No. IX.—ON THE MYSIDACEA AND EUPHAUSIACEA COLLECTED IN THE INDIAN OCEAN DURING 1905.

By W. M. Tattersall, D.Sc., *Keeper of the Manchester Museum.*

(Plates **6** and **7**.)

(Communicated by Prof. J. Stanley Gardiner, M.A., F.R.S., F.L.S.)

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I am indebted to the courtesy of Professor Stanley Gardiner for the opportunity of examining the collection of Schizopoda, with which the following account deals, made by him in the Indian Ocean in the year 1905.

The collection is by far the largest individual one made in the Indian Ocean and is a valuable addition to our knowledge of the Schizopod fauna of that sea. It contains thirty-six species as against a total of thirty-two species, the sum of the results of previous observations on this group of Crustacea in that locality. Only ten of the species here recorded have hitherto been noted from the Indian Ocean so that the present collection adds twenty-six species to its fauna and brings the total number of species of Schizopoda known from these waters up to fifty-eight.

Much, however, still remains to be done, especially with regard to the *Mysidacea*, before the Schizopod fauna of the Indian Ocean can be said to be completely or even nearly elucidated. One had hoped that Professor Gardiner's collection would have thrown considerable light on the bottom living species of tropical *Mysidacea* but it contained only one specimen, of a known species, of forms which fall into that category*.

Of pelagic *Mysidacea* the *Sealark* captured fourteen species, two of which are new to science and belong to two genera recently instituted by Hansen for *Siboga* specimens. Of the remainder, four are known only from the *Siboga* material while a fifth has hitherto only been captured by the *Valdivia* expedition, naturally enough in the same locality as by the *Sealark*.

As regards the *Euphausiacea*, Professor Gardiner was distinctly more successful. In all twenty-two species were collected, a number which compares very favourably with the total of twenty-five taken by the *Siboga* expedition.

* [We intentionally ran most of our dredgings on the edges of the banks we visited, while on their surfaces we were particularly investigating upgrowing banks. The ground was generally rough and unsuitable for catching *Mysidacea*. Our dredges also were built so as to bite deeply into the ground. In spite of these facts I cannot understand the absence of *Mysidacea* unless they are really scarce on these oceanic coral banks. J. Stanley Gardiner.]

The Schizopod fauna of the Indian Ocean as evinced by the present collection presents no very marked characteristics. No fewer than fourteen of the species of *Euphausiacea* are common to both the Atlantic and Pacific Oceans. Of the remaining eight, two, *Stylocheiron elongatum* and *Euphausia hemigibba* are known only from the Atlantic and Indian Oceans while the remaining six are Pacific forms. Of the *Mysidacea*, the species of *Gnathophausia* and *Eucopia* and *Euchætomera typica* are bathypelagic species of wide distribution and the surface form, *Siriella thompsoni*, has also an extensive range in the tropical and subtropical waters of the globe. *Siriella gracilis* is, up till now, exclusively a Pacific species while the remainder are known only from one or two records, all in the Pacific or Indian Oceans, so that their geographical range cannot yet be said to be known.

In the preparation of this report I have received much valuable help from my friend Dr H. J. Hansen. Through his courtesy I was allowed to see an advance proof of his *Siboga* report and thereby saved the trouble of describing several new species therein described and enabled to work over my collections with his latest views before me. Evidence of the debt I owe to Dr Hansen will be found on almost every page of this report and I wish to express to him my best thanks.

Order MYSIDACEA.

Sub-order LOPHOGASTRIDA.

Family **Lophogastridæ**.

Genus Lophogaster, M. Sars.

1. *Lophogaster typicus*, M. Sars, var.

*Station**. South of the Saya de Malha Banks, 145 fms., one ovigerous female, 20 mm.

I have compared this specimen with British examples of the species and find the following small points of difference :—

(1) The median-dorsal area of the carapace is finely punctate but there is an entire absence of the coarser tubercular granules characteristic of northern specimens.

(2) The median fork of the rostral plate is the same length as the lateral forks whereas in British specimens it is slightly longer.

(3) The rostral plate covers the greater part of the cornea of the eyes so that the latter are much more hidden than in the more typical forms. It may also be noted, though the character has no special importance, that the pigment of the eyes in the present specimen is much paler than I have noticed in British examples of the species.

(4) The prominent lobe on the inner distal corner of the third joint of the antennular peduncle, is slightly serrate on the margin, instead of smooth.

* The Stations where the different species were caught will be found recorded in Trans. Linn. Soc. London, ser. 2, Zool., vol. xii. pp. 169—174.

There are six teeth, including the terminal one, on the outer margin of the antennal scale while the structure and armature of the telson agree exactly with the type. Having but one specimen from the Indian Ocean, I am unable to decide whether the small points of difference, noted above, are constant and thus deserving of varietal or even specific rank. The species has never before been recorded from the Indian Ocean but to judge from Ortmann's paper (1906) it has a very wide geographical distribution, practically world-wide in temperate and tropical seas. The localities given by Sars in his *Challenger* report and by Stebbing (1902), to the south of Cape Town, are the nearest to the Saya de Malha Banks at which the species has been captured. It should be mentioned that the present specimen has the ventral armature of the pleon, recently described by me (1909) for Mediterranean specimens. Hansen (1910) has confirmed my observations on a new species of the genus, *L. intermedia*, captured by the *Siboga* expedition in the waters round the Netherland East Indies. *Lophogaster* was the only bottom-haunting Schizopod captured by the *Sealark*.

Genus Gnathophausia, Will.-Suhm.

2. *Gnathophausia calcarata*, G. O. Sars.

G. calcarata, G. O. Sars, 1883.
G. calcarata, G. O. Sars, 1885.
G. bengalensis, Wood-Mason, 1891.
G. calcarata, Ortmann, 1906.

Station. N., near the Chagos Archipelago, 0—600 fms., one, 26 mm. from the eye to the apex of the telson.

The epimeral plate of the sixth segment of the pleon agrees in form with that figured by Ortmann (1906), pl. I., fig. 2*a*, for a specimen 42 mm. long. The rostrum measures 12 mm. from the level of the eyes to its apex. The postero-lateral spines of the carapace extend to the middle of the telson and the posterior median dorsal spine to the third segment of the pleon. The specimen is the smallest yet recorded for the species. *G. calcarata* is a widely distributed form in the Pacific Ocean but the present record is the most westerly one known for that ocean.

Family **Eucopiidæ.**

Genus Eucopia, Dana.

3. *Eucopia unguiculata* (Will.-Suhm).

Chalaraspis unguiculata, Will.-Suhm, 1875.
Eucopia australis (pars), G. O. Sars, 1885.
Eucopia unguiculata, Hansen, 1905 (2).
Eucopia unguiculata, Hansen, 1910.

Station. N., near the Chagos Archipelago, 0—600 fms., one, 20 mm.

I am not aware that this species has ever before been recorded from the Indian Ocean though known from the East Indian Archipelago and off the coasts of California. It is widely distributed in the Atlantic.

4. *Eucopia sculpticauda*, Faxon.

E. sculpticauda, Faxon, 1895.
E. sculpticauda, Hansen, 1905 (1).
E. intermedia, Hansen, 1905 (1).
E. sculpticauda, Hansen, 1910.

Station. aa, near Providence Island, 900 fms., one, 33 mm.

Alcock has recorded *E. sculpticauda* from the Indian Ocean. This is the only previous record for these waters known to me.

Sub-order MYSIDA.

Family **Mysidæ.**

Subfamily **Siriellinæ,** Norman.

Genus Siriella, Dana.

5. *Siriella thompsoni* (H. Milne-Edwards).

Cynthia thompsoni, Milne-Ed., 1837.
Siriella thompsoni, Hansen, 1910.

Station. n, north of the Saya de Malha banks, surface, three males, 6·5—8 mm., one female, 4·5 mm.

Hansen's paper, quoted above, should be consulted for the full synonymy of this form. To the list of synonyms I would add *S. edwardsi*, Paulson = *S. similis*, Czerniavsky.

6. *Siriella gracilis*, Dana.

S. gracilis, Dana, 1852.
S. gracilis, Sars, 1885.
S. gracilis, Hansen, 1910.

Stations. Q, Chagos Archipelago, surface, one female, 2 mm.; n, north of Saya de Malha banks, surface, five males, 7 mm., and one female, 4 mm.; dd, Alphonse Island, surface, one male, 7 mm.

7. *Siriella æquiremis*, Hansen, ?.

S. æquiremis, Hansen, 1910.

Stations. Q, Chagos Archipelago, surface, four females, 4—7 mm.; oo, Amirante Islands, surface, one female, 5 mm.

Hansen (*loc. cit.*) has described from the collections made by the *Siboga* expedition, no fewer than thirteen new species of the genus *Siriella* and has revised the genus on a sound basis. Unfortunately, however, species can only be satisfactorily determined from male specimens. As the material of the present species is represented by female specimens only, I am somewhat doubtful as to its correct determination, but from the general structure it seems to agree with *S. æquiremis*. Before receiving Hansen's paper

I had named these specimens *S. paulsoni*, Kossmann, and I am still inclined to think that when male specimens of the latter species are discovered, *S. æquiremis* will be found to be synonymous with *S. paulsoni*. None of the *Sealark* specimens are as large as the single specimen, recorded as *S. paulsoni*, from Ceylon by me (1906), but, otherwise, show the closest agreement with the latter. After several years' preservation, no trace of the distinctive colouration of *S. æquiremis*, mentioned by Hansen, can be discovered.

Genus HEMISIRIELLA, Hansen, 1910.

8. *Hemisiriella gardineri*, n. sp. (Plate **6**, figs. 1—5).

Stations. w, Farquhar Islands, surface, two males, immature, 6 mm.; oo, Amirante Islands, surface, one male, immature, 6 mm.

Form moderately slender.

Carapace not very short, laterally leaving only part of the last thoracic segment exposed, dorsally leaving the whole of the last and part of the penultimate segments of the thorax exposed; moderately produced anteriorly with the tip rounded.

Eyes rather small, pigmented area occupying less than half the whole eye.

Antennular peduncle (fig. 1) with the third joint about equal to the first and one and a half times as long as broad.

Antennal scale (fig. 1) about two and a half times as long as broad, reaching to about the middle of the third joint of the antennular peduncle, terminal lobe broader than long, about one-fifth of the entire length of the scale, terminal spine of the outer margin strong.

Antennal peduncle (fig. 1) as long as the scale, with the second joint almost three times as long as the third.

Third pair of thoracic limbs (fig. 3) without any transverse articulation on the sixth joint; dactylus distinct and slightly curved; terminal brush of setæ longer than the dactylus.

Fourth pair of thoracic limbs (fig. 4) extremely elongate, reaching when extended to the end of the antennular peduncle; sixth joint with a distinct articulation anterior to the middle; dactylus very rudimentary and hidden in the long terminal brush of setæ.

Pleopods in the male with the pseudobranchial rami on the second to fourth pairs spirally twisted and the endopods and exopods of the third and fourth pairs similar, without modified setæ.

Telson (fig. 5) a little longer than the last segment of the pleon and about three times as long as broad at its base; constricted somewhat near the base after which the margins converge gradually to a broadly rounded apex; at the constriction the lateral margins are armed by two rather long spines, then follows a short unarmed part of the lateral margins after which the latter bear about eighteen spines which are arranged distally in groups of five, four, three and five spines; terminal spines at the apex, the longest, about one-ninth of the total length of the telson; between the terminal spines there are three subequal spinules and a pair of plumose setæ.

Inner uropod (fig. 5) slightly longer than the outer, its inner margin armed with a row of spines, arranged more or less in groups and extending to the apex.

Outer uropod (fig. 5) with the terminal joint about one-fourth of the length of the proximal joint and about one and a half times as long as broad; outer margin of the proximal joint armed with seven spines which occupy considerably more than one-half of the margin, the proximal four very distantly placed, the terminal three situated at the junction with the terminal joint.

Length of male specimens, not quite mature, 6 mm.

Figs. 2, 3 and 4 on Plate **6** show the endopods of the second, third and fourth thoracic limbs magnified to the same scale and sufficiently explain these appendages.

The genus *Hemisiriella* was founded by Hansen for two species which differ from *Siriella* in the following points:—

(1) In having the carapace unusually short so that it leaves fully exposed, both laterally and dorsally, the last two segments of the thorax.

(2) In the comparative greater length of the third joint of the antennular peduncle.

(3) The small size of the antennal scale.

(4) In several small details in the structure of the mandibles.

(5) In having the third pair of thoracic limbs (first pair of thoracic legs according to the terminology adopted by Hansen, the first and second pair of thoracic limbs being called by that author maxillipede and gnathopod respectively) greatly elongated, with the dactylus very rudimentary and hidden in a brush of peculiar setæ.

It is with very great diffidence that I refer the present species to the same genus, for it agrees with *Hemisiriella* in only two of the above five points, viz. in the small size of the antennal scale and in the form of the mandibles.

As regards the last of the five points already mentioned, *H. gardineri* shows a remarkable feature. It has one of the thoracic limbs considerably elongated and exhibiting the same structure as in *H. parva* and *H. pulchra* but, instead of it being the third thoracic limb as in the latter two species, it is the fourth thoracic limb of *H. gardineri* which is thus elongated. I have been led to refer *H. gardineri* to the genus *Hemisiriella* mainly on its possession of an elongate thoracic limb, agreeing in its essential structure with those described for the genus though differing in position. It is quite probable that future observers may regard the difference in position of the elongate limb as of generic importance for it would appear to be an exactly parallel instance to that seen in the genera *Nematoscelis* and *Nematobrachion* among the *Euphausiacea*. Attention may be directed to Calman's remarks on the latter genera (Calman, 1905).

For the rest, *H. gardineri* resembles a true *Siriella* in the form of the carapace, antennular peduncle and telson. The species is sufficiently distinguished by the combination of characters presented by the uropods, antennal scale and thoracic limbs.

Subfamily, **Gastrosaccinæ**, Norman.

Genus GASTROSACCUS, Norman.

9. *Gastrosaccus indicus*, Hansen.

G. indicus, Hansen, 1910.

Stations. u, Farquhar Island, surface, one male, 7 mm.; v, Farquhar Island, surface, two females, 7 mm.; y, Providence Island, surface, one male, 7 mm.

Hitherto, only known from Hansen's records from the Netherland East Indies, where the types were captured by the *Siboga* expedition.

10. *Gastrosaccus parvus*, Hansen.

G. parvus, Hansen, 1910.

Stations. u, Farquhar Island, surface, one male, 6 mm.; x, Providence Island, surface, one male, 7 mm.

This species, also described in the first place from the *Siboga* collections, has a distribution coinciding with that of the last.

Subfamily **Leptomysinæ**, Norman.

Genus EUCHÆTOMERA, G. O. Sars.

11. *Euchætomera typica*, G. O. Sars.

E. typica, G. O. Sars, 1885.
E. limbata, Illig, 1906.

Stations. bb, near Providence Island, 0—140 fms., one female, 9 mm.; kk, Amirante Islands, 100 fms., one female, 9 mm.

I have already expressed the opinion (Tattersall, 1909), that *E. limbata*, Illig, would prove to be a synonym of *E. typica*, Sars, and, after an examination of actual specimens and a comparison of them with the type species, I am fully confirmed in my opinion. *E. limbata* is stated to differ from *E. typica* in the presence of a finger-like process on the eyes and in having an armature of small teeth on the anterior margin of the carapace. Both these supposed differences disappear on an examination of Sars' types, for the latter possess finger-like processes on the eyes and the armature of small teeth on the carapace. I would further note that both Sars' types and those in the present collection have the lateral posterior margins of the first four segments of the pleon and the entire posterior margin of the fifth and sixth segments of the pleon coarsely serrate.

The present specimens, though apparently sexually mature, are smaller than both Sars' and Illig's types.

E. typica has not before been recorded from the Indian Ocean.

12. *Euchætomera oculata*, Hansen.

E. oculata, Hansen, 1910.

Stations. p, near Farquhar Island, 600 fms., one female, 8 mm.; kk, Amirante Islands, 150 fms., one female, 8 mm.

These specimens are in substantial agreement with Hansen's recent description and I am convinced that they belong to the same species. But I am by no means certain that this form is distinct from *E. glyphiophthalma*, Illig. The only important difference in the published descriptions, is that the antennal scale of the latter species is described as four and a half times as long as broad while in *E. oculata* the scale is three and a half times as long as broad. Illig's figure does not agree exactly with his description, but brings the species much more into line with *E. oculata.*

Subfamily **Mysinæ.**

Genus Anisomysis, Hansen.

13. *Anisomysis bifurcata*, n. sp. (Plate **7**, figs. 1—6).

Stations. A, north of the Chagos Islands, 150 fms., one female, 3 mm.; v, Farquhar Island, surface, one male, 5·5 mm.; w, Farquhar Island, surface, one male, 5·5 mm.

Carapace covering all but the last thoracic segment; produced in front into a broad triangular plate with a pointed apex, which does not reach to the distal end of the first joint of the antennular peduncle.

Pleon with the first five segments sub-equal, sixth segment nearly twice as long as the fifth; at the ventral postero-lateral corners of each of the first five segments of the pleon there is a small blunt spine, those on the first segment being larger than any of the others.

Eyes rather large, pigment black.

Antennular peduncle (fig. 1) in the male with the terminal lobe large, longer than broad with the distal extremity considerably narrower than the proximal and slightly curved.

Antennal scale (fig. 2) barely over-reaching the antennular peduncle, about five times as long as broad, the second joint about one and a half times as long as broad; lanceolate in shape and setose all round.

Mouth parts and thoracic limbs agreeing essentially with those given in Hansen's definition of the genus, except that I was unable to make out any subjoints in the sixth joint (tarsus) of the third thoracic limb (the only one remaining in any of the specimens, after the first and second pair).

First, second, third and fifth pleopods in the male, rudimentary plates as in the female; fourth pair (fig. 5) reaching beyond the sixth segment of the pleon, to the level of the otocyst of the inner uropods, distal peduncular joint three times as long as broad, exopod with the first joint rather more than four times as long as the second, third joint twice as long as the latter, somewhat swollen at the extremity and bearing two terminal branches, the inner with a thickened basal part and a tapering terminal part adorned with setæ along both margins, outer branch unjointed, in the form of a long slender spine.

Telson (fig. 6) as long as the last segment of the pleon and two and a half times as long as broad at its base; very deeply cleft for more than one-third of its length, cleft very wide and unarmed, so that the distal part of the telson has the form of a two-pronged fork; lateral margins armed along the distal two-thirds of the margin with six spines, three of which are on the forks of the prong, the distal one at the tip.

Uropods long and slender, about one and a third times as long as the telson, the inner one very slightly longer than the outer, without spines on its inner ventral margin.

Length of an adult male, 5·5 mm.

I have been somewhat puzzled as to what genus this species should be referred to and after much hesitation I have placed it in the genus *Anisomysis*, Hansen, as being the one with which it agrees most closely in its main features. It differs in having the tarsus of the thoracic limbs apparently undivided and in the striking form of the telson. In having the outer terminal branch of the fourth pleopods in the male unjointed it also presents a small point of difference. But otherwise it agrees so closely with Hansen's type species, the only one known*, *A. laticauda*, that I have preferred to refer it to the same genus rather than erect a new one for its reception. The form of the telson will at once serve to distinguish it from all known Mysidæ.

Species of uncertain generic position.

14. "*Mysis*" *quadrispinosa*, Illig (Plate **6**, figs. 6, 7).

M. quadrispinosa, Illig, 1906.

Stations. I, north of the Chagos Islands, 500 fms., one female, 5 mm.; M, Chagos Islands, 75 fms., one female, 3 mm.

This species was described by Illig from a female captured at the Chagos Islands by the *Valdivia* expedition, and Illig rightly left its generic position unsettled till male specimens should be taken. The present specimens were captured in the same locality as Illig's type and appear to be the same species, but since both specimens are females and still immature, it has not been found possible to throw any light on its generic affinities. I am able, however, to add one or two particulars to Illig's brief description which will serve for the better elucidation of its characters.

The pleon is distinctly hispid all over and has the first five segments subequal in length, the sixth being almost twice as long as the fifth.

There does not seem to be any hispidity on the thorax. The carapace is produced into a short acutely pointed rostral projection which reaches about half way along the first joint of the antennular peduncle.

The antennal scale is slightly longer than the antennular peduncle and twice as long as its own. It is about six times as long as broad, narrowly lanceolate in shape, setose all round and having a small terminal joint. The outer distal corner of the joint from which the scale springs is produced into a short stout spine-like projection.

The telson (fig. 7) is only slightly shorter than the last segment of the pleon and twice as long as broad at its base. It is deeply cleft for two-fifths of its length, the cleft

* While this paper was in the press, two further species of *Anisomysis* have been described from Japan by Nakazawa (Ann. Zool. Japon., vol. vii. pt. iv. 1910). In both species the telson is described as entire and, as such, cannot be confused with the present species.

armed with a pair of plumose setæ at the apex and seven to ten small spines on each lateral margin. The tip of each lobe of the cleft bears three short stout spines and the lateral margins of the telson are armed along their distal half with seven small spines. The dorsal surface of the telson is somewhat deeply channelled in the median line.

The inner uropod is about once and two-thirds as long as the telson and is armed along its inner margin with ten long, rather stout spines, somewhat distantly set and not reaching to the apex. The outer uropods are a little longer than the inner.

Length of an immature female, 5 mm.

Illig makes no mention of the hispidity of the pleon or of the spines arming the inner uropod, and the shape of the telson as he depicts it is somewhat different from that shown in fig. 7, but I have little doubt that the two forms belong to the same species.

Order EUPHAUSIACEA.

Family **Euphausiidæ.**

Genus Thysanopoda, H. Milne-Edw.

15. *Thysanopoda tricuspidata*, H. Milne-Edw.

Stations. D, surface, two, 5 and 5·5 mm.; P, 20 fms., twelve, 7—11 mm.; Q, surface, twenty; a, 150 fms., one, 5 mm.; e, 300 fms., one, 10 mm.; n, surface, ten; q, 1000—0 fms., two, 10 and 12 mm.; s, 250—0 fms., five, 5—15 mm.; dd, surface, thirteen; ll, 750 fms., one, 17 mm.

16. *Thysanopoda æqualis*, Hansen.

T. æqualis, Hansen, 1905.
T. æqualis, Tattersall, 1909.
T. æqualis, Hansen, 1910.

Stations. C, 1200—0 fms., eight, 8—16 mm.; L, 75 fms., one, 15 mm.; N, 600—0 fms., two, 12 mm.; O, 180—0 fms., one, 8 mm.; Q, surface, one, 13 mm.; c, 300 fms., one, 9 mm.; p, 600 fms., one; q, 1000—0 fms., four, 12—17 mm.; r, 500—250 fms., one, 16 mm.; s, 250—0 fms., two, 14 and 16 mm.; s, 750—500 fms., two, 12 and 16 mm.; aa, 900—0 fms., two, 12 and 13 mm.; ll, 750 fms., four, 13—16 mm.

I have nothing to add to Hansen's description of this species, with which these specimens are in perfect agreement. It is very closely allied to *T. obtusifrons*, G. O. Sars, from which it is distinguished by the shape of the antennular lobe and the structure of the copulatory organs of the first pleopods in the male. I would point out that both species have the telson armed dorsally with two rows of many spines, which, when broken off, have the appearance of two serrated keels. Sars has described this character for *T. obtusifrons*, and it serves as a ready means of distinguishing these two forms from their allies.

17. *Thysanopoda monacantha*, Ortmann (Plate 7, fig. 8).

T. monacantha, Ortmann, 1893.
T. agassizii, Ortmann, 1894.

T. agassizii, Hansen, 1910.
T. monacantha, Hansen, 1911.

Stations. C, 1200—0 fms., two, 20 mm.; q, 1000—0 fms., three, 12—19 mm.; s, 750—500 fms., one, 23 mm.; ll, 750 fms., eighteen, 13—28 mm.; mm, 400 fms., fifteen, 17—24 mm.; nn, 200 fms., three, 24 mm.

I had already named these specimens as *T. monacantha*, Ortmann, when I received Hansen's report on the *Siboga* collections. In this report Hansen had regarded *T. monacantha* and *T. agassizii* as distinct though very closely allied forms, but in his most recent paper (1911) he has arrived at the conclusion that their separate specific identity cannot be maintained. With this conclusion, I am in entire agreement. I give (fig. 8) a figure of the copulatory apparatus on the first pleopod of the largest male in the collection. Dr Hansen has seen this figure and is inclined to think that the specimen from which it was taken is immature.

18. *Thysanopoda microphthalma*, G. O. Sars.

T. microphthalma, Sars, 1885.
T. distinguenda, Hansen, 1905.
T. distinguenda, Holt and Tattersall, 1906.
T. microphthalma, Hansen, 1910.

Stations. s, 500—750 fms., one female, 18 mm.; ll, 750 fms., one female, 31 mm.; mm, 400 fms., four females, 20—27 mm. and one male (immature), 20 mm.

The only male specimen is immature so that the structure of the copulatory organs cannot be ascertained. This renders the identification of the species very uncertain. I have very carefully compared these specimens with Atlantic representatives of *T. microphthalma* and I am unable to find any appreciable differences between them. But I cannot overlook the possibility that the *Sealark* forms may be *T. orientalis*, Hansen, a species very closely allied to *T. microphthalma* and only distinguishable by the structure of the first pair of pleopods in the male.

19. *Thysanopoda pectinata*, Ortmann (Plate 7, fig. 7).

T. pectinata, Ortmann, 1893.
T. pectinata, Hansen, 1905 (2).
T. ctenophora, Illig, 1908 (1) (*fide* Illig, 1908 (2)).
Parathysanopoda foliifera, Illig, 1909.
T. pectinata, Hansen, 1911.

Stations. N, 600—0 fms., one female, 18 mm.; ll, 750 fms., one male, 33 mm.

I had already named these specimens as *T. pectinata*, Ortmann, when Hansen's report on the *Siboga* collections came to hand. On consulting him with reference to these specimens, he told me that he believed they represented a new form, distinguished from *T. pectinata* by the somewhat longer and more acute rostrum. In his recent paper (1911), however, he has expressed the opinion that the Pacific and Atlantic forms are specifically inseparable. This confirms my earlier conclusions as to the name to be attached to the *Sealark* specimens.

I append a brief description of my specimens and give a figure of the copulatory apparatus on the first pleopods of the male.

Carapace without lateral denticles and gastro-hepatic groove; produced in front as a triangular plate with the terminal angle slightly less than 90°, the apex pointed and very slightly upturned, reaching about half-way up the basal joint of the antennular peduncle and not as far forward as the eyes; the anterior third of the carapace is adorned in the mid-dorsal line by a low keel which does not reach the apex of the rostral plate and in front of which is a median depression which latter is produced laterally for a little way on each side of the keel.

Antennular peduncle with a rather long slender spine on the outer corner of the basal joint; the lobe from the inner corner of the basal joint is in the shape of a quadrangle with the outer distal corner produced slightly outward and forward, the anterior margin being straight or lightly concave, and deeply serrate or pectinate, with about twelve or thirteen spiniform teeth; the lobe proceeds from the usual raised hispid cushion, extends for rather more than half-way up the second joint of the antennular peduncle and is less than half the width of the basal joint at its base but considerably more than half the width of the second joint at its distal margin; the lobe from the inner corner of the second joint of the antennular peduncle is rather large, sub-quadrangular in shape, without spine or process.

The antennal scale reaches about half-way up the third joint of the antennular peduncle; the basal ventral spine is about one-third of the length of the scale, long, slender and smooth.

The telson has two pairs of dorsal denticles and the inner uropod reaches to the apex of the telson, the outer uropod being somewhat longer.

The figure (fig. 7) will best explain the structure of the copulatory apparatus on the first pleopod of the male. The nomenclature of the parts is that suggested by Hansen. A spine-shaped process, p^1, is present. The terminal process, p^2, is somewhat stout, reaching to the base of p^4, and widening distally into more or less spatulate form. The proximal process, p^3, is about as long as p^2, sickle shaped, sharply pointed at the tip and having a stout tooth or heel on the inner side of the first curve.

Genus Euphausia, Dana.

20. *Euphausia mutica*, Hansen.

E. pellucida (pars), G. O. Sars, 1885.
E. mutica, Hansen, 1905.
E. mutica, Tattersall, 1906.
E. mutica, Hansen, 1910.

Stations. C, 1200—0 fms., two; D, surface, four; F, surface, three; H, surface, two; L, 75 fms., two; N, 600—0 fms., sixteen; O, 180—0 fms., one; P, 20 fms., twenty-one; Q, surface, thirteen; c, 225 fms., four, 250 fms., seven, 275 fms., sixteen, 300 fms., fifteen; d, surface, two; e, 300 fms., four; k, 100 fms., one; n, surface, one; o, surface, one; q, 1000—0 fms., seven; r, 500—250 fms., one; s, 250—0 fms., six, 750—0 fms., one;

u, surface, three; v, surface, two; w, surface, two; y, surface, four; aa, 900—0 fms., twelve; bb, 140—0 fms., four; ee, surface, ten; gg, surface, eight; hh, surface, seven; kk, 250 fms., twenty-four, 300 fms., thirteen; ll, 750 fms., eighteen; mm, 400 fms., sixteen; nn, 200 fms., twenty-nine.

21. *Euphausia similis*, G. O. Sars.

E. similis, G. O. Sars, 1883.
E. similis, G. O. Sars, 1885.
E. similis, Hansen, 1910.

Stations. C, 1200—0 fms., seven; F, 50 fms., one, 100 fms., one, 150 fms., one; N, 600—0 fms., twelve; p, 500 fms., three; q, 1000—0 fms., seven; s, 250—0 fms., five, 750—500 fms., three; aa, 900—0 fms., ten; kk, 250 fms., three; ll, 750 fms., nineteen; mm, 400 fms., four; nn, 200 fms., fifteen.

These specimens belong to the var. *crassirostris* described by Hansen (1910).

22. *Euphausia hemigibba*, Hansen.

E. hemigibba, Hansen, 1910.

Stations. C, 1200—0 fms., ten; N, 600—0 fms., one male, two females; c, 225—300 fms., three males, four females; s, 750—500 fms., one male; y, surface, two males; ll, 750 fms., two; mm, 400 fms., one male, one female.

Hansen (1910) has lately divided the species *E. gibba* into four species, mainly on the structure of the copulatory organs on the first pleopods in the male. Females are extremely difficult or almost impossible to name accurately but from an examination of every male of the *gibba* group in this collection it appears that only two species of the group, this and the following one, are represented.

I should mention that the specimens recorded by me from the Mediterranean (1909) as *E. gibba* are in the light of Hansen's work really referable to this form.

23. *Euphausia paragibba*, Hansen.

E. paragibba, Hansen, 1910.

Stations. C, 1200—0 fms., eighteen; L, 125 fms., one male; N, 600—0 fms., five males, five females; Q, surface, two males; p, 600 fms., three; q, 1000—0 fms., two males, one female; r, 500—250 fms., one male, two females; s, 250—0 fms., one female, 750—500 fms., two males; v, surface, one male; y, surface, seven males; kk, 300 fms., two males, one female; ll, 750 fms., thirty-two; mm, 400 fms., five males, three females; nn, 200 fms., seven males, two females.

This species, a Pacific form according to Hansen, is evidently much more abundant in the Indian Ocean than the last species, an Atlantic form.

24. *Euphausia tenera*, Hansen.

E. gracilis, G. O. Sars, 1883.
E. gracilis, G. O. Sars, 1885.
E. tenera, Hansen, 1905.

E. tenera, Hansen, 1910.
nec *E. gracilis*, Dana, 1852.

Stations. C, 1200—0 fms., five; D, 120 fms., one; F, 100 fms., two, 150 fms., three; L, 75 fms., one, 125 fms., one; N, 600—0 fms., four; O, 180—0 fms., two; P, 20 fms., two; Q, surface, seventeen; c, 275—300 fms., five; n, surface, one; p, 500 fms., one; q, 1000—0 fms., one; s, 250—0 fms., forty-eight, 500—750 fms., one; v, surface, one; y, surface, one; aa, 900—0 fms., three; kk, 250—300 fms., three; mm, 400 fms., two; nn, 200 fms., four.

Genus PSEUDEUPHAUSIA, Hansen.

Euphausia (pars), Sars, 1885.
Euphausia, Stebbing, 1905.
Euphausia (pars), Tattersall, 1906.
Pseudeuphausia, Hansen, 1910.

25. *Pseudeuphausia latifrons* (G. O. Sars).

Euphausia latifrons, G. O. Sars, 1883.
Euphausia latifrons, Sars, 1885.
Euphausia latifrons, Stebbing, 1905.
Euphausia latifrons, Tattersall, 1906.
Euphausia latifrons, Hansen, 1908.
Pseudeuphausia latifrons, Hansen, 1910.

Station. k, 100 fms., one, 5 mm., 300 fms., one, 7 mm.

In 1905 Stebbing pointed out that specimens of this species from near the Cape of Good Hope possessed a lateral denticle on the carapace. In the next year I was able to confirm this observation for specimens from Ceylon and I also pointed out that the leaflet on the antennular peduncle did not agree exactly with Sars' figures. I gave a figure of the antennular leaflet and mentioned the fact that my observations had been confirmed by examination of the type specimens, kindly done for me by Dr W. T. Calman. Hansen (1908) confirmed my description of the antennular leaflet and in 1910 gave a full description of the species, with figures, in the course of which he refers it to a new genus, *Pseudeuphausia*, differing from *Euphausia* mainly in the aberrant condition of the copulatory organs on the first pleopod of the male.

Genus NEMATOSCELIS, G. O. Sars.

26. *Nematoscelis microps*, G. O. Sars.

N. microps, G. O. Sars, 1883.
N. microps, G. O. Sars, 1885.
N. rostrata, G. O. Sars, 1885.
N. microps, Hansen, 1905.
N. microps, Tattersall, 1906.
N. microps, Hansen, 1910.

Stations. A, 50 fms., ten, 75 fms., two, 125 fms., one; B, 50 fms., four; C, 1200—0 fms., five; F, 150 fms., one; L, 50 fms., one; N, 600—0 fms., seventeen; P, 20 fms., one; e, 300 fms., one, 400 fms., one; p, 200 fms., one, 400 fms., one, 500 fms., five, 600 fms., six, 800 fms., two; q, 1000—0 fms., seventeen; r, 500—250 fms., three; s, 250—0 fms., nine, 750—500 fms., six; u, surface, three; v, surface, three; w, surface, one; aa, 900—0 fms., three; bb, 140—0 fms., two; kk, 250 fms., two, 300 fms., four; ll, 750 fms., twelve; mm, 400 fms., nine; nn, 200 fms., ten.

27. *Nematoscelis gracilis*, Hansen.

N. gracilis, Hansen, 1910.

Stations. F, 50 fms., two; N, 600—0 fms., two; q, 1000—0 fms., five; s, 250—0 fms., one, 750—500 fms., one; aa, 900—0 fms., three; ll, 750 fms., three; mm, 400 fms., three.

28. *Nematoscelis tenella*, G. O. Sars.

N. tenella, G. O. Sars, 1883.
N. tenella, G. O. Sars, 1885.
N. tenella, Hansen, 1905.
N. tenella, Hansen, 1910.

Stations. L, 50 fms., one; N, 600—0 fms., three; O, 180—0 fms., one; a, 50 fms., six, 100 fms., one; p, 500 fms., one, 800 fms., three; q, 1000—0 fms., three; r, 500—250 fms., one; s, 250—0 fms., two, 750—500 fms., one; aa, 900—0 fms., four; kk, 300 fms., two; ll, 750 fms., two; mm, 400 fms., one; nn, 200 fms., eight.

Genus NEMATOBRACHION, Calman.

29. *Nematobrachion boöpis* (Calman).

Nematodactylus boöpis, Calman, 1896.
Nematobrachion boöpis, Calman, 1905.
N. boöpis, Holt and Tattersall, 1905 and 1906.
N. boöpis, Hansen, 1905.

Stations. N, 600—0 fms., one, 18 mm.; k, 300 fms., one, 9 mm.; kk, surface, one, 10 mm.

30. *Nematobrachion flexipes* (Ortmann).

Stylocheiron flexipes, Ortmann, 1893.
Nematodactylus flexipes, Calman, 1896.
Nematobrachion flexipes, Hansen, 1905.

Stations. e, 400 fms., one, 11 mm.; k, 250 fms., one, 9 mm.

Calman (1896) was the first to suggest that the *Stylocheiron flexipes* of Ortmann should be referred to his genus *Nematodactylus* (since changed to *Nematobrachion*). Hansen, in 1905, confirmed Calman's suggestion after examining specimens in the Copenhagen Museum.

I am not aware of any records of this form subsequent to Ortmann's original ones from the northern part of the South Atlantic. The present records, therefore, indicate a wide increase in its horizontal distribution and are the first from the Pacific Ocean.

Genus Stylocheiron, G. O. Sars.

31. *Stylocheiron carinatum*, G. O. Sars.

S. carinatum, G. O. Sars, 1883.
S. carinatum, G. O. Sars, 1885.
S. carinatum, Hansen, 1910.

Stations. A, 75 fms., eight, 125 fms., two; B, 100 fms., one; C, 1200—0 fms., eighteen; D, surface, one; F, 150 fms., three; H, surface, three; L, 50 fms., one, 75 fms., two; M, 25 fms., thirteen, 75 fms., four; P, 20 fms., seven; Q, surface, three; a, 25 fms., twenty-one, 50 fms., two, 75 fms., two, 100 fms., one, 150 fms., two; c, 250 fms., four, 275 fms., five, 300 fms., four; d, surface, one; e, 50 fms., one; s, 250—0 fms., six; w, surface, two; bb, 140—0 fms., four; gg, surface, one; kk, surface, one; ll, 750 fms., one; mm, 400 fms., one; nn, 200 fms., one.

32. *Stylocheiron suhmi*, G. O. Sars.

S. suhmi, G. O. Sars, 1883.
S. suhmi, G. O. Sars, 1885.
S. suhmi, Hansen, 1910.

Stations. A, six; B, four; C, 1200—0 fms., three; F, 50 fms., one, 150 fms., one; L, 75 fms., three; M, 25 and 75 fms., one; N, 600—0 fms., one; a, eight; c, 275—300 fms., four; e, 50 fms., three; k, 200 fms., one; p, 200—500 fms., three; s, 250—0 fms., six; u, surface, one; bb, 140—0 fms., four, hand-net, surface, one.

33. *Stylocheiron longicorne*, G. O. Sars.

S. longicorne, Sars, 1883.
S. longicorne, Sars, 1885.
S. longicorne, Hansen, 1910.

Stations. A, two; B, two; C, 1200—0 fms., one; F, 150 fms., one; I, 500 fms., one; M, 25 and 75 fms., two; a, one; c, 275—300 fms., three; e, 200 fms., one; k, 250 fms., one, 300 fms., five; p, 500 fms., two; bb, 140—0 fms., two; kk, surface, one; ll, 750 fms., two; mm, 400 fms., one.

34. *Stylocheiron microphthalma*, Hansen.

S. microphthalma, Hansen, 1910.

Stations. A, seven; B, one; F, 50 fms., two; M, 25 and 75 fms., eight; a, one; c, 275—300 fms., one; s, 250—0 fms., four; gg, surface, one.

35. *Stylocheiron abbreviatum*, G. O. Sars.

S. abbreviatum, G. O. Sars, 1883.
S. abbreviatum, G. O. Sars, 1885.
S. chelifer, Chun, 1896.
S. abbreviatum, Hansen, 1910.

Station. kk, 100 fms., one, 9 mm.

36. *Stylocheiron elongatum*, G. O. Sars.

S. elongatum, G. O. Sars, 1883.
S. elongatum, G. O. Sars, 1885.
S. elongatum, Hansen, 1905.
S. elongatum, Holt and Tattersall, 1906.

Stations. C, 1200—0 fms., one, 10 mm.; c, 300 fms., two, 8·5 and 9 mm.; k, 300 fms., one, 10 mm.; s, 250—0 fms., one, 10 mm.

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EXPLANATION OF PLATES 6 AND 7.

PLATE 6.

Fig. 1. *Hemisiriella gardineri*, Tattersall, male, antennular peduncle, antennal scale and peduncle. × 68.

Fig. 2. Same, endopod of the second thoracic limb. × 68.

Fig. 3. Same, endopod of the third thoracic limb. × 68.

Fig. 4. Same, endopod of the fourth thoracic limb. × 68.

Fig. 5. Same, telson and uropods. × 68.

Fig. 6. "*Mysis*" *quadrispinosa*, Illig, female, dorsal view of anterior end. × 68.

Fig. 7. Same, telson. × 21.

PLATE 7.

Fig. 1. *Anisomysis bifurcata*, Tattersall, male, dorsal view of anterior end. × 68.

Fig. 2. Same, antennal scale and peduncle. × 68.

Fig. 3. Same, endopod of the second thoracic limb. × 68.

Fig. 4. Same, endopod of the third thoracic limb. × 68.

Fig. 5. Same, fourth pleopod. × 68.

Fig. 6. Same, telson. × 68.

Fig. 7. *Thysanopoda pectinata*, Ortmann, copulatory organs on first pleopod of male. × 21.

Fig. 8. *Thysanopoda monacantha*, Ortmann, copulatory organs on first pleopod of male. × 68.

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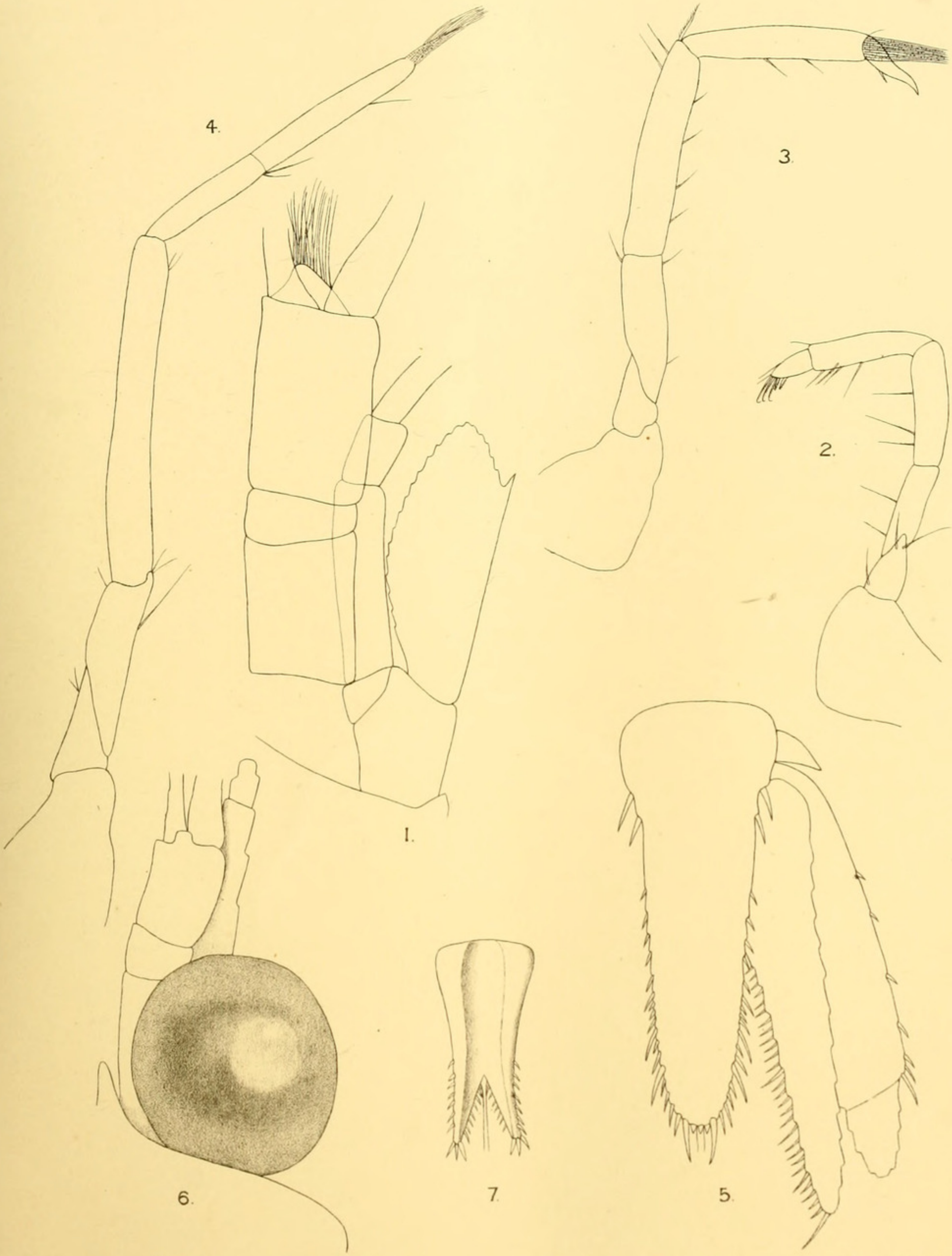

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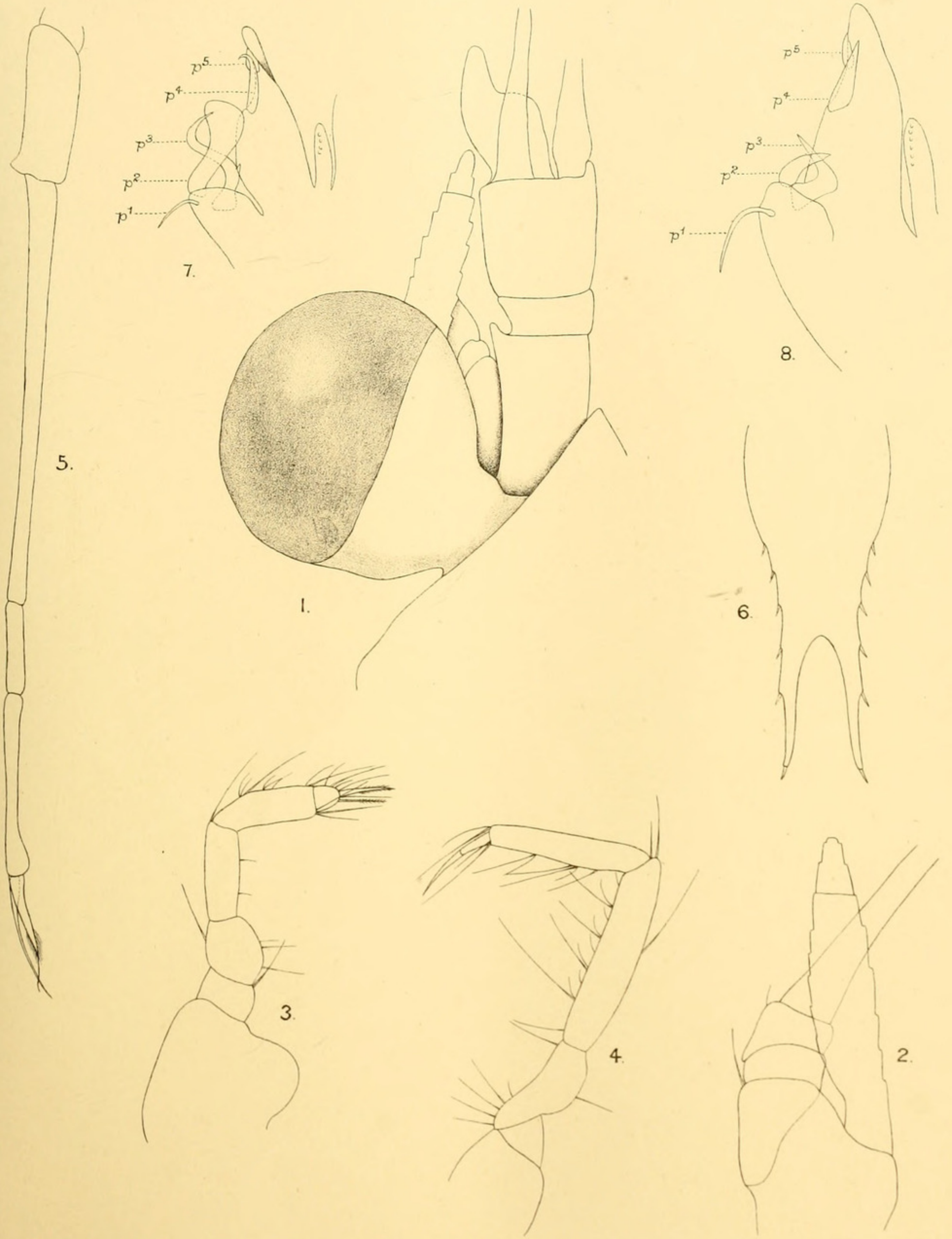
CRUSTACEA FROM THE INDIAN OCEAN.



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