

NOTES ON THE SURFACE COPEPODA OF THE
GULF OF MANNAR.

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(With five Plates and one Map.)

THE collections on which the following notes are based are two in number. The first of these is a very extensive one from the Ceylon pearl banks and neighbouring waters. This collection was made by Mr. T. Southwell during the years 1906-09, when he was Scientific Adviser to the Ceylon Pearl Fishery Syndicate, and comprises 326 samples; at the time when the Syndicate ceased its operations, this collection was handed over to Dr. J. Pearson, the Director of the Colombo Museum, and I have to thank him for entrusting it to me for examination. The second collection was made by Mr. S. W. Kemp, of the Indian Museum, during the month of February, 1913, at Paumben and Kilakarai on the south coast of India. The collections proved to be exceedingly rich, containing in all 87 species and varieties, of which five are new to science, namely, *Acrocalanus similis*, *Scolecithricella pearsoni*, *Centropages trispinosus*, *Acartia southwelli*, *Acartiella kemp*i, gen. nov.; and in addition I am able to record the occurrence of the following hitherto unknown forms:—*Eucalanus mucronatus*, ♂; *Labidocera pavo*, ♂; *Acartia amboinensis*, ♀; *Tortanus forcipatus*, ♂.

In the accompanying table I have given a complete list of the various species and varieties, and have indicated by + the various localities in which they were present. For the most part the species are widely distributed, but it is of interest to note that the species of the genera *Euchæta*, *Scolecithrix*, *Scolecithricella*, and *Candacia* appear to be very largely confined to the region of the pearl banks lying to the west of Karativu island, between it and the overfalls, including

Dutch Moderagam, Karativu, and Alanturai paars, all of which localities proved to be exceedingly rich as regards the Copepod fauna.

The positions of the various localities in which collections were made are shown on the chart, but in the case of many of the paars they are approximate only.

Family, CALANIDÆ.

Genus **Calanus**, Leach.

CALANUS MINOR (Claus.).

- * *Calanus minor*, Giesbrecht, 1888, p. 331.
 ————— Giesbrecht, 1891, p. 282.
 ————— Cleve, 1901, p. 5.
 ————— A. Scott, 1902, p. 422.
 ————— Thompson & Scott, 1903, p. 241.
 ————— Wolfenden, 1905, p. 995.
 ? *Calanus caroli* (♀), Wolfenden, 1905, p. 994.
Calanus minor, Cleve, 1905, p. 186.
 ————— A. Scott, 1909, p. 7.
 ————— Sewell, 1912, p. 354.
Undinula caroli (♀), Sewell, 1912, p. 356.
Calanus minor, Pesta, 1913, p. 30.

This species is comparatively rare on the pearl banks, and is absent altogether in the majority of tow-nettings. Most of the specimens obtained were females. Wolfenden (1905) obtained a female calanid, of which he gives neither a full description nor any figures, from the Maldive and Laccadive Archipelagoes: he believed this form to be the hitherto-unknown female of *Undinula (Calanus) caroli*, Giesbrecht. I obtained what appeared to be similar examples from the Burma coast, but a subsequent examination showed that they were in reality examples of *Calanus minor*, and, as I have pointed out below (p. 199), there seems to be some reason for believing that *Undinula caroli* is merely a variety of *Undinula darwini*, Giesbrecht (♂).

* In the majority of cases the list of references only includes those that refer to the occurrence of the species in Indian waters.

CALANUS TENUICORNIS, Dana.

Calanus tenuicornis, Cleve, 1904, p. 186.

————— A. Scott, 1909, p. 8.

This species was represented by a single female taken near Karativu Paar. Its occurrence is of some interest, as it is the first occasion on which it has been recorded from Indian coastal waters.

Genus **Canthocalanus**, A. Scott.

CANTHOCALANUS PAUPER (Giesbrecht).

Calanus pauper, Thompson, 1899, p. 275.

————— Cleve, 1901, p. 5.

————— A. Scott, 1902, p. 400.

————— Cleve, 1903, p. 357.

————— Thompson & Scott, 1903, p. 241.

————— Wolfenden, 1905, p. 995.

Canthocalanus pauper, A. Scott, 1909, p. 9.*Calanus pauper*, Pesta, 1912, p. 43.*Canthocalanus pauper*, Sewell, 1912, pp. 315 and 355.*Calanus pauper*, Pesta, 1913, p. 30.

CANTHOCALANUS PAUPER, var. PLUMULOSUS, Wolfenden.

Canthocalanus pauper, var. *plumulosus*, Sewell, 1912, p. 355.

This species was universally distributed over the pearl banks and neighbouring waters, occurring at times in large numbers. Wolfenden (*loc. cit.*, p. 994, 1905) has called attention to a curious modification of the furcal setæ which is occasionally met with in *Undinula vulgaris*, *Paracalanus aculeatus*, *Calocalanus pavo*, and *Euchirella bella* var. *indica*. This modification consists of "a more or less dichotomous

branching, repeated in the sub-branches, the whole forming a sort of brush," and he has proposed that examples showing this character should be considered as a variety under the name "*plumulosus*." I have previously (*loc. cit.*, pp. 355, 357, and 359) recorded a similar modification in *Canthocalanus pauper*, *Undinula caroli*, and *Acrocalanus longicornis*.

Numerous specimens, both of the above species and of *Undinula vulgaris*, showed this peculiarity, and a study of these examples has caused me to alter my opinion. I am inclined to regard this branching of the setæ merely as an abnormality and not a true variety. In the tables below I have given the results obtained from an examination of the furcal setæ of a series of individuals of these two species, in which this peculiarity was present to a greater or less degree; in all cases the seta showing the modification is indicated by +.

Canthocalanus pauper.

No. and Sex.	Left Furca.					Right Furca.					
	5	4	3	2	1	1	2	3	4	5	
1	.	.	.	+	.	.	+	.	.	.	Average number of setæ affected in ♂, 2.3.
2	.	.	.	+	+	.	
3	+	+	.	.	
4	.	.	.	+	.	.	+	+	.	.	
5	.	+	+	+	.	.	+	+	.	.	
6	.	+	+	+	.	.	+	+	.	.	
7	+	
8	+	+	.	.	
9	.	.	.	+	
10	+	+	+	+	.	+	+	+	.	.	Average number of setæ affected in ♀, 5.1.
11	.	+	+	+	.	+	+	+	.	.	
12	.	+	+	+	+	+	+	+	.	.	
13	.	.	+	+	.	.	+	+	+	+	
14	.	.	+	+	+	+	+	+	.	.	
15	+	.	.	.	
16	.	+	+	+	.	.	+	+	.	.	
17	.	+	+	+	.	.	+	+	+	.	
18	.	+	+	+	+	.	+	+	.	.	
19	.	+	+	+	.	.	+	+	.	.	
20	+	.	+	+	
Number of times each seta is affected	0	10	12	16	3	5	14	13	3	1	

Undinula vulgaris.

No. and Sex.	Left Furca.					Right Furca.						
	5	4	3	2	1	1	2	3	4	5		
1	Average number of setae affected, 3.7.
2	+	+	.	
3	+	
4	.	.	+	+	.	+	+	
5	.	.	+	+	+	+	+	+	+	+	.	
6	.	.	.	+	+	+	+	+	+	+	.	
7	+	+	.	+	
8	.	+	
9	.	.	.	+	+	.	.	.	+	.	.	
10	.	+	+	+	+	+	+	+	+	+	.	
11	.	.	.	+	+	+	
12	.	+	+	+	+	+	+	
13	.	.	+	+	+	+	+	+	.	.	.	
14	.	.	+	+	+	+	+	
15	.	.	.	+	
16	.	+	
17	.	.	+	+	.	.	.	+	+	+	.	
18	.	+	+	+	+	+	+	+	+	.	.	
19	.	.	+	
20	.	.	+	
21	+	+	+	+	+	+	.	
22	+	.	.	.	+	
23	+	.	.	.	
24	+	+	+	+	+	+	+	
25	+	+	+	.	
26	.	+	+	+	+	
27	+	+	+	+	.	+	+	+	+	+	.	
28	.	+	+	+	+	+	+	+	+	+	.	
29	+	.	.	.	
30	+	+	+	+	.	.	.	
31	.	+	.	.	+	+	
32	+	
Number of times each seta is affected	4	12	15	18	18	15	20	14	10	.	.	With spermatophores, average number of setae affected, 4.3.
												Without spermatophores, average number of setae affected, 2.2.

From the above it is evident that there is little or no regularity in the disposition of the plumose setae in any particular individual, in some cases only a single hair showing this change, in others all ten doing so; it is quite exceptional to find any attempt at symmetry in the arrangement. It will be noticed that in the number of individuals affected, the proportion of females is larger than that of males, but a

difference such as this might easily be accounted for by the greater preponderance of females in the catch.

With regard to the total number of hairs affected and their relative position, it is quite clear that on the whole far more setæ are abnormal in the female than in the male, and, further, the setæ most frequently affected are those that possess the greatest length, *i.e.*, numbers 2, 3, and 4.

I have on one occasion found a similar "plumose" seta arising from the tip of a damaged antenna in an example of *Acrocalanus longicornis*. In this case the antenna had obviously been damaged on some previous occasion, the terminal segments being broken off; subsequently the stump had healed, and from the scar this seta had arisen.

I am of the opinion that this plumose modification is an abnormality produced by injury to, and subsequent regeneration of, the seta, and, further, the prevalence of this change in spermatophore-bearing females of *Undinula vulgaris* would tend to show that the injury is frequently caused during the act of deposition of the spermatophore by the male.

Genus *Undinula*, Scott.

UNDINULA VULGARIS (Dana).

(Pl. XVII., figs. 1 and 2.)

Calanus vulgaris, Giesbrecht, 1896, p. 318.

————— Thompson, 1899, p. 275.

————— Cleve, 1901, p. 5.

————— A. Scott, 1902, p. 400.

————— Thompson & Scott, 1903, p. 357.

————— Cleve, 1903, p. 357.

————— Cleve, 1904, p. 186.

————— Wolfenden, 1905, p. 994.

Undinula vulgaris, A. Scott, 1909, p. 16.

————— Sewell, 1912, pp. 315 and 356.

Calanus vulgaris var. *plumulosus*, Wolfenden, 1905, p. 994.

Pl. XCVI., figs. 21, 22.

Undinula vulgaris var. *plumulosus*, Sewell, 1912, p. 356.

This species was widely distributed throughout the regions investigated. Numerous examples were obtained showing the modified tail setæ as described by Wolfenden (*vide ante*, p. 193), but, as I have already pointed out, I do not consider this condition to be a true variation.

Several examples were obtained which show the double spine on the left side of the posterior thoracic margin. This modification was first described by Giesbrecht (1893, Pl. VII., fig. 28). I have since obtained specimens from the east side of the Bay of Bengal, in the neighbourhood of the Andaman Islands and Mergui Archipelago, in which this condition is even more pronounced. In these specimens the left side of the thoracic margin is considerably swollen, and forms a stout prominence projecting outwards and backwards, and bears two stout spines—the dorsal projecting backwards and somewhat upwards, and the ventral pointing vertically downwards and being considerably swollen at its base.

We thus have three forms, which appear to be quite distinct from one another, for I have up to the present failed to discover any intermediate forms.

UNDINULA DARWINI (Lubbock).

- Calanus darwini*, Thompson, 1899, p. 275.
 ————— Cleve, 1901, p. 5.
 ————— A. Scott, 1902, p. 400.
 ————— Thompson & Scott, 1903, p. 241.
 ————— Cleve, 1903, p. 357.
 ————— Cleve, 1904, p. 185.
 ————— Wolfenden, 1905, p. 994.
Undinula darwini, A. Scott, 1909, p. 17.
 ————— Sewell, 1912, p. 356.
 ————— Pesta, 1913, p. 30, fig. 13.

This species was much less common in the Ceylon collections than the preceding, though it is of frequent occurrence in other parts of the Indian Ocean. According to Giesbrecht (1893, Pl. VII., fig. 29), both first and second abdominal segments are furnished with a row of sharp spines on the

posterior margin, and the posterior thoracic margin on the left side is produced backwards in a rectangular projection ; but a study of numerous examples from various localities in the Indian Ocean and Bay of Bengal has shown that these characters are subject to very considerable variation. As regards the spinulation of the abdominal segments, many specimens possessed spines only on one of the segments, while in some cases spines were absent altogether. Again, in numerous examples the posterior thoracic margin formed almost a uniform curve, with a very slight rounded projection towards the ventral side ; in other cases this prominence was more marked and formed a somewhat triangular prominence, while in a few cases the typical projection was present.

In this species, as in *U. vulgaris*, it would appear that there are three forms of the posterior thoracic margin, which are quite distinct from one another, and a close examination of a large number of specimens has failed to show any correlated change.

UNDINULA DARWINI, var. *CAROLI* (Giesbrecht).

Calanus caroli, Giesbrecht, 1888, p. 331.

————— Giesbrecht, 1893, p. 91. Pl. VIII., fig. 36.

————— ♂, Wolfenden, 1905, p. 994. Pl. XCVII.,
fig. 41.

Undinula caroli, A. Scott, 1909, p. 18.

This form was first described by Giesbrecht (*loc. cit.*, 1888), who considered that it was a distinct species. Wolfenden (*loc. cit.*, 1905) obtained examples from the Maldive and Laccadive Archipelagoes, and associated with these were several females, which he considered to be the hitherto-unknown female. According to his brief description these forms were distinguished from the female *Undinula darwini* by the absence of teeth on the distal portion of the margin of exopod 3 in the second and third pairs of swimming feet, and by the presence of a few fine spines on the first basal of the first pair. The absence of the marginal teeth separates these females from the present form, in which these teeth invariably occur exactly as in *U. darwini*, and the fine spines on the first basal of the first leg is a character that I have found

present in *Calanus minor*. As I have previously mentioned (*vide ante*, p. 192), I consider that these forms are in all probability examples of *Calanus minor*.

As A. Scott (*loc. cit.*) has pointed out, the form known as *U. caroli* ♂ is easily recognizable from *U. darwini* ♂ by its constantly smaller size and by the structure of the fifth pair of legs.

In a tow-netting taken at "Investigator" Station No. 470 (Sawi Bay, Kar Nicobar, December 7, 1912), large numbers of both forms were present, associated with numerous examples of *Undinula darwini* ♀; a comparative study of the two forms of male has given the following interesting results.

The proportional lengths of the abdominal and furcal segments in the two forms are—

Undinula darwini : 45 : 41 : 32 : 27 : 25 : 23.

Undinula caroli : 45 : 41 : 31 : 27 : 24 : 22.

The proportional lengths of the antennal joints are as follows :—*

Segments :	1-2.	3-5.	6.	7.	8-9.	10.	11.	12.	13.	14.	15.
<i>U. darwini</i> ..	121	82	26	27	40	26	31	38	46	46	49
<i>U. caroli</i> ..	118	79	24	26	39	28	30	37	45	45	50
Segments :	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	
<i>U. darwini</i> ..	49	51	53	57	46	46	51	51	46	18	
<i>U. caroli</i> ..	50	51	53	56	47	47	53	53	50	19	

The structure of the first four pairs of swimming legs is exactly similar in the two forms, not only as regards the spinulation, but also in the proportional lengths of the various segments; thus the proportional lengths of the segments and end spine in the third leg of the two forms are as follows :—

	<i>U. darwini.</i>	<i>U. caroli.</i>
First Basal ..	17·9	17·9
Second Basal ..	8·7	8·3
Exopod 1 ..	11·0	11·0
Exopod 2 ..	15·0	14·5
Exopod 3 ..	28·9	30·0
End spine ..	18·5	18·3
Total length ..	100·0	100·0

* In all cases the total length of the antenna has been taken = 1,000. In this way it is found that comparison between specimens of unequal size is greatly facilitated.

As a result of a careful study, it appears that the sole appreciable difference between these forms lies in the structure of the fifth pair of legs. The question then arises, Are we justified in considering these forms to be distinct "species"?

Examples of variation in the structure of the sexual appendages have been described in other species, e.g., *Labidocera kröyeri* (Brady); and the similarity of the two forms is so close, even to the lengths of the antennal segments and the proportions of the swimming feet, that I submit we could only get such a close resemblance in individuals of the same species, and I believe that the form described by Giesbrecht under the name *Calanus caroli* is merely a variation of the male of *Undinula darwini*.

Genus **Eucalanus**, Dana.

EUCALANUS ATTENUATUS (Dana).

- Eucalanus attenuatus*, Thompson, 1899, p. 276.
 ----- Cleve, 1901, p. 6.
 ----- Cleve, 1903, p. 362.
 ----- Thompson & Scott, 1903, p. 242.
 ----- Wolfenden, 1903-06, p. 996.
 ----- Cleve, 1904, p. 189.
 ----- Sewell, 1912, p. 357.

A few examples occurred in the collection from the pearl banks.

EUCALANUS SUBTENUIS, Giesbrecht.

- Eucalanus subtenuis*, Cleve, 1901, p. 7.
 ----- Scott, 1902, p. 401.
 ----- Cleve, 1903, p. 363.
 ----- Thompson & Scott, 1903, p. 242.
 ----- Wolfenden, 1903-06, p. 996.
 ----- Cleve, 1904, p. 190.
 ----- Scott, 1909, p. 21.
 ----- Sewell, 1912, p. 358.

This species was on the whole well represented in the collections.

EUCALANUS MUCRONATUS, Giesbrecht.

Eucalanus mucronatus, Cleve, 1901, p. 7.
 ————— Cleve, 1903, p. 362.
 ————— Cleve, 1904, p. 189.
 ————— Wolfenden, 1905, p. 996.
 ————— Scott, 1909, p. 20.

Several examples of this species were obtained, although it was by no means common. Hitherto only the female form has been known, but in a tow-netting from Dutch Moderagam Paar, associated with several females was a single male specimen, that shows the following characters :—

♂. Total length, 3·3 mm.

The proportions of the cephalothorax and abdomen are as 7 : 1. The head and first thoracic segments are fused, but the fourth and fifth thoracic segments are separate. The anterior extremity of the head region is produced in a spike, as in the female.

The abdomen consists of four segments, of which the second and third are slightly longer than the first, and the anal segment is quite short. The furcal setæ are asymmetrical, the second seta on the left side being much longer and stouter than the others.

The first antennæ are long, over-reaching the tip of the furcal rami by the last five or six segments. The proportional lengths of the various segments are as follows, and for purposes of comparison I give the lengths of the segments in the female :—

Segments :	1-2.	3.	4.	5.	6.	7.	8-9.	10.	11.	12.	13.	
♀. ..	123	25	25	25	25	29	50	34	34	39	43	
♂. ..	69	69	24	24	24	24	26	52	38	38	48	
Segments :	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
♀. ..	45	49	49	49	53	53	49	49	41	41	29	41
♂. ..	52	53	52	52	48	48	41	41	32	38	27	38

In the main the proportions of the joints are very much the same, the principal differences being the fusion of segments 1 and 2 in the female, and the short 22nd segment in the male.

The second antenna, mouth parts, and the first four pairs of swimming legs are similar to those of the female.

The fifth swimming legs are of interest, in that both are present, thus resembling the condition found in *E. attenuatus* (Dana) and *E. elongatus*. The left leg is the longer, and when folded back reaches to the extreme tip of the furcal rami; the right leg is somewhat stouter, and the terminal segment bears a stout seta.

An immature male was also obtained in the same locality. In this individual the abdomen consists of three segments only, the third not yet having undergone division. Both legs of the fifth pair were present, but were equal in size.

EUCALANUS PILEATUS, Giesbrecht.

Eucalanus pileatus, Thompson & Scott, 1903, p. 242.

————— Cleve, 1904, p. 189.

————— Wolfenden, 1905, p. 996.

————— A. Scott, 1909, p. 21.

————— Sewell, 1912, p. 357.

Only a few examples of this species were obtained.

EUCALANUS MONACHUS, Giesbrecht.

Eucalanus monachus, Cleve, 1901, p. 6.

————— Cleve, 1903, p. 362.

————— Thompson & Scott, 1903, p. 242.

————— Cleve, 1904, p. 189.

————— Wolfenden, 1905, p. 996.

————— A. Scott, 1909, p. 20.

————— Sewell, 1912, p. 357.

This species was fairly well represented in the collections.

EUCALANUS CRASSUS, Giesbrecht.

Eucalanus crassus, Cleve, 1901, p. 6.

————— Scott, 1902, p. 401.

————— Cleve, 1903, p. 362.

- Eucalanus crassus*, Thompson & Scott, 1903, p. 242.
 ----- Cleve, 1904, p. 189.
 ----- Wolfenden, 1905, p. 996.
 ----- Scott, 1909, p. 19.
 ----- Sewell, 1912, p. 357.

Numerous examples were obtained.

EUCALANUS SUBCRASSUS, Giesbrecht.

- Eucalanus subcrassus*, Giesbrecht, 1888, p. 334.
 ----- Giesbrecht, 1891, p. 282.
 ----- Giesbrecht, 1896, p. 317.
 ----- Cleve, 1903, p. 242.
 ----- Thompson & Scott, 1903, p. 242.
 ----- Cleve, 1904, p. 190.
 ----- Wolfenden, 1905, p. 996.
 ----- Scott, 1909, p. 21.
 ----- Sewell, 1912, p. 358.
 ----- Pesta, 1912, p. 44, fig. 3.
 ----- Pesta, 1913, p. 31.

Examples of this species were common; it appears to be widely distributed throughout the Indian Ocean and its offshoots.

Genus **Rhincalanus**, Dana.

RHINCALANUS GIGAS, Dana.

- Rhincalanus cornutus*, Thompson, 1899, p. 276.
 ----- Cleve, 1901, p. 8.
 ----- A. Scott, 1902, p. 402.
 ----- Thompson & Scott, 1903, p. 242.
 ----- Cleve, 1903, p. 368.
 ----- Cleve, 1904, p. 196.
 ----- Wolfenden, 1905, p. 996.
 ----- A. Scott, 1909, p. 23.
 ----- Sewell, 1912, p. 358.

Although widely distributed in Indian waters, this species is by no means common in surface collections. A few examples were obtained on the pearl banks.

- Paracalanus aculeatus*, Giesbrecht, 1896, p. 318.
 ————— Giesbrecht & Schmeil, 1898, p. 24.
 ————— Cleve, 1901, pp. 8 and 47. Pl. VI.,
 figs. 1-10.
Acrocalanus pediger (♂ only), Cleve, 1901, p. 35. Pl. I.,
 figs. 15-20.
Paracalanus aculeatus, A. Scott, 1902, pp. 402 and 423.
 ————— Cleve, 1903, p. 366.
 ————— Cleve, 1904, p. 194.
 ————— Wolfenden, 1905, p. 998. Pl.
 XCVI., figs. 12-15.
 ————— Sars, 1905, p. 2.
Paracalanus clevei, Carl, 1907, p. 7.
Paracalanus aculeatus, A. Scott, 1909, p. 26.
 ————— Pesta, 1912, p. 44, fig. 4.
 ————— Sewell, 1912, pp. 326 and 358.
 ————— Pesta, 1913, p. 31.

As the above synonymy sufficiently indicates, considerable confusion has arisen as regards this species, which was first described by Giesbrecht in 1888 from the female only.

The first record that I can find in the literature of the occurrence of male examples is that by Dahl (1894), but gives no description or figures. Cleve (1901) in the account of his investigations on the Malayan Plankton describes a male form, but from his description it is quite obvious that the specimens before him were immature, and had not adopted the final sexual characters. In the same paper, however, he has described a new species of *Acrocalanus* under the name *A. pediger*. In his description he gives a detailed account of the structure of both male and female forms, and his conclusion, that they are specifically the same, appears to have been accepted. To Carl (1907) belongs the credit of being the first to recognize that the two sexes described by Cleve do not belong to one another, that whereas the so-called female (*vide infra*, p. 211) belongs to the genus *Acrocalanus*, the male is undoubtedly a *Paracalanus*; he, therefore, separates this latter sex and proposes for it the name *Paracalanus clevei*. During my investigations on the Copepoda of the coast of Burma and on the present collections from the Gulf of Mannar,

I have met with numerous examples of this male form, and a study of its structure has convinced me that it is the true male of *P. aculeatus*.

I give below a description of these individuals :—

♂. Total length, 1·2 mm.

The abdomen and cephalothorax have the relative proportions 1 : 2·6. The head and first thoracic segments are fused, as are also the fourth and fifth thoracic segments, though in the latter region traces of the original line of division are distinctly visible ; the posterior thoracic margin is rounded.

The abdomen consists of five segments, having, with the furca, the following proportional lengths :—

13 : 27 : 20 : 19 : 17 : 12.

The furcal rami are symmetrical, and the proportions of length to breadth are 12 : 9.

The First Antenna.—As in the case of the adult male of *P. parvus*, so here also we find that the basal segments of the antenna become fused together into three joints—the first and second, the third to the sixth, and the seventh and eighth segments respectively being fused. The proportional lengths of the joints are as follows :—

Segments :	1-2.	3-6.	7-8.	9.	10.	11.	12.	13.	14.	15.
	117	157	68	20	26	28	31	40	40	40
Segments :	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	43	43	46	46	46	46	43	49	40	31

The antenna when folded back only reaches to the end of the abdomen.

Second Antenna.—This appendage exactly resembles those of the sexually mature males of *P. parvus* (*vide* Giesbrecht, 1893, Pl. IX., fig. 23) and *P. serratipes* (*vide* Sewell, 1912, Pl. XV., fig. 7). As I have already pointed out, the nipple-like termination of the exopodite is a sexual character developed in adult males in the three genera *Paracalanus*, *Acrocalanus*, and *Peizocalanus* (*loc. cit.*, 1912, p. 336).

The mouth parts are similar to those of other adult males of the same genus.

The First Pair of Legs.—Basal 1 bears a single seta on its inner border, and is devoid of any spines either on its surfaces or the external margin.

Basal 2 bears the usual S-shaped seta on its distal inner border, and is likewise devoid of spines.

Exopod 1 bears a single inner seta and has no marginal spine.

Exopod 2 has a single inner seta and bears a short transverse row of needle-like spines on the outer margin.

Exopod 3 has four inner setæ : the usual two marginal spines are present, and in addition there is a row of three or four teeth on the proximal part of the outer border. The end spine is long and slender, being nearly as long as the whole exopodite.

The endopodite is two-jointed, and reaches to the level of the joint between exopods 2 and 3.

The Second Pair of Legs.—Basal 1 bears a single inner seta and no spines.

Basal 2 has no spines or setæ.

Exopod 1 has a well-developed marginal spine, and bears in addition a transverse row of sharp spinules on its outer and posterior aspect. There is a single inner seta.

Exopod 2 bears a marginal spine, and in addition has a row of six curved claw-like spinules on its outer margin, and three triangular spines on its anterior surface. A single seta is present on the inner margin.

Exopod 3 bears two marginal spines and a row of spinules on that part of the outer margin proximal to the first spine. Five setæ arise from the inner border. The terminal spine is a trifle longer than the last segment, in the proportions 9 : 8.

Endopod 1 is small, and the outer border ends in a short spine. A single seta is present.

Endopod 2 bears an oblique curved row of spinules, usually five or six in number on the posterior surface, and a longitudinal row of four or five needle-like spinules on the outer border, which also terminates in a small spinous process. A corona of small spinules is situated on the anterior aspect near the distal margin. A pair of setæ are present on the inner border.

This species was first obtained from the Burmese coast ; a few examples occurred in the collections from the pearl banks, which undoubtedly belong to the same species ; they however, differ slightly from the Burmese specimens in that the terminal segment of the first antenna is somewhat longer in proportion to the preceding segments, but in all other respects these examples agree with the type specimens.

Genus **Acrocalanus**, Giesbrecht.

ACROCALANUS LONGICORNIS, Giesbrecht.

- Acrocalanus longicornis*, Giesbrecht, 1888, p. 332 ; Giesbrecht, 1891, p. 282.
 _____ Cleve, 1901, p. 5.
 _____ Thompson & Scott, 1903, p. 243.
 _____ Wolfenden, 1905, p. 1000.
 _____ Scott, 1909, p. 28.
 _____ Sewell, 1912, p. 358.
 _____ Pesta, 1913, p. 13, fig. 14.

Examples of this species were fairly plentiful ; it appears to have a wide distribution in Indian seas.

ACROCALANUS GRACILIS, Giesbrecht.

- Acrocalanus gracilis*, Giesbrecht, 1896, p. 318.
 _____ Cleve, 1901, p. 4.
 _____ Thompson & Scott, 1903, p. 243.
 _____ Cleve, 1903, p. 356.
 _____ Cleve, 1904, p. 184.
 _____ Wolfenden, 1905, p. 1003.
 _____ Scott, 1909, p. 29.
 _____ Sewell, 1912, p. 359.

This species was by no means common in the collections all the examples obtained were females.

ACROCALANUS MONACHUS, Giesbrecht.

- Acrocalanus monachus*, Thompson & Scott, 1903, p. 243.
 ----- Cleve, 1903, p. 356.
 ----- Wolfenden, 1905, p. 1002.
 ----- A. Scott, 1909, p. 30.
 ----- Sewell, 1912, p. 359.

A few specimens were obtained.

ACROCALANUS GIBBER, Giesbrecht.

- Acrocalanus gibber*, Giesbrecht, 1888, p. 332.
 ----- Giesbrecht, 1891, p. 282.
 ----- Giesbrecht, 1896, p. 318.
 ----- Thompson, 1899, p. 276.
 ----- Cleve, 1901, pp. 4 and 36. Pl. II.,
 figs. 1-16.
Acrocalanus pediger (♀ part), Cleve, 1901, pp. 5 and 33.
 Pl. I., figs. 1-14.
Acrocalanus gibber, A. Scott, 1902, pp. 402 and 423.
Acrocalanus gibber, Thompson & Scott, 1903, p. 243.
Acrocalanus pediger, Cleve, 1903, p. 356.
Acrocalanus gibber, Cleve, 1904, p. 184.
 ----- Wolfenden, 1905, p. 1003.
 ----- A. Scott, 1909, p. 29.
 ----- Sewell, 1912, pp. 315 and 359.

Considerable confusion appears to have arisen with regard to this species. The original description was based on female examples only, and this form is easily recognized by the shape of the body and the partial separation of the first thoracic segment from the head region. Cleve (*loc. cit.*, 1901) described a form from the Malay Archipelago which he considered to be the adult male; these examples, though closely resembling the female as regards the armature of the swimming legs, yet differ considerably in the shape and structure of the cephalothorax. In the same paper he described a form which he named *A. pediger*, but as I have already pointed out (*vide*

ante, pp. 205, 206), the male of this so-called *Acrocalanus* is in reality the male *Paracalanus aculeatus*. The supposed female is undoubtedly an *Acrocalanus*, but is an immature male : the presence of a fifth leg on the left side and the segmentation of the abdomen are sufficient to indicate the sex, and the form apparently corresponds to the male *Acrocalanus gibber*. In the Ceylon collections numerous examples of this immature male were present, and in almost every case were associated with both immature and mature females of the above species.

ACROCALANUS GARDINERI, Wolfenden.

Acrocalanus gardineri, Wolfenden, 1905, p. 1004. Pl. XCVII., figs. 5, 10, 14-21.

————— Sewell, 1912, p. 359.

The above name was given by Wolfenden to certain adult males that he found in Professor Stanley Gardiner's collections from the Maldive and Laccadive Archipelagoes. In the present collections are several examples that agree very fairly well with Wolfenden's description and figures. These males are usually associated with females that appear to belong to the species *A. gracilis*, and I am inclined to regard *A. gardineri* and *A. gracilis* as synonymous, but, at the present time, the data at my disposal is not sufficient to warrant a definite pronouncement on this point.

ACROCALANUS SIMILIS, sp. nov.

(Pl. XVII., figs. 3-5.)

Several examples, both male and female, of a species of *Acrocalanus* were obtained at several stations in the Gulf of Mannar. At first sight I took these specimens to be examples of *A. inermis*, a species that was described by me (*loc. cit.*, 1912, p. 334, Pl. XVI., figs. 1-9) from the coast of Burma, but a closer examination revealed the fact that, although the resemblance between these two forms is very close, yet they differ in several characters, and I consider that the present examples are in all probability a new species, for which I propose the above name.

♀. Total length, 0·75-0·80 mm.

The proportions of cephalothorax and abdomen are as 3 : The head and first thoracic segment are fused together, as also in adult specimens are thoracic segments 4 and 5, though in immature forms the line of separation between the latter can readily be made out. The posterior thoracic margin is rounded and is devoid of spines. The rostrum is bifid, and is long and slender.

The abdomen consists of four segments, having with the furcal rami the following proportions : 17 : 10 : 10 : 15 : 13. The first segment shows a prominent genital swelling on the ventral aspect.

The first antenna when folded back reaches to the end of the furcal rami, the first and second segments are fused, and the line of separation between segments 8 and 9 is not complete, being only present on the posterior aspect.

The antennal joints have the following proportions :—

Segments :	1-2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
	120	32	32	36	36	29	26	28	28	29	34	38

Segments :	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	36	36	40	40	44	44	44	48	44	52	44	60

The mouth parts closely resemble those of *A. inermis*, but the mandible is slightly different ; the arrangement of the teeth is the same, but the separate first tooth has a longer and somewhat narrower basal portion. The swimming legs in these two species are very similar : in both cases the external margin of the exopodites is devoid of any spines, but in the present form there are no spines on the posterior aspect of exopod 2 in the second to fourth pairs.

♂. Total length, 0·8 mm.

The proportional lengths of cephalothorax and abdomen are 2·25 : 1. The abdomen consists of five segments, having with the furcal rami the proportional lengths 10 : 20 : 15 : 15 : 13 : 12.

First Antenna.—As in other members of this genus, the basal segments are fused together to form two large joints. The proportional lengths of the various joints are as follows :—

Segments :	1-6.	7-8.	9.	10.	11.	12.	13.	14.	15.	16.
	286	73	24	25	29	29	36	34	39	39

Segments :	17.	18.	19.	20.	21.	22.	23.	24.	25.
	39	41	44	44	48	48	48	44	29

Second Antenna.—As in other members of the genus, in adult males the last joint of the exopodite is devoid of setæ, and forms a nipple-like projection.

The first to fourth pairs of swimming feet are the same as in the female ; the fifth leg on the left side is present, and consists of a somewhat swollen basal segment and four free joints : the terminal joint bears two unequal setæ, and the penultimate joint has a short spine at its distal external angle.

It is obvious that this species is very closely related to *A. inermis*, from the Burma coast, but it differs from it in the following characters :—

- (1) The total length is somewhat smaller.
- (2) The terminal segment of the first antenna in the female is somewhat longer, and there are no transverse rows of spinules on segments 1-6.
- (3) There are no spinules on the posterior thoracic margin.
- (4) There are no spines on the posterior aspect of exopod 2 of any of the swimming legs.
- (5) The rostrum is long and slender.

It is possible that these differences may be merely due to altered environment, but for the present I prefer to consider the above a new species, and I have therefore given it the name *A. similis*.

Genus **Calocalanus**, Giesbrecht.

CALOCALANUS PAVO (Dana).

Calocalanus pavo, Giesbrecht, 1896, p. 317.

————— Thompson, 1899, p. 277.

————— Cleve, 1901, p. 5.

- Calocalanus pavo*, Scott, 1902, pp. 402 and 423.
 ----- Thompson & Scott, 1903, p. 243.
 ----- Cleve, 1903, p. 357.
 ----- Cleve, 1904, p. 186.
 ----- Wolfenden, 1905, p. 999.
 ----- Scott, 1909, p. 30.
 ----- Sewell, 1912, p. 359.

This species is widely distributed throughout Indian waters.
 Several examples were obtained on the pearl banks.

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 CALOCALANUS PLUMULOSUS (Claus.).

- Calocalanus plumulosus*, A. Scott, 1902, pp. 403 and 423.
 ----- Thompson & Scott, 1903, p. 243.
 ----- Wolfenden, 1905, p. 999.
 ----- A. Scott, 1909, p. 31.
 ----- Sewell, 1912, p. 360.

A few examples were obtained from Dutch Moderagam
 Paar.

Family PSEUDOCALANIDÆ.

Genus **Clausocalanus**, Giesbrecht.

CLAUSOCALANUS ARCUICORNIS (Dana).

- Clausocalanus arcuicornis*, Thompson, 1899, p. 277.
 ----- Cleve, 1901, p. 5.
 ----- Thompson & Scott, 1903, p. 243.
 ----- Cleve, 1903, p. 359.
 ----- Cleve, 1904, p. 188.
 ----- Wolfenden, 1905, p. 999.
 ----- A. Scott, 1909, p. 32.
 ----- Sewell, 1912, p. 360.

Several examples were obtained on the pearl banks.

CLAUSOCALANUS FURCATUS (Brady).

- Clausocalanus furcatus*, Giesbrecht, 1896, p. 317.
 ----- Cleve, 1901, p. 5.
 ----- A. Scott, 1902, pp. 403, 423.
 ----- Thompson & Scott, 1903, p. 244.
 ----- Cleve, 1903, p. 360.
 ----- Cleve, 1904, p. 188.
 ----- Wolfenden, 1905, p. 999.
 ----- A. Scott, 1909, p. 32.

Examples of this species were comparatively common ; both it and the preceding species appear to have a wide distribution in Indian waters.

Genus **Euchæta**, Philippi.

EUCHÆTA MARINA (Prestandrea).

- Euchæta marina*, Thompson, 1899, p. 278.
 ----- Cleve, 1901, p. 7.
 ----- A. Scott, 1902, p. 403.
 ----- Thompson & Scott, 1903, p. 244.
 ----- Cleve, 1903, p. 363.
 ----- Cleve, 1904, p. 190.
 ----- Wolfenden, 1905, p. 1007. Pl. C., figs.
 19 and 20 (♂).
Euchæta indica, Wolfenden, 1905, p. 1008. Pl. C., figs.
 12-16 (♀).
Euchæta marina, A. Scott, 1909, p. 67. Pl. XIX.,
 figs. 9-20.
 ----- Sewell, 1912, p. 360.
 ----- Pesta, 1912, p. 45.
 ----- Pesta, 1913, p. 32.

Several examples of this species, belonging to both sexes, were obtained on the pearl banks.

EUCHÆTA CONCINNA, Dana.

- Euchæta concinna*, Cleve, 1901, p. 7.
 ----- Thompson & Scott, 1903, p. 244.
 ----- Cleve, 1903, p. 363.
 ----- Wolfenden, 1905, p. 1008. Pl. C.,
 figs. 1-6.
 ----- A. Scott, 1909, p. 65. Pl. XIX., figs.
 21-27.
 ----- Sewell, 1912, p. 360.

This species was by far the most common example of the genus present in the Ceylon collection.

EUCHÆTA WOLFENDENI, Scott.

- Euchæta marina*, Wolfenden, 1905, p. 1007. Pl. C., figs. 7,
 8, 10, 11, 17, 18.
Euchæta wolfendeni, A. Scott, 1909, p. 68. Pl. XVII.,
 figs. 1-12.

Two examples of this species were obtained from Karativu Paar and Dutch Moderagam Paar, respectively.

This species apparently has a wide distribution in Indian waters, for I have recently obtained specimens from tow-nettings taken off the Andaman Islands, and from the Ganjam coast.

Family SCOLECITHRICIDÆ.

Genus **Scolecithrix**, G. Brady.

SCOLECITHRIX DANÆ (Lubbock).

- Scolecithrix danæ*, Thompson, 1899, p. 279.
 ----- Cleve, 1901, p. 9.
 ----- A. Scott, 1902, p. 403.
 ----- Thompson & Scott, 1903, p. 245.
 ----- Cleve, 1903, p. 368.
 ----- Cleve, 1904, p. 197.

Scolecithrix danæ, Wolfenden, 1905, p. 1009.

————— A. Scott, 1909, p. 88.

————— Sewell, 1912, p. 360.

This species was comparatively rare in the collection.

Genus **Scolecithricella**, Sars.

SCOLECITHRICELLA PEARSONI, sp. nov.

(Pl. XVII., figs. 6, 7, and Pl. XVIII., figs. 1-4).

A single male and several females of a species of *Scolecithricella* were obtained at Dutch Moderagam and Karativu Paars. The examples appear to belong to a hitherto undescribed species, and I have given it the above name after Dr. J. Pearson, the Director of the Colombo Museum, who kindly entrusted the present collection from the Ceylon pearl banks to my care for the purpose of examination.

The characters of the above species are as follows :—

♀. Total length, 1·0 mm.

The proportions of cephalothorax and abdomen are 3·5 : 1.

The cephalothorax is robust, and is uniformly rounded dorsally. The head and first thoracic segment are fused together, as also are thoracic segments 4 and 5. The rostrum consists of two stout spinous processes. The abdomen has four segments, showing with the furcal rami the following relative proportional lengths :—6 : 3 : 3 : 1 : 2.

The first antenna is short and reaches, when folded back, to the posterior end of the thorax : it consists of twenty joints having the following proportional lengths :—

Segments :	1-2.	3.	4.	5.	6.	7.	8-10.	11.	12-13.	14.
	102	27	23	23	23	23	58	23	51	39

Segments :	15.	16.	17.	18.	19.	20.	21.	22.	23.	24-25.
	43	47	47	51	51	51	58	66	89	105

The first and second, eighth to tenth, and twelfth and thirteenth segments are respectively fused together, and so are the twenty-fourth and twenty-fifth.

The second antenna and mouth parts are similar to those of other members of the genus.

The First Pair of Legs.—The first basal joint bears no external spine or internal seta; the external margin bears a series of fine curved spinules, diminishing in size proximally; the second basal joint bears no marginal spine, but carries a single seta on its inner distal angle.

The exopodite consists of three segments: exopod 1 bears no marginal spine; exopod 2 has a single spine, as usual; exopod 3 in most cases bears a single spine on the external margin at its distal extremity, but in two of the specimens examined (a ♂ and a ♀) there was a second spine present at the junction of the middle and distal thirds. The end spine is long and slender, and is equal in length to the preceding two segments. The endopodite consists of a single segment having a well-marked rounded swelling on the external border, and across the base of this swelling is a transverse row of needle-like spines.

The Second Pair of Legs.—The first basal bears a single seta internally, and is finely serrated on the proximal two-thirds of the outer margin. The second basal is produced at both the internal and external distal angles in a triangular spinous process.

The exopodite consists of three segments: exopod 1 bears a single seta internally, and externally is armed with a long spine that reaches as far as the base of the spine on the succeeding segment; exopod 2 bears a single internal seta, and the external spine extends well beyond the base of the proximal spine on exopod 3. On the posterior aspect are two rows of small spinules, one row extends vertically down the centre of the segment and the second runs horizontally along the distal margin; exopod 3 bears four setæ on its internal margin, and externally is armed with three teeth of more or less equal size. On its posterior aspect, this segment carries three curved rows of spinules. Terminally, the end spine is broad and somewhat curved, having a finely-serrated outer margin.

The endopodite is two-jointed: endopod 1 bears a single inner seta, and externally is produced at its distal extremity

in a sharp spinous projection; exopod 2 bears five setæ and terminates in a small apical spinous process, while on its posterior aspect it carries a series of sharp needle-like spines.

The Third Pair of Legs.—Basal 1 bears a single internal seta, and is finely serrated on its external margin; basal 2 has a spine-like projection on both inner and outer ends of the distal margin. Both exopodite and endopodite consist of three segments: exopod 1 has a single external spine and one internal seta; exopod 2 is similarly provided; exopod 3 bears three external spines; all the marginal spines are of equal size. In addition, certain of these segments are armed with rows of spinules; the second basal segment carries a series of small spines on the triangular projection of its distal margin, behind the base of exopod 1; exopod 2 bears a transverse row of spines parallel to its posterior distal margin, and exopod 3 bears two rows of spines, one distally along the transverse border and one shaped like Γ about the middle of its length, both on the posterior aspect.

Endopod 1 bears a single internal seta, and terminates externally in a sharp spine-like process; exopod 2 is similarly provided, and in addition is armed with long needle-like spines on its posterior aspect. Endopod 3 bears five setæ, and is armed with spines like the preceding segment.

The fourth pair of legs are similar to the third pair, but are armed with a transverse row of spines of the first basal segment, and the marginal serration on this segment is absent.

The fifth pair of legs have the form characteristic of the genus. The single segment bears three spines; the outer is extremely small and arises from the external margin; the second arises distally and is somewhat longer; the third spine is large and projects inwards from the inner margin; it is finely serrated on its internal border.

♂. The total length, 7.0 mm.

The proportional lengths of cephalothorax and abdomen are 3 : 1. The abdomen consists of four segments having, with the furcal rami, the following proportions : 15 : 25 : 20 : 22 : 10.

The first antenna consists of eighteen joints, having the following relative lengths :—

Segments :	1.	2.	3.	4.	5.	6.	7.	8-14.	15.
	54	32	29	25	25	25	25	132	32
Segments :	16.	17.	18.	19.	20.	21.	22.	23.	24-25.
	50	64	68	68	71	75	43	86	96

The eighth to the fourteenth segments inclusive appear to have fused to form a single joint.

The second antenna, mouth-parts, and swimming legs are the same as those of the female.

The Fifth Pair of Legs.—Each leg has a stout basal segment and a short one-jointed endopodite ; the right exopodite consists of three segments ; exopod 2 bears a row of small spines on the distal part of its inner margin ; exopod 3 is somewhat claw-shaped, terminating in a sharp point and having a swollen base. The proportional lengths of the basal joint and exopods are 24 : 22 : 16 : 8 ; the relative length of the endopod is 8.

The left leg has the basal joint produced in a somewhat swollen rounded projection distally. The exopod is two-jointed, each joint being of nearly equal length ; the terminal joint is tapered, ending in a sharp point. The endopod is short and spine-like.

Tribe **HETERARTHANDRIA.**

Family **CENTROPAGIDÆ.**

Genus **Centropages**, Kroyer.

CENTROPAGES FURCATUS (Dana).

- Centropages furcatus*, Giesbrecht, 1889, Sem. 1, p. 811.
 ————— Giesbrecht, 1891, p. 282.
 ————— Giesbrecht, 1893.
 ————— Giesbrecht, 1896, p. 317.
 ————— Thompson, 1899, p. 279.
 ————— Cleve, 1901, p. 5.
 ————— A. Scott, 1902, pp. 403 and 423.

- Centragages furcatus*, Cleve, 1903, p. 359.
 ———— Thompson & Scott, 1903, p. 246.
 ———— Cleve, 1904, p. 187.
 ———— Wolfenden, 1905, p. 1016.
 ———— A. Scott, 1909, p. 113.
 ———— Pesta, 1912, p. 46, fig. 5.
 ———— Sewell, 1912, pp. 315 and 360.
 ———— Pesta, 1913, p. 32.

This species is widely distributed throughout Indian waters, and numerous examples were obtained from the pearl banks.

CENTROPAGES ORSINII, Giesbrecht.

- Centropages orsinii*, Giesbrecht, 1889, Sem. 1, p. 811.
 ———— Giesbrecht, 1891, p. 282.
 ———— Giesbrecht, 1893.
 ———— Giesbrecht, 1896, p. 317.
 ———— Cleve, 1901, p. 5.
 ———— A. Scott, 1902, pp. 404 and 423.
 ———— Cleve, 1903, p. 359.
 ———— Thompson & Scott, 1903, p. 247.
 ———— Wolfenden, 1905, p. 1015. Pl. XCVIII., figs. 1, 4, 8, 11, 12 ♂, and 5, 13 ♀.
 ———— A. Scott, 1909, p. 115.
 ———— Pesta, 1912, p. 46, fig. 6.
 ———— Sewell, 1912, pp. 315 and 362.
 ———— Pesta, 1913, p. 32.

Examples of this species were of common occurrence, and were widely distributed throughout the areas under investigation.

CENTROPAGES TENUIREMIS, Thompson & Scott.

- Centropages tenuiremis*, Thompson & Scott, 1903, p. 247. Pl. I., figs. 14-18.
Centropages arabicus, Cleve, 1903, p. 371. Pl. XVI., figs. 1-9, and Pl. XVII., fig. 1.

Centropages tenuiremis, Sewell, 1912, p. 363. Pl. XXIV.,
figs. 6-7.

This species has now been reported from the Arabian Sea, the coastal waters of Ceylon, and the coast of Burma. It was present in several of the tow-nettings from the pearl banks, but never in any considerable numbers.

CENTROPAGES DORSISPINATUS, Thompson & Scott.

Centropages dorsispinatus, Thompson & Scott, 1903, p. 247.
Pl. I., figs. 19-25.

Centropages notoceras, Cleve, 1903, pp. 359 and 373.
Pl. XVII., figs. 2-10, and
Pl. XVIII., fig. 1.

————— Sewell, 1912, p. 360.

Several examples of this species were taken in a tow-netting at Kilakarai at the head of the Gulf of Mannar. As I have already pointed out (*loc. cit.*), the descriptions given by Thompson & Scott and Cleve differ in several details; the present specimens agree exactly with those from the Persian Gulf and from Burma.

CENTROPAGES ELONGATUS, Giesbrecht.

Centropages elongatus, Giesbrecht, 1896, pp. 317, 322.
Pl. V., figs. 3-6.

————— A. Scott, 1902, p. 404. Pl. I., figs.
13, 14.

————— Cleve, 1903, p. 359.

————— Thompson & Scott, 1903, p. 246.

————— Wolfenden, 1905, p. 1014. Pl.
XCVIII., figs. 2, 3, 9, 10, 14.

————— A. Scott, 1909, p. 113.

This species is comparatively rare in the present collections. A few examples of both sexes were obtained at Dutch Moderam, Krusadai, and Jokenpidi Paars.

CENTROPAGES GRACILIS (Dana).

- Centropages gracilis*, Cleve, 1901, p. 5.
 ----- Cleve, 1903, p. 359.
 ----- Thompson & Scott, 1903, p. 247.
 ----- Wolfenden, 1905, p. 1013. Pl.
 XCVIII., fig. 7.
 ----- A. Scott, 1909, p. 114.

A single example of a mature female was obtained at Jokenpidi Paar.

CENTROPAGES TRISPINOSUS, sp. nov.
 (Pl. XVIII., figs. 5-8.)

A single example, a female, of apparently a new species of *Centropages*, was taken in a tow-netting at Kilakarai. The single specimen obtained presents several characteristic features in which it differs from all previously described specimens, and I have therefore given it the above name.

♀ Total length, 1.4 mm.

The proportional lengths of cephalothorax and abdomen are 3 : 1. The head and first thoracic segment are quite separate, as also are thoracic segments four and five. The dorsum is uniformly rounded. The posterior thoracic margin is rounded, and is armed with three short spines situated rather towards the ventral side. The rostrum consists of two slender processes. The abdomen possesses three segments having, with the furcal rami, the proportional lengths 4 : 3 : 2 : 2. The genital segment is somewhat barrel-shaped, and has a rounded swelling on the dorsal aspect.

The first antenna, when folded back, reaches to the end of the abdomen. The number and relative lengths of the basal segments are not easily determined; apparently several segments are fused together to form the second joint, and the eighth and ninth are also partially fused, and the twenty-fourth and twenty-fifth segments completely so.

The proportional lengths of the various joints are as follows :—

Segments :	1.	2-4.	5.	6.	7.	8-9.	10.	11.	12.	13:	
	43	43	14	17	28	37	23	26	37	63	
Segments :	14:	15.	16.	17.	18.	19.	20.	21.	22.	23.	24-25.
	68	68	77	86	88	77	51	46	31	34	43

The Fifth Pair of Legs.—Both rami are three-jointed.

Exopod 1 bears a marginal spine, but has no internal seta ; exopod 2, in addition to the single external marginal spine, bears the usual spine on its inner border. This spine is long and has a somewhat swollen base ; it tapers gradually to a fine point and bears no teeth on its surface. Exopod 3 has two marginal spines and a finely serrated end-spine.

The endopodite reaches to the level of the joint between exopods 2 and 3. Endopod 1 presents a well-marked rounded swelling at its distal external angle.

The remaining appendages appear to be very similar to those of *Centropages alcocki* (Sewell, 1912, p. 338, Pl. XVII., figs. 1-7), but the serrations on the terminal spines of the swimming feet are not so coarse and are less widely separated.

Genus **Pseudodiaptomus**, Herriek.

PSEUDODIAPTOMUS AURIVILLII, Cleve.

Pseudodiaptomus aurivillii, Cleve, 1901, p. 48. Pl. VI.,
figs. 11-22, and Pl. VII.,
figs. 1, 2.

————— Thompson & Scott, 1903, p.
248. Pl. II., figs. 24-26.

————— A. Scott, 1909, p. 116.

————— Sewell, 1912, p. 363.

Numerous examples of both sexes were obtained in the present collections. The male was first obtained by Thompson and Scott, but as they give no description of its structure I give below a brief account of some of the more salient features.

♂. Total length, 1.1 mm.

Proportional lengths of cephalothorax and abdomen 2 : 1.

The head and first thoracic segment are fused completely and thoracic segment 4 and 5 partially so; the postero-lateral border of the fifth segment is, as in the female, armed with a large backwardly projecting spine. The rounded anterior "forehead" terminates ventrally in a bifid rostrum composed of long fleshy processes.

The abdomen consists of five segments having, with the furca, the following relative proportions:—16 : 25 : 24 : 24 : 11 : 21. Segments 2 to 4 inclusive are armed round their posterior borders with a series of triangular spines.

The first antenna on the right side is modified to form a grasping organ; it is composed of twenty joints, having the following relative proportional lengths:—

Segments:	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	95	52	24	14	14	19	14	14	24	28
Segments:	11.	12.	13.	14.	15.	16.	17.	18.	19-20.	21-23.
	24	24	28	66	57	62	43	118	114	165

The knee-joint is situated between segments 18 and 19, and the "Endabschnitt" consists of two joints only, segments 19 and 20 and 21 to 23 being respectively fused together. Segment 10 bears a long spine-like seta, and segments 12 to 16 are all armed with needle-like spines; the seventeenth segment bears a lamellar process on its anterior aspect; both segments of the knee-joint are armed with lamellar plates, that on the proximal segment being armed with needle-like teeth, while that on the distal is unarmed.

The Second Antenna.—The two rami are of nearly equal length; the last joint of the exopodite is swollen and nipple-shaped. The endopodite is of the usual type.

The Second Maxilliped.—Basal 1 is three-fifths as long as broad; it bears four setæ on its anterior border and carries a single stout spine-like seta distally; basal 2 is beset with fine hairs proximally, and about the middle of its length bears three stout setæ; it is about twice as long as broad. The terminal portion of the appendage consists of the usual five segments.

The First Pair of Swimming Legs.—Basal 1 bears an internal seta, and is armed with a few spines on its anterior aspect near the base ; basal 2 bears a corona of spines distally on its outer and anterior surfaces. The rami are in exact agreement with Cleve's original description (*loc. cit.*, 1901).

The remaining swimming legs are similar to those of the female, and the fifth pair of legs correspond exactly with the description given by Thompson and Scott.

PSEUDODIAPTOMUS SERRICAUDATUS (T. Scott).

- Pseudodiptomus serricaudatus*, A. Scott, 1902, p. 404.
 Pl. I., fig. 6.
 _____ Cleve, 1903, p. 368.
 _____ Thompson & Scott, 1903,
 p. 248.
 _____ Cleve, 1904, p. 196.
 _____ Tollinger, 1911, p. 177.

Examples of this species were of common occurrence throughout the area under investigation.

Family TEMORIDÆ.

Genus **Temora**, W. Baird.

TEMORA DISCAUDATA, Giesbrecht.

- Temora discaudata*, Giesbrecht, 1889, Sem. 1, p. 814.
 _____ Giesbrecht, 1891, p. 282.
 _____ Giesbrecht, 1896, p. 317.
 _____ Thompson, 1899, p. 280.
 _____ Cleve, 1901, p. 9.
 _____ A. Scott, 1902, pp. 405 and 423.
 _____ Cleve, 1903, p. 369.
 _____ Thompson & Scott, 1903, p. 248.
 _____ Cleve, 1904, p. 198.
 _____ Wolfenden, 1905, p. 1023.

- Temora discaudata*, A. Scott, 1909, p. 118.
 ————— Pesta, 1912, p. 47, fig. 7.
 ————— Sewell, 1912, p. 365. Pl. XXII.,
 figs. 8, 9.

Numerous examples of this species were obtained ; as the above list of references shows, it is widely distributed throughout Indian waters.

TEMORA STYLIFERA (Dana).

- Temora stylifera*, Thompson, 1899, p. 280.
 ————— Cleve, 1901, p. 9.
 ————— A. Scott, 1902, p. 404.
 ————— Cleve, 1903, p. 369.
 ————— Thompson & Scott, 1903, p. 249.
 ————— Cleve, 1904, p. 198.
 ————— Wolfenden, 1905, p. 1023.
 ————— Sewell, 1912, p. 366.

The above species also appears to be widely distributed throughout Indian waters ; it was common in the present collections.

TEMORA TURBINATA (Dana).

- Temora turbinata*, Giesbrecht, 1889, Sem. 1, p. 814.
 ————— Giesbrecht, 1891, p. 282.
 ————— Giesbrecht, 1896, p. 318.
 ————— Thompson & Scott, 1903, p. 249.
 ————— Scott, 1909, p. 118.
 ————— Pesta, 1912, p. 48, fig. 8.
 ————— Sewell, 1912, p. 366.
 ————— Pesta, 1913, p. 32.

This species also was common in the collections, and appears to be widely distributed in these waters.

Family LUCICUTIIDÆ.

Genus **Lucicutia**, Giesbrecht.

LUCICUTIA FLAVICORNIS (Claus.).

Leuckartia flavicornis, Cleve, 1901, p. 7.*Lucicutia flavicornis*, A. Scott, 1902, p. 405.

————— Thompson & Scott, 1903, p. 249.

————— Cleve, 1903, p. 364.

————— Cleve, 1904, p. 192.

————— Wolfenden, 1905, p. 1012.

————— A. Scott, 1909, p. 125.

————— Sewell, 1912, p. 366.

A few examples only were obtained.

Genus **Metacalanus**, Cleve.

METACALANUS AURIVILLII, Cleve.

Metacalanus aurivillii, Cleve, 1901, pp. 7, 43. Pl. IV.,
figs. 16-25, and Pl. V., figs. 1-6.————— Thompson & Scott, 1903, p. 243.
Pl. II., figs. 18-20.

————— A. Scott, 1909, p. 146.

Numerous examples of this species were obtained. It has now been reported from the Malay Archipelago and Ceylon, and I have myself found it in the Plankton of the Tenasserim coast. It was also of frequent occurrence in the "Siboga" collection, and is probably widely distributed throughout the Indian seas. Owing to its small size, however, it is very liable to be overlooked.

Family CANDACIIDÆ.

Genus **Gandacia**, Dana.

CANDACIA ÆTHIOPICA (Dana).

Candacia æthiopica, Thompson, 1899, p. 281.

————— Scott, 1902, p. 405.

- Candacia aethiopica*, Thompson & Scott, 1903, p. 250.
 ————— Cleve, 1903, p. 358.
 ————— Scott, 1909, p. 151.
 ————— Sewell, 1912, p. 366.

Only a few examples were obtained in the present collections.

CANDACIA CATULA (Giesbrecht).

- Candacia catula*, Giesbrecht, 1896, p. 317.
 ————— Cleve, 1901, p. 5.
 ————— Scott, 1902, p. 405.
 ————— Thompson & Scott, 1903, p. 250.
 ————— Cleve, 1903, p. 358.
 ————— Cleve, 1904, p. 186.
 ————— Wolfenden, 1905, p. 1012.
 ————— Scott, 1909, p. 152.
 ————— Sewell, 1912, p. 367.

This species appears to be widely distributed throughout Indian waters. It was by no means common on the pearl banks, but several examples of both sexes were obtained.

CANDACIA BRADYI, A. Scott.

- Candacia bradyi*, Scott, 1902, p. 406. Pl. I., figs. 9-12 (♂).
 ————— Thompson & Scott, 1903, p. 250.
Candacia tuberculata, Wolfenden, 1905, p. 1013.
Candacia bradyi (♂ part), Carl, 1907, p. 9. Pl. I., figs. 11
 and 14, and Pl. XCVI., figs. 40-44 (♂).
 ————— Scott, 1909, p. 156. Pl. XLVII., figs.
 1-9 (♂).
 ————— Pesta, 1912, p. 49, fig. 9 (♀).
 ————— Sewell, 1912, p. 366. Pl. XXIII., figs.
 6 and 7 ().

This species appears to have a fairly wide distribution throughout Indian waters. Its occurrence has now been reported from localities ranging from the Persian Gulf to Amboina and the Phillipines.

CANDACIA DISCAUDATA, Scott.

Candacia bradyi (♀ part), Carl, 1907, p. 9. Pl. I., figs. 8-10, 12-13.

Candacia discaudata, Scott, 1909, p. 157. Pl. XLVII., figs. 10-20.

————— Sewell, 1912, p. 367.

The first to describe this species was Dr. J. Carl; he, however, only had the female sex before him, and he made the mistake of associating his examples with *Candacia bradyi*, Scott, of which at that time only the male was known. Scott, who does not appear to have been acquainted with Carl's Paper, re-described the species from the Siboga collection under the above name.

Several examples of both sexes were obtained from the pearl banks, so the known distribution of this form is extended considerably to the westward.

CANDACIA PACHYDACTYLA, Dana.

Candace pachydactyla, Cleve, 1901, p. 5.

Candacia pachydactyla, Thompson & Scott, 1903, p. 251.

————— Cleve, 1903, p. 358.

————— Cleve, 1904, p. 187.

————— Wolfenden, 1905, p. 1013.

————— Scott, 1909, p. 153.

————— Sewell, 1912, p. 368.

Although this species appears to be widely distributed throughout Indian waters, it was of rare occurrence in the present collection.

CANDACIA TRUNCATA, Dana.

Candacia truncata, Thompson, 1899, p. 282.

————— Scott, 1902, p. 405.

————— Thompson & Scott, 1903, p. 250.

————— Cleve, 1903, p. 358.

- Candacia truncata*, Cleve, 1904, p. 187.
 ————— Wolfenden, 1905, p. 1013.
 ————— Scott, 1909, p. 155.
 ————— Sewell, 1912, p. 368.

This species also appears to have a wide distribution, but only a single specimen was found in the collection.

Family PONTELLIDÆ.

Genus **Calanopia**, Dana.

CALANOPIA ELLIPTICA (Dana).

- Calanopia elliptica*, Giesbrecht, 1896, pp. 317, 325. Pl. V.,
 figs. 7-9.
 ————— Thompson, 1899, p. 282.
 ————— Cleve, 1901, p. 5.
 ————— A. Scott, 1902, pp. 406 and 423.
 ————— Thompson & Scott, 1903, p. 251.
 ————— Cleve, 1903, p. 356.
 ————— Wolfenden, 1905, p. 1023.
 ————— A. Scott, 1909, p. 177. Pl. XLVIII.,
 figs. 1-5.
 ————— Pesta, 1912, p. 50, fig. 10.
Calanopia sp. (= ♂ juv.), Pesta, 1912, p. 52, fig. 12.
Calanopia elliptica, Sewell, 1912, p. 368.
 ————— Pesta, 1913, p. 32.

This species is of comparatively common occurrence in Indian waters; examples of both sexes were plentiful in the Ceylon collection. The form described by Dr. Pesta (*loc. cit.*, 1912) is, in my opinion, a young and immature male; the form of the fifth appendage is exactly similar to that found in young males just before they undergo the sexual moult.

CALANOPIA AURIVILLII, Cleve.

- Calanopia aurivillii*, Cleve, 1901, p. 37. Pl. II., figs.
 17-23, and Pl. III., figs. 1-10.
 ————— Thompson & Scott, 1903, p. 251.

Calanopia minor, Sewell, 1912, p. 368.

Calanopia aurivillii, A. Scott, 1909, p. 181. Pl. XLVIII.,
figs. 16-20.

Numerous examples of both sexes were obtained in the Ceylon collections; they agree exactly with the descriptions of Cleve and Scott. I have re-examined the specimens which I recorded from the coast of Burma under the name *C. minor* and I find that for the most part they do not belong to that species, but are examples of *C. aurivillii*.

CALANOPIA THOMPSONI, A. Scott.

Calanopia thompsoni, Scott, 1909, p. 17a. Pl. XLIX.
figs. 1-8.

————— Sewell, 1912, p. 368.

Numerous examples of this species were obtained from the Ceylon pearl banks; they were especially common in a tow-netting from Marichchukkaddi Bay. Its occurrence in these waters increases the range of this species very considerably.

CALANOPIA MINOR, A. Scott.

Calanopia minor, A. Scott, 1902, p. 406. Pl. I., figs. 1-5.

————— Thompson & Scott, 1903, p. 251.

————— Cleve, 1903, p. 356.

————— Wolfenden, 1905, p. 1023.

————— A. Scott, 1909, p. 177. Pl. XLVIII.,
figs. 6-10.

————— Pesta, 1912, p. 51.

————— Sewell, 1912, p. 368.

A few examples of this species were obtained on the pearl banks, but on the whole it was comparatively rare.

Genus **Labidocera**.

LABIDOCERA ACUTA (Dana).

Labidocera acutum, Giesbrecht, 1889, p. 27.

————— Giesbrecht, 1891, p. 282.

- Labidocera acuta*, Giesbrecht, 1896, p. 317.
 ———— Thompson, 1899, p. 282.
 ———— Cleve, 1901, p. 7.
 ———— A. Scott, 1902, p. 407.
 ———— Thompson & Scott, 1903, p. 251.
 ———— Cleve, 1903, p. 363.
 ———— Cleve, 1904, p. 191.
 ———— Wolfenden, 1905, p. 1016.
 ———— Scott, 1909, p. 164.
 ———— Pesta, 1912, p. 52, fig. 13.
 ———— Sewell, 1912, p. 368.
 ———— Pesta, 1913, p. 32.

This species was of common occurrence in the Ceylon collections. As the above list of references indicates, it has a wide distribution throughout Indian waters.

LABIDOCERA KROYERI (Brady).

- Labidocera kroyeri*, Cleve, 1901, p. 7.
 ———— Thompson & Scott, 1903, p. 251.
 ———— Scott, 1909, p. 165.
 ———— Sewell, 1912, p. 369.
Labidocera kroyeri var. *stylifera*, Thompson & Scott.
Labidocera kroyeri var. *stylifera*, Thompson & Scott,
 1903, p. 252. Pl.
 II., figs. 8, 9.
 ———— Sewell, 1912, p. 369.
Labidocera kroyeri var. *burmanica*, Sewell.
Labidocera kroyeri var. *burmanica*, Sewell, 1912, p. 369.
 Pl. XXIII., figs. 4
 and 5.

Examples of this species were common throughout the area under investigation. A peculiarity of this species is the degree of variation exhibited by the males. Thompson and Scott described two varieties from the Ceylon coast, var. *stylifera* and var. *gallensis*, and I have previously described a third, var. *burmanica*, from the Tenasserim coast. The vast majority of the males obtained in the present collection

belonged to the variety of *stylifera*; a few examples of the *burmanica* variety and two examples of the normal male were also obtained.

LABIDOCERA MINUTA, Giesbrecht.

- Labidocera minutum*, Giesbrecht, 1889, p. 27.
 ————— Giesbrecht, 1891, p. 28e.
 ————— Cleve, 1901, p. 7.
Labidocera minuta, A. Scott, 1902, p. 407.
 ————— Thompson & Scott, 1903, p. 251.
 ————— Cleve, 1903, p. 363.
 ————— Wolfenden, 1905, p. 1018. Pl.
 XCVIII., figs. 18, 24, 25, 29, 32, 37
 ————— A. Scott, 1909, p. 167.
 ————— Pesta, 1912, p. 53, fig. 14.
 ————— Sewell, 1912, p. 370.

Examples of this species, though not common, were yet of fairly frequent occurrence in the collections; the species appears to be widely distributed throughout Indian waters.

LABIDOCERA PAVO, Giesbrecht.

(Pl. XXI., figs. 1-3.)

- Labidocera pavo*, Giesbrecht, 1889, p. 27.
 ————— Giesbrecht, 1891, p. 282.
 ————— Cleve, 1901, p. 7.
 ————— Thompson & Scott, 1903, p. 251.
 ————— Cleve, 1903, p. 364.

Numerous examples of this species, including the hitherto unknown male, were obtained in some of the tow-nettings from the pearl banks.

♂. Total length, 2·2 mm.

Proportional lengths of cephalothorax and abdomen about 4 : 1. The head and first thoracic segments are fused together, and there is a well-marked groove across the dorsal aspect of the "neck."

The fourth and fifth thoracic segments are also fused. The posterior thoracic margin is rounded, and is armed with a small spine. The head is furnished with a pair of large eye lenses, and the ventral lens is well developed and of a plum-colour. The rostrum is bifid, and is composed of two slender spines; there is no rostral lens. The abdomen consists of five segments, having, with the furcal rami, the following proportional lengths:—27 : 32 : 32 : 16 : 9 : 38.

The first antenna, when folded back, reaches to the middle of the abdomen; that on the left side consists of twenty-two joints, having the following proportional lengths, and for purposes of comparison I also give the lengths of the joints in the female:—

Segments :	1.	2.	3.	4.	5.	6.	7-8.	9.	10.	11.	12.
♂ ..	65	65	15	11	13	26	49	26	23	38	39
♀ ..	81	81	17	13	14	28	50	22	22	36	38
Segments :	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
♂ ..	36	41	73	73	81	86	54	52	52	41	41
♀ ..	36	45	66	66	78	81	52	48	50	38	38

Segments 7 and 8 are partially fused together. The right antenna is modified to form a grasping organ; it consists of nineteen joints, having the following proportional lengths:—

Segments :	—	—	—	—	—	—	—	—	12.	13.
♂ ..	56	75	18	14	13	32	37	42	26	24
Segments :	14.	15.	16.	17.	18.	19-21.	22.	23.	24-25.	
♂ ..	40	72	87	70	106	119	89	40	40	

Segments 11, 12, and 13 each bear a minute spine on the anterior surface; the seventeenth segment bears a curved lamellar plate very similar to that present in *L. detruncata*; the eighteenth segment is armed with a lamellar plate carrying a number of fine acicular spines, and the nineteenth segment carries a raised tooth-plate very similar to that of *L. detruncata*, but only reaching about three-fourths the length of the segment, not beyond the distal joint as in *L. detruncata*, nor is it so rounded at its extremity.

The Fifth Pair of Legs.—That on the right side has much the same shape as that of *L. detruncata*, but the proximal process is not so stout; the left leg also has a similar structure,

but the spines on the distal segment are somewhat differently arranged. The first spine arises from the middle of the external margin and the remaining three from the extreme tip; the inner margin is beset with fine hairs.

It is evident that this species closely resembles *L. detruncata*, but in both sexes there are certain constant differences that render identification comparatively easy.

LABIDOCERA PECTINATA, Thompson & Scott.

Labidocera pectinata, Thompson & Scott, 1903, p. 252.
Pl. II., figs. 10-14.

Labidocera similis, Cleve, 1903, pp. 364 and 378. Pl. XIX.,
figs. 4-6.

Labidocera pectinata, Sewell, 1912, p. 370. Pl. XXIII.,
figs. 8-9.

A single example of this rare species was obtained from a tow-netting taken at Paumben.

Genus **Pontella**, Dana.

PONTELLA DANÆ, var. **CEYLONICA**, Thompson & Scott.

Pontella danæ var. *ceylonica*, Thompson & Scott, 1903, p.
252. Pl. II., figs. 1-5.

————— Sewell, 1912, p. 370.

A few examples were obtained; they agree exactly with the original figures and description.

PONTELLA INVESTIGATORIS, Sewell.

Pontella investigatoris, Sewell, 1912, p. 371. Pl. XXIII.,
figs. 1-3.

This species was first described by me from male examples taken on the coast of Burma. Several specimens were obtained in the present collections from the Ceylon pearl banks, and these agree exactly with the types. One cannot help

remarking on the frequency with which these males are associated with the females of the preceding species, and in neither case have any corresponding members of the opposite sex been obtained. The male, *P. danæ*, as described, is obviously not the same as the present species, but it is possible that the variety of the female, as described by Thompson & Scott, is in reality a different species, and I am inclined to regard it as the female of *P. investigatoris*. There is a very close similarity in the general structure, and especially is this seen in the relative lengths of the antennal joints in the two forms. I give below the proportional lengths of the joints in the antenna of *P. danæ* var. *ceylonica* (♀), and those of the unaltered antenna of *P. investigatoris* (♂).

	Segments: 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
<i>P. danæ</i> ;												
var. <i>ceylonica</i> . ♀ . .	95	71	16	17	20	22	20	20	27	23	22	38
<i>P. investi-</i>												
gatoris, ♂	98	71	16	16	18	20	18	18	25	20	20	35
	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
<i>P. danæ</i> ;												
var. <i>ceylonica</i> . ♀ . .	38	42	47	61	61	66	71	49	47	50	34	43
<i>P. investi-</i>												
gatoris, ♂	34	34	44	59	60	70	76	56	56	56	40	48

It is obvious that there is a fairly close resemblance between these two forms, and I am inclined to believe that the form described by Thompson & Scott as *P. danæ* var. *ceylonica* is in reality not a variety of Giesbrecht's species, but the female of *P. investigatoris*.

PONTELLA FERA, Dana.

- Pontella fera*, Giesbrecht, 1889, p. 28.
- Giesbrecht, 1891, p. 282.
- A. Scott, 1902, p. 408.
- Thompson & Scott, 1903, p. 252.
- Wolfenden, 1905, p. 1021.
- A. Scott, 1909, p. 159.

Although recorded from various parts of the Indian Ocean and its offshoots, this species would appear to be by no means

Several examples of this species were obtained from the pearl banks. Though differing in several unimportant details from the original description, I have no doubt that the above is the correct specific identity. In the present specimens, the genital segment of the abdomen in the female frequently bears a small spine on the dorsal surface and somewhat towards the left side, in addition to the two on the right side described by Thompson & Scott; in all my specimens the furcal setæ are plumose.

PONTELLOPIS KRAMERI (Giesbrecht).

- Monops krameri*, Giesbrecht, 1896, pp. 317, 323.
Pontellopsis krameri, A. Scott, 1902, p. 423. Pl. I., figs. 7, 8, and Pl. II., figs. 1, 2.
 ————— Thompson & Scott, 1903, p. 253.
 ————— Wolfenden, 1905, p. 1021. Pl. XCVIII., figs. 39-41.
 ————— A. Scott, 1909, p. 171.
 ————— Sewell, 1912, p. 376.

Several examples of the male of this species were obtained, but no corresponding females.

PONTELLOPSIS PERSPICAX (Dana).

- Pontellopsis perspicax*, Thompson & Scott, 1903, p. 253.
 ————— A. Scott, 1909, p. 171.

A single female belonging to the above species was taken at Periya Paar.

PONTELLOPSIS REGALIS (Dana).

- Pontellopsis regalis*, Thompson, 1899, p. 283.
Monops regalis, Cleve, 1901, p. 7.
Pontellopsis regalis, Thompson & Scott, 1903, p. 253.
Monops regalis, Cleve, 1903, p. 364.
Pontellopsis regalis, A. Scott, 1909, p. 171.
 ————— Sewell, 1912, pp. 315, 376.

A single example was obtained in the present collection.

Genus **Pontellina**, Dana.

PONTELLINA PLUMATA (Dana).

- Pontellina plumata*, Giesbrecht, 1889, p. 29.
 ————— Giesbrecht, 1891, p. 282.
 ————— Thompson, 1899, p. 283.
 ————— Cleve, 1901, p. 8.
 ————— A. Scott, 1902, p. 408.
 ————— Thompson & Scott, 1903, p. 253.
 ————— Cleve, 1903, p. 367.
 ————— Cleve, 1904, p. 195.
 ————— Wolfenden, 1905, p. 1022.
 ————— A. Scott, 1909, p. 175.
 ————— Sewell, 1912, p. 354.

A few examples of this species were taken in the present collections. Though widely distributed, it does not appear to be common in Indian waters.

Genus **Acartia**, Dana.

ACARTIA CENTRURA, Giesbrecht.

- Acartia centrura*, Giesbrecht, 1889, p. 25.
 ————— Giesbrecht, 1891, p. 282.
 ————— Thompson & Scott, 1903, p. 254.

Several examples were obtained in the present collections.

ACARTIA DANÆ, Giesbrecht.

- Acartia danæ*, Cleve, 1903, p. 355.
 ————— Cleve, 1904, p. 184.
 ————— Wolfenden, 1905, p. 1023.
 ————— A. Scott, 1909, p. 187.
 ————— Sewell, 1912, p. 376.

A few examples of this species were present.

ACARTIA ERYTHRÆA, Giesbrecht.

- Acartia erythræa*, Giesbrecht, 1889, p. 26.
 ————— Giesbrecht, 1891, p. 282.
 ————— Giesbrecht, 1896, p. 317.
 ————— Thompson, 1899, p. 284.
 ————— Cleve, 1901, p. 4.
 ————— A. Scott, 1902, pp. 408, 423.
 ————— Thompson & Scott, 1903, p. 254.
 ————— Cleve, 1903, p. 355.
 ————— Wolfenden, 1905, p. 1023.
 ————— A. Scott, 1909, p. 187.
 ————— Pesta, 1912, p. 53, fig. 16.
 ————— Sewell, 1912, p. 377.
 ————— Pesta, 1913, p. 32.

Numerous examples of both sexes were obtained; this species is both widely distributed and of common occurrence in Indian waters.

ACARTIA NEGLIGENS, Dana.

- Acartia negligens*, Cleve, 1901, p. 4.
 ————— A. Scott, 1902, p. 408.
 ————— Thompson & Scott, 1903, p. 254.
 ————— Wolfenden, 1905, p. 1023.
 ————— A. Scott, 1909, p. 188.

Examples of this species were obtained at several of the localities on the pearl banks, though in no case was it present in any considerable numbers.

ACARTIA SPINICAUDA, Giesbrecht.

- Acartia spinicauda*, Cleve, 1901, p. 4.
 ————— Cleve, 1903, p. 355.
 ————— A. Scott, 1909, p. 188.
 ————— Sewell, 1912, pp. 315 and 377.

Only a few examples of this species were present.

ACARTIA BISPINOSA, Carl.

Acartia bispinosa, Carl, 1907, p. 13. Pl. I., figs. 1, 2.

————— Pesta, 1912, p. 54, fig. 17.

This species was first described by Carl from Amboina, and since then it has been recorded by Pesta from the Persian Gulf. Numerous examples were obtained in the Ceylon collections, and the specimens agree closely with previous descriptions. According to Carl and Pesta, there are only two spines on the postero-lateral thoracic margin, but this appears to be a variable character, as in some of the present examples an extra spine occurred, making three in all. Only the males of this species have up to the present time been discovered.

ACARTIA PIETSCHMANI, Pesta.

Acartia pietschmani, Pesta, 1912, p. 55, fig. 18.

————— Pesta, 1913, p. 33.

This species was described from the Persian Gulf, where examples of the adult female and some immature males were obtained, and has since been obtained in the Arabian Sea. Several examples were found in the Ceylon collections that correspond with this form; they at first sight are likely to be mistaken for *A. erythræa*, but they are of smaller size, and the structure of the fifth pair of legs in the female of the two species is different.

ACARTIA AMBOINENSIS, Carl.

(Pl. XIX., figs. 1-7).

Acartia amboinensis, Carl, 1907, p. 12. Pl. I., figs. 3-5.

Numerous examples were found in the present collections. This species was described by Carl from male examples only; these very closely resemble the male of *A. erythræa*, but there are certain constant differences in the structure of the fifth

pair of thoracic appendages; and on the posterior thoracic margin, in most cases, there are two small spines situated dorsally, though in some instances as many as three are present, whereas in *A. erythræa* there is only one.

Associated with these males in the present collections were numerous females.

♀. Total length, 1.2 mm.

Proportional lengths of cephalo-thorax and abdomen, 14 : 3.

The head and first thoracic segment are separate, but the last two thoracic segments are fused. The posterior thoracic margin bears a large lateral spine, as *A. erythræa*, and one, sometimes two, small spines dorsally. The rostrum consists of a pair of slender spines.

The abdomen consists of three segments having, with the furcal rami, the following proportions:—7 : 3 : 2 : 3. The first segment is armed near its posterior border with a pair of small spines dorso-laterally; the second segment is devoid of spines. The furcal setæ are all of the same thickness, but the second is somewhat longer than the others.

The first antenna, when folded back, reaches to the end of the first abdominal segment. It consists of eighteen joints, having the following proportions:—

Segments :	1.	2-4.	5-6.	7-8.	9-10.	11.	12-13.	14.	15-16.
	49	81	35	22	97	51	111	57	92
Segments :	17.	18.	19.	20.	21.	22.	23.	24.	25.
	62	57	49	46	57	32	51	38	13

The first joint bears a long straight spine on its anterior aspect, and two small spines posteriorly; the second joint bears a large curved hook on its posterior border; and the fourth joint is armed with two small spines posteriorly.

The second antenna is as figured.

The first pair of swimming legs consist of a basal portion and two-jointed exopodite and endopodite: exopod 1 has a fine seta-like marginal spine; exopod 2 bears three margin spines, the proximal of which is long and stout and reaches well beyond the end of the terminal segment, while the distal two are slender and seta-like; the end spine is slender and in length nearly equals the whole exopodite.

The third and fourth pairs of legs are very similar to *A. crythræa*.

The fifth pair of legs bear a short external seta; and the terminal process is long and curved and is very slightly swollen at the base.

These examples very closely resemble the females of *A. crythræa*, but the spinulation of the basal segments of the first antenna and the form of the fifth pair of legs are different and are quite characteristic.

ACARTIA SOUTHWELLI, sp. nov.

(Pl. XIX., figs. 8, 9.)

Several examples, both male and female, of what appears to be a new species of *Acartia* were obtained from Kilakarai. The chief characters of these specimens are as follows:—

♀. Total length, 0·8 mm.

Proportional lengths of cephalothorax and abdomen, 35 : 1.

The head and first thoracic segment are separate, but the fourth and fifth thoracic segments are fused together.

The posterior thoracic margin is rounded, and is devoid of spines. The anterior extremity is rounded, and bears a pair of slender curved rostral filaments.

The abdomen consists of three segments having, with the furcal rami, the following proportions:—26 : 13 : 10 : 15; all the segments are devoid of any trace of spines, and the genital segment is somewhat swollen and rounded. The furcal rami are nearly as wide as long, 9 : 10.

The first antennæ, when folded back, reach just beyond the posterior thoracic margin; each consists of twenty joints, the more proximal of which are, as usual, very indistinctly marked off from one another, so that it is a matter of some difficulty to determine their exact limits; they appear to have the following proportions:—

Segments :	1.	2-4.	5-6.	7-8.	9-10.	11.	12.	13-14.	15.	16.
	73	54	24	24	20	49	43	125	43	68

Segments :	17.	18.	19.	20.	21.	22.	23.	24.	25.
	58	68	49	49	49	34	63	44	20

The second antenna and mouth-parts are similar to other members of the genus.

The fifth pair of legs consist of a fairly long basal joint bearing a minute seta on its external margin distally, and having a long and delicate terminal spine. This spine is curved, and has a markedly swollen base.

♂. Total length, 0.75 mm.

The proportional lengths of cephalothorax and abdomen are, 4 : 1.

The abdomen consists of four segments having, with the furcal rami, the proportional lengths :—18 : 14 : 3 : 9 : 10.

The first antenna on the right side is, as usual, modified to form a grasping organ ; it consists of fifteen separate joints having the following proportions :—

Segments :	1-4.	5-6.	7-8.	9.	10.	11.	12.	13.	14.
	121	66	66	18	36	36	97	42	48
Segments :	15.	16.	17.	18.	19-21.	22-25.			
	96	115	109	42	66	42			

The fifth pair of legs are of the usual type ; the right leg forms a claw, the second segment bears a somewhat quadrangular process on its inner border, and the third segment terminates in two short unequal spines.

Genus *Acartiella*, nov.

I propose to establish a new genus for the reception of certain *Acartia*-like species which have been obtained from Indian coastal waters. The first species I described under the name *Acartia tortaniformis* (Sewell, 1912, p. 346, Pl. XXI., figs. 1-10), from the Chittagong region and Rangoon river estuary on the coast of Burma ; a second species was obtained in a tow-netting taken off Kilakarai.

These two species differ from those of the genus *Acartia*, in that in the female the fifth pair of legs possesses both an exopodite and endopodite, and in the male the right leg forms a well-developed clasping apparatus ; in both species the rostrum is absent ; the first antenna of the female consists of

21 joints, segments 2-6 being fused together, while in the male the grasping antenna resembles that of an *Acartia*; the abdomen is long, and terminates in two long furcal rami which are symmetrical.

ACARTIELLA KEMPI, sp. nov.

(Pl. XX., figs. 1-5, and Pl. XXI., fig. 4.)

♀. Total length, 1.0 mm.

Proportional lengths of cephalothorax and abdomen, 2.5 : 1.

The head and first thoracic segment are separate, thoracic segments 4 and 5 are fused together, the posterior thoracic margin is rounded and devoid of spines. The anterior head region is uniformly rounded, and the rostrum is absent.

The abdomen consists of three separate segments having, with the furcal rami, the following proportions :—32 : 15 : 25 : 34. The first segment is devoid of spines, thus differing from *A. tortaniformis*.

The furcal rami are long and slender as in the genus *Tortanus*, but are symmetrical.

The first antenna, when folded back, reaches to the last abdominal segment; it consists of twenty-one separate joints, having the following proportional lengths :—

Segments :	1.	2-6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
	53	116	53	32	35	39	28	35	32	39	35
Segments :	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	
	35	53	63	63	53	60	46	63	46	21	

None of the segments possess spines.

The second antenna resembles that present in the genus *Acartia*; it has a long endopodite and a short exopodite. In this respect this species differs very considerably from *Acartiella tortaniformis* (Sewell), the only other member of the genus in which this appendage is of a somewhat unusual form.

The mouth-parts and *swimming legs* closely resemble those of *A. tortaniformis*.

The fifth pair of legs consists of a short, stout, basal portion carrying a single plumose seta, and both exopodite and endopodite are present; the exopodite consists of a long slightly curved process, terminating in a sharp point and bearing a single seta-like spine on its external margin at about the junction of the middle and distal thirds; the endopodite is short and conical. There are no teeth on either ramus, as is the case in *A. tortaniformis*.

♂. Total length, 0·9 mm.

Proportional lengths of cephalothorax and abdomen, 2 : 1.

The abdomen consists of five segments having, with the furcal rami, the following proportional lengths:—12 : 22 : 17 : 11 : 11 : 35.

The first antenna on the right side is modified to form a grasping organ. It consists of eighteen separate joints, having the following proportional lengths:—

Segments :	1.	2-4.	5.	6.	7.	8.	9.	10.	11.	12.
	66	84	25	11	22	33	25	40	25	33
Segments :	13.	14.	15.	16.	17.	18.	19-21.	22-25.		
	44	36	44	40	76	120	131	145		

The second to fourth segments inclusive are fused together to form a single joint; the "endabschnitt" consists of two joints, segments 19-21 and 22-25, respectively, being fused. The seventeenth segment bears a row of needle-like teeth on its anterior margin; the eighteenth segment bears a row of needle-like teeth anteriorly, and distally is armed with two claw-like spines, of which the proximal is the larger; the nineteenth segment carries a tooth-plate armed with acicular teeth, and the plate is produced beyond the distal extremity of the joint in a sharp spinous process.

The mouth-parts and swimming legs are the same as in the female.

The Fifth Pair of Legs.—Each consists of three segments, and that on the right side forms a well-developed grasping apparatus, as figured.

I have much pleasure in dedicating this species to Mr. S. W. Kemp, of the Indian Museum, who kindly made the collections for me at Kilakarai and Paumben, in which this species occurred.

Genus **Tortanus**, Giesbrecht.

TORTANUS GRACILIS (Brady).

(Pl. XXI., fig. 5.)

- Tortanus gracilis*, Cleve, 1901, p. 5. Pl. VII., figs. 11-14.
 ----- A. Scott, 1902, p. 423.
 ----- Thompson & Scott, 1903, p. 254.
 ----- Cleve, 1903, p. 369.
 ----- Wolfenden, 1905, p. 1026.
 ----- A. Scott, 1909, p. 190.
 ----- Sewell, 1912, p. 377.

Several examples of this species, belonging to both sexes, were present in the Ceylon collections.

Both Cleve and Wolfenden are inclined to believe that this species and the following, *T. forcipatus*, are synonymous, but a careful study of the examples in the present collection has shown that this view is absolutely untenable. For the purpose of comparison I give below a few details of structure in this species.

♀. *The first antenna* consists of seventeen joints, having the following relative proportions :—

Segments :	1-7.	8.	9-10.	11.	12.	13-14.	15.	16.	17.
	87	18	52	28	28	74	52	52	59
Segments :	18.	19.	20.	21.	22.	23.	24.	25.	
	67	68	81	65	61	80	91	37	

Segments 1-7, 9-10, and 13-14 are, apparently, respectively fused together. The fifth pair of legs, as pointed out by Cleve (*loc. cit.*, 1901), are asymmetrical, but the degree of asymmetry is very slight, and not in the least comparable to that present in the corresponding appendages in *T. forcipatus*.

♂. *The grasping antenna* consists of sixteen joints, having the following proportional lengths :—

Segments :	1-5.	6.	7.	8.	9.	10.	11.	12.
	62	11	19	16	30	27	24	24
Segments :	13.	14.	15.	16.	17.	18.	19-21.	22-25.
	49	67	67	62	76	81	133	252

The fifth pair of legs correspond exactly with the description and figures given by Cleve (*loc. cit.*, 1901).

TORTANUS FORCIPATUS (Giesbrecht).

(Pl. XXI., fig. 6.)

Tortanus forcipatus, Thompson & Scott, 1903, p. 254.

This species was first described by Giesbrecht from female examples only. In the present collection numerous examples were found, and associated with them were several examples of a hitherto undescribed male, which I have no doubt is the unknown male of this species.

♂. Total length.

Proportional lengths of cephalothorax and abdomen, 5 : 3. The head and all the thoracic segments are separate. The abdomen consists of five segments having, with the furcal rami, the following proportional lengths :—14 : 15 : 12 : 9 : 13 : 70. In *T. gracilis* the corresponding proportional lengths are : 14 : 14 : 11 : 8 : 15 : 72. The furcal rami are symmetrical ; four furcal setæ arise from the distal end of the ramus, and of these the second is the longest. The fifth seta is quite short, and arises from the lateral border.

The grasping antenna consists of sixteen joints, having the following proportional lengths :—

Segments :	1-5.	6.	7.	8.	9-10.	11.	12.	13.
	114	13	20	20	26-29	23	23	43
Segments :	14.	15.	16.	17.	18.	19-21.	22-25	
	62	59	62	75	98	150	183	

So far as its structure is concerned, the grasping antenna very closely resembles that of *T. gracilis* : segments 17, 18, and 19-21 are all armed with rows of needle-like teeth.

The fifth pair of legs show distinct differences from the corresponding appendages of *T. gracilis* ; these can best be seen by comparing the figures given.

♀. In the female *T. forcipatus* the first antenna consists apparently of seventeen joints, having the following proportional lengths :—

Segments : 1-7.	8.	9-10.	11.	12.	13-14.	15.	16.	
99	23	57	28	28	51.	42	48	
Segments : 17.	18.	19.	20.	21.	22.	23.	24.	25.
54	59	68	82	71	71	79	92	48

The fifth pair of legs are markedly asymmetrical and correspond exactly with the figure given by Giesbrecht (1893, Pl. 31, fig. 15).

The occurrence of the hitherto unknown male is of interest and the differences that it presents to the male of *T. gracilis* show that these two forms are undoubtedly different species.

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APPENDIX.

LIST OF COLLECTING STATIONS.

Kilakarai.

12/20-2-13	..	Tow-net in shallow water, 0-2 fathom.
13-2-13	..	Tow-net from weeds.
„	..	Tow-net from weeds in 2 ft. of water.
„	..	Tow-net from weeds over shallow water.
„	..	Tow-net over weeds, 4 ft. of water.
17-2-13	..	⊖ net in 3 fathoms.
„	..	Tow net over 3 fathoms of water.

Between Kilakarai and Apa Island.

14-2-13	..	Tow net over 2 to 3 fathoms.
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Paumben.

22-2-13	..	Tow-net over 4 ft. of water.
„	..	⊖ net in 2 ft. of water through "Yostera" bed.
24-2-13	..	Surface tow-net.
25-2-13	..	⊖ net, on shelly ground in 1 fathom.

Anaivilundan Paar.

Date.	Time.	Depth in Fathoms of Net.	Position.
8-11-08	.. 7.30 A.M.	.. 0 ..	—
13-11-08	.. 8 A.M.	.. 0 ..	Dutch Anaivilundan.

Nadukudda Paar.

4-11-08	.. 12 noon	.. 0 ..	—
4-11-08	.. 5 P.M.	.. 0 ..	—
5-11-08	.. 8 A.M.	.. 0 ..	—
5-11-08	.. 12 noon	.. 0 ..	—
6-11-08	.. 7.30 A.M.	.. 0 ..	West side.
14-11-08	.. 12.30 P.M.	.. 0 ..	Dutch Nadukudda.

Koopay Paar.

11-11-08	.. 12 noon	.. 0 ..	—
11-11-08	.. 5 P.M.	.. 0 ..	—
12-11-08	.. 8.30 A.M.	.. 0 ..	South.
4-11-08	.. 5 P.M.	.. 0 ..	West.

Vankalai Paar.

Date.	Time.	Depth in Fathoms of Net.	Position.
11-4-07	.. 5-5.30 P.M.	.. 6 ..	—
30-10-08	.. 8 A.M.	.. 0 ..	—
30-10-08	.. 5 P.M.	.. 0 ..	—
31-10-08	.. 7.30 A.M.	.. 0 ..	—
31-10-08	.. 12 noon	.. 0 ..	—
31-10-08	.. 5 P.M.	.. 0 ..	—
15-10-08	.. 8.30 A.M.	.. 0 ..	1½ mile W.N.W.
15-11-08	.. 5 P.M.	.. 0 ..	do.
16-11-08	.. 8.30 A.M.	.. 0 ..	2½ miles N.N.W.

Periya Paar.

7-2-08	.. 8-8.30 A.M.	.. 0 ..	South end.
7-2-08	.. 8-8.30 A.M.	.. 6 ..	South end.
22-2-08	.. 8 A.M.	.. 0 ..	—
17-11-08	.. 5.30 P.M.	.. 0 ..	—
18-11-08	.. 7.30 A.M.	.. 0 ..	1 mile W. by S.
19-11-08	.. 12 noon	.. 0 ..	1½ mile N. by W.
19-11-08	.. 5 P.M.	.. 0 ..	2½ miles N.W.
20-11-08	.. 12 noon	.. 0 ..	2½ miles N. by W.
20-11-08	.. 5.30 P.M.	.. 0 ..	2½ miles W.S.W.
22-11-08	.. 5.30 P.M.	.. 0 ..	—
23-11-08	.. 8 A.M.	.. 0 ..	South shoal.

Periya Paar Karai.

9-4-07	.. 5-5.30 P.M.	.. 6 ..	—
10-4-07	.. 8-8.30 A.M.	.. 0 ..	—
11-4-07	.. 8-8.30 A.M.	.. 6 ..	—
17-11-08	.. 8.30 A.M.	.. 0 ..	—
17-11-08	.. 12 noon	.. 0 ..	—

Aripu Paar East.

3-12-08	.. 8 A.M.	.. 0 ..	—
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North Cheval Paar.

9-4-07	.. 8-8.30 A.M.	.. 6 ..	—
7-11-07	.. 4-4.30 P.M.	.. 0 ..	—
7-11-07	.. 4-4.30 P.M.	.. 5 ..	—
19-11-07	.. 8-8.30 A.M.	.. 6 ..	—

North-East Cheval Paar.

6-11-07	.. 8-8.30 A.M.	.. 0 ..	—
6-11-07	.. 8-8.30 A.M.	.. 5 ..	—
6-11-07	.. 4-4.30 P.M.	.. 0 ..	—
7-11-07	.. 8-8.30 A.M.	.. 0 ..	—
7-11-07	.. 8-8.30 A.M.	.. 5 ..	—
20-11-07	.. 8-8.30 A.M.	.. 0 ..	—

Date.	Time.	Depth in Fathoms of Net.	Position.
8-11-08	7.30 A.M.	0	—
27-11-08	5.30 P.M.	0	—
28-11-08	7.30 A.M.	0	—

Mid-East Cheval Paar.

7-2-07	5-5.30 P.M.	0	—
8-2-07	8-8.30 A.M.	0	—
8-2-07	12-12.30 P.M.	0	—
8-2-07	12-12.30 P.M.	6	—
3-11-07	4-4.30 P.M.	0	—
4-11-07	8-8.30 A.M.	0	—
4-11-07	8-8.30 A.M.	4	—
4-11-07	4-4.15 P.M.	0	—
4-11-07	4-4.15 P.M.	4	—
5-11-07	8-8.30 A.M.	0	—
5-11-07	8-8.30 A.M.	4	—
20-11-07	4-4.30 P.M.	0	—
21-11-07	8-8.30 A.M.	0	East side.
3-2-08	4-4.30 P.M.	0	do.
18-2-09	7.30 A.M.	0	—

South-East Cheval Paar.

6-2-07	5-5.30 P.M.	0	—
7-2-07	8-8.30 A.M.	0	—
23-11-07	8-8.30 A.M.	0	North edge.
16-2-09	5.30 P.M.	0	—
16-2-09	5.30 P.M.	6	—

South Cheval Paar.

19-2-09	5 P.M.	6	—
20-2-09	7 A.M.	0	—
20-2-09	7 A.M.	6	—

South-West Cheval Paar.

20-2-09	5.30 P.M.	0	—
21-2-09	7.30 A.M.	6	—
21-2-09	12 noon	0	—

Mid-West Cheval Paar.

22-1-07	3.45-4 P.M.	6	—
23-1-07	8-9 A.M.	6	—
23-1-07	12.30-1 P.M.	6	—
23-1-07	5-5.45 P.M.	6	—
24-1-07	8-9 A.M.	0	—
24-1-07	8-9 A.M.	6	—
24-1-07	12.30-1.30 P.M.	0	—

Date.	Time.	Depth in Fathoms of Net.	Position.
25-1-07	.. 8-9 A.M.	0 ..	West edge.
25-1-07	.. 8-9 A.M.	8 $\frac{3}{4}$..	do.
6-2-07	.. 12-12.30 P.M.	0 ..	—
9-2-07	.. 8-8.30 A.M.	0 ..	—
9-2-07	.. 8-8.30 A.M.	6 ..	—
30-3-07	.. 8-8.30 A.M.	0 ..	—
30-3-07	.. 8-8.30 A.M.	6 ..	—
30-3-07	.. 5-5.30 P.M.	0 ..	—
30-3-07	.. 5-5.30 P.M.	6 ..	—
31-3-07	.. 8-8.30 A.M.	0 ..	—
31-3-07	.. 8-8.30 A.M.	6 ..	—
31-3-07	.. 5-5.30 P.M.	6 ..	—
1-4-07	.. 8-8.30 A.M.	0 ..	—
1-4-07	.. 8-8.30 A.M.	6 ..	—
1-4-07	.. 5-5.30 P.M.	6 ..	—
2-4-07	.. 8-8.30 A.M.	0 ..	—
2-4-07	.. 8-8.30 A.M.	6 ..	—
6-2-08	.. 8-8.30 A.M.	0 ..	—
<i>West Cheval Paar.</i>			
28-11-07	.. 8-8.30 A.M.	0 ..	—
28-11-07	.. 8-8.30 A.M.	6 ..	—
<i>North-West Cheval Paar.</i>			
4-2-08	.. 4-4.30 P.M.	0 ..	—
<i>Mid-Cheval Paar.</i>			
4-2-08	.. 8-8.30 A.M.	0 ..	East side.
<i>North-Central Cheval Paar.</i>			
26-11-08	.. 12 noon	0 ..	—
26-11-08	.. 5.30 P.M.	0 ..	—
27-11-08	.. 8 A.M.	0 ..	—
<i>Challai Paar.</i>			
1-2-08	.. 8-8.30 A.M.	0 ..	—
1-2-08	.. 4-4.30 P.M.	0 ..	1 mile west.
2-2-08	.. 8-8.30 A.M.	0 ..	do.
3-2-08	.. 8-8.30 A.M.	0 ..	3 miles west.
<i>Silavatturai Paar.</i>			
28-3-09	.. 12 noon	0 ..	—
<i>Kondachi Paar.</i>			
21-10-08	.. 8 A.M.	0 ..	—
22-10-08	.. 8-8.30 A.M.	0 ..	—
29-10-08	.. 8 A.M.	0 ..	Near to.

Date.	Time.	Depth in Fathoms of Net.	Position.
<i>Jaggerboom Bank.</i>			
22-2-09	.. 7 30 A.M.	.. 0 ..	—
<i>Moderagam Paar.</i>			
6-4-07	.. 5-5 30 P.M.	.. 0 ..	South.
6-4-07	.. 5-5.30 P.M.	.. 6 ..	do.
7-4-07	.. 8-8.30 A.M.	.. 0 ..	do.
7-4-07	.. 8-8.30 A.M.	.. 6 ..	do.
28-11-07	.. 4-4.40 P.M.	.. 0 ..	do.
29-11-07	.. 8-8.30 A.M.	.. 0 ..	do.
29-11-07	.. 8-8.30 A.M.	.. 5 ..	do.
14-2-08	.. 4-4.30 P.M.	.. 6 ..	North end.
17-2-08	.. 4-4.30 P.M.	.. 0 ..	do.
14-2-09	.. 12 noon	.. 0 ..	North.
14-2-09	.. 5.30 P.M.	.. 0 ..	do.
15-2-09	.. 7.30 A.M.	.. 0 ..	do.
15-2-09	.. 5.30 P.M.	.. 0 ..	—
15-2-09	.. 5.30 P.M.	.. 6 ..	—
16-2-09	.. 7.30 A.M.	.. 0 ..	South.
<i>Old Dutch Jaggerboom Bank.</i>			
10-2-09	.. 5 P.M.	.. 0 ..	—
10-2-09	.. 5 P.M.	.. 6 ..	—
11-2-09	.. 7.30 A.M.	.. 0 ..	—
11-2-09	.. 12 noon	.. 0 ..	—
<i>Marichchukkaddi Bay.</i>			
10-2-07	.. 8-8.30 A.M.	.. 0 ..	—
11-2-07	.. 8-8.30 A.M.	.. 0 ..	—
12-2-07	.. 8-8.30 A.M.	.. 0 ..	—
13-2-07	.. 8-8.30 A.M.	.. 0 ..	—
14-2-07	.. 7.30-8 A.M.	.. 0 ..	—
17-2-07	.. 7.30-8 A.M.	.. 0 ..	—
18-2-07	.. 7.30-8 A.M.	.. 0 ..	—
14-11-07	.. 3.45-4 P.M.	.. 0 ..	—
10-2-08	.. 8-8.30 A.M.	.. 0 ..	2 miles out.
<i>Kudrimalai Paar.</i>			
11-2-08	.. 10-10.30 A.M.	0 ..	—
<i>Dutch Moderagam Paar.</i>			
27-1-07	.. 5.30-6 P.M.	.. 6 ..	—
28-1-07	.. 8-8.30 A.M.	.. 6 ..	—
28-1-07	.. 12-12.30 P.M.	0 ..	—
28-1-07	.. 12-12.30 P.M.	6 ..	—
28-1-07	.. 5-5.30 P.M.	.. 0 ..	—
28-1-07	.. 5-5.30 P.M.	.. 6 ..	—
29-1-07	.. 8-8.30 A.M.	.. 0 ..	—
29-1-07	.. 8-8.30 A.M.	.. 6 ..	—
20-2-07	.. 7.30-8 A.M.	.. 0 ..	—

Date.	Time.	Depth in Fathoms of Net.	Position.
20-2-07	.. 7.30-8 A.M.	6 ..	—
20-2-07	.. 5-5.30 P.M.	6 ..	—
21-2-07	.. 5-5.30 P.M.	0 ..	—
21-2-07	.. 5-5.30 P.M.	6 ..	—
22-2-07	.. 8-8.30 A.M.	0 ..	—
22-2-07	.. 8-9 A.M.	0 ..	—
22-2-07	.. 5-5.30 P.M.	0 ..	—
22-2-07	.. 5-5.30 P.M.	6 ..	—
23-2-07	.. 8-9 A.M.	6 ..	—
23-2-07	.. 5-5.30 P.M.	0 ..	—
24-2-07	.. 8-8.30 A.M.	0 ..	—
24-2-07	.. 8-8.30 A.M.	6 ..	—
24-2-07	.. 12-12.30 P.M.	0 ..	—
24-2-07	.. 5-5.30 P.M.	0 ..	—
24-2-07	.. 5-5.30 P.M.	6 ..	—
25-2-07	.. 8-8.30 A.M.	0 ..	—
25-2-07	.. 5-5.30 P.M.	0 ..	—
25-2-07	.. 5-5.30 P.M.	6 ..	—
26-2-07	.. 8-8.30 A.M.	0 ..	—
26-2-07	.. 5-5.30 P.M.	0 ..	—
26-2-07	.. 5-5.30 P.M.	6 ..	—
27-2-07	.. 8-8.30 A.M.	6 ..	—
27-2-07	.. 5-5.30 P.M.	0 ..	—
27-2-07	.. 5-5.30 P.M.	6 ..	—
28-2-07	.. 8.8.30 A.M.	0 ..	—
28-2-07	.. 5-5.30 P.M.	0 ..	—
1-3-07	.. 8-8.30 A.M.	0 ..	—
1-3-07	.. 8-8.30 A.M.	6 ..	—
1-3-07	.. 5-5.15 P.M.	0 ..	—
2-3-07	.. 5-5.15 P.M.	0 ..	—
2-3-07	.. 5-5.15 P.M.	6 ..	—
3-3-07	.. 8-8.30 A.M.	6 ..	—
9-2-09	.. 7 A.M.	0 ..	—
10-2-09	.. 12 noon	0 ..	1½ mile to the east.
10-2-09	.. 12 noon	6 ..	do.
13-2-09	.. 7.30 A.M.	6 ..	Old Dutch site.
<i>Karaitivu Paar.</i>			
14-11-06	.. 9 A.M.	0 ..	—
14-11-06	.. 9 A.M.	6 ..	—
26-1-07	.. 12-12.30 P.M.	0 ..	—
29-1-07	.. 5-5.30 P.M.	0 ..	—
30-1-07	.. 12-12.30 P.M.	0 ..	—
30-1-07	.. 5-5.30 P.M.	6 ..	—
31-1-07	.. 8-8.30 A.M.	0 ..	—
31-1-07	.. 12-12.30 P.M.	6 ..	—
4-3-07	.. 5-5.30 P.M.	0 ..	—
4-3-07	.. 5-5.30 P.M.	6 ..	—
5-3-07	.. 8-8.30 A.M.	0 ..	—

Date.	Time.	Depth in Fathoms of Net.	Position.
5-3-07	.. 8-8.30 A.M.	6 ..	—
5-3-07	.. 5-5.30 P.M.	0 ..	—
5-3-07	.. 5-5.30 P.M.	6 ..	—
6-3-07	.. 8-8.30 A.M.	0 ..	—
6-3-07	.. 5-5.30 P.M.	6 ..	—
8-3-07	.. 8-8.30 A.M.	0 ..	—
8-3-07	.. 8-8.30 A.M.	6 ..	—
14-3-07	.. 5-5.30 P.M.	0 ..	—
14-3-07	.. 5-5.30 P.M.	6 ..	—
15-3-07	.. 8-8.30 A.M.	6 ..	—
15-3-07	.. 5-5.30 P.M.	6 ..	—
16-3-07	.. 8 A.M.	0 ..	—
16-3-07	.. 8 A.M.	6 ..	—
18-3-07	.. 5-5.30 P.M.	6 ..	—
19-3-07	.. 8 A.M.	6 ..	—
20-3-07	.. 8-8.30 A.M.	0 ..	—
20-3-07	.. 5-5.30 P.M.	6 ..	—
21-3-07	.. 8-8.30 A.M.	0 ..	—
21-3-07	.. 8-8.30 P.M.	6 ..	—
21-3-07	.. 5-5.30 P.M.	0 ..	—
14-2-08	.. 4-4.30 P.M.	0 ..	—
14-2-08	.. 4-4.30 P.M.	6 ..	—
15-2-08	.. 8-8.30 A.M.	0 ..	—
7-2-09	.. 7 A.M.	0 ..	2½ miles to the eastward.

Karaitivu Shoal, North End.

1-11-07	.. 4-4.30 P.M.	0 ..	—
1-11-07	.. 4-4.30 P.M.	4 ..	—
2-11-07	.. 8-8.45 A.M.	0 ..	—
2-11-07	.. 8-8.45 A.M.	4 ..	—
2-11-07	.. 4-4.45 P.M.	0 ..	—
2-11-07	.. 4-4.45 P.M.	4 ..	—

Alanturai Paar.

2-1-07	.. 8-8.30 A.M.	0 ..	—
2-1-07	.. 8-8.30 A.M.	6 ..	—
2-1-07	.. 12-12.30 P.M.	0 ..	—
1-2-07	.. 8-8.30 A.M.	0 ..	—
1-2-07	.. 12-12.30 P.M.	0 ..	—
1-2-07	.. 12-12.30 P.M.	6 ..	—
1-2-07	.. 5-5.30 P.M.	0 ..	—
1-2-07	.. 5-5.30 P.M.	6 ..	—
2-2-07	.. 5-5.30 P.M.	0 ..	—
3-2-07	.. 8-8.30 A.M.	6 ..	—
12-3-07	.. 5-5.30 P.M.	6 ..	—
13-3-07	.. 5-5.30 P.M.	0 ..	—
13-3-07	.. 5-5.30 P.M.	6 ..	—
14-3-07	.. 8-8.30 A.M.	0 ..	—
14-3-07	.. 8-8.30 A.M.	6 ..	—

Date.	Time,	Depth in Fathoms of Net.	Position.
27-3-07	.. 8-8.30 A.M.	.. 0 ..	—
27-3-07	.. 8-8.30 A.M.	.. 6 ..	—
27-3-07	.. 5-5.30 P.M.	.. 6 ..	—
28-3-07	.. 8-8.30 A.M.	.. 0 ..	—
28-3-07	.. 5-5.30 P.M.	.. 0 ..	—
13-4-07	.. 5-5.30 P.M.	.. 0 ..	—
13-4-07	.. 5-5.30 P.M.	.. 6 ..	—
14-4-07	.. 8-8.30 A.M.	.. 0 ..	—
14-4-07	.. 8-8.30 A.M.	.. 6 ..	—
16-4-07	.. 5-5.30 P.M.	.. 0 ..	—
17-4-07	.. 8-8.30 A.M.	.. 0 ..	—
17-4-07	.. 5-5.30 P.M.	.. 0 ..	—
18-4-07	.. 8-8.30 A.M.	.. 0 ..	—
18-4-07	.. 5-5.30 P.M.	.. 6 ..	—
19-4-07	.. 8-8.30 A.M.	.. 6 ..	—
1-2-09	.. 7.30 A.M.	.. 0 ..	—
1-2-09	.. 12.30 P.M.	.. 0 ..	—
4-2-09	.. 5.30 P.M.	.. 0 ..	—
5-2-09	.. 12 noon	.. 0 ..	—
8-2-09	.. 7 A.M.	.. 0 ..	½ mile to the north.
8-2-09	.. 12 noon	.. 0 ..	do.

Muttuvaratu Paar.

19-11-06	.. —	.. 0 ..	—
20-11-06	.. —	.. 6 ..	—
21-11-06	.. —	.. 0 ..	—
22-11-06	.. —	.. 0 ..	—
5-2-07	.. 12-12.30 P.M.	.. 0 ..	—
(?)-2-07	.. 12-12.30 P.M.	(?) ..	—
22-3-07	.. 5-5.30 P.M.	.. 6 ..	—
23-3-07	.. 8-8.30 A.M.	.. 6 ..	—
26-3-07	.. 8-8.30 A.M.	.. 0 ..	—
18-2-08	.. 8-8.30 A.M.	.. 0 ..	North end.
18-2-08	.. 8-8.30 M.A.	.. 6 ..	do.
27-1-09	.. 7.30 A.M.	.. 0 ..	—
27-1-09	.. 9.30 A.M.	.. 0 ..	—
27-1-09	.. 5.30 P.M.	.. 0 ..	—
28-1-09	.. 12 noon	.. 0 ..	—
28-1-09	.. 5.30 P.M.	.. 0 ..	1½ mile to the east.
29-1-09	.. 7.30 A.M.	.. 0 ..	do.

Donnan's Muttuvaratu Paar.

3-2-09	.. 7.30 A.M.	.. 0 ..	—
3-2-09	.. 12 noon	.. 0 ..	North end.

Hamilton's Muttuvaratu Paar.

1-2-09	.. 5.30 P.M.	.. 0 ..	—
2-2-09	.. 12.30 P.M.	.. 0 ..	—
4-2-09	.. 7.30 A.M.	.. 0 ..	1½ mile to the west.
4-11-09	.. 12 noon	.. 0 ..	do.

Date.	Time.	Depth in Fathoms of Net.	Position.
5-2-09	.. 5 P.M.	.. 0 ..	1½ mile to the east.
6-2-09	.. 7 A.M.	.. 0 ..	do.
6-2-09	.. 12 noon	.. 0 ..	do.
<i>Krusadai Paar.</i>			
14-11-06	.. (?)	.. 6 ..	—
17-11-06	.. (?)	.. 1 ..	—
19-11-06	.. (?)	.. 1 ..	—
25-11-07	.. 8-8.30 A.M.	.. 0 ..	—
25-11-07	.. 8-8.30 A.M.	.. 5 ..	—
26-11-07	.. 8-8.30 A.M.	.. 0 ..	—
26-11-07	.. 4-4.30 P.M.	.. 5 ..	West side.
27-11-07	.. 8-8.30 A.M.	.. 5 ..	do.
15-2-08	.. 4-4.30 P.M.	.. 0 ..	—
15-2-08	.. 4-4.30 P.M.	.. 6 ..	—
16-2-08	.. 8-8.30 A.M.	.. 0 ..	—
16-2-08	.. 4-4.30 P.M.	.. 0 ..	South side.
17-2-08	.. 8-8.30 A.M.	.. 0 ..	do.
<i>Dutch Bay Spit.</i>			
30-1-09	.. 5 P.M.	.. 0 ..	4½ miles north.
31-1-09	.. 7.30 A.M.	.. 0 ..	do.
31-1-09	.. 12 noon	.. 0 ..	4½ miles west.
<i>Talaivillu Paar.</i>			
4-3-09	.. 5.30 P.M.	.. 0 ..	—
5-3-09	.. 7.30 A.M.	.. 0 ..	—
5-3-09	.. 5.30 A.M.	.. 6 ..	—
<i>Navakkaduwa Paar.</i>			
5-3-09	.. 5.30 P.M.	.. 0 ..	—
6-3-09	.. 7.30 A.M.	.. 0 ..	—
<i>Jokenpiddi Paar.</i>			
11-3-09	.. 7.30 A.M.	.. 0 ..	—
11-3-09	.. 7.30 A.M.	.. 6 ..	—
<i>Karkopanni Paar.</i>			
7-3-09	.. 7.30 A.M.	.. 0 ..	—
<i>Chilaw.</i>			
9-3-09	.. 5.30 P.M.	.. 0 ..	—
<i>Nadalaikula Paar.</i>			
4-3-09	.. 7.30 A.M.	.. 0 ..	—
4-3-09	.. 7.30 A.M.	.. 6 ..	—
<i>Bar Reef.</i>			
29-1-09	.. 5 P.M.	.. 0 ..	2½ miles north.
30-1-09	.. 7.30 A.M.	.. 0 ..	—
—	.. 12 noon	.. 0 ..	—

EXPLANATION OF PLATES.

Plate XVII.

1. *Undinula vulgaris* (Dana), var. . . Left posterior thoracic margin, lateral view.
2. *Undinula vulgaris* (Dana), var. . . Left posterior thoracic margin, dorsal view.
3. *Acrocalanus similis*, sp. nov. . . ♀, 3rd leg.
4. *Acrocalanus similis*, sp. nov. . . ♀, 4th leg.
5. *Acrocalanus similis*, sp. nov. . . ♂, 5th leg.
6. *Scolecithricella pearsoni*, sp. nov. . . ♀, dorsal view.
7. *Scolecithricella pearsoni*, sp. nov. . . ♀, 1st leg.

Plate XVIII.

1. *Scolecithricella pearsoni*, sp. nov. . . ♀, 2nd leg.
2. *Scolecithricella pearsoni*, sp. nov. . . ♀, 3rd leg.
3. *Scolecithricella pearsoni*, sp. nov. . . ♀, 5th leg.
4. *Scolecithricella pearsoni*, sp. nov. . . ♂, 5th pair of legs.
5. *Centropages trispinosus*, sp. nov. . . ♀, lateral view.
6. *Centropages trispinosus*, sp. nov. . . ♀, 1st antenna.
7. *Centropages trispinosus*, sp. nov. . . ♀, 2nd leg.
8. *Centropages trispinosus*, sp. nov. . . ♀, 5th leg.

Plate XIX.

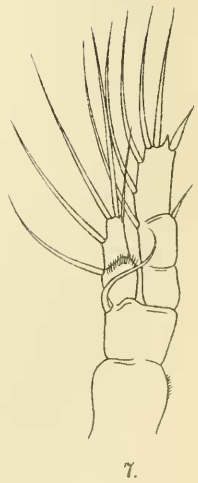
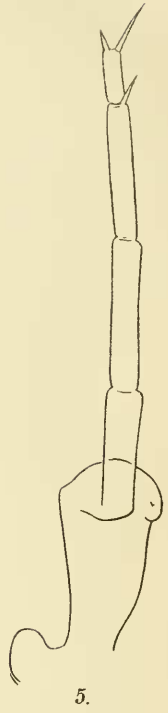
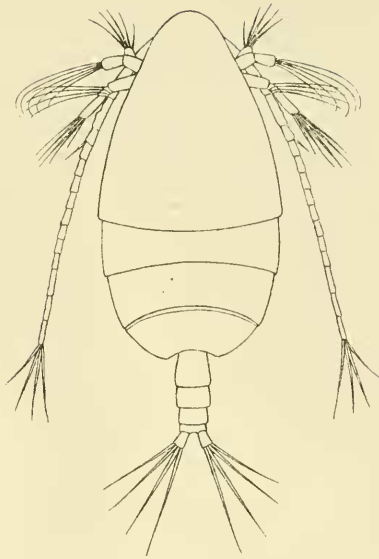
1. *Acartia amboinensis*, Carl . . ♀, lateral view.
2. *Acartia amboinensis*, Carl . . ♀, abdomen, dorsal view.
3. *Acartia amboinensis*, Carl . . ♀, 1st antenna, basal joints.
4. *Acartia amboinensis*, Carl . . ♀, Maxilliped.
5. *Acartia amboinensis*, Carl . . ♀, 1st leg.
6. *Acartia amboinensis*, Carl . . ♀, 3rd leg.
7. *Acartia amboinensis*, Carl . . ♀, 5th leg.
8. *Acartia southwelli*, sp. nov. . . ♂, 5th pair of legs.
9. *Acartia southwelli*, sp. nov. . . ♀, 5th leg.

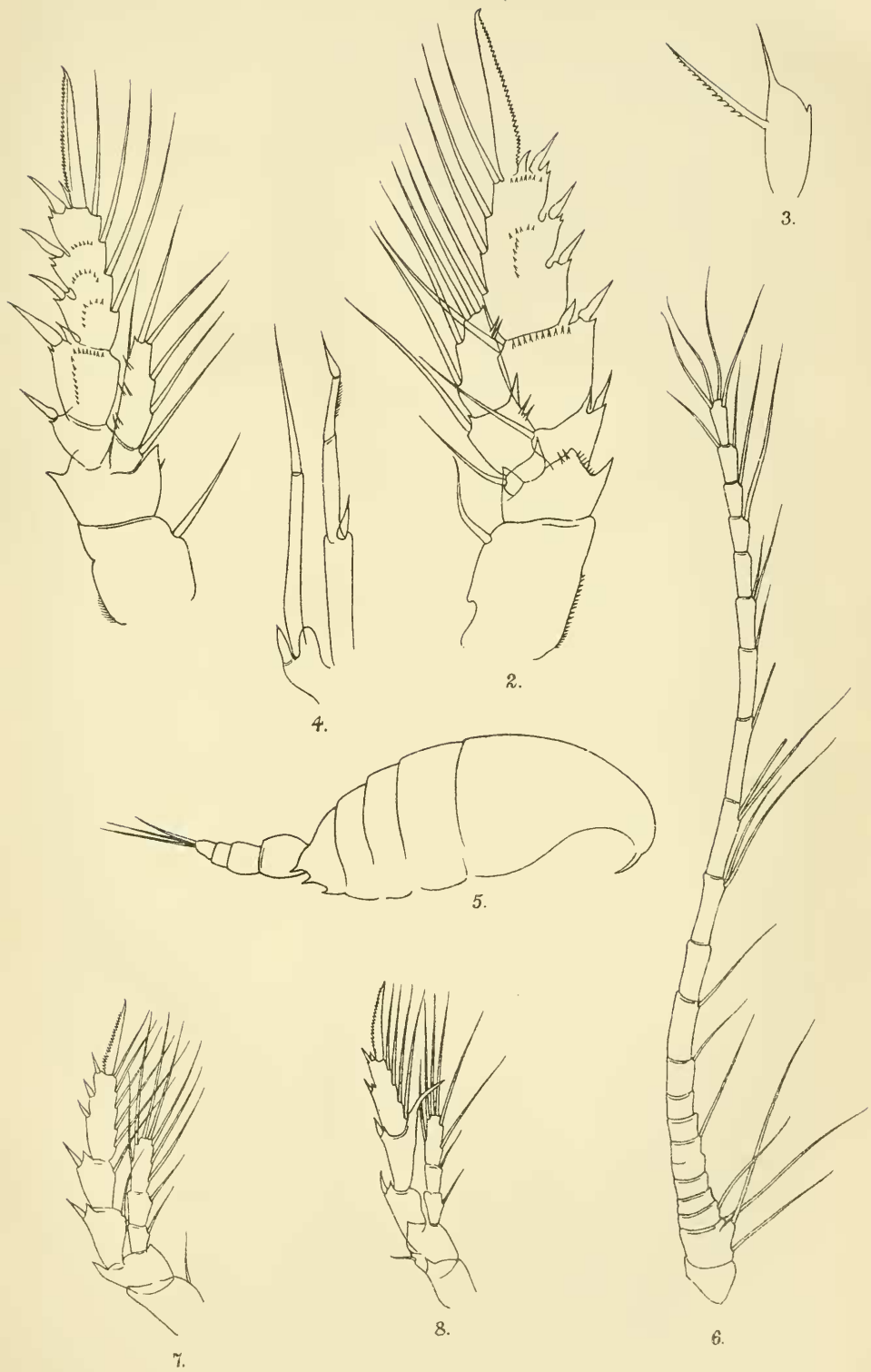
Plate XX.

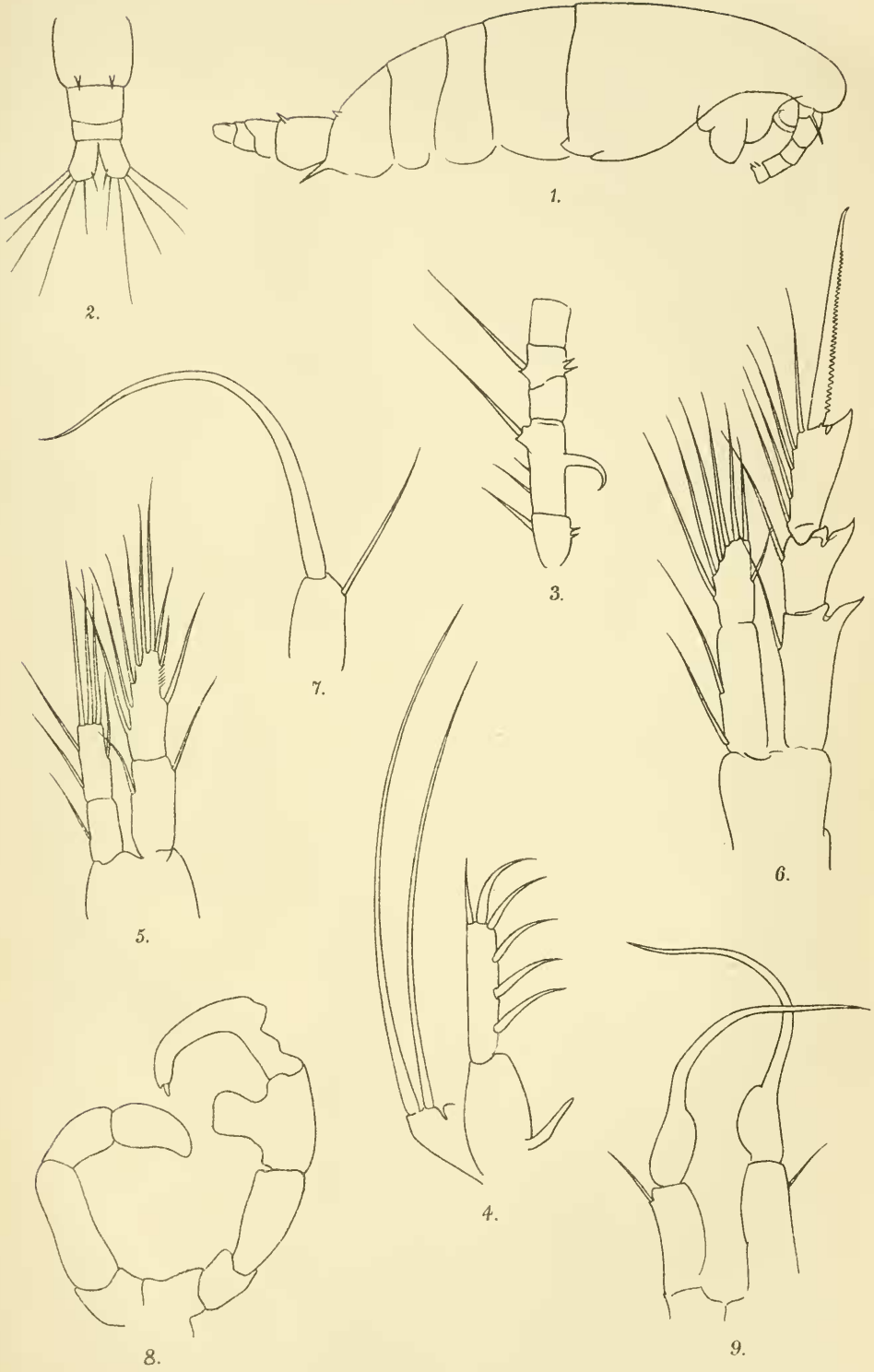
1. *Acartiella kempfi*, gen. nov. ; sp. nov. ♀, lateral view.
2. *Acartiella kempfi*, gen. nov. ; sp. nov. ♀, 1st antenna.
3. *Acartiella kempfi*, gen. nov. ; sp. nov. ♂, 1st antenna.
4. *Acartiella kempfi*, gen. nov. ; sp. nov. ♀, 2nd leg.
5. *Acartiella kempfi*, gen. nov. ; sp. nov. ♂, 5th pair of legs.

Plate XXI.

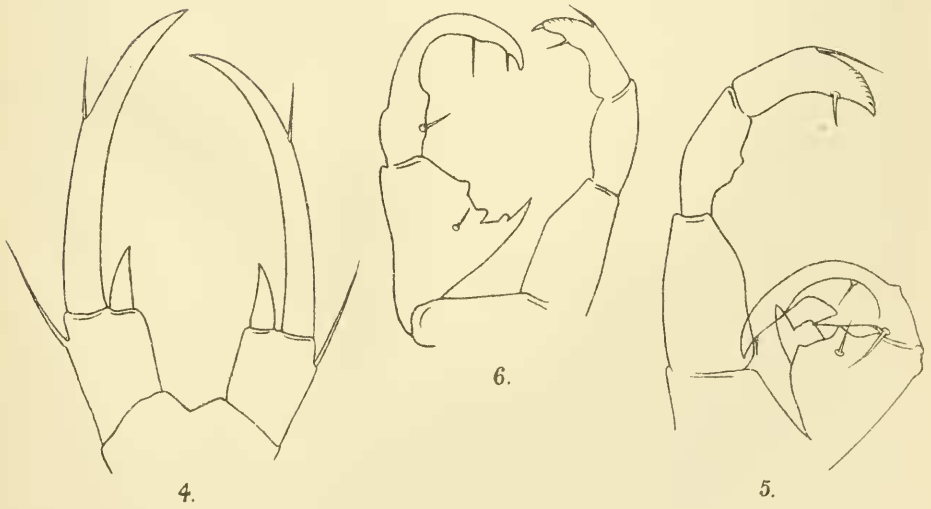
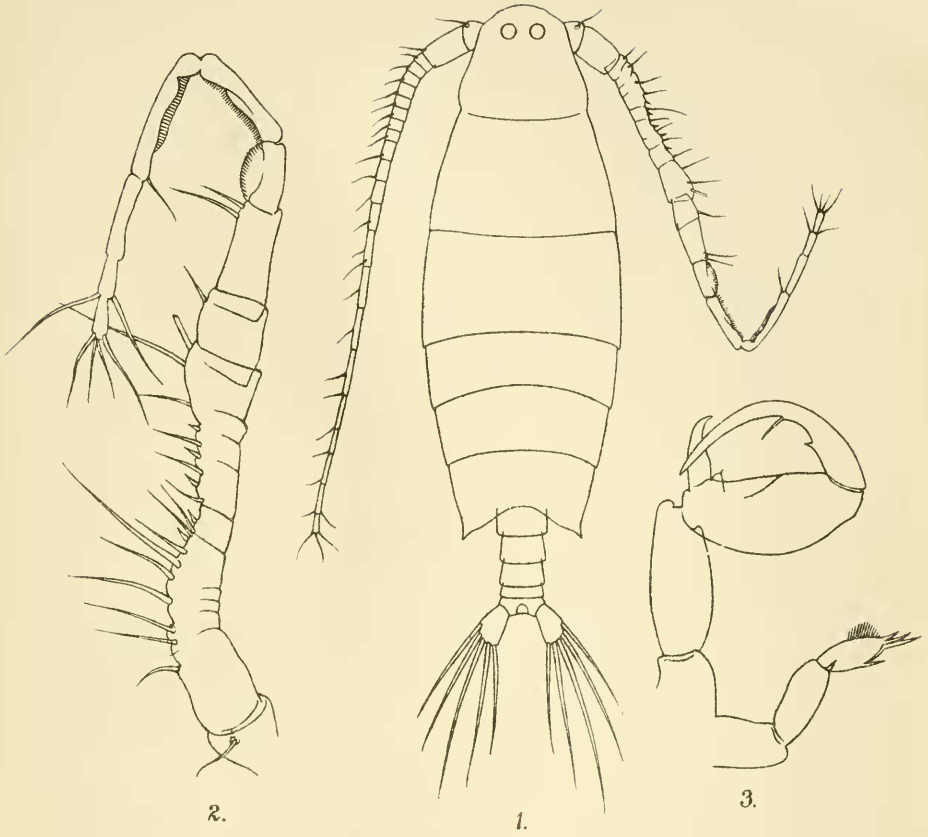
1. *Labidocera pavo*, Giesbrecht . . ♂, dorsal view.
2. *Labidocera pavo*, Giesbrecht . . ♂, grasping antenna.
3. *Labidocera pavo*, Giesbrecht . . ♂, 5th pair of legs.
4. *Acartiella kempfi*; gen. nov. ; sp. nov. ♀, 5th pair of legs.
5. *Tortanus gracilis* (Brady) . . ♂, 5th pair of legs.
6. *Tortanus forcipatus* (Giesbrecht) . . ♂, 5th pair of legs.













MAP OF THE GULF OF MANNAR.