

ISOPODS COLLECTED BY THE R. I. M. S. "INVESTIGATOR".

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Whereas some of the Amphipods collected by the R. I. M. S. "Investigator" were described by Giles, the major part of the collection of Isopods has remained hitherto unworked, though the noteworthy capture of *Bathynomus giganteus* has been recorded [Wood-Mason and Alcock, *Ann. Mag. Nat. Hist.* (6) VII, p. 270; and Alcock, 1902, *A Naturalist in Indian Seas*].

For the privilege of studying this very interesting collection I have to thank the Director of the Zoological Survey of India and Dr. B. Chopra.

The collection contains littoral, shallow-water and deep-water species from localities in the whole Indian region extending from the Mergui Archipelago in the east to the Arabian Sea and mouth of the Persian Gulf in the west. Numerous shallow water Isopods have been recorded from this area. The early collectors contributed to the museums of Europe specimens from India and the East Indies, which were described by Milne-Edwards, Heller, Bleeker, Schioedte and Meinert, Miers, Hansen, and others. The expeditions of Stanley Gardiner to the Maldives and Laccadives (1899-1900), of Herdman to Ceylon a few years later, and of H. M. S. "Sea Lark" to the Chagos and Seychelles groups in 1905 made most important collections, which were reported on by Stebbing. In later years the Chilka Lake Isopods were described by Chilton. These are only the major contributions to our knowledge of the Isopods of the Indian coasts and seas. The fauna-list (excluding Epicaridea and Oniscoida, but including Tanaidacea) of the Indian, Arabian, and East African regions north of the Seychelles and Zanzibar contains approximately 100 species.

With the exception of *Bathynomus*, however, no deep-water forms have been recorded from this area. Barring the German Deep-sea Expedition ("Valdivia"), which crossed the Indian Ocean from Sumatra to Ceylon and Zanzibar, and whose results as regards Isopods have not been published, the "Investigator" is the only ship which has worked the deeper parts of this region, until the recent cruises of the John Murray Expedition in the western portion.

The "Investigator" made some interesting and unexpected captures, even more unexpected than the finding of the West Indian *Bathynomus* in the Arabian Sea. *Pleopodias* and *Livoneca propinqua* are not unexpected having been found in the region of the Philippine Islands, but the presence of the Arctic *Aega ventrosa* is very surprising. It would probably be straining speculation too far to regard this latter species as a relic from the days of the Cretaceous-Tertiary sea of Tethys.

The much more easily explained connection between the Indian and South African regions is exemplified by the more or less pelagic species *Cirolana hirtipes* and *Cleantis natalensis*.

The collection contains 34 species. Seven species are described as new, one of which is a littoral woodlouse necessitating the institution of a new genus in the Detonidae. Two singleton specimens of *Cirolana* and some juvenile Cymothoids and Sphaeromids are not specifically identifiable.

Family ANTHURIDAE.

Barnard, 1925, *J. Linn. Soc. Lond.* XXXVI, p. 109 (revision).

Accalathura Brnrd.

Barnard, *l. c.*, p. 147.

Accalathura gigas (Whitel.).

Whitelegge, 1901, *Austr. Mus. Mem.* IV, p. 225, figs. 19a-e.

Stebbing, 1910, *Tr. Linn. Soc. Lond.* XIV, p. 91, pl. vii (*A. sladeni*).

Barnard, 1925, *l. c.*, p. 148.

Locality.— $\frac{6407}{3}$ East of the Terribles, 13 fathoms (Arakan, Lower Burma). 1 ovig. ♀, 19 mm.

Remarks.—Contrary to the South Australian ♀ specimen, which had 3 pairs of oostegites, this ♀ has 4 pairs (on segments 2-5). Eyes well developed.

Distribution.—New South Wales (*gigas*); Seychelles and South Australia (*sladeni*).

Family EURYDICIDAE.

(Cirolanidae auct.)

Stebbing, 1905, *Herdman's Ceylon Pearl Fish. Suppl. Rep.* XXIII, p. 10.

Monod, 1930, *Ann. Sci. Nat. Zool.* (ser. 10) XIII, pp. 129-183.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, p. 147, (Cirolaninae).

Eurydice Leach.

Monod, *l. c.*, p. 169.

Nierstrasz, *l. c.*, pp. 147, 148.

Remarks.—Nierstrasz includes *Cirolana latistylis* Dana in this genus. If Dana's species really is an *Eurydice* then it seems that Vanhöffen's Simonstown specimen (1914, *Deutsch Südpol. Exp.* XV p. 505 (fig. 41) is wrongly identified, for the figure is certainly not that of a species of this genus but looks more like an *Argathona*.

Eurydice orientalis Hansen.

Hansen, 1890, *Vid. Selsk. Skr.* (ser. 6) V, pp. 369, pl. vi, figs. 2-2h.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 8.

Nierstrasz, 1930, *Mem. Mus. d'Hist. Nat. Belge.* III, p. 3, fig. 1.

Id., 1931, *l. c.*, p. 147.

Hale, 1933, *Ann. Mag. Nat. Hist.* (10) XI, p. 558.

Locality.—St. 582, 11° 13' 50" N. 98° 11' 40" E., 12 fathoms. (Mergui) 2 ♂♂ 4-5 mm. 2 juv. 2.75-3 mm.

Distribution.—Java (Hansen); Philippine Islands (Richardson); East Indies (Nierstrasz); Low Isles, Gt. Barrier Reef (Hale).

Cirolana Leach.

Nierstrasz, 1931, *l. c.*, p. 149 seq.

Cirolana elongata M. Edw.Milne-Edwards, 1840, *Hist. Nat. Crust.* III, p. 236.Hansen, 1890, *l. c.*, p. 345, pl. iii, figs. 4-4l.*Id.*, 1895, *Plankton Exp.* II G., p. 12.Thielemann, 1910, *Abh. K. Bay. Ak. Wiss.* II Suppl. Bd., p. 14.Nierstrasz, 1931, *l. c.*, p. 151.*Localities*—

St. 492, 12° 58' 15" N. 97° 50' 45" E. ca. 30 fathoms. (Mergui)

3 ♂♂ 11-12 mm., 22 immat. ♀♀ and juv. 7.5-17 mm.

7361 14° 37' N. 73° 49' E., 29 fathoms. (Goanese coast) 3 juv.

6 7-9.5 mm.

Remarks.—Nierstrasz has already remarked upon the size of the eyes as figured by Hansen. The outline of the head in Hansen's figure is correct, but the eyes occupy only half the lateral margin, the front margin forming a bilobed projection.

In juveniles 7-7.5 mm. in length the 7th peraeopods are not fully developed, being shorter and more slender than the 6th pair, and their 2nd joints are nearly linear. The head has the characteristic bilobed front margin, though not quite as strongly developed as in larger specimens.

The ♂♂ have the stylet on pleopod 2 separate from and about as long as the inner ramus (as in Hansen's fig. 4*k*). The vasa deferentia open on the 7th peraeon sternite flush with the surface, or in a very slightly raised tubercle the openings about .65 mm. apart. It is possible that in larger ♂♂ definite penial processes are developed.

No rostral point; bases of 1st antennae contiguous.

This species is stated to be pelagic, and doubtless the delicate and nearly transparent telson and uropods are in keeping with this mode of existence. Along with the present specimens was a specimen of the pelagic Amphipod *Synopia scheeleana* Bov.

Distribution.—Mouth of the Ganges (M. Edwards); Bay of Bengal, East Indies to Japan (Hansen).

Cirolana porcellana, sp. nov.

Locality.—St. 561, 12° 0' 10" N. 98° 20' 30" E., 7½ fathoms. (Mergui)
1 non-ovig. ♀ 17×4 mm.

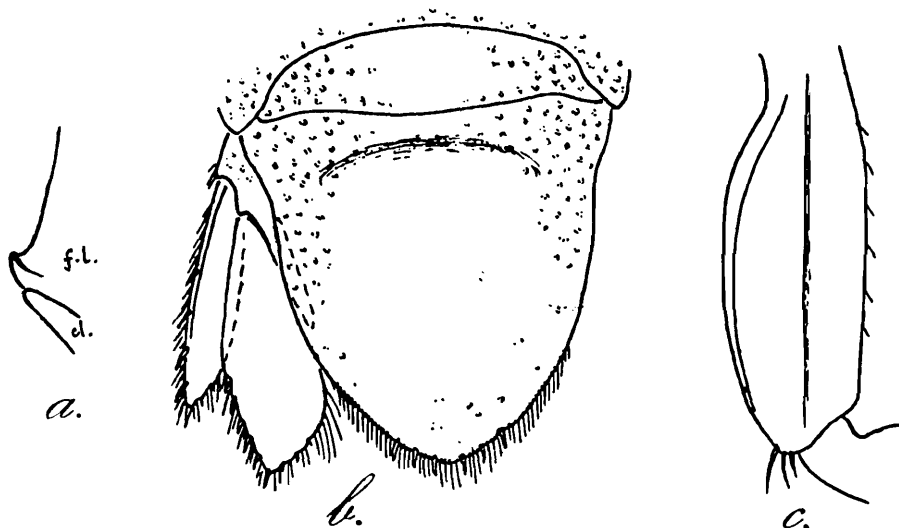
Description.—Body elongate and narrow. Frontal margin of head very slightly convex, costate (*cf. pumicea* Hale 1925). Peraeon and pleon smooth and polished, punctate laterally and more or less in two transverse lines on each peraeon segment. Side-plates as in *pumicea*. Telson very nearly as long as basal width, shield-shaped, with shallow concavity proximally, apex with 6 spines among the setae; punctae mainly at outer basal corners.

Frontal lamina as in *pumicea*, *i. e.*, very narrow and deep-lying between the bases of the antennae, but widened and raised into a short projecting knob at its junction with clypeus, not so prominent however as in *pumicea*, and not nearly so prominent as in *elongata* (even the juvenile of the latter).

Antenna 1 extending almost to end of peduncle of antenna 2, 1st joint very short. Antenna 2 extending to end of 3rd peraeon segment.

Peraeopods 1-3 as in *elongata* and *pumicea*, the 3rd and 4th joints strongly expanded, the apex of the expansion on 4th joint in peraeopod

1 reaching almost to end of 6th joint. Peraeopods 4-7 not strongly spinose or setose, 2nd joints nearly linear, without fringes of setae.



TEXT-FIG. 1.—*Cirolana porcellana*, sp. nov. a. profile of epistome and clypeus. b. telson and uropod. c. 2nd joint of peraeopod 7. c. l. clypeus; f. l. frontal lamina.

Inner ramus of uropod extending to level of telsonic apex, outer ramus narrower and shorter, both with spines and setae around the apex.

Colour (as preserved) creamy-white, with faint indications of pigment across hind margins of the hinder peraeon segments, and of the pleon segment, eyes black.

Remarks.—Although Hale did not say so (*Trans. Roy. Soc. S. Austr.* XLIX, p. 130), *pumicea* appears to be very nearly related to *elongata* M. Edw., but differs in the shape of the head and the frontal lamina. The present specimen agrees with *pumicea* as regards these two characters (though the ridge on frontal margin of head is here scarcely “bisinuate”), but the process on the frontal lamina is less conspicuous and hook-like. The anterior legs also are like those of the two species mentioned. As regards the features of the hinder end, however, the shape of the telson of the inner ramus of uropod, and of the 2nd joints of peraeopods 4-7 easily distinguish the present species from *elongata* and *pumicea*.

Cirolana hirtipes M. Edw.

Milne-Edwards, 1840, *l. c.*, p. 236, pl. xxxi, figs. 25, 26.

Id. 1836-49, *Regne Anim. Crust.* p. 67, figs. 6-6i.

Hansen, 1890, *l. c.*, p. 326, pl. i, figs. 2-2g.

Stebbing, 1910, *Ann. S. Afr. Mus.* VI, p. 421.

Tattersall, 1913, *Trans. Roy. Soc. Edinb.* XLIX, p. 880.

Vanhöffen, 1914, *Deutsch. Südpol. Exp.* XV, p. 501, fig. 38.

? Filhol, 1885, *Mem. Rapp... Venus.* III, p. 455, (*fide* Nierstrasz, 1931, *l. c.*, p. 158).

Localities.—

St. 291, 26° 22' N. 56° 10' E., 48-49 fathoms. (Strait of Ormuz)
1 ♀ 13.5 mm.

5714 W. of Mangalore, 26-31 fathoms. (Malabar coast) 1 immat.
9 (? ♀) 8.5 mm.

St. 556, 12° 40' N. 98° 26' 30" E., 10 fathoms. (Mergui) 1 ♂ 6 mm.

Remarks.—This species was described by Milne-Edwards from the “Cape of Good Hope” (without particular locality), and later recorded

by Hansen from Table Bay, by Tattersall from Saldanha Bay (West coast) and by Vanhöffen from Simonsbay (False Bay). Tattersall makes no comments on his specimen. None of the specimens collected by the Cape Government Trawler s. s. "Pieter Faure" seem to have been submitted to Stebbing.

It is, therefore, not surprising that Nierstrasz (1917, *Zool. Med.* III, pp. 93, 94) claims *hirtipes*, along with *borealis* and others, as an Atlantic species, accepting Lo Bianco's record from the Mediterranean (1903-04, *Mitt. Zool. St. Neapel*, XVI, p. 258). Hansen has doubted European records of this species, and Filhol's record from Cook Strait seems to me also suspect in view of the very close similarity between *hirtipes* and *rossi* (see Nierstrasz, 1917, *l. c.*). Monod (1930 *l. c.*, p. 142 seq.) does not include *hirtipes* among the European and Mediterranean species.

True diagnoses of *borealis*, *hirtipes*, *japonensis* and *rossi* can only be given after a detailed comparison of actual specimens side by side. It may be mentioned that there is another South African species so deceptively like *hirtipes* that only after prolonged study I have satisfied myself as to its distinctness; it will be dealt with on another occasion.

Although *hirtipes* has been reckoned an Atlantic species, the South African Museum collection possesses only 4 specimens taken in the neighbourhood of Table Bay (3 of them from mouth of a *Carcharias* shark), and no others from west of 25° E. long.; on the other hand it has a number of specimens from Algoa Bay to Natal. It seems therefore probable that *hirtipes* is more at home in the warmer waters of the Mozambique current and its capture by the "Investigator" in the mouth of the Persian Gulf and on the west coast of India is not, after all, so surprising. Its presence in the Mergui Archipelago requires confirmation.

Hansen has used the furrows on the side-plates to distinguish *hirtipes* and *borealis*. I have no example of the latter for a direct comparison, but the following features of *hirtipes* may be noted. The front of the head is bisinuate, with a short rostral point which just meets the frontal lamina, and separates the 1st antennae; from the hind margins of the eyes a very fine impressed line more or less punctate, is continuous across the head; the greatest width of 2nd joint of peraeopod 7 is in the distal third of its length. The shape of the side plate of peraeon segment 4 may also prove useful in diagnosis.

The ♂ is small for a normal specimen of this species, and I am not fully satisfied as to its identity.

Distribution.—South and south-east Africa.

***Cirolana pleonastica* Stebb.**

Stebbing, 1900, Willey's *Zool. Res.* V, p. 629, pl. lxxvii A.

Barnard, 1935, *Rec. Ind. Mus.* XXXVII, p. 309, fig. 18a [non Chilton, 1924 and 1926.]

Localities :—

1124 St. 175, 8° 51' 30" N. 81° 11' 52" E., 28 fathoms. (N. E.

10 of Ceylon) 1♂ 6 mm. 1 ovig. ♀ 7 mm. 1 immat. 5.25 mm.

5549 6° 1' N. 81° 16' E. 34 fathoms. (S. E. of Ceylon) 1 ovig.

9 ♀ 5.5 mm.

Remarks.—I have already shown that the Chilka Lake specimens, and probably also those from Talé Sap, are referable to another species. The present specimens, however, are the true *pleonastica* (I have compared them with cotypes), and constitute the second record of this species.

The front margin of the head is well marked and in dorsal view hides the bases of the 1st antennae; its rim is slightly up-turned, more so in ♂ than in ♀. An additional feature in the ♂, which is not found in the cotypes, and is not mentioned by Stebbing, is a short transverse ridge between the eyes. The three middlemost tubercles on pleon segments 4 and 5 are distinctly more prominent than any of the others.

The discovery of this species actually on the coast of India increases the desirability of a fresh description, with figure, of the type, if it is still extant, of *sculpta* M. Edw., which came from the Malabar coast.

Distribution.—Blanche Bay, New Britain, 60 and 100 fathoms.

***Cirolana albicaudata* Stebb.**

Stebbing, 1900, *l. c.*, p. 631, pl. lxxvii B.

Richardson, 1910, *l. c.*, p. 5.

Thielemann, 1910, *l. c.*, p. 8, figs. 1-4, (subsp. *japonica*).

Nierstrasz, 1931, *l. c.*, p. 152, (and subsp. *japonica*).

Locality.— $\frac{572}{10}$ St. 189, 20° 37' 15" N. 69° 24' 20" E., 44 fathoms.

(Kathiawar Peninsula, Bombay) 1 ♂ 8 mm.

Remarks.—This remarkable specimen is, I believe, the fully adult ♂ of this species. Leaving out of discussion for a moment the 2nd antennae and the uropods, the only appreciable difference lies in the shape of the telson, which is more broadly rounded in the present specimen than in Stebbing's enlarged figure (T). All the spines and setae have been rubbed off. On the other hand there is full agreement in the pereopods, and also in one feature which is illustrated but not described by Stebbing, *viz.*, the pair of long plumose setae on 2nd joint of antenna 1, and the simple and plumose setae on inner apex of 5th joint of antenna 2. In the present specimen there are 2 simple and 2 plumose setae on antenna 2. This may be a feature of minor importance, but the agreement with Stebbing's figures is noteworthy.

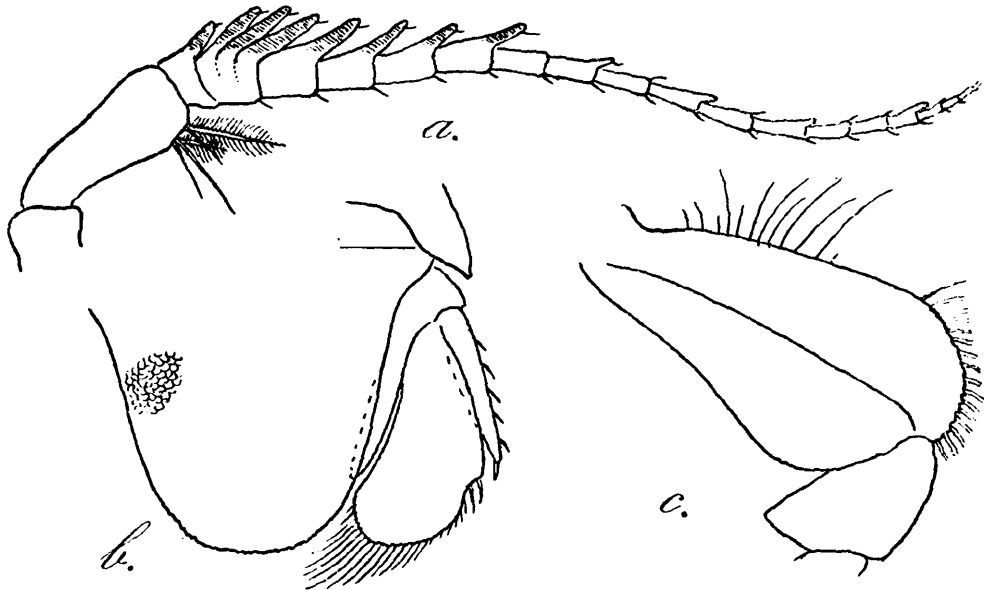
Frontal lamina narrow, elongate, but not constricted as in the form described by Thielemann as *japonica*.

The stylet on pleopod 2 as figured by Stebbing. No penial processes, vasa deferentia opening flush with surface of sternite.

The inner ramus of uropod (like the telson) agrees in general shape better with Stebbing's small figure than with his larger one; there is no outer distal angle, but on the contrary a shallow excision.

The remarkable feature of this specimen is the development of digitiform processes on the flagellum of antenna 2. The joints from which the first 4 processes arise are indistinctly demarcated, but assuming there are 4 joints, the processes arise from joints 1-8 inclusive, 10, 12, 14, and 17; joints 9, 11, 13, 15, 16, and 18-20 lack processes. Each of the first 8 processes is minutely transversely striate, and bears a subapical setule.

These processes may be suspected to be sensory, and to be peculiar to the adult ♂. Secondary sexual characters are not abundant in *Cirolana*: Thielemann (*l. c.*, p. 8.) mentions *harfordi* subsp. *japonica*, and *willeyi* in both of which the ♂ has the flagellum of antenna 2 more strongly setose than the ♀. The excision on the inner ramus of uropod is probably not a sexual but an adult character.



TEXT-FIG. 2.—*Cirolana albicaudata* Stebb. a. 5th peduncular joint and flagellum of 2nd antenna ♂. b. telson and uropod, surface sculpturing on former partly indicated, and apical setae omitted. c. 2nd and 3rd joints of peracopod 7, the plumose setae on distal front margin not completely drawn in, and those on hind margin omitted.

The colour (as preserved) is pale horny, with darker, irregularly oval, and closely aggregated dots on the head and anterior 3 peraeon segments, and laterally on the other peraeon segments, leaving a uniform space medio-dorsally; the pleon and telson are uniform, the latter very pale.

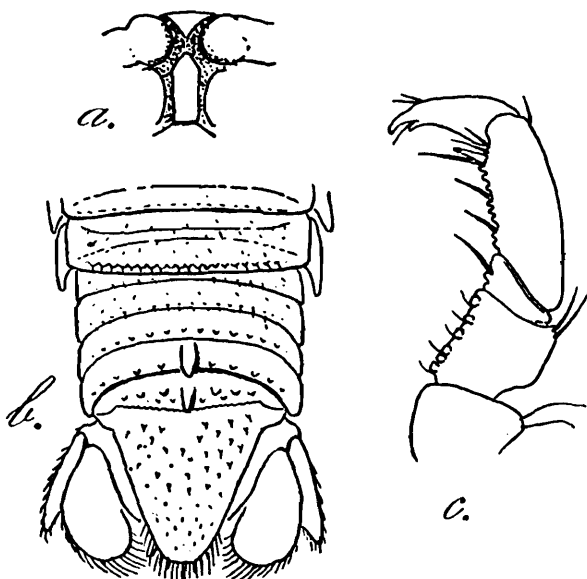
Distribution.—New Britain (Stebbing); Philippine Islands (Richardson); East Indies (Nierstrasz). The subsp. *japonica* is recorded from Japan (Thielemann) and East Indies (Nierstrasz).

***Cirolana perlata*, sp. nov.**

Locality.—Bassein River estuary. 30.x.09. Townet. (Lower Burma) 1♀ 7×2 mm., 1 ovig. ♀ 6 mm. 1 ♀ (with brood lamellae) 5.5×1.75 mm., 1 juv. 3.5 mm.

Description.—A rather slender, elongate species. Head with rostral point, which almost meets the narrowly pentagonal frontal lamina. Peraeon segments with a few fine setules on hind margins, giving a crimped or beaded appearance, chiefly noticeable on segment 7; each segment with 2 fine impressed transverse lines. Pleon segment 4 overlapping segment 5 laterally; hind margin of segments 3, 4 and 5 very minutely crenulate; segment 3 with a transverse series of small tubercles; segment 4 with a prominent medio-dorsal tooth, flanked by 4-5 small tubercles on each side; segment 5 with a smaller and less prominent medio-dorsal tooth flanked by 3 (or more) small tubercles.

Telson smooth but with fine setules arising from minute conical granules, sides straight, apex narrowly rounded, with plumose setae and 8 spines.



TEXT-FIG. 3.—*Cirolana perlata*, sp. nov. a. ventral view of rostral point and frontal lamina. b. peraeon segments 6 and 7, and pleon. c. distal joints of peraeopod 7.

Antenna 2 extending to end of peraeon segment 2.

Peraeopods in general (extent of outer apex of 4th joint etc.) resembling those of *pleonastica* Stebb. (1900, *l. c.*, pl. lxxvii A), but hinder peraeopods more slender. Inner margin of 5th and 6th joints of peraeopod 1 with 2-3 rounded denticles proximal to the spine-setae (*pleonastica* has a single rather larger denticle before each spine-seta, not shown in Stebbing's figure). Inner ramus of uropod apically rounded, outer ramus subacute.

Remarks.—It does not seem possible to regard this form as *sculpta* M. Edw. for the same reasons as Stebbing gave in describing *willeyi* (1904, *Spolia. Zeylan.* II, p. 13). *C. sculpta* has the inner ramus of uropod pointed, and a median tooth on the "last segment of abdomen"; here the more prominent of the two median teeth is not even on the 5th segment (as in *willeyi*) but on the 4th segment.

The specimens are quite colourless, with black eyes. The largest specimen is probably also a ♀. It is a much more slender form than either *willeyi* or *pleonastica*; the lack of pigmentation also prevents it being regarded as a less highly sculptured variety of the former. The frontal lamina is a further point of difference from *willeyi*, *pleonastica* and *fluviatilis*, and from *arabica* Kossm.

***Cirolana parva* Hansen.**

Stebbing, 1905, p. 12.

Id., 1910, *J. Linn. Soc. Lond.* XXXI, p. 217.

Barnard, 1914, *Ann. S. Afr. Mus.* X, p. 353a.

Nierstrasz, 1931, *l. c.*, p. 151.

? Chilton, 1924, *Mem. Ind. Mus.* V, p. 883, fig. 5.

? Chilton, 1926, *Rec. Ind. Mus.* XXVIII, p. 180.

Locality.— $\frac{229}{7}$ Off Little Andaman Island. 1 ♀ with embryos 4.5 mm.

Remarks.—Chilton identified the Chilka Lake specimens with hesitation as this species. His figure of the telson is much more like that of *cranchii*, a European species which occurs in varietal forms in South Africa (Barnard, *l. c.*, *supra*, p. 351*a. vicina*, and 1920, *Ann. S. Afr. Mus.* XVII, p. 346) and in Australia (Hale, 1925, *Tr. Roy. Soc. S. Austr.*, XLIX, p. 141).

Distribution.—Ceylon, Red Sea (Stebbing); Samoa (Hansen); Mozambique (Barnard); East Indies (Nierstrasz); West Indies and Gulf of Mexico (Hansen, Richardson, Moore); ? Chilka Lake and Talé Sap (Chilton).

Cirolana spp.

There are two specimens of *Cirolana* which I do not care to identify definitely without further material of other species for comparison.

St. 464, 6° 2' 30" N. 81° 29' E. 52-68 fathoms. 1♂ 11×3.5 mm. Pale yellowish with scattered (faded) dendritic dots. Resembles *parva* in the pentagonal frontal lamina, broadly rounded telsonic apex, and uropods, but seems too large for this species. There are 8 stout spines set rather far apart, and in definite notches, around the telsonic apex. Peraeon and pleon perfectly smooth. Antenna 2 reaching to end of 3rd peraeon segment.

$\frac{8622}{10}$ St. 513, Mergui Archipelago, shore-collecting. 1 ovig. ♀ 7×2.5 mm. Closely pigmented with grey dendritic dots. Frontal lamina pentagonal. Telson triangular, slightly shorter than basal width, sides straight, apex narrowly rounded (not so sharp as in Chilton's figure 5 of the Chilka Lake specimen), with 6 spines (*cf. cranchii*).

Family CORALLANIDAE.

Stebbing, 1904, *Fauna Geogr. Mald. Laccad.* II, p. 703.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXIIc, p. 163, (Corallaninae).

Argathona Stebb.

Stebbing, 1905, Herdman's *Ceylon Pearl Fish. Suppl. Rep.* XXIII, p. 17.

? Budde-Lund, 1909, *Voeltzkow Reise*, II, p. 305, (*Gurida*).

Id., *ibid.* p. 306, (*Brotherus*).

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 9.

Stebbing, 1910, *l. c.*, p. 99.

Id., 1911, *Rec. Ind. Mus.* VI, p. 179.

Nierstrasz, 1917, *Zool. Med.* III, pp. 102, 103.

Hale, 1925, *Trans. Roy. Soc. S. Austr.* XLIX, p. 161.

Nierstrasz, 1931, *l. c.*, p. 172 seq., and p. 170 (*Orcilana*).

Monod, 1933, *Bull. Inst. d'Egypte.* XV, p. 153.

Remarks.—Stebbing (1911) has no hesitation in uniting *Brotherus* with *Argathona*, or alternatively transferring *A. reidi* Stebb. 1910, to *Brotherus* if the fusion of two joints in the palp of maxilliped should be regarded as of generic value. Neither in 1910 nor in 1911, however, does he mention Budde-Lund's genus *Gurida* or compare *A. reidi* with *G. caelata*. While Budde-Lund gives "lacinia mobilis nulla" for *Gurida* (differing in this respect from *Brotherus*), Stebbing finds it very feeble in *A. reidi*. There is so great a resemblance between these two forms, from localities not

so very far apart, that I venture to suggest that *A. reidi* will prove to be synonymous with *G. caelata*, and that Budde-Lund failed to observe the delicate and easily broken lacinia mobilis in his preparation of the mandible of *Gurida*. Monod regards *Orcilana* as synonymous.

As regards the species, the genotype *normani* is easily distinguished by the pair of prominent tubercles on the 5th pleon segment and the smaller one in each outer basal corner of the telson. These tubercles are present in both sexes. But the breadth of the animal relative to its length should not be used as a specific character, as this seems to vary with age and according to whether a specimen is "gorged" or not.

Argathoa normani Stebb.

Stebbing, 1905, *l.c.*, p. 17. pl. iii A.

Localities :—

$\frac{7361}{6}$	14° 37' N. 73° 49' E. 29 fathoms. (Goanese coast)	1 ♂
	11 × 4.5 mm.	
$\frac{5647-8}{9}$	26 miles WSW of Honawar, 28 fathoms. (Malabar coast)	1 ♂ 8.5 × 3.5 mm., 1 ♀ 7.5 × 3 mm.
$\frac{5712-3}{9}$	W of Mangalore, 26-31 fathoms. (Malabar coast)	2 ♂♂
	9 × 3.5 and 8 × 5 mm.	
$\frac{1124}{10}$	St. 175, 8° 51' 30" N. 81° 11' 52" E. 28 fathoms. (N.E. of Ceylon)	1 ♂ 11 × 5 mm., 1 gorged ♀ 10 × 4 mm., 1 ♀ 8 × 4.3 mm., 3 juv. 6 × 2, 4 × 2.3, and 3.5 × 1.5 mm.

Remarks.—The tubercles of peraeon segments 5-7 are not conspicuous (owing to the covering of spines and setae) in the large ♂♂, and in the smaller ♂♂ and ♀♀ are very obscure (10 mm. specimens) or absent (8 mm.). The tubercles on 5th pleon segment and telson are present in the ♀ but less conspicuous than in the ♂, especially in the smaller ♀. None of the tubercles are present in the juveniles, which, however, are equally as spinulose and setose as the adults, judging by the numerous punctae (or scars from which the spines and setae have been rubbed off) along the hind margins of the segments.

In one specimen examined the inner margin of the 4th joint of the maxilliped (*i.e.*, Stebbing's fused 4th+5th=ischium+merus) shows a slight indent with a seta, indicating the fusion of two joints.

Penial processes are almost obsolete, the vasa deferentia opening by two very short papillae.

Distribution.—Gulf of Manaar and Galle, Ceylon.

Barybrotos Sch. and Mein.

Schioedte and Meinert, 1879, *Nat. Tidsskr.* (3) XII, p. 280.
Hansen, 1890, *Viden. Selsk. Skr.* (6) V, pp. 290, 314, 402.
Stebbing, 1893, *Hist. of Crust.* p. 347.

Remarks.—As Stebbing points out the specific name of the only known species should be *indus*.

Barybrotes indus Sch. and Mein.

Schioedte and Meinert, 1879, *l. c.*, p. 281, pl. iii, figs. 1-10, pl. iv, fig. 1.

Id. ibid., p. 283, pl. iii, figs. 11-13, (*agilis*).

Hansen, 1890, *l. c.*, p. 403, pl. ix, figs. 3-3s. (*agilis*).

Richardson, 1910, *l. c.*, p. 8, (*agilis*).

Locality.—St. 291, 26° 22' N. 56° 10' E. 48-49 fathoms. (Strait of Ormuz) 1 immat. ♀ 9 mm.

Remarks.—On the inner apex of 5th peduncular joint of antenna 2 there is a strong plumose seta and one or two simple setae, as in *Cirolana albicaudata* (*supra*).

This species is stated to be pelagic, and in the present instance was caught in association with *Cirolana hirtipes*.

Distribution.—Bay of Bengal, Java Sea, Gaspar Strait (2° 41' S. 107° E.) (Schioedte and Meinert); Southern China Sea (Hansen); Philippine Islands (Richardson).

Family AEGIDAE.

Nierstrasz, 1931, *Siboga Exp. Monogr. XXXIIc*, p. 177, (Aeginae).

Aega Leach.

Hale, 1925, *Tr. Roy. Soc. S. Austr. XLIX*, p. 168.

Nierstrasz, 1930, *Mem. Mus. Roy. Hist. Nat. Belge*, p. 4.

Id., 1931, *l. c.*, pp. 177 seq.

Remarks.—Nierstrasz (1930, fig. 2.) figures a maxilliped with 2 endites (inner plates). In 1931 (p. 181) he regards this as possibly an abnormality. The figure seems to indicate that the appendage is in course of ecdysis.

Aega ventrosa M. Sars.

Sars, M., 1859, *Forh. Vid. Selsk. Christiania*, p. 156.

Schioedte and Meinert, 1879, *Nat. Tidsskr.* (3) XII, p. 375, pl. viii, figs. 7-10.

Sars, G. O., 1897, *Crust. Norw.* II, p. 64, pl. xxvi, fig. 3.

Norman, 1904, *Ann. Mag. Nat. Hist.* (7) XIV, p. 432, pl. xii, figs. 5-8, pl. xiii, figs. 8, 9.

Richardson, 1905, *Bull. U. S. Nat. Mus.* LIV, p. 187, figs. 173, 174.

Stephensen, 1913, *Medd. Gronland*, XXII, p. 234 (synonymy).

Hansen, 1916, *Dan. Ingolf Exp.* III, 5, p. 172.

Gurjanova, 1933, *Fauna Arctica*, VI, p. 430.

Localities :—

842 St. 184, 22° 14' 25" N. 67° 8' 55" E. 947 fathoms. (Arabian
10 Sea) 1 non-ovig. ♀ 32×13 (14) mm.

7° 17' 30" N. 76° 54' E. 430 fathoms. (Maldives) 1 juv. 11.5 mm.

Description.—Integument with rather numerous punctae. Eyes separated by a space equal to basal width of rostral point, which curves down between bases of 1st antennae to overlap anterior margin of frontal lamina. The transverse keel on the latter is entire (not bilobed).

Antenna 1 extending to end of 1st peraeon segment, 3rd peduncular joint subequal to 1st plus 2nd joints, flagellum *ca.* 19-jointed (12 in juv.). Antenna 2 extending to middle of 3rd peraeon segment, 5th peduncular joint very slightly longer than 4th, flagellum *ca.* 20-jointed (15 in juv.).

Side-plates with oblique, curved keel; side-plates on segments 2-5 with postero-inferior corner quadrate with short sharp point, those on segments 6 and 7 more produced and more acute.

Peraeopods 1-3, 6th joint subequal to 4th plus 5th joints, and distinctly longer than 3rd; on inner apex of 6th joint there is a small spine, and on inner apex of 5th joint a slightly larger and stouter one. Inner margin of 4th joint slightly concave and without armature.

Remarks.—G. O. Sars, although fully cognisant of the puncturation of the integument in other species, describes this species as being "quite smooth." It is very unusual to find an integument entirely smooth, and as the present specimen is punctate I am inclined to regard Schioedte and Meinert's description as being more correct. The anterior peraeopods are in better agreement with Norman's figure 8 than with the figures given by G. O. Sars and Richardson. Neither the Danish collaborators nor G. O. Sars give a full side view of the side-plates, but the present specimens agree very well with the former authors' figure 9 (*virgo*) on pl. ix.

In comparison with the Cape specimen of *A. gracilipes* Hansen (Barnard, 1914, *Ann. S. Afr. Mus.* X, p. 362), which I am satisfied is correctly identified, the present specimens have the side-plates not nearly so acutely produced, especially the hinder plates; and the keel forming the lateral margin of the plates on segments 5-7 is not so sharp and is not continued so far towards the upper anterior corner of the plates. The telson in *gracilipes* is slightly shorter than its basal width, whereas in the present specimens the length is almost exactly equal to the basal width and in *gracilipes* the lateral margins are a little more strongly sinuous.

There is no question that the present specimens are distinct from *gracilipes*, and although I have no actual specimen of *ventrosa* for direct comparison, the descriptions of the Danish authors and G. O. Sars leave no choice but to identify them with the Northern Atlantic and Arctic species. Moreover, I have all the less hesitation in doing this, since the John Murray Expedition has captured two Amphipods in the Arabian Sea area which hitherto have not been recorded from outside the Northern Atlantic region (Barnard, *John Murray Exp. Rep. Amphipoda*. In preparation).

Distribution.—N. Atlantic; W. of Ireland to Greenland, Iceland, Scandinavian seas, Spitzbergen, Kara Sea and Murman coast. 216-1428 metres.

***Aega ommatophylax* Stebb.**

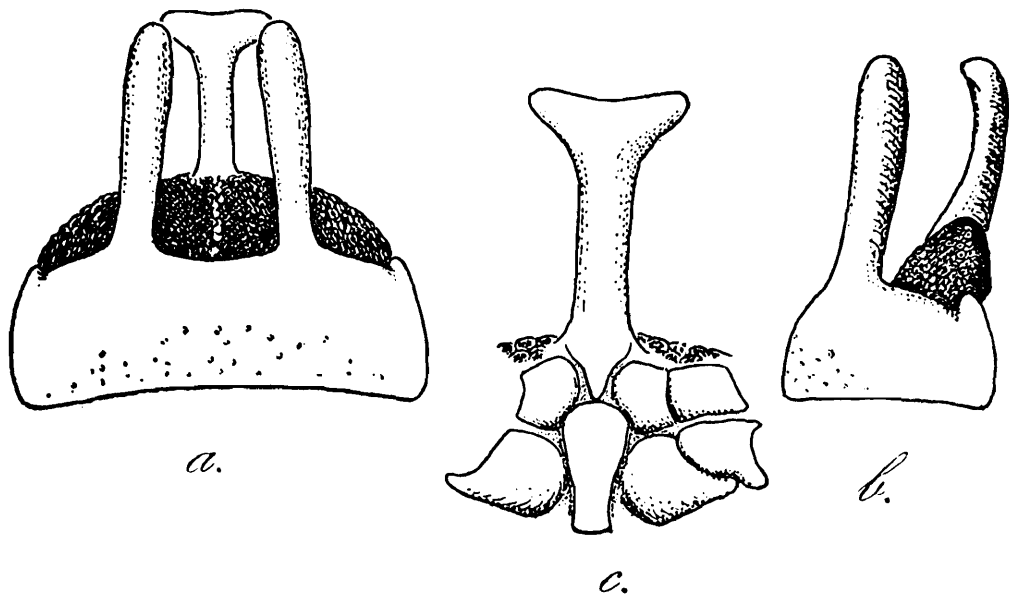
Stebbing, 1905, *Herdman's Ceylon Pearl Fish. Suppl. Rep.* XXIII, p. 21, pls. iv (♂) and v A (♀). ? *Id.*, 1910, *Tr. Linn. Soc. Lond.* XIV, p. 101, pl. ix B (♀).

Locality.— $\frac{8596}{6}$ Andaman Islands, 36 fathoms. 1 ♂ 16 mm. (excl. rostral process).

Remarks.—This specimen, slightly larger than Stebbing's type, is noteworthy for the much greater development of the processes on the head and 1st peraeon segment, which somewhat resemble the 3-pronged arrangement in the males of some Coprine beetles.

The rostral process is 2 mm. in length, and expanded at the apex; at its base is a small acute rostral point which meets the frontal lamina.

As the latter was not figured by Stebbing for the ♂, a figure is here given; it differs from that figured for the supposed ♀ (1905, pl. v A.) in having



TEXT-FIG. 4.—*Aega ommatophylax* Stebb. a, b, dorsal and lateral views respectively of head and pereon segment 1. c. ventral view of rostral projection and frontal lamina.

a broader base. Assuming that the frontal lamina of Stebbing's ♂ resembled that of the present specimen, the difference in shape does not seem to warrant us in regarding the 1905 ♀ as belonging to another species (e.g. *vigilans* or *dubia*); and in the absence of any other distinguishing characters in the ♀♀ it is reasonable to assume that the 1905 ♀ (but not the 1910 ♀ from Mauritius) from approximately the same locality is the ♀ of *ommatophylax*, unless the cultriform process of 5th joint of pereopods 2 and 3 can be shown to be a specific character (as in *crenulata*) and not merely sexual.

The eyes in the present specimen are continuous across the head, but some of the ocelli in the middle line are unpigmented, causing an irregular white line. The processes of the 1st pereon segment are 2.75 mm. in length. The cultriform process on 5th joints of pereopods 2 and 3 is present on both right and left sides. The 2nd joints of pereopods 4-7 are keeled in middle of outer surface. The genital papillae are as in Stebbing's figure.

Distribution.—Ceylon; ? Mauritius.

Rocinela Leach.

Nierstrasz, 1931, *l. c.*, pp. 184 seq.

Remarks.—Besides *orientalis*, the following species have been described from the Indian region; *mundana* Lanchester (1903, *Proc. Zool. Soc. Lond.* 1902, II, p. 378, pl. xxxv, figs. 9, 9a. from gills of a freshwater skate, Talé Sap), *latis* Southwell (1915, *Rec. Ind. Mus.* XI, p. 321, pl. xxviii, figs. 12-15, from skin of the fish *Lates*), and *simplex* Chilton (1926, *Rec. Ind. Mus.* XXVIII, p. 182, figs. 4a-m, from Chilka Lake, recorded in 1924 as *orientalis*, and Talé sap).

Lanchester describes the anterior legs as "without teeth, but with a few short cilia", and unfortunately he figures a posterior leg and not an anterior one. Nevertheless one suspects that the 6th joint of the anterior peraeopods is not enlarged, and also that Chilton's *simplex* from the same locality is synonymous. This latter species is clearly an *Alitropus* and is probably synonymous with *A. typus* M. Edw. already recorded from Bengal and other localities.

Southwell's specimens are not *Rocinela*, but ♂♂ of either *Nerocila* or *Livoneca*, in view of the number of spines on the 6th joints of the anterior legs probably the latter (see *infra* under *Nerocila*).

Rocinela orientalis Sch. and Mein.

- Schioedte and Meinert, 1879, *Nat. Tidsskr.* (3) XII, p. 395, pl. xiii, figs. 1, 2.
 Miers, 1884, *Zool.* "Alert", p. 304.
 Stebbing, 1905, *l. c.*, p. 24, pl. vi C.
Id., 1910, *l. c.*, p. 101.
 Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 17.
 Barnard, 1914, *Ann. S. Afr. Mus.* X, p. 369, pl. xxxvii D.
 Hale, 1925, *l. c.*, p. 182, fig. 27.

Locality.—St. 291, 26° 22' N. 56° 10' E. 48-49 fathoms (Strait of Ormuz). 1 ♂ 12 × 5.5 mm.

Remarks.—The 6th joints of peraeopods 1-3 carry 3 slender spines and a still more slender spine-seta on the inner margin, as in *granulosa* Brnrd. (1914, *l. c.*, pl. xxxi D.), but the inner margin is here evenly expanded. The spines are much more slender than in the South African representatives assigned to *orientalis*.

The flagellum of antenna 2 is 13-jointed, and bears a thick fringe of plumose setae on its outer surface. A long simple seta on inner apex of 4th peduncular joint, and a shorter plumose one on inner apex of 5th peduncular joint.

The outer rami of pleopods 2-5 show a submarginal series of little opaque squarish spots, as in Chilton's figure 4*k* (1926, *l. c.*, *supra*) of *simplex*.

Distribution.—Philippine Islands (Schioedte and Meinert, Richardson); Calcutta (Schioedte and Meinert); Ceylon (Miers, Stebbing); Gulf of Suez (Miers); Zanzibar (Stebbing); Natal coast (Barnard); Torres Straits, Moreton Bay and Queensland (Miers, Hale).

Family CYMOTHOIDAE.

- Schioedte and Meinert, 1881, *Nat. Tidsskr.* (3) XIII, pp. 1-166.
Id., 1883, *ibid.*, XIII, pp. 281-378.
Id., 1884, *ibid.*, XIV, pp. 221-454.
 Stebbing, 1900, *Mar. Invest. S. Afr.* I, p. 55.
 Hale, 1926, *Tr. Roy. Soc. S. Austr.* I, p. 201.
 Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c. p. 123, (Cymothoinae).

Renocila Miers.

- Miers, 1880, *Ann. Mag. Nat. Hist.* (5) V, p. 464.
 Schioedte and Meinert, 1884, *l. c.*, p. 414.
 Stebbing, 1900, Willey's *Zool. Res.* V, p. 640.

Remarks.—In discussing *Livoneca dubia* Nierstr. 1918, Nierstrasz (1931, *l. c.*, p. 141) himself doubts whether his species is assigned to its

correct genus. In figure 4 he shows a peculiarity of the anterior peraeopods, which is again illustrated by Stebbing (1900, *l. c.*, pl. lxxviii B. gn. 1, gn. 2), though neither author mentions it in his description, *viz.*, the apical projection of the 2nd joint of the (three) anterior peraeopods. In Stebbing's specimen this process was small, but this author's accurate draughtsmanship leaves no doubt as to its actual presence. It is larger in Nierstrasz' figure; and in the specimen mentioned below it is very large. Stebbing has dealt with the mouth-parts of a ♂, but unfortunately no author has described these parts in an adult ♀.

I think that *Livoneca dubia* should be transferred to this genus, but the question whether all the hitherto described species (*ovata* Miers, *indica* Sch. and Mein., *periophthalmi* Stebb., and *dubia* Nierstr.) should be recognized as valid is much more difficult. Stebbing had a ♂ (or perhaps a very young ♀ with persistent ♂ stylet on pleopod 2) 12 mm. in length, Miers 2 ♀♀ *ca.* 24 and 17 mm. with brood-pouches, Schioedte and Meinert a non-ovigerous ♀ 18 mm., and Nierstrasz ♀♀ with embryos 11½-21 mm., and 2 ♂♂ 6.5 and 11 mm. in length. It is possible that the size of breeding females varies according to the size of the host-fish and the available space in its mouth- (or gill-) cavity. Some of Nierstrasz' specimens, however, were collected amongst coral, and the present specimen has coralline and filamentous algal growths on the pleon and hinder peraeon segments, clearly indicating a free-living existence, at least for part of its life.

***Renocila ovata* Miers.**

Miers, 1880, *l. c.*, p. 464, pl. xv, figs. 11-14.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 725, p. 22.

Locality.— $\frac{3970}{10}$ Andaman Islands. 1 ♀ with embryos 25×12 mm.

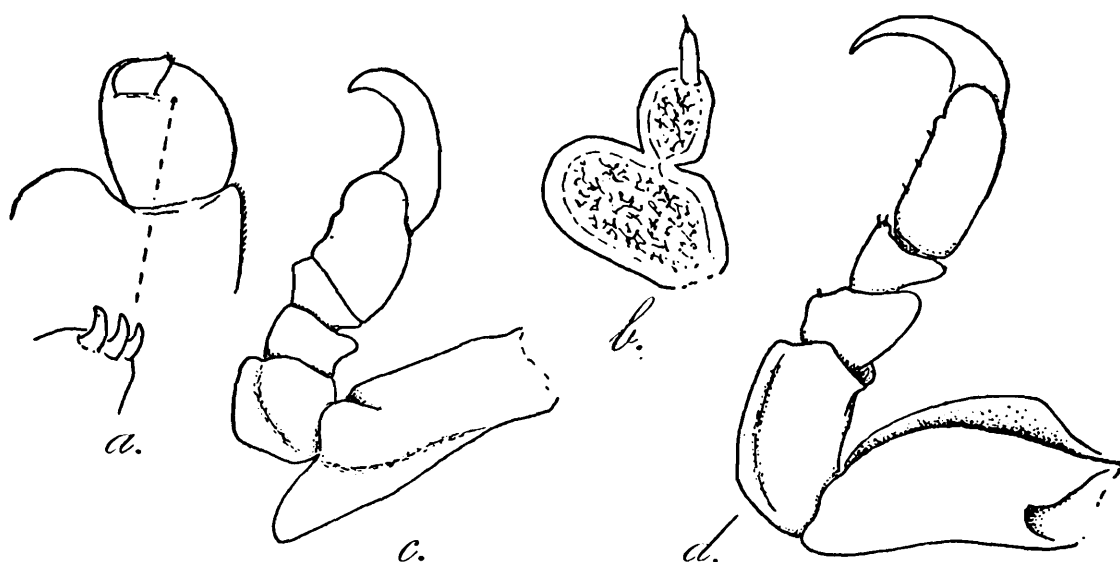
Description.—Agreeing well with Miers' figure, though the pleon anteriorly is narrower, and the telsonic apex is feebly excavate. Eyes distinct. The first peraeon segment has been injured, and has been abnormally regenerated, its hind margin strongly arcuate, and medianly sunk into a hole in the 2nd segment. Side-plates agreeing with Miers' description, and the later description of those of *dubia* by Nierstrasz.

Antennae 1 and 2 respectively 7- and 8-jointed. Mandible with palp greatly enlarged, 1st joint transverse, projecting inwards as a rounded lobe, 2nd joint stout but longer than broad, 3rd slender, terete. Maxilliped with 1st joint of palp very broad, 2nd joint inserted sub-apically and scarcely projecting beyond apical margin of 1st joint (unless forcibly extended).

Peraeopods 1-3, 2nd joint keeled on anterior (outer) margin inner distal corner produced as a subacute lobe, which is easily pliable like one of the pleopods, and (as preserved) is folded up against the posterior surface of the joint, 3rd joint strongly keeled on inner margin, dactylus not noticeably geniculate and without any thickening on outer margin (such as is present in *indica*, *periophthalmi* and *dubia*).

Peraeopods 4-7, 2nd joint keeled on anterior outer margin, with a less conspicuous keel on the posterior outer margin (neither keel prominent on peraeopod 4, but becoming more prominent on the other peraeopods), inner margin of 3rd joint keeled but not so sharply as in the anterior

peraeopods, one minute spinule on inner apex of 4th joint, 2 on 5th, and 3 on inner margin of 6th joint (all easily overlooked).



TEXT-FIG. 5.—*Renocila ovata* Miers. a. palp of maxilliped, with apex of 2nd joint further enlarged. b. mandibular palp, inner margin to left. c, d. peraeopods 1 and 7 respectively, posterior surfaces.

Pleopods with small notch on outer margin of outer ramus, but the suture between the two joints barely traceable; no persistent stylet on pleopod 2; inner ramus of pleopod 5 with 2-3 large longitudinal folds or pleats.

Outer ramus of uropod a little longer than inner ramus, apically subacute.

Colour (as preserved) dull olivaceous or plumbeous; both antennae, mandibular palp, all peraeopods, basal portions of the brood-lamellae, and the pleopods (especially the first pair) closely speckled with dark grey stellate and dendritic pigment; eyes black.

Embryos 2.75 mm. in length, yellowish, with black eyes and a dark stripe on each lateral margin of the peraeon and pleon, and continued on to outer rami of uropods. Rostrum very short, constricted in front of eyes. Telson longer than its basal width, apex rounded, with plumose setae. Inner ramus of uropod oval, apically rounded, extending beyond telsonic apex, outer ramus narrow, elongate, twice as long as inner, apex acute with one spine, inner margins of both rami with plumose setae (cf. Schioedte and Meinert, *l. c.*, pl. xvi, fig. 14.)

Peraeopod 1, 5th and 6th joints unarmed or with 1-2 very obscure spinules on inner margin of 6th, 3 blunt denticles on inner margin near base of dactylus. Peraeopods 2 and 3, one spinule on inner apex of 5th joint, 3 on inner margin of 6th, 4-5 spiniform denticles, well spaced on dactylus. Peraeopods 4-6 (7 of course not yet developed), one spine on inner apex of 5th joint, 3-4 strong spines on inner margin of 6th, and 4 blunt denticles on dactylus.

Remarks.—As the present specimen exhibits both resemblances to and differences from the other species of the genus, I think best to employ Miers' name for it, until such time as more material is available for comparison.

Distribution.—East Indies: Philippine Islands. The other species inhabit the same region, as far east as the Loyalty Islands.

Nerocila Leach.

Nierstrasz, 1931, *l. c.*, pp. 124 seq.
Monod, 1931, *Rev. Zool. Bot. Afric.* XXI, p. 5.

Remarks.—Southwell (1915, *Rec. Ind. Mus.* XI, p. 321, pl. xxviii, figs. 12-15) has described male specimens of parasites of *Lates calcarifer* from the Hughli River as *Rocinela latis*. They do not, however, belong to that genus, but are the males of a species of either *Nerocila* or *Livoneca* (*cf.* Schioedte and Meinert, 1881, *l. c.*, pl. ii figs. 11-13 and 1884, pl. xiv, figs. 8-12). They closely resemble the males of *N. phaeopleura* mentioned below, but the 6th joint of the anterior peraeopods is said to have "about 8" strong spines, and the figure shows 9 (the 10th probably arising from the 5th joint). It is perhaps more likely that "*R. latis*" is really a species of *Livoneca*. See remarks on juvenile Cymothoids *infra*, p. 172.

Nerocila sundaica Blkr.

Bleeker, 1857, *Verh. Nat. Ver. Nederl. Ind.* II, p. 26, pl. i, figs. 4-4b.
Schioedte and Meinert, 1881, *l. c.*, p. 9, pl. i, figs. 1-3.
Lanchester, 1903, *Proc. Zool. Soc. Lond.* 1902, II, p. 378.
Nierstrasz, 1915, *Zool. Med.* I, p. 72.
Id., 1918, *ibid.*, IV, p. 111.

Localities—

3968 Off Godavari (Sacraments mouth), 6 fathoms. 1 ovig.
10 ♀ 36 mm. (apex of telson mutilated).

3516
7 St. 72, Ganjam coast, 7 fathoms. 1 non-ovig. ♀ 22.5 mm.

Remarks.—The outer margin of inner ramus of uropod of the non-ovigerous ♀ is serrulate as in *serra*.

Distribution.—Indian seas to East Indies.

Nerocila serra Sch. Mein.

Schioedte and Meinert, 1881, *l. c.*, p. 17, pl. i, figs. 12-14.
Nobili, 1903, *Boll. Mus. Zool. Anat. Torino.* XVIII, p. 39.
Nierstrasz, 1915, *l. c.*, p. 74.
Barnard, 1925, *Ann. S. Afr. Mus.* XX, p. 392.
Nierstrasz, 1931, *l. c.*, p. 124.

Localities—

3844 Off Devi River, Orissa coast, 30.xii.88. 1 ovig. ♀ 21 mm.,
9 clinging to abdomen of *Arius sagor* (Hamilton).

1781 St. 87, Vizagapatam coast, 7½-9½ fathoms. 1 ♂ 16×4.3
7 mm.

1783 St. 88, Vizagapatam coast, 7½-9½ fathoms. 1 ovig. ♀
7 18 mm. attached to throat of the Sea-snake *Hydrophis obscurus* Daud.

3515 St. 72, Ganjam coast, 7 fathoms. 1 ♀ 19 mm. (brood
7 escaped).

Remarks.—Nierstrasz (1931) quotes an opinion of Monod (*in litt.*) that Hale's Queensland specimens (1926. *Tr. Roy. Soc. S. Austr.* I,

p. 208, fig. 6.) belong not to *serra* but to *trivittata* Blkr. The latter species was not dealt with by Schioedte and Meinert, and Bleeker's paper is inaccessible to me. The present specimen is now uniform straw-colour.

As the ♂ was found in the immediate neighbourhood (St. 87 and 88, of one of the ♀♀ one assumes specific identity, but the specimen is indistinguishable from the ♂♂ actually found with ♀♀ of *phaeopleura* (see *infra*) where a similar assumption is unassailable. The anterior legs have 4 strong spines on the 6th joint. The specimen is, therefore, recorded as *Nerocila* sp. ♂.

Distribution.—East Indies ; Delagoa Bay.

Nerocila phaeopleura Blkr.

Bleeker, 1857, *l. c.*, p. 25, pl. i, fig. 3.

Schioedte and Meinert, 1881, *l. c.*, p. 13, pl. i, figs. 6, 7.

Nierstrasz, 1915, *l. c.*, p. 75, pl. iii, figs. 1, 2.

Id., 1913, *l. c.*, p. 113, pl. ix, figs. 6, 7.

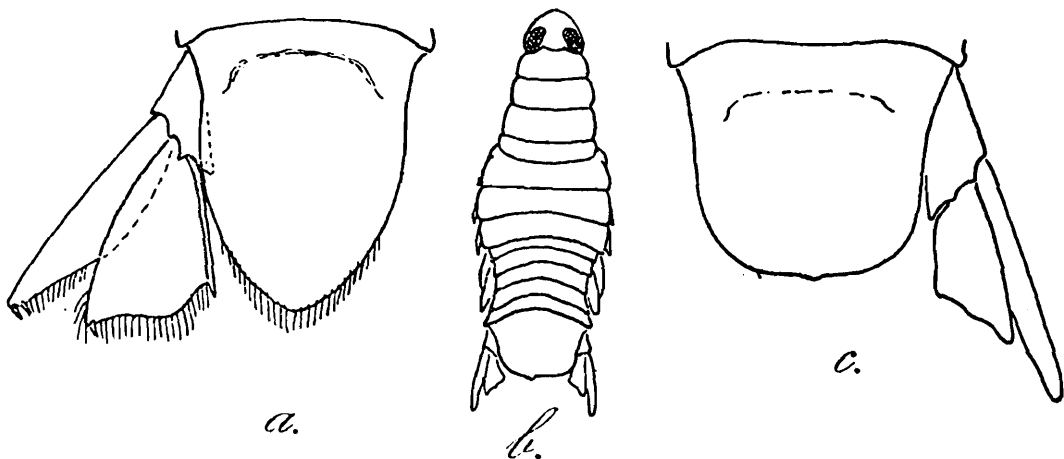
Barnard, 1925, *l. c.*, p. 392.

Chilton, 1926, *Rec. Ind. Mus.* XXVIII, p. 180, figs. 3a, b.

Locality.—Bay of Bengal, ectoparasitic on *Histiophorus gladius* 3 ♂♂ 13 × 3, 15 × 4, and 17 × 4.3 mm., 1 ♀ 14 mm., 2 ♀♀ 21 mm. (mutilated) 2 ovig. ♀♀ 19 and 20 mm.

Remarks.—The ♂ stylet on pleopod 2 is persistent in the ovigerous ♀♀, as Hale found (1926, *Tr. Roy. Soc. S. Austr.* I, p. 202).

The 3 ♂♂ measuring 13, 15 and 17 mm. in length resemble Schioedte and Meinert's figures of the "Pullus stadii secundi", some of which were probably functional ♂♂. As these authors apparently did not realize the occurrence of protandrous hermaphroditism in this genus, the specimens they figured as "Mas adolescens" and "Mas adultus" were probably in an intermediate stage, or even "Feminae virgines", with the persistent stylets. The body is nearly parallel-sided. The telson and uropods are fringed with plumose setae, the apex of outer ramus carries 2 short spines and the apex of inner ramus one or two spines: inner margin of inner ramus thickened and ending in a projecting spiniform



TEXT-FIG. 6.—*Nerocila phaeopleura* Blkr. a. telson and uropod ♂. b. specimen in course of ecdysis, anterior portion ♂, posterior portion ♀. c. telson and uropod of same specimen.

point (*cf.* Chilton's fig. 3a). The stylet on pleopod 2 is as long as the inner ramus. No penial processes (or genital papillae) on 7th sternite.

The lateral dark pigmentation is continued on to the peduncles and outer rami of uropods.

The 14 mm. "♂" is a most interesting specimen, caught midway between two stages, to which Schioedte and Meinert's words "Virgo in evolut." might justifiably be applied. This condition is commonly observed in terrestrial woodlice, but rarely in marine Isopods¹. The head and 4 anterior peraeon segments are masculine, including the peraeopods, which still retain the 4 strong spines on 6th joint and have not the much enlarged and strongly arcuate dactylus characteristic of the ♀. The hinder half of the body is broader and feminine; there is no marked difference in peraeopods 5-7 between the ♂ and the (ovigerous) ♀, but the telson and uropods have assumed the ♀ characters: total loss of fringing setae, shortening and broadening of the telson, reduction of inner ramus of uropod with loss of the thickened inner margin, increase in length and decrease in width of outer ramus. The persistent stylet on pleopod 2 is $\frac{3}{4}$ length of inner ramus. There is no difference in the hardness (as preserved) of the integument of the anterior and posterior parts of the body.

Anilocra Leach.

Schioedte and Meinert, 1881, *l. c.*, pp. 100 seq. (figures of 14 species).

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 18.

Neirstrasz, 1915, *l. c.*, p. 79.

Hale, 1926, *l. c.*, p. 210.

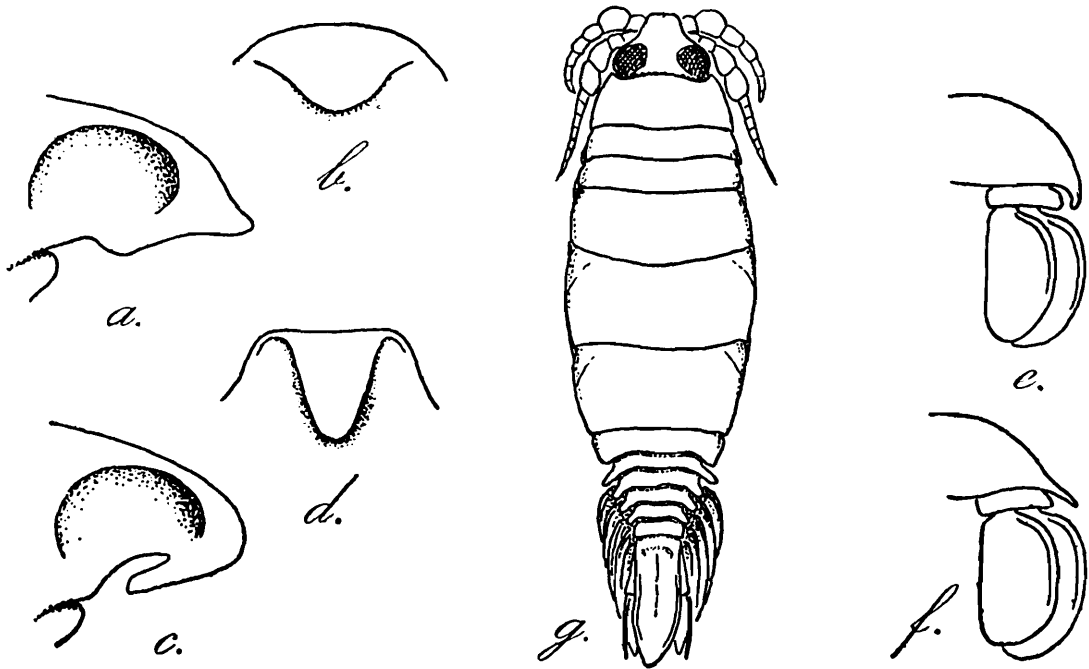
Nierstrasz, 1931, *l. c.*, p. 128.

Remarks.—Although there are no specimens of this genus in the present collection, a brief discussion is necessary as a preliminary to the following genus. In the conspectus given by the Danish authors the genus is divided into those species with geniculate 1st antennae (*i.e.*, the flagellum is distinct from the peduncle owing to the enlargement of the 3rd joint of the latter) and those with straight (or undifferentiated) 1st antennae. The first group includes *leptosoma*, *dimidiata*, *gigantea*, *longicauda* and *amboinensis*, all of which except the last seem to be of a more slender build than the species of the second group. *A. amboinensis*, however, is very broad and does not look like an *Anilocra* at all, though *rhodotaenia* and *laticauda* seem to be transitional between it and the more normal shape.

As I have examples only of the two South African species, I can only suggest an investigation to those students more fortunately situated. I find a correlation between the structure of the 1st antennae and the shape of the frons or rostral point. In *leptosoma*, with geniculate antennae, the rostral point is turned over on to the ventral surface where it forms a freely-projecting (and to some extent movable) point; in *capensis*, with straight antennae, there is no freely-projecting point (fig.

¹ See Stebbing (1923, *S. Afr. Fish. Mar. Biol. Surv. Spec. Rep.* 3, pl. xv) and Monod (1924, *Bull. Comité Hist. Sci. Afr. Occid. Franc. Parasitol. Mauritan.*, fasc. 1, p. 75 and fig. C on p. 80) for figures of similar stages in "Rosca rogans" (= *Nerocila orbigny*) and *Nerocila cephalotes* Sch. Mein. (= *N. orbigny*). Monod speaks of a "forme normale" and a "variété à péréion dilaté", whereas Stebbing rightly interprets the latter form as merely a stage in ecdysis.

7). If the correlation holds good for all the species, it might be convenient to separate the *leptosoma* group from *Anilocra*, *sensu stricto*.



TEXT-FIG. 7.—*Anilocra* and *Pleopodias*. *a*, *b*. lateral and ventral views respectively of rostrum of *A. capensis* M. Edw. *c*, *d*. the same of *A. leptosoma* Blkr. *e*, *f*. diagrammatic cross-sections of pleon of *Anilocra* (*leptosoma*) and *Pleopodias* respectively. *g*. *Pleopodias elongatus* Rich., "Investigator" specimen.

Pleopodias Rich.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 25.
Id., 1911, *Bull. Mus. d'Hist. Nat. Paris*, p. 525.

Remarks.—The status of this genus, so far as I am aware, has never been discussed. It contains one Philippine and one Atlantic species, which are characterized by the rapidly narrowing pleon, leaving the pleopods exposed laterally, and the 7th pair of peraeopods abruptly longer than the 6th pair, with relatively shorter and less curved dactyli.

Richardson neither compared the genus with *Anilocra*, nor placed it immediately after that genus in her 1910 paper, although it is clearly very closely allied to Leach's genus, more especially to the *leptosoma* group of species, with geniculate antennae, slender build, and more or less elongate linguiform telson.

The present specimen, which I think would be assigned to *Pleopodias* without hesitation by every carcinologist, has the freely-projecting rostral point on the ventral surface separating the bases of the geniculate 1st antennae, as in *leptosoma*. The 7th peraeopod is not more abruptly longer than the 6th than in *leptosoma*. Even in *capensis* the 7th peraeopod is very distinctly longer than the 6th; so that this feature will not separate *Pleopodias* generically from *Anilocra*.

Between Richardson's figure of *Pleopodias elongatus* and most of Schioedte and Meinert's figures of *Anilocra* there is a wide gulf; but not so wide when one includes in the comparison the present specimen and the figure of *dimidiata* (Schioedte and Meinert, *l.c.*, pl. viii, fig. 5). I have seen examples of *leptosoma* with an even more pronouncedly narrow pleon. Comparing the "Investigator" specimen with *leptosoma*, the

difference lies not in the width of the pleon segments, but in the degree of imbrication or telescoping, and the plane of the pleural portions; in *leptosoma* the latter are vertical or may even curl slightly inwards on the ventral surface, whereas in *Pleopodias* they lie more or less horizontal. But see the Danish authors' fig. 7 of *longicauda*, one of the *leptosoma* group. Here again there is no sharp distinction between *Anilocra* and *Pleopodias*.

As regards the exposed pleopods, Hale's figure (*l. c.*, fig. 7) of a specimen assigned to *A. cavicauda* Rich.¹ shows them, and also Nierstrasz' figure of *laticauda* (1915, *l. c.*, pl. iii, fig. 7), though in neither case so prominently as in the figure of *P. elongatus*. I have seen examples of *leptosoma*, and even of *capensis* (a species with broad pleon) in which the pleopods are more or less visible in a dorsal view; and inspection of these specimens leaves no doubt that the lateral spreading and consequent exposure of the pleopods is largely an accident of preservation, though of course it is more likely to become manifest in those species which have a narrow pleon.

Thus none of the alleged distinguishing characters of *Pleopodias* are really valid, yet both Richardson's figure of *elongatus* and the present specimen have a distinctive "facies" which it is impossible to ignore completely. I therefore retain *Pleopodias*, regarding it as a deep-water derivative of the *leptosoma* group of *Anilocra*.

***Pleopodias elongatus* Rich.**

Richardson, 1910, *l. c.*, p. 26, fig. 25.

Locality.— $\frac{2685}{10}$ 14° 13' N. 93° 40' E. 370-419 fathoms (N. of Andaman Is.) 1 ovig. ♀ 15.5 mm.

Remarks.—This specimen is identified with Richardson's species not without some diffidence. In the first place the description of *elongatus* gives the apex of the telson as rounded, whereas the figure shows it squarely truncate, with only the postero-lateral angles rounded. In the present specimen the telson is more like that of *A. cavicauda* Rich. (1910, *l. c.*, p. 18, fig. 17); it is concave dorsally, though there is a faint median keel in the basal half immediately following the transverse basal depression, the lateral margins are up-turned, the apex rather narrowly rounded and somewhat asymmetrical. The telson, especially the sides and apex, is very feebly chitinized, and its apex might easily suffer injury.

The relative lengths of the peraeon segments may be variable according to age or sex; the type specimen of *elongatus* was 22.66 mm. in length. In this respect our specimen agrees better with the figure of *A. cavicauda* which was even larger. Postero-lateral angles of peraeon segment 7 rounded.

The first pleon segment is laterally conspicuous. The difference in elongation of the pleon between Richardson's and our specimens may be due to preservation, the former appearing to be strongly contracted, whereas the latter is not at all contracted; it can in fact be squeezed

¹ For other reasons I think Hale's specimens are more likely to be *dimidiata*.

up so as to give the appearance shown in Richardson's figure. When thus manipulated the apex of the telson scarcely, if at all, extends beyond the apices of the uropods.

The uropods are very delicate, and, as preserved, the inner ramus lies horizontally under the telson, while the outer ramus is in a vertical plane. Both rami are elongate-oval, with rounded apices, and subequal in length.

Dactyli of the anterior peraeopods evenly tapering, without nodular enlargements.

Distribution.—Philippine Islands, 170 fathoms.

Lobothorax Blkr.

Bleeker, 1857, *Verh. Nat. Ver. Nederl. Ind.* II, p. 39.
Schioedte and Meinert, 1883, *l. c.*, p. 282, (*Saophra*).
Richardson, 1910, *l. c.*, p. 19.

Lobothorax laevis Rich.

Richardson, 1910, *l. c.*, p. 19, fig. 18.

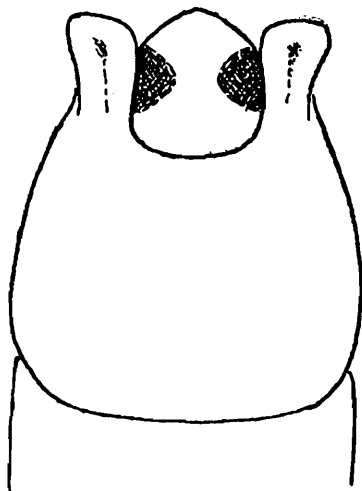
Localities.—

Bay of Bengal. 1 immat. ♀ 17 mm.

Morrison Bay, Mergui Archipelago, 1914. 1 mature but non-ovig. ♀ 17 mm.

Remarks.—These specimens agree with *laevis* in the smooth or nearly smooth body and the shape of the uropodal rami, which latter, however, are here narrower than in the figure of *laevis*.

As the figure of *laevis* does not show the processes of the 1st peraeon segment I give a figure here. They extend to the level of front of head (or almost), slightly expanded apically, with a shallow groove dorsally; in the immature specimen the apices are horizontal, but in the mature specimen they are vertical and pressed against the sides of head just like "ears". The length of the head and anterior four peraeon segments is 10.5 mm. in the Bengal specimen, 9 mm. in that from Mergui; the



TEXT-FIG. 8.—*Lobothorax laevis* Rich. Dorsal view of head and peraeon segment 1.

greatest width in the former is across the hind margin of 4th segment : 5.5 mm., and in the latter across the 5th segment : 6 mm.

The hindmost pair of brood-lamellae arising from the bases of the 5th peraeopods are fully developed in the Bengal specimen, folding over one another across the whole width of the sternite; but there are no traces of the anterior pairs. In the Mergui specimen 4 pairs (on segments 2-5) are developed. Miers [1880, *Ann. Mag. Nat. Hist.* (5) V, p. 461] mentions specimens of a *Cymothoa* in the stage in which the brood-lamellae are developed on the "three posterior segments of the body only", that being apparently one of the few Cymothoids which have seven pairs of brood-lamellae (Calman, 1909, *Lankester's Treat. Zool.* pt. 7, p. 203), and refers to Schioedte's paper [1878, *Ann. Mag. Nat. Hist.* (5) II, p. 196] on this subject.

Richardson's specimen was an adult ♀. It is possible, however, that like the present Mergui specimen it was not *fully grown*. The ruggedness of the peraeon segments and the falcate uropodal rami may be features of large and fully grown specimens; Schioedte and Meinert's examples of this genus measured 33-40 mm. The Bengal specimen has a perfectly smooth and hard integument; the Mergui one on the other hand has the head and first 3 segments softer than the rest of the body, and irregularly wrinkled.

Both specimens have a few dark stellate specks on head and across the peraeon and pleon segments and base of telson.

Distribution.—Philippine Islands, 188 fathoms.

Agarna Sch. and Mein.

Schioedte and Meinert, 1884, *l. c.*, p. 328.

Richardson, 1905, *Bull. U. S. Nat. Mus.* LIV, pp. 243-245.

Agarna engraulidis, sp. nov.

Locality.— $\frac{3845}{9}$ Off mouth of Devi River, Orissa coast, 28.xii.88

1 ovig. ♀ 12 × 8 mm., height 6 mm. Parasitic on operculum of *Engraulis setirostris*.

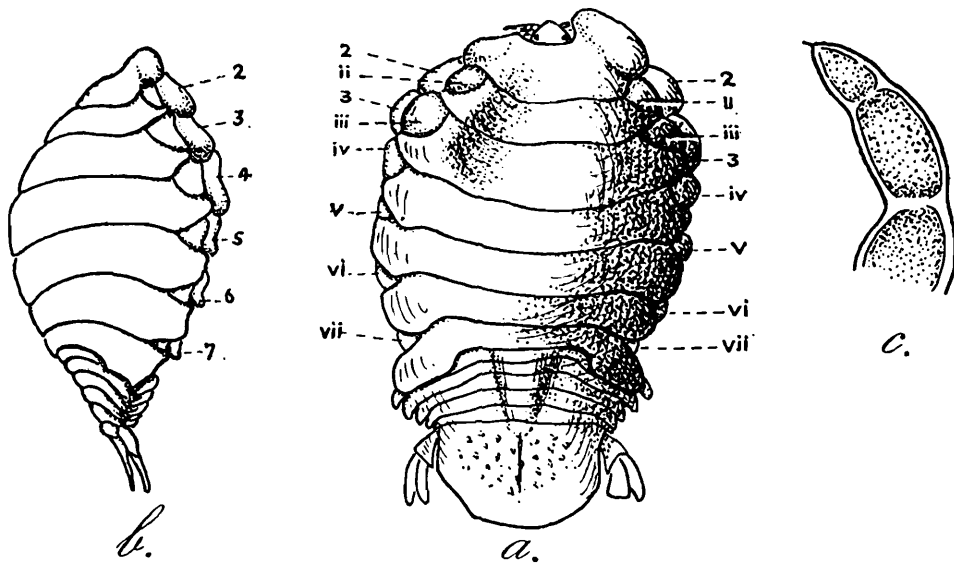
Description.—Body strongly convex dorsally, asymmetrical, with a remarkable resemblance to a Bopyrid parasite.

Head deeply immersed in 1st peraeon segment, subtriangular, eyes small, black.

Peraeon segment 1 with right lateral margin strongly gibbose, the left margin less so; segments 2-7 with the antero-lateral corners very clearly demarcated, those on segments 2-4, especially on the right side, gibbose and resembling the so-called "ovarian bosses" of the Bopyrids; those on segments 5-7 decreasing in size and much less conspicuous. In dorsal view the side-plates on segments 2 and 3 only are visible; the other side-plates are concealed beneath the lateral margins of the segments, shallow, and much shorter than their segments.

Pleon nearly as wide as peraeon; 1st segment visible medianly, and its lateral angles projecting beyond lateral corners of 7th peraeon segment; lateral angles of 5th almost hidden between those of the 4th segment and the peduncles of the uropods. Telson broader than long, apically rounded, surface faintly foveolate.

Mandibular palp with the 3 joints concrescent and not truly articulated, a minute apical seta.



TEXT-FIG. 9.—*Agarna engraulidis*, sp. nov. a, b. dorsal and right-side views respectively, roman numerals indicate the demarcated antero-lateral corners of segments 2-7, arabic numerals the side-plates, only the first two of the latter (on segments 2 and 3) visible in dorsal view. c. mandibular palp.

Peraeopods 4-7 with 2nd joint ovate (less so on peraeopod 4), with a low keel, which however runs in an even curve from base to apex, without the squarish projection at base found in some species of *Livoneca*, etc.

Outer rami of uropods narrow-ovate, inner ramus on left side similar, but that on right side much broader, obovate, with truncate apex.

Remarks.—I am not satisfied that this species is correctly placed in the genus *Agarna*, which hitherto has contained only one species from the West Indian region¹. The highly vaulted peraeon and broad pleon seem to indicate some affinity, though the former may be accidental. If so, the species might find a home in *Livoneca*. The swollen antero-lateral corners of the anterior peraeon segments give a very distinctive appearance, though it is only an extreme development of features found in other species (e.g., *Telotha indica* Nierstrasz, 1915, *l. c.*, p. 94).

The label says parasitic "on" operculum, but one suspects that the specimen was found, or until the fish was caught had been living, *within* the branchial cavity.

Livoneca Leach.

Haller, 1880, *Arch. Naturg.* XLVI, p. 392.

Schioedte and Meinert, 1884, *l. c.*, p. 340.

Nierstrasz, 1931, *l. c.*, p. 138 seq.

Remarks.—In the species recorded below, and in the South African *raynaudii* M. Edw., there is a pair of penial processes on the 7th sternite, and the ♂ stylet on pleopod 2 does not persist in the ♀. In *Nerocila* the reverse seems to be the case, but whether it applies to all species remains to be seen.

¹ *A. carinata* Sch. and Mein., 1884, which seems to be a synonym of *Livoneca cumulus* Haller, 1880.

Livoneca propinqua Rich.

Richardson, 1904, *Proc. U. S. Nat. Mus.* XXVII, p. 37, figs. 6, 7.
Id., 1909, *ibid.*, XXXVII, p. 87.
Id., 1910, *l. c.*, p. 23.

Localities—

$\frac{122}{10}$ St. 184, 22° 14' 25" N. 67° 8' 55" E. 947 fathoms
 2/i/95. (Arabian Sea) 1 ♀ without brood-lamellae 11×6 mm.

St. 386, 11° 55' N. 74° 22' E. 360 fathoms (Laccadives). 1 ♂
 10×4 mm., 2 ♀♀ without brood-lamellae 12×6.5 and
 17×9 mm. From gills of *Macrurus*.

$\frac{3762}{10}$ 8° 9' N. 76° 30' E., 464 fathoms (Maldives). 1 ovig. ♀
 18×10 mm.

$\frac{3763}{10}$ 8° 10' N. 76° 26' E., 445-386 fathoms (Maldives). 1 ♂
 9×3.5 mm.

$\frac{4764}{7}$ St. 197, 9° 34' 57" N. 75° 36' 30" E., 406 fathoms 20/i/95
 (Maldives) 1 ♀ without brood-lamellae 11×6 mm.

Remarks.—In the ♀ the side-plates on segments 2 and 3 are rounded posteriorly, on segments 4 and 5 acute, on segment 6 acute, subacute or narrowly rounded, and on segment 7 broadly rounded. In the ♂ those on segments 4-7 are all subacute.

The penial processes are well developed, about 5 mm. in length in the 10 mm. ♂, and situated close together. The ♂ stylet on pleopod 2 is about $\frac{3}{4}$ length of inner ramus; traces of its persistence in ♀.

The eyes in the largest ♀ are composed of rather loosely aggregated ocelli. In all specimens they are dull reddish in colour.

There are two reasons for identifying these specimens with Richardson's species: similarity both of structure and of host. So far as I am aware *propinqua* is the only species which has been recorded from a Macrurid fish (Richardson, 1909, 1910). The host of the type Japanese specimen was not recorded, and only one of the present lots has a record of the host.

On the relationship of *propinqua* to the other species of this genus I am not prepared to express an opinion.

Distribution.—Japan; Philippine Islands. 189-244 fathoms.

IMMATURE CYMOTHOID FORMS.

Remarks.—To work out the growth-stages of the Cymothoids is difficult, as the young stages, and probably also the males, are to a large extent free-swimming. The youngest of these stages, ready to be liberated from the brood-pouch of the mother, can be described, but only the laborious examination of a very large amount of material of later stages is likely to produce satisfactory correlations; and probably even then only generic, not specific, differences will be recognizable. Fortunate chances occur sometimes when a number of these parasites in different stages is found on one fish, e.g., in the case of Southwell's

"*Rocinela latis*" (1915, *Rec. Ind. Mus.* XI, p. 321); but Southwell apparently was not aware that many of these parasites are protandrous hermaphrodites, and that where males are found on the skin of a fish, the female is likely to be found in the mouth or gill-cavities.

This point is mentioned so that future collectors, finding parasites on a fish, should thoroughly examine the fish and collect every one of the parasites, from the largest to the smallest.

All the following specimens are casual captures in townets etc., and cannot be identified specifically or even generically; nevertheless it may be useful to separate them into "species" and briefly point out their characters. In all of them the 7th pair of peraeopods and the ♂ stylets on 2nd pleopods are developed unless the contrary is stated. None of them show penial processes on 7th sternite. The antennae and mouth-parts have not been studied.

Form A.

Localities—

3846 False Point. Orissa coast, 20.xii.88. Surface. 2 specimens 9×2.5 and 12×3.3 mm.

St. 577, $11^{\circ} 58' 20''$ N. $98^{\circ} 18' 15''$ E., 8 fathoms, (Mergui). 6 specimens 4×1 mm.— 7×2 mm.

St. 595, $11^{\circ} 31' 15''$ N. $98^{\circ} 35' 15''$ E., 11 fathoms, (Mergui). 3 specimens 5×1.5 mm.— 7×2.3 mm.

Remarks.—Body nearly parallel-sided. Rostrum short with very slight constriction in front of eyes. Anterior peraeopods with 5-7 stout spines on expanded inner margin of 6th joint and blunt rounded denticles on inner margin of dactylus. Both rami of uropods oval, apically rounded, outer ramus with 2 apical spinules.

From the character of the 6th joint of the anterior peraeopods this form might be considered a young *Rocinela*, but according to Schioedte and Meinert the young of *Nerocila* and *Livoneca* have the same character.

Form B.

Localities—

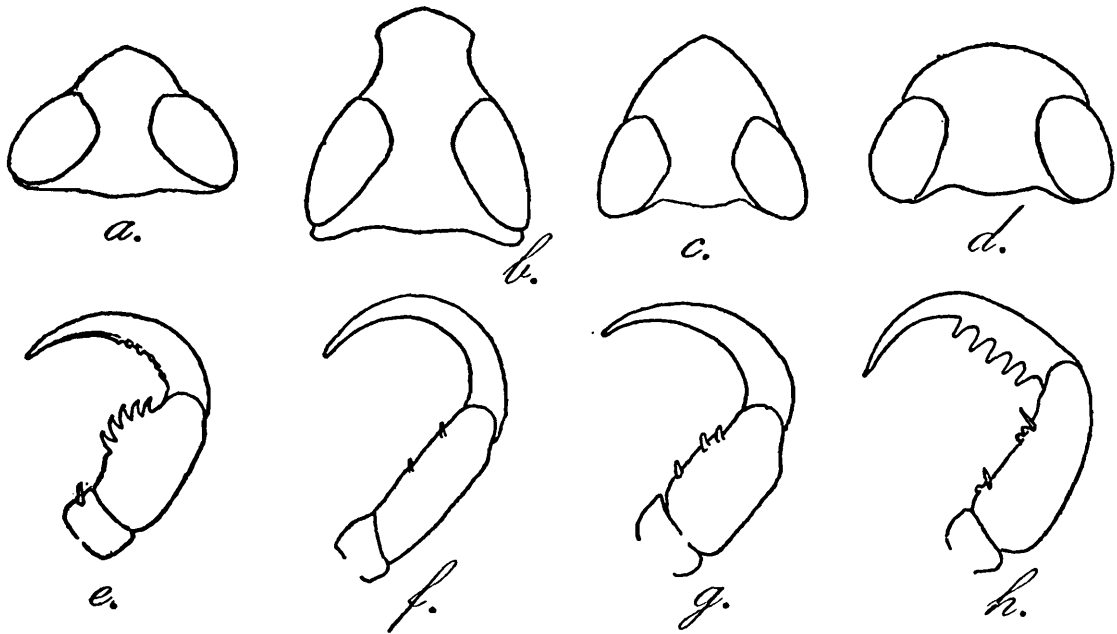
St. 556, $12^{\circ} 40'$ N. $98^{\circ} 26' 30''$ E., 10 fathoms (Mergui). 1 specimen 9×1.9 mm.

St. 577, $11^{\circ} 58' 20''$ N. $98^{\circ} 18' 15''$ E., 8 fathoms (Mergui). 2 specimens $6.5-6.75 \times 1.3-1.5$ mm.

Off Haingyi Is., off Bassein River. 14.xi.09. Towntet (Lower Burma). 1 specimen 7×1.5 mm.

Remarks.—Body parallel-sided and very narrow. Rostrum prominent, constricted in front of eyes, length of head equalling width. Anterior peraeopods with slender 6th joint, with only 2 spinules, and very long, strongly curved and smooth dactylus. Posterior peraeopods slender. Uropods with outer ramus ovate-lanceolate, ending in a spini-

form point, with (Haingyi Is.) or without (St. 577) an additional spine, inner ramus oval.



TEXT-FIG. 10.—Cymothoid juveniles. *a-d.* outline of head of Form A, B, C, and E respectively. *e-h.* distal joints of pereopod 2 of Form A, B, C and F respectively.

Form C.

Localities—

St. 524, 12° 29' 45" N. 98° 12' E., 7 fathoms 1912-13 (Mergui). 3 specimens 4.5 × 1.5, 6 × 2, and 8 × 2.75 mm. Attached to fish.

St. 595, 11° 31' 15" N. 98° 35' 15" E., 11 fathoms (Mergui). 1 specimen 7 × 2.5 mm.

Remarks.—Rostrum prominent, not constricted in front of eyes. Anterior pereopods stout, but inner margin of 6th joint not expanded, with 3 short stout spines, dactylus smooth. Uropods as in Form A.

Form D.

Localities—

St. 602, 11° 27' 40" N. 98° 38' 45" E., 8½ fathoms (Mergui). 1 specimen 9.5 × 2.5 mm.

Off Haingyi Is., off Bassein River (Lower Burma). 1 specimen 6.5 × 1.75 mm.

Remarks.—Body parallel-sided. Rostrum prominent as in Form C, without constriction. Anterior pereopods with 6 spines on expanded inner margin of 6th joint, dactylus smooth. Uropods as in ♂ of *Nerocila phaeopleura*.

As the specimens differ in size, but agree as regards the development of the uropods, two species may be represented. The specimens are considerably smaller than the ♂♂ of *phaeopleura*, and the curve of the front margin of rostrum is slightly different.

Form E.

Locality.—St. 394, Mouth of Rangoon River, 6 fathoms (Lower Burma). 1 specimen 3.75×1 mm.

Remarks.—Rostrum short and broadly rounded, without constriction. Anterior peraeopods with 5 spines on expanded inner margin of 6th joint, dactylus smooth. Both rami of uropod oval, apices rounded, 2 spinules on apex of outer ramus. Seventh peraeopods and stylet on pleopod 2 not developed.

Form F.

Locality.—St. 582, $11^{\circ} 13' 50''$ N. $98^{\circ} 11' 40''$ E., 12 fathoms (Mergui). 1 specimen 3×1 mm.

Remarks.—Scarcely any rostrum in front of the very large eyes, which almost meet. Telson shorter than its basal width, broadly rounded apically. Anterior peraeopods with 2 spines on inner margin of the nearly parallel-sided 6th joint, a small blunt knob proximal to the proximal spine, and 2 knobs proximal to the distal spine, dactylus angularly curved, with 5 sharp spiniform denticles on inner proximal margin. Posterior peraeopods with 3 spines on 6th joint, dactylus evenly curved, with 4-5 blunt denticles on inner margin. Rami of uropod oval, apically rounded. Seventh peraeopod and stylet on pleopod 2 not developed.

According to the figures in Schioedte & Meinert's work this is a very young Cymothoine or Livonecine. It is comparable with the above described embryo of *Renocila ovata*, but differs in the armature of the 6th joint of anterior peraeopods and the angularly bent dactylus.

Form G.

Locality.—St. 556, $12^{\circ} 40'$ N. $98^{\circ} 26' 30''$ E., 10 fathoms. (Mergui). 1 specimen 8.3×2 mm.

Remarks.—Body parallel-sided. Rostrum very short, frontal margin truncate and nearly straight, no constriction in front of the very large eyes, which almost meet. Anterior peraeopods with 6 spines on expanded margin of 6th joint, dactylus smooth. Antenna 1 with rather strongly moniliform joints, which are setose on their hinder distal margins. Antenna 2 with peduncular and flagellar portions distinct. Outer ramus of uropod distinctly longer than inner ramus, narrow lanceolate, with 2 apical spines, inner ramus obovate, 1 spine on rounded outer distal corner.

Family LIMNORIIDAE.

Limnoria Leach.

Stebbing, 1904, *Fauna Geogr. Mald. Laccad.* II, p. 713.

Chilton, 1914, *Ann. Mag. Nat. Hist.* (8) XIII, p. 380 (comparison of species).

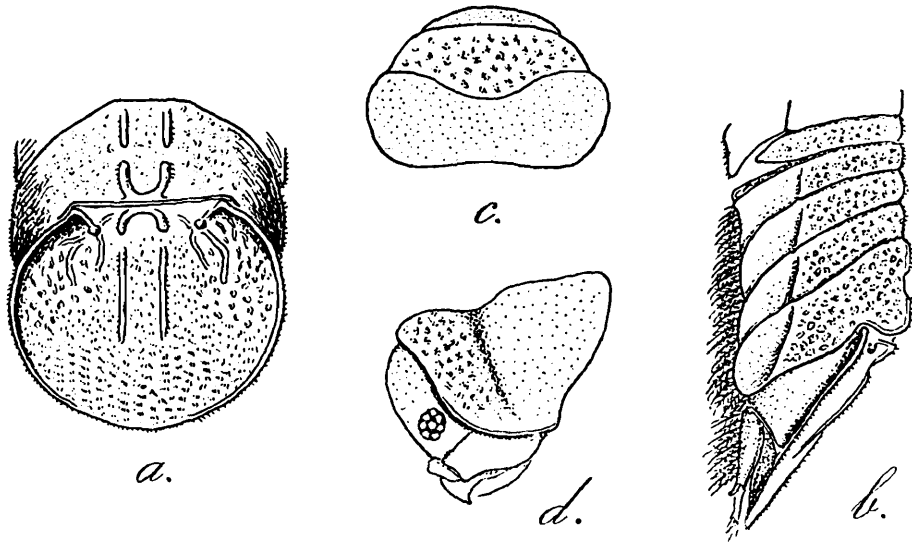
Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, p. 191.

Limnoria septima*, sp. nov.Localities*—

3194 North Sentinel bearing N. 150, W 18 miles, 250 fathoms
 9 (Andamans). 2 ♀♀ (1 ovig.) 5.25 and 5.75 mm., 1 juv.
 3.5 mm.

3981 St. 233, 13° 17' 15" N. 93° 10' 25" E., 185 fathoms
 10 (Andamans). 1 juv. 4 mm.

Description.—Peraeon segment 1 longer but narrower than any of the following segments, separated by a shallow arcuate groove into an anterior portion, which is punctate-foveolate, and a posterior portion, which like the head is only minutely shagreened. The following peraeon segments shagreened, with very minute granules and short fine pubescence, arranged on the hinder segments more or less in a transverse row towards the hind margin of each segment.



TEXT-FIG. 11.—*Limnoria septima*, sp. nov. a. dorsal view of 5th pleon segment and telson. b. lateral view of pleon and telson. c, d. dorsal and lateral views respectively of head and 1st peraeon segment.

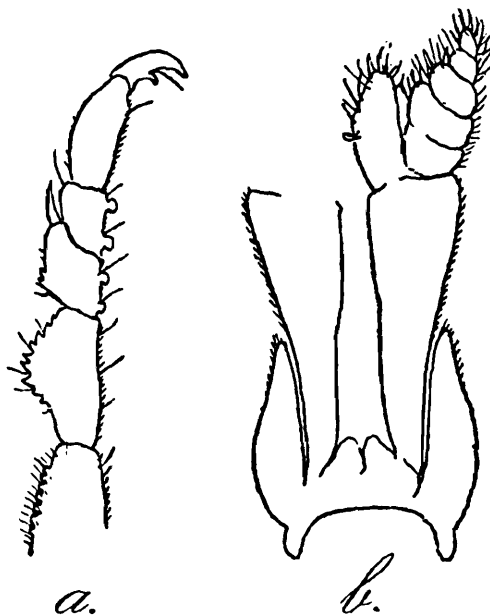
Pleon segment 1 narrower than segments 2-5, each of which has an oblique ridge laterally, becoming more conspicuous posteriorly. Segment 5 dorsally with 2 pairs of longitudinal ridges, the posterior pair joined behind, forming a U-shaped ridge. Telson concave, except in the centre where it is slightly convex, with strongly raised marginal rim; at the base a \cap -shaped ridge, followed by a pair of elongate longitudinal ridges; on either side of the \cap -shaped ridge a small tubercle, from which radiate short vermiculiform ridges. Whole of upper surface of pleon segments 1-5 foveolate, more strongly so on the posterior segments; telson also foveolate proximally; rest of surface with minute short pubescence, which is arranged more or less in little groups.

Antennae 1 and 2 as in *lignorum* (see Sars, 1897, *Crust. Norw.* II., pl. xxxi). Mandibles with well developed palp. Maxilliped with 2nd joint widening distally from a narrow base, epipod narrow lanceolate, extending only half the length of 2nd joint.

Peraeopod 1, 6-7 stout blunt knobs on inner margin of 3rd joint, one on 4th, 6th joint with apically 2 ctenate spines (one short, one longer), 7th with stout bifid spine below unguis.

Peraeopods 2-5, 2 blunt knobs on inner margin of both 4th and 5th joints.

Outer distal margin of 2nd joint and outer margin of 3rd joint in peraeopods 1-5 serrate, the serrations blunt on the 2nd joint (more crenulate or castellate), but sharp on the 3rd joint.



TEXT-FIG. 12.—*Limnoria septima*, sp. nov. a. peraeopod 3. b. maxilliped (palp on one side omitted).

Peraeopod 6 similar, but 3rd joint more elongate, and with 3-4 spines on outer apex of 4th joint, and 3 strong spines on apex of 5th, one of them bidentate, but inserted laterally and easily overlooked as it lies against the 6th joint.

Peraeopod 7 elongate as in *lignorum*, but more slender than in Sars' figure (and also Stebbing's figure of *pfefferi*, 1904, *l.c.*, pl. lii A.).

Uropod, peduncle with a blunt knob on outer distal corner, but no serrations along outer margin, which is fringed with long plumose setae, subacutely produced between the two rami, inner ramus only half the length of peduncle, outer ramus barely half the length of inner ramus, unguiform.

Remarks.—The species to which the present specimens bear most resemblance is *japonica* Richardson (1909, *Proc. U. S., Nat. Mus.*, XXXVII, p. 95, fig. 21). The latter species has "two tubercles in longitudinal series" on pleon segment 5 (the figure shows only one), and a large median basal tubercle on the telson followed by a pair of tubercles and these again by 2 parallel ridges. As will be seen from the figure the arrangement in the present species is quite distinct. Richardson gives no details as to the maxilliped or mandible, and though Chilton (*l.c.*, p. 388) suspects that the epipod of the maxilliped will be found to be short, he includes the species in his key under the heading "epipod longer than 2nd joint" In the present species the epipod extends a relatively shorter distance along the 2nd joint than in any of the other species.

Whereas most records of *Limnoria* are from shallow water (floating logs, wharf-piles, sea-weed), *japonica* was taken in 163 fathoms. Thus the two species which show the greatest development of sculpturing on the pleon are both from fairly deep water.

Family SPHAEROMIDAE.

Group HEMIBRANCHIATAE.

Sphaeroma Bosc.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, p. 192.

Sphaeroma triste Heller.

Heller, 1868, *Novara Reise. Zool.* II, p. 142, pl. xii, fig. 12.

Studer, 1884, *Abh. K. Preuss. Ak. Wiss.* 1883, p. 18.

Lanchester, 1903, *Proc. Zool. Soc. Lond.*, 1902, II, p. 379, pl. xxxv, fig. 10 (*felix*).

Locality.—St. 619, West of jetty, Camorta Is., Nicobars. 1 ovig. ♀ 8.5 mm., ♀♀ 6.5-9 mm.

Remarks.—In spite of Lanchester's brief but pertinent description, I was already convinced that the present specimens were referable to his species, when I recollected the locality of Heller's species. Lanchester unconsciously named his species on the principle *lucus a non lucendo*.

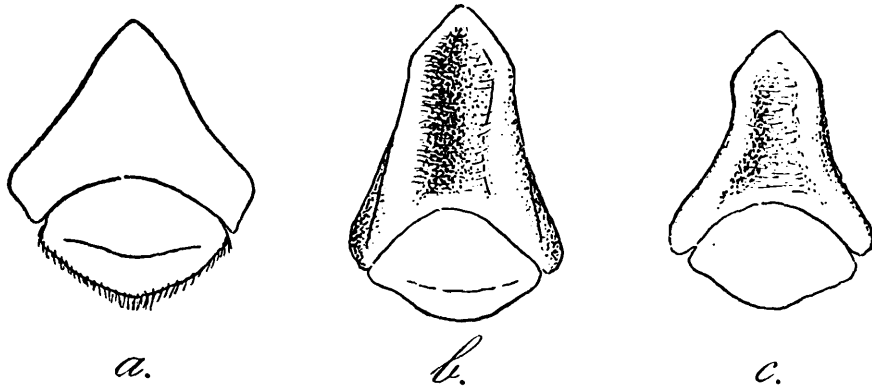
Heller's description is also short and to the point. Lanchester gives no size, and neither he nor Heller state the sex of their specimens. Heller's figure shows pairs of definite tubercles on the two divisions of the pleon, and the inner ramus of uropod apically bifid. One suspects it represents a ♂. The present specimens are all ♀♀ and correspond better with Lanchester's description and figure.

There is a minute and obscure tubercle in the middle of the head (best seen in a dried specimen). Head and peraeon segment 1 minutely granulate. Peraeon segments 2-7 (ignoring the smooth articular portion) with a transverse ridge or costa on both the anterior and posterior margins evanescent laterally, and more prominent on the hinder segments, especially the anterior ridges on segments 6 and 7, which are obscurely granulate. Compare Heller's "granulis in segmentis thoracis duas series transversas formantibus" and Lanchester's "a raised, broadish transversely-grooved ridge" with the above description, assuming that Heller described a ♂, in which the granulation is probably more marked.

There is a pair of very low and rounded setiferous tubercles on the anterior and posterior divisions of the pleon, the whole surface of which is covered with minute setiferous granules, which at the base of the telson are arranged more or less in longitudinal rows with narrow smooth intervals. This is usually visible only after cleansing; before cleansing "mit einem filzigen Überzuge", as Heller says.

Outer ramus of uropod with 9, or occasionally only 8, serrations, including the apical point. Apex of inner ramus in all the present specimens pointed, as in Lanchester's figure.

Inner plate of maxilla 1 with one small (on outer apex) and 3 large plumose setae (as in *annandalei* Stebbing, 1911, *Rec. Ind. Mus.*, VI, pl. x.). Inner plate of maxilla 2 as in *annandalei*, i.e., broad and subquadrate. Fifth (3rd palpal) joint of maxilliped also as in *annandalei* (not as in *walkeri* Stebbing, 1905, *l.c.*, *infra* pl. vii.). The inner plate of the maxilliped is triquetral in section and very setose; according to the position in which it is flattened under a cover-slip it may be either narrow pointed (*annandalei*) or broad and rather blunt (*walkeri*).



TEXT-FIG. 13.—Epistome and upper lip of a *Sphaeroma triste* Heller. b. *S. walkeri* Stebb. c. *S. annandalei* Stebb. (c. drawn from South African examples).

Colour of the present specimens (as preserved) pale buff with a faint greyish tinge, chiefly on the head and telson; eyes black.

The two little dots on the front of the head in Heller's figure represent the articular surfaces of the knob-like bases of the 1st antennae, which are kept clean of particles of mud, etc., and consequently stand out as two dark spots.

From *terebrans* Bate, *walkeri* Stebb., and *annandalei* Stebb. the present species is easily distinguished not only by the shape and sculpturing of the telson, but by the number of serrations on the outer ramus of uropod. The epistome (fig. 13) also distinguishes *triste* from *terebrans* and *walkeri* (Stebbing's figure of the epistome of *annandalei* is not a true full-view and is ambiguous).

Distribution.—Nicobars (Heller); some unknown locality visited during the course of the "Skeat" Expedition to the Malay Peninsula (Lanchester).

***Sphaeroma walkeri* Stebb.**

Stebbing, 1905, *Herdman's Ceylon Pearl Fish*, *Suppl. Rep.* XXIII, p. 31, pl. vii.

Id., 1910, *J. Linn. Soc. Lond.*, XXXI, p. 220.

Id., 1917, *Ann. Durban Mus.* I, p. 444, pl. xxiii.

Barnard, 1920, *Ann. S. Afr. Mus.* XVII, p. 360.

Omer-Cooper, 1927, *Tr. Zool. Soc. Lond.* XXII, p. 204.

Baker, 1928, *Tr. Roy. Soc. S. Austr.* III, p. 49.

Monod, 1931, *Mem. Soc. Sci. Nat. Maroc.* XXIX, p. 36, figs. 5, 23A, 43A, B.

Id., 1933, *Bull. Inst. d'Egypte.* XV, p. 154.

Locality.—Off mouth of Devi River, Orissa coast, 23-25 fathoms. 15-25.iv.09. "Golden Crown" 1 immat. ♂ 8 mm., 1 juv. 4.5 mm.

Remarks.—The ♂ is obscurely sculptured on the telson, and the juvenile still more obscurely.

S. venustissimum Monod, (1930, *Bull. Soc. Zool. Fr.* LV, p. 492, figs. 1-3) from French West Africa is very closely allied (see Monod, 1931, *l.c.*, *supra*), but its epistome has not been figured.

Distribution.—Ceylon, Suez (Stebbing); Port Said (Omer-Cooper); Ismailia (Monod); Natal (Stebbing, Barnard); New South Wales (Baker).

Cymodoce Leach.

Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, pp. 198 seq.

Cymodoce longistylis Miers.

[*Non* Baker, 1928, *Tr. Roy. Soc. S. Austr.* LII, p. 53, pl. vi, figs. 1-4; *pelsarti* Tattersall 1922.]

? Stebbing, 1910, *Tr. Linn. Soc. Lond.* XIV, p. 105, pl. ix, fig. D (*zanzibarensis*).

? Hale, 1933, *Ann. Mag. Nat. Hist.* (10) XI, p. 560 (*zanzibarensis*).

Miers, 1884, *Zool. "Alert"*, p. 305, pl. XXXIII, fig. C.

Richardson, 1910, *U. S. Bur. Fish. Doc.* 736, p. 27.

Nierstrasz, 1931, *l.c.*, p. 199, figs. 90, 91.

Localities—

St. 614, Octavia Bay, Nancouri Harbour, Nicobars, 13 fathoms.

1 ♂ 9.3 mm.

St. 621, East of jetty, Camorta Is., Nicobars. 1 ♂ 10 mm.

Also 3 ♂♂ 7.5-8 mm., 4 immat. ♀♀ 7-8 mm., 11 juv. 4-5.5 mm.

Remarks on the ♂.—Only one feature might cause one to hesitate in identifying the present two ♂♂ with Miers' species: the size of the granules on the peraeon segments. In Miers' figure they are much larger than in our specimens. In view, however, of the almost exact agreement in other respects I think this discrepancy may be attributed to a slight error on the part of the artists who drew Miers' figure.

In conjunction with Miers' description the following points may be noted. Hind margin of 4th pleon segment with only one other tooth between each of the two (submedian) projections and the lateral lobes (*cf. zanzibarensis* Stebb., which has two teeth). Each of the two prominences (keels) on the telson is composed of a tubercle at its proximal end, and several smaller tubercles or granules along the ridge, and ends in a strong conical tubercle, with a somewhat smaller one on its outer flank, with a tuft of setae between the two tubercles (as is very roughly indicated in Miers' figure). Between these ridges 2 irregular lines of tubercles as in Miers' figure. The round button-like boss (the proximal part of whose circumference is not drawn in Miers' figure) is rose-coloured, as in *zanzibarensis*, more or less glabrous on top but fringed with stiff brown setae. Median and lateral lobes of telsonic apex bituberculate with brown setae between the pairs of tubercles; the median lobe more prominently bifid than the lateral lobes, as is indicated in both Miers' and Stebbing's figures.

Inner ramus of uropod as in Miers' figure; apices of both inner and outer rami formed by a sharp conical tubercle (*cf. figure of zanzibarensis*).

The outstanding difference between *zanzibarensis* and *longistylis* is the shortness of the inner ramus of uropod in the former. Stebbing's specimen was 11 mm. in length, and thus can scarcely be claimed as a

not quite adult ♂, in which the granulation of the peraeon and the inner rami of the uropods have not reached their full development, although the above comparison strongly tempts one to this conclusion.

C. bicarinata Stebb. from the Maldives, Ceylon, and Zanzibar (Stebbing, 1904, 1905, 1910) is closely allied to *longistylis*, but considerably more material is needed for the elucidation of the relationship of these two forms. The original 1904 figure, as Nierstrasz (1931) remarks, is rather different from the 1905 figure of the same species; there are points of resemblance between it and the figure of *zanzibarensis* which the 1905 figure does not show.

I cannot agree that the New South Wales specimens as figured by Baker, 1928, belong to Miers' species. The figure shows the two keels on the telson separated by a narrow space or groove (instead of a broad space with 2 rows of tubercles), and also a tubercle arising from the top of the subapical prominence. On the other hand the likeness to *pelsarti* Tattersall (1922, *J. Linn. Soc. Lond.* XXXV, p. 15, pl. ii, figs. 30-33; pl. iii, fig. 36) is evident, and I think Baker's specimens should be assigned to this latter species.

Remarks on the ♀♀ and immature ♂♂.—Nierstrasz, 1931, has described and figured ♀♀, captured along with a ♂ on two separate occasions, which may belong to this species. In the present collection there are 18 ♂♂, immature ♀♀, and juveniles which were captured along with one adult ♂ of *longistylis* at St. 621. It is a reasonable assumption, though by no means certain, that all these 19 specimens belong to one species.

Our specimens closely resemble Nierstrasz' figure except that none of them possess the small point on either side of the last peraeon segment. The ♀♀ have squarely truncate inner rami of the uropods, while in the ♂♂ the outer distal corner is more prominent and acute; but there is very little difference in the median lobe of the telson. None of the ♀♀ are ovigerous or have modified mouth-parts.

Although found with an adult ♂, it is a little difficult to believe that one of the smooth ♂♂ 8 mm. in length could undergo so great a change in sculpturing, as is necessary to produce the ornate adult form, with so little increase in size. I have, therefore, instituted the following comparison with another species, if only as a further comment on the well-known difficulty of assigning ♀♀ and immature ♂♂ of *Cymodoce* to their true adult ♂♂.

Our specimens are very like Haswell's Queensland species *mammifera* as described and figured by him (1880, *Proc. Linn. Soc. N. S. W.*, V, p. 474, pl. xviii, figs. 1, 1x), although the inner ramus of the uropod barely extends beyond the level of the telsonic apex. Haswell gave the length as $\frac{3}{8}$ inch (9.4 mm.), but no indication of the sex. The larger specimens (12 mm.) from West Australia, which were assigned to Haswell's species by Tattersall (1922, *l.c.*, *supra*, p. 14, pl. iii, fig. 35), have a more extended telsonic apex, reaching well beyond the rami of the uropods; this is a development which one might reasonably expect in a more fully grown male.

The South African species *setulosa* (Stebb.) (see Barnard, 1920, *Ann. S. Afr. Mus.* XVII, p. 363) is well distinguished by a relatively broader body, and stronger granulation.

Hale's Gt. Barrier Reef specimen, assigned to *zanzibarensis*, was identified by Baker, who noted that the species is "closely allied to *coronata* Hasw." (see Baker, 1928, *Tr. Roy. Soc. S. Austr.* LII, pp. 51, 52, pl. ii, figs. 2-9 with vars.). *C. coronata*, however, does not appear from Baker's figures to have the button-like prominence at the end of the telson, and in this respect is comparable with Miers' figure of *longistylis*. A direct comparison of *longistylis*, *coronata* (the cotype of which is in the British Museum, *vide* Hansen, 1905, *Q. J. Microsc. Sci.* XLIX, p. 121), *zanzibarensis*, and *bicarinata* would certainly yield useful results.

Distribution.—Thursday Island and Singapore (Miers); Philippine Islands (Richardson); East Indies (Nierstrasz). Zanzibar (Stebbing); Gt. Barrier Reef (Hale).

Cilicaea Leach.

Stephensen, 1927, *Vid. Medd. Dansk. Nat. For.* LXXXIII, p. 364.
Nierstrasz, 1931, *Siboga Exp. Monogr.* XXXII c, p. 204.

Remarks.—To the species now included in this genus, as listed in the above two papers, I am inclined to add *Cilicaeopsis dakini* Tattersall, 1922, as the description of the hind margin of the telson having a "vestige" of a median lobe is by no means borne out by the figure, which shows a well developed median lobe.

Cilicaea canaliculata (Thomson).¹

Thomson, 1879, *Tr. New Zeal. Inst.* XI, p. 234, pl. x, fig. A 7 (*Nesea canaliculata, sic*).
Miers, 1884, *Zool. "Alert"*, p. 309. (*Cilicaea canaliculata*).
Filhol, 1885, *Crust. Mem. passage de Venus* III, p. 458 (quoted from Nierstrasz, 1931).
Thomson & Chilton, 1886. *Tr. New Zeal. Inst.* XVIII, p. 153.
Hansen, 1905, *Q. J. Microsc. Sci.* XLIX, pp. 123, 125 (*Cilicaea canaliculata*).
Chilton, 1911, *Rec. Canterbury Mus.* I, p. 311 (*canaliculata*).
Id., 1911, *Tr. New Zeal. Inst.* XLIII, p. 568 (*canaliculata*).

Locality.—Bay of Bengal (without detailed locality). 2 adult ♂♂ 12 and 13 mm., 3 juv. ♂♂ 7.5, 10, and 11 mm., 1 ovig. ♀ 11.5 mm., 6 juv. ♀♀ 6-10 mm.

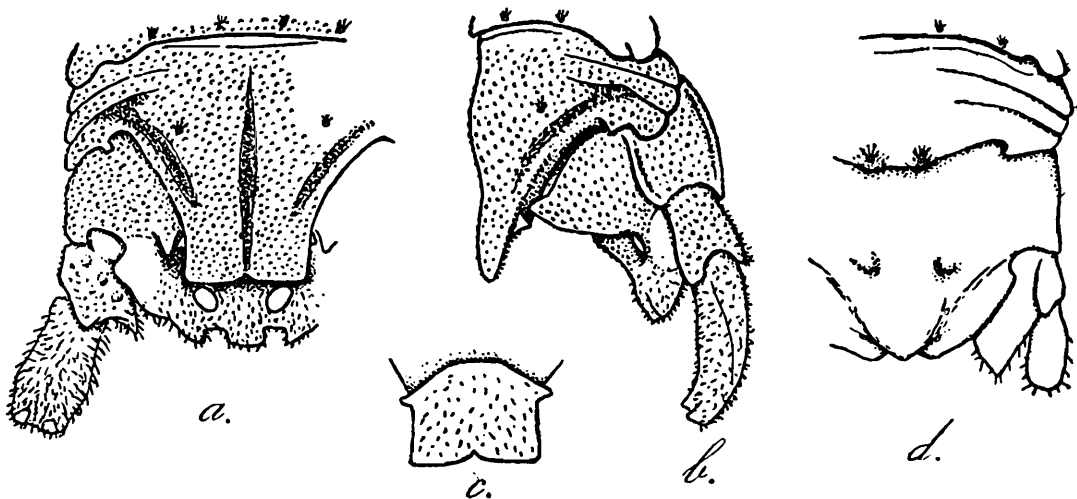
Description.—♂. Surface without pubescence or setae except on hind part of telson, and on outer ramus of uropod; a transverse series of 4 tiny pits on hind margin of head and each of the pereaeon segments, from which arise minute tufts of setules; 2 similar pits on process of 4th pleon segment. Head and 1st pereaeon segment closely punctate, the punctae not covering the very slightly raised vermiculate markings on the dorso-lateral parts of 1st segment. Segments 2-7 granulate, the granules on segment 2 more or less aggregated to form two slightly raised ridges, one on anterior, the other on posterior margin of the segment; these ridges are more distinct on segments 3-7.

Pleon segment 4 with a broad, apically squarely truncate, conical projection, not reaching quite to end of telson. This projection has a shallow medio-dorsal groove, and a similar groove on each lateral margin;

¹ A note by Thomson states that he cannot confirm Miers' reference of the species to the genus *Cilicaea* as the type appears to be lost.

The original spelling of the specific name was retained by Miers and twice by Chilton.

ventrally near the end there is a semicircular ridge which projects laterally like a small conical tooth.



TEXT-FIG. 14.—*Cilicæa canaliculata* (Thomson). *a*, *b*, dorsal and lateral views respectively of pleon and telson of adult ♂. *c*, ventral view of the dorsal process on pleon segment 4. *d*, dorsal view of pleon and telson of ♀.

Telson strongly convex proximally, with 2 conical bosses which fit in front of the lateral projections of the process of the 4th segment when the latter is depressed; distally the telson is depressed, with 2 longitudinally oval perforations; apical margin with squarish median lobe. Whole surface of pleon and telson, except a bare area adjoining the insertion of the uropods, strongly granulate.

Peraeopod 1, 3rd joint with 1 spine on outer distal margin, 4th, 5th and 6th joints with 5, 3, 4 spines respectively on inner margins.

Pleopod 2, stylet half as long again as inner ramus. Penial processes on 7th sternite elongate, extending to end of outer ramus of pleopod 1 (*in situ*).

Uropod, peduncle with upper surface shallowly punctate and with 3 low knobs near hinge, outer ramus granulate and setose, apically truncate, with 2 conical knobs.

Ovigerous ♀ (with modified mouth-parts)—Surface much smoother, punctate but with scarcely any granulation. The setiferous pits as in ♂, the pair on the 4th pleon segment being situated at the apices of very low and inconspicuous bosses. Two bosses, more conspicuous, on telson, the bluntly pointed apex of which overhangs the apical notch.

Spines on peraeopod 1 as in ♂. Uropods as in figure 14, sparsely setose.

The smallest juv. ♀ resembles the adult ♀ (except of course as regards the mouth-parts).

Immature ♂ resembles the ♀, but the surface is more granulate, the knobs on 4th pleon segment and telson are more prominent, and the outer ramus of uropod is shorter and broader, especially in the 10 and 11 mm. specimens. In these latter the penial processes extend to end of peduncle of pleopod 1; in the 7.5 mm. specimen they do not reach the base of pleopod 1.

Remarks.—To judge from Thomson's description and figure, it did not seem possible that these specimens could be referred to his species,

in spite of a certain superficial resemblance. But thanks to Prof. Percival of Canterbury College, New Zealand, I have received specimens identified by the late Dr. Chilton as *canaliculata*, with which the Indian Museum specimens are identical. The New Zealand specimens have the pair of perforations in the telson, which were not noticed by Thomson in his original description; and the later references (1886 and Chilton, 1911) are only locality records.

The absence of a detailed locality for the Indian Museum specimens leads one to suspect that the specimens really came from New Zealand, although Dr. Chopra assures me that there is no evidence that this was the case.

The broad square process of the 4th pleon segment is enough to separate the present species from all the others of the genus, apart from the peculiar perforations in the telson. When the animal is completely rolled up the epistome and peduncles of 1st antennae fit closely against the lower surface of the telsonic margin, and the two perforations allow the access of water to the branchial pleopods.

The ♀ is easily distinguished from that of *latreillei*, which is also recorded from Indian seas, by the absence of the tooth on outer margin of outer ramus of uropod.

Group EUBRANCHIATAE.

Remarks.—Among the specimens of *Cilicæa canaliculata* from some locality in the Bay of Bengal was a small juvenile Sphaeromid belonging to this group. The specimen is much too young to be identified even generically, and is only mentioned here because it, together with the following species, is the first record of a Eubranchiata Sphaeromid from this part of the Indian Ocean.

Cerceis, M. Edw.

Milne-Edwards, 1840, *Hist. Nat. Crust.* III, p. 220.

Hansen, 1905, *Q. J. Microsc. Sci.* XLIX., pp. 108, 127.

Baker, 1908, *Tr. Roy. Soc. S. Austr.* XXXLI, p. 153 (*Circeis*).

Id., 1910, *Ibid.*, XXXIV, p. 85.

Id., 1926, *Ibid.*, L, p. 270.

Hale, 1929, *Crust. S. Austr.* pt. 2, p. 299.

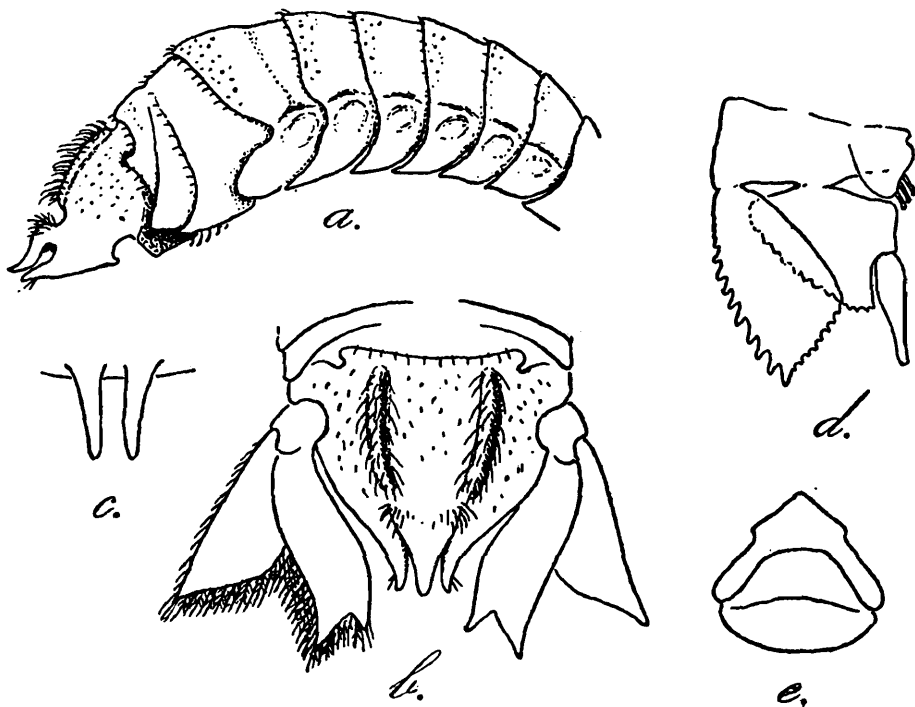
Nierstrasz, 1931, *l.c.*, p. 215 seq. (*Circeis*).

Cerceis bicarinata, sp. nov.

Locality.— $\frac{230}{7}$ Off Little Andaman Island. 1 ♂ 6×2.3 mm.

Description.—Body widest across 7th peraeon segment and pleon narrowing anteriorly, smooth, but hinder parts of peraeon segments, especially the posterior segments, coarsely punctate, margins with setules. Side-plates on segments 2-7 demarcated by distinct grooves, each side-plate feebly bulbous at base, postero-inferior corners acute, except side-plate 7 which is narrowly rounded (contrast *picta* Nierstr.). Anterior portion of pleon without ornamentation. Telson strongly convex proximally, with a pair of raised, strongly setose keels, distal to which is a sharply pointed median process, strongly setose at its base, more or less concealing the apical notch which is bounded on either side by a sharp, slightly out-curved point.

Antenna 1, 1st peduncular joint with the usual 2 apical teeth, flagellum 9-jointed. Antenna 2, flagellum 10-jointed.



TEXT-FIG. 15.—*Cerceis bicarinata*, sp. nov. ♂. a. lateral view of peraeon and pleon, (uropod omitted). b. dorsal view of telson and uropods. c. penial processes on 7th sternite. d. pleopod 2, marginal setae omitted. e. epistome and upper lip.

Pleopod 2, outer ramus strongly dentate on outer margin, stylet on inner ramus rather broad at base and tapering to a subacute apex; 3 coupling spines on basal joint.

Uropod, inner ramus elongate-oblong, slightly sinuous, apex deeply notched between the sharp outer and inner corners, outer ramus broadly lanceolate, with sharp apex, apical and outer margins of inner ramus and inner margin of outer ramus densely fringed with plumose setae.

Colour (as preserved) dull horny, with indications of darker oval markings laterally on the peraeon segments, as in *picta* Nierstr., the bulbous parts of the side-plates being also darker.

Remarks.—Amongst the described species, this specimen is comparable with only three forms, viz., *bidentata* M. Edw., 1840, *aspericaudata* Miers, 1884, and *intermedia* Baker, 1926. That the two latter forms should be regarded as varieties of *tridentata* M. Edw. rests partly on the fact that probably Miers had at that time not seen Haswell's descriptions (1882, *Proc. Linn. Soc. N. S. W.*, VI), and on Hansen's (1905) statement that *bidentata* is a ♀. Hansen was careful, however, to say a ♀ either of *tridentata* "or a closely allied species" *C. bidentata* and the two varietal forms, and the present specimen are the only ones which have a pair of elevations (tubercular or cariniform) on the telson. Although he does not mention it, Miers' figure shows a V-shaped line distal to the two bosses but not reaching the apical notch, which seems to be comparable with the median process in Baker's figure of *intermedia*, slightly more distal and projecting into (or overlapping) the notch. Whether the respective artists viewed their specimens from slightly different angles, or Baker's specimen represents a more mature example, I

think there is little doubt that they are forms of the same species, and that the name *intermedia* ought to go into synonymy. Miers' specimen from Prince of Wales Channel, Torres Straits, was a ♂ (12 mm.), and Baker's specimens from the Gulf of Carpentaria and Queensland comprised ♀♀ and an immature ♂ (size not stated).

One would like to identify our specimen as *aspericaudata*, but I do not think the evidence warrants that course, and I therefore propose to regard it as a new species.

From personal inspection of examples of *acuticaudata*, *trispinosa*, *trilobata* and *ovata*, for which I am indebted to the kindness of Mr. Baker, it seems that the shape of the 7th side-plate can be used as an additional specific character (Baker, 1910, *l.c.*, p. 85, mentions the hooked shape in *trispinosa*); and also that the dark markings so conspicuous in *picta*, and to a lesser degree in our present specimen, may occur in other species, and is not therefore specific.

Family IDOTEIDAE.

Tattersall, 1921. *Mem. Asiat. Soc. Bengal*, VI, p. 424.

Synidotea Harger.

Synidotea variegata Clge.

Collinge, 1917, *Rec. Ind. Mus.* XIII, p. 2, pl. i.

Chilton, 1924, *Mem. Ind. Mus.* V, p. 891, fig. 10, and pl. lx, fig. 6.

Omer-Cooper, 1927, *Trans. Zool. Soc. London*, XXII, p. 205. (? *S. hirtipes*).

Barnard, 1935, *Rec. Ind. Mus.* XXXVII, p. 313.

Locality.— $\frac{2372-2380}{7}$ St. 74, Ganjam coast, $7\frac{1}{2}$ - $9\frac{1}{2}$ fathoms

40 ♂♂, ovig. ♀♀ and juv.

Remarks.—The ♂♂ measure up to 12 mm. in length; there are 2 ovigerous ♀♀ 8.5 and 9 mm., and 10 ovigerous ♀♀ 4.5-5 mm., but none of an intermediate size.



TEXT-FIG. 16.—*Synidotea*, fused penial processes of 1st pleon segment in *a. variegata* Clge., and *b. hirtipes* (M. Edw.).

The ♂ has a *single* penial process on the 1st pleon segment. Among the species of Idoteidae known to me, *Synidotea hirtipes* is the only one which exhibits the same peculiarity, all the other species, having a pair of penial processes (see Barnard, 1920, *Ann. S. Afr. Mus.* XVII, p. 380).

I have seen seven specimens from the Suez Canal which Omer-Cooper doubtfully identified as the South African *hirtipes*. They are certainly not this species, and I think they should be identified as *variegata*. The specimens include 3 ovigerous ♀♀ 5.5-6 mm. in length.

Distribution.—Gulf of Manaar; Chilka Lake; Travancore; Suez Canal.

Cleantis Dana.

Tattersall, 1921, *l.c.*, p. 425 seq. (discussion).

Hale, 1924, *Tr. Roy. Soc. S. Austr.* XLVIII, p. 223 (*Zenobiana*).

Barnard, 1925, *Ann. S. Afr. Mus.* XX, p. 393 (references).

Cleantis natalensis Brnrd.

Barnard, 1925, *l.c.*, p. 394.

Localities.—

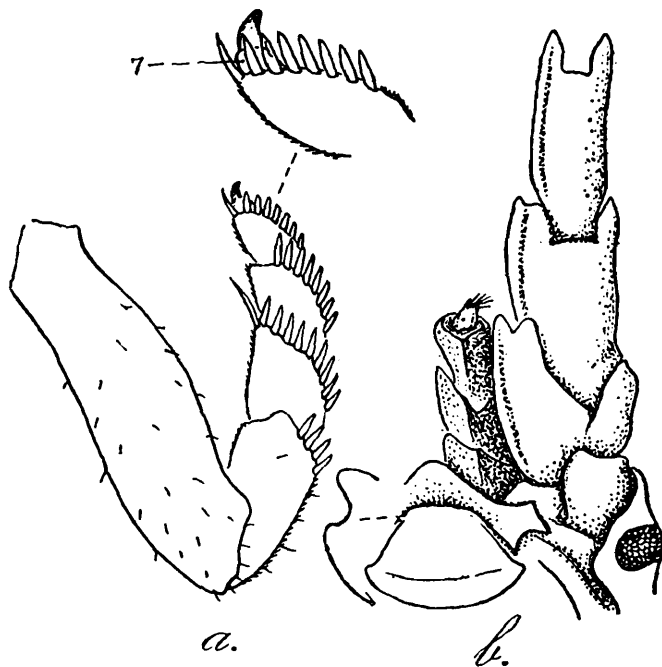
- | | |
|---------|--|
| 3847-48 | Off Puri, mouth of Devi River, about 8 fathoms. |
| 9 | 24. xii. 88 (Orissa). |
| | 1 ♀ 16mm., 1 ovig. ♀ in tube 17mm. |
| 3850 | Tanda, 19° 52' N. 86° 15' E., about 8 fathoms. |
| 9 | 19. xii. 88. (Orissa). |
| | 1 ♀ 18mm., 1 juv. ♀ 11mm. |
| 2381 | St. 74, Ganjam coast, 7½-9½ fathoms. 1 ovig. ♀ |
| 7 | 15 mm. |
| 9305 | Bassein River estuary, 30. x. 09. (Lower Burma). |
| 10 | 1 juv. 7 mm. |
| | Off Haingyi Is., off Bassein River, 14. xi. 09. Towntet. (Lower Burma). 1 juv. 4 mm. |

Remarks.—This species is closely related to *planicauda* and *japonica* (for description of latter see Richardson, 1912, *Proc. U. S. Nat. Mus.* XLII, p. 27, fig. 1). Although the hinder part of the telson is slightly convex between the curved raised rims, there is no trace of the conical tubercle found in *japonica*. The 4th pleon segment, which is partially separated from the 5th segment (telson) by the incomplete suture, does not extend to the lateral profile but is pinched out by the approximation of the 3rd and 5th segments, as in *annandalei* Tattersall (1921, *l.c.*, pl. xvii, fig. 1). The figure of *japonica* shows segment 4 as wide as the other segments, as does Collinge's figure of *Zenobiana prismatica* (1917, *Tr. Roy. Soc. Edinb.* LI, pl. x).

The antennae were referred to in the original description. A figure is given here showing the character of the 2nd joint of antenna 2, which may prove to be a specific character. In the 18 mm. specimen the 2nd antennae are 6 mm. in length (incl. 1st joint), and extend back to end of 3rd peraeon segment, but in the 16 mm. specimen they are only 4 mm. in length and extend back only to the middle of the 2nd segment.

Maxilliped with 3 coupling hooks on inner plate. The suture between 2nd and 3rd joints of the palp is rather obscure, and is best seen on the outer margin.

Peraeopod 4 (Tattersall: 5th) short, 2nd joint as long as the rest together, 3rd-6th joints with stout spines on anterior, posterior and



TEXT-FIG. 17.—*Cleantis natalensis* Brnrd. a. peraeopod 4, posterior surface, with 6th and 7th joints further enlarged. b. ventral view of head showing 1st and 2nd antenna, epistome and upper lip, with profile of epistome and upper lip.

lower distal margins, less numerous on 3rd joint, 5th and 6th joints with an additional row of spines in the middle of the lower margin. 7th joint very short, with short stout unguis which, owing to its strong chitinization and brown colour, is distinguishable from the paler spines of the 6th joint. Although the 7th joint (dactylus) is absent in *annandalei* Tattersall (1921) it will probably be found to be present in those species which appear to be more closely allied to *natalensis*, viz., *planicauda* Bened., *occidentalis* Rich., *japonica* Rich., and *prismatica* (Risso). The peculiar structure of this peraeopod seems to be an adaptation to a tubicolous habitat.

The larger specimens, collected in 1888, no doubt owing to the length of time they have been in preservative, show very little if any trace of longitudinal stripes. They are brownish, paler on the middle part of the body and medio-dorsally, becoming slaty on the head and telson, the latter with 4 semicircular creamy patches on the rounded apical margin (*cf.* the figure of *japonica*). The ♀ from St. 74 is pale brown, with 4 pale patches around end of telson. The 7 mm. juvenile is uniform pale buff, and the 4 mm. juvenile is white with faint grey speckling. The eyes in all specimens are black.

The tube, in which the ovigerous ♀ is ensconced, is about 18 mm. in length, and 7-8 mm. in external diameter; the diameter of the lumen is 4 mm. and just wide enough to accommodate the animal. The tube appears to be a partially decomposed portion of a monocotyledonous stem, from which the pith has completely rotted. Externally it is covered with Hydroid hydrorhiza and three flat disc-like chitinous capsules, probably egg-capsules of a Gastropod mollusc.

Distribution.—Natal coast, on sea-weed.

Family MUNNOPSISIDAE.

Hansen, 1916, *Dan. Ingolf Exp.* III, 5, Crust. Malacostr. 3.

Remarks.—Hansen divides the Asellota into a number of Groups (e.g., Eurycopini, p. 129) and does not use family names.

Eurycope G. O. Sars.

Stephensen, 1913, *Vid. Medd. Naturh. For. Copenhagen* LXIV, p. 99 (*Munneurycope*).

Id., 1915, *Rep. Dan. Ocean Exp.* II D. 1, p. 23 (*Munneurycope*).

Hansen, 1916, *l.c.*, p. 137.

Barnard, 1920, *Ann. S. Afr. Mus.* XVII, p. 420 (references).

Eurycope murrayi (Wlkr.).

Walker, 1903, *Ann. Mag. Nat. Hist.* (7) XII, p. 227, pl. xviii, figs. 1-6 (*Munnopsis m.*)

Tattersall, 1905, *Fish. Irel. Sci. Invest.* 1904, pp. 24, 73, pl. v, fig. 8 (mandible) (*Munnopsis m.*).

Vanhöffen, 1914, *Deutsch Südpol. Exp.* XV, p. 581 (*Munnopsis m.*).

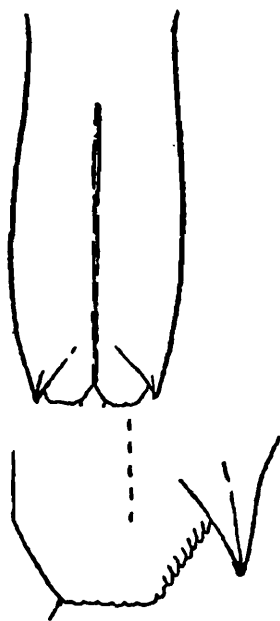
Stephensen, 1915, *l.c.*, p. 23, figs. 12, 13 (*Munneurycope tjalfiensis*).

Hansen, 1916, *l.c.*, p. 137, pl. xii, figs. 7a, b (mxp. plp. 2 ♂).

Locality.—St. 462A, 9° 8' N. 87° 25' E. (Bay of Bengal). 1 ♂, 2 non-ovig. ♀♀, ca. 6-7 mm.

Remarks.—The specimens are mutilated, the antennae and peraeopods being missing except the basal joints, and show no trace of dark colouration.

The mandibles and other details, however, leave no doubt that the specimens belong to this or a very closely allied species. Compared with Stephensen's figures there are two differences: the 1st pleopods ♂, of which a figure is given here, and the uropods. The latter are more elongate than in Stephensen's figure, the ramus being $4\frac{1}{2}$ times



TEXT-FIG. 18.—*Eurycope murrayi* (Wlkr.). 1st pleopods ♂, with apex of one lobe further enlarged.

the length of peduncle; no outer ramus is traceable in any of our specimens. These two features, if constant, might well characterize a

distinct species, but I do not propose to base a new species on the present material. Moreover Vanhöffen has recorded Walker's species from the Southern Indian Ocean, without however, giving any details. His material should be re-examined to see whether there is any variation in the two characters mentioned above.

The maxillipeds agree with Hansen's figure.

The character of the uropods seems to me to be a good reason for not including this species in the genus *Eurycope*, as Hansen has done, but on the contrary for accepting Stephensen's genus. In this respect it bears considerable resemblance to *Paramunnopsis*, a genus which Hansen places in a different group (Munnopsini).

Distribution.—North Atlantic (Walker, Tattersall, Stephensen); Middle and South Atlantic, Southern Indian Ocean (Vanhöffen).

Family LIGIIDAE.

Ligia Fabr.

van Name, 1925 *Zoologica*, VI, p. 497.

Barnard, 1932, *Ann. S. Afr. Mus.* XXX, p. 184 (references)

Ligia exotica Roux.

Stebbing, 1904, *Fauna Geogr. Mald. Laccad.* II, p. 718.

Id., 1905, *Herdman's Ceylon Pearl Fish. Suppl. Rep.* XXIII, p. 57.

Chilton, 1916, *Mem. Ind. Mus.* V, p. 462, figs. 1-22.

Tattersall, 1921, *Mem. Asiat. Soc. Bengal*, VI, p. 430.

Jackson, 1922, *Proc. Zool. Soc. Lond.*, p. 693, pl. ii, fig. 10.

Chilton, 1924, *Mem. Ind. Mus.*, V, p. 894.

Id., 1926, *Rec. Ind. Mus.*, XXVIII, p. 185.

Jackson, 1927, *Ann. Mag. Nat. Hist.* (9), XIX, p. 134.

Id., 1927, *Insects Samoa, Brit. Mus.*, pt. 8, p. 11.

Id., 1931, *Res. Sci. Voy. Ind. Or. Neerland.* III, 9, p. 4.

Barnard, 1932, *l.c.*, p. 192, figs. 1b, 2d, 3c.

Localities.—

3968 Off Godavari (Sacraments mouth), 6 fathoms. 1 ♂
10 28 mm., 4 ♀♀.

St. 503, Elphinstone Is., Mergui Archipelago. 1 ♂, 2 juv. ♂♂,
5 juv. (probably ♀♀).

St. 560, Parker Island, Mergui. 1 juv. ♂, 1 juv.

St. 571, Jack and Una Islands, Mergui. 2 juv. ♂♂, 2 juv.
(probably ♀♀).

St. 625, Nancouri Harbour, Nicobars. 1 juv. ♂.

Remarks.—The stylet on pleopod 2 of the juvenile ♂ is somewhat different from that of the adult (figured by Chilton, 1916, and Barnard, 1932), being subapically geniculate and sharply pointed. The largest specimen showing this feature is 18 mm. in length, the smallest 12 mm.

The specimens from Godavari were in the same tube with one *Nerocila sundaica*. As it is extremely unlikely that *Ligia* should be captured at a depth of 6 fathoms, some error in labelling must be presumed to have occurred.

Distribution.—Although widely distributed on the warmer shores of the Indo-Pacific Ocean (and Atlantic), there do not seem to be any actual records from India except the Chilka Lake record (Chilton).

Family DETONIDAE.

(SCYPHACIDAE auct.)

Barnard, 1932, *l.c.*, p. 219, (with key to genera).

Remarks.—The diagnosis of the family must be slightly emended to include the following new genus, *viz.*, flagellum of 2nd antenna 3-4-jointed, or *multiarticulate*. Inner plate of 1st maxilla *usually* with 2 plumose setae.

Camorta, gen. nov.

Closely allied to *Scyphacella* S. I. Smith (see Richardson, 1905, *Bull. U. S. Nat. Mus.*, No. 54, p. 671).

Eyes rather small, subcircular, ocelli 6-7.

Pleon abruptly narrower than peraeon; telson very short, laterally overlapped by hind corners of 5th pleon segment.

Flagellum of 2nd antennae multiarticulate.

Mandible with an elongate seta in place of the molar (appearing like a single seta under a low power, but really composed of 3-4 setae graduated in length). Maxilla 1, outer plate with 4 apical spines, which are blunt and somewhat recurved; inner plate apically acute, with a few fine setules. Maxilla 2 slender and apically setose, without apical notch. Maxilliped resembling those of the other genera of the family, rather than the figure given in Richardson (*l.c.*, fig. 712 *b*), epipod only half as long as 2nd (basal) joint, which is shortly produced at outer apex.

Peraeopods alike, without special armature in ♂.

Pleopods without air-cavities.

Uropods exposed, outer ramus longer than peduncle, inner ramus attached near base.

Remarks.—At once distinguished from all the other genera by the multiarticulate flagellum of 2nd antenna. This feature and the abruptly narrowed pleon give the animal a resemblance to a *Ligia*, though the general shape of the body is more like that of a *Philoscia*.

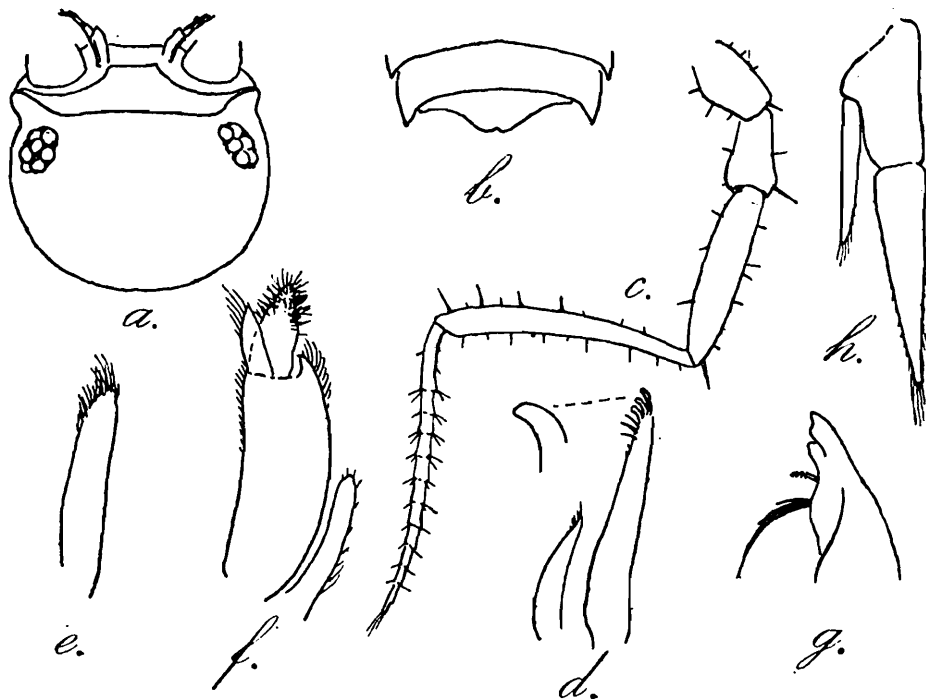
If the figures given in Richardson (*l.c.*, fig. 710 is stated to be "after Harger", but the other figures are not thus qualified) are correct, the present form has a more normal shape; but there would probably be a close resemblance in the outer plate of 1st maxilla if the fig. 712 *c* of that of *Scyphacella* had not been so diagrammatically sketched.

Camorta nicobarica, sp. nov.

Locality.—St. 619, Camorta Is., Nicobars, (west of jetty). 1 ♂, 5.3 mm., 1 non-ovig. ♀ 5 mm.

Description.—Surface smooth, minutely shagreened, glabrous. The slightly raised frontal line extending laterally on to the antero-lateral angles. Eyes rather small, subcircular, with 6-7 ocelli. Epimera not demarcated. Pleon segments with short postero-lateral points. Telson very short, sub-triangular, but apex rather broadly rounded, with a minute median indent.

Antenna 1, 1st joint rather elongate, 2nd and 3rd much shorter and narrower, the latter with apical tuft of setae. Antenna 2 reaching back nearly to end of 6th peraeon segment, flagellum *ca.* 12-jointed.



TEXT-FIG. 19.—*Camorta nicobarica*, gen. et sp. nov. a. dorsal view of head. b. 4th and 5th pleon segments and telson. c. 2nd antenna. d. maxilla 1, with apical spine further enlarged. e. maxilla 2. f. maxilliped. g. apex of mandible. h. uropod.

Mandibles alike on both sides, a single penicil between the secondary cutting-plate and the long composite seta. Maxilla 1, outer plate with 4 somewhat recurved apical spines, and 3-4 slender spine-setae.

Peraeopods closely resembling those of *Scyphax ornatus* as figured by Chilton (1901, *Tr. Linn. Soc. Lond.* VIII, pl. xv, fig. 1), most of the spines on lower margins of 4th-6th joints apically trifold.

Pleopods without noteworthy features. Uropod, see fig. 19h.

Colour (as preserved) greyish, with pale dorsal mottling, eyes black.

Family BOPYRIDAE.

Chopra, 1923, *Rec. Ind. Mus.* XXV, p. 411 seq.

Id., 1930, *ibid.*, XXXII, p. 113 seq.

Parathelges Bonnier.

Bonnier, 1900, *Trav. Stat. Zool. Wimereux*, VIII, p. 215.

Nierstrasz and Brandis, 1923, *Siboga Exp. Monogr.* XXXII, b, p. 104.

Id., 1931, *Vid. Medd. Dansk. Naturh. For.* XCI, p. 200.

Parathelges weberi Nierstr. & Brand.

Nierstrasz and Brandis, 1923, *l.c.*, p. 105. figs. 28 a-d.

Locality.— $\frac{2972}{7}$ Gt. Coco Is., Andamans. 1 ♀ 9 mm.

Remarks.—Host not recorded. *P. aniculi* (Whitel.) was found on the Hermit-crab *Aniculus*, and *whiteleggei* Nierstr. & Brand. on a *Pagurus*.

No parasites (see Nierstrasz & Brandis, 1923, *l.c.*, p. 116) in brood chamber.

Distribution.—East Indies (exact locality and host not recorded).