards, 1840, III, p. 223.
Cassidina, Hansen, 1905, p. 112.

Some of the isopods which resemble *Cassidina* in the depressed flattened body and reduced outer branch of the uropods do not really belong to the genus but the species

[1] The fauna of the R. Menam at Bangkok is euryhaline. *N. A.*

described below appears to agree with the characters of the genus in the mouth parts, pleopoda, etc.

The genus *Cassidisca* Richardson, 1905, is said to differ from *Cassidina* M.-Edw. in not having the second, third and fourth joints of the palp of the maxillipeds produced into lobes. No information is given about the pleopoda of *Cassidisca* so that it is impossible to say whether it comes under Hansen's section Cassidinini or not. If it does, it is probably very near *Cassidina* for the differences in the maxillipeds are not great or of much importance.

Cassidina pulchra, sp. nov.

(Plate LX, fig. 4.)

Localities.

Eight miles W. by S. of Breakfast Island. One specimen.

Off Samal Island, 8-15 ft. Several specimens.

Diagnosis.—Body oval, length about 20 mm., breadth 11 mm., much depressed, margins fringed with setae, surface smooth, but with a pair of rather pointed tubercles on each of the body segments and on the first (combined) segment of the pleon, on the terminal segment the tubercles are continued as two longitudinal ridges lying close together. Head considerably broader than long, produced into flat lateral expansions. Uropods large, inner branch fitting closely against terminal segment and reaching back to about the middle of the terminal segment, outer branch nearly half the total length of uropod.

Frontal plate large, triangular. First antenna with basal joint not flattened but large, swollen, somewhat constricted near the middle, rather longer and much narrower than the second ; flagellum of about seven joints. Second antenna with third, fourth and fifth joints of peduncle subequal, flagellum of about six joints, first two subequal and much longer than the others.

Mouth parts normal. Maxillipeds with the inner margins of the second, third and fourth segments of palp produced inwards into small rounded lobes fringed with setae.

Legs short and not visible in dorsal view, subequal in length.

Pleopoda apparently normal (*see* fig. 8 *h*, *i*, *j*, *k*).

Size.—Length about 20 mm.

Colour.—Brownish.

Remarks.—This species presents very close resemblance to *C. typa* which is found in New Zealand, but in that species the joints of the peduncle of the first antenna are distinctly produced into a flat flange and the outer branch of the uropods is much smaller in proportion.

Cassidisca lunifrons Richardson, from New Jersey, North America, shows a general resemblance to the present species in the shape of the body, the antennae and even the maxillipeds but the outer branch of the uropod is only one-fourth as long as the inner branch and, as stated above, there is no information as to the structure of the pleopoda.

From a comparison of figs. 8 *e* and 8 *f* it appears that the lobes of the palp-joints may vary in size ; the differences between the figures in this and other points are partly due to the different positions in which the maxillipeds were lying when drawn.

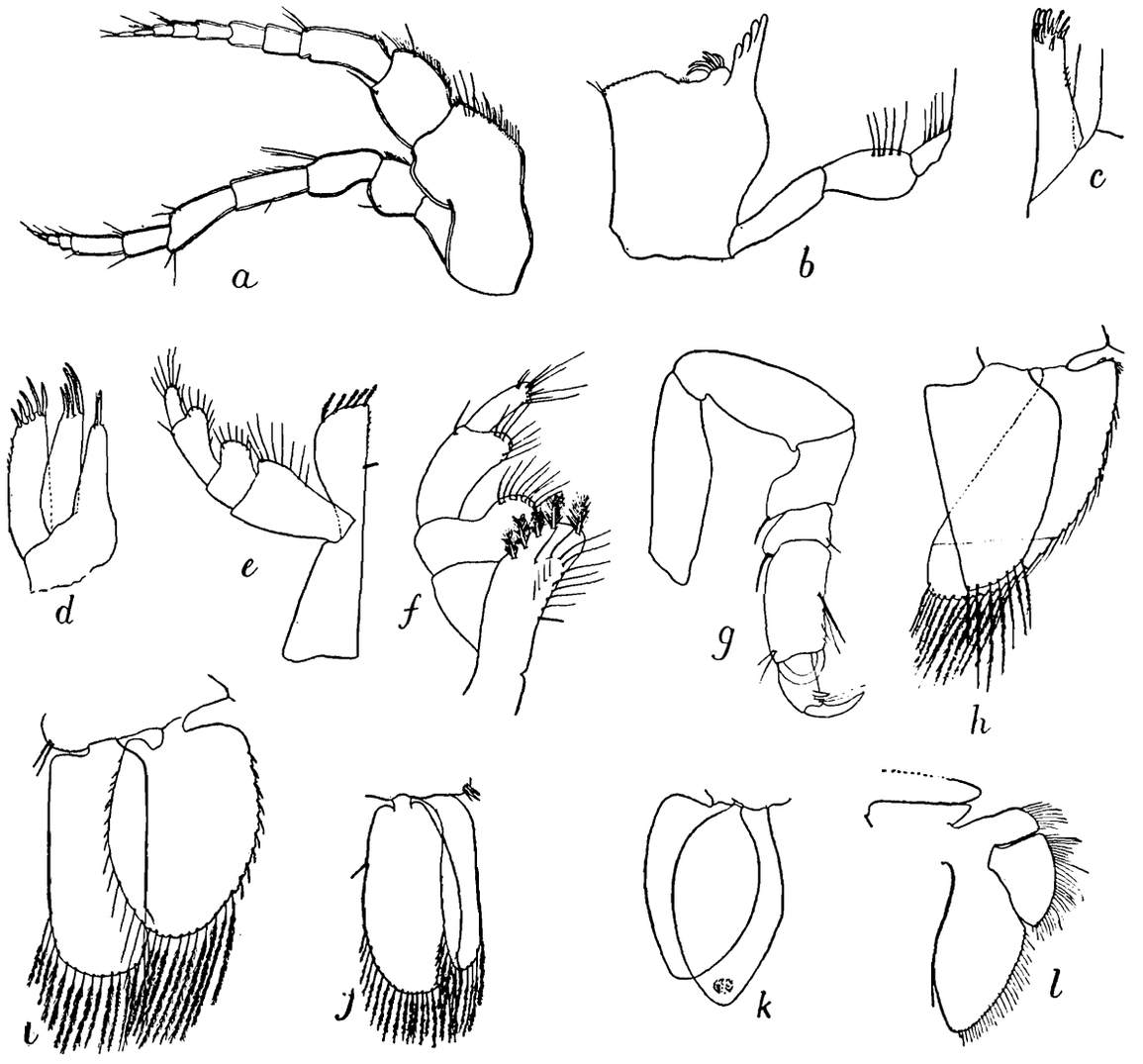


FIG. 8.—*Cassidina pulchra*, sp. nov.

a. Antennae, upper and lower.
b. Mandible.
c. Maxilla 1 (inner lobe imperfect).
d. Maxilla 2.
e. Maxilliped.
f. Maxilliped, from another specimen.
g. Trunk limb.
h. First pleopod.
i. Second pleopod.
j. Third pleopod.
k. Fifth pleopod.
l. Uropod.

Genus **EXOSPHAEROMA** Stebbing.

Exosphaeroma, Stebbing, 1900 B, p. 553.
Exosphaeroma, Richardson, 1905, p. 287.

Miss Richardson distinguishes this genus from *Sphaeroma* by the following characters :—

1. Second, third and fourth joints of palp of the maxilliped produced into lobes.
2. Outer branch of uropod not denticulate on its exterior margin.

Exosphaeroma parva, sp. nov.

(Plate LX, fig. 5.)

Localities.

Maludai Kuda Island. Two specimens.
Off Samal Island, 8-15 ft. Several specimens.
Rambha. 22-9-13 Several specimens.

This species in many respects is very like *E. gigas* (Leach) except in size. It differs, however, in having the body less flattened, the epimeral portions of the segments being directed nearly vertically downwards. The terminal segment is broadly rounded or truncate posteriorly. The whole dorsal surface is smooth. The mouth parts, the body limbs and pleopods

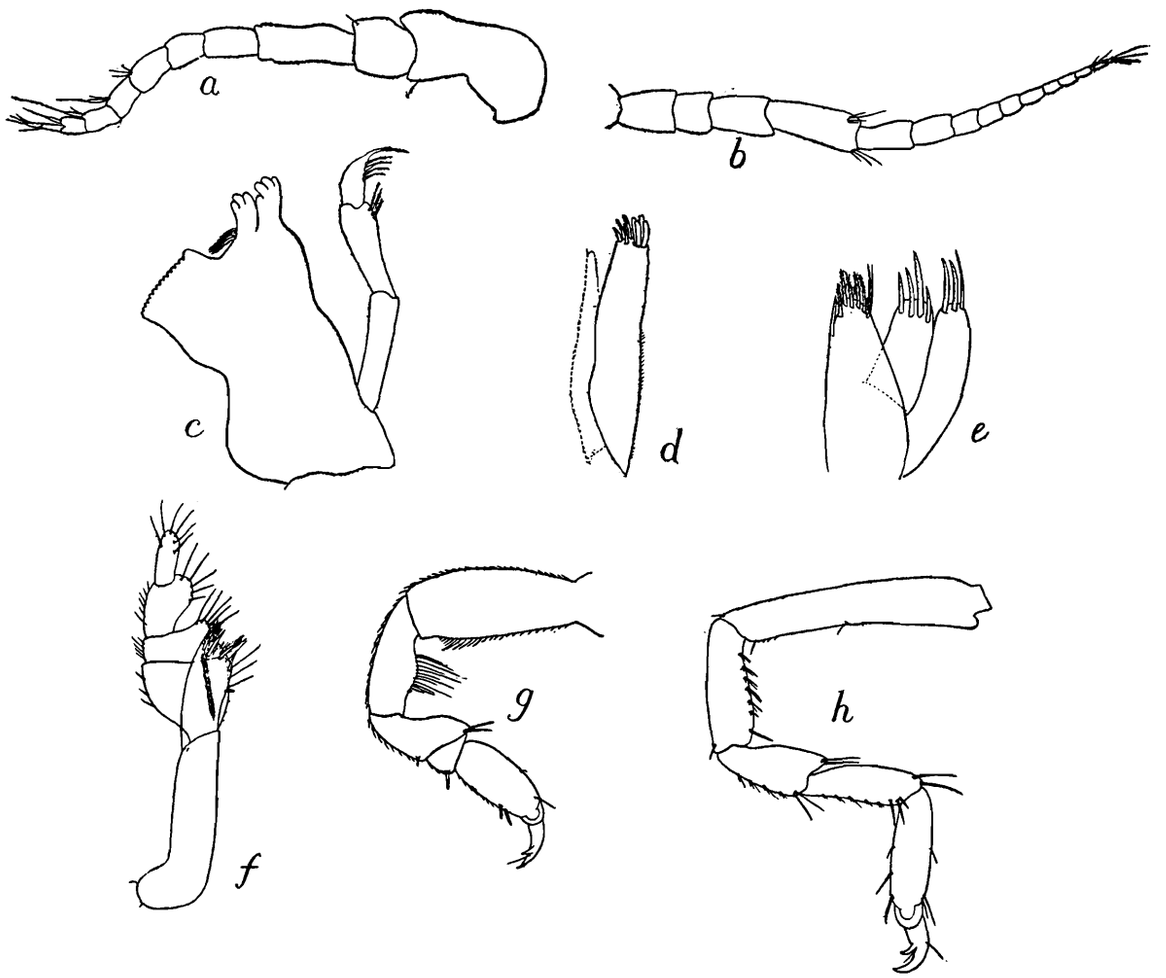


Fig. 9.—*Exosphaeroma parva*, sp. nov.

a. Upper antenna.
b. Lower antenna.
c. Mandible.
d. Maxilla 1.
e. Maxilla 2.
f. Maxilliped.
g. Peraeopod 1.
h. Peraeopod 7.

present no distinctive feature but are on the whole like those of *E. gigas*. In the uropods the branches are subequal in length and breadth, both reaching as far as the end of the terminal segment and being fringed with small setules.

Colour.—Dark slaty coloured.

Size.—About 4 mm. in length.

Remarks.—I have some hesitation in describing this as a new species for I have not seen any specimen that I could be quite sure was the male, and in many allied species the male is distinctly different from the female and marked by some striking character. If in *E. parva* the male is similar in general appearance to the female, it will make the species approach still nearer to *E. gigas*, although a comparison of this minute species from India with the large forms of *E. gigas* from Macquarie Island and other subantarctic localities would at first appear very striking. *E. gigas*, however, is not only found on all subantarctic shores but extends along the shores of New Zealand right up to the north in Lat. 35° S. and also on the coasts of Australia to even lower latitudes. The forms inhabiting these more temperate regions are very much smaller in size than those in the higher latitudes but I can find no difference in other respects and in regard to size there is a gradual transition between the two extremes. A form very similar if not identical with *E. gigas* is found in Cape Colony, South Africa. This is of moderate size, about 10 mm. It would not therefore be very astonishing if the same species in reduced size were actually found in Chilka Lake, but as there appears to be a slight difference in the shape of the terminal segment I prefer to give the species a name to itself in the meantime.

The structure of the mouth parts and other appendages can be readily learnt from the figures given.

Family IDOTEIDAE.

Genus **SYNIDOTEA** Harger.

Synidotea, Richardson, 1905, p. 376.

Synidotea variegata Collinge.

(Plate LX. fig. 6.)

Synidotea variegata, Collinge, 1917, p. 1, pl. 1.

Localities.

Manikpatna, Chilka Lake (oyster-beds).
Off Satpara, Chilka Lake, 4-6 ft.
Off Samal Id., 8-15 ft., Chilka Lake.
Barkul, Chilka Lake.
Off Barkul, Chilka Lake.
East side of Rambha Bay.
Eight miles W by S. of Breakfast Id.
East side of Rambha Bay.
Barkuda Id.
One to nine miles N. E. by E. of Breakfast Id.
Six miles S. S. W of Kalidai.
Off north shore of Samal Id.
One to eight miles N. of W of Samal Point.

One to five miles E. S. E. of Barkul bungalow.
Main Channel, W. of Satpara Id.

[The species is common amongst *Potamogeton pectinatus* and the stouter algae all over the lake. *N.A.*]

I have no hesitation in referring these specimens to Collinge's species, the type specimens of which were obtained from coral reefs in the Gulf of Mannar. The Chilka Lake specimens agree in practically all characters with Mr. Collinge's description as regards the shape of the body, relative length of segments and even the small arcuate depression near the anterior margin of peraeon segments two to four. The terminal segment of the pleon has the emargination on the posterior margin rather wider and more distinct than is shown in his figure.

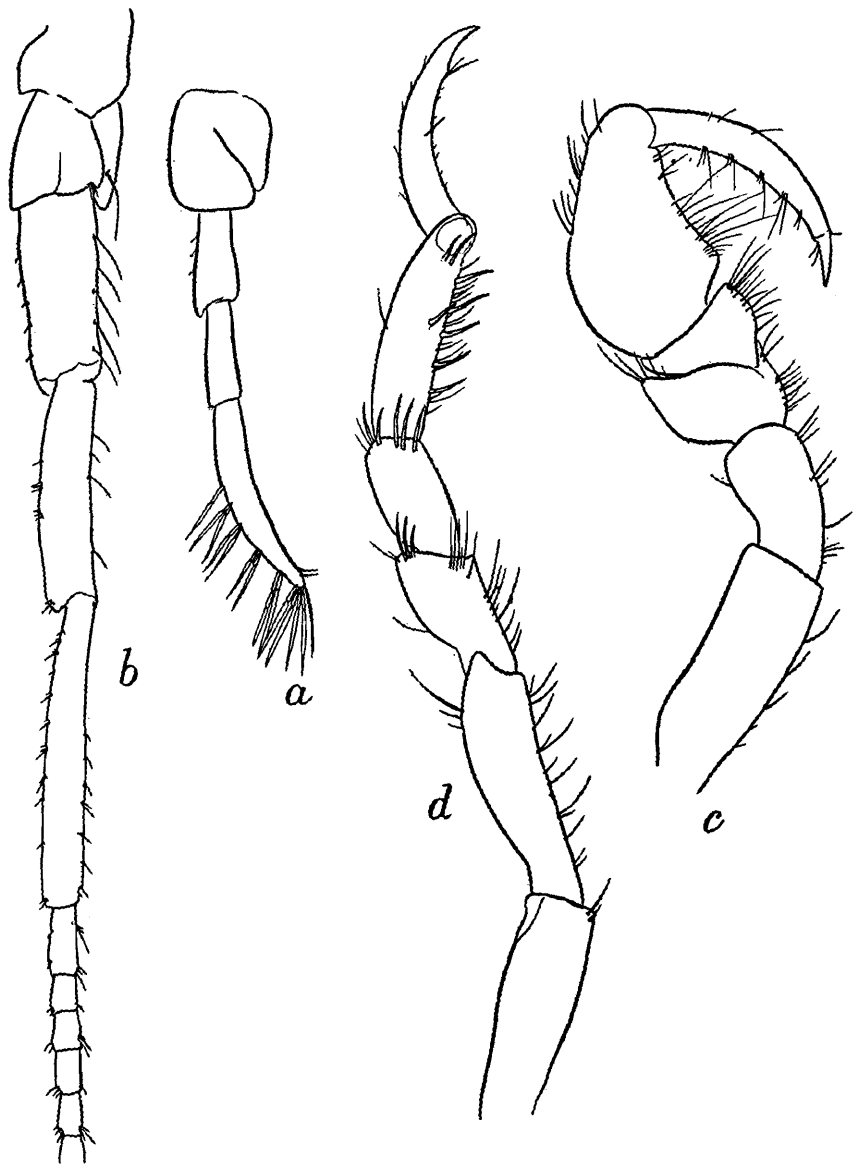


FIG. 10.—*Synidotea variegata* Collinge.

a. Upper antenna.
b. Lower antenna.
c. First trunk limb.
d. Seventh trunk limb.

I give a figure of the first antennae which shows that it is rather more slender than that of the type specimen. The last joint bears six tufts of ordinary and olfactory setae, showing it is probably to be considered as a flagellum with the joints coalesced. In the specimen

examined the first maxilla bears ten to eleven denticulate spines at the apex and there is only one plumose spine at the end of the other lobe.

This species was taken in considerable numbers at many localities in the lake.

Order ONISCOIDEA.

Oniscoidea, Harriet Richardson, 1905, p. 583.

Family ONISCIDAE.

Oniscidae, Harriet Richardson, 1905, p. 592, with analytical key to the genera.

Genus **ALLONISCUS** Dana.

Alloniscus, Richardson, 1905, p. 593.

Alloniscus pigmentatus Budde-Lund.

Alloniscus pigmentatus, Chilton, 1916, p. 474.
Arhina barkulensis, Collinge, 1915, p. 147, pl. viii, figs. 1 to 10.

I find that the specimens which I identified with some hesitation as *Alloniscus pigmentatus* Budde-Lund are the same as those described under the name of *Arhina barkulensis* by Dr. Collinge, a species which unfortunately I had at the time overlooked. Dr. Collinge has been good enough to send me specimens of his species collected at Barkul, Chilka Lake, and they are without doubt the same as those examined by me, but which is the more correct name it is difficult to decide as Budde-Lund's classification and descriptions are difficult to follow. It is hoped that an examination of the types in Budde-Lund's collection will solve this question.

Genus **HEMIPORCELLIO.**

Hemiporcellio carinatus Collinge.

Hemiporcellio carinatus, Chilton, 1916, p. 477.

Locality.

Barkuda Island. Two specimens.

Family ARMADILLIDIDAE.

Genus **CUBARIS** Brandt.

Cubaris, Harriet Richardson, 1905, p. 639.

Cubaris granulatus Collinge.

Cubaris granulatus, Chilton, 1916, p. 479.

Locality.

Patsahanipur Hill, off Balugaon. Two specimens.

Family LIGIIDAE.

Ligydidae, Harriet Richardson, 1905, p. 673.

Genus **LIGIA** Fabricius.

Ligia exotica Roux.

Ligia exotica, Chilton, 1916, p. 462, figs. 1 to 22 (with synonymy and detailed description).
Ligia exotica, Jackson, 1922, p. 693.

A description of this species is given by Jackson in his valuable revision of the genus *Ligia* based on Budde-Lund's collection now in the British Museum. He gives the distribution of the species and the names of the localities from which Budde-Lund's specimens were obtained. These include Singapore, Pulo Milo, Tonga (Malay Archipelago). In my collection there is a male specimen undoubtedly belonging to this species from New Caledonia, thus extending the distribution further to the south-west Pacific.

In my report on the terrestrial Isopoda of Chilka Lake, I stated (1916, p. 462) that most species of *Ligia* live near the sea-shore, but in some cases where conditions are favourable they have been found in moist places at a considerable distance from high water mark. Dollfus in 1893 instituted t e genus *Geoligia* for a terrestrial species found at a height of 1,200 metres in Venezuela and afterwards referred to this genus a species (*Geoligia perkinsi* Dollfus) found at similar heights in the Hawaiian Islands. I have shown (1921, p. 1) that the genus *Geoligia* is bas d on incorrect observations and that the species described under it really belong to *Ligia*. Jackson had quite independently come to the same conclusion about the same time. *L. exotica* is found on the shores of the Hawaiian Islands and it is highly probable that the form described by Dollfus as *Geoligia perkinsi* has been derived from *Ligia exotica* through the animal's extending further and further from the sea-shore and becoming more adapted to terrestrial life. Apparently no corresponding change has as yet taken place in its structure as it probably confines itself to moist places where branchial breathing is still possible. I had considered it to be the same as *Ligia exotica*. Jackson, however, prefers to look upon it as a distinct species, *L. perkinsi* (Dollfus). Similar phenomena are observed in Lord Howe Island, off the coast of Australia. On the sea-shore the form known as *L. australiensis*, found also on the mainland of Australia, is common, and a form which I consider to be the same as *L. australiensis* is found at varying heights up to 500 metres, where Mr. A. R. McCulloch of the Australian Museum collected several specimens, describing it as a long tailed Isopod sunning itself on the rocks and when alarmed rapidly making its way into the water of the stream or lake.

[Several years' observation fully confirm my statement as to the seasonal occurrence of this species on the shores of the Chilka Lake (*Rec. Ind. Mus.* XXII, p. 321). Young are hatched in the rainy season (June to October) from eggs carried by the female. As soon as the weather becomes dry and cool both young and adults disappear. When it grows warm again in spring the young reappear, having concealed themselves for some months without any perceptible increase in size. The adults do not reappear and the life of the individual is evidently limited to about one year. In individuals hatched at the end of the wet season it is probably much shorter. Half-grown individuals, which reappear in spring, grow fairly rapidly but do not apparently become mature until the rainy season. At this season the Crustacean is abundant on tree-trunks and posts about a hundred feet or a little more from the edge of the lake as well as on the shore, but I have near seen it in the interior a few hundred yards away. *N.A.*]

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