

A KEY FOR  
THE IDENTIFICATION OF  
THE MORE COMMON  
PLANKTONIC COPEPODA OF  
INDIAN COASTAL WATERS

By L. R. Kasturirangan



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MORE COMMON PLANKTONIC COPEPODA  
OF INDIAN COASTAL WATERS

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## FOREWORD

India is an active participant in the International Indian Ocean Expedition. The National Programme which is co-ordinated by the Council of Scientific & Industrial Research has been developed by the Indian National Committee on Oceanic Research. The Expedition is stimulating a considerable amount of work on marine sciences in this country. It is appropriate that the Indian National Committee is sponsoring publications of direct interest in the Expedition. The present volume by Shri L.R. Kasturirangan which is a field guide for the identification of planktonic copepods is one of several publications which the Council of Scientific and Industrial Research propose to publish within the coming few years.

Copepods which are very small crustaceans form the most important element in the zooplankton and consist of many hundreds of species. Their correct identification is by no means easy. The more critical work on the group is essentially a matter for the specialist but a great deal of observational work can be done by junior workers. Publications of this type will not only enlarge the scope of marine biological observations made at different places but also encourage closer studies of planktonic groups. The literature on this group is very scattered and attempts have, therefore, been made to bring the essential taxonomic material within the framework of this small publication so as to help preliminary analysis and sorting of plankton.

I commend this volume to the scientific public in the hope that it will encourage specialists in other groups also to come forward with such field guides and thus create greater interest in field biology.

New Delhi  
24.8.1963

S. HUSAIN ZAHEER  
*Director-General*  
*C.S.I.R.*

# INTRODUCTION

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This key has been prepared for the use mainly of non-specialists in the group Copepoda, to aid them in the ready identification of the commoner species occurring in marine plankton. In framing the key an attempt has been made to avoid excessive technicality on the one hand and too great artificiality on the other. It will be seen that the species are treated in a linear order that is not very different from the taxonomic order. The morphological characters used for differentiation are, as far as possible, such as could be verified by non-specialists and offer less of difficulty in the actual working. The characters are those of the sexually mature individuals only, since the larval and copepodite stages are excluded from the purview of the key.

The "commonness" of a species has reference to the magnitude of the numerical, temporal and geographical distribution and all three aspects have been borne in mind in deciding which are the species to be included. Yet no sharp line can be drawn separating the common from the less common species, since the latter grade into the former. It is hoped that the ninety-nine species listed below would be found to be a representative and useful selection. All these species have been examined, at one time or another, by the author in the course of his studies at Madras, Kozhikode, Cochin and Mandapam.

The form and details of the fifth pair of legs of copepods are very distinctive for each species and with differentiating characters for the males and the females. While this is broadly true of the several suborders, it is especially true in the case of suborder Calanoida, which comprises the bulk of the planktonic species. The general form of the body and of the fifth pair of legs is invariably sufficient to guide one to the correct determination and consequently the figures provided nearly always include them. The student would require some skill to manipulate

the copepod under the microscope so as to bring the fifth pair of legs into clear view and this could be acquired in course of time through practice. The correctness of the species determined, should be verified, as far as possible, by reference to the full morphological description of the species to be found in a systematic work. Some of the terms used in the key are explained below to avoid ambiguity and this section should be read through before the key is actually employed.

**Body length.** The length from the anterior margin of the head region to the posterior margin of the caudal rami excluding the caudal setae.

**Body regions.** The three terms defined below are useful to refer to three regions of the body of the copepod visibly distinguishable from one another. They do not correspond exactly to the morphological body-divisions, *viz.* head, thorax and abdomen. Authorities sometimes debate where to locate the boundary between one morphological region and another, or the number of segments included in one morphological region or the homology between regions called by the same name in different classes of crustacea. The use of the terms cephalosome, metasome and urosome is quite free of morphological implications and makes for precision in referring to the different body regions.

**Cephalosome.** The anterior unsegmented region of the body that includes not only the head but also, at the least, the segment of the maxillipeds. One or more of the segments corresponding to the anterior pairs of swimming legs may also be merged in the cephalosome. The appendages of the head-region are the first pair of antennae, the second pair of antennae, the mandibles, the first maxillae and the second maxillae. In some of the older works the second maxillae are referred to as the first pair of maxillipeds and the true maxillipeds are referred to as the second pair of maxillipeds. This practice is out of date.

**Metasome.** The segmented region of the body immediately posterior to the cephalosome and anterior to the urosome. It is separated from the latter by a distinct articulation which admits of free movements. The metasome includes a variable number of segments, never more than five, corresponding to the swimming legs. The reduction in the number of the obvious segments is due, either to the merging of the anterior segments in the cephalosome, or the posterior segments in the urosome, or to the coalescence of some of the segments with one another. The metasome includes the greater number, but not all, of the segments of the body corresponding to the thorax.

**Urosome.** The posteriormost region of the body of the copepod, usually narrower than the rest of the body and marked off from the metasome by a distinct articulation in virtue of which the urosome can be

freely moved about like a tail. The urosome includes, at the least, the genital segment (i.e. the last thoracic segment) and the post-genital segments numbering 1 to 5 (i.e. the abdominal segments). The last or anal segment bears the caudal rami. One or more of the pre-genital segments corresponding to the 5th and 4th pairs of legs may also be incorporated in the urosome through the forward shifting of the point of articulation.

**Caudal rami.** A pair of laminar structures at the posterior end of the anal segment, movably articulated with the latter and each provided typically with six setae. The older name, caudal furca, is now-a-days discarded.

**The eye.** Paired compound eyes are absent in the copepoda except in the Arguloidea. The eye when present is the median eye or nauplius eye, composed of three ocelli close to one another, two of them being dorso-lateral in position and one, median-ventral. The well-developed eyes of *Pontella* or *Corycaeus* are instances of high elaboration of the simple ocelli.

**Geniculation.** Modification of the first antennae for prehension or grasping, through the formation of an elbow or hinge.

#### ACKNOWLEDGEMENTS

The preparation of this key was originally suggested by Dr N.K. Panikkar, at present Director, Indian Programme of International Indian Ocean Expedition, C.S.I.R., and the author is grateful to him for continued interest and encouragement. The author is keenly appreciative of the help received from many colleagues and the benefit derived from discussing with them problems relating to work on the copepoda and he wishes to acknowledge in particular his gratitude to Dr S. Jones and Dr R.R. Prasad. Grateful thanks are due to Prof. P.K. Menon of Presidency College, Madras, for affording library facilities. Among the many publications that have been found useful or indispensable, the chief works consulted will be found listed at the end. The debt to the papers of Lt. Col. R.B. Seymour-Sewell is one to be acknowledged not only by the present author but by every student of the copepoda of the Indian Ocean. It was the intention in the beginning to prepare a fresh set of sketches for every species to be included in this key as G.O. Sars did for the Crustacea of Norway. But this had to be abandoned and the majority of sketches have been adapted from published works as acknowledged in the legends to the figures.

# SYSTEMATIC LIST OF SPECIES

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## ORDER COPEPODA

### Suborder CALANOIDA

#### Family Calanidae

*Calanus tenuicornis* Dana

*Nannocalanus minor* (Claus)

*Canthocalanus pauper* (Giesbrecht)

*Undinula vulgaris* (Dana)

variety *typica*, v. *giesbrechti*, v. *zeylanica*. Sewell

*Undinula darwini* (Lubbock)

variety *symmetrica*, v. *intermedia*, v. *typica*. Sewell

#### Family Eucalanidae

*Rhincalanus cornutus* Dana

*Rhincalanus nasutus* Giesbrecht

*Eucalanus elongatus* (Dana)

*Eucalanus attenuatus* (Dana)

*Eucalanus pseudattenuatus* Sewell

*Eucalanus monachus* Giesbrecht

*Eucalanus crassus* Giesbrecht

*Eucalanus subcrassus* Giesbrecht

#### Family Pseudocalanidae

*Calocalanus pavo* Dana

#### Family Paracalanidae

*Paracalanus parvus* (Claus)

*Paracalanus aculeatus* Giesbrecht

*Acrocalanus gibber* Giesbrecht

*Acrocalanus gracilis* Giesbrecht

*Acrocalanus longicornis* Giesbrecht

*Acrocalanus monachus* Giesbrecht

Family Euchaetidae

*Euchaeta concinna* Dana

*Euchaeta marina* Prestandrea

*Euchaeta wolfendeni* A. Scott

Family Scolecithricidae

*Scolecithrix danae* (Lubbock)

Family Centropagidae

*Centropages orsinii* Giesbrecht

*Centropages furcatus* (Dana)

*Centropages tenuiremis* Thompson & Scott

*Centropages alcocki* Sewell

*Centropages trispinosus* Sewell

*Centropages calaninus* (Dana)

*Centropages gracilis* (Dana)

*Centropages elongatus* Giesbrecht

*Isias tropica* Sewell

Family Pseudodiaptomidae

*Pseudodiaptomus aurivilli* Cleve

*Pseudodiaptomus serriicaudatus* (T. Scott)

*Pseudodiaptomus annandalei* Sewell

Family Temoridae

*Temora turbinata* (Dana)

*Temora stylifera* (Dana)

*Temora discaudata* Giesbrecht

Family Lucicutiidae

*Lucicutia flavicornis* (Claus)

Family Arietellidae

*Metacalanus aurivilli* Cleve

Family Candaciidae

*Candacia discaudata* A. Scott

*Candacia bradyi* A. Scott

*Candacia pachydactyla* (Dana)

*Candacia aethiopica* (Dana)

Family Pontellidae

*Calanopia elliptica* (Dana)

*Calanopia aurivilli* (Cleve)

*Calanopia minor* A. Scott

*Labidocera acuta* (Dana)

*Labidocera pectinata* Thompson & Scott  
*Labidocera minuta* Giesbrecht  
*Labidocera pavo* Giesbrecht  
*Pontella danae* Giesbrecht, variety *ceylonica* Thompson &  
Scott  
*Pontella securifer* Brady  
*Pontella spinipes* Giesbrecht  
*Pontellopsis herdmanni* Thompson & Scott  
*Pontellopsis macronyx* A. Scott  
*Pontellopsis scotti* Sewell  
*Pontellina plumata* (Dana)

Family Acartiidae

*Acartia spinicauda* Giesbrecht  
*Acartia erythraea* Giesbrecht  
*Acartia centrura* Giesbrecht  
*Acartia danae* Giesbrecht  
*Acartia negligens* Dana  
*Acartia southwelli* Sewell  
*Acartia chilkaensis* Sewell  
*Acartiella sewelli* Steuer

Family Tortanidae

*Tortanus barbatus* (Brady)  
*Tortanus gracilis* (Brady)

Suborder HARPACTICOIDA

Family Longipediidae

*Longipedia weberi* A. Scott  
*Longipedia coronata* Claus

Family Ectinosomidae

*Microsetella norvegica* (Boeck)  
*Microsetella rosea* (Dana)

Family Macrosetellidae

*Macrosetella gracilis* (Dana)  
*Macrosetella oculata* (G.O. Sars)  
*Miracia efferata* Dana

Family Clytemnestridae

*Clytemnestra scutellata* Dana  
*Clytemnestra rostrata* (Brady)

Family Tachidiidae

*Euterpina acutifrons* (Dana)

Family Metidae

*Metis jousseaumei* (Richard)

Suborder CYCLOPOIDA

Family Oithonidae

*Oithona spinirostris* Claus (= *O. atlantica* Farran)

*Oithona plumifera* Baird

*Oithona similis* Claus (= *O. helgoiandica* Claus)

*Oithona rigida* Giesbrecht

*Oithona brevicornis* Giesbrecht

*Oithona linearis* Giesbrecht

Family Oncaeiidae

*Oncaea venusta* Philippi

*Oncaea conifera* Giesbrecht

Family Corycaeiidae

*Corycaeus speciosus* Dana

*Corycaeus danae* Giesbrecht (= *C. crassiusculus* Dana)

*Corrycaeus catus* F. Dahl

*Corycella gibbula* Giesbrecht

*Copilia vitrea* (Haeckel)

*Copilia mirabilis* Dana

*Copilia quadrata* Dana

Family Sapphirinidae

*Sapphirina ovatolanceolata* Dana

*Sapphirina auronitens* Claus

*Sapphirina nigromaculata* Dana

Family Bomolochidae

*Bomolochus* species

# KEY

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- 1 Paired compound eyes never present.....2  
Paired compound eyes present ; 5th and 6th legs absent ; the corresponding segments merged in the abdomen which is leaf-like, unsegmented and notched or bilobed posteriorly

—ARGULOIDA

- 2 Second antennae and mouth parts present ; developmental stages usually free-swimming ; adults free-swimming or ectoparasitic only .....3

Second antennae and mouth parts absent in the adult which is free-swimming ; developmental stages parasitic

—MONSTRILLOIDA

- 3 Body not depressed and habits not ectoparasitic except in very rare instances ; metasome ends behind the segment of the 4th or 5th pair of legs ; sternal fork not present .....4

Body depressed and habits ectoparasitic ; when the articulation between metasome and urosome is well-marked at all, it is just behind the segment which forms a waist at the anterior margin of the urosome ; sternal fork present between the bases of the maxillipeds..... CALIGOIDA

- 4 Urosome includes not only the genital and abdominal segments but one further segment bearing the 5th pair of legs ; first antennae of the male, if geniculate, geniculate on both sides.....5

Urosome includes the genital and abdominal segments only ; first antennae of the male, if geniculate, geniculate on one side only, commonly the right side.....CALANOIDA 6

Note: Members of the first three suborders have not been included in this Key, being mostly less common species.

5 Body usually cylindrical, the metasome passing into the urosome without abrupt change in width; basal segment of the fifth legs usually showing an inner expansion ; males distinguished from the females in all cases by the geniculation of the first antennae ; eggsacs usually unpaired, carried underneath....HARPACTICOIDA 119

Body usually depressed with the metasome much wider than the urosome; basal segment of the fifth legs without an inner expansion; geniculation of the first antennae of the male is usual but not invariable; eggsacs paired, carried laterally or subdorsally  
.....CYCLOPOIDA 129

6 Swimming legs 1 to 4 with 3-segmented exopodites and endopodites...7

Swimming legs 2, 3 and 4 with 3-segmented exopodites and endopodites, but swimming leg 1 with less than 3 segments in the endopodites or in both rami .....17

Swimming legs 3 and 4 with 3-segmented exopodites and endopodites but swimming legs 1 and 2 with less than 3 segments in some of the rami ..... 39

Swimming legs 1 to 4 with 3-segmented exopodites but most or all of the endopodites are 2-segmented through reduction or coalescence of the segments.....45

Swimming legs 1 to 4 with 2-segmented exopodites and endopodites except for the exopodite of the 1st leg which is 3-segmented ; the 2-segmented condition of the exopodites is due to the partial or complete disappearance of the articulation between the basal and the middle segments.....66

7 Fifth legs with 3-segmented rami in both sexes and substantially similar to the swimming legs.....8

Fifth legs substantially similar to the swimming legs in the females only, i.e. 3-segmented and fully setose; the male fifth legs are always considerably different from the swimming legs.....13

Fifth legs of both sexes markedly different from the swimming legs..58

8 Basipod of 1st legs without a hook and seta arrangement on the anterior face ; inner margin of basipod 1 of 5th legs in both sexes denticulate or serrate in most species (though not in *C. tenuicornis*) 9

Basipod of 1st legs with a hook and seta arrangement on the anterior face ; inner margin of basipod 1 of 5th legs smooth in both sexes.  
.....CANTHOCALANUS 12

9 Females only : Urosome 4-segmented ; 5th legs symmetrical, fully setose.....10

Males only: Urosome 5-segmented ; 5th legs unlike on the two sides, the left leg being usually longer through the greater elongation of the two proximal exopodite segments, the terminal segment being rather short ..... 11

10 First antennae extend beyond caudal rami by about half body length ; length 1.9 to 2.5 mm. :

♀ *Calanus tenuicornis* Dana (Fig. 1a, b)

First antennae reach caudal rami; length 1.9 to 2.0 mm. :

♀ *Nannocalanus minor* (Claus) (Fig. 2a, b)

11 Fifth legs as figured, with exopodites devoid of plumose setae on both the right and the left leg ; left leg not longer than the right leg ; length 1.9 mm. :

♂ *Calanus tenuicornis* Dana (Fig. 1c, d)

Fifth legs as figured, with a few plumose setae present on the right exopodite ; left leg distinctly longer than the right leg ; external

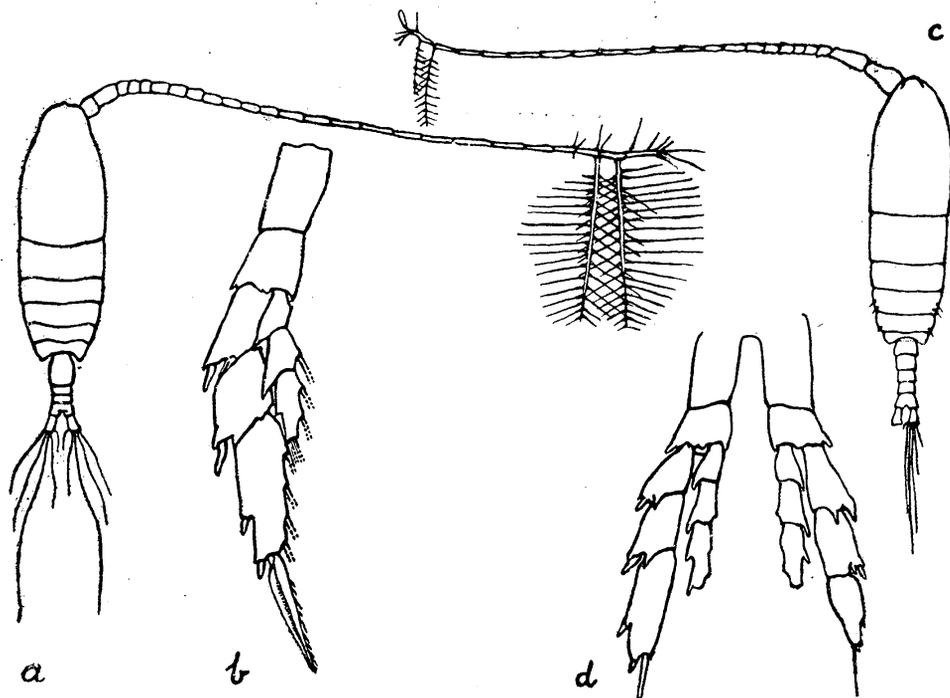


Fig. 1. *Calanus tenuicornis* Dana : (a) Female, dorsal view. (b) Female, 5th leg of one side. (c) Male, dorsal view. (d) Male, 5th pair of legs, anterior face. Setae absent on the exopodites; setae present on the endopodites but not shown in the figure. (After Giesbrecht).

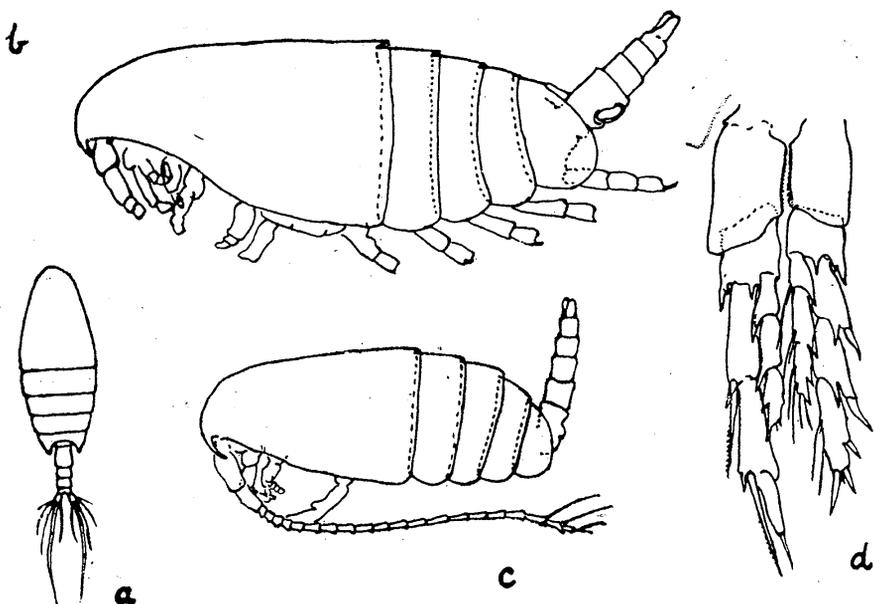


Fig. 2. *Nannocalanus minor* (Claus). (a) Female, dorsal view. (b) Female, lateral view. (c) Male, lateral view. (d) Male, 5th pair of legs, posterior face. (a. after Wilson; b.c.d. after Sewell.)

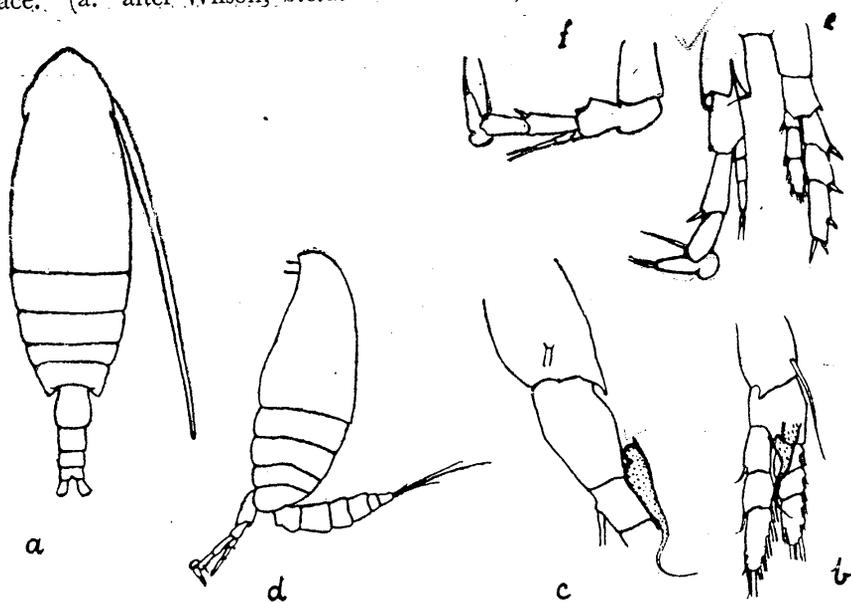


Fig. 3. *Canthocalanus pauper* (Giesbrecht). (a) Female, dorsal view. (b) Female, 1st leg, anterior face. (c) Female, 1st leg, lateral view. (d) Male, lateral view. (e) Male, 5th pair of legs, posterior face. (f) Male, left 5th leg, in flexed position. (a. after Colefax; b. to f. after Wolfenden).

marginal spines greatly enlarged on the left exopodite ; length 1.70 mm. :

♂ *Nannocalanus minor* (Claus) (Fig. 2c, d)

12 Urosome 4-Segmented ; exopodites of 5th legs with plumose setae ; length 1.7 mm :

♀ *Canthocalanus pauper* (Giesbrecht) (Fig. 3a, b, c)

Urosome 5-segmented ; exopodites of 5th legs without plumose setae ; the left exopod often flexed outwards to assume a hammer-like form ; left endopod with 2 terminal setae only ; length 1.4 mm. :

♂ *Canthocalanus pauper* (Giesbrecht) (Fig. 3d, e, f)

13 Fifth legs of the female without an inwardly pointed spine on the exopods ; the left fifth leg of the male is very greatly lengthened and modified to form a grasping organ ; 1st antenna not geniculate on either side in the male.....UNDINULA 14

Fifth legs of the female with a prominent inwardly pointed spine on the middle exopod segment ; in the male, the left exopod is 2-segmented ; the right exopod is 3-segmented and forms a strong chela ; 1st antenna geniculate on the right side in the male ..... CENTROPAGES (part) 48

14 Outer margin of second exopod segment of second legs deeply notched in both sexes ; usually over 2 mm. in length.....15  
Outer margin of second exopod segment of second legs without notch ; length below 2 mm.....16

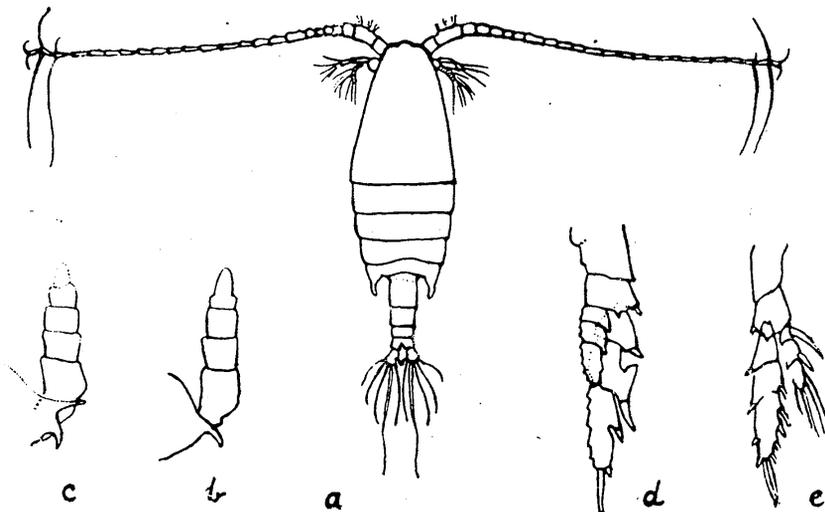


Fig. 4. *Undinula vulgaris* (Dana). Female : (a) Dorsal view. (b) Lateral view from the left, *variety typica*. (c) Lateral view from the left *variety giesbrechti*. (d) 2nd leg, showing deep notch on 2nd exopod segment. (e) Right 5th leg, anterior face. (a. original b.c.d. after Sewell ; e. after Colefax.

15 Posterior margin of metasome drawn out into spines ; urosome 4-segmented ; 5th legs similar to the 4th legs ; length 1.8 to 2.6 mm. :

♀ *Undinula vulgaris* (Dana) (Fig. 4)

Posterior margin of metasome rounded ; Urosome 5-segmented ; 5th legs highly modified as figured, folded like a Z when not extended ; metasome more slender than in the female ; length 2.0 to 2.3 mm. :

♂ *Undinula vulgaris* (Dana) (Fig. 5a,b)

Note: The female *U. vulgaris* is distinguished into three varieties as follows by Sewell (1929) :

**Variety typica** : metasome ending in a single downward bent spine on both right and left sides (Fig. 4b)

**Variety giesbrechti** : metasome ending in a single downward bent spine on the right side but a double spine present on the left side, of which the upper spine points straight backwards and the lower one is downwardly curved (Fig. 4c)

**Variety zeylanica** : metasome drawn out on the right hand side into a single spine which is thickened and points straight backwards, but a double spine on the left, similar to the one in *v. giesbrechti*.

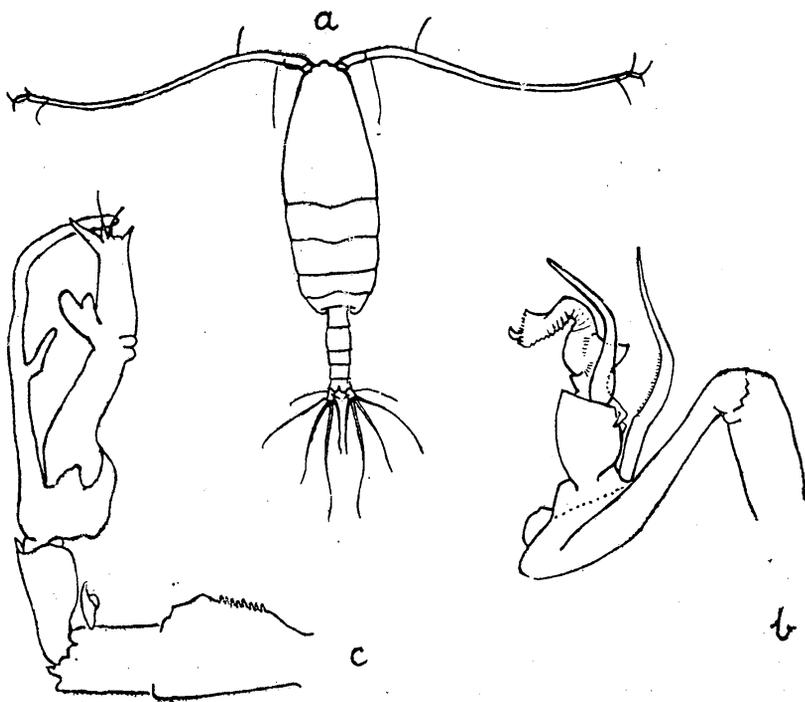


Fig. 5. *Undinula vulgaris* (Dana) ♂ (a) Dorsal view. (b) Left 5th leg. *Undinula darwini* (Lubbock) ♂ (c) Left 5th leg. (b. & c. after Wolfenden, a. original).

16 Urosome 4-segmented ; 5th legs similar to the 4th legs; length 1.66 to 2.3 mm. :

♀ *Undinula darwini* (Lubbock) (Fig. 6)

Urosome 5-segmented; 5th legs as figured ; length 1.8 to 2.0 mm. :

♂ *Undinula darwini* (Lubbock) (Fig. 5c)

Note: The female *U. darwini* also is distinguished into three varieties (Sewell 1929) :

**Variety *symmetrica*** : Posterior margin of the metasome alike on the two sides, the postero-inferior region produced into a very small prominence with an equally small notch in front of it. (Fig. 6a)

**Variety *intermedia*** : Posterior margin of the metasome unlike on the two sides, on the right as in *V. symmetrica*, on the left produced into a larger triangular flap. (Fig. 6b)

**Variety *typica*** : Posterior margin of the metasome unlike on the two sides, on the right as in *V. symmetrica*, on the left produced into a rectangular lappet that is larger than in *V. intermedia*. (Fig. 6c)

17 First legs with 2-jointed exopods and 2-jointed endopods; 5th legs of the female are uniramous and 3-segmented, of the male uniramous on the right and biramous on the left; head produced forward into a conical process.....RHINCALANUS 18

First legs with 3-jointed exopods and 2-jointed endopods; 5th legs uniramous in both sexes, occasionally absent in the female.....19

18 Anterior projection of head distinctly anchor-shaped and the rostral filaments visible in dorsal view; the sexes distinguished by the form of the 5th legs; length of female 3.6 mm., length of male 2.68 mm. :

♀ ♂ *Rhincalanus cornutus* Dana (Fig. 7)

Anterior projection of head bluntly conical with the rostral filaments below it and not visible in dorsal view; the sexes distinguished by the

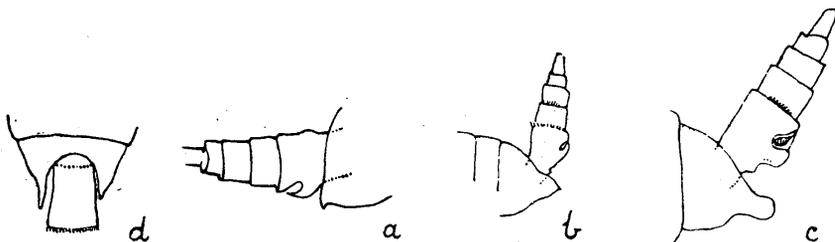


Fig. 6. *Undinula darwini* (Lubbock) Female : (a) *Variety typica*, view from the right side. (*Variety symmetrica* has this shape on both sides). (b) *Variety intermedia*, view from the left side. (c) *Variety typica*, view from the left side. (d) *Variety typica*, dorsal view of posterior margin of metasome. (a. b. c. after Sewell; d. after Colefax).

form of the 5th legs; length of female 3.9 to 5.1 mm., length of male 3.5 to 3.8 mm.:

♀ ♂ *Rhincalanus nasutus* Giesbrecht (Fig. 8)

- 19 Outer margin of 2nd, 3rd and 4th exopodites not toothed..... 20  
 Outer margin of 2nd, 3rd and 4th exopodites toothed.....32
- 20 Head triangular; caudal rami fused to the anal segment particularly in the females; body more than 4 times as long as the greatest breadth.....EUCALANUS 21  
 Head not triangular; caudal rami not fused to the anal segment; body usually much less than 4 times as long as the greatest breadth ..... CALOCALANUS 31
- 21 Females only : urosome 3-or 4-segmented ; caudal rami fused to the anal segment; 5th legs absent.....22  
 Males only : urosome 5-segmented; caudal rami indistinctly separated from the anal segment, 5th legs present, asymmetrical.....27

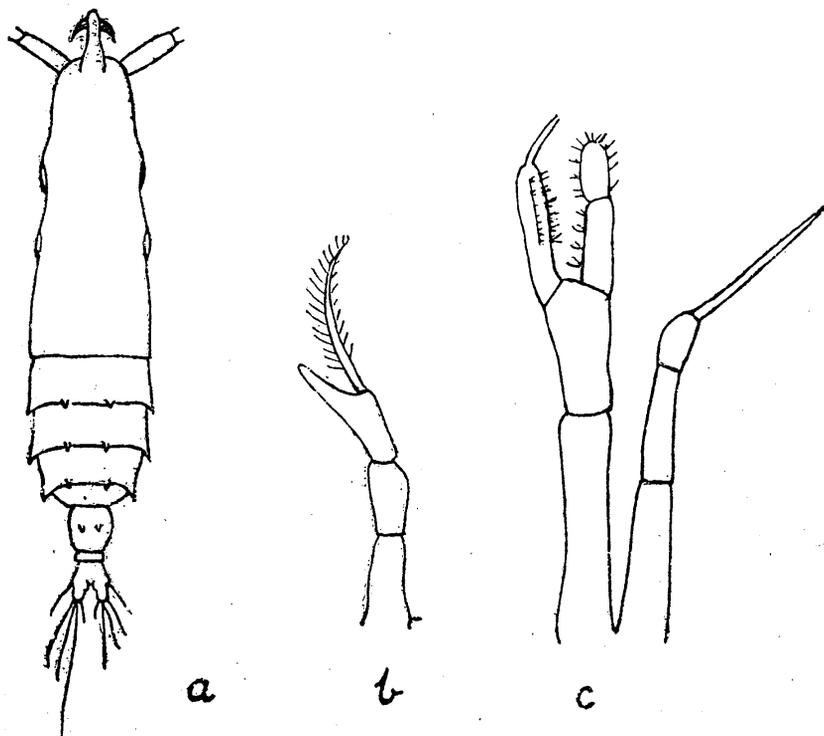


Fig. 7. *Rhinacalanus cornutus* Dana. (a) Female, dorsal view. (b) Female, 5th leg of one side. (c) Male, 5th pair of legs, anterior face. (after Wilson).

22 Urosome 4-segmented; an enlarged caudal seta present on the right side, posterior margin of metasome rounded in the Indo-Pacific forms but two blunt teeth present in the Atlantic form; length 4.4 to 8.25 mm.:

♀ *Eucalanus elongatus* (Dana) (Fig. 9a,b)

Urosome 3-segmented; an enlarged caudal seta present on the left side; posterior margin of metasome rounded..... 23

Note: *E. elongatus* is remarkable for its large size and 4-segmented urosome in the female. It was observed on several occasions at Kozhikode in plankton from 18 km. off the coast but always in few numbers.

23 Genital segment longer than broad; head indented on either side on the frontal margin..... 24

Genital segment broader than long; head not indented on either side ..... 25

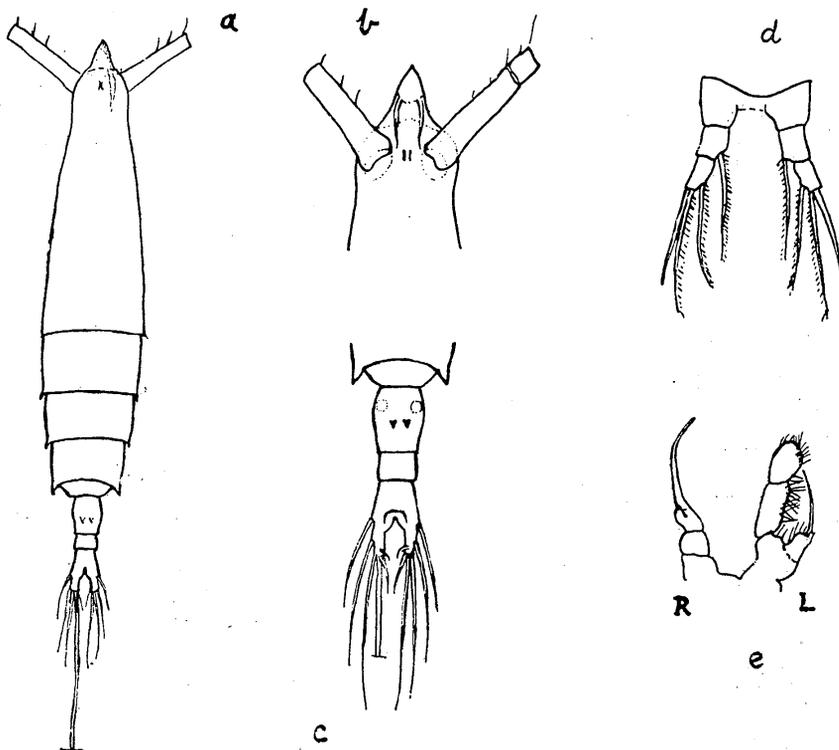


Fig. 8. *Rhincalanus nasutus* Giesbrecht. (a) Female, dorsal view. (b) Female, head-end, ventral view. (c) Female, urosome, dorsal view. (d) Female, 5th pair of legs. (e) Male, 5th pair of legs, posterior face. (after Sars).

24 Head end bluntly pointed; no trace of junction of 1st metasome segment with cephalon; 4th and 5th metasome segments clearly separated; length greater, 4.2 to 5.9 mm.:

♀ *Eucalanus attenuatus* (Dana) (Fig. 10a,b,c)

Head end acutely pointed; junction of 1st metasome segment with cephalon is faintly discernible; 4th and 5th metasome segments are fused at lateral margins only, the line of separation being discernible in the middle line; length lesser, 3.3 to 4.25 mm.:

♀ *Eucalanus pseudattenuatus* Sewell (Fig. 10e)

Note: These two species are closely allied. They were observed in plankton from about 18 km. off Kozhikode and are easily recognized by their peculiar posture. The 1st pair of antennae are held pointing forward rigidly at an angle to look like a Y. They seem to be sluggish in their movements.

25 Forehead elongated in dorsal view; outer margin of middle endopod segment of legs 1 to 4 bearing a small tooth in both sexes; genital

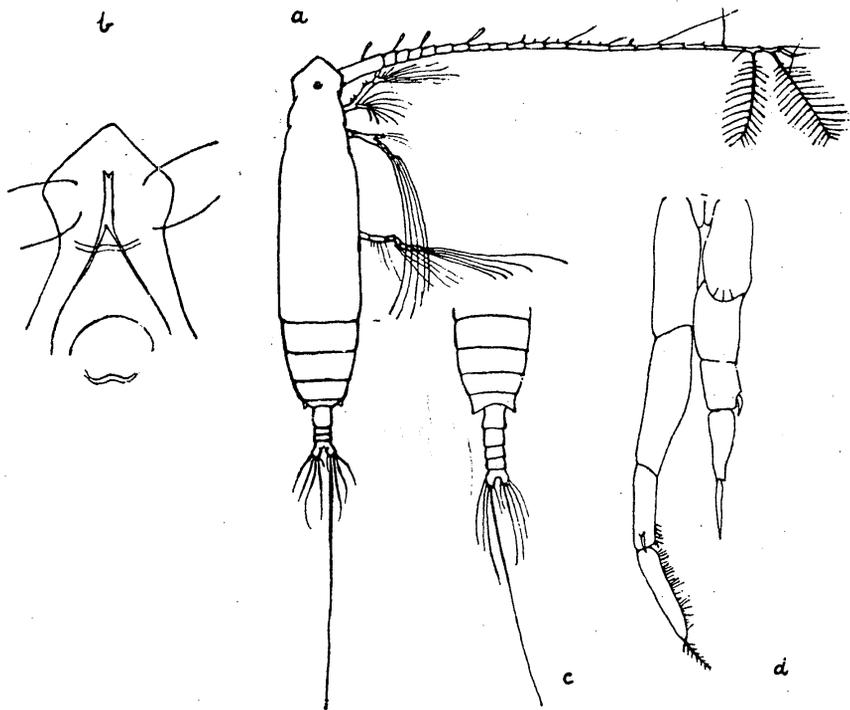


Fig. 9. *Eucalanus elongatus* (Dana). (a) Female, dorsal view of Atlantic Ocean form. (b) Female, rostral filaments, ventral view. (c) Male, metasome and urosome, dorsal view. (d) Male, 5th pair of legs; posterior face. (after Giesbrecht).

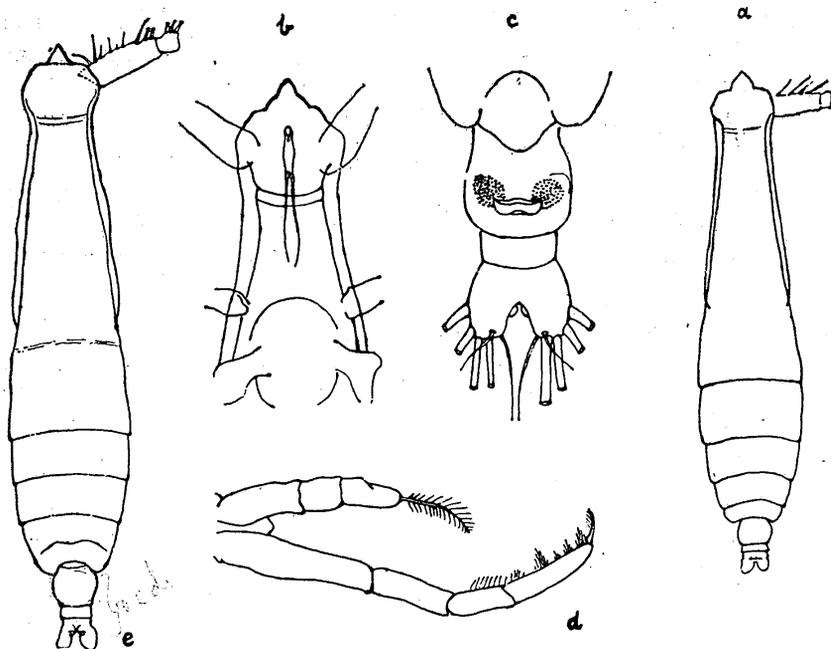


Fig. 10. *Eucalanus attenuatus* (Dana). (a) Female, dorsal view. (b) Female, rostrum, ventral view. (c) Female, urosome, ventral view. (d) Male, 5th pair of legs, posterior face. *Eucalanus pseudattenuatus* Sewell. (e) Female, dorsal view. (a. & e. after Sewell; b, c, d. after Giesbrecht).

segment only a little broader than long; length 2.50 mm.:

♀ *Eucalanus monachus* Giesbrecht (Fig. 11a)

Forehead rounded in dorsal view; outer margin of middle endopod segment of legs 1 to 4 smooth and without a tooth.....26

26 Genital segment much broader than long, onion shaped; size of the copepod 4.4 to 4.6 mm.; body tumid, swollen.

♀ *Eucalanus crassus* Giesbrecht (Fig. 12a,b,c)

Genital segment a little broader than long as figured; size of the copepod 1.9 to 2.1 mm.; body not so tumid as in *E. crassus*.

♀ *Eucalanus subcrassus* Giesbrecht (Fig. 12d,e)

Note: *Eucalanus subcrassus* is met with in greater numbers than any other species of this genus in Indian coastal waters.

27 Fifth legs present on both sides.....28

Fifth legs present on the left only; right 5th leg absent.....29

28 Right 5th leg more than half as long as left 5th leg; length 3.9 to 4.8 mm.:

♂ *Eucalanus elongatus* (Dana) (Fig. 9c,d)

Right 5th leg less than half as long as left 5th leg; head not as pointed as in the female *E. attenuatus*; length 3.1 to 3.25 mm.:

♂ *Eucalanus attenuatus* (Dana) (Fig. 10d)

Note: The male of *E. pseudattenuatus* is distinguishable from the allied species chiefly by its slightly smaller size. In either species, the males could be assigned to the species of the females along with which they occurred in the tow net collection.

29 A small tooth present on the outer margin of the middle endopod segment of swimming legs 2, 3 and 4; length 2.00 mm.:

♂ *Eucalanus monachus* Giesbrecht (Fig. 11b,c)

Outer margin of the middle endopod segment of swimming legs 2, 3 and 4 smooth and without tooth like projection . . . . .30

30 Fourth metasome segment bears two tactile setae on each side as figured; length 2.6 mm.:

♂ *Eucalanus crassus* Giesbrecht (Fig. 11d,e)

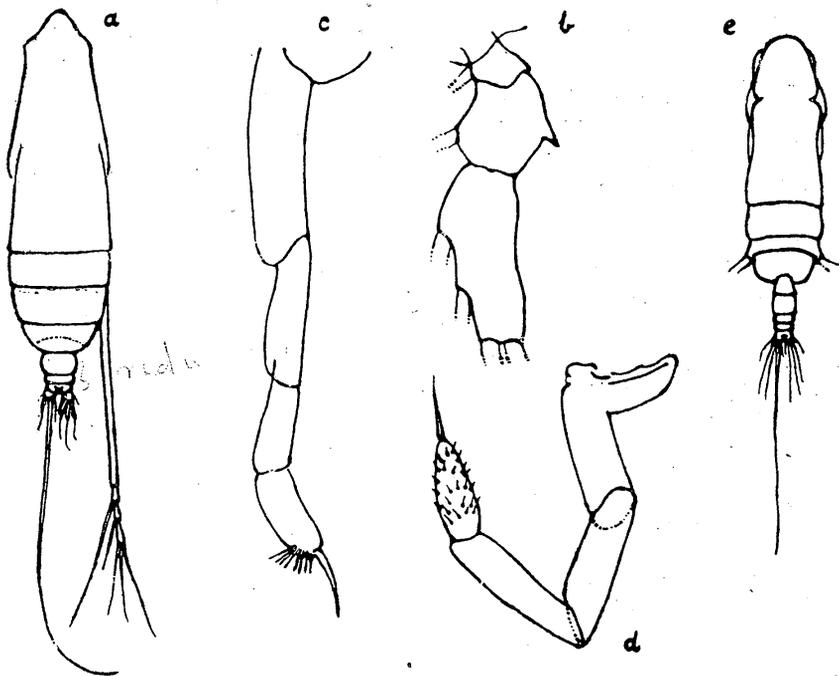


Fig. 11. *Eucalanus monachus* Giesbrecht. (a) Female, dorsal view. (b) Male, 4th leg, endopodite showing tooth on middle segment. (c) Male, 5th leg, posterior face. *Eucalanus crassus* Giesbrecht Male (d) 5th leg, posterior face. (e) Dorsal view. (after Giesbrecht).

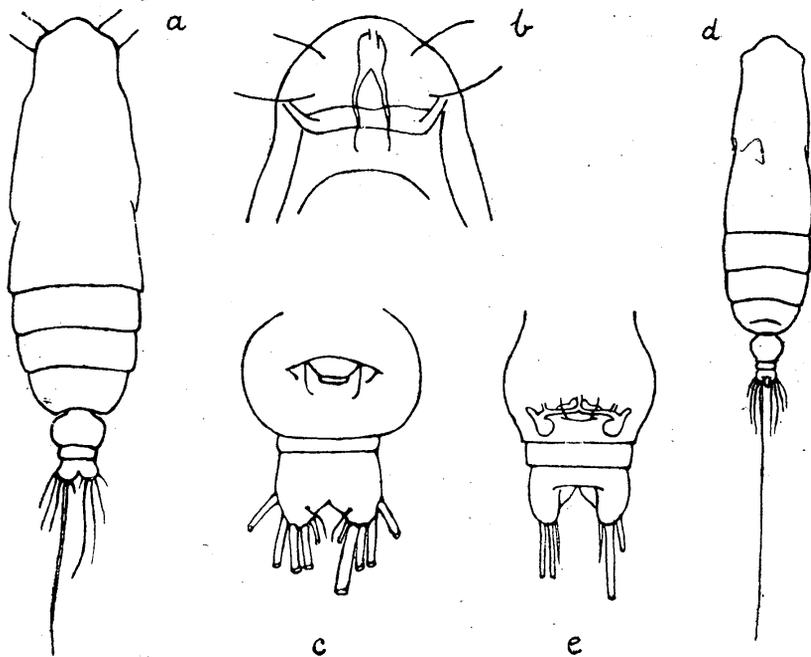


Fig. 12. *Eucalanus crassus* Giesbrecht. ♀ (a) Dorsal view. (b) Rostrum, ventral view. (c) Urosome, ventral view. *Eucalanus subcrassus* Giesbrecht. ♀ (d) Dorsal view. (e) Urosome, ventral view. (a. after Colefax; b., c. after Giesbrecht; d, e. after Sewell).

Fourth metasome segment without conspicuous laterally placed setae; length 1.7 to 1.8 mm

♂ *Eucalanus subcrassus* Giesbrecht

- 31 Urosome 2-segmented; caudal rami turned outwards at right angles to the body axis, each ramus bearing four equal plumose setae; 5th legs 4-segmented, symmetrical; length 0.88 to 1.2 mm.:

♀ *Calocalanus pavo* (Dana) (Fig. 13 & 14a)

Urosome 5-segmented; caudal rami parallel to the body axis and not provided with large plumose setae; 5th legs asymmetrical, right leg 4-segmented, left leg 5-segmented and much longer than the right; length 1.04 mm.:

♂ *Calocalanus pavo* (Dana) (Fig. 14b & c)

- 32 Terminal segment of the exopodites of legs 2, 3 and 4 is separated into a proximal and a distal portion by the outer marginal spine such that the proximal portion is at least twice as long as the distal portion; 2nd antenna of the female with the exopodite (7-segmented)

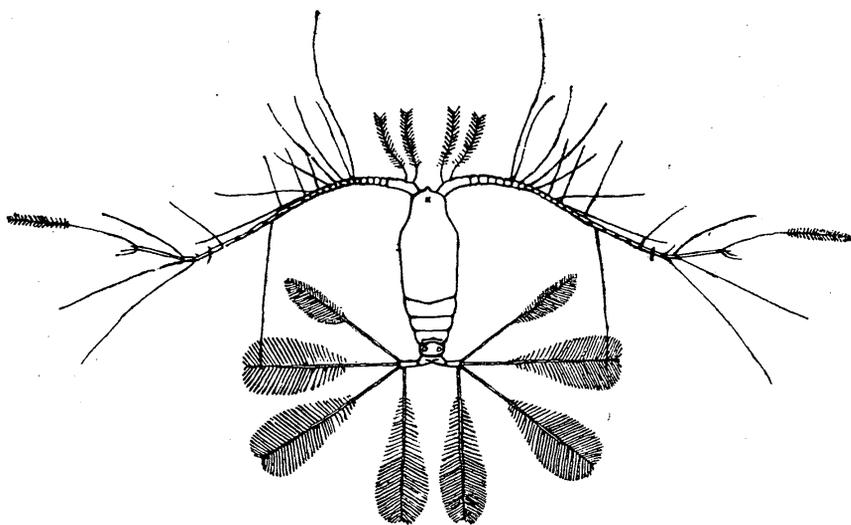


Fig. 13. *Calocalanus pavo* (Dana) ♀ Dorsal view (after Giesbrecht).

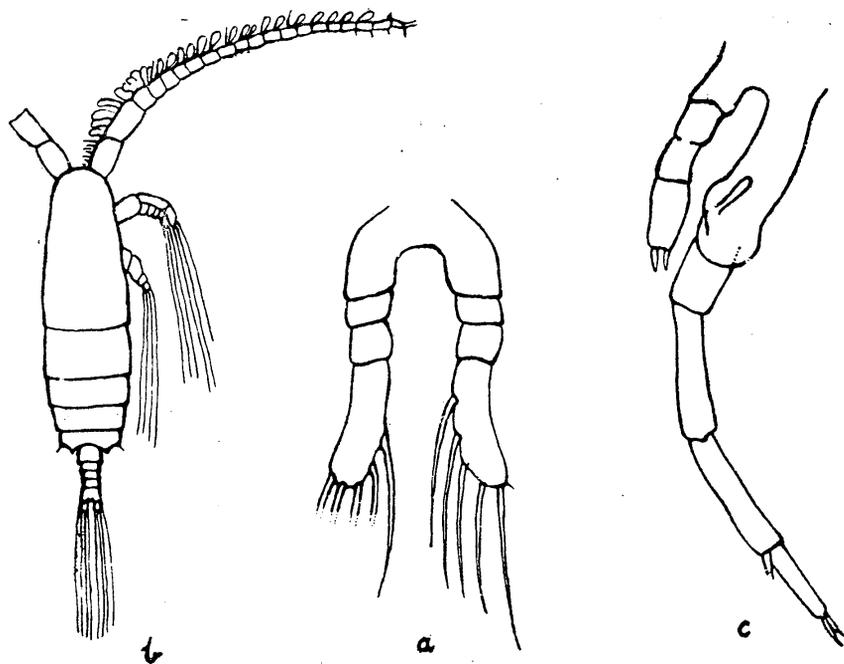


Fig. 14. *Calocalanus pavo* (Dana) (a) Female, 5th pair of legs. (b) Male, dorsal view. (c) Male, 5th pair of legs, anterior face (after Giesbrecht).

- as long as the endopodite (2-segmented) ; 5th legs present in the female ..... PARACALANUS 33
- Terminal segment of the exopodites of legs 2, 3 and 4 is separated into a proximal and a distal portion by the outer marginal spine such that the proximal portion is less than twice as long as the distal portion; 2nd antenna of the female with the exopodite (7-segmented) shorter than the endopodite (2-segmented); 5th legs absent in the female..... ACROCALANUS 36
- 33 First antennae not generally reaching beyond the caudal rami, surface of basipod 1 of legs 1 to 4 beset by hairs and bristles..... 34
- First antennae reaching beyond the caudal rami; surface of basipod 1 of legs 1 to 4 naked (except for one plumose seta) though hairs and bristles occur on the segments of the exopod and endopod.... 35
- 34 Urosome 4-segmented; 5th legs symmetrical, 2-segmented, genital opening oval, broader than long; length 0.8 to 1.00 mm :  
 ♀ *Paracalanus parvus* (Claus) (Fig. 15 a,b,c,d),  
 ♂ *Paracalanus parvus* (Claus) (Fig. 15 e,f,g.)

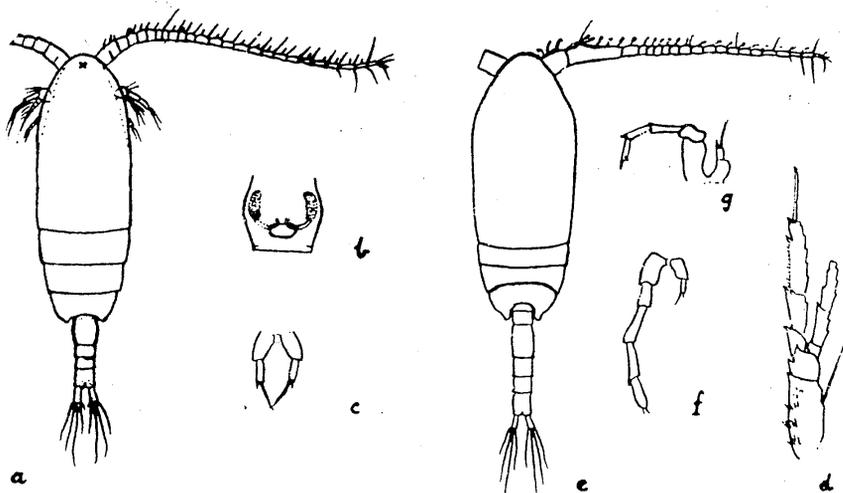


Fig. 15. *Paracalanus parvus* (Claus) (a) Female, dorsal view. (b) Female, genital segment, ventral view. (c) Female, 5th pair of legs. (d) Female, 4th leg, to show hairs and spines on the 1st basipodite segment. (e) Male, dorsal view. (f,g) Male, 5th pair of legs, two views. (a; c, e, f. after G.O. Sars; b, d, g. after Sewell).

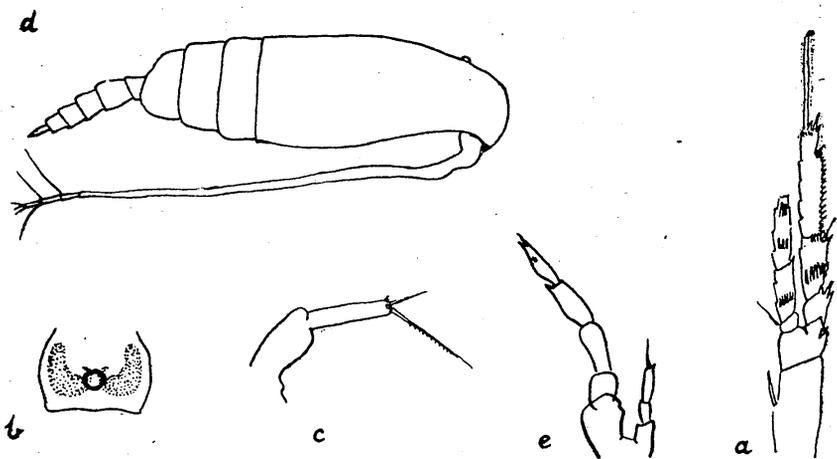


Fig. 16. *Paracalanus aculeatus* Giesbrecht. (a) Female, 4th leg, to show absence of hairs and spines on the 1st basipodite segment. (b) Female, genital segment, ventral view. (c) Female, 5th leg. (d) Male, lateral view. (e) Male, 5th pair of legs. (a, b, c. after Sewell; d, e. after Colefax).

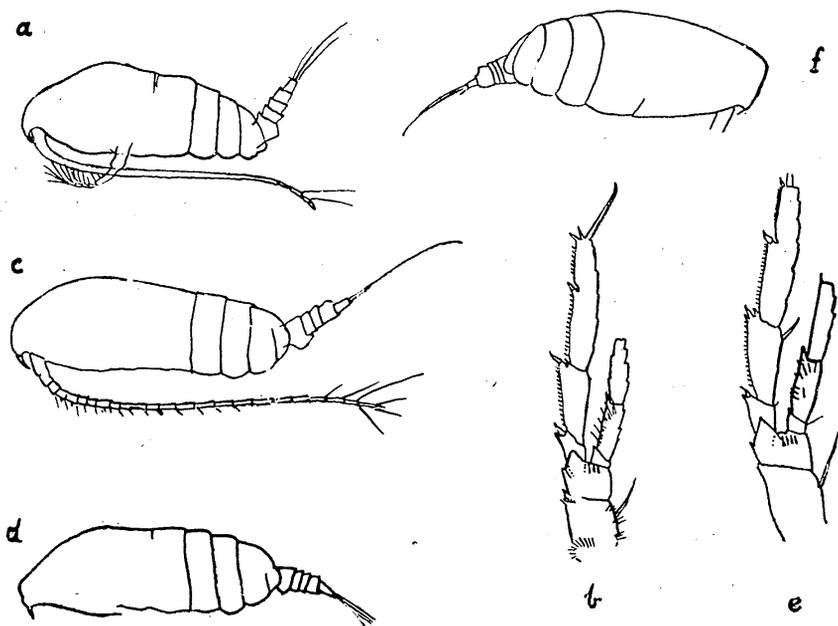


Fig. 17. *Acrocalanus* ♀ (a) *A. gibber* Giesbrecht, lateral view. (b) *A. gibber* Giesbrecht, 4th leg. (c) *A. gracilis* Giesbrecht, lateral view. (d) *A. longicornis* Giesbrecht, lateral view. (e) *A. longicornis* Giesbrecht, 4th leg (f) *A. monachus* Giesbrecht, lateral view. (a, c, d, f, after Wolfenden; b, e, after Sewell).

35 Urosome 4-segmented; 5th legs symmetrical, 2-segmented, genital opening circular; length greater than in *P. parvus*, 1.25 mm.

♀ *Paracalanus aculeatus* Giesbrecht (Fig. 16 a,b,c,)

Urosome 5-segmented; 5th legs asymmetrical, short and 3-segmented on the right side, long and 5-segmented on the left side; bubble-like eminence on cephalosome quite distinct in profile view; length 1.2 mm :

♂ *Paracalanus aculeatus* Giesbrecht (Fig. 16 d,e,)

Note— The two species of *Paracalanus* share with species of *Acartia* and *Oithona* the distinction of being the "commonest" copepods of inshore waters of the Indian coast. Though small in size, they occur in almost all months of the year and in quite considerable numbers.

36 Females only : urosome 4-segmented; 5th legs absent ..... 37

Males only : urosome 5-segmented; 5th leg present on the left side only, 4-segmented; the male *Acrocalanus* can be assigned to its correct species only with considerable difficulty, owing to the inadequate descriptions available ♂ *Acrocalanus* species

37 First antenna does not reach beyond caudal rami; cephalosome in lateral view, with a humped outline; body compact, length 0.93 to 1.00 mm.

♀ *Acrocalanus gibber* Giesbrecht (Fig. 17a, b)

First antenna reaches beyond caudal rami; cephalosome not humped in lateral view ; body more elongated than in *A. gibber* ..... 38

38 Lateral view of the body as figured, cephalosome very evenly rounded; armature of the distal portion of the terminal exopodite segment of the 4th legs consists of teeth which are not smaller or different in size from the teeth on the proximal portion, being like *A. gibber* in this respect; length 1.30 to 1.40 mm.

♀ *Acrocalanus gracilis* Giesbrecht (Fig. 17 c).

Lateral view of the body as figured, cephalosome less evenly rounded than in *A. gracilis* ; armature of the distal portion of the terminal exopodite segment of the 4th legs consists of a few fine teeth whereas the teeth on the proximal portion are comparatively coarser and more numerous ; length 1.14 to 1.20 mm :

♀ *Acrocalanus longicornis* Giesbrecht (Fig. 17 d, e)

Lateral view of the body as figured, outline almost quadrate; body short and compact; terminal exopodite segment of the 4th legs as in *A. gibber* and *A. gracilis*.

♀ *Acrocalanus monachus* Giesbrecht (Fig. 17 f)

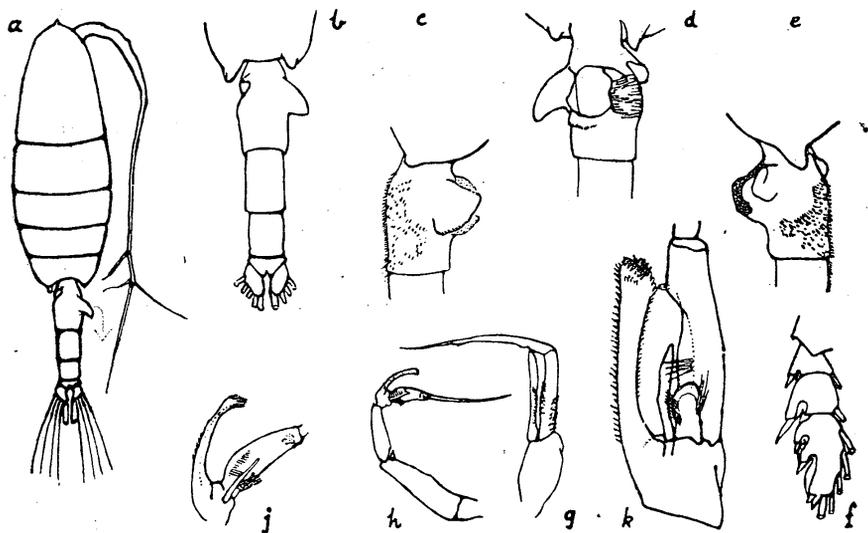


Fig. 18. *Euchaeta concinna* Dana. (a) Female, dorsal view. (b) Female, urosome, dorsal view. (c) Female, genital segment, view from the right. (d) Female, genital segment, ventral view. (e) Female, genital segment, view from the left. (f) Female, 2nd leg, exopodite. (g) Male, right 5th leg. (h) Male, left 5th leg. (j) Male, left 5th leg, terminal part, enlarged view. (k) Male, left 5th leg, terminal part another view, more enlarged. (a, g, h, j, after Colefax; b, c, d, e, f. after Wolfenden; k. after A. Scott.)

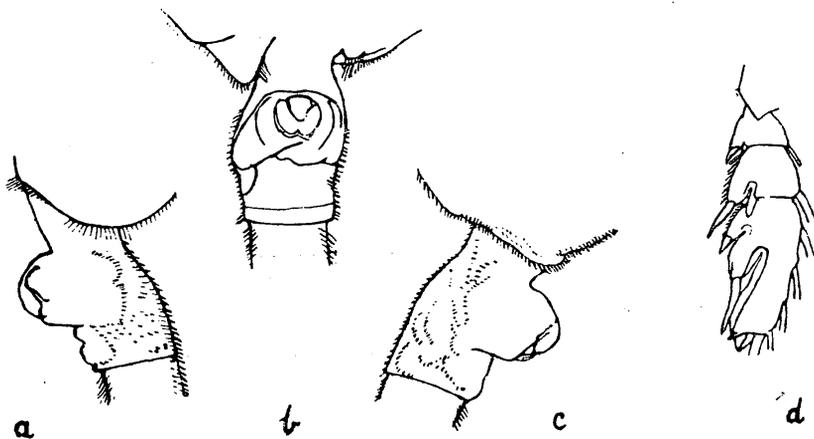


Fig. 19. *Euchaeta marina* Prestandrea ♀ (a) Genital segment, view from the left. (b) Genital segment, view from ventral aspect. (c) Genital segment, view from the right. (d) 2nd leg, exopodite. (after Wolfenden).

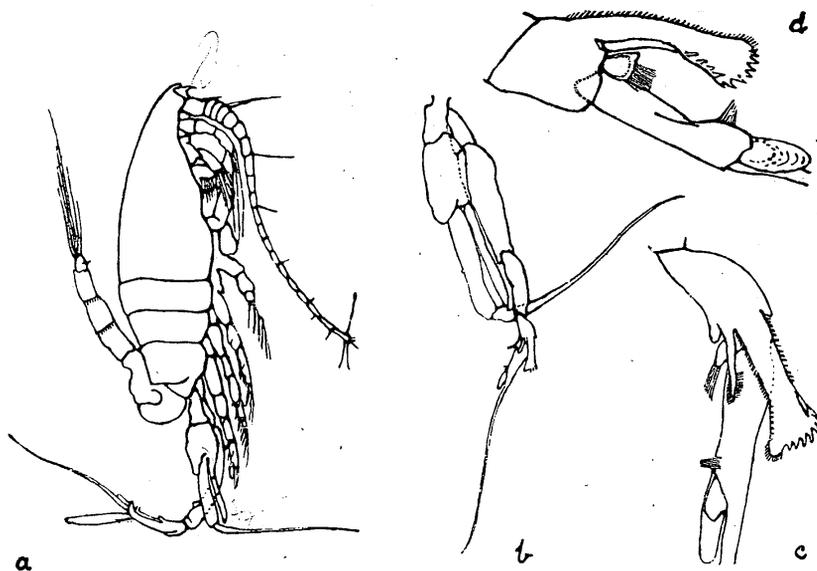


Fig. 20. *Euchaeta marina* Prestandrea ♂ (a) View from the right. (b) 5th pair of legs, anterior face. (c) Left 5th leg, terminal part, enlarged. (d) Left 5th leg, terminal part, another view, enlarged. (a. after Giesbrecht; b, c. after Wolfenden; d. after A. Scott).

39 Swimming legs 1 and 2 with 2- and 3-segmented exopodites respectively and 1-segmented endopodites; posterior margin of metasome rounded, covered ventrally with tufts of hairs; 1st antennae moderately long with numerous stiff setae; head-end pointed, with a frontal projection dorsal to the rostral projection, the two together constituting a characteristic profile view.....EUCHAETA 40

Swimming legs 1 and 2 with 3-segmented exopodites and 1 and 2 segmented endopodites respectively; posterior margin of metasome rounded, without tufts of hairs; 1st antennae not extending beyond the metasome. ....SCOLECITHRIX 44

40 Females only: urosome 4-segmented, anal segment very short; 5th legs absent.....41

Males only: urosome 5-segmented, anal segment very short; body more slender than in the female; 5th legs large, conspicuous, biramous on the right side and uniramous on the left, the left foot terminating in a complicated "hand", which transfers the spermatophore .....43

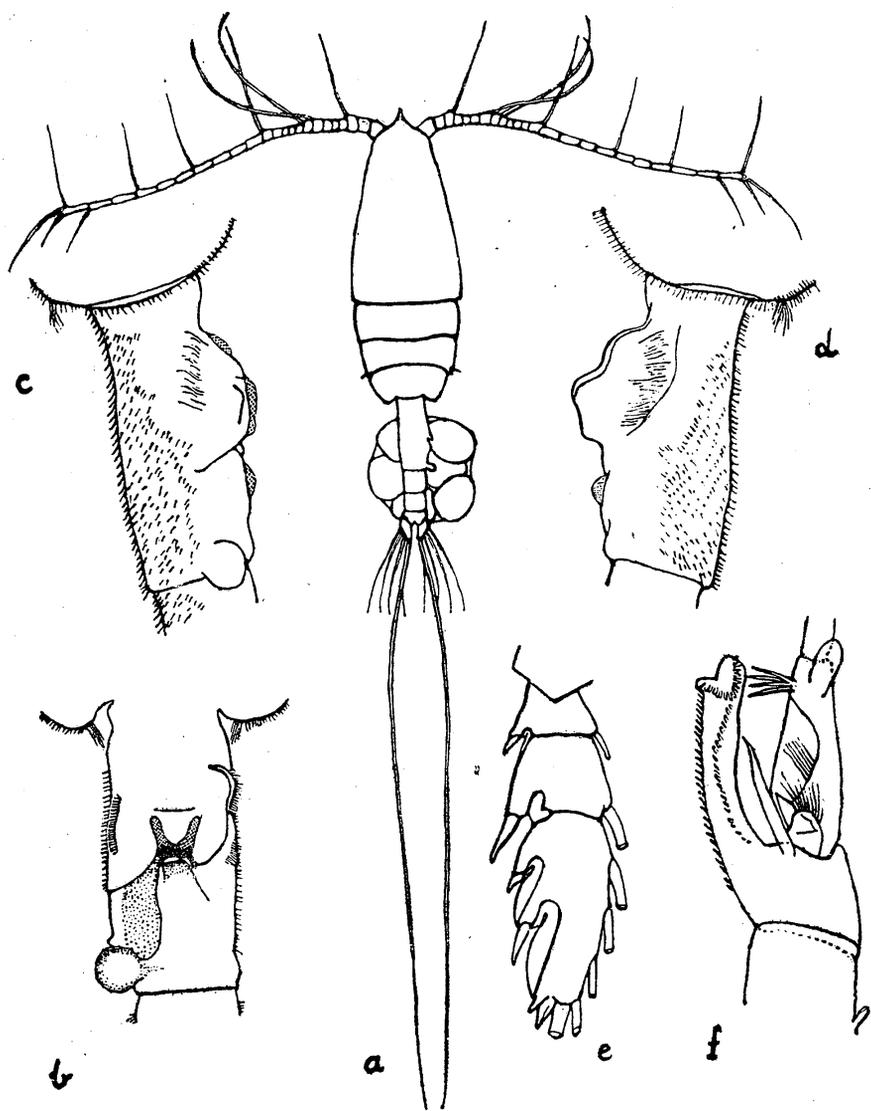


Fig. 21. *Euchaeta wolfendeni* A. Scott (a) Female, dorsal view. (b) Genital segment, ventral view. (c) Genital segment, view from the right. (d) Genital segment, view from the left. (e) 2nd leg, exopodite. (f) Male, left 5th leg, terminal part, enlarged view. (a. to e. after Wolfenden; f. after A. Scott)

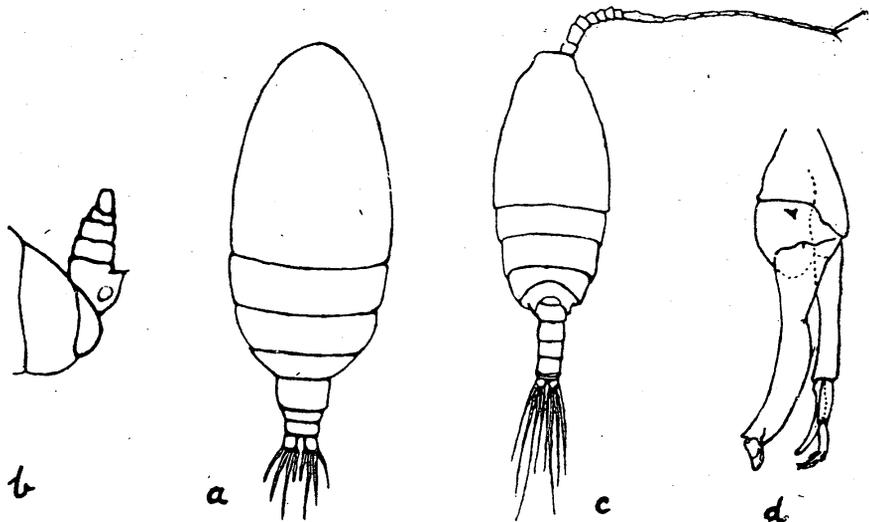


Fig. 22. *Scolecithrix danae* (Lubbock) (a) Female, dorsal view. (b) Female, urosome, lateral view to show shovel-like ventral projection on genital segment. (c) Male, dorsal view. (d) Male, 5th pair of legs, anterior face. (a. after Wilson; b. after Giesbrecht, c, d. after Colefax).

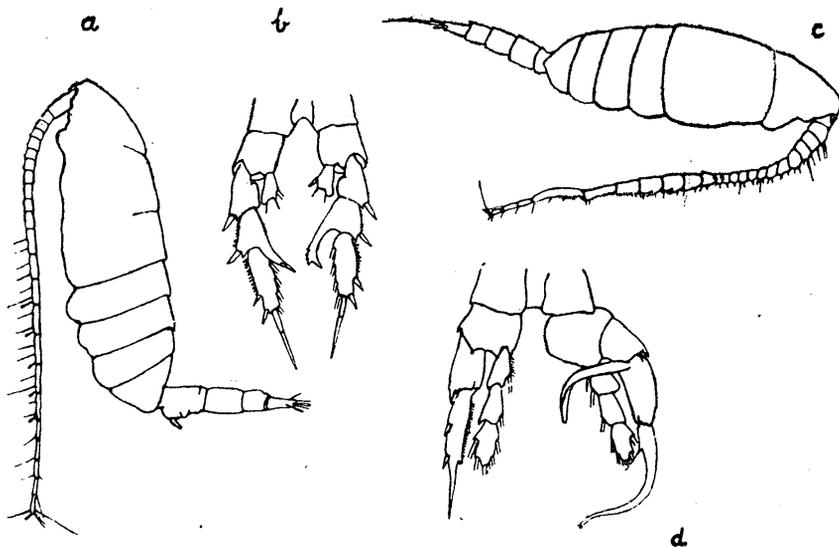


Fig. 23. *Centropages orsinii* Giesbrecht (a) Female, lateral view. (b) Female, 5th pair of legs, posterior face. (c) Male, lateral view. (d) Male, 5th pair of legs, posterior face. (after Wolfenden).

41 Genital segment provided on the right side with a blunt peg-like projection which is curved towards tail end; in the 2nd leg the terminal exopod segment bears three external marginal spines, all three being quite short and of equal length; in the same leg, the middle exopod segment bears a single external marginal spine which is so long as to reach beyond the base of the spine above it; Length 3.75 mm.

♀ *Euchaeta concinna* Dana (Fig. 18a to f)

Genital segment without peg-like projection; in the 2nd leg the terminal exopod segment bears three external marginal spines of which spine No. 2 is always longer than spines 1 and 3; in the same leg, the middle exopod segment bears a single external marginal spine which does not reach beyond the base of the spine above it...42

42 Posterior margin of metasome more produced on the right side than on the left; genital segment with irregular outline on the right side; in the terminal exopod segment of the 2nd leg external marginal spine No. 2 is very long and reaches as far as spine No. 3; length 2.25 to 3.9 mm.

♀ *Euchaeta marina* Prestandrea (Fig. 19)

Posterior margin of metasome of the two sides appears symmetrical in dorsal view; genital segment with a small round button-like protuberance at the posterior margin on the right side; in the terminal exopod segment of the 2nd leg, external marginal spine No. 2 is less than half as long as necessary to reach spine No. 3; length 3.30 mm.

♀ *Euchaeta wolfendeni* A. Scott (Fig. 21a to e)

43 Toothed process at the end of the left 5th leg is armed with fine teeth as figured; length 2.6 mm.

♂ *Euchaeta concinna* Dana (Fig. 18g to k)

Toothed process at the end of the left 5th leg is somewhat broader and set with coarse teeth as figured; length 2.8 to 3.2 mm.

♂ *Euchaeta marina* Prestandrea (Fig. 20)

Toothed process at the end of the left 5th leg is armed with fine teeth and the apex is notched as figured; length 2.7 mm.

♂ *Euchaeta wolfendeni* A. Scott (Fig. 21f)

44 Fifth legs lacking; genital segment with a shovel-like ventral projection; length 2.2 mm.

♀ *Scolecithrix danae* (Lubbock) (Fig. 22a, b)

Fifth legs biramose on the left with 3-jointed exopod and one jointed endopod borne at the tip of the much elongated second basal segment; uniramous on the right as figured; length 2.0 to 2.15 mm.

♂ *Scolecithrix danae* (Lubbock) (Fig. 22c, d)

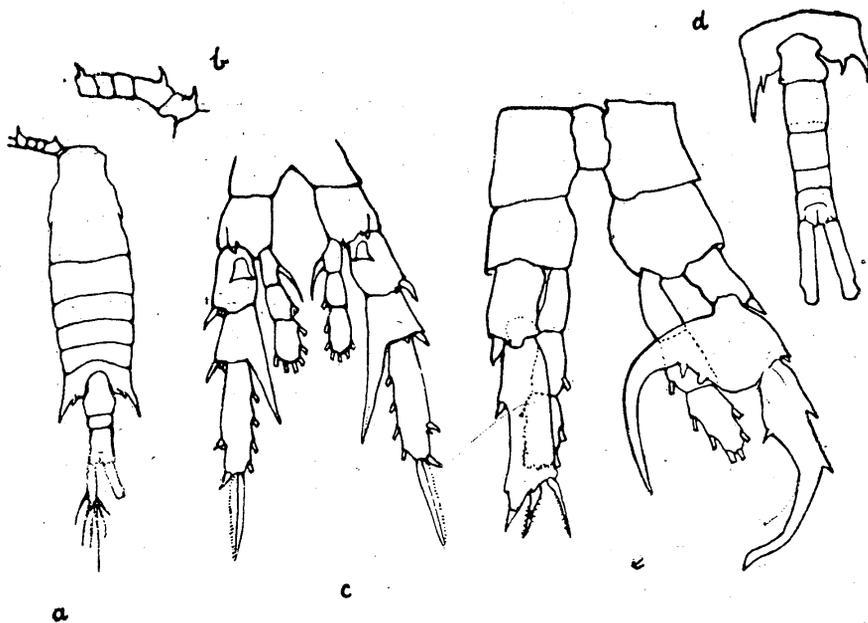


Fig. 24. *Centropages furcatus* (Dana) (a) Female, dorsal view. (b) Female, proximal five segments of 1st antenna. (c) Female, 5th pair of legs, posterior face. (d) Male, urosome and part of metasome, dorsal view. (e) Male, 5th pair of legs, posterior face. (a, d. after Giesbrecht, c. after Colefax; b, e. original).

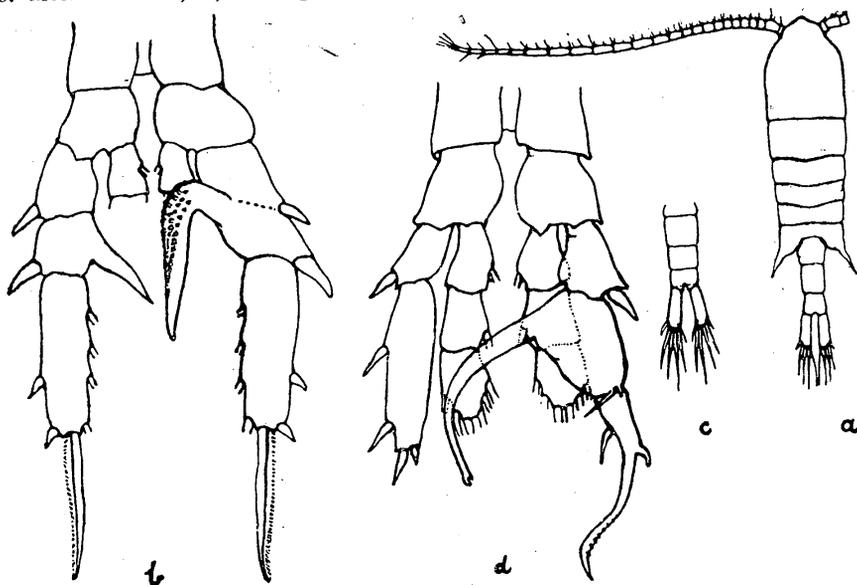


Fig. 25. *Centropages tenuiremis* Thompson & Scott (a) Female, dorsal view. (b) Female, 5th pair of legs, posterior face. (c) Male, urosome, dorsal view. (d) Male, 5th pair of legs, posterior face. (a, c. after Thompson & Scott; b, d. Original).

- 45 Endopodites of legs 1 to 4 are 2-segmented in both sexes. . . . .46  
 Endopodites of legs 2 to 4 are 2-segmented but endopodite of leg 1 is  
 3-segmented. . . . .94  
 Endopodites of legs 2 to 4 are 2-segmented but endopodite of leg 1 is  
 either 2- or 3-segmented, the latter condition being exceptional and  
 peculiar to the males of some of the species. . . . .117
- 46 The endopodites of the 5th legs are 3-segmented and fully furnished  
 with plumose setae; the 2-segmented appearance of the endopods  
 of legs 1 to 4 is secondary owing to the fusion of the proximal  
 segment with the middle segment, partially in leg 4 and more  
 completely in legs 3, 2 and 1. . . . .CENTROPAGES (part) 47  
 The endopodites of the 5th legs are either rudimentary or absent, the  
 2-segmented condition of the endopodites of legs 1 to 4 gives no  
 indication of secondary derivation. . . . .74
- 47 Urosome 3-segmented; 5th legs as figured; length 1.7 mm.  
 ♀ *Centropages orsimii* Giesbrecht (Fig. 23a, b)  
 Urosome 4-segmented; 5th legs as figured; length 1.3 to 1.5 mm.  
 ♂ *Centropages orsimii* Giesbrecht (Fig. 23c, d)
- 48 Posterior corners of metasome drawn out into strong spiniform  
 projections. . . . .49  
 Posterior corners of metasome without strong spiniform projections. .51
- 49 A prominent backwardly curved spine is present in the mid-dorsal  
 line near the posterior margin of the cephalosome; 5th legs as  
 figured; length of female 1.3 to 1.4 mm., of male 1.2 to 1.3 mm.  
 ♀ ♂ *Centropages dorsispinatus* Thompson & Scott (Fig. 26)  
 No spine is present in the mid-dorsal line. . . . .50
- 50 Posterior margin of metasome provided with two smaller, more dorsally  
 placed spines in addition to the two large ones; a tooth present  
 on the anterior margin of segments 1, 2 and 5 of 1st antennae; eye,  
 red in colour, in continual movement in the living condition: 5th  
 legs as figured; length of female 1.9 mm., of male 1.5 to 1.7 mm.  
 ♀ ♂ *Centropages furcatus* (Dana) (Fig. 24)  
 Posterior margin of metasome without additional spines; no teeth  
 present on the anterior margin of 1st antennae; eye not in move-  
 ment; 5th legs as figured; length of female 2.0 mm., of male 1.8 mm.  
 ♀ ♂ *Centropages tenuiremis* Thompson & Scott (Fig. 25)
- 51 Anterior part of body comparatively broad and compact, as in  
*C. dorsispinatus*. . . . .52  
 Anterior part of body comparatively long and slender, as in  
*C. furcatus*. . . . .53

52. Posterior margin of metasome with three small tooth-like projections visible in lateral view only; 5th legs in female of normal type, in male as figured; length of female 1.00 to 1.20 mm.; of male 1.0 mm.

♀ ♂ *Centropages trispinosus* Sewell (Fig. 27d, e, f)

Posterior margin of metasome with only one small tooth, visible in lateral view only; 5th legs as figured; length of female 1.1 to 1.4 mm., of male 1.0 to 1.2 mm.

♀ ♂ *Centropages alcocki* Sewell (Fig. 27a, b, c)

53 Females only: urosome 3-segmented; 1st antennae alike on the two sides.....54

Males only: urosome 4-segmented; 1st antennae geniculate on the right.....56

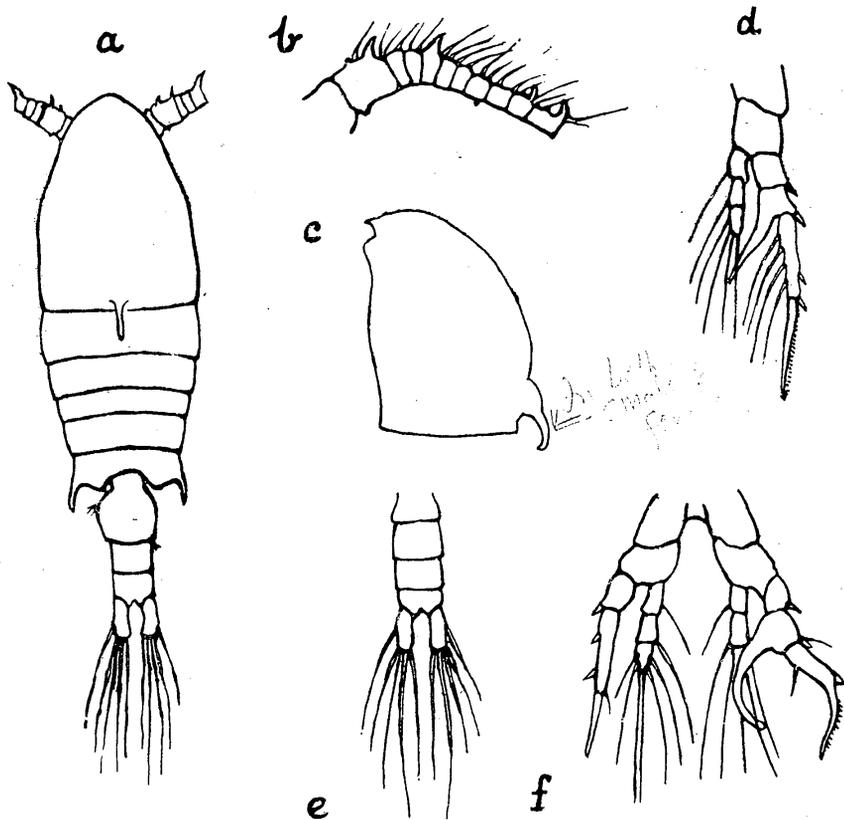


Fig. 26. *Centropages dorsispinatus* Thompson & Scott (a) Female, dorsal view. (b) Female, 1st antenna, proximal section to show teeth present on antennal segments 2, 5, 10 and 11. (c) Female, cephalosoma, lateral view. (d) Female, 5th leg of one side. (e) Male, urosome. (f) Male, 5th pair of legs, posterior face. (after Thompson & Scott).

54 Caudal rami asymmetrical; anal segment, in ventral view, appears twice as long as the preceding segment (because of the slant in the articulation between these two segments); length 1.9 mm.

♀ *Centropages calaninus* (Dana) (Fig. 28a, b, c, d)

Caudal rami symmetrical; anal segment not conspicuously longer than the other urosome segments..... 55

55 Second urosome segment with two small peg-like projections laterally, covered with fine short spines; 1st antennae extend beyond caudal rami by about five segments; the inwardly pointed spine of the middle exopod segment of the 5th leg is distinctly shorter than the terminal exopod segment, as figured; length 2.0 mm.

♀ *Centropages gracilis* (Dana) (Fig. 28g, h, j)

Second urosome segment without knobs or spines; 1st antennae extend beyond the caudal rami by one or two segments only as in *C. calaninus*; the inwardly pointed spine of the middle exopod segment of the 5th legs is a little longer than the terminal exopod segment (but not so long as in *C. calaninus*) as figured; length 1.54 mm.

♀ *Centropages elongatus* Giesbrecht (Fig. 28e, f)

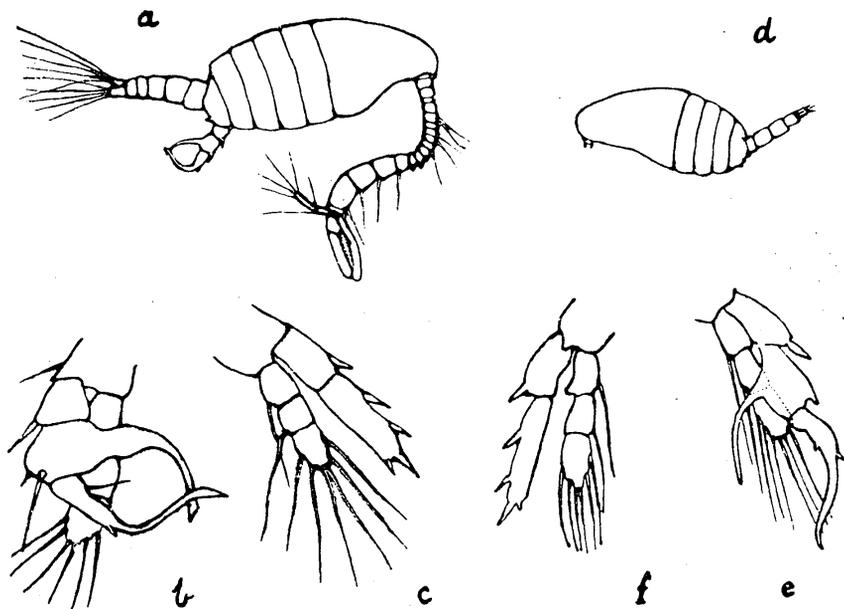


Fig. 27. *Centropages alcocki* Sewell ♂ (a) Lateral view. (b) Right 5th leg, anterior face. (c) Left 5th leg, anterior face. *Centropages trispinosus* Sewell ♂ (d) Lateral view. (e) Right 5th leg, posterior face. (f) Left 5th leg, posterior face. (a, b, c. after Sewell; d, e, f. after Krishnaswamy).

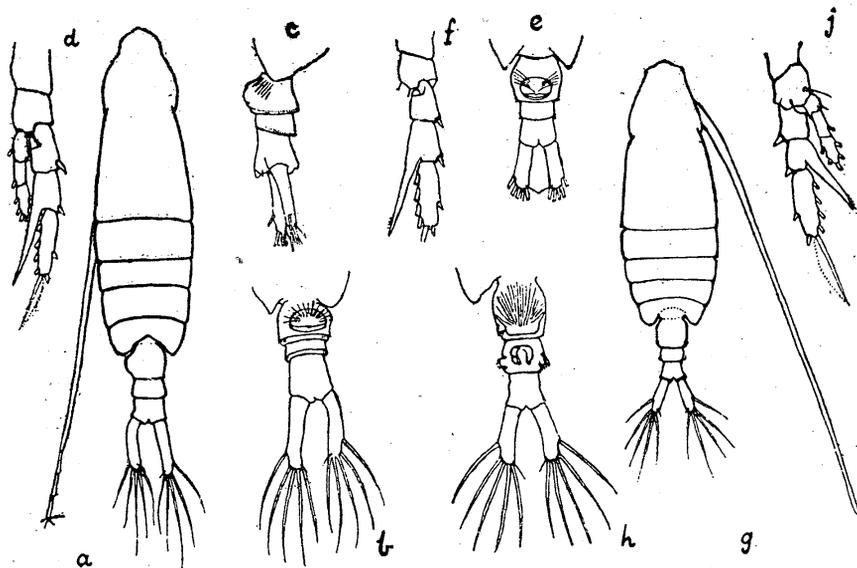


Fig. 28. *Centropages calaninus* (Dana) ♀ (a) Dorsal view. (b) Urosome, ventral view. (c) Urosome, lateral view. (d) 5th leg of one side. *Centropages elongatus* Giesbrecht. ♂ (e) Urosome, ventral view. (f) 5th leg of one side. *Centropages gracilis* (Dana) ♀ (g) Dorsal view. (h) Urosome, ventral view. (j) 5th leg of one side. (a, d, g, j, after Colefax; b, c, e, f, h. after Wolfenden).

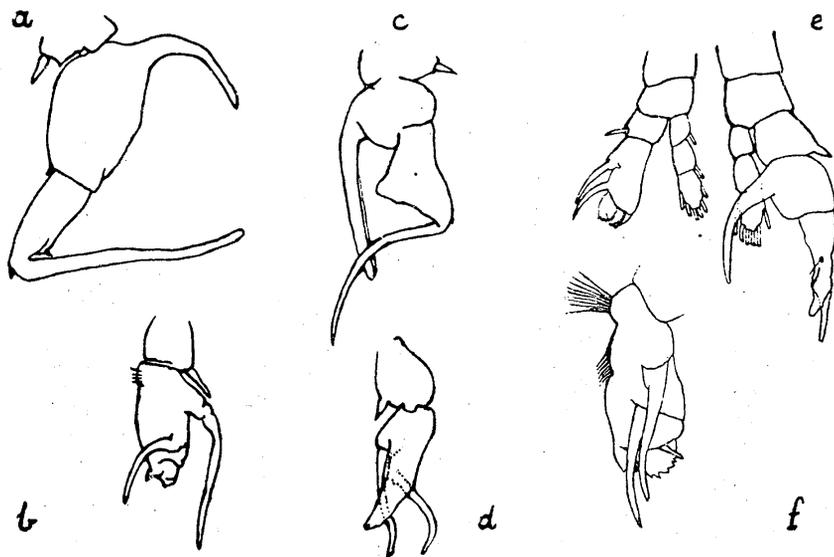


Fig. 29. *Centropages calaninus* (Dana) ♂ (a) Chela of right 5th leg, anterior face. (b) Exopodite of left 5th leg, anterior face. *Centropages gracilis* (Dana) ♂ (c) Chela of right 5th leg, posterior face. (d) Exopodite of left 5th leg, posterior face. *Centropages elongatus* Giesbrecht. (e) 5th pair of legs, posterior face. (f) Exopodite of left 5th leg, view from outer side. (a, b, c, d. after Giesbrecht; e, f. after Wolfenden).

56 Right 5th leg of the male with the claw-like terminal segment of the exopod comparatively long and bent into a V ..... 57

Right 5th leg of the male with the claw-like terminal segment of the exopod comparatively short and not bent, as depicted in figure; body length 1.50 mm.

♂ *Centropages elongatus* Giesbrecht (Fig. 29e, f)

57 Thumb of chela is curved and shorter than the middle exopod segment from which it springs; distal arm of the V-shaped terminal segment is straight; body length 1.8 mm.

♂ *Centropages calaninus* (Dana) (Fig. 29a, b)

Thumb of chela is straight and longer than the middle exopod segment from which it springs; distal arm of the V-shaped terminal segment is curved outwards, proximal arm broadened inwards triangularly; body length 1.70 mm.

♂ *Centropages gracilis* (Dana) (Fig. 29c, d)

Note: These three species of *Centropages* were observed during 1949-53 at Kozhikode in plankton collected from approximately 18 km. off the coast.

58 Fifth legs clearly biramose in both sexes ..... 59

Fifth legs uniramous in the female and usually in the male too, with only indistinct indications of the endopod in the male, if at all

PSEUDODIAPTOMUS 61

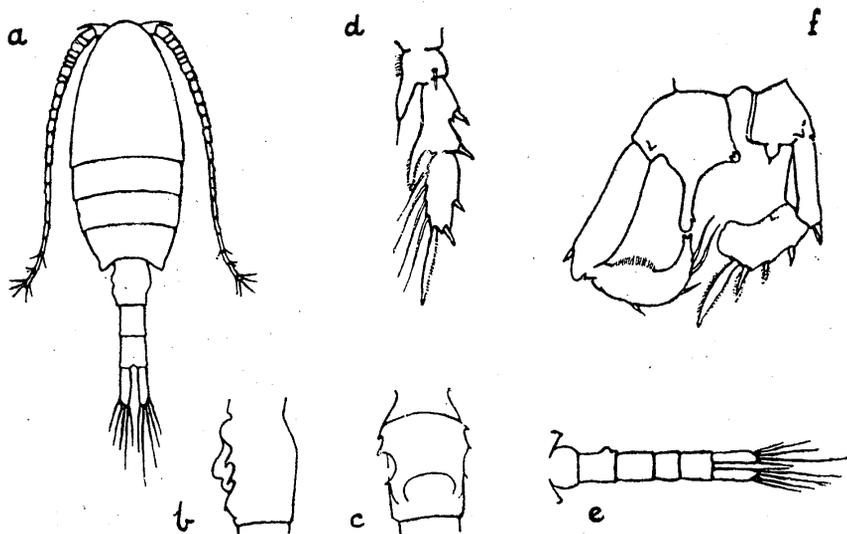


Fig. 30. *Isias tropica* Sewell. (a) Female, dorsal view. (b) Female, genital segment, view from the left (c) Female, genital segment, ventral view. (d) Female, 5th leg of one side. (e) Male, urosome, dorsal view. (f) Male, 5th pair of legs, anterior face. (after Sewell).

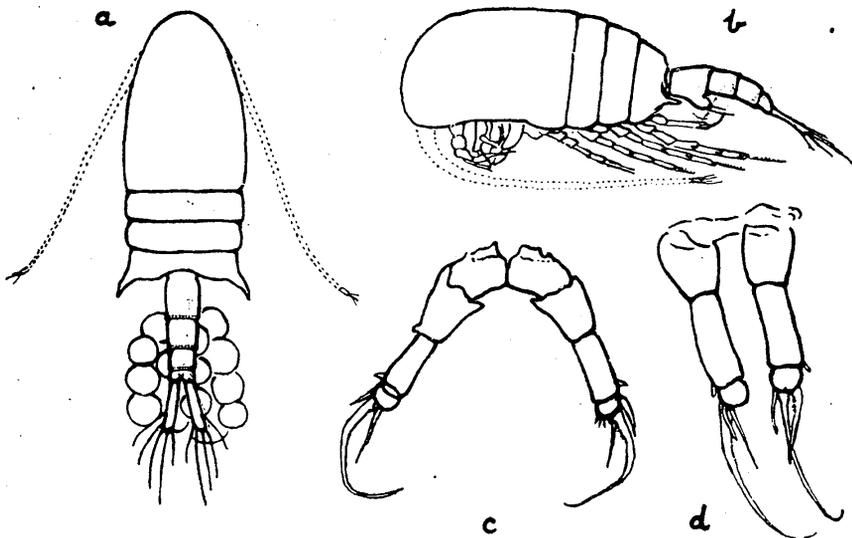


Fig. 31. *Pseudodiptomus aurivilli* Cleve. ♀ (a) Dorsal view. (b) View from the left. (c) 5th pair of legs. (d) 5th pair of legs, another view. (original).

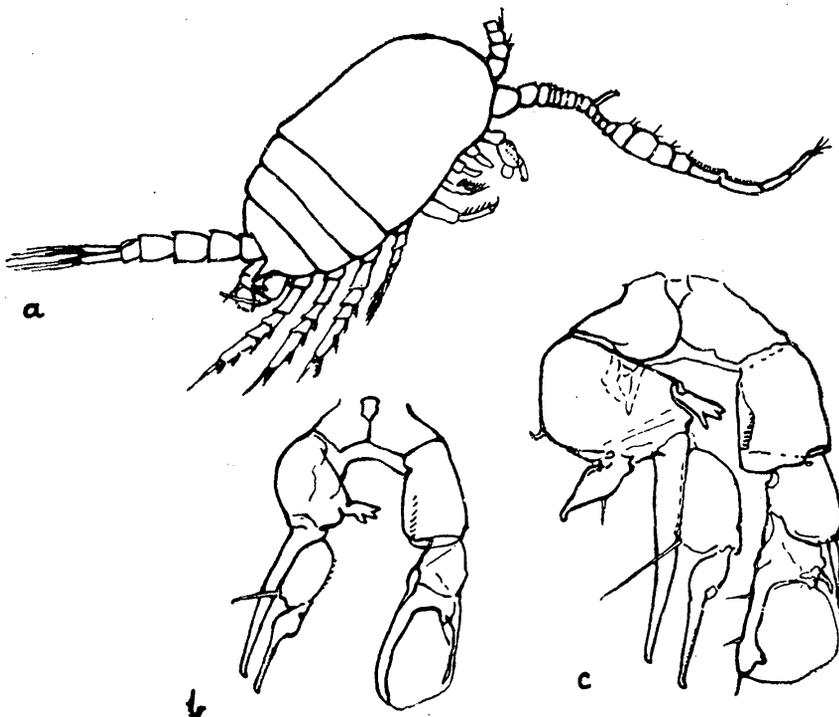


Fig. 32. *Pseudodiptomus aurivilli* Cleve ♂ (a) Dorso-lateral view. (b) 5th pair of legs, anterior face. (c) 5th pair of legs, another view of anterior face. (Original).

- Fifth legs clearly uniramous in both sexes, 2-segmented in the female and 5-segmented in the male..... .METACALANUS 73
- 59 Fifth legs of the female with 3-segmented exopodites and very short 1-segmented endopodites; of the male, with two segmented exopodites, endopodites absent in the right foot, 1-segmented in the left foot, the right foot larger than the left..... ISIAS 60
- Fifth legs of the female with plumose setae, with 3-segmented exopodites and very short 3- or 2-segmented endopodites; of the male, both rami 3-segmented in the left foot and two segmented in the right foot, right exopodite prehensile, sub-chelate. . . LUCICUTIA 72
- 60 Urosome 3-segmented; 1st antenna alike on the two sides; genital segment with asymmetrical lateral margins; length 1.25 mm.  
 ♀ *Isias tropica* Sewell (Fig. 30a to d)
- Urosome 5-segmented; 1st antenna geniculate on the right side; the third urosome segment with a projection on the right; length 1.25 mm.  
 ♂ *Isias tropica* Sewell (Fig. 30e, f)
- Note: This species was observed in Cochin harbour waters in 1956-57 during monsoon months.
- 61 Posterior margin of metasome drawn out into prominent spine-like projections, one on each side.....62
- Posterior margin of metasome not drawn out into prominent projections.....63
- 62 Urosome 4-segmented; 1st antennae alike on the two sides; 5th legs as figured; length 1.2 mm.  
 ♀ *Pseudodiaptomus aurivilli* Cleve (Fig. 31)
- Urosome 5-segmented; 1st antennae geniculate on the right side; 5th legs highly complex, as figured; length 0.93 mm.  
 ♂ *Pseudodiaptomus aurivilli* Cleve (Fig. 32)
- Note: It is open to doubt whether *Ps. mertoni* Fruchtl is a valid species, distinct from *Ps. aurivilli* Cleve. In the specimens examined on numerous occasions, the ♂ 5th legs agreed with published figures of *Ps. mertoni*, while the ♀ corresponded more to the descriptions of *Ps. aurivilli*. The specific name which has priority is used here. This species and *Ps. serricaudatus* are very commonly observed in inshore plankton collections.
- 63 Females only: urosome 4-segmented; 1st antennae alike on the two sides.....64
- Males only: urosome 5-segmented; 1st antennae geniculate on the right side .....65

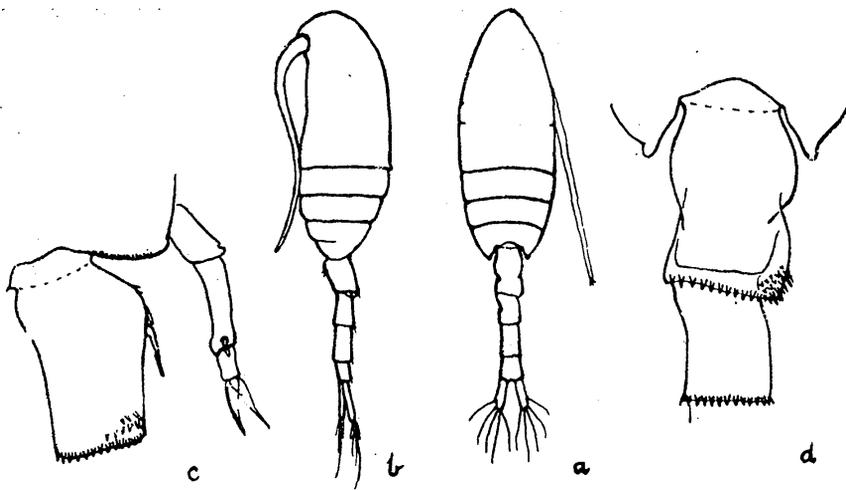


Fig. 33. *Pseudodiptomus serricaudatus* (T. Scott) ♀ (a) Dorsal view. (b) Lateral view. (c) Dorso-lateral view of last metasome segment and genital segment; Note teeth on metasome segment margin, 5th leg of right side and setiform projections near genital opening. (d) Dorsal view of genital and succeeding segment; note triangular teeth on posterior margin of segments. These are longer and more crowded at the right hand edge. Note asymmetry of segments. (Original).

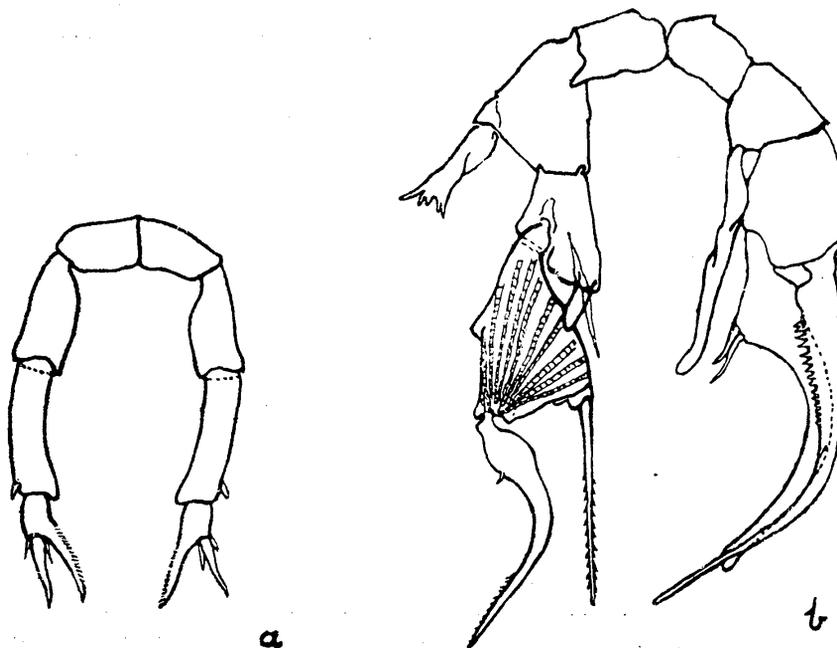


Fig. 34. *Pseudodiptomus serricaudatus* (T. Scott) (a) Female, 5th pair of legs. (b) Male, 5th pair of legs anterior aspect. Note long, blade-like endopod of left foot. (Original).

64 Genital segment with a prominent spine on each side pointing outwards; 5th legs as figured; length 1.18 mm.

♀ *Pseudodiptomus annandalei* Sewell (Fig. 35a, b, c)

Note: *Ps. annandalei* was observed on a number of occasions in Cochin harbour waters and on a few occasions in Kozhikode during monsoon months.

Genital segment without laterally pointing spines, slightly asymmetrical, the posterior margin being more produced backwards on the right than on the left; all urosome segments with a regular row of triangular teeth on posterior margin; 5th legs as figured, length 0.9 to 1.2 mm.

♀ *Pseudodiptomus serricaudatus* (T. Scott) (Fig. 33, 34a)

65 Fifth legs uniramous on both sides as figured; length 1.09 mm.

♂ *Pseudodiptomus annandalei* Sewell (Fig. 35d)

Fifth legs highly complex as figured; left leg bears a long blade-like endopod; length 0.9 to 1.1 mm.

♂ *Pseudodiptomus serricaudatus* (T. Scott) (Fig. 34b)

56 Body short, compact, head-end massive, caudal rami over six times as long as broad.....TEMORA 67

67 Females only; urosome 3-segmented; 5th legs 3-segmented and symmetrical.....68

Males only: urosome 5-segmented; 5th legs 3-segmented, asymmetrical, the left leg forming a chela.....70

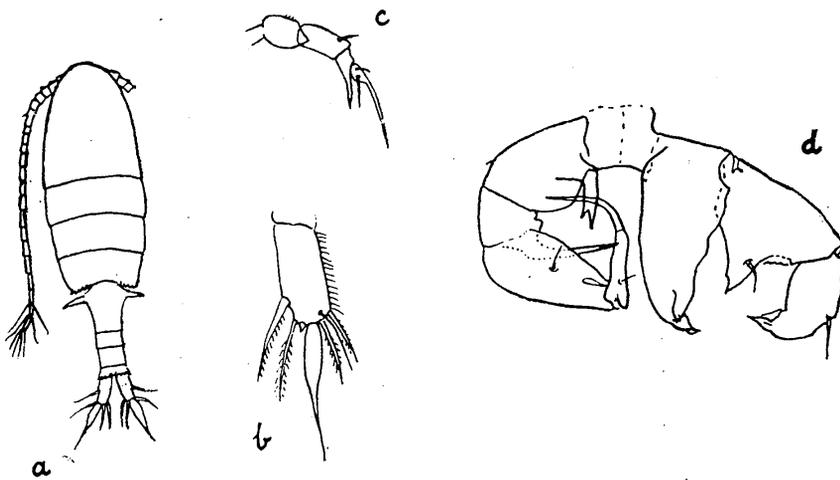


Fig. 35. *Pseudodiptomus annandalei* Sewell (a) Female, dorsal view. (b) Female, caudal ramus and setae. (c) Female, 5th leg of one side. (d) Male, 5th pair of legs, anterior face. (a. after Sewell; b, c. after Brehm; d. Original).

- 68 Posterior margin of metasome rounded; length 1.50 mm.  
 ♀ *Temora turbinata* (Dana) (Fig. 36a, b)
- Posterior margin of metasome drawn out into spines which are symmetrical.....69
- 69 Caudal rami symmetrical; postero-lateral corners of cephalosome expanded into laminae; length 1.35 mm.  
 ♀ *Temora stylifera* (Dana) (Fig. 38a, b)
- Caudal rami strongly asymmetrical; length 1.90 mm.  
 ♀ *Temora discaudata* Giesbrecht (Fig. 37a, b, c)
- 70 Posterior margin of metasome rounded; details of 5th legs as figured; length 1.40 mm.  
 ♂ *Temora turbinata* (Dana) (Fig. 36c)
- Posterior margin of metasome drawn out into spines which are not symmetrical, the left spine being larger.....71

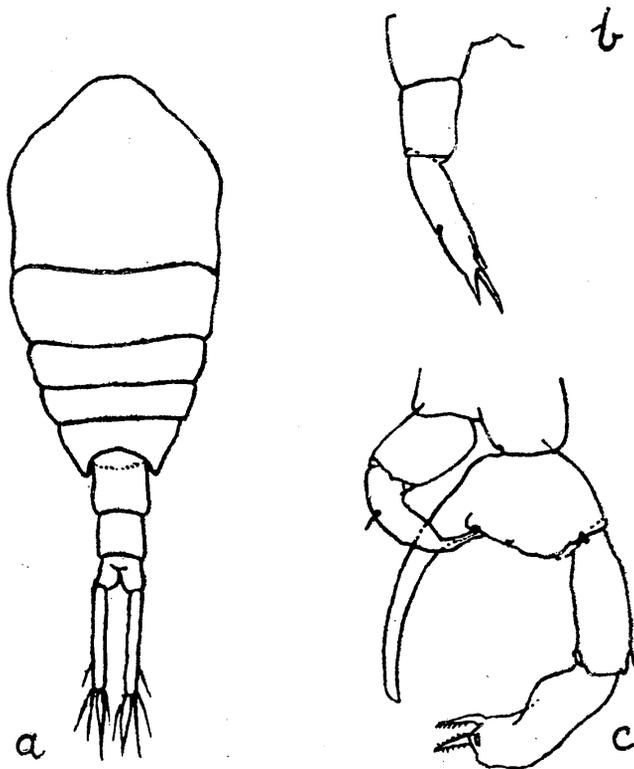


Fig. 36. *Temora tubinata* (Dana) (a) Female, dorsal view. (b) Female, 5th leg of one side. (c) Male, 5th pair of legs, anterior face. (after Giesbrecht).

71 Asymmetry of metasomal spines is slight; details of 5th legs as figured, the middle segment of the right leg being very short and the end segment (end claw) being short as compared to *T. discaudata*; length 1.30 mm.

♂ *Temora stylifera* (Dana) (Fig. 38c, d)

Asymmetry of metasomal spines is pronounced; details of 5th legs as figured, the middle and end segments of the right leg being much longer as compared to *T. stylifera*; length 1.80 mm.

♂ *Temora discaudata* Giesbrecht (Fig. 37 d, e)

72 Urosome 4-segmented; 1st antennae alike on the two sides; 5th legs symmetrical, similar to swimming legs 3 and 4 but differing in one

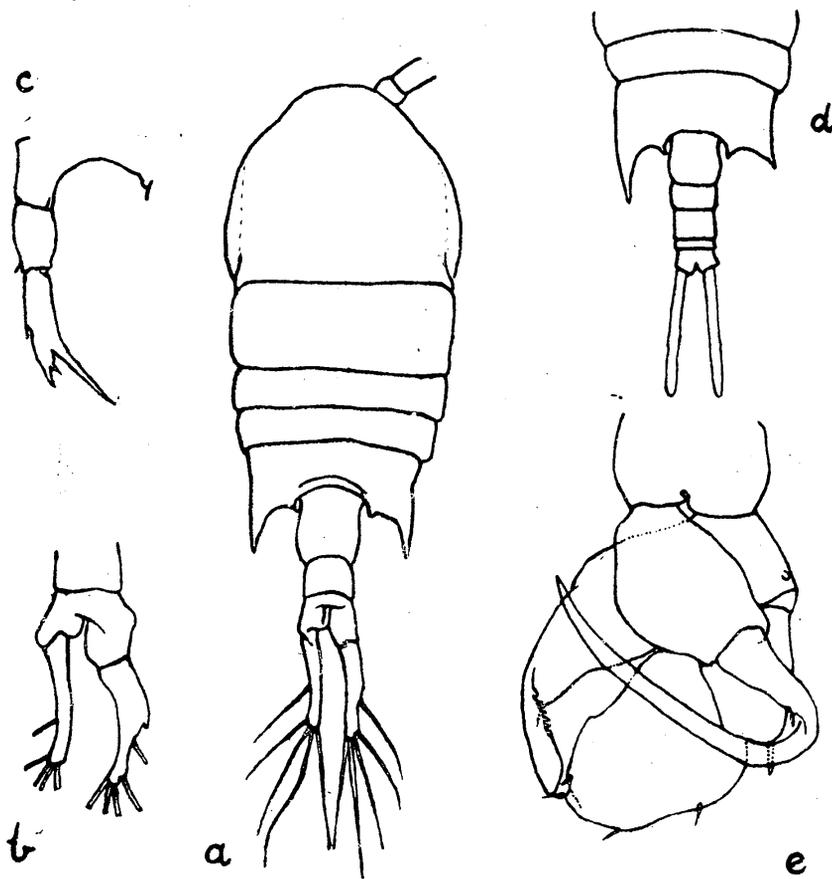


Fig. 37. *Temora discaudata* Giesbrecht. (a) Female, dorsal view. (b) Female, anal segment and caudal rami, different specimen. (c) Female, 5th leg of one side. (d) Male, part of metasome and urosome, dorsal view. (e) Male, 5th pair of legs, anterior face. (a, b, c, e, after Giesbrecht; d, original).

respect, the inner distal angle of the middle exopod segment is furnished with a large awl-shaped spine; length 1.4 to 1.75 mm.

♀ *Lucicutia flavicornis* (Claus) (Fig. 39 a, b)

Urosome 5-segmented; 1st antenna geniculate on the left side but not conspicuously; 1st antennae of both sides richly furnished with aesthetascs along anterior margin; 5th legs asymmetrical, right foot prehensile; length 1.3 to 1.7 mm.

♂ *Lucicutia flavicornis* (Claus) (Fig. 39 c, d)

*Note:* This species was observed on a few occasions at Kozhikode in plankton from 18 km. off the shore. It is a strikingly beautiful species.

73 Body short and compact as figured; end segment of 5th legs lamellar in the female and in the form of a slender smooth claw in the male; length of female 0.63 mm. of male 0.55 mm.

*Metacalanus aurivilli* Cleve (Fig. 40)

*Note:* This small copepod is quite numerous and occurs frequently in the plankton of the Gulf of Mannar during most months of the year. It was observed very seldom in plankton of the west coast.

74 Head-end truncate and rectangular without a distinct rostrum or rostral filaments; outer margins of exopods toothed in legs 1 to 4  
.....CANDACIA 75

Head-end not truncate or rectangular; outer margins of exopods not toothed ..... 82

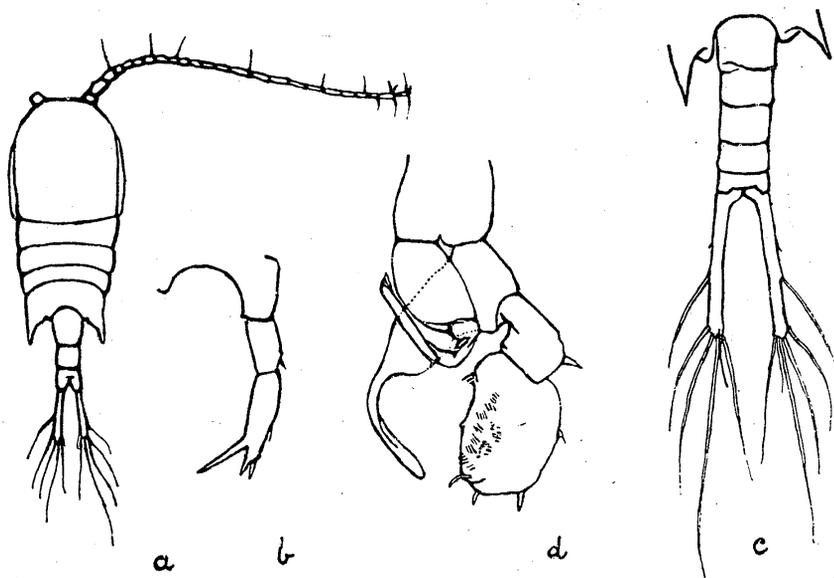


Fig. 38. *Temora stylifera* (Dana) (a) Female, dorsal view. (b) Female, 5th leg of one side. (c) Male, border of metasome and urosome, dorsal view. (d) Male, 5th pair of legs, anterior face. (after Giesbrecht).

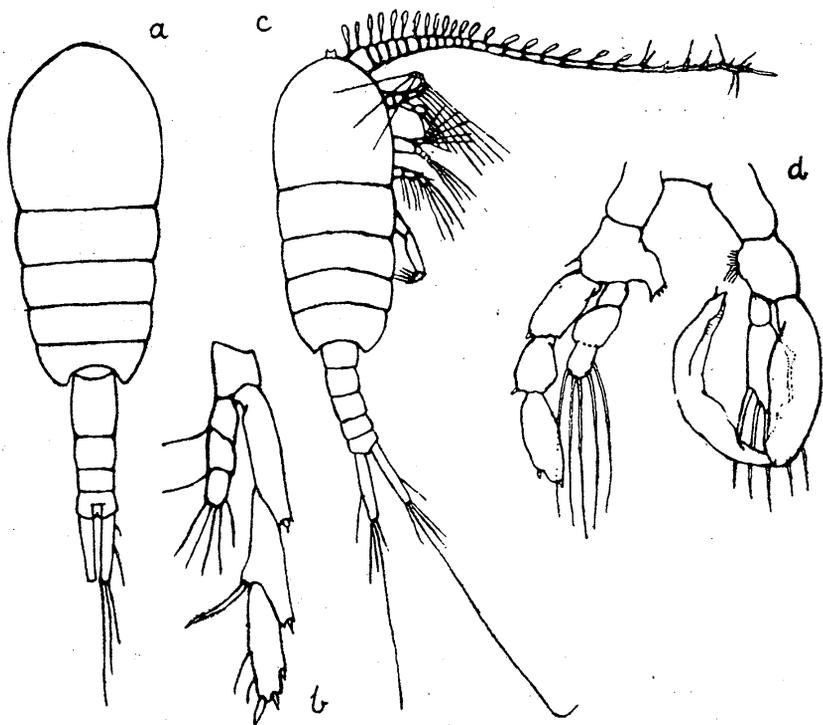
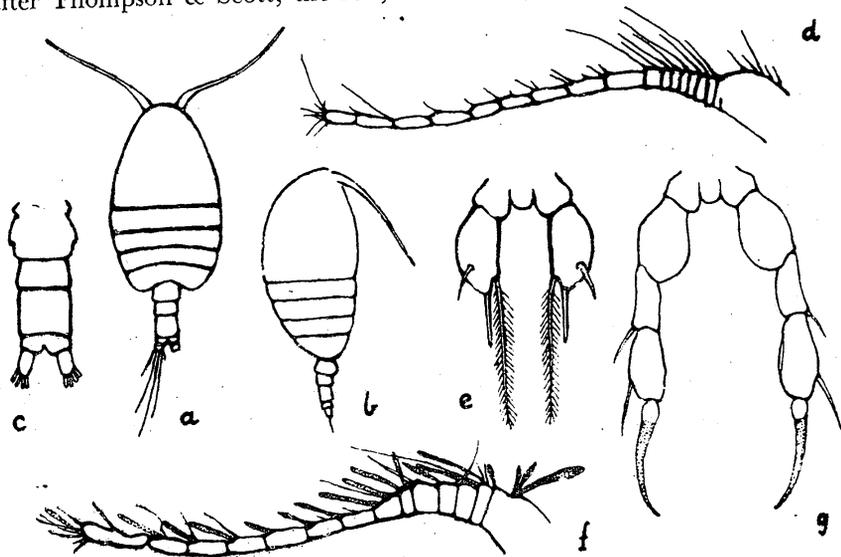


Fig. 39. *Lucicutia flavicornis* (Claus) (a) Female, dorsal view. (b) Female, 5th leg of one side. (c) Male, dorsal view. (d) Male, 5th pair of legs, posterior aspect. (after Giesbrecht).

Fig. 40. *Metacalanus auriilli* Cleve (a) Female, dorsal view. (b) Female, lateral view. (c) Female, urosome, dorsal view. (d) Female, 1st antenna. (e) Female, 5th pair of legs. (f) Male, Left antenna of 1st pair. Note aesthetascs and incipient geniculation of the two terminal segments. (g) Male, 5th pair of legs, posterior aspect. (c, e, g. after Thompson & Scott; the rest, after Cleve).



- 75 Females only : urosome 3-segmented; 1st antennae symmetrical 76  
 Males only : urosome 5-segmented, 1st antenna geniculate on the  
 right ..... 79
- 76 Anal segment and caudal rami asymmetrical; 5th legs long slender,  
 tipped with three teeth close together; length 1.94 mm.  
 ♀ *Candacia discaudata* A. Scott (Fig. 41 a to d)  
 Anal segment and caudal rami symmetrical ..... 77
- 77 Middle segment of urosome bears a curved pointed spine in median  
 ventral position; 5th legs slender, tipped with a single tooth; length  
 1.8 mm.  
 ♀ *Candacia bradyi* A. Scott (Fig. 42)  
 Middle segment of urosome without pointed ventral spine ..... 78
- 78 Genital segment bears long pointed processes on either side as figured;  
 these are not symmetrical; 5th legs bear three blunt teeth at the  
 tip; length 2.4 to 3.00 mm.  
 ♀ *Candacia pachydactyla* (Dana) (Fig. 44 a to d)  
 Genital segment bears a short flat process, one on either side symmetri-  
 cally placed; tip of each 5th leg bears several thin, sharp-pointed  
 teeth; length 2.6 mm.  
 ♀ *Candacia aethiopica* (Dana) (Fig. 44 e to h)

*Note*: In almost every instance when observed, *Candacia aethiopica* had an opaque black colour over the entire dorsal surface. It occurred in plankton from 18 km. off the coast at Kozhikode.

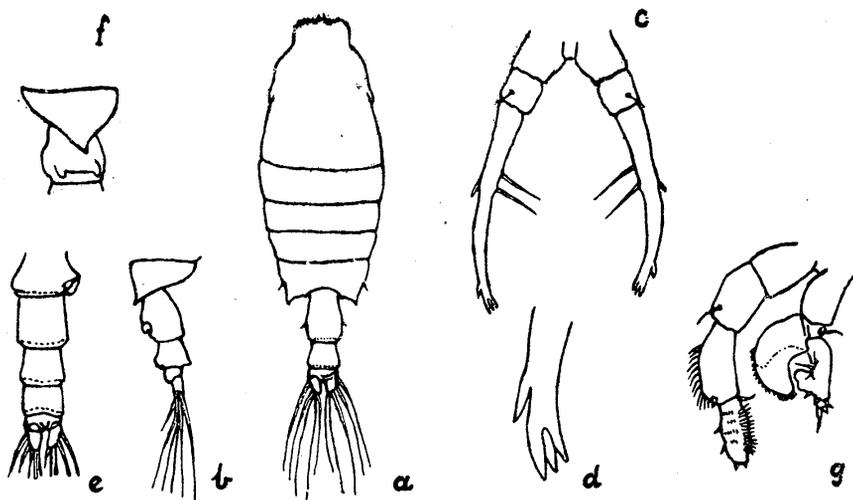


Fig. 41. *Candacia discaudata* A. Scott. (a) Female, dorsal view. (b) Female, part of metasome and urosome, lateral view. (c) Female, 5th pair of legs. (d) Female, tip of 5th leg. (e) Male, urosome, dorsal view. (f) Male, genital segment, view from the right. (g) Male, 5th pair of legs, posterior view. (after A. Scott).

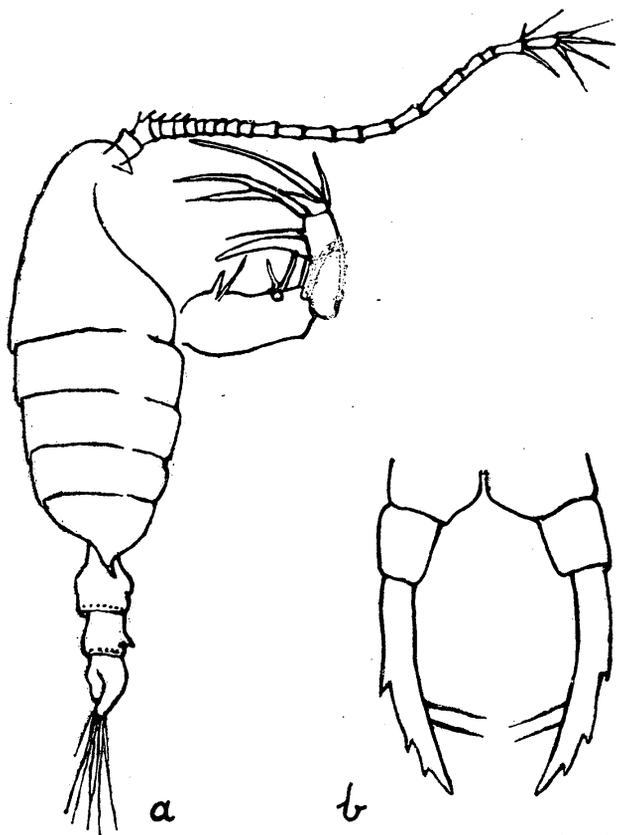
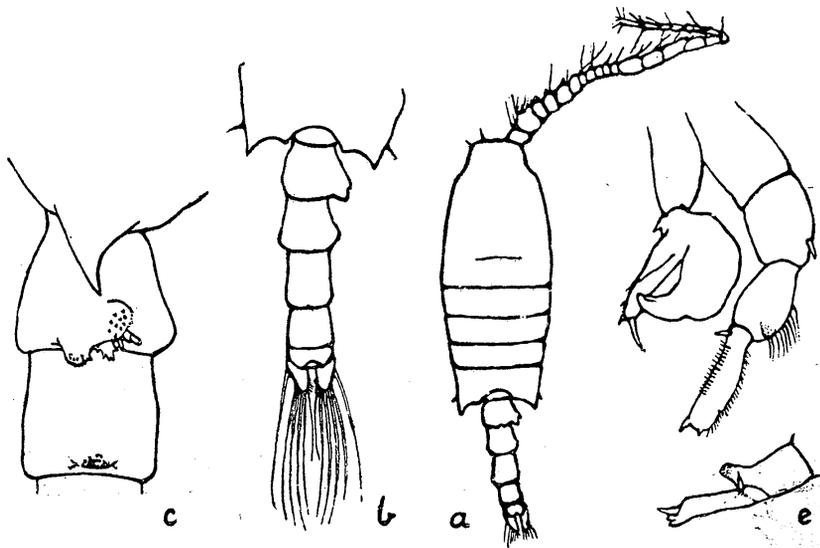


Fig. 42. *Candacia bradyi* A. Scott ♀ (a) View from the right. (b) 5th pair of legs. (after Sewell).

Fig. 43. *Candacia bradyi* A. Scott ♂ (= *C. tuberculata* Wolfenden). (a) Dorsal view. (b) Urosome, dorsal view. (c) Urosome, first two segments, view from the right. (d) 5th pair of legs, anterior aspect. (e) Left 5th leg, last two segments, edge view. (after Wolfenden)



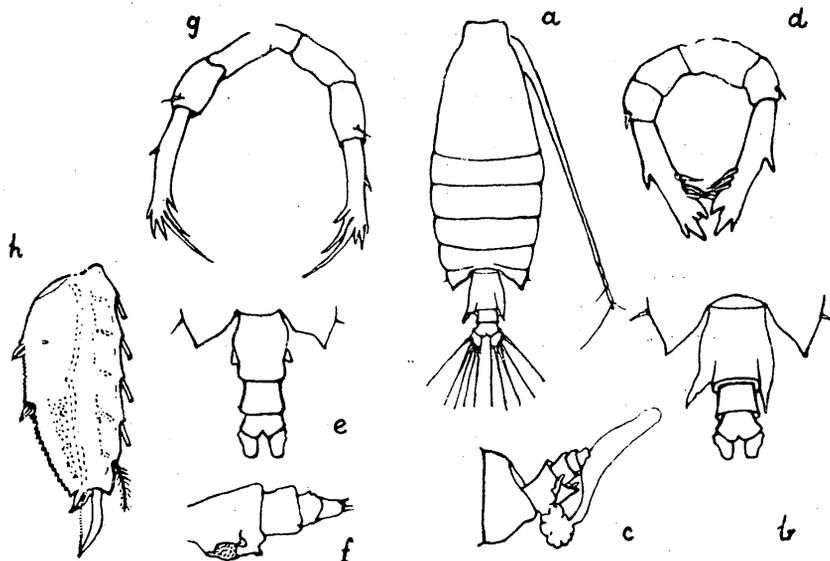


Fig. 44. *Candacia pachydactyla* (Dana) ♀ (a) Dorsal view. (b) Urosome, dorsal view. (c) Urosome, lateral view. Note spermatophore attached to ventral surface of genital segment. (d) 5th pair of legs. *Candacia aethiopica* (Dana) ♀ (e) Urosome, dorsal view. (f) Urosome, lateral view. (g) 5th pair of legs. (h) 3rd leg, terminal exopod segment; Note toothed margin. (after Colefax).

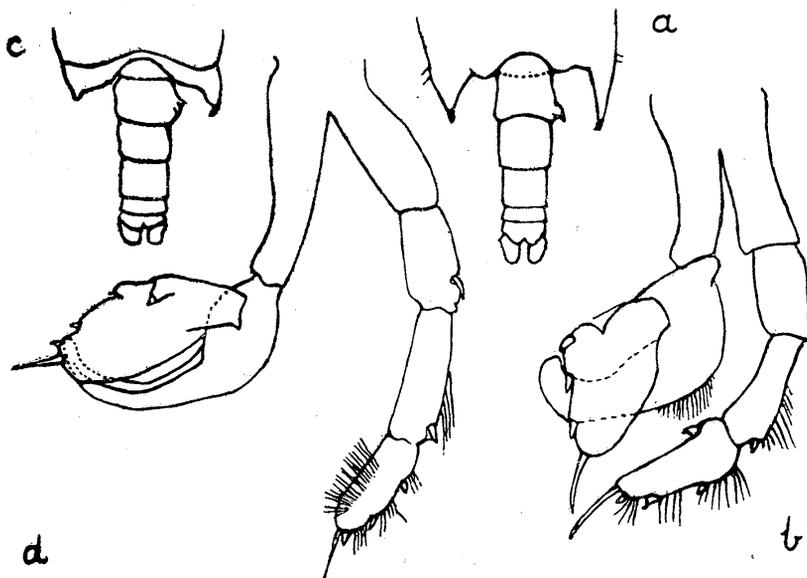


Fig. 45. *Candacia pachydactyla* (Dana) ♂ (a) Part of metasome and urosome, dorsal view. (b) 5th pair of legs, anterior aspect. *Candacia aethiopica* (Dana) ♂ (c) Part of metasome and urosome, dorsal view. (d) 5th pair of legs, anterior aspect. (a, c, d. after Colefax; b. after Wilson)

- 79 Metasome corners symmetrical.....80  
 Metasome corners asymmetrical, more produced on the right.....81
- 80 Anal segment and caudal rami asymmetrical though less so than in the female; details of 5th legs as figured; process on the right of the genital segment comparatively simple; length 1.8 mm.  
 ♂ *Candacia discadata* A. Scott (Fig. 41 e, f, g)
- Anal segment and caudal rami symmetrical; details of 5th legs as figured; process on the right of the genital segment more complicated as figured; a slight eminence present on the right side of the following segment also; length 1.9 mm.  
 ♂ *Candacia bradyi* A. Scott (Fig. 43)
- 81 Metasome corner of right side prolonged to reach beyond the genital segment; a bluntly pointed process present on the right of the genital segment; details of 5th legs as figured; length 2.3 to 2.6 mm.  
 ♂ *Candacia pachydactyla* (Dana) (Fig. 45 a, b)
- Metasome corner of right side is only a little longer than the left and does not reach beyond genital segment; a flat outgrowth present on the right of the genital segment; details of 5th legs as figured; length 2.4 mm.  
 ♂ *Candacia aethiopica* (Dana) (Fig. 45 c, d)
- 82 Body not usually pellucid; anterior lip not greatly enlarged; 5th legs not very slender or spine like; endopod of 2nd antenna 2-segmented with distal segment shorter than proximal .....83
- Body fusiform and usually highly pellucid; anterior lip large, prominent, three-lobed; 5th legs of females usually spiniform; endopod of 2nd antenna either of one short segment or two long segments, distal as long as proximal .....105
- 83 Cuticular eye-lenses not present ..... CALANOPIA 84  
 One pair of cuticular eye-lenses present dorsally on the cephalosome ..... LABIDOCERA 89
- 84 Females only: urosome 2-segmented; 1st antenna not geniculate; 5th legs 4-segmented.....85  
 Males only: urosome 5-segmented, 1st antenna geniculate on the right side; right 5th leg chelate, prehensile.....87
- 85 Left 5th leg longer than the right; length of body 1.9 mm.  
 ♀ *Calanopia elliptica* (Dana) (Fig. 46 a, b, c)
- Left 5th leg symmetrical with right 5th leg .....86
- 86 Terminal seta of 5th leg is very long and slender; tip of terminal segment bears 2 long pointed teeth outer to the seta; length 1.34 mm.  
 ♀ *Calanopia auriwilli* Cleve (Fig. 47 a, b, c)

Terminal seta of 5th leg is moderately long, stoutish, tip of terminal segment bears a single tooth, outer to the seta; length 1.4 mm.

♀ *Calanopia minor* A. Scott (Fig. 48 a, b, c)

87 Second urosome segment bears a small but distinct tooth-like projection on the posterior margin of the right side; details of 5th legs as figured; length 1.8 mm.

♂ *Calanopia elliptica* (Dana) (Fig. 46 d, e)

Second urosome segment bears no tooth-like projection.....88

88 Inner margin of second segment of left 5th leg is raised into an eminence tipped with a small flat plate; length 1.12 mm.

♂ *Calanopia aurivilli* Cleve (Fig. 47 d)

Inner margin of second segment of left 5th leg is raised into an eminence tipped with a small curved pointed tooth; length 1.2 mm.

♂ *Calanopia minor* A. Scott (Fig. 48 d, e)

89 Anterior margin of head with a median pointed hook curved to the ventral aspect; body size large, 2.8 to 3.4 mm.....90

Anterior margin of head without a hook, body size lesser, 2.1 mm. or less.....91

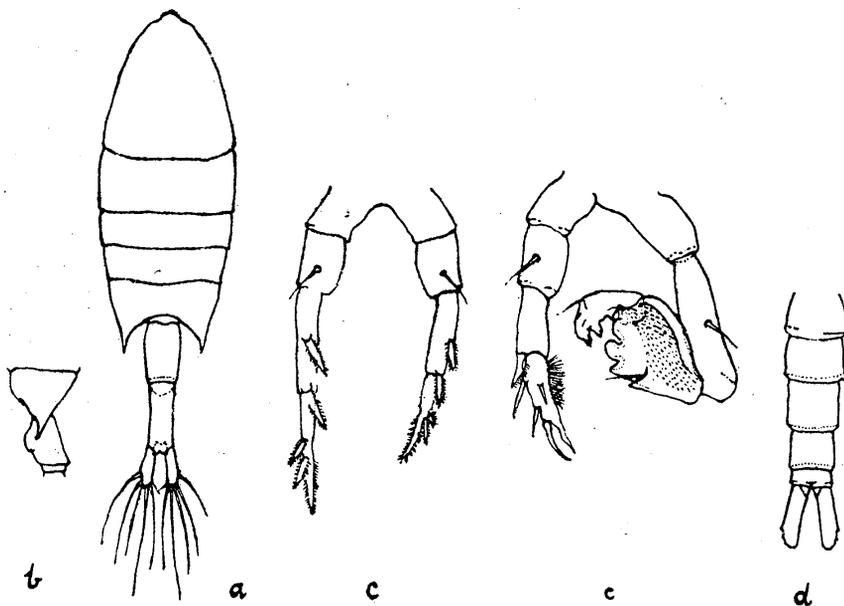


Fig. 46. *Calanopia elliptica* (Dana) (a) Female, dorsal view. (b) Female, part of metasome and genital segment, left aspect. (c) Female, 5th pair of legs, posterior aspect. (d) Male, urosome, dorsal view. (e) Male, 5th pair of legs, posterior aspect. (after A. Scott)

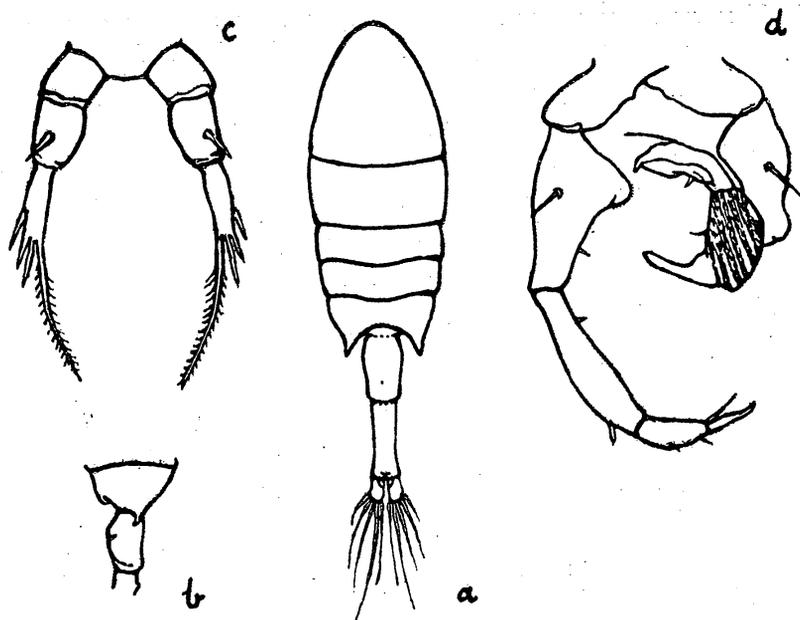


Fig. 47. *Calanopia aurivilli* Cleve (a) Female, dorsal view. (b) Female, part of metasome and genital segment, lateral view. (c) Female, 5th pair of legs. (d) Male, 5th pair of legs, posterior aspect. (after A. Scott.)

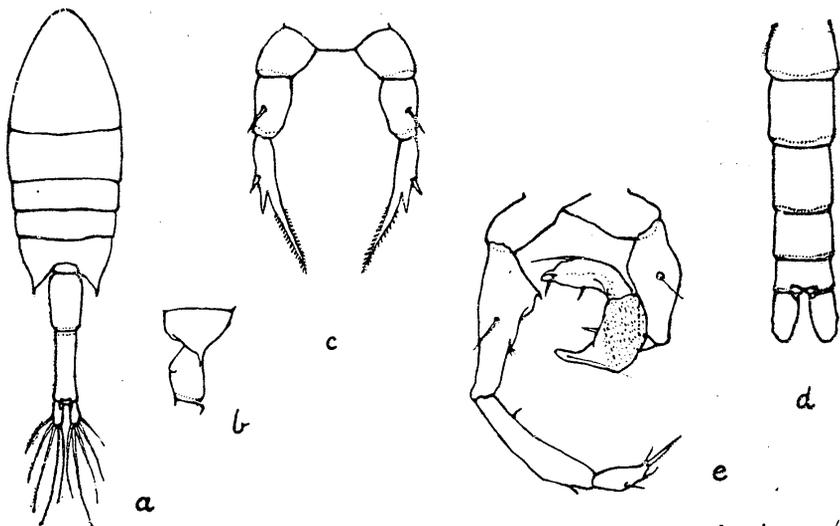


Fig. 48. *Calanopia minor* A. Scott (a) Female, dorsal view. (b) Female, part of metasome and genital segment, lateral view. (c) Female, 5th pair of legs. (d) Male, urosome, dorsal view. (e) Male, 5th pair of legs, posterior aspect (after A. Scott)

90 Urosome 3-segmented; 1st antennae symmetrical; corners of metasome symmetrical; eye-lenses not so large as in the male; 5th legs as figured; length 3.00 to 3.40 mm.

♀ *Labidocera acuta* (Dana) (Fig. 49)

Urosome 5-segmented, 1st antenna geniculate on the right side; corners of metasome unlike on the two sides as figured; eye-lenses larger than in the female; 5th legs as figured; length 2.8 to 3.3 mm.

♂ *Labidocera acuta* (Dana) (Fig. 49)

91 Females only: urosome 3-segmented; 1st antennae symmetrical... 92  
 Males only: urosome 5-segmented, 1st antenna geniculate on the right side... 93

92 Corners of metasome drawn out into down curved points that are clearly perceived in lateral view; details of urosome and 5th legs as figured; length 2.1 mm.

♀ *Labidocera pectinata* Thompson & Scott (Fig. 50)

Posterior margin of metasome rounded, with a very small projection present on the right side only, not visible in dorsal view; details of urosome and 5th legs as figured; length 2.1 mm.

♀ *Labidocera minuta* Giesbrecht (Fig. 52 a to d)

Corners of metasome ending in points but not drawn out; urosome condensed, very short, with a peg-like projection on the right side; 5th legs as figured; length 1.9 mm.

♀ *Labidocera pavo* Giesbrecht (Fig. 53 a, b)

Note— *L. pectinata* is the commonest *Labidocera* in coastal plankton.

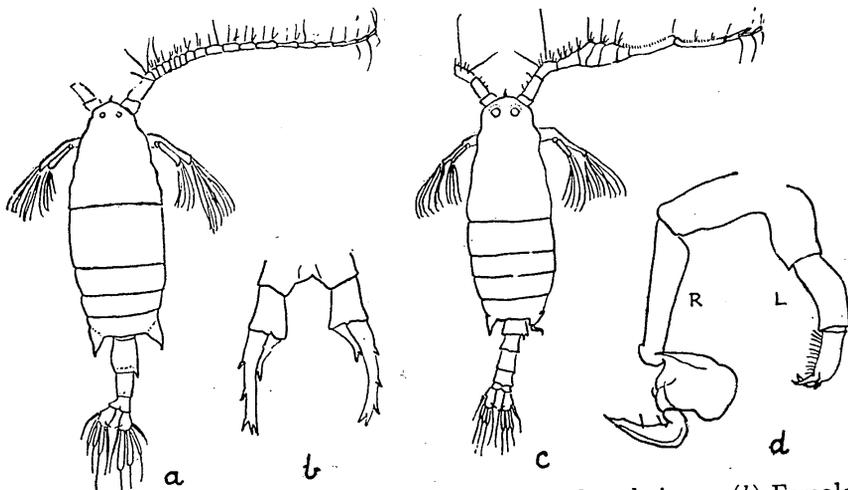


Fig. 49. *Labidocera acuta* (Dana) (a) Female, dorsal view. (b) Female, 5th pair of legs. (c) Male, dorsal view. (d) Male, 5th pair of legs, anterior aspect. (original)

93 Corners of metasome drawn out into prominent spines, the spine on the right side bifid; genital segment and 5th legs as figured; length 1.7 mm.

♂ *Labidocera pectinata* Thompson & Scott (Fig. 51)

Corners of metasome drawn out into spines, the spine on the right longer and somewhat spatulate; details of urosome and 5th legs as figured; length 1.54 to 1.75 mm.

♂ *Labidocera minuta* Giesbrecht (Fig. 52 e, f)

Corners of metasome ending in points but not drawn out, details of 5th legs as figured; length 1.9 mm

♂ *Labidocera pavo* Giesbrecht (Fig. 53 c,d)

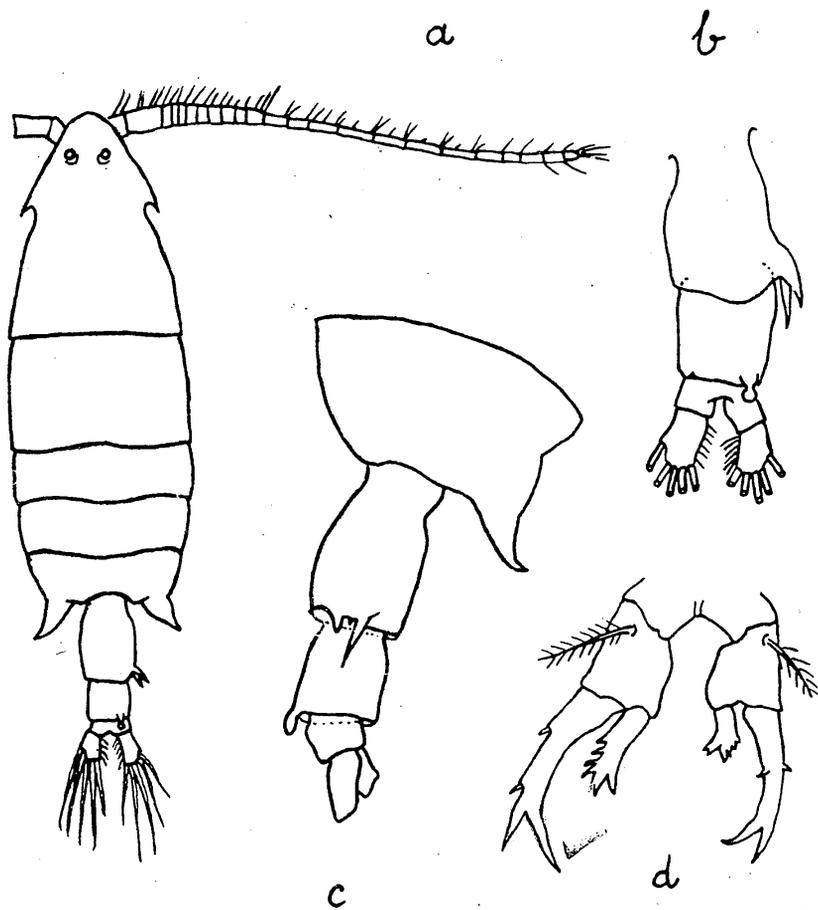


Fig. 50. *Labidocera pectinata* Thompson and Scott ♀ (a) Dorsal view. (b) Urosome, dorsal view. (c) Part of metasome and urosome, view from the right. (d) 5th pair of legs, posterior aspect (a, d. after Thompson & Scott; b, c. original)

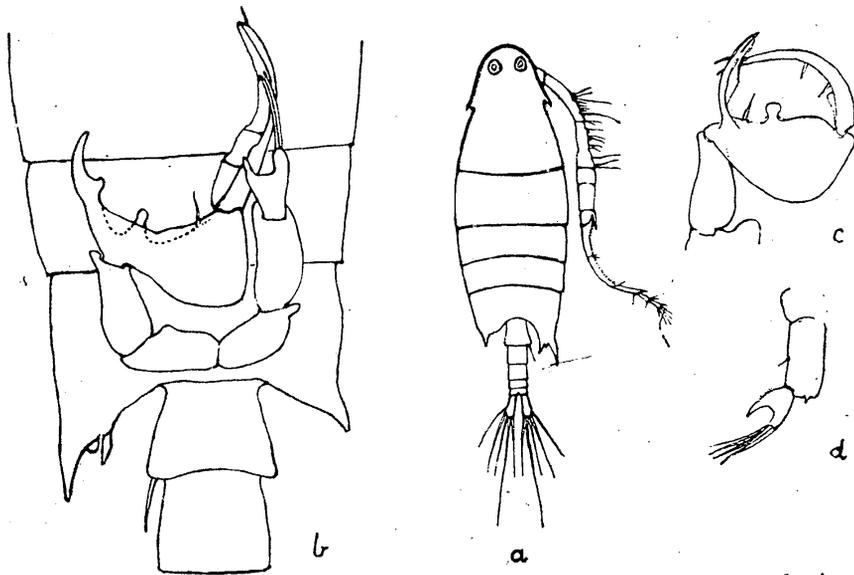


Fig. 51. *Labidocera pectinata* Thompson and Scott ♂ (a) Dorsal view. (b) Ventral view to show 5th pair of legs in position, metasome corners and spine on the genital segment. (c) Right 5th leg, chela. (d) Left 5th leg. (a, c, d. after Sewell; b. original)

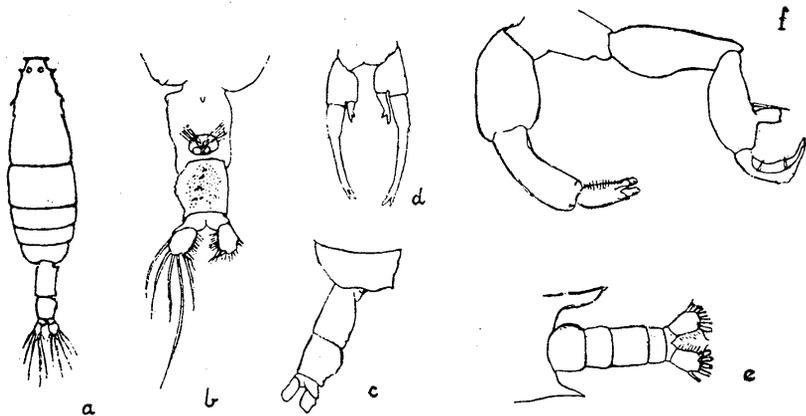


Fig. 52. *Labidocera minuta* Giesbrecht (a) Female, dorsal view. (b) Female, part of metasome and urosome, ventral view. (c) Female, part of metasome and urosome, dorsolateral view. (d) Female, 5th pair of legs. (e) Male, part of metasome and urosome dorsal view. (f) Male, 5th pair of legs, posterior aspect. (a, c, f. after Colefax; b, d, e. after Wolfenden)

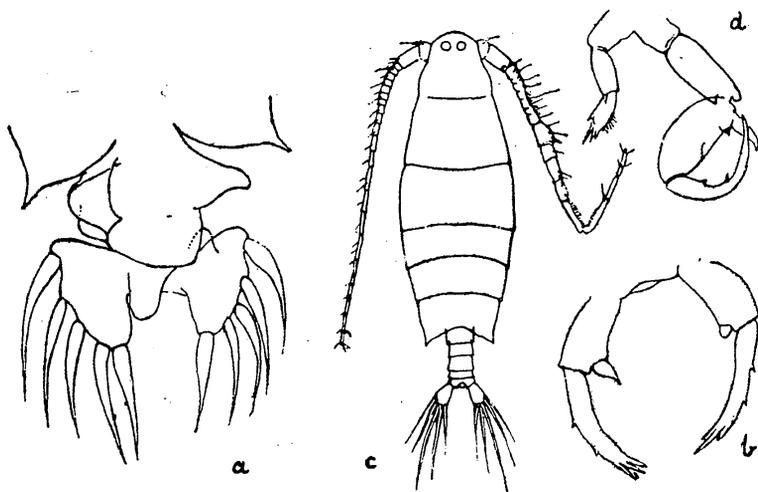


Fig. 53. *Labidocera pavo* Giesbrecht (a) Female, dorsal view of metasome corners and urosome. (b) Female, 5th pair of legs. (c) Male, dorsal view. (d) Male, 5th pair of legs. (after Sewell)

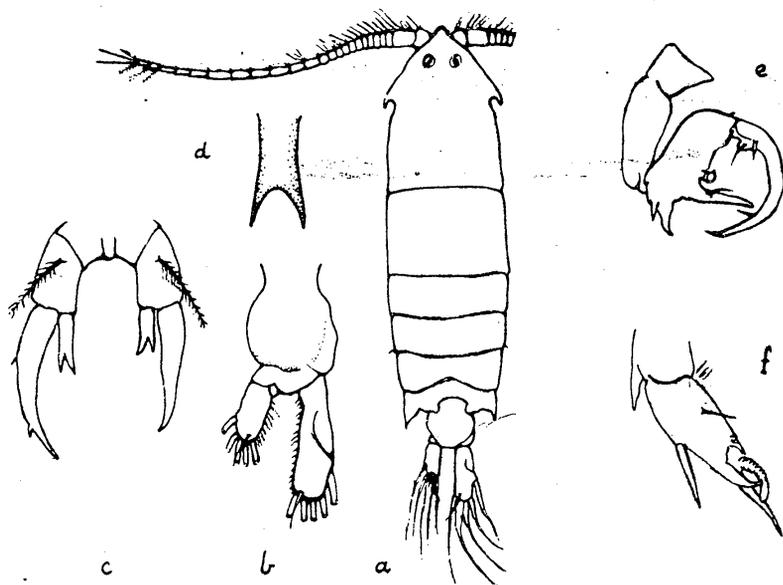


Fig. 54. *Pontella danae* Giesbrecht. (a) Female, dorsal view, *variety ceylonica*. (b) Female, urosome, dorsal view, *variety ceylonica*. (c) Female, 5th pair of legs, *variety ceylonica*. (d) Female, rostrum, *variety ceylonica*. (e) Male, right 5th leg. (f) Male, terminal segments of left 5th leg. (a, b, c, d. after Thompson and Scott; e, f. after Giesbrecht)

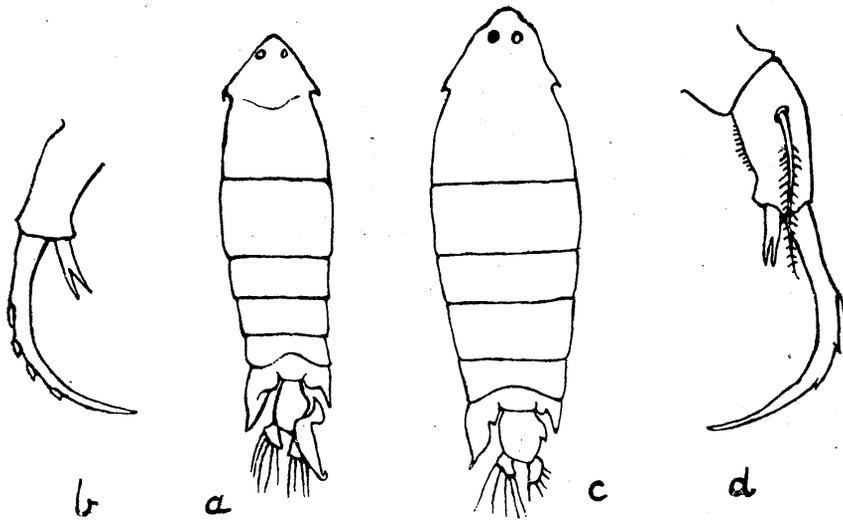


Fig. 55. *Pontella securifer* Brady ♀ (a) Dorsal view. (b) 5th leg of one side. *Pontella spinipes* Giesbrecht ♀ (c) Dorsal view. (d) 5th leg of one side. (after Wilson)

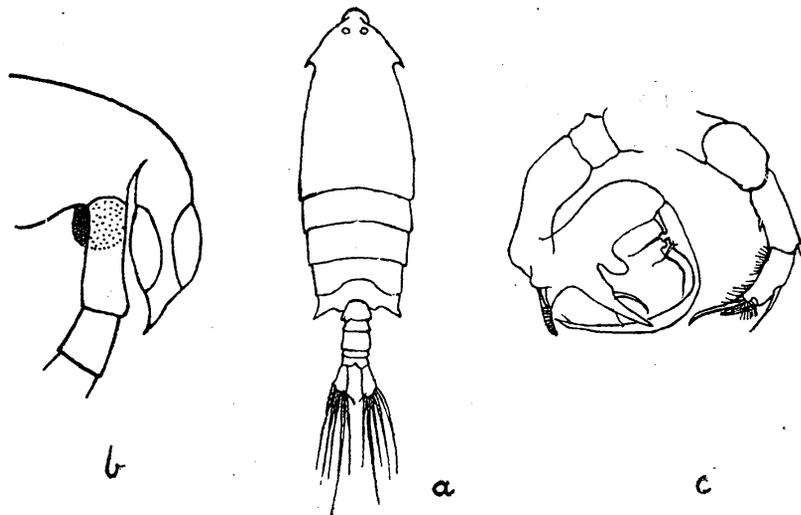


Fig. 56. *Pontella securifer* Brady ♂ (a) Dorsal view. (b) Rostrum, lateral view to show ventral eye and rostral lens. (c) 5th pair of legs, anterior aspect. (a, c. after Colefax; b. original)

94 Both the caudal rami distinctly separated from the anal segment....95

Left caudal ramus distinctly separated from the anal segment but the right caudal ramus more or less fused with it .....103

95 One pair of dorsal eye-lenses are present, larger in the males, rostral lens also usually present; rostral rami comparatively short, lateral margins of the head with a hook on each side ....PONTELLA 96

Dorsal and rostral eye-lenses quite absent; rostral rami comparatively long and slender; head without lateral hooks .....  
.....PONTELLOPSIS 100

96 Females only: urosome 2-segmented, genital segment with various outgrowths and excrescences concealing the urosome segments in dorsal view; urosome and caudal rami more or less asymmetrical; 1st antennae alike on the two sides .....97

Males only: urosome 5-segmented, the segments clearly visible in dorsal view; urosome and caudal rami little or not at all asymmetrical; 1st antenna geniculate on the right side .....99

97 Corners of metasome only a little asymmetrical, the left one being a little longer; right caudal ramus distinctly larger and bearing a vertical crest-like extension visible in lateral view; left 5th leg longer with 2 outer spines on exopodite, one of which is distinct; length 3.4 mm.

♀ *Pontella danae* Giesbrecht, variety *ceylonica*, Thompson & Scott (Fig. 54 a to d)

Corners of metasome strongly asymmetrical, the left lobe reaching the middle of the left caudal ramus; right caudal ramus larger; 5th legs not unequal in length.....98

98 Genital segment with two or three finger-like outgrowths on the dorsal surface; exopods of 5th legs strongly curved, with 4 outer spinules; length 4.4 mm.

♀ *Pontella securifer* Brady (Fig. 55a, b)

Genital segment with transverse corrugations on the dorsal surface; right caudal ramus larger but its setae much shorter as compared to left side; exopods of 5th legs strongly curved, with 3 outer spinules; length 4.5 mm

♀ *Pontella spinipes* Giesbrecht (Fig. 55c, d)

99 In the chela of the right 5th leg, the terminal claw bears on its inner margin, about half way along its length, three rounded processes; the "hand" bears three short more or less triangular processes;

the "thumb" is long, smooth and simple; it has no corrugated appendage; body length 3.2 to 4.4 mm.

♂ *Pontella spinipes* Giesbrecht (Fig. 57)

In the chela of the right 5th leg, the terminal claw bears no rounded processes near the middle of its length; but only two setae, proximally placed; the "hand" bears one, long, pointed process and one very short rounded process; the "thumb" is short; it has a corrugated appendage; body length 4.3 mm.

♂ *Pontella securifer* Brady (Fig. 56)

Details of the 5th legs as figured, terminal claw and "hand" of the right 5th leg very similar to *P. securifer* but the thumb has no corrugated process; tip of left 5th leg as figured; body length 3.1 mm.

♂ *Pontella danae* Giesbrecht (Fig. 54 e, f)

100 Females only: urosome 2-segmented, 1st antennae symmetrical... 101

Males only: urosome 5-segmented; 1st antenna geniculate on the right side..... 102

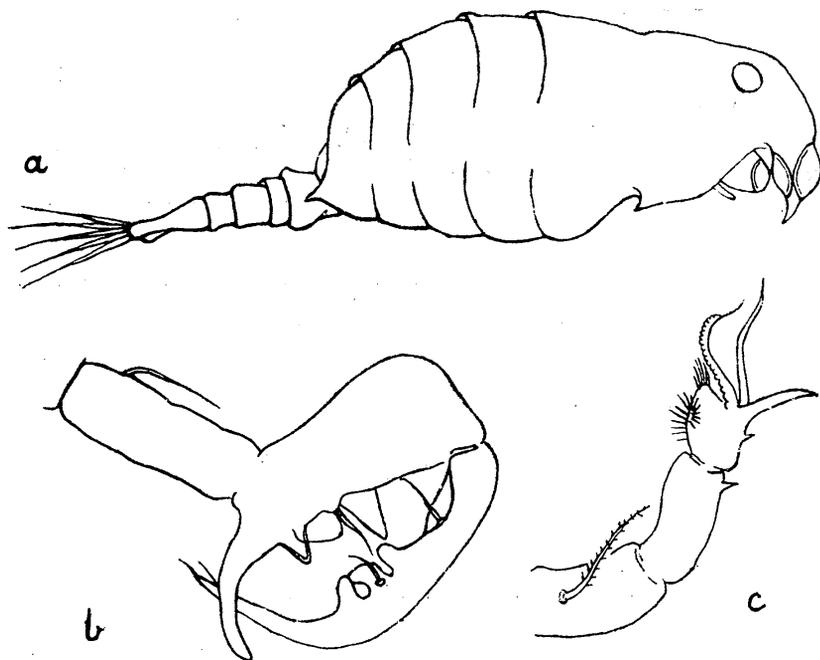


Fig. 57. *Pontella spinipes* Giesbrecht ♂ (a) View from the right. (b) Chela of right 5th leg. (c) Left 5th leg. (after Sewell)

101 Metasome corners symmetrical; genital segment with outgrowths as figured, the spine on the right posterior corner being the largest, caudal rami quite symmetrical; length 1.90 mm; the male undescribed yet.

♀ *Pontellopsis herdmani* Thompson & Scott (Fig. 58)

Metasome corners symmetrical; genital segment with a different arrangement of outgrowths as figured, the left posterior spine being the largest, caudal rami slightly asymmetrical; length 1.7 to 1.97 mm

♀ *Pontellopsis macronyx* A. Scott (Fig. 59 a, b)

Metasome corners asymmetrical, the left corner bearing a longer projection; genital segment with two long spinous projections on the right margin as figured, right caudal ramus slightly more posterior in position than the left, length 1.6 to 1.9 mm.

♀ *Pontellopsis scotti* Sewell (Fig. 60 a, b)

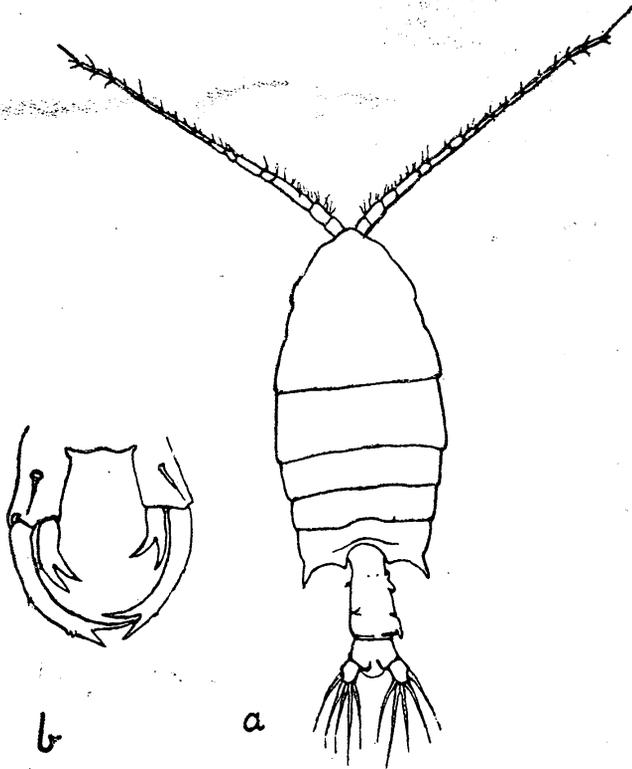


Fig. 58. *Pontellopsis herdmani* Thompson & Scott. ♀ (a) Dorsal view (b) 5th pair of legs. (after Sewell).

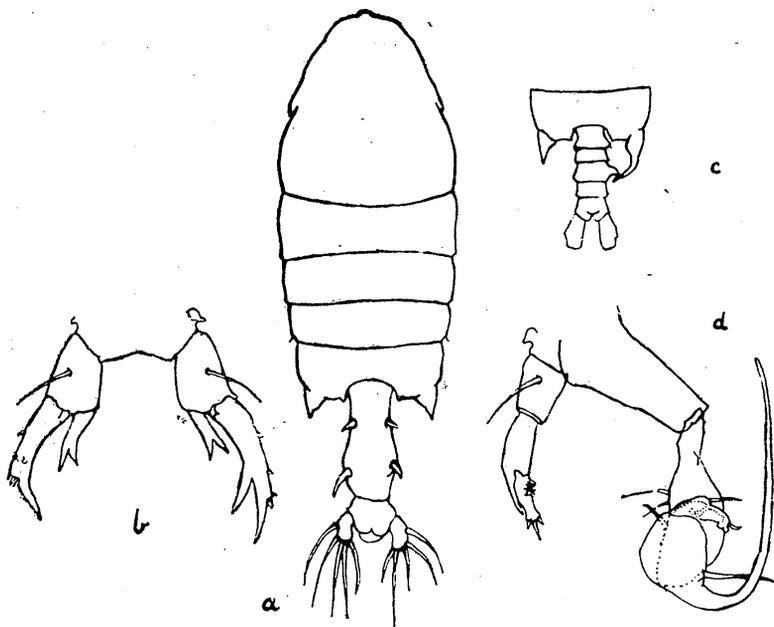


Fig. 59. *Pontellopsis macronyx* A. Scott (a) Female, dorsal view. (b) Female, 5th pair of legs. (c) Male, urosome and a part of metasome, dorsal view. (d) Male, 5th pair of legs, posterior face. (after A. Scott)

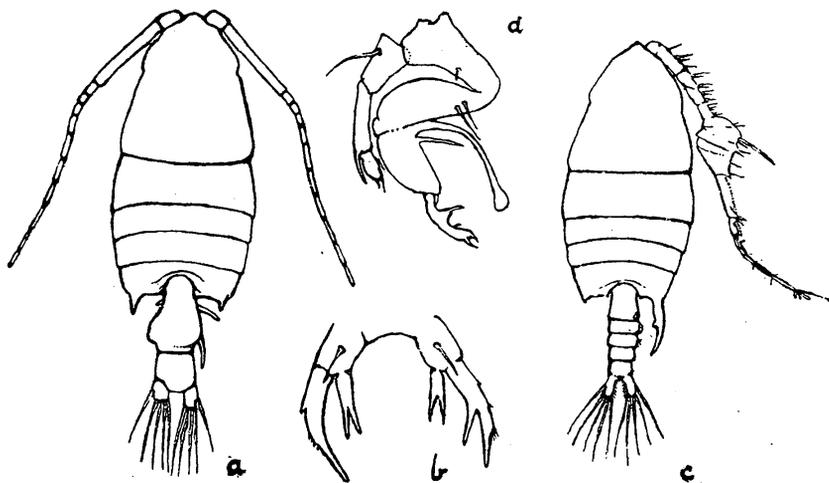


Fig. 60. *Pontellopsis scotti* Sewell. (a) Female, dorsal view. (b) Female, 5th pair of legs. (c) Male, dorsal view. (d) Male, 5th pair of legs. (after Sewell).

102 Right metasomal spine dilated at base and curved inwards as figured; 3rd urosome segment with a peg-like projection on the right margin; in the chela of the right 5th leg, the fixed claw is very long, straight and pointed; length 1.67 mm.

♂ *Pontellopsis macronyx* A. Scott (Fig. 59 c, d)

Right metasomal spine slightly curved, shaped as in the figure; 2nd and 3rd urosome segments each with a group of minute teeth on the right margin; fixed claw of the chela curved, its tip spatulate; length 1.42 mm.

♂ *Pontellopsis scotti* Sewell (Fig. 60 c, d)

103 Body short and robust; no dorsal eye-lenses; plumose setae of 2nd antennae and mandibular palps are very long and conspicuous  
 .....PONTELLINA 104

104 Urosome 2-segmented; 1st antennae alike on two sides; 5th legs as figured; length 1.6 to 1.9 mm.

♀ *Pontellina plumata* (Dana) (Fig. 61 a, b)

Urosome 5-segmented; 1st antenna geniculated on the right side; 5th legs as figured; length 1.5 to 1.65 mm.

♂ *Pontellina plumata* (Dana) (Fig. 61 c)

Note— *Pontellina plumata* occurred frequently in the plankton from 18 km. off the coast at Kozhikode. It is easily recognized by the large setae borne on the 2nd antennae and mandibular palps which are used in swimming. The movements of *Pontellina* recall the flapping movements of the wings of a bird in flight.

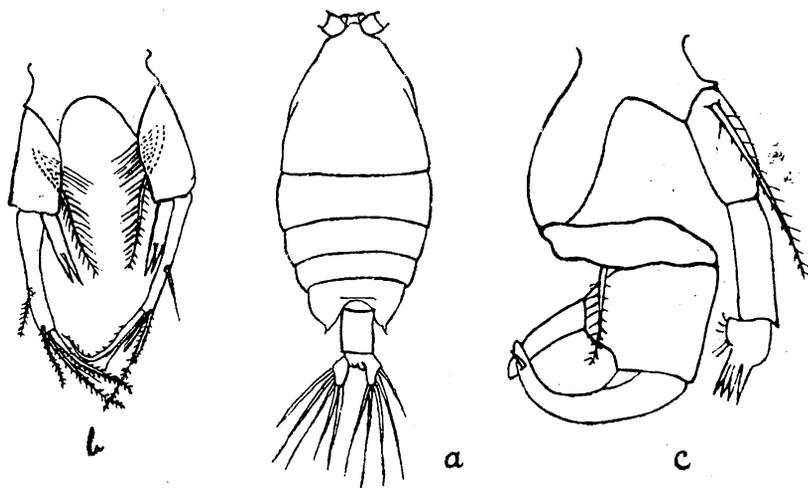


Fig. 61. *Pontellina plumata* (Dana). (a) Female, dorsal view. (b) Female, 5th pair of legs. (c) Male, 5th pair of legs. (a, b. after Colefax, c. after Wilson).

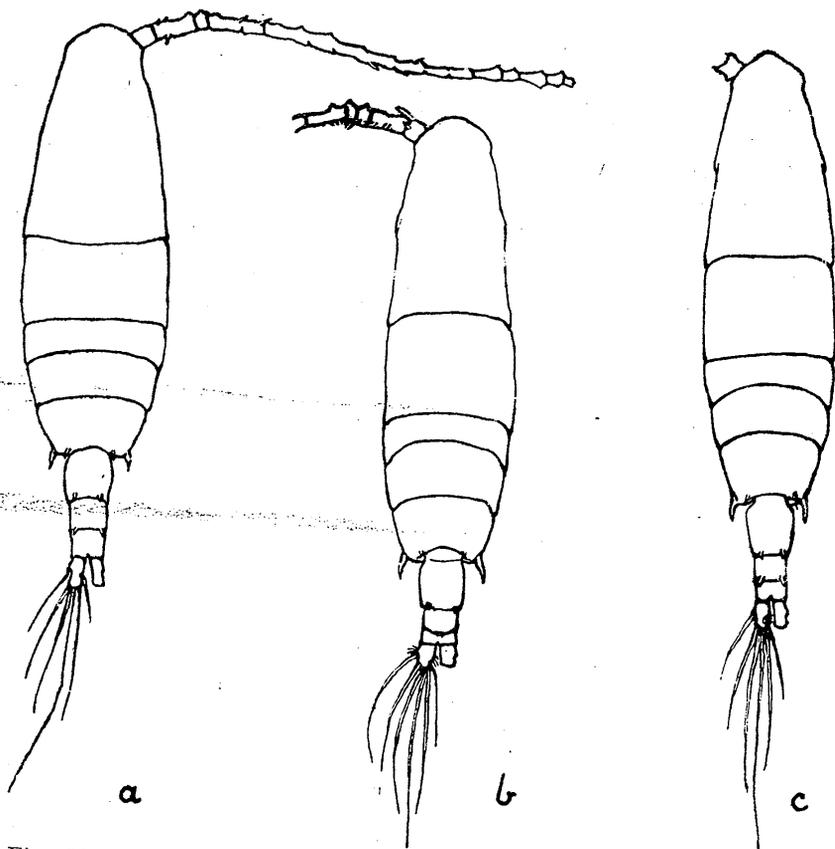
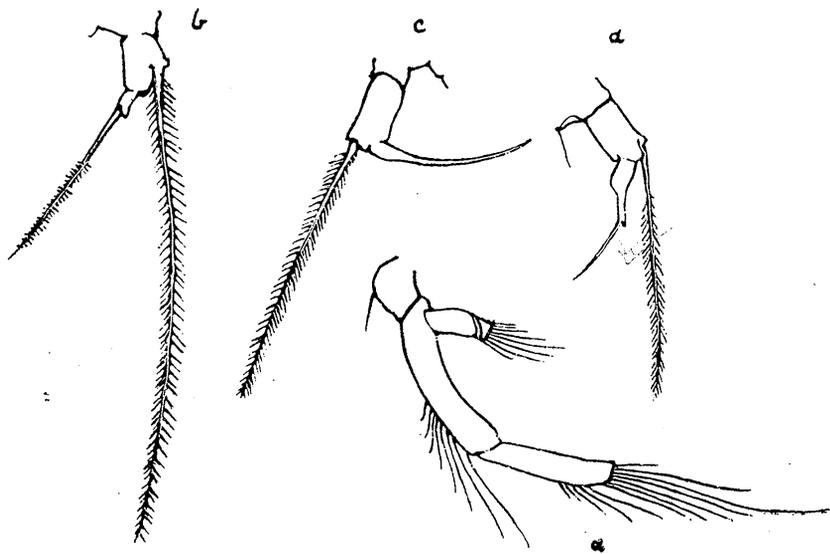


Fig. 62. (a) *Acartia spinicauda* Giesbrecht ♀ Dorsal view. (b) *Acartia erythraea* Giesbrecht ♀ Dorsal view. (c) *Acartia centrura* Giesbrecht ♀ Dorsal view. (after Giesbrecht).

Fig. 63. (a) *Acartia spinicauda* Giesbrecht ♀ 2nd antenna. (b) *Acartia spinicauda* Giesbrecht ♀ 5th leg. (c) *Acartia erythraea* Giesbrecht ♀ 5th leg. (d) *Acartia centrura* Giesbrecht ♀ 5th leg. (a. original; b, c, d. after Giesbrecht)



- 105 Second antenna with two-jointed endopod in which the distal segment is as long as the proximal (Fig. 63 b), 5th legs of the female always uniramous, slender and spine-like.....ACARTIA 106
- Second antenna with a short one-jointed endopod that is fused to the basal segment, and a one-jointed exopod (Fig. 69 b); 5th legs of the female biramous, spine-like.....ACARTIELLA 116
- 106 Posterior margin of metasome drawn out into spines ..... 107
- Posterior margin of metasome without large spines .....114
- 107 Two prominent metasomal spines present and in addition two smaller spines present, situated more dorsally and nearer the middle line .....108
- Two prominent metasomal spines present but no additional spines..113
- 108 Females only: urosome 3-segmented; 1st antennae alike on two sides .....109
- Males only: urosome 5-segmented, 4th segment very short, second segment the largest, 1st segment with lateral genital aperture, 1st antenna of the right side is geniculate but very indistinctly.....111
- 109 The 2nd urosome segment bears two small inconspicuous spines placed close together; terminal claw of 5th leg thickened a little at the base, slightly curved, smooth, and without any notch; length 1.0 to 1.4 mm.
- ♀ *Acartia erythraea* Giesbrecht (Fig. 62b, 63c)
- The 2nd urosome segment bears two spines that are comparable in size and position to the spines on the first urosome segment.....110
- 110 The spines of the metasome corners are as large as in *A. erythraea*; terminal claw of 5th leg swollen at the base, smooth, straight and with a distinct notch as figured; length 1.20 to 1.24 mm.
- ♀ *Acartia centrura* Giesbrecht (Fig. 62c, 63d)
- The spines of the metasome corners are smaller than in *A. erythraea* and *A. centrura*; terminal claw of 5th leg scarcely widened at base, straight, without notch and with serrations on distal half as figured; length 1.0 to 1.3 mm.
- ♀ *Acartia spinicauda* Giesbrecht (Fig. 62a, 63b)
- Note— Great care is required to distinguish from one another the above three species of *Acartia*. While *A. centrura* appears to be less frequent than the other two, *A. erythraea* is the most abundant at Madras, and *A. spinicauda* is at least as common as *A. erythraea* at Kozhikode and Cochin.

111 Second urosome segment wider than long, with two pairs of prominent spines, inner pair as large as the outer; details of 5th legs as figured, length 1.0 to 1.3 mm.

♂ *Acartia erythraea* Giesbrecht (Fig. 64b, 65b)  
 Second urosome segment almost as wide as long.....112

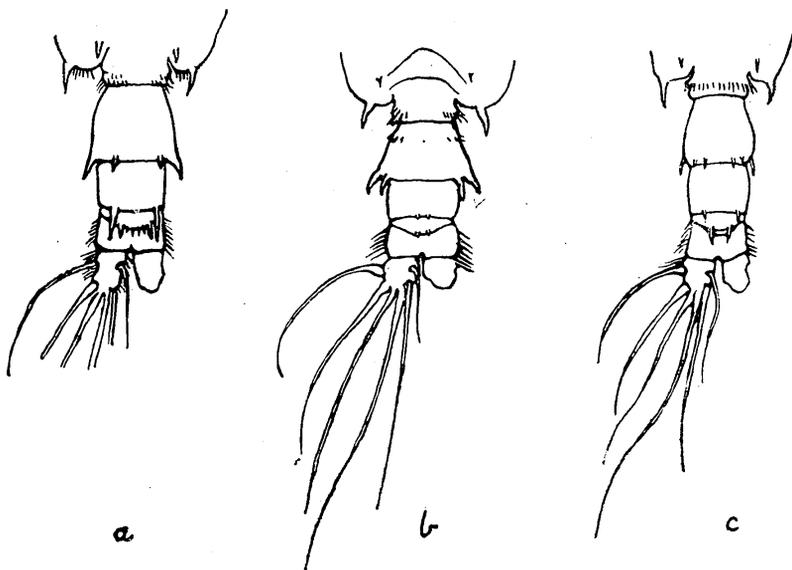


Fig. 64. (a) *Acartia spinicauda* Giesbrecht, ♂ Urosome, dorsal view. (b) *Acartia erythraea* Giesbrecht ♂ Urosome, dorsal view. (c) *Acartia centrura* Giesbrecht ♂ Urosome, dorsal view. (after Giesbrecht).

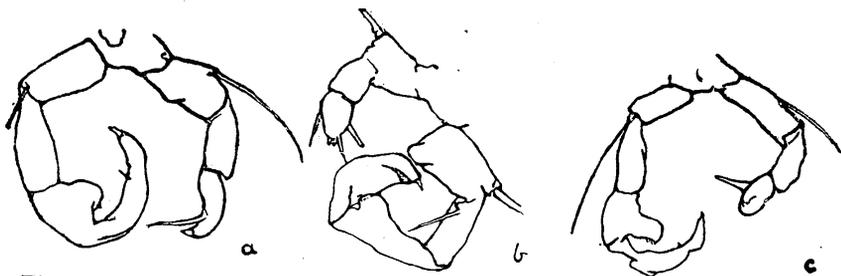


Fig. 65. (a) *Acartia spinicauda* Giesbrecht ♂, 5th pair of legs, anterior view. (b) *Acartia erythraea* Giesbrecht ♂, 5th pair of legs, posterior view (c) *Acartia centrura* Giesbrecht ♂, 5th pair of legs, anterior view. (after Giesbrecht).

112 Second urosome segment with two pairs of spines, inner pair smaller than outer; spines on third urosome segment are long and overreach the very short 4th segment as figured; details of 5th legs as figured; length 1.0 to 1.2 mm.

♂ *Acartia spinicauda* Giesbrecht (Fig. 64a, 65a)

Second urosome segment with three pairs of spines, the two inner pairs quite small, the outer pair a little longer; spines on third urosome segment do not fully overreach the 4th segment; details of 5th legs as figured; length 1.02 mm.

♂ *Acartia centrura* Giesbrecht (Fig. 64c, 65c)

113 The 5th legs of the female as figured, straight, with a crowd of small teeth near the tip; male underscribed; length 1.0 to 1.2 mm.

♀ *Acartia danae* Giesbrecht (Fig. 66)

114 Metasome of female with very minute spinules only; 5th leg as figured, with a crowd of small teeth near the tip as in *A. danae*; marine in habit; length 0.8 to 1.1 mm; male undescribed.

♀ *Acartia negligens* Dana (Fig. 67)

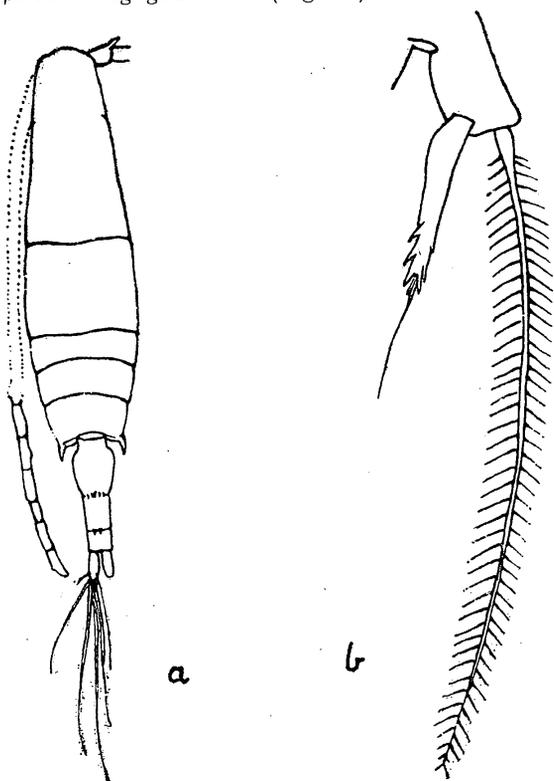


Fig. 66. *Acartia danae* Giesbrecht ♀ (a) Dorsal view. (b) 5th leg of one side. (after Giesbrecht).

Metasome, posterior margin smooth or with minute spinules only; habitat estuarine and brackish water; both sexes known.....115

115 Dorsal view of female and details of 5th legs as figured; female 5th legs, smooth, slightly curved and without notch, as in *A. erythraea*; length of ♀ 0.73 to 0.80 mm; of ♂ 0.70 to 0.75 mm.:

♀ ♂ *Acartia southwelli* Sewell (Fig. 68, a,b,c)

Dorsal view of female, of male urosome and details of 5th legs as figured; female 5th legs straight, with a notch as in *A. centrura* but set with short hairs on both margins; length 1.0 to 1.1 mm in both sexes

♀ ♂ *Acartia chilkaensis* Sewell (Fig. 68 d to h)

116 Urosome 3-segmented, anal segment very short; right caudal ramus a little longer than the left; details of 5th legs as figured; length 1.38 to 1.57 mm.

♀ *Acartiella sewelli* Steuer (Fig. 69a,b,c)

Urosome 4-segmented; right caudal ramus longer than the left, this inequality being more pronounced than in the female; details of the 5th legs as figured, right leg longer and with a short process arising from its basal segment; length 1.27 to 1.51 mm.

♂ *Acartiella sewelli* Steuer (Fig. 69d, e)

Note :- These three species were observed in Cochin harbour waters in monsoon months. When the salinity is at its lowest and zooplankton elements are almost entirely absent, *A. sewelli* is seen to occur as the sole zooplankton element and is therefore noteworthy. Its occurrence in Indian coastal areas appears to be a new record, since it was described from Burma.

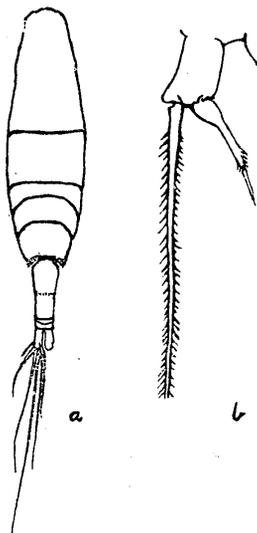


Fig. 67. *Acartia negligens* Dana ♀ (a) Dorsal view. (b) 5th leg of one side (only one half of seta is shown). (after Giesbrecht).

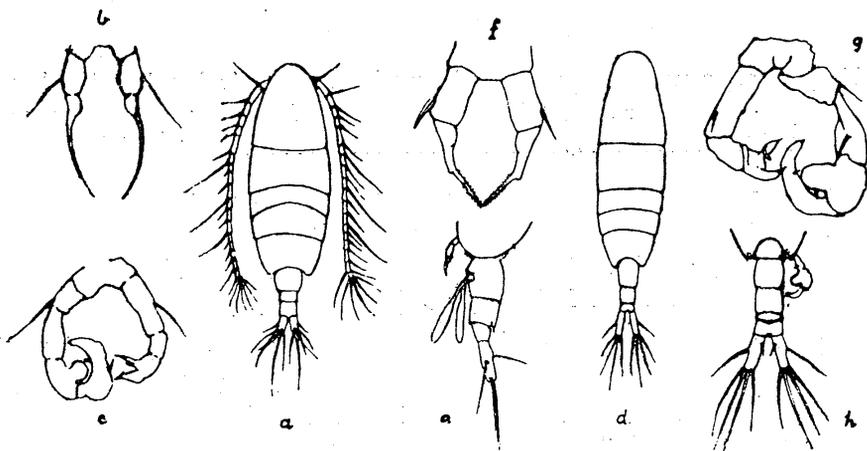


Fig. 68. *Acartia southwelli* Sewell. (a) Female, dorsal view. (b) Female, 5th pair of legs. (c) Male, 5th pair of legs, anterior face. *Acartia chilkaensis* Sewell (d) Female, dorsal view. (e) Female, urosome, lateral view. (f) Female, 5th pair of legs. (g) Male, 5th pair of legs, posterior face. (h) Male, urosome and a part of metasome, dorsal view. (a, b, c. after Sewell; d. to h. after Steuer).

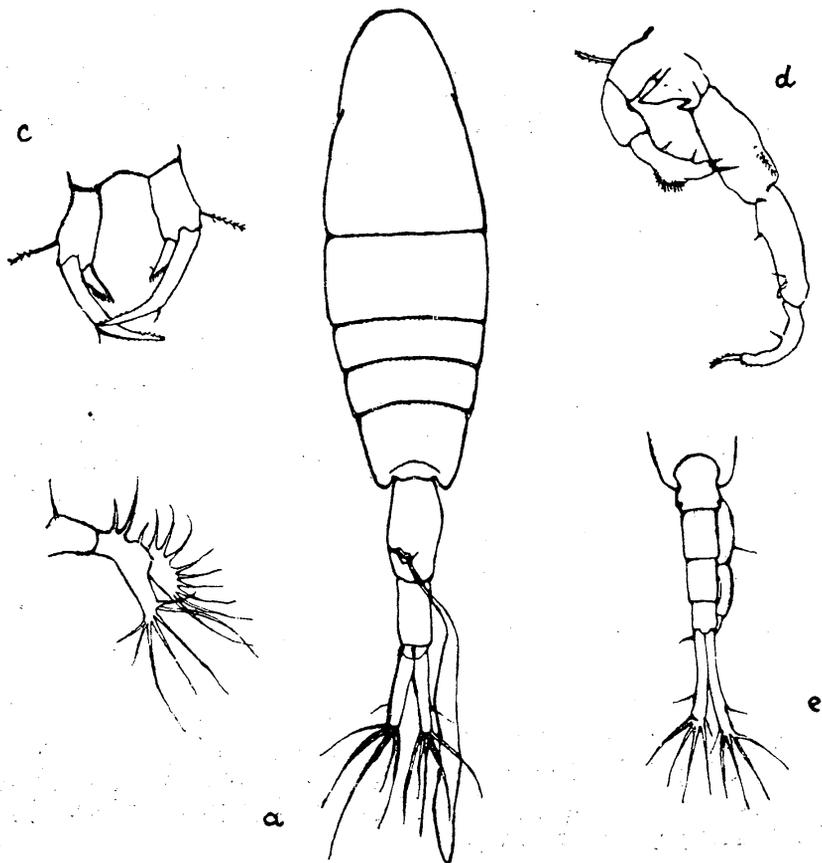


Fig. 69. *Acartiella sewelli* Steuer (a) Female, dorsal view. (b) Female, 2nd antenna. (c) Female, 5th pair of legs. (d) Male, 5th pair of legs, posterior face. (e) Male, urosome, dorsal view. (after Steuer).

117 Anal segment and caudal rami usually asymmetrical, this being less pronounced or absent in the males; anal segment with a peculiar twist.....TORTANUS 118

118 Fifth legs of female asymmetrical, left leg longer, with a group of teeth on inner border of terminal segment; dorsal view of female as figured, length 1.36 to 1.43 mm., male undescribed.

♀ *Tortanus barbatus* (Brady) (Fig. 70 a, b)

Fifth legs of female symmetrical or nearly so; details of male 5th legs as figured; dorsal view of female very similar to *T. barbatus*; length of male 1.5 mm., of female 1.6 to 1.8 mm.

♀ ♂ *Tortanus gracilis* (Brady) (Fig. 70 c, d)

119 No eye-lenses present on the head... 120  
One pair of eye-lenses present on the head... 125

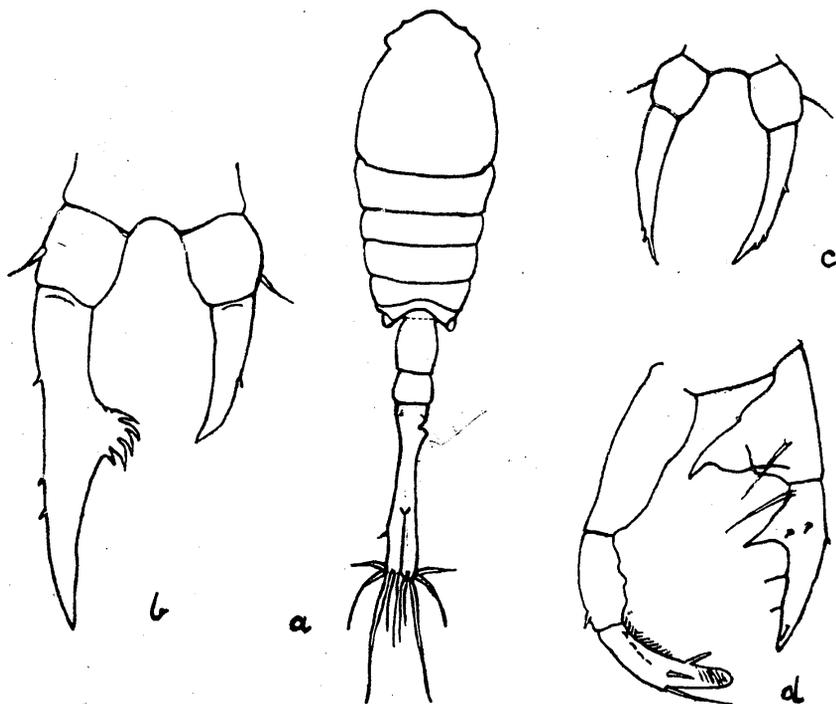


Fig. 70. *Tortanus barbatus* (Brady) (a) Female, dorsal view. (b) Female, 5th pair of legs, posterior face. *Tortanus gracilis* (Brady) (c) Female, 5th pair of legs. (d) Male, 5th pair of legs posterior face. (a, b. after A. Scott; c, d. after Cleve).

120 Fifth pair of legs with the basal segment possessing the inward expansion characteristic of the Harpacticoida (Fig. 72 d).....121  
 Fifth pair of legs without the characteristic inward expansion....126

121 Endopods of 2nd legs greatly elongated; inward expansion of 5th legs narrow, curved and pointed.....LONGIPEDIA 122  
 Endopods of 2nd legs not elongated; body fusiform; caudal setae very long.....123

122 Anal operculum with the central tooth a little longer than the two teeth on each side (Fig. 71 e) : female as depicted, length 0.95 mm.; male undescribed.

♀ *Longipedia weberi* A. Scott (Fig. 71 a to e)

Anal operculum with the central tooth much longer than the two teeth on each side (Fig. 71 g); general appearance much as in *L. weberi*, length of 0.8 to 1.30 mm.; of male 1.08 mm.

♂ *Longipedia coronata* Claus (Fig. 71 f, g)

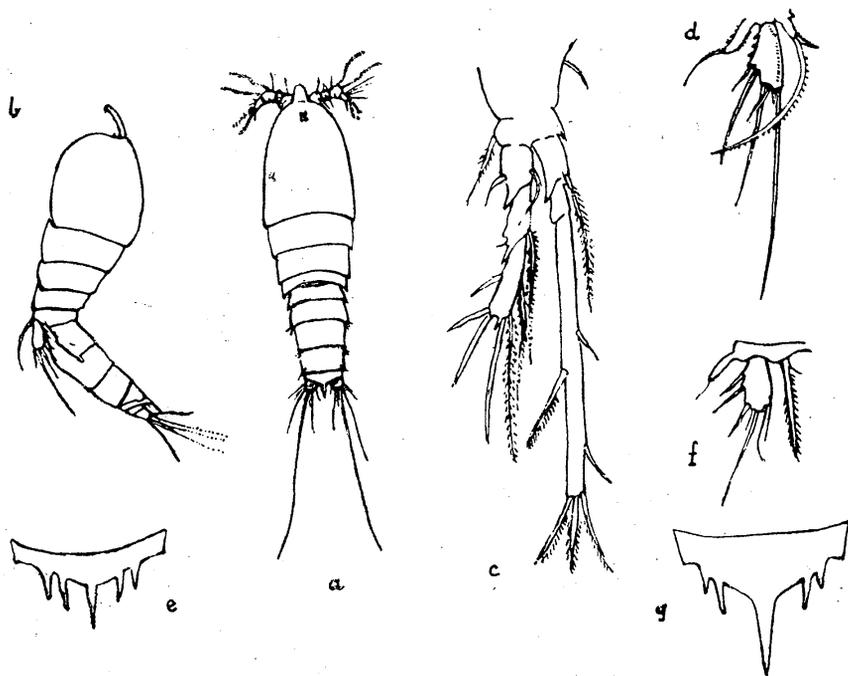


Fig. 71. *Longipedia weberi* A. Scott ♀ (a) Dorsal view. (b) Lateral view. (c) 2nd leg of one side. (d) 5th leg of one side. (e) Anal operculum. *Longipedia coronata* Claus (f) Male, 5th leg. (g) Female, anal operculum. (a, c, d, f, after Sewell; b, e, g, after A. Scott).

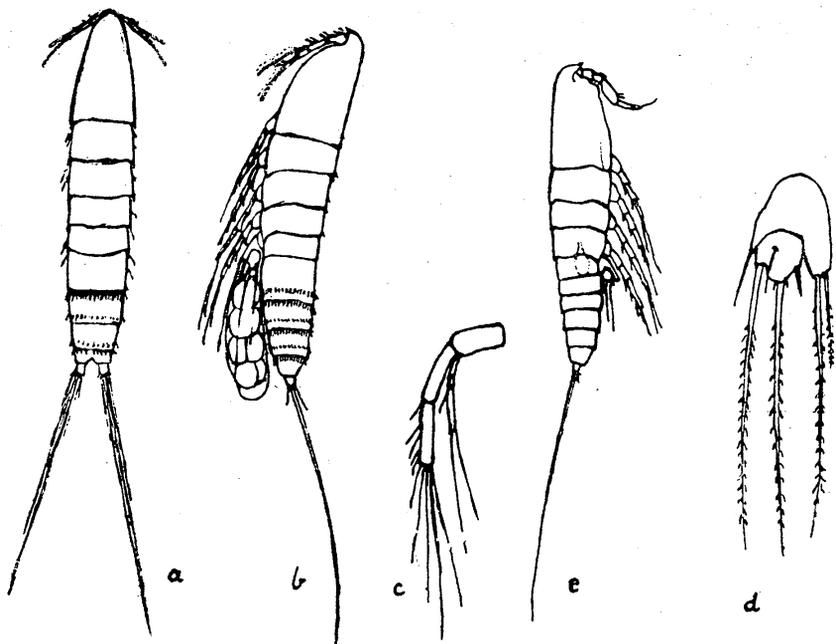


Fig. 72. *Microsetella norvegica* (Boeck) (a) Dorsal view of ♀. (b) Lateral view of ♀. (c) Female, 2nd antenna. (d) Female, 5th leg of one side. (e) Male, lateral view. (after G.O. Sars).

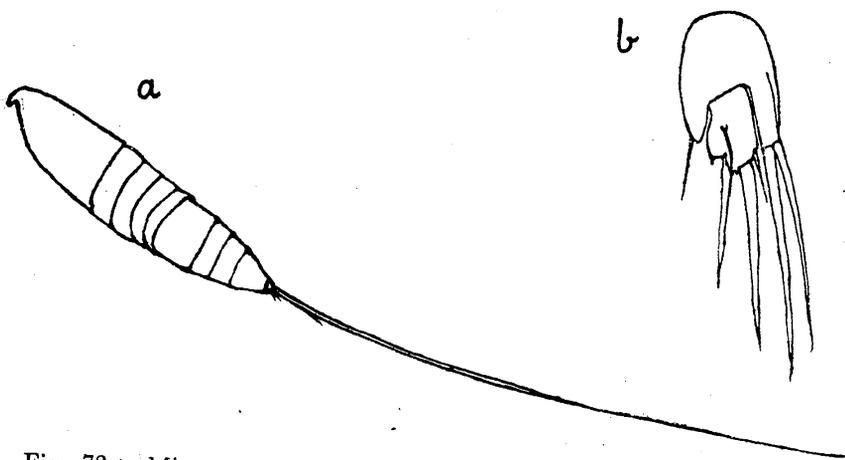


Fig. 73. *Microsetella rosea* (Dana) ♀ (a) Lateral view. (b) 5th leg of one side. (after Giesbrecht).

123 Caudal rami as long as broad, inconspicuous, 2nd antennae with 3-segmented exopodite (Fig. 72 c) ; small in size, less than 0.85 mm.....124

Caudal rami slender, cylindrical, over 4 times as long as broad; 2nd antennae without any exopodite; larger in size, over 1.0 mm.; caudal setae about as long as the body; length of female 1.4 to 1.5 mm., of male 1.16 to 1.30 mm.

♀ ♂ *Macrosetella gracilis* (Dana) (Fig. 74)

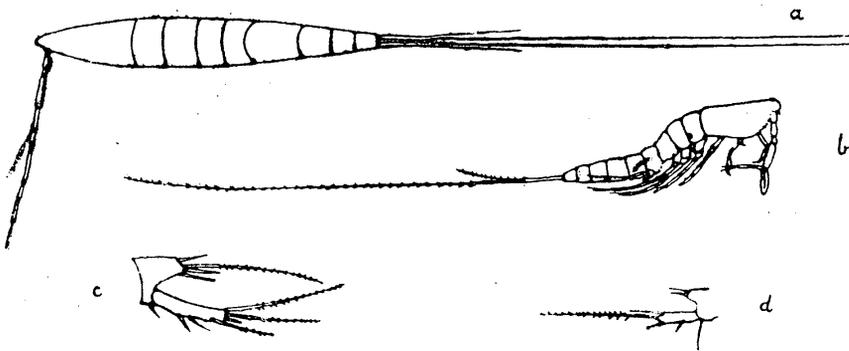


Fig. 74. *Macrosetella gracilis* (Dana) (a) Female, dorsal view. (b) Male, lateral view. (c) Female, 5th leg of one side. (d) Male, 5th leg of one side. (a, b. after Giesbrecht; c. d. after Wilson).

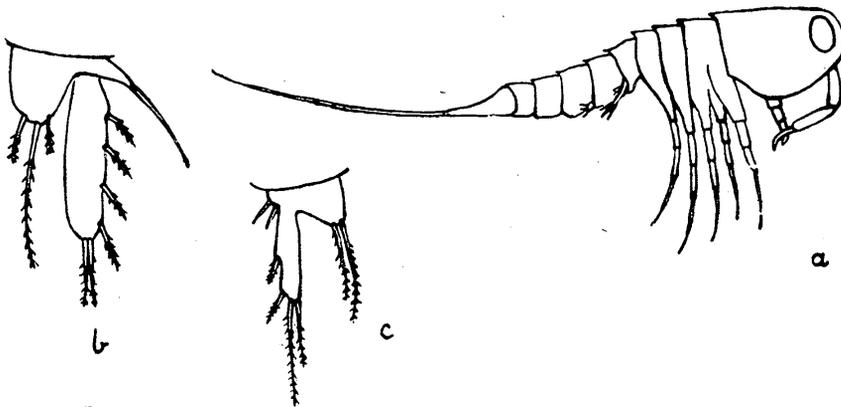


Fig. 75. *Macrosetella oculata* (G.O. Sars) (a) Female, lateral view. (b) Female, 5th leg of one side. (c) Male, 5th leg of one side. (after Wilson).

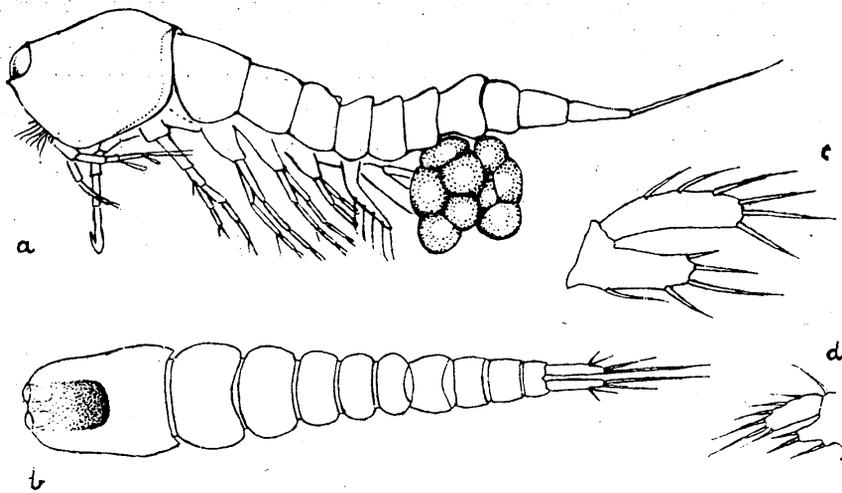


Fig. 76. *Miracia efferata* Dana (a) Female, lateral view. (b) Female, dorsal view. (c) Female, 5th leg of one side. (d) Male, 5th leg of one side. (after Wilson).

124 The inward expansion of the basal of the 5th leg bears one short and one long seta; caudal setae about as long as the body; length of female 0.35 to 0.53 mm., of male 0.33 to 0.42 mm.

♀ ♂ *Microsetella norvegica* (Boeck) (Fig. 72)

The inward expansion of the basal of the 5th leg bears two equally long setae; caudal setae  $1\frac{1}{2}$  times as long as the body; length of female 0.64 to 0.85 mm.; of male 0.56 mm.

♀ ♂ *Microsetella rosea* (Dana) (Fig. 73)

125 Second antennae without an exopodite; apical caudal setae more than twice as long as caudal rami; body proportions as figured, length of female 1.2 to 1.35 mm., of male 1.15 to 1.30 mm.

♀ ♂ *Macrosetella oculata* (G.O. Sars) (Fig. 75)

Second antennae with a small one-jointed exopodite; apical caudal setae only a little longer than the caudal rami; body proportion as figured; length of female 1.75 to 2.10 mm. of male 1.4 to 1.6 mm

♀ ♂ *Miracia efferata* Dana (Fig. 76)

126 Body depressed, with angular projections at the posterior corners of the cephalosome and the next three segments; 5th legs long, narrow, 2-segmented and tipped with setae.....127

Body not depressed; 5th legs plate-like.....128

127 Exopod of 2nd antenna represented by two long setae; 1st antenna 8-segmented; caudal rami twice as long as broad; apical caudal setae very long in the males only, quite short in the females; length of female 1.07 to 1.30 mm., of male about the same

♀ ♂ *Clytemnestra scutellata* Dana (Fig. 77; 78 a to d)

Exopod of 2nd antenna represented by one long seta; 1st antenna 7-segmented through the fusion of two terminal segments; caudal rami hardly as long as broad; length of female 0.5 to 0.87 mm., of male 0.4 to 0.7 mm

♀ ♂ *Clytemnestra rostrata* (Brady) (Fig. 78 e, f, g)

Note: The three most frequently seen Harpacticoids in inshore plankton are (in decreasing order of frequency) *Euterpina acutifrons*, *Clytemnestra scutellata* and *Macrosetella gracilis*. *Clytemnestra scutellata* is remarkable for its rapid movements. Each of these three species may, on occasion, occur in "swarm" condition eclipsing all other zooplankton elements in numbers.

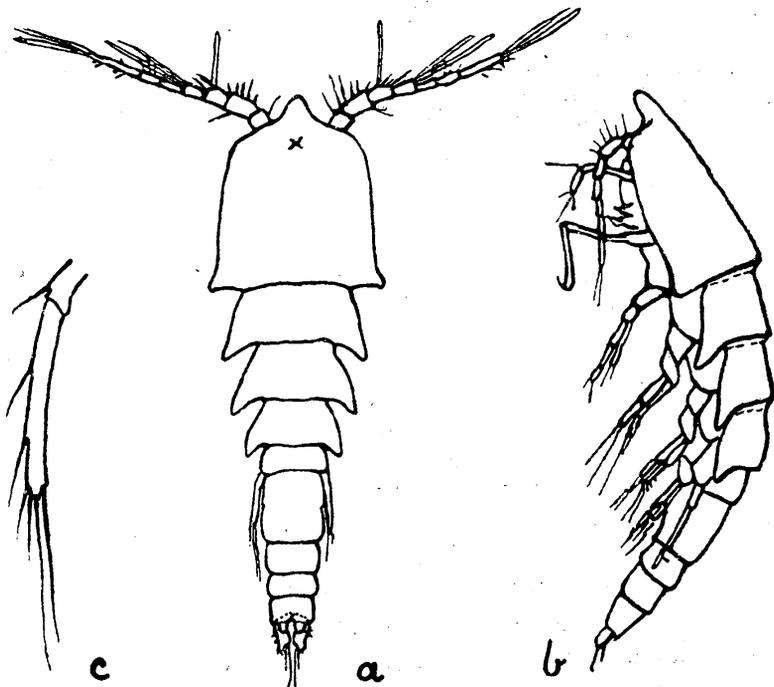


Fig. 77. *Clytemnestra scutellata* Dana, female (a) Dorsal view. (b) Lateral view. (c) 5th leg of one side. (after G.O. Sars).

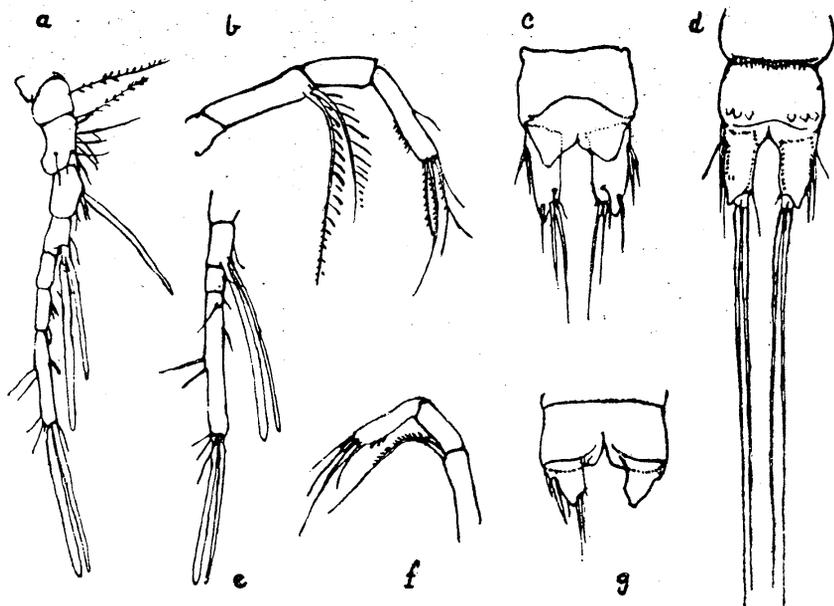


Fig. 78. *Clytemnestra scutellata* Dana (a) Female, 1st antenna of one side. (b) Female, 2nd antenna. (c) Female, caudal rami and anal segment, (d) Male, last two segments of urosome, caudal rami. *Clytemnestra rostrata* (Brady) (e) First antenna, segments 4, 5, 6 and 7. (f) Second antenna. (g) Anal segment and caudal rami. (after Giesbrecht).

128 Body subpyriform; cephalosome drawn out in front into a greatly prominent rostral projection, acute at the tip; 5th legs formed by two undivided juxtaposed plates in the female, coalesced in the middle in the male; length of female 0.5 to 0.8 mm., of male 0.50 to 0.66 mm.

♀ ♂ *Euterpina acutifrons* (Dana) (Fig. 79)

Body onion-shaped, length of body greatly abbreviated, 5th legs rudimentary, more or less fused, unlike in the two sexes; length of female 0.35 to 0.5 mm., of male 0.3 to 0.4 mm.

♀ ♂ *Metis jousseaumei* (Richard) (Fig. 80)

Note :- *Metis jousseaumei* has been observed several times in the Gulf of Mannar but on a few occasions only at Kozhikode.

- 129 Cuticular eye-lenses not present on the cephalosome.....130  
 Cuticular eye-lenses present on the cephalosome.....138

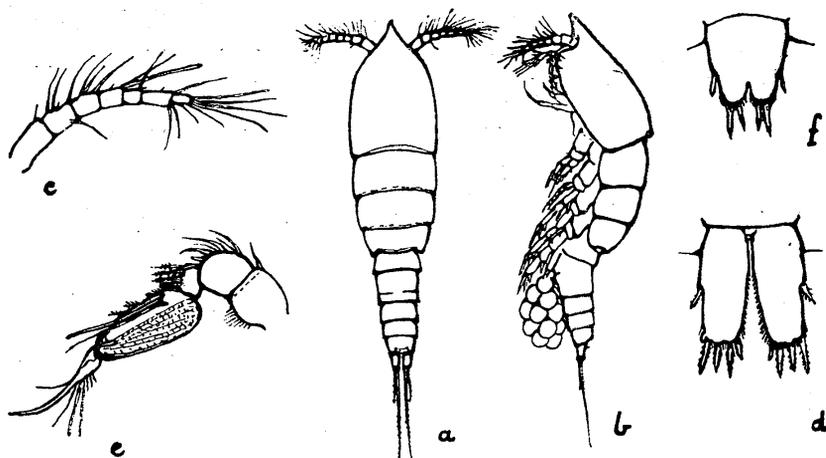


Fig. 79. *Euterpina acutifrons* (Dana) (a) Female, dorsal view. (b) Female, lateral view. (c) Female, 1st antenna. (d) Female, 5th pair of legs. (e) Male, 1st antenna of one side. (f) Male, 5th pair of legs. (after G.O. Sars).

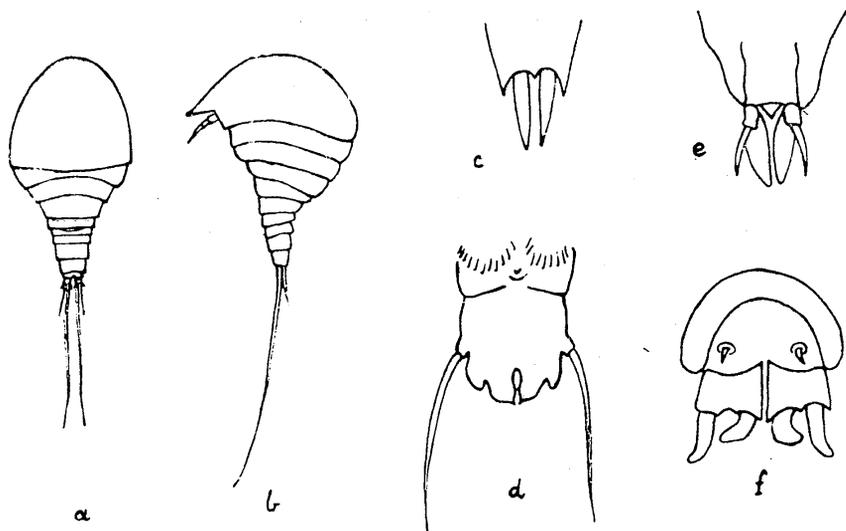


Fig. 80. *Metis jousseaumei* (Richard) (a) Female, dorsal view. (b) Female, lateral view. (c) Female, rostrum. (d) Female, 5th pair of legs. (e) Male, rostrum. (f) Male, 5th pair of legs. (a. after Sewell; b to f. after Wilson).

- 130 Body not depressed, of cyclopid form, maxillipeds normal.....131  
 Body depressed, leaf-like and transparent as in *Sapphirina*.....140  
 Body depressed but of cyclopid form; maxillipeds specialized in both sexes.....152
- 131 Genital segment only a little larger than the other urosome segments; maxillipeds and 2nd maxillae slender, covered with numerous spiny bristles.....OITHONA 132  
 Genital segment conspicuously enlarged; succeeding segments inconspicuous; maxillipeds 3-segmented, subchelate, forming powerful grasping organs in both sexes.....ONCAEA 137
- 132 Females only: metasome very slender, fusiform; head terminating in front in a pointed rostrum; 1st antennae not geniculate on either side, bearing numerous setae; urosome 5-segmented; genital segment a little wider than the other urosome segments.....133  
 Males only: metasome not so slender as in the female, smaller in length; head-end truncate, without a rostrum; each 1st antenna twice geniculate, with fewer setae than in the female; urosome 6-segmented; genital segment wider than other urosome segments, this being more pronounced than in the female.....136
- 133 Rostrum visible in dorsal view; body length over 1 mm; outer marginal spines of the terminal exopod segments of legs 1 to 4 number 2, 2, 1, 1; two apical setae greatly elongated in each caudal ramus..... 134  
 Rostrum bent down, not visible in dorsal view; body length less than 1 mm.; outer marginal spine formula variable; apical setae not so greatly elongated.....135  
 Rostrum not visible in dorsal view; body length 1.2 mm.; metasome and cephalosome together being shorter than urosome (11:13); metasome only about 3 times wider than urosome; outer marginal spines of the terminal exopod segments of legs 1 to 4 number 3, 2, 1, 1; male undescribed.  
 ♀ *Oithona linearis* Giesbrecht (Fig. 83 c)
- 134 Conspicuously coloured plumose setae are present on the outer margin of second basipod segment of legs 2, 3 and 4 and they project outwards and upwards, being visible in dorsal view if undamaged; the enlarged caudal setae are also plumose and conspicuous; genital segment bears a bunch of fine hairs on each side ventrally; length 1.0 to 1.5 mm.  
 ♀ *Oithona plumifera* Baird (Fig. 81 b, c)

No conspicuous setae borne on basipod segment of legs 2, 3 and 4; enlarged caudal setae not plumose; no bunch of hairs on genital segment; length 1.25 to 1.40 mm

♀ *Oithona spinirostris* Claus (Fig. 81 a)

135 First antennae reach up to end of metasome; outer marginal spines are 2, 1, 1, 0 in terminal exopod segments of legs 1 to 4; body highly pellucid; length 0.7 to 0.95 mm.

♀ *Oithona similis* Claus (Fig. 82 a)

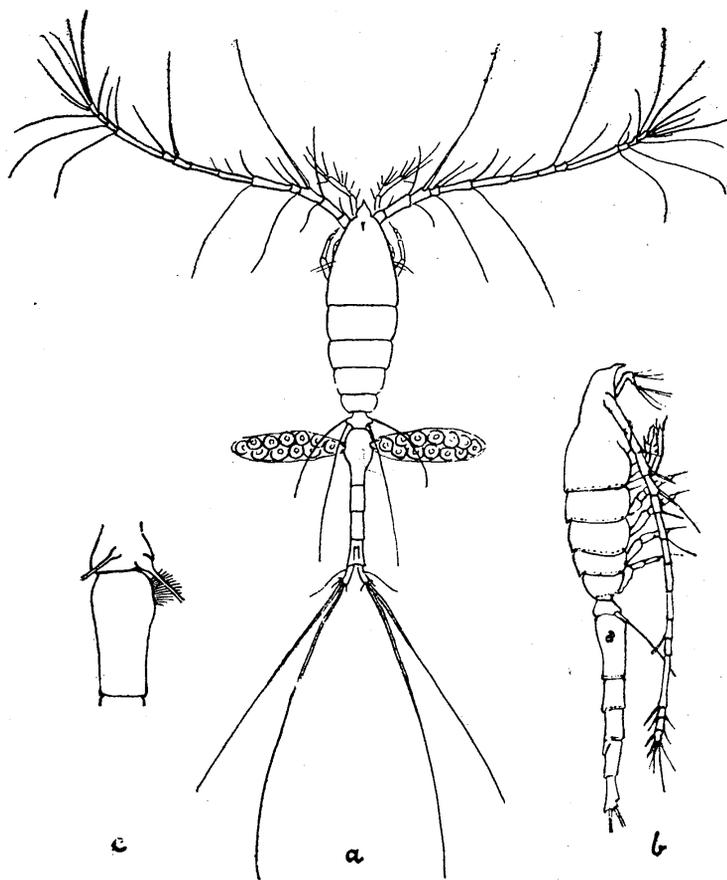


Fig. 81. (a) *Oithona spinirostris* Claus ♀ Dorsal view (after Sars). (b) *Oithona plumifera* Baird ♀ Lateral view (after Sewell). (c) *O. plumifera* Baird ♀ Genital segment, lateral view. (after Colefax).

First antennae reach up to end of 3rd metasome segment only; outer marginal spines are 3, 3, 3, 2 in terminal exopod segments of legs 1 to 4; body usually with much pigment; caudal setae coarsely plumose, forming a fan; length 0.75 to 0.85 mm.

♀ *Oithona rigida* Giesbrecht (Fig. 82 c, d)

First antennae reach up to 2nd metasome segment only; outer marginal spines are 3, 3, 3, 2 in terminal exopod segments of legs 1 to 4; the two longer setae on each caudal ramus show a peculiar crossed arrangement; length 0.6 mm.

♀ *Oithona brevicornis* Giesbrecht (Fig. 83 a)

136 First antennae twice geniculate, the first segment beyond the proximal elbow, sheathing the base of the segment beyond it; the 1st segment beyond the distal elbow bearing a small semicircular process (Fig. 82 b); outer marginal spines are 2, 2, 2, 2 in terminal exopod segments of legs 1 to 4; length 0.5 to 0.7 mm.

♂ *Oithona similis* Claus (Fig. 82 b)

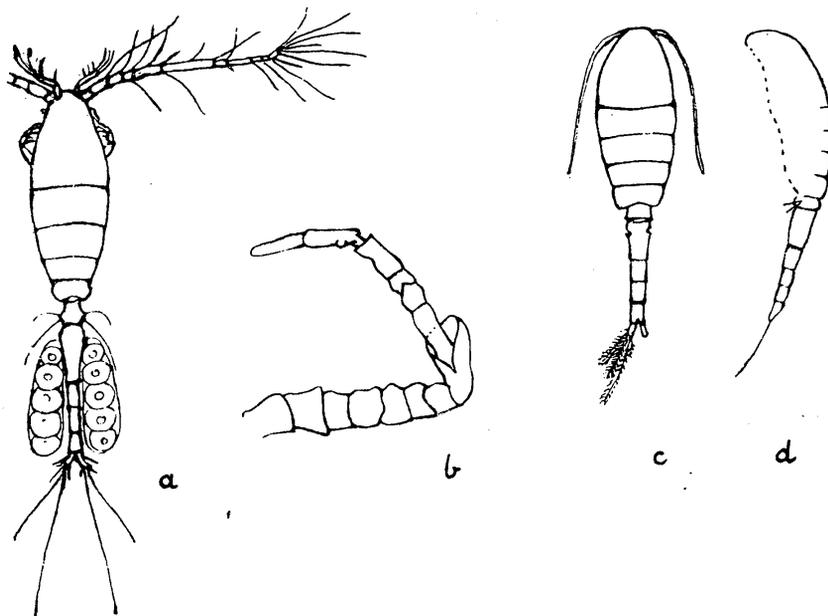


Fig. 82. (a) *Oithona similis* Claus ♀ Dorsal view. (after Sars). (b) *Oithona similis* Claus ♂ 1st antenna to show sheathing base of 1st segment after 1st geniculation and semicircular process on 1st segment after 2nd geniculation (after W.M. Wheeler). (c) *Oithona rigida* Giesbrecht ♀ Dorsal view. (after Cleve). (d) *Oithona rigida* Giesbrecht ♀ Lateral view. (after Cleve).

First antennae as described above; outer marginal spines are 2, 3, 3, 2 in terminal exopod segments of legs 1 to 4; length 0.75 to 1.0 mm

♂ *Oithona plumifera* Baird

First antennae twice geniculate; only a trace of the sheathing base is found: semicircular process absent on 1st segment beyond distal elbow; outer marginal spines are 2, 3, 3, 2 in terminal exopod segments of legs 1 to 4; length 0.75 mm. to 0.85 mm.

♂ *Oithona spirostris* Claus

First antennae twice geniculate; sheathing base appears to be present; semicircular process absent; outer marginal spines are 3, 3, 3, 2 in terminal exopod segments of legs 1 to 4; length 0.7 mm.

♂ *Oithona rigida* Giesbrecht

First antennae twice geniculate; neither proximal sheath nor distal semicircular process is present; outer marginal spines are 3, 3, 3, 2 in terminal exopod segments of legs 1 to 4; length 0.55 mm.

♂ *Oithona brevicornis* Giesbrecht (Fig. 83 b)

Note:- *Oithona rigida* is the commonest species of *Oithona* in inshore waters. *O. plumifera* and *O. spirostris* were observed very often at Kozhikode in plankton from 18 km. off the shore. They have been observed also at Cochin, Madras and Mandapam

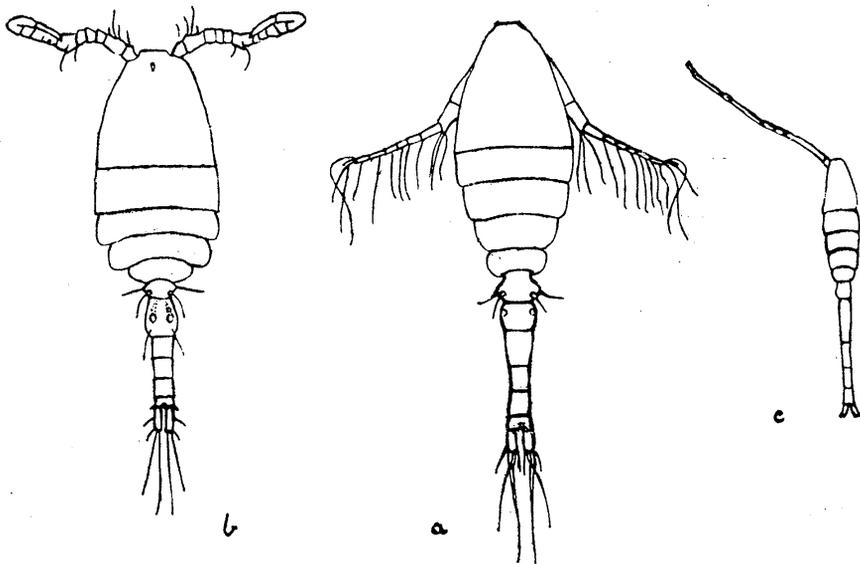


Fig. 83. (a) *Oithona brevicornis* Giesbrecht Female Dorsal view. (b) *Oithona brevicornis* Giesbrecht Male Dorsal view. (c) *Oithona linearis* Giesbrecht Female Dorsal view. (a, b. after Wilson; c. after Wolfenden).

137 Second free metasome segment raised into a prominent hump on the dorsal middle line; outline of the genital segment in both sexes as figured; length of female 0.75 to 1.25 mm., of male 0.6 to 0.8 mm.

♀ ♂ *Oncaea conifera* Giesbrecht (Fig. 84 d to g)

Second free metasome segment not raised into a hump; anterior part of the body obovate in the female, less wide in the male; genital segment more conspicuously enlarged in the male than in the female and followed by 3 (in the female) or 4 (in the male) segments which are closely telescoped together; length of female 1.1 to 1.27 mm, of male 0.7 to 1.00 mm.

♀ ♂ *Oncaea venusta* Philippi (Fig. 84 a, b, c)

138 Body moderately depressed or not at all; caudal rami styliform. . . . 139

Body greatly depressed and flattened, most so in the males; caudal rami broadly lamellate, without elongated setae. . . . .

.....SAPPHIRINA 148

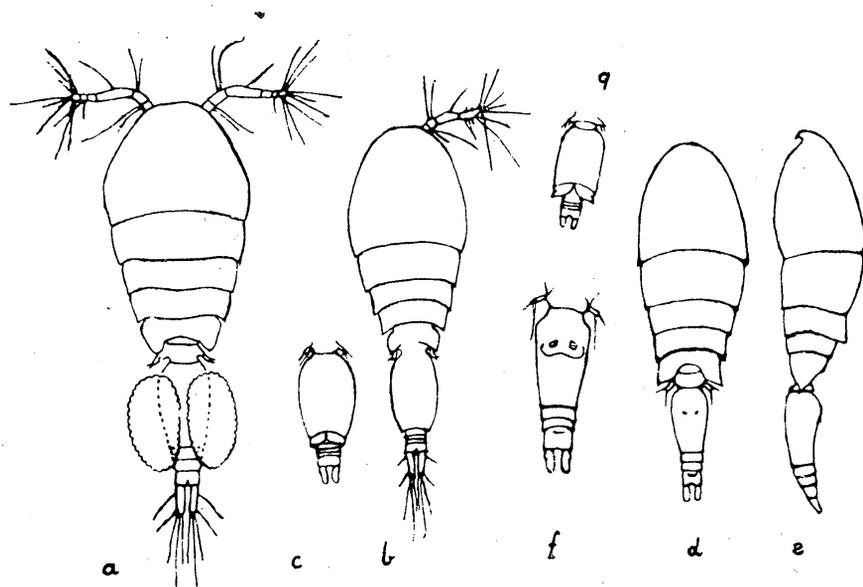


Fig. 84. *Oncaea venusta* Philippi. (a) Female, dorsal view. (b) Male, dorsal view. (c) Male, urosome, ventral view. *Oncaea conifera* Giesbrecht (d) Female, dorsal view. (e) Female, lateral view. (f) Female, urosome, ventral. (g) Male, urosome, ventral view. (a, b, c, f, g. after Giesbrecht; d, e. after Farran).

139 Body not at all depressed, club-shaped; head rounded anteriorly; the last metasome segment usually and the penultimate segment always, provided with tailward prolongations or 'lappets'; 2nd antennae stout, subchelate, larger in the males than in the females; single egg-sac, borne dorsally on the genital segment.....141

Body moderately depressed; head squarely truncated in front, with the corneal lenses near the corners; free metasome segments without lateral prolongations; 2nd antennae, slender, prehensile, 4-segmented; two egg-sacs borne laterally on the genital segment.....  
..... ♀ COPILIA 145

140 Body depressed greatly as in *Sapphirina* but distinguishable from the latter by absence of eye-lenses and by the greatly elongated and styliform caudal rami; mouth parts in general reduced.....  
..... ♂ COPILIA 146

141 The two free metasome segments usually not fused together; urosome 2-segmented; 2nd antennae 3-segmented; no beak-shaped process on the ventral surface.....CORYCAEUS 142

The two free metasome segments fused together; urosome one-segmented; 2nd antennae 4-segmented (Fig. 87 e); a protuberance is present in the median ventral line behind the maxillipeds, beak-like in the female, rounded in the male.....CORYCELLA 144

142 Caudal rami very short, equal in length to the anal segment in the male, a little longer than anal segment in the female; male genital segment with a ventral hook at the anterior border; length of female 1.00 mm., of male 0.80 mm.

♀ ♂ *Corycaeus catus* F. Dahl (Fig. 87 a, b, c)

Caudal rami long, always nearly equal to the urosome in length in both sexes; male genital segment without a ventral hook..... 143

143 Lappets of metasome very long, reaching up to the end of the genital segment in the female, up to the middle of the genital segment in the male; genital segment of female does not overhang the anal segment; length of female 2.3 mm., of male 1.9 mm.

♀ ♂ *Corycaeus speciosus* Dana (Fig. 85)

Lappets of metasome long but not reaching up to the end of genital segment in the female or up to the middle of the genital segment in the male; genital segment overhangs the anal segment in the female as seen in lateral view (Fig. 86 b); details of 2nd antennae of both sexes as figured; length of female 1.6 to 1.7 mm., of male 1.4 to 1.5 mm.

♀ ♂ *Corycaeus danae* Giesbrecht (Fig. 86)

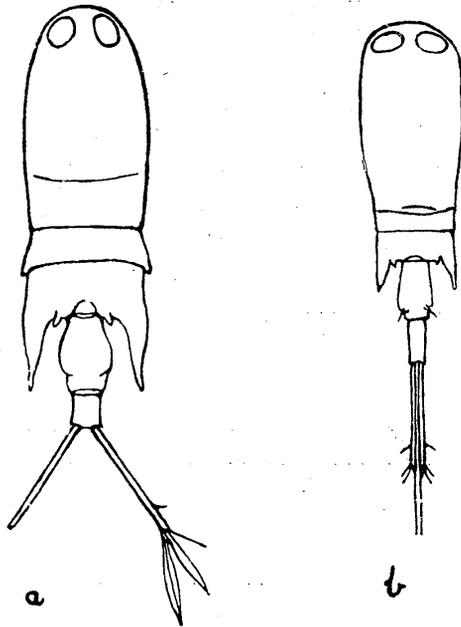


Fig. 85. *Corycaeus speciosus* Dana (a) Female, dorsal view. (b) Male, dorsal view. (after Giesbrecht).

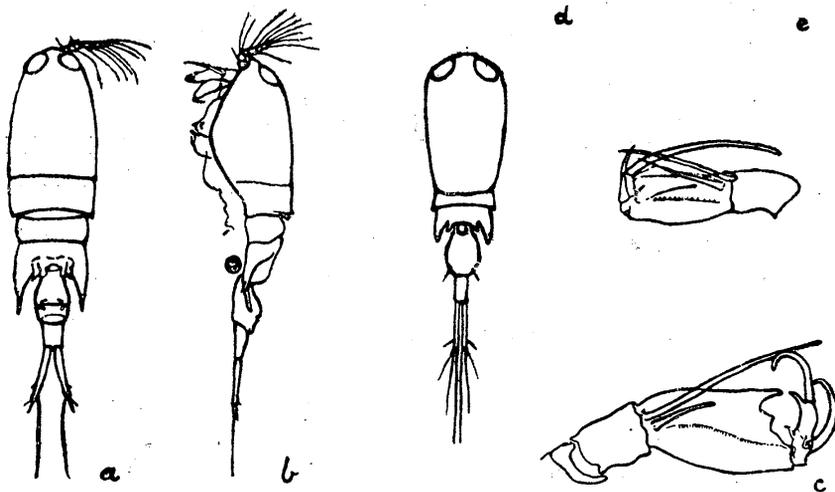


Fig. 86. *Corycaeus danae* Giesbrecht (a) Female, dorsal view. (b) Female, lateral view—note the slanting junction between genital and anal segments. (c) Female, 2nd antenna (note 3 segments). (d) Male, dorsal view. (e) Male, 2nd antenna. (a, b, c, e. after Sewell, d. after Colefax).

144 Outline of the body, particularly the genital segment, in lateral view as figured; length of female 0.85 to 1.00 mm., of male 0.82 to 0.95 mm.

♀ ♂ *Corycella gibbula* Giesbrecht (Fig. 87d, e, f).

145 Distance between eye-lenses less than the lens diameter; length of anal segment  $1\frac{1}{2}$  times its least width; endopod as long as first exopod segment in 4th leg; length 3.2 to 5.4 mm.

♀ *Copilia vitrea* (Haeckel) (Fig. 88 a, b, c)

Distance between eye-lenses less than twice lens diameter; length of anal segment 5 times its least width; endopod as long as first exopod segment in 4th leg; length 2.2 to 4.1 mm

♀ *Copilia mirabilis* Dana (Fig. 88, d, e, f)

Distance between eye-lenses approximately three times the lens diameter; length of anal segment  $2\frac{1}{2}$  times its least width; endopod distinctly shorter than first exopod segment in 4th leg; length 2.2 to 4.4 mm.

♀ *Copilia quadrata* Dana (Fig. 88 g, h, j)

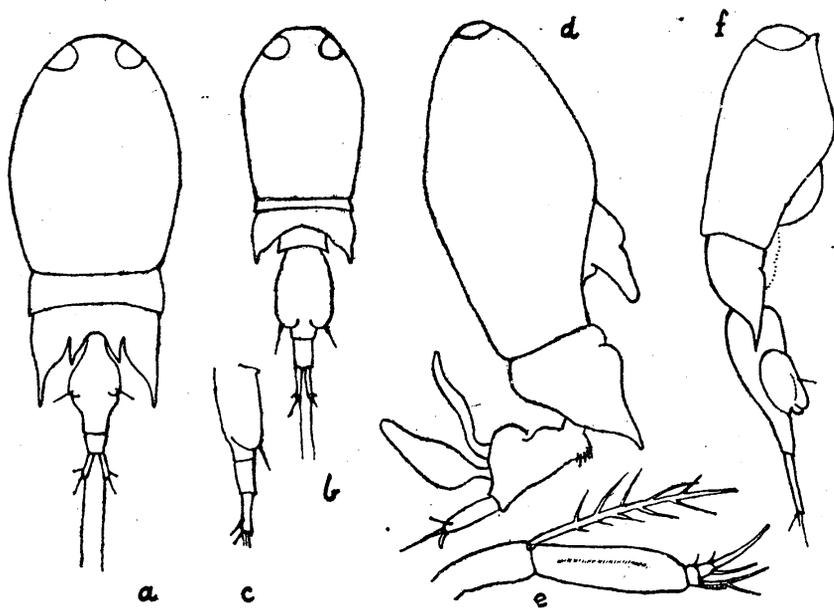


Fig. 87. *Corycaeus catus* F. Dahl. (a) Female, dorsal view. (b) Male, dorsal view. (c) Male, urosome, lateral view (note hook). *Corycella gibbula* Giesbrecht (d) Female, lateral view (note ventral beak). (e) Female, 2nd antenna (note 4 segments). (f) Male, lateral view. (a, b, c, d, f. after Colefax; e. after Wolfenden).

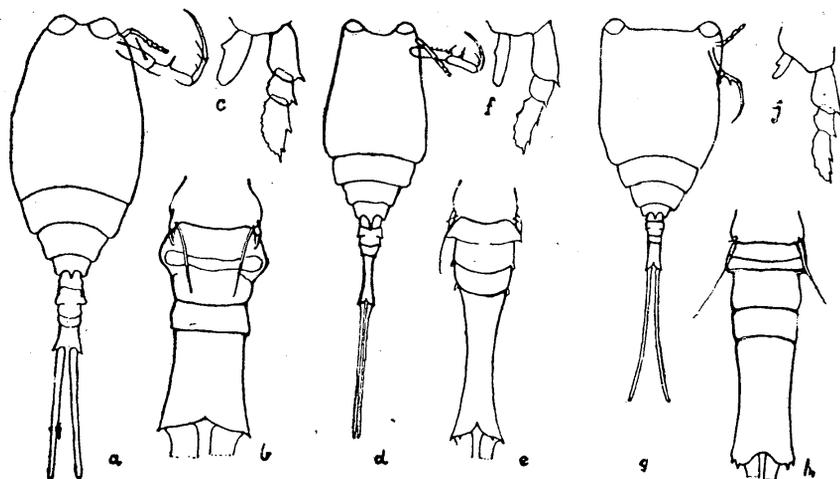


Fig. 88. *Copilia vitrea* (Haeckel) ♀ (a) Dorsal view. (b) Urosome, ventral view. (c) 4th leg. *Copilia mirabilis* Dana ♀ (d) Dorsal view. (e) Urosome, ventral view. (f) 4th leg. *Copilia quadrata* Dana ♀ (g) Dorsal view. (h) Urosome, ventral view. (j) 4th leg. (after Lehnhofer).

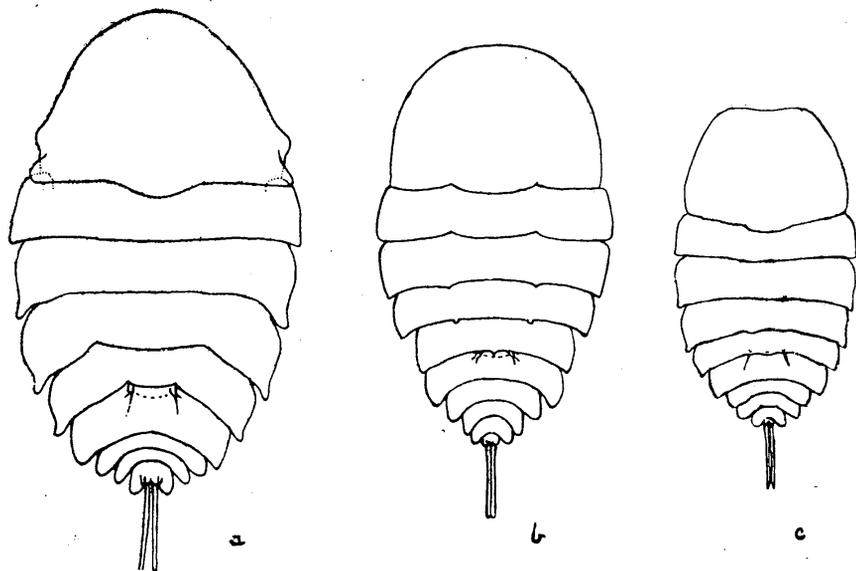


Fig. 89 (a) *Copilia vitrea* (Haeckel) ♂ dorsal view. (after Colefax) (b) *Copilia mirabilis* Dana, ♂ dorsal view (after Brady) (c) *Copilia quadrata* Dana, ♂ dorsal view. (after Giesbrecht).

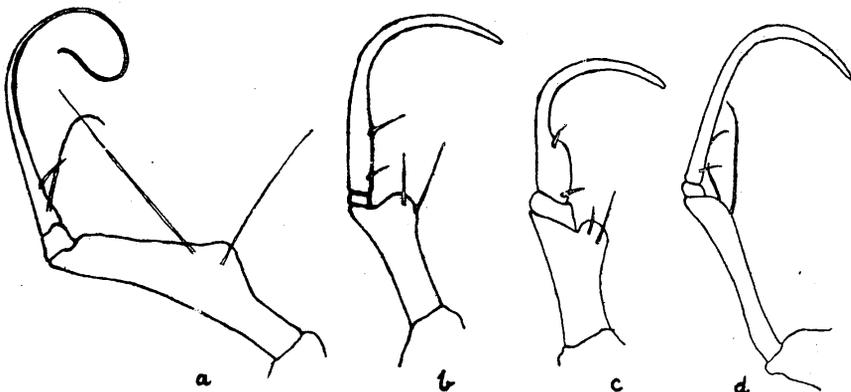


Fig. 90. *Copilia vitrea* (Haeckel) ♂ (a) maxilliped; *Copilia mirabilis* Dana ♂ (b) maxilliped of *forma typica* (c) maxilliped of *forma platynyx*; *Copilia quadrata* Dana ♂ (d) maxilliped (after Lehnhofer)

146 Length of cephalosome is more than 2/3 of breadth ..... 147  
 Length of cephalosome is 2/3 of breadth or less; details of maxilliped  
 (in two forms) as figured; length 3.2 to 6.1 mm.  
 ♂ *Copilia mirabilis* Dana (Fig. 89 b; 90 b, c)

147 Anterior border of cephalosome evenly rounded; maxillipeds as  
 figured, terminal segment whip-like, 2nd segment comparatively  
 large; length 5.5 to 9.0 mm.  
 ♂ *Copilia vitrea* (Haeckel) (Fig. 89 a; 90a)

Anterior border of cephalosome flat or slightly incurved; maxillipeds  
 as figured; terminal segment is a curved claw, 2nd segment is long  
 and narrow; length 3.5 to 5.7 mm.  
 ♂ *Copilia quadrata* Dana (Fig. 89 c; 90 d)

148 Females only: urosome distinctly narrower than the metasome; 5-  
 segmented, or 6-segmented when the genital segment is distinctly  
 divided into two; 1st urosome segment is not concealed; it bears  
 the 5th pair of legs which are small and alike in both sexes; dorsal  
 surface not as iridescent as in the males.....149

Males only: urosome wide, only a little narrower than metasome;  
 always 6-segmented; 1st urosome segment concealed; epimeral  
 plates well developed on urosome segments 2 to 5; dorsal surface  
 of body usually iridescent or brightly tinted or both.....150

149 Outline of body long and narrow as figured; 4th leg with the endopod  
 as long as the exopod; length 2.3 mm.  
 ♀ *Sapphirina ovatolanceolata* Dana (Fig. 91 a, b)

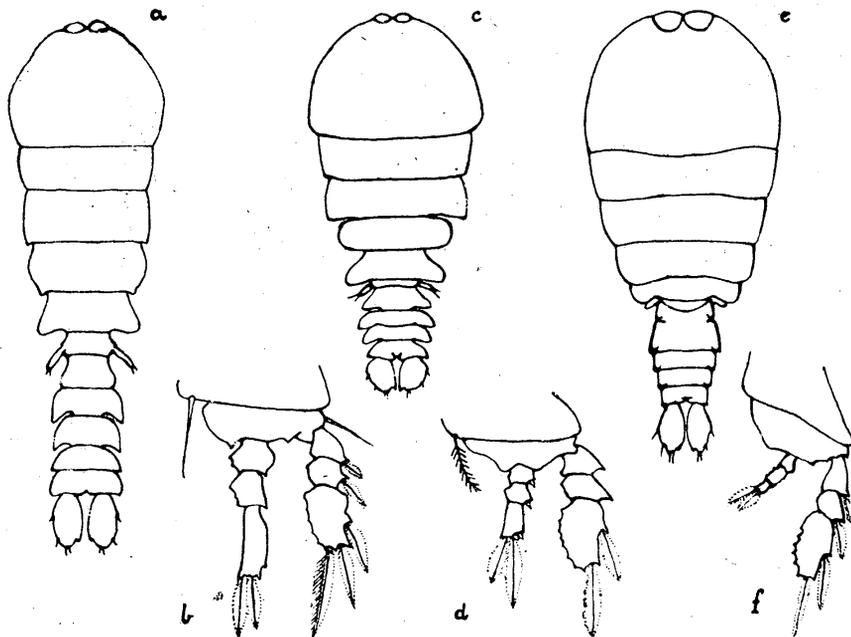


Fig. 91. *Sapphirina ovatolanceolata* Dana ♀ (a) Dorsal view (b) 4th leg. *Sapphirina auronitens* Claus ♀ (c) Dorsal view. (d) 4th leg. *Sapphirina nigromaculata* Dana ♀ (e) Dorsal view. (f) 4th leg. (a, b. after Colefax, c, d, f. after Wilson; e. after Giesbrecht).

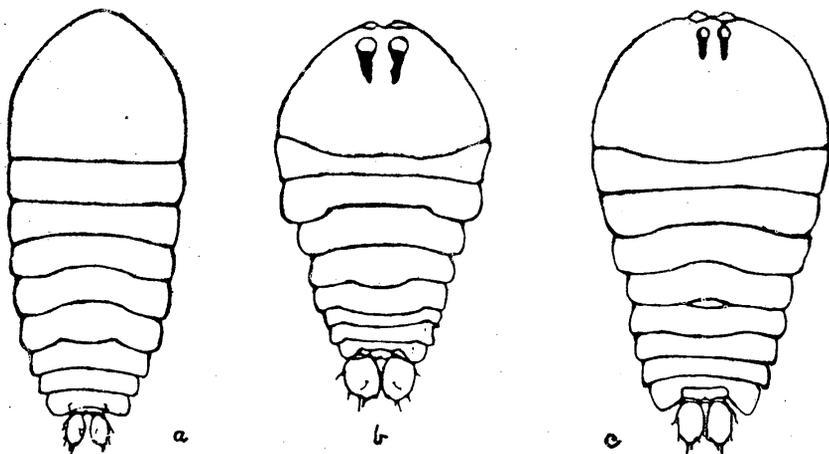


Fig. 92. (a) *Sapphirina ovatolanceolata* Dana ♂ Dorsal view. (b) *Sapphirina auronitens* Claus ♂ Dorsal view. (c) *Sapphirina nigromaculata* Dana ♂ Dorsal view. (a, c. after Giesbrecht; b. after Colefax).

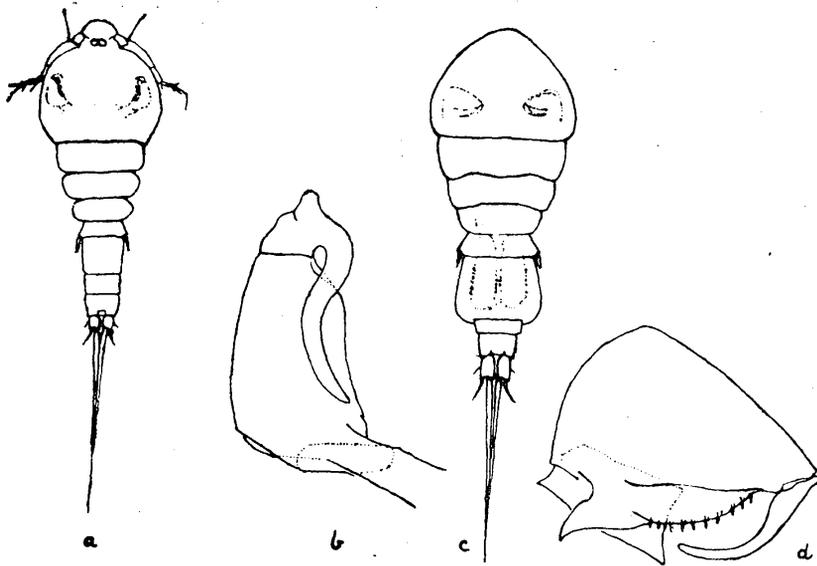


Fig. 93. *Bomolochus* sp. (a) Female, dorsal view. (b) Female, maxilliped. (c) Male, dorsal view (at greater magnification than the female). (d) Male, maxilliped (original).

Outline of body as figured; 4th leg with the endopod shorter than the exopod but over  $\frac{1}{2}$  its length; length 2.3 mm.

♀ *Sapphirina auronitens* Claus (Fig. 91 c, d)

Outline of the body as figured; 4th leg with the endopod only one half as long as exopod; length 1.9 to 2.0 mm.

♀ *Sapphirina nigromaculata* Dana (Fig. 91 e, f)

150 Third and fourth metasome segments as wide as cephalosome; corneal lenses not visible in dorsal view, length 4.1 mm.

♂ *Sapphirina ovatolanceolata* Dana (Fig. 92 a)

Third and fourth metasome segments narrower than cephalosome; corneal lenses visible in dorsal view . . . . . 151

151 Caudal rami hardly  $1\frac{1}{4}$  times as long as broad, length 2.2 mm.

♂ *Sapphirina auronitens* Claus (Fig. 92 b)

Caudal rami at least  $1\frac{1}{2}$  times as long as broad; length 2.05 to 2.45 mm.

♂ *Sapphirina nigromaculata* Dana (Fig. 92 c)

152 Maxillipeds in the female turned forward outside the other mouth parts and more or less fused with the head, the apical claw S shaped; in the male not fused to the head; gill-parasites of fishes often found

free-swimming in the plankton; ♀ 0.6 to 0.75 mm.; ♂ 0.5 to 0.70 mm.

♀ ♂ *Bomolochus species* (Fig. 93)

*Note:* The figures given are those of an undescribed species observed frequently in plankton. Though the number of segments in swimming legs and in the urosome appeared to be fewer than in the adult, at least the male depicted seemed to be sexually mature.

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