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**REPORT ON SOME COPEPODA COLLECTED DURING
THE MELANESIA EXPEDITION OF THE ÔSAKA MUSEUM
OF NATURAL HISTORY^{1,2)}**

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With 32 Text-figures

The present report is based on a small sample of copepods, mainly Harpacticoida, obtained together with ascidians at Noumea, New Caledonia, during the Melanesia Expedition of the Ôsaka Museum, Japan. The specimens were kindly placed at my disposal by Dr. Takasi TOKIOKA of the Seto Marine Biological Laboratory, Sirahama, Japan; they were mainly obtained from the bottom of collecting bottles with ascidians studied by Dr. TOKIOKA. Though there is no definite information concerning the conditions under which the species of copepods actually lived there is evidence to suggest that the majority is bottom living. There are some accidentally introduced pelagic species whilst there is reason to suggest that at least one of the species (*Paramphiascella pacifica* nov. spec.) is actually associated with ascidians.

I want to express my sincere gratitude to Dr. Takasi TOKIOKA, who kindly placed this small but interesting collection at my disposal. Though the number of species is small the percentage of new forms is fairly high and the inspection of this more or less incidentally collected sample of copepods once more proves the very incomplete knowledge of the Pacific harpacticoid copepods.

LIST OF SPECIES

CALANOIDA

PARACALANIDAE: *Paracalanus parvus* (CLAUS, 1863)

CYCLOPOIDA

OITHONIDAE: *Oithona simplex* FARRAN, 1913
 Oithona spec.

HARPACTICOIDA

ECTINOSOMIDAE: *Ectinosoma acutorostratum* nov. spec.

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- 1) Scientific Results of the Melanesia Expedition, No. 14.
 - 2) Contributions from the Ôsaka Museum of Natural History, No. 77.

Publ. Seto Mar. Biol. Lab., X (2), 1962. (Article 19)

HARPACTICIDAE :	<i>Harpacticus compsonyx</i> MONARD, 1926
TISBIDAE :	<i>Tisbe acanthifera</i> nov. spec.
THALESTRIDAE :	<i>Rhynchothalestris rufocincta</i> (BRADY, 1880)
	<i>Dactylopodella clypeata</i> G. O. SARS, 1911
DIOSACCIDAE :	<i>Amphiascus angustipes</i> GURNEY, 1927
	<i>Paramphiascella pacifica</i> nov. spec.
AMEIRIDAE :	<i>Ameira parvula</i> (CLAUS, 1866)
	<i>Nitocra affinis</i> GURNEY, 1927
	<i>Psyllocamptus minutus</i> G. O. SARS, 1911
LAOPHONTIDAE :	<i>Laophonte thoracica</i> BOECK, 1865
	<i>Paralaophonte obscura</i> nov. spec.
	<i>Esola bulligera</i> (FARRAN, 1913)

REPORT ON THE SPECIES

CALANOIDA

Genus *Paracalanus* BOECK, 1865

The number of species of this genus has rapidly increased recently, but after a careful examination of the existing descriptions I think that only the following are admissible :

- "aculeatus" group: *Paracalanus aculeatus* GIESBRECHT, 1888
 (= *Paracalanus aculeatus* var. *plumulosus* WOLFENDEN, 1905; *Acrocalanus pediger* ♂, CLEVE, 1901; *Paracalanus Clevei* FRÜCHTL, 1923)
Paracalanus serratipes SEWELL, 1912
Paracalanus denudatus SEWELL, 1929
- "parvus" group: *Calanus parvus* CLAUS, 1863
 (= *Calanus pygmaeus* CLAUS, 1863; *Paracalanus parvus* var. *borealis* WOLFENDEN, 1905; *Paracalanus parvus* var. *Indicus* WOLFENDEN, 1905; *Paracalanus parvus* var. *perplexus* NORMAN & T. SCOTT, 1906; *Piezocalanus lagunaris* GRANDORI, 1912; *Paracalanus mariae* BRADY, 1918; *Paracalanus intermedius* SHEN & BAI, 1956¹⁾.
Paracalanus crassirostris F. DAHL, 1894
 (= *Paracalanus crassipes* APSTEIN, 1912; *Paracalanus*

1) The inclusion of *Paracalanus pygmaeus* in the synonymy of *Paracalanus parvus* is based on the descriptions of *P. pygmaeus* that so far have been published. It does not appear improbable that on closer examination of material from the type localities both species will prove to be different.

- crassirostris* f. *scotti* FRÜCHTL, 1923; *Paracalanus*
crassirostris var. *nudus* DAVIS, 1944)
Paracalanus nanus G. O. SARS, 1907;
Paracalanus dubia SEWELL, 1912
(= *Paracalanus crassirostris* f. *sewelli* FRÜCHTL, 1923)
Paracalanus nudus SEWELL, 1929

The synonymy of the various forms will not be discussed here; the differences separating the forms listed above are usually fairly small and the specific variability within each species seems to be wide.

In order to facilitate the identification of the various species I have constructed the following key, which can only be used for the identification of the females and has very limited value: a very careful comparison of the shape of the body, and the structure of the antennae and legs with the existing descriptions remains necessary. The identification of the males meets with even more difficulties and I failed to make a satisfactory key.

Key to the females of *Paracalanus*:

1. Antennule with the segments 1 and 2 always, and the segments 8 and 9 usually fused 2
- Antennule with the segments 1 and 2 always, and segments 8 and 9 usually separate 4
2. Terminal segment of leg 5 apically with a long and a short spine, but without additional teeth. No spinules occur on the posterior aspect of exopodite of leg 4. Number of spinules along external margin of third exopodal segment of legs 3 and 4 reduced (8-0 on leg 3, 4-0 on leg 4). Ultimate segment of antennule as long as penultimate and antipenultimate together *P. denudatus* SEWELL
- Terminal segment of leg 5, in addition to apical big and small spine, with a number of small spinules. Spinules also occur on the posterior aspect of second exopodal segment of leg 4; number of spinules along external margins of third exopodal segment of leg 3 and leg 4 about 11 and about 15 respectively 3
3. Antennule reaches middle of abdomen; ultimate segment shorter than either penultimate or antipenultimate segments *P. serratipes* SEWELL
- Antennule reaches beyond abdomen; ultimate segment about 1.5 times as long as penultimate segment *P. aculeatus* GIESBRECHT
4. Terminal segment of leg 5 with 2 short, thick spines of unequal length, the biggest twice as long as shorter spine. Rostrum short and thick *P. crassirostris* F. DAHL
- Terminal segment of leg 5 either with 2 setiform, slender spines, or with a long and slender and a short and thick spine 5
5. Terminal segment of leg 5 short, with a long, haired seta and a small, short spine. No spinules occur on external margin of third exopodal segment of

- legs 2 to 4. Lateral margin of last thoracic somite with a backward directed tuft of hairs. Right side of genital somite with some small spinules *P. nudus* SEWELL
- No haired, setiform spine on terminal segment leg 5; margin of last thoracic somite nude, no spinules on genital somite 6
6. Abdomen notably short; cephalothorax fully 4.5 times as long as abdomen. Antennule short, as long as cephalothorax *P. nanus* G. O. SARS
- Abdomen longer, cephalothorax about 3.5 times as long as abdomen. Antennules reach the middle of the abdomen 7
7. Longest spine on terminal segment of leg 5 slender, as long as or longer than terminal segment. In addition to the shorter spine there is only 1 tooth on the terminal segment *P. parvus* (CLAUS)
- Terminal segment of leg 5 long and cylindrical, the longest spine of this segment longer than this segment which, in addition to the short spine, carries several smaller teeth *P. dubia* SEWELL

Paracalanus parvus (CLAUS, 1863)

(figs. 1, 2)

Paracalanus parvus, VERVOORT, 1946, p. 130; VERVOORT, 1957, p. 36; SHEN & BAI, 1956, pp. 183, 219, pl. 2 figs. 7-11; TANAKA, 1956, p. 369; TANAKA, 1960, p. 27.

Paracalanus intermedius SHEN & BAI, 1956, pp. 184, 219, pl. 2 figs. 12-16.

MATERIAL. One adult female, one male and one female copepodite stage V.

REMARKS. I have figured and dissected the female specimen so as to be quite certain of my identification. It agrees in all particulars with SEWELL's specimens from the Bay of Bengal and it seems unnecessary to give a complete redescription here.

The species is a free living, planctonic form and its occurrence in the Noumea sample is quite accidental.

A comparison of the description by SHEN & BAI (1956, pp. 217, 218) of their new species *Paracalanus intermedius*, with existing descriptions of *Paracalanus parvus* from various parts of the tropical and subtropical seas has convinced me that this new species cannot possibly be separated from *Paracalanus parvus*. The differences in spinulation of the legs, a character used by SHEN & BAI to discriminate between their new species and both *Paracalanus parvus* and *P. aculeatus*, are entirely without specific value and are entirely within the normal range of variation exhibited by the variable *Paracalanus parvus*. Their *Paracalanus intermedius*, with regards to this spinulation, approaches SEWELL's specimens of *Paracalanus parvus* from the Bay of Bengal (and also the present specimen) more closely than the specimens described by SHEN & BAI as *Paracalanus parvus*, though these too are also unmistakably representatives of this variable form.

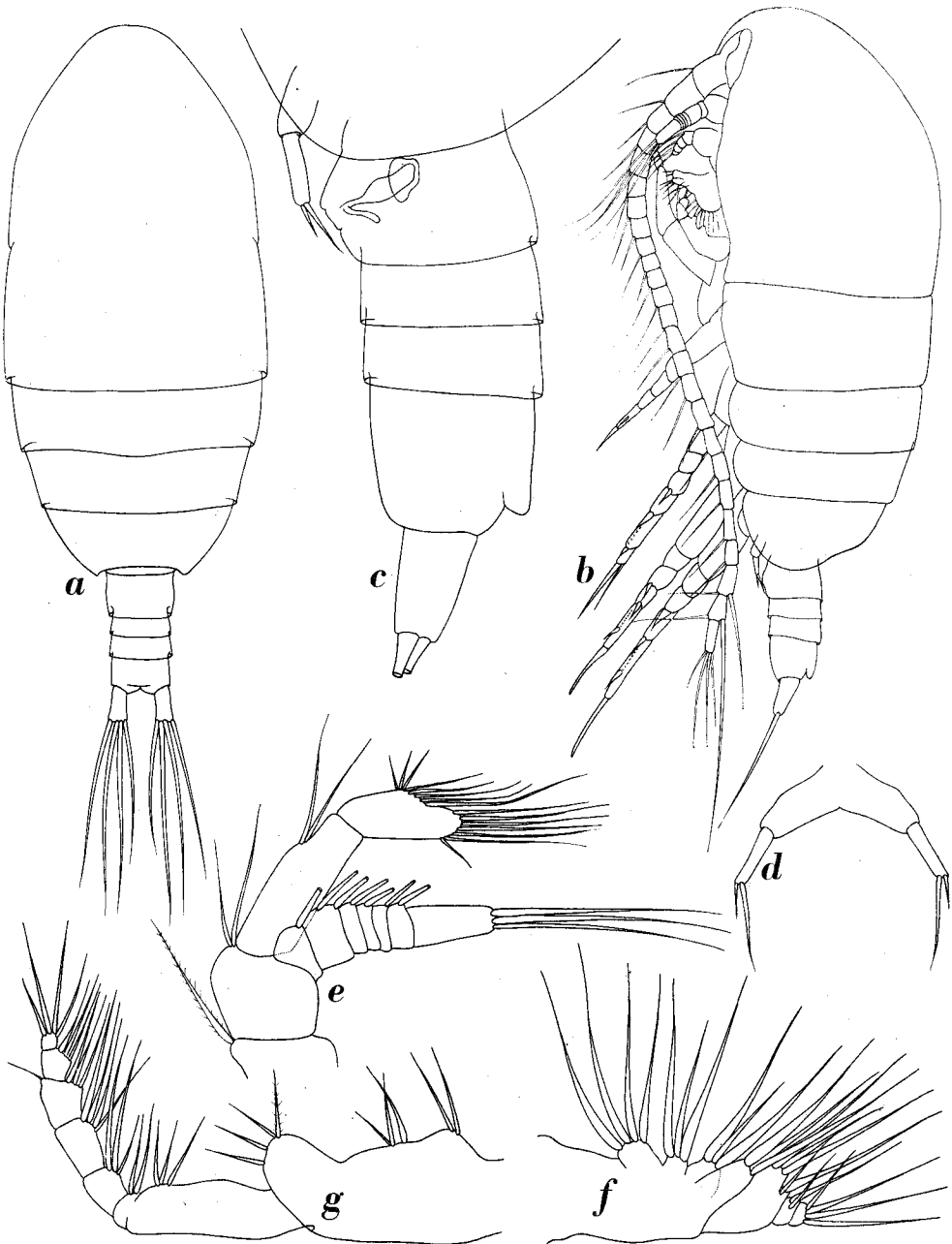


Fig. 1. *Paracalanus parvus* (CLAUS), adult female. a, whole animal, dorsal view; b, whole animal, lateral view from left side; c, fifth leg and abdomen, lateral view from left side; d, fifth pair of legs; e, antenna; f, maxilla; g, maxillipede. a, b, $\times 100$; c-g, $\times 325$.

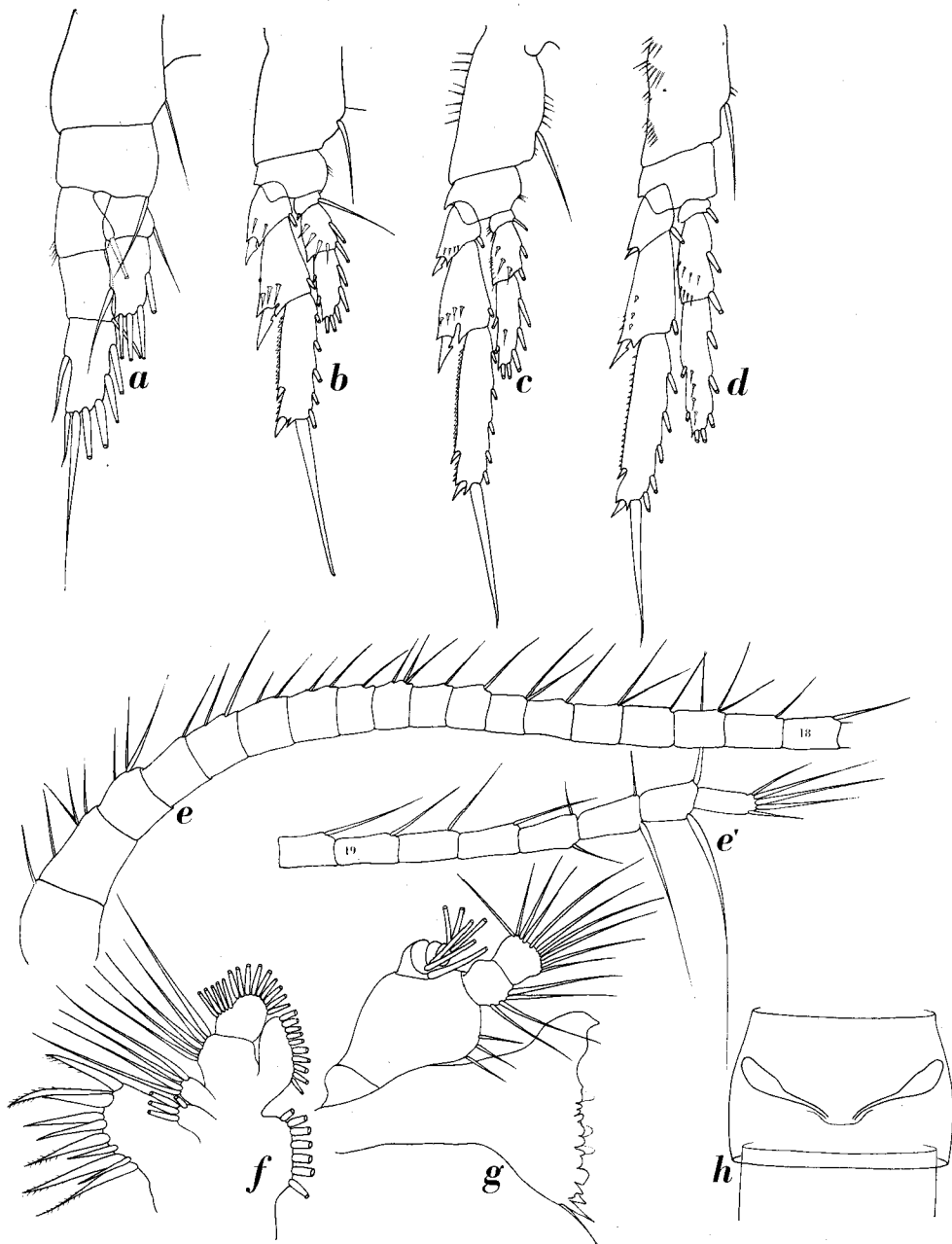


Fig. 2. *Paracalanus parvus* (CLAUS), adult female. a, first leg; b, second leg; c, third leg; d, fourth leg, all legs figured from posterior side; e, e', antennule; f, maxillule; g, mandible; h, ventral surface of genital somite. $\times 325$.

Paracalanus intermedius, as figured by SHEN & BAI, has very slender legs (l.c., pl. 2 fig. 15), but so has their specimen of *Paracalanus parvus* (l.c., pl. 2 fig. 10).

In the male of *Paracalanus intermedius* the left fifth foot is described as 7-segmented, whilst the corresponding appendage in *P. parvus* and *P. aculeatus* is 5-segmented. This statement is almost certainly the result of a mistake, originating from the position in which the fifth feet have been figured. The left fifth foot, as in the other males of *Paracalanus*, is 5-segmented.

CYCLOPOIDA

Genus *Oithona* BAIRD, 1843

Oithona simplex FARRAN, 1913

Oithona simplex FARRAN, 1913, p. 187, pl. 29 figs. 10-14, pl. 30 figs. 1, 2; ROSENDORN, 1917, p. 44, fig. 26 a-f; FRÜCHTL, 1923, p. 451; FRÜCHTL, 1924, p. 73; KIEFER, 1929, p. 9; SEWELL, 1947, p. 3; LINDBERG, 1955, p. 466; GRICE, 1960, pp. 220, 222; GRICE, 1960a, p. 488, figs. 12-18; TANAKA, 1960, p. 64, pl. 28 figs. 1-6.

MATERIAL. One adult male specimen of 360 μ total length.

REMARKS. This male specimen agrees completely with the descriptions of this species by ROSENDORN (1917, p. 44), KIEFER (1929, p. 9) and TANAKA (1960, p. 65). *Oithona simplex* is well distributed over the tropical and sub-tropical parts of the Atlantic, Indian and Pacific Oceans.

Oithona spec.

MATERIAL. There are two juvenile specimens of an unidentifiable *Oithona* in the present collection.

HARPACTICOIDA

Genus *Ectinosoma* BOECK, 1865

This genus has been divided by LANG (1944, p. 6) into two subgenera, viz. *Ectinosoma* BOECK, 1865, with the type *Ectinosoma melaniceps* BOECKS, 1865, and *Halectinosoma* LANG, 1944. No distinct type has been indicated for this second subgenus, which is split by LANG (l.c., p. 6) into two groups, the "sarsi" group, with the type *Ectinosoma sarsi* BOECK, 1872, and the "curticornis" group, with the type *Ectinosoma curticorne* BOECK, 1872. The species *Ectinosoma sarsi* BOECK, 1872, is here designated to be the type of the subgenus *Halectinosoma*. Since the publication of LANG's monograph the number of species has increased, so that now the following species can be recognized:

females

males

- subgenus *Ectinosoma* BOECK, 1865
- Ectinosoma melaniceps* BOECK, 1865 *Ectinosoma melaniceps* BOECK, 1865
 (= *Cyclops minuticornis* BAIRD, 1836;
Tachidius minutus CLAUS, 1866;
Tachidius pygmaeus KRIČAGIN, 1873;
Ectinosoma australe BRADY, 1899;
Ectinosoma antarcticum GIESBRECHT, 1902)
- Ectinosoma melaniceps* var. *tuberculata* ROE, 1958 *Ectinosoma melaniceps* var. *tuberculata* ROE, 1958
- Ectinosoma normani* T. & A. SCOTT, 1894 *Ectinosoma normani* T. & A. SCOTT, 1894
- Ectinosoma tenuipes* T. & A. SCOTT, 1894 *Ectinosoma tenuipes* T. & A. SCOTT, 1894
- Ectinosoma compressum* G. O. SARS, 1920
- Ectinosoma obtusum* G. O. SARS, 1920
- Ectinosoma dentatum* STEUER, 1940 *Ectinosoma dentatum* STEUER, 1940
- Ectinosoma tholomiges* JAKOBI, 1954
- Ectinosoma tholophilos* JAKOBI, 1954
- Ectinosoma reductum* BOŽIĆ, 1955
- Ectinosoma conceiroi* JAKOBI & NOGUEIRA, 1960

A new species of the subgenus *Ectinosoma* will be described below as *Ectinosoma acutorostratum* nov. spec., only the female of this species is known. There is one doubtful species which certainly belongs to this subgenus, viz. *Ectinosoma Henneguyi* LABBÉ, 1926, of which the female only has been described.

subgenus *Halectinosoma* LANG, 1944

"sarsi" group

- Ectinosoma Sarsii* BOECK, 1872
- Tachidius abrau* KRIČAGIN, 1877 *Tachidius abrau* KRIČAGIN, 1877
 (= *Bradyi Edwardsi* RICHARD, 1890)
- Ectinosoma Chrystallii* T. SCOTT, 1893
- Ectinosoma propinquum* T. & A. SCOTT, 1894
- Ectinosoma Herdmani* T. & A. SCOTT, 1894
- Ectinosoma armiiferum* T. & A. SCOTT, 1894
- Ectinosoma finmarchicum* T. SCOTT, 1903 (*Ectinosoma finmarchicum* T. SCOTT, 1903)
- Ectinosoma neglectum* G. O. SARS, 1904 *Ectinosoma neglectum* G. O. SARS, 1904
- Ectinosoma elongatum* G. O. SARS, 1904 *Ectinosoma elongatum* G. O. SARS, 1904
- Ectinosoma brunneum* BRADY, 1905
 (= *Ectinosoma clavatum* G. O. SARS, 1920)
- Ectinosoma proximum* G. O. SARS, 1919
- Ectinosoma angulifrons* G. O. SARS, 1919 *Ectinosoma angulifrons* G. O. SARS, 1919

Ectinosoma tenerum G. O. Sars, 1920

Ectinosoma intermedia NICHOLLS, 1939

Ectinosoma littoralis NICHOLLS, 1939

"spinicauda" group

Ectinosoma spinicauda WELLS, 1961

"curticorne" group

Ectinosoma curticorne BOECK, 1872

Ectinosoma curticorne BOECK, 1872

(= *Ectinosoma edwardsi* var. *vitiosa* GAGERN, 1925)

Ectinosoma gothiceps GIESBRECHT, 1881

(= *Ectinosoma pygmaeum* T. & A. SCOTT, 1894)

Ectinosoma Barroisi RICHARD, 1894

Ectinosoma Barroisi RICHARD, 1893

Ectinosoma mixtum G. O. Sars, 1904

Ectinosoma brevirostre G. O. Sars, 1904

Ectinosoma distinctum G. O. Sars, 1920

Ectinosoma concinnum AKATOVA, 1935

Ectinosoma concinnum AKATOVA, 1935

The following species are insufficiently known and must be considered as species incertae:

Ectinosoma melaniceps var. T. SCOTT, 1912

Ectinosoma Scotti BRADY, 1910

Ectinosoma gracilicorne BRADY, 1910

Ectinosoma major OLAFSSON, 1917

Ectinosoma arcticum OLAFSSON, 1917

Ectinosoma veili L'ABBÉ

Ectinosoma weisii SMIRNOV, 1932.

There are, moreover, three nomina nuda: *Ectinosoma curvifrons* G. O. Sars, 1927; *Ectinosoma porrectum* G. O. Sars, 1927; *Ectinosoma ischium* G. O. Sars, 1927.

The species *Ectinosoma spinicauda*, recently described by WELLS (1961, p. 264, fig. 1), though it shows affinities with the "sarsi" group, differs in the setal formulae of the legs and has been placed here in a separate group.

Key to the species of the subgenus *Ectinosoma* BOECK:

1. Exopodite of leg 5 with a distinct tubercle at the internal margin 2
- Exopodite of leg 5 without tubercle, but occasionally with a slit at the internal margin 6
2. Second seta of exopodite of leg 5, counted from external margin inwards, very small and scarcely developed *E. (Ectinosoma) obtusum* G. O. Sars
- Second seta of exopodite of leg 5, counted from external margin inwards, distinctly visible, though occasionally smaller than the remaining setae 3
3. External appendage of baso-endopodite of leg 5 setiform 4
- External appendage of baso-endopodite of leg 5 more or less broadened, lancet-shaped 5

4. Rostrum triangular and hyaline, produced forward
..... *E. (Ectinosoma) acutorostratum* nov. spec.
- Rostrum normally developed, curved, scarcely visible from above
..... *E. (Ectinosoma) tenuipes* T. & A. SCOTT
5. Antennules 7-segmented *E. (Ectinosoma) dentatum* STEUER
- Antennules 8-segmented *E. (Ectinosoma) couceiroi* JAKOBI & NOGUEIRA
6. Second seta of exopodite of leg 5, counted from external margin inwards,
flattened and distinctly lancet-shaped *E. (Ectinosoma) tholophilos* JAKOBI
- Second seta of exopodite of leg 5, counted from external margin inwards,
fine, slenderer than remaining setae 7
7. External appendage baso-endopodite of leg 5 lancet-shaped or very short and
flattened 8
- External appendage of baso-endopodite of leg 5 setiform 10
8. Setal formula of exopodite of leg 3 is 222 *E. (Ectinosoma) reductum* BOŽIĆ
- Setal formula of exopodite of leg 3 is 323 9
9. Setal formula of exopodite of leg 4 is 322 ... *E. (Ectinosoma) tholomiges* JAKOBI
- Setal formula of exopodite of leg 4 is 323 ... *E. (Ectinosoma) melaniceps* BOECK
10. Antennules 6-segmented. Internal and external seta of exopodite of leg 5 of
nearly the same length *E. (Ectinosoma) compressum* G. O. SARS
- Antennule 7-segmented. Internal seta of exopodite of leg 5 shorter and
slenderer than external seta *E. (Ectinosoma) normani* T. & A. SCOTT

The setal formulae of the various species of the subgenus *Ectinosoma*¹, as far as these are properly known, have been tabulated below.

Species	P ₁		P ₂		P ₃		P ₄	
	Endop.	Exopod.	Endop.	Exopod.	Endop.	Exopod.	Endop.	Exopod.
<i>E. melaniceps</i> BOECK	1.1. 221	0.1. 123	1.1. 221	1.1. 223	1.1. 221	1.1. 323	1.1. 221	1.1. 323
<i>E. tenuipes</i> T. & A. SCOTT	1.1. 221	0.1. 123	1.1. 221	1.1. 223	1.1. 221	1.1. 223	1.1. 221	1.1. 222
<i>E. dentatum</i> STEUER	1.1. 221	0.1. 123	1.1. 221	1.1. 223	1.1. 221	1.1. 322	1.1. 221	1.1. 322
<i>E. tholomiges</i> JAKOBI	1.1. 221	0.1. 123	1.1. 221	1.1. 223	1.1. 221	1.1. 323	1.1. 221	1.1. 322
<i>E. tholophilos</i> JAKOBI	1.1. 221	0.1. 222	1.1. 221	1.1. 322	1.1. 221	1.1. 223	1.1. 221	1.1. 322
<i>E. reductum</i> BOŽIĆ	221	222	221	223	221	222	221	223
<i>E. couceiroi</i> JAKOBI & NOGUEIRA	1.1. 221	0.1. 123	1.1. 221	1.1. 223	1.1. 221	1.1. 322	1.1. 221	1.1. 322

E. (Ectinosoma) couceiroi JAKOBI & NOGUEIRA, 1960, has many points in common with *E. (Ectinosoma) dentatum* STEUER. It has the same setal formulae, almost the same structure of leg 5 and the same general shape of the body. It differs in the segmentation of the antennule, which is 8-segmented in *E. couceiroi* and 7-segmented in *E. dentatum*, whilst the dorsal and lateral spinules are apparently absent in *E. couceiroi*. These spinules, however, are very easily removed

and when actually present they are easily overlooked. Both species may very well turn out to be identical.

In the description of *E. (Ectinosoma) reductum* Božić has shifted the setal formulae of exo- and endopodites, whilst his figure 5 represents the exopodite of leg 4 and not the endopodite of that leg as is wrongly stated in the explanation. Božić states that his *E. reductum* has the same setal formulae as *E. normani* from the Heligoland area (as described by KLIE, 1949, p. 103), while LANG (1948, p. 203) distinctly states that in *E. normani* the setal formulae are as in *E. melaniceps*, which would involve that they are also different from those of *E. reductum* as described by Božić.

***Ectinosoma acutorostratum* nov. spec.**

(figs. 3, 4)

MATERIAL. One adult female of 305 μ total length (holotype). This specimen has been dissected and the appendages have been mounted. The slides are in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

DESCRIPTION OF THE HOLOTYPE. Adult female, total length 305 μ ; greatest diameter 95 μ , length of longest furcal seta 150 μ .

The general shape of the body is very slender and almost cylindrical, with a scarcely indicated division between the cephalothorax and the abdomen (fig. 3a, b). The cephalothorax, including the rostrum but minus the fifth thoracic somite, is 1.5 times as long as the rest of the body. The greatest diameter is found at the end of the cephalic somite; this diameter remains uniform until the genital complex is reached, caudally of this part of the body it narrows very gradually.

The head and the first thoracic somite are fused to form the cephalic somite, this, with the rostrum, is as long as the combined lengths of thoracic somites 2 to 5. The cephalic somite has a gradually curved back, running imperceptibly into the very prominent rostrum; in dorsal aspect the anterior part of the cephalic somite, near the rostral base, is uniformly rounded (fig. 3b). There are two threadlike spinules at the distal end of the cephalic somite, one on each side of the mid-dorsal line. The rostrum is a hyaline, triangular plate with a fairly sharp apex, pointing forward and slightly downwards, its basal part covers the first segment of the antennules. This hyaline rostrum, the exact structure of which appears quite clearly from the figures, is a very prominent feature of the body in its dorsal aspect. The sides of the cephalic somite are scarcely produced, the latero-ventral apices are rounded. The thoracic somites 2 to 4 have the same length, their epimeral plates are slightly produced and hyaline, covering a part of the coxae of legs 2 to 4. They are slightly produced caudally and rounded. The fifth thoracic somite has a sinuous outline; its shape appears from fig. 3c. This 5th thoracic somite is distinctly visible in both lateral and dorsal aspects.

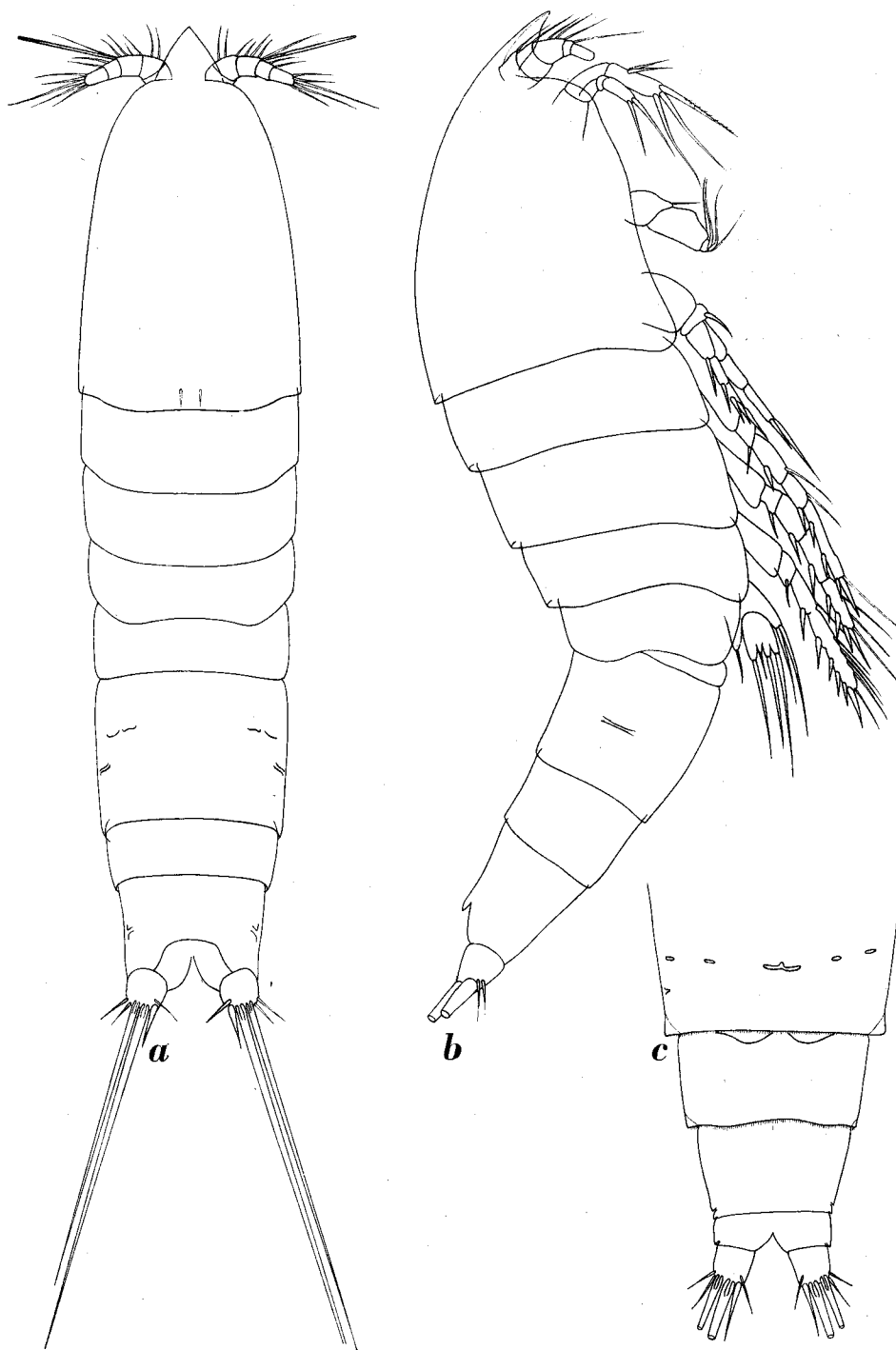


Fig. 3. *Ectinosoma acutorostratum* nov. spec., adult female, holotype. a, whole animal, dorsal view; b, whole animal, lateral view from right side; c, abdomen, ventral surface. $\times 325$.

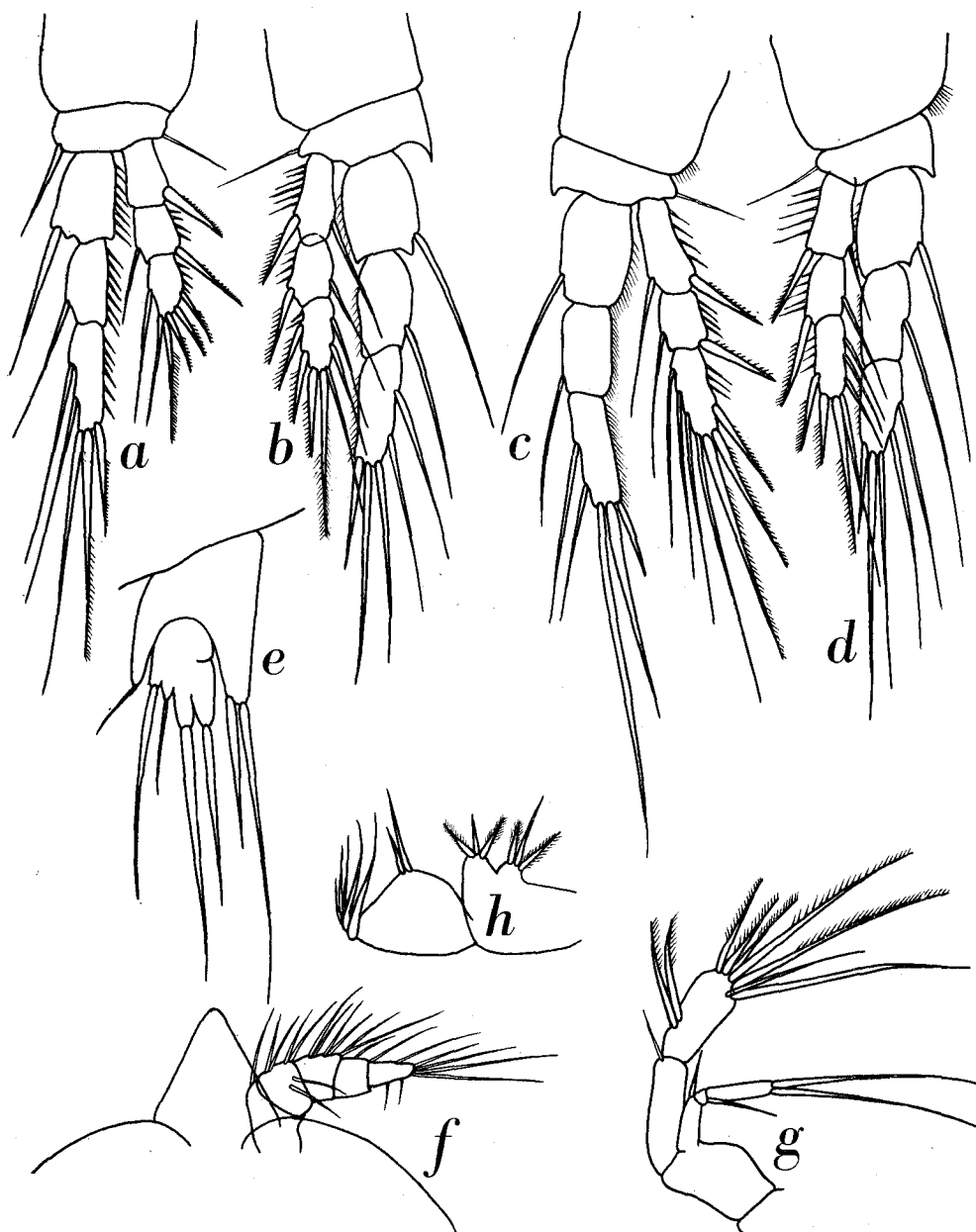


Fig. 4. *Ectinosoma acutorostratum* nov. spec., adult female, holotype. a, first leg; b, second leg; c, third leg; d, fourth leg; e, fifth leg; f, rostrum and antennule, dorsal view; g, antenna. $\times 625$.

The first and second abdominal somites are fused to form the genital complex; the line of fusion is marked by chitinized patches visible in both lateral and dorsal view. In addition there is, on each side, a chitinized ridge caudally of the above mentioned patches at the line of fusion; the positions of these ridges are seen in fig. 3c. The ventral aspect of the genital complex too is illustrated in fig. 3c. The fourth and fifth abdominal somites are more or less completely fused; a line of fusion is very indistinctly visible in the preparation of the abdomen, while in the intact animal there is an incision of the sides of the anal complex indicating the former articulation. The anal plate is very indistinctly visible; it appears to be broad and slightly curved. The ventral distal borders of the genital complex and the third abdominal somite are lined with very fine spinules.

The furcal rami are squarish and almost as long as wide. Each ramus has 5 marginal setae and one appendicular seta. Seta 4 and the appendicular seta are fine and short; the appendicular seta inserting close to the median wall of each ramus. Seta 1 is shaped as a fairly strong, short spine; seta 5 too is spiniform but very slender; this seta is placed some distance from the caudal end of the furca and appears to insert on the dorsal wall of each ramus, so that its position is not altogether marginal. Setae 2 and 3 are lengthened and thickened, especially seta 2.

The antennules are very short and 5-segmented; their length is about one third of that of the cephalic somite. The setation is represented in fig. 4f.

The antenna (fig. 4g) has a long, 3-segmented exopodite, with 1 seta on the first, 1 on the second and 2 on the third segment. The basis and the first endopodal segment are separate, the first endopodal segment has a single apical seta. The second endopodal segment has 2 internal and 6 marginal setae, all setae, with the exception of 2 of the marginal setae, are strongly spinulose.

I failed to obtain suitable preparations of the oral parts of this small species, with the exception of the maxilla, which is figured here (fig. 4h). The praecoxa and coxa are well developed; the basis is much reduced and an endopodite is absent. The praecoxa has two distinct endites, each with 3 setae. The basis has a medial, swollen part, which may represent one of the endites, bearing 2 setae. There are 5 more setae inserting on a small segment apparently representing the basis.

The characters of the legs 1 to 4 can best be taken from the drawings (fig. 4a-d) and from the setal formulae:

	endopodite	exopodite
leg 1	1. 1. 221	0. 1. 123
leg 2	1. 1. 221	1. 1. 223
leg 3	1. 1. 221	1. 1. 322
leg 4	1. 1. 221	1. 1. 322

The external marginal spines and the terminal spines of the exopodites are strongly spinulose.

The baso-endopodite of leg 5 reaches along three-fourth the length of the exopodite and carries two setae of unequal length, the external seta being about half the length of the median seta. The exopodite is about twice as long as broad and carries 4 marginal setae, the development of which appears from fig. 4e. The second seta counted from the external border inwards is small but still distinctly developed. The upper third of the exopodite has a small tubercle near the internal wall.

REMARKS. This new species resembles *Ectinosoma dentatum* STEUER in many particulars and at first I was inclined to consider it simply a variety of this species, which was found to occur plentifully in the sand at Ifaluk atoll, Caroline Islands. The material of *Ectinosoma dentatum* which I have seen in the Ifaluk collection, though it varies in the number of spinules on the back, is quite uniform in the development of the rostrum and none of the many specimens which I could study approached the condition observed here. Moreover, the fifth leg on dissection proved to show a different structure (in *E. dentatum* the external seta on the baso-endopodite is lancet-shaped), so that I have thought it advisable to describe it as a new species. Unfortunately no further specimens than the holotype have come under observation.

Genus *Harpacticus* MILNE EDWARDS, 1840

Harpacticus compsonyx MONARD, 1926

(figs. 5, 6)

Harpacticus compsonyx, KLIE, 1941, p. 11; LANG, 1948, p. 332, fig. 152 no. 5; MARCUS & PÓR, 1960, p. 146, pl. 1 figs. 1-7.

MATERIAL. On adult female, 405 μ total length. This specimen has been dissected and the appendages mounted; the slides are in the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

DESCRIPTION. Adult female, total length 405 μ , of which 255 μ for the cephalothorax (including the fifth thoracic somite) and 155 μ for the abdomen. The general shape of the body is fairly slender, with the division between cephalothorax and abdomen well marked (fig. 5a). The cephalothorax is oblong-ovate, with the greatest diameter at the end of the cephalic somite. The head and the first thoracic somite are fused to form the cephalic somite, this somite is particularly characterized by the rounded line of the back and the rounded sides (fig. 5b). The rostrum is scarcely visible from above, only the rostral base can then be observed, separated from the somite by a distinct groove; it points downwards. The thoracic somites 2 to 4 have about the same length, the epimeral

plates are rounded. The dorsal part of the distal wall of each somite is slightly produced backward. The fifth thoracic somite is scarcely visible dorsally and laterally.

The abdominal somites 1 and 2 are fused to form the genital complex, which has about the same length as width. In dorsal view the complex is barrel-shaped, with a distinct internal chitinized ridge to mark the line of fusion between its two composing somites. Fine spinules occur along the distal wall of the complex and near the line of fusion, in the last instance they are restricted to the sides of the somite. Somites 2 and 3 have about the same length and each have a row of fine spinules along the distal margin. The anal somite, which has about the same length as each of the preceding somites, is nude; the anal plate is small. The furcal rami are slightly wider than long; the dorsal surface of each ramus is produced into a point bearing a seta. There are, on each ramus, an appendicular seta and 5 marginal setae. The appendicular seta and setae 1, 4 and 5 are small; seta 4 occurs on the apex of the triangularly produced dorsal wall of each ramus. Setae 2 and 3 are lengthened and thickened, particularly seta 2, which surpasses the length of the abdomen. In addition there are some spinules on the furcal rami (fig. 5c).

The antennules are 9-segmented and slightly shorter than the cephalic somite. The setation is represented in fig. 6f; segment 4 has a short, conical prolongation bearing an aesthetask and 2 setae.

The antenna (fig. 6g) has an allobasis and a 2-segmented exopodite. Segment 1 of the exopodite has 2, segment 2 has 4 setae, one of which is small. The endopodite has 7 marginal appendages, of which 3 are heavy, crenulated spinules and 4 are geniculate setae.

The mouthparts, with the exception of the maxillipedes, have not been studied in detail.

The maxillipede (fig. 6h) has a long, slender coxa. The basis is deeply concave; the concavity is bridged by a hyaline lamella and partly bordered with slender spines. In addition there is a fine spinule at the external wall. The endopodite is shaped like a strong, curved claw, composed of two fused segments; the apex of the claw reaches the highest part of the basis and an additional seta occurs on the claw near the fusion between both composing segments.

The coxa and basis of the first leg (fig. 6a) are well developed; the basis has an external spine and an internal seta. Both endo- and exopodite are 2-segmented. Both segments of the exopodite are elongated and have a small external seta each. There are 3 terminal claws on the exopodite, that are all heavily crenulated. There is a fine seta near the base of the spines. The first endopodal segment is elongated and reaches slightly beyond the articulation between exopodal segments 1 and 2. The second endopodal segment is small and carries a very heavy, crenulated claw and a thick, geniculate seta. There are 2

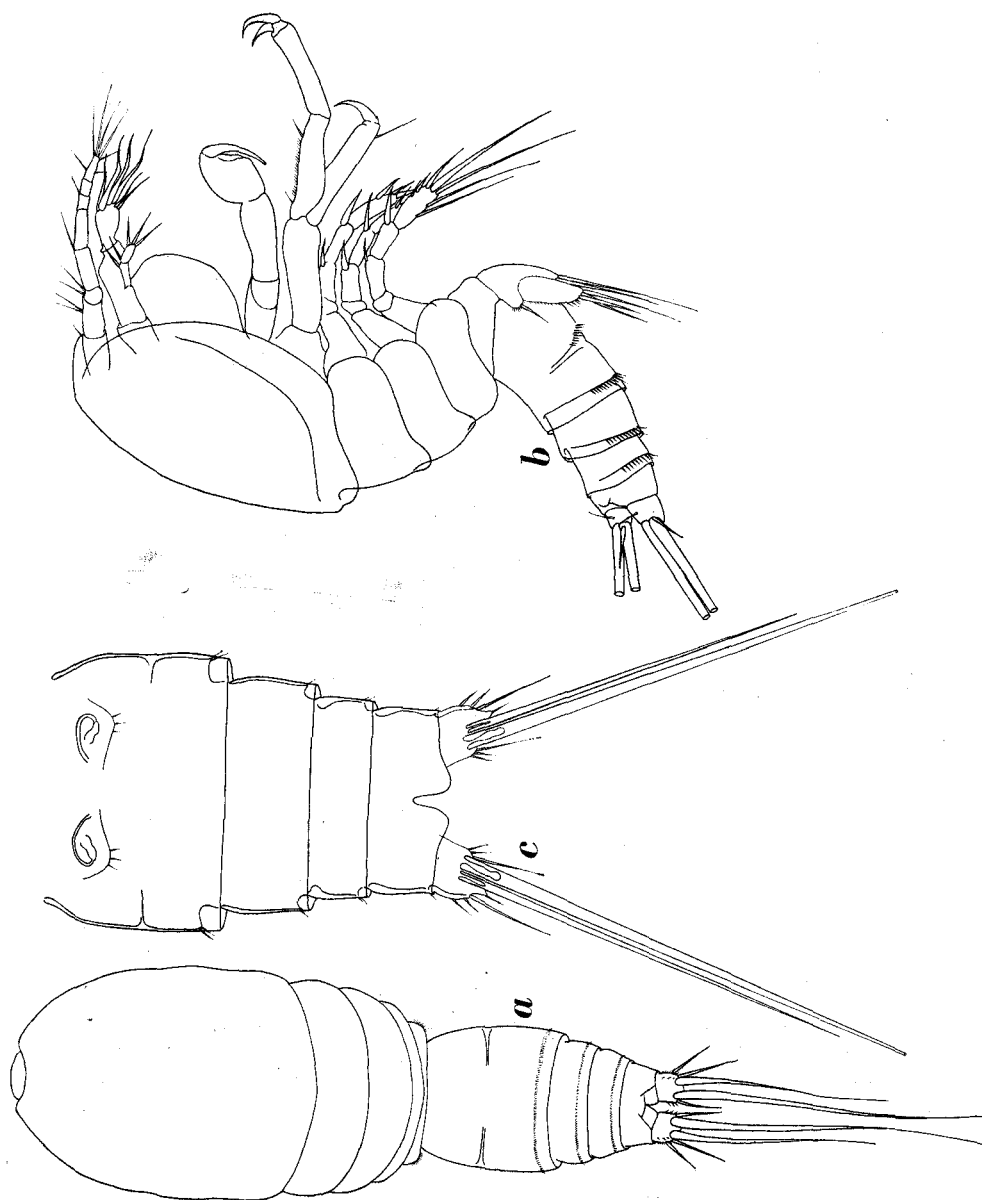


Fig. 5. *Harpacticus compsonyx* MONARD, adult female. a, whole animal, dorsal view; b, whole animal, lateral view from right side; c, abdomen, ventral surface. a, b, $\times 200$; c, $\times 325$.

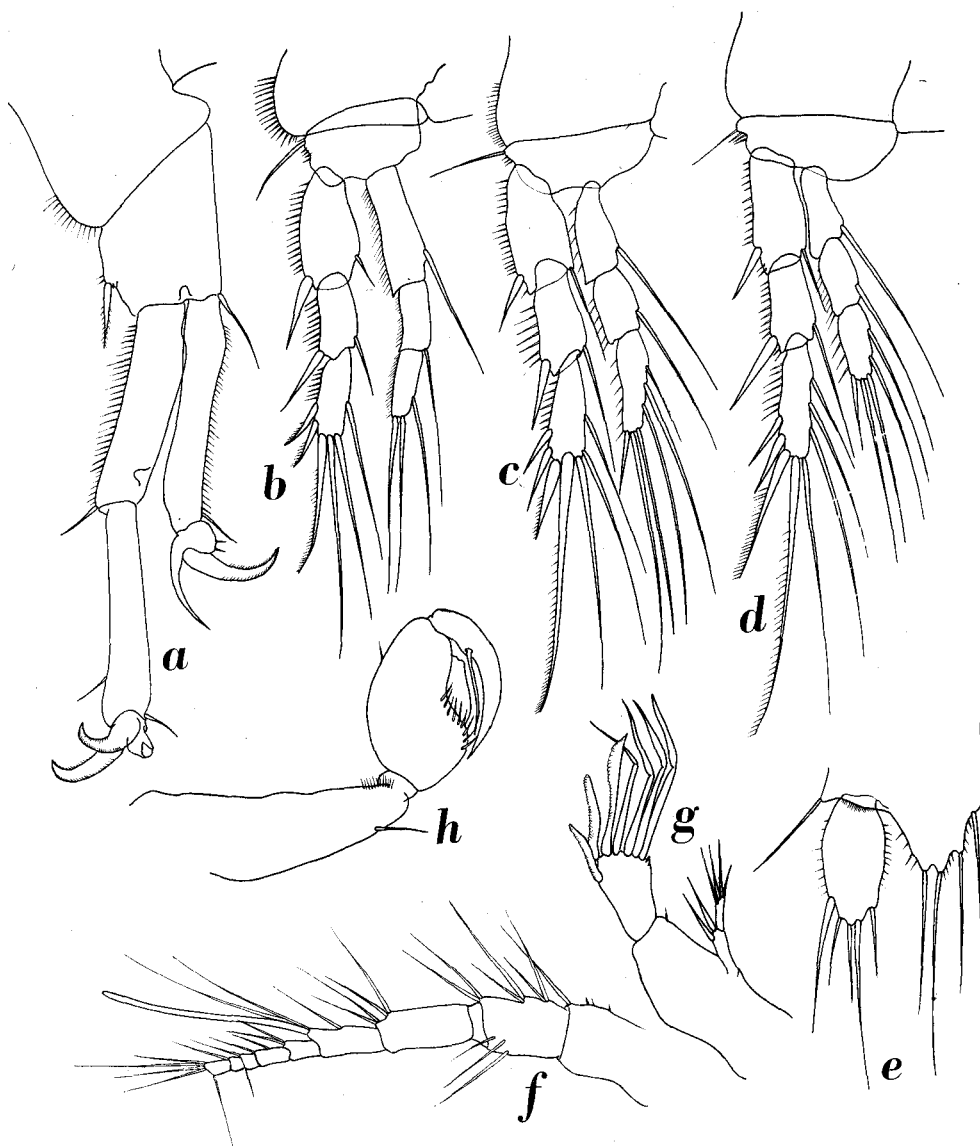


Fig. 6. *Harpacticus compsonyx* MONARD, adult female. a, first leg; b, second leg; c, third leg; d, fourth leg; e, fifth leg; f, antennule; g, antenna; h, maxillipede. $\times 420$.

fine but distinct spinules on the second endopodal segment, none of which is turned upwards.

The particulars of the legs 2 to 4 appear from the fig. 6b-d, and the setal formulae:

	endopodite	exopodite
leg 2	1. 1. 120	(1). 1. 123
leg 3	1. 1. 321	1. 1. 223
leg 4	1. 1. 221	1. 1. 323

The internal seta of the first exopodal segment of leg 2 is very small and scarcely visible.

The exopodite of leg 5 (fig. 6e) is well developed and oblong-ovate, twice as long as wide. There are 5 marginal setae, the distribution of which appears from fig. 6e. The baso-endopodite reaches halfway along the exopodite and has 4 distinct setae. The external lobe is distinct and has a fine seta. In addition spinules border the margins of both exopodite and baso-endopodite.

REMARKS. The present specimen agrees with the description of the typical form of this species given by LANG (1948, p. 332) and MARCUS & PÓR (1960, p. 146). The three strong spines on the endopodite of the antenna have strongly crenulated edges, just as figured by MARCUS & PÓR (l.c., pl. 1 fig. 1). The area of distribution of this species includes a number of localities in the western Mediterranean (LANG, 1948), whilst it has also been recorded from the Aegean Sea (BRIAN, 1928) and the Black Sea (MARCUS & PÓR, 1960). The present record is the first from the Pacific Ocean.

Genus *Tisbe* LILLJEBORG, 1853

The present collection contains some specimens of an apparently new species. Though the distinction between the various species of this genus is usually very complicated and the construction of a satisfactory key almost impossible, I have compared my new form with the descriptions of the various members of the genus *Tisbe*. I have found it to be quite distinct from the species listed below, though apparently related to *Tisbe elegantula* G. O. SARS, a species of which the female only is known.

The genus *Tisbe* (type species *Cyclops furcatus* BAIRD, 1837) at present comprises the following species and varieties:

females	males
<i>Cyclops furcatus</i> BAIRD, 1837	<i>Cyclops furcatus</i> BAIRD, 1837
	(= <i>Idya barbiger</i> PHILIPPI, 1843,
	<i>Tisbe pontica</i> KRIČAGIN, 1873;
	<i>Zaus adversipes</i> KRIČAGIN, 1873)

Tisbe acanthifera nov. spec.

(figs. 7-9)

MATERIAL. 3 adult females, 0.87, 0.98 and 1.04 mm length. The female of 0.98 mm length has been chosen as the holotype; this specimen has been figured, dissected and the appendages mounted on slides (collection Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands). The two remaining female specimens are the paratypes, one of which (1.04 mm length) has been deposited in the collection of the Ôsaka Museum, the smaller paratype (0.87 mm length) is in the collection of the Rijksmuseum van Natuurlijke Historie. In addition there is a male allotype of 0.68 mm length, which has also been dissected and mounted; this specimen too is in the collection of the Rijksmuseum van Natuurlijke Historie.

DESCRIPTION OF THE HOLOTYPE. Adult female, total length 0.98 mm. Length of cephalothorax 630μ , length of abdomen 345μ , length of the longest furcal seta 525μ . Greatest diameter of the cephalothorax 260μ .

The general shape of the body differs from the generally accepted type in this genus by the structure of the cephalothorax, which is only slightly compressed dorso-ventrally. In dorsal view the cephalothorax is oblong-ovate, with the greatest diameter at the end of the cephalic somite (fig. 7a); in lateral view the epimeral plates of the thoracic somite are only slightly produced (fig. 7b). The head and the first thoracic somite are fused to form the cephalic somite; this, in dorsal view, is about as long as wide and shows a distinctly produced part between the antennular bases. In lateral view the cephalic somite shows a gently curved back, running into the bluntly pointed rostral prominence. The lateral parts of the cephalic somite are produced so as to form rounded lappets covering the basal parts of the oral appendages. The thoracic somites 2 to 4, in dorsal aspect, gradually diminish in width; somites 2 and 3 have about the same length, but the fourth is only half as long as 2 or 3. The fifth thoracic somite is very narrow and is just visible in dorsal view.

The genital somite of the abdomen is composed of the fused abdominal somites 1 and 2; it has the same length as the rest of the abdomen. Abdominal somites 1 and 2 are still separated by a distinct lateral and dorsal suture bordered by fine spinules. A completely closed row of spinules runs along the distal portion of the second abdominal somite. Abdominal somites 3 and 4 have the same length; both have, on their distal portion, a row of fine spinules. This row is interrupted on the dorsal surface of the fourth abdominal somite, but here the extreme distal margin of the somite carries a number of distinct spines, directed caudally. The fifth or anal somite is small, the anal plate is rounded and nude. The furcal rami are conical and exactly as long as their width at the base. Each ramus has five marginal and one appendicular (dorsal) seta. Setae 1 and 4 have about the same length; seta 1 is perfectly straight and reaches half

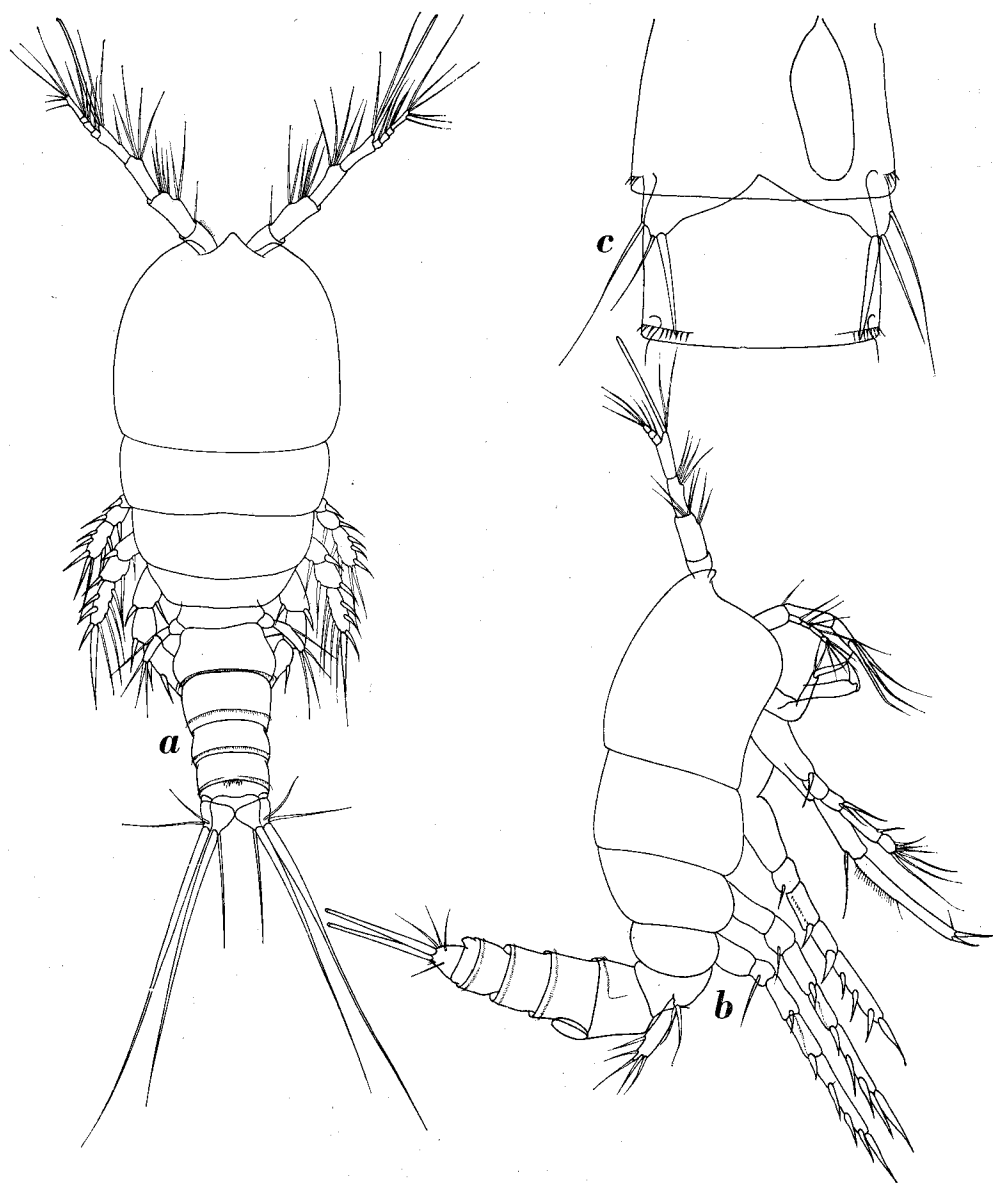


Fig. 7. *Tisbe acanthifera* nov. spec. a, b, adult female, holotype; a, whole animal, dorsal view; b, whole animal, lateral view from right side. c, adult male, allotype, first and second abdominal somites in ventral view. a, b, $\times 75$; c, $\times 235$.

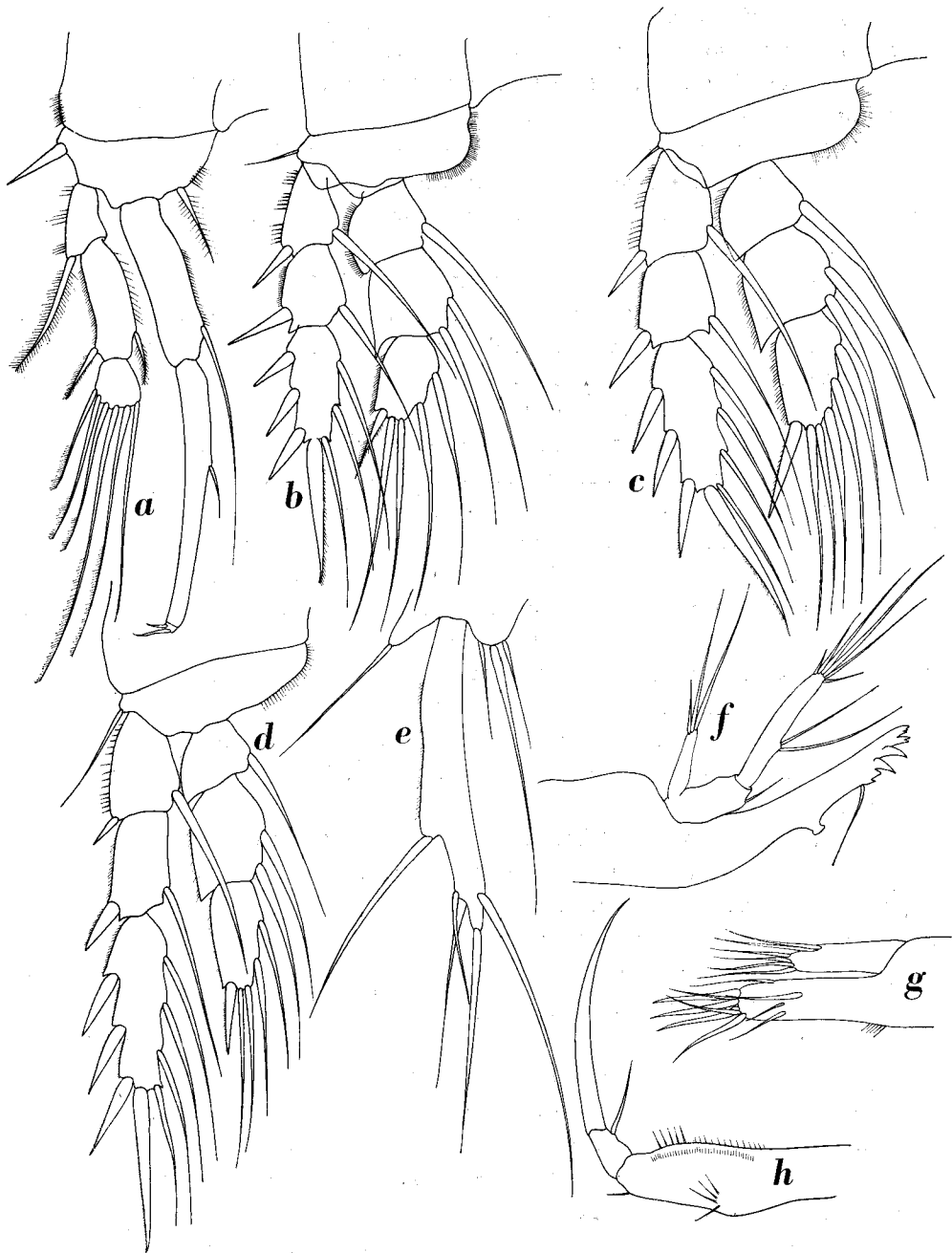


Fig. 8. *Tisbe acanthifera* nov. spec., adult female, holotype. a, first leg; b, second leg; c, third leg; d, fourth leg; e, fifth leg; f, mandible; g, maxillule; h, maxillipede. a-d, $\times 200$; e-h, $\times 325$.

the length of the abdomen. Setae 2 and 3 are lengthened and thickened, the third is slightly longer than the second, which reaches half the length of the abdomen. Seta 5 is a small seta inserting halfway along the external margin of each furcal ramus.

In lateral aspect this species is furthermore characterized by the long and slender antennules, the long and slender legs 1 to 4 and the very slender exopodite of leg 5. In the holotype a small spermatophore is attached to the genital area of the genital complex (fig. 7 b, c).

The antennules (fig. 9a) are long and slender, especially the segments 2 to 4, segment 1 is only slightly shorter. The fourth segment has a distinct conical process bearing a thick aesthetascer and 2 setae. Segments 5 to 6 are short, the seventh segment again is lengthened. The shape of the antennular segments and the setation appear from fig. 9a.

The antennal basis has a single internal seta; the exopodite is long and slender. There are 4 exopodal segments, the first to third with one seta each, the fourth with three setae. The two segments of the endopodite are separate; the first has a single internal seta, the second segment has one short, hooked seta at the internal margin and 6 apical setae, 4 of which are geniculate (fig. 9b).

The mandible has a very big praecoxal masticatory process; the arrangement of the teeth along the cutting edge appears from fig. 8f, in addition there is a fine seta and a distinct knob along the internal margin. Coxa and basis are fused, the complex bears a single seta. The endo- and exopodite are both 1-segmented, but the endopodite is much longer than the exopodite and carries two setae halfway along its internal margin and 6 setae at the apex. The exopodite has a total of 3 setae.

The maxillule has a well developed, more or less conical arthrite with a total of 9 appendages, of which 4 are developed as strong marginal teeth. The arrangement of the appendages appears from fig. 8g. The whole rest of the maxillule is shaped as a short, conical process, which in my preparation is in such a bad position that I cannot possibly give the number of its setae; the number represented in the drawing (fig. 8g) is too small.

The praecoxa and the basis of the maxilla are fused to form a big segment, bearing a single seta (or a slender endite with a coalescent seta). The basis has a big endite, coalescent with a strong, curved spine, at the base of which there is a smaller seta. There is no trace of an endopodite (fig. 9c).

The maxillipedes are big, prehensile organs. The coxa is short and has a single apical seta. The basis is fairly big; at the middle of the external margin there is a coronula of spinules, the internal margin has a longitudinal row of spinules. The first endopodal segment is short and has a single seta. The rest of the endopodite is claw-shaped and only indistinctly separated from the first segment; curved against the basis it just reaches its base (fig. 9c).



Fig. 9. *Tisbe acanthifera* nov. spec. a-c, adult female, holotype; a, antennule; b, antenna; c, maxilla. d-i, adult male, allotype; d, abdomen, lateral view from right side; e, endopodite of leg 1; f, endopodite of leg 2; g, antennule; h, maxilla; i, maxillipede. $\times 325$.

The coxa of leg 1 is externally haired. The basis is small; it has a strong external spine and a spinulose internal seta. Both exo- and endopodites are 3-segmented. The endopodite is long and graceful, the jointing between segments 1 and 2 is at the same level as that of the exopodal segments 2 and 3. The first endopodal segment is 4 times as long as wide and has a very long internal seta almost at the end of the internal margin. The second endopodal segment is 1.5 times as long as segment 1 and 9 times as long as wide; a fine, short seta inserts some distance above the middle of the internal margin. The third endopodal segment is very small and carries 2 short, nude spines of unequal size. The first exopodal segment has a strong external spine and no internal seta. The second exopodal segment is 1.5 times as long as the first and 3 times as long as wide; it has a short external spine and a small internal seta. The third exopodal segment has a total of 6 marginal appendages, 5 of which are in shape of bristles with an apical brush of stiff hairs. The whole structure of leg 1 appears from fig. 8a.

The structure of legs 2 to 4 appears from fig. 8a-c, the notes and the setal formulae:

	endopodite	exopodite
leg 2	1. 2. 221	1. 1. 223
leg 3	1. 2. 321	1. 1. 323
leg 4	1. 2. 221	1. 1. 323

The external borders of the endopodal segments are haired. The external margin of the first exopodal segment is spinulose, that of the second exopodal segment set with short, stiff hairs.

The endopodite of leg 2 (fig. 8b) is only slightly shorter than the exopodite.

The endopodite of leg 3 (fig. 8c) appears to be more strongly flattened than that of legs 2 or 4. The apex of the endopodite reaches two-thirds the length of exopodal segment 3.

The apex of the endopodite of leg 4 (fig. 8d) reaches the middle of the third exopodal segment.

The fifth legs are striking because of the great length of the exopodite, which is 7 times as long as the greatest diameter. The structure appears clearly from fig. 8e; there are 4 apical setae, one of which is placed on a distinct socle. In addition there is a seta at the external margin, placed at a distance of two-thirds the external margin from the base. The proximal part of the external margin is haired. There is a distinct external lobe on the baso-endopodite, bearing a strong seta. The baso-endopodite is a short, rounded lobe, bearing 3 setae, viz. two fine, short setae flanking a greatly developed median seta, which reaches about the same length as the exopodite.

DESCRIPTION OF THE ALLATYPE. Adult male, total length 680 μ . Total length of the cephalothorax (including the fifth abdominal somite) 405 μ , length of the

abdomen 275 μ . Greatest diameter of the cephalothorax 110 μ , the furcal setae are damaged and could not be measured. This specimen will not be described in detail because of its great resemblance with the female.

The general shape of the body is almost exactly as that of the female; it is, however, smaller and shows the following differences.

The abdomen (fig. 9d) has the first and second somites separate. There is a row of spinules on the distal part of the first abdominal somite, visible on the dorsal and lateral parts of the somite; it does not continue ventrally but terminates some distance above the well developed sixth feet. On the distal parts of the second, third and fourth abdominal somites the row of spinules is completely closed. In addition some large spinules occur at the extreme distal end of the fourth somite, to the left and right sides of the median line. The development of the furca is just as in the female.

The antennules are haplocerate, with an extra segmentation in the third and fourth segments. The conical process, usually found on the fourth segment, here is placed on a separate little segment; at the apex of the cone a swollen, sausage-shaped aesthetasc inserts; in addition there are two flanking setae. The setation of the antennule is represented in fig. 9g.

The antenna and the mouthparts are as in the female, with the exception of the maxilla and the maxillipede. The basal endite of the maxilla, as in the female, is well developed and coalescent with a big, curved spine; there are, at the base of that spine, two fine setae. There is no jointing between the praecoxa and the coxa; two fine setae occur at the distal end of the coxa (fig. 9h).

The basis of the maxillipede is distinctly swollen distally and set with a row of spiniform hairs. The endopodite is distinctly 2-segmented, the distal segment is spiniform and produced into a tooth at the base. There are no additional setae on the endopodite and the coxa too appears to be devoid of setae (fig. 9i).

There is a small difference in the shape of the first endopodal segment of leg 1; a distinct tubercle occurs on the internal margin some distance above the insertion of the internal seta (fig. 9e).

The endopodite of leg 2 is characterized by the presence of a modified internal seta on the first endopodal segment. The seta is shaped as a large dagger with a slightly curved apex and a small additional tooth (fig. 9f).

The fifth foot has the same number and arrangement of setae as in the female, but the appendage is much shorter, reaching along one-third the length of the genital somite. Only two setae were observed on the baso-endopodite, the large median seta present in the female is either absent in this sex or removed as the result of damage in my male specimen (fig. 9d).

The sixth feet (genital flaps) are well developed in the male of this species (figs. 5, 7c, 9d); each foot has a strong, dagger-shaped internal spine and 2 fine lateral setae. A fairly small, elongated-oval spermatophore is visible in the genital somite (fig. 7c).

REMARKS. On comparison of this new species with the existing descriptions I find that it has many characters in common with *Tisbe elegantula* (G. O. Sars, 1905). The most striking difference with this species is in the shape of the cephalothorax: the rostral portion in the present new species is distinctly set off from the rest of the cephalic somite, but in *Tisbe elegantula* the outline of the cephalic somite, in dorsal view, is uninterrupted, so that the frontal part of the head is smoothly curved into the bluntly pointed rostral prominence. There are additional differences in the insertion of the setae on leg 1 and the shape of the exopodite of leg 5. An additional difference is observed in the setation of the baso-endopodite of leg 5; in *Tisbe elegantula* the external seta of the set of three is very small and the remaining two have about the same length. In *Tisbe acanthifera* the median seta of this set is greatly lengthened and much stronger than in- and external setae. According to Sars (1905, p. 93) the first two abdominal segments are fused and the line of fusion is only marked laterally. Here such a suture is very prominent and marked by the presence of a row of spinules. The spinules at the distal borders of the abdominal somites are also missing in *Tisbe elegantula*, as are also the big spines at the end of abdominal somite 4. The furcal rami, in *Tisbe acanthifera*, are more conical than those of *Tisbe elegantula* appear to be (Sars, l.c., pl. 54 fig. 2).

The specific name "*acanthifera*" refers to the presence of spinules on the abdomen.

Genus *Rhynchothalestris* G. O. Sars, 1905

Rhynchothalestris rufocincta BRADY, 1880

(figs. 10, 11)

Rhynchothalestris rufocincta, SEWELL, 1940, pp. 184, 353, 357, 361, 363, 366, 367, 370, 372, 373, 374, 375; NICHOLLS, 1944, p. 489; DAHL, 1948, p. 95; LANG, 1948, p. 523, fig. 214 no. 2; Marine Biological Association, 1957, p. 166; ROE, 1958, p. 228; ROE, 1960, p. 279.

Rhynchothalestris similis A. SCOTT, 1909, p. 215, pl. 62 figs. 6-11; SEWELL, 1940, p. 185, figs. 24, 25.

MATERIAL. One adult male of 750 μ length. This specimen has been dissected and the appendages mounted; all slides are now in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

REMARKS. Though I have made complete drawings of this male specimen I refrain from giving a complete description of this fairly well known form. On comparison of my drawings with the figures of the male presented by Sars (1905, pls. 73, 74) I find only few differences, which I have recorded in the following notes:

The general shape of the body approaches Sars' figures of the female very closely, but the rostrum, in dorsal view, is distinctly broader at its base (fig. 10a).

The abdomen is distinctly hirsute and in this respect approaches the condition found in *Rhynchothalestris similis* A. SCOTT, 1909 (pl. 62 fig. 6). The spine on the furcal rami, which SARS figures between setae 4 and 5, is also present in my specimen, where it is a conspicuous furcal structure, but seta 4 is absent (apparently broken) and seta 5 is short. There is an oblique row of spinules on the anal somite (fig. 10a) but the insertion of the furcal rami is nude.

The antennules (fig. 10f) are almost exactly as figured by SARS, though there is a small difference in the number of setae. As my specimen was very dirty some setae may have been obscured in my preparation.

The antennae (fig. 11e) are identical with those figured by SARS.

No differences occur in the structure of the mandibular palp (fig. 11f) between my specimen and that figured by SARS, but the shape of the teeth along the praecoxal cutting edge is different; in the male there are 5 teeth of which the basal four are leaf-shaped.

There is no difference in the number of setae on the arthrite and endites of the maxillule, though the articulation between the various segments in my specimen is exceedingly obscure (fig. 11g).

The maxilla (fig. 11h) is exactly as figured by SARS.

The maxillipede (fig. 10g) in my specimen differs from SARS' figure by the presence of only 2 setae on the coxa (4 are figured by SARS), and 1 seta on the basis.

The first leg (fig. 11a) is remarkable by the very slender exo- and endopodites and in this respect differs from both SARS' and A. SCOTT's specimens. The second exopodal segment is fully four times as long as the first and 8 times as long as wide. The apex of the endopodite just reaches the articulation between exopodal segments 2 and 3.

The endopodite of leg 2 (fig. 11b), as in SARS' specimen, is modified; the shape of the modified seta at the apex of the endopodite in my specimen differs slightly from SARS' figure but agrees closely with SEWELL's figure (1940, fig. 25d).

The endopodite of leg 3 (fig. 11c) is also modified and the structure of this appendage in the present specimen resembles SARS' figure. There is a rounded lamella or tooth at the jointing of endopodal segments 2 and 3 that is not figured by SARS.

The fourth leg shows no differences with SARS' figure.

The baso-endopodite in leg 5 (fig. 10e) is slightly shorter than appears to have been so in SARS' specimen; here it just reaches halfway along the exopodite. There is no difference in setation.

Legs 6 (fig. 10c) is a distinctly produced lobe at the corner of the genital plates. There are, in my specimen, three setae of equal length (the median seta in SARS' specimen is greatly lengthened and thick). The epimeral plate of the

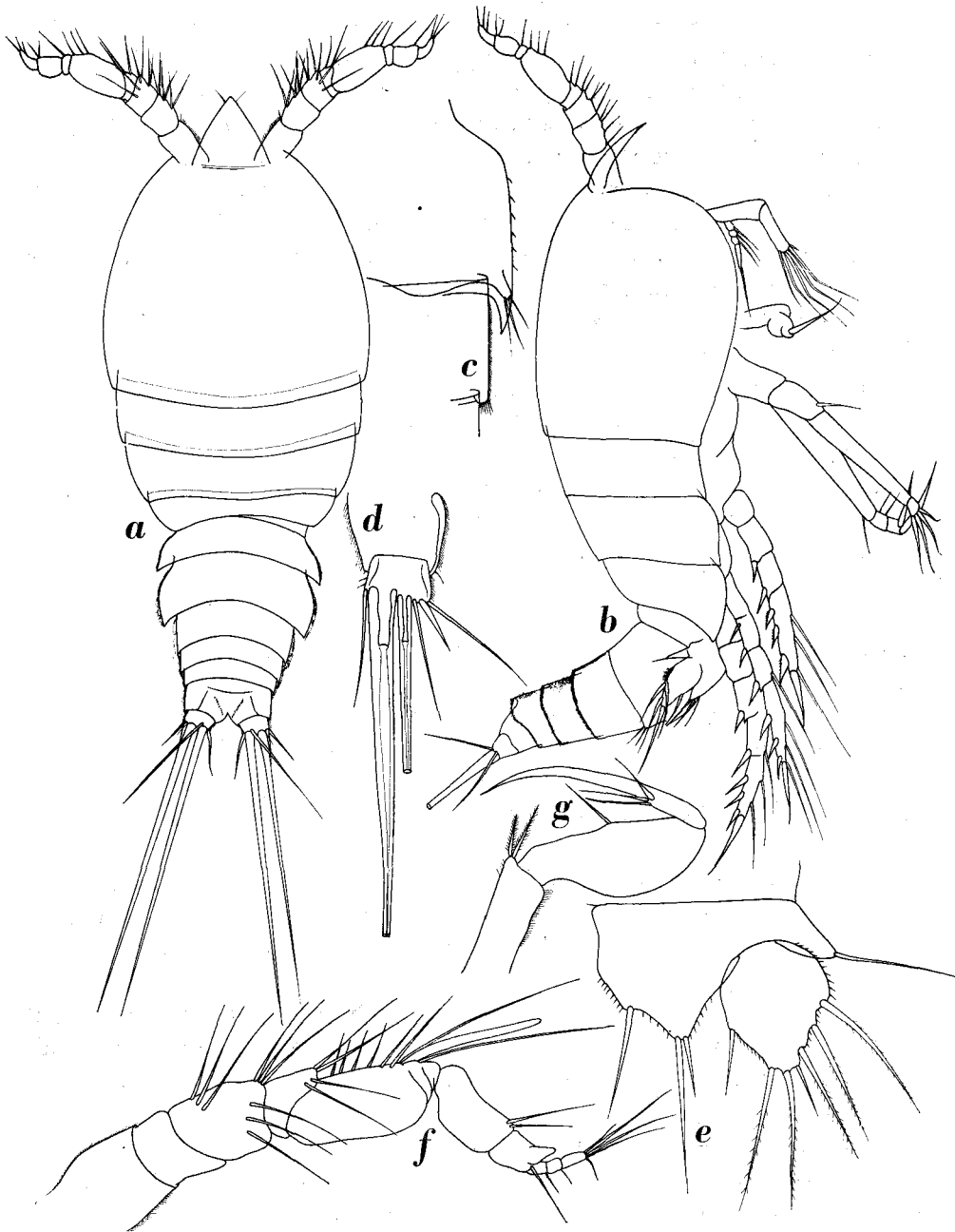


Fig. 10. *Rhynchothalestris rufocincta* (BRADY), adult male. a, whole animal, dorsol view; b, whole animal, lateral view; c, left side of ventral surface of first abdominal somite; d, right furcal ramus, dorsal surface; e, fifth leg; f, antennule; g, maxillipede. a, b, $\times 100$; c-g, $\times 325$.



Fig. 11. *Rhynchothalestris rufocincta* (BRADY), adult male. a, first leg; b, second leg; c, third leg; d, fourth leg; e, antenna; f, mandible; g, maxillule; h, maxilla. $\times 325$.

first abdominal somite terminates in an acute spine whilst Sars figures a seta at the lateral corner of this somite.

I have followed LANG in considering *Rhynchothalestris similis* A. SCOTT a synonym of *Rhynchothalestris rufocincta*. Both male and female of *Rhynchothalestris similis* have recently been redescribed by SEWELL and the differences between them and the typical form of *Rhynchothalestris rufocincta* are so slight that *R. similis* may probably be sunken into the synonymy of the widely distributed *R. rufocincta*. My male specimen agrees completely with SEWELL's account of the male of *R. similis*, particularly in the structure of leg 2.

The geographical distribution of *Rhynchothalestris rufocincta* (including *R. similis*) has been summarized by LANG (1948, p. 524) and includes a large number of localities distributed over the tropical, subtropical and temperate parts of the Atlantic and over the Mediterranean. The species has also been recorded from a number of localities in the tropical and subtropical parts of the Pacific Ocean, suggesting that its distribution there is just as wide as in the Atlantic. The present record is an additional support for this suggestion.

Genus *Dactylopodella* G. O. Sars, 1905

Dactylopodella clypeata G. O. Sars, 1911

(figs. 12, 13)

Dactylopodella clypeata G. O. Sars, 1911, p. 373, suppl. pl. 13 fig. 1; LANG, 1948, p. 578, fig. 236 no. 4.

MATERIAL. One adult female, total length 475μ . This specimen has been figured, dissected and the appendages mounted. The slides are in the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

DESCRIPTION OF THE ADULT FEMALE. Total length 475μ , length of the cephalothorax 325μ , length of the abdomen 150μ . Greatest diameter 200μ , length of longest furcal seta 150μ .

The general shape of the body is characterized by the ovoid cephalothorax and the very short abdomen (fig. 12a, b). The head and the first thoracic somite are fused to form the cephalic somite, this cephalic somite is distinctly longer than the rest of the cephalothorax, including the fifth abdominal somite. The line of the back is smoothly and broadly rounded into the fairly long, curved rostrum, there is no groove at the base of the rostrum; the lateral parts of the cephalic somite are broadly rounded and cover the basal parts of the oral appendages (fig. 12a). In dorsal view the basal part of the rostrum is just visible between the antennules. The cephalic somites 2 to 4 have about the same length, but owing to the curvature of the cephalothorax this is best observed in lateral view. The epimeral plates are rounded and very slightly produced backward.

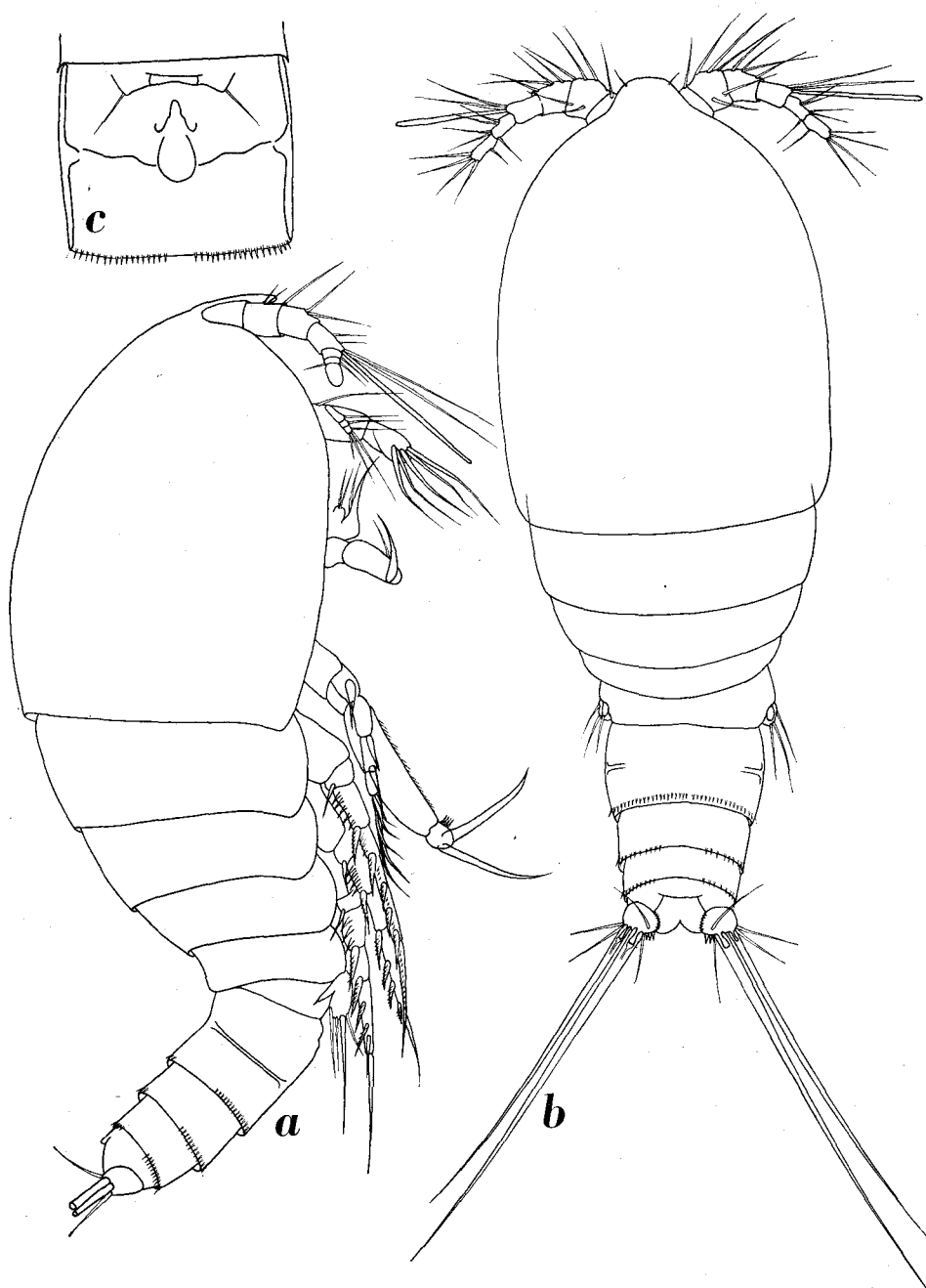


Fig. 12. *Dactylopodella clypeata* G. O. Sars, adult female. a, whole animal, lateral view from right side; b, whole animal, dorsal view; c, genital somite, ventral surface. a, b, $\times 250$; c, $\times 420$.

The fifth thoracic somite is shorter than the preceding somites (2 to 4) but it is distinctly visible in dorsal and lateral view.

The total length of the abdomen, excluding the fifth thoracic somite, is about one-third the length of the rest of the body; the first and second abdominal somites are fused to form the genital complex, this is about as long as the combined lengths of somites 3 and 4 and has, both laterally and dorsally, a distinctly marked line of fusion. The extreme distal border of the genital complex is set with fine spinules, the genital area is figured in fig. 12c. The distal ends of the third and fourth abdominal somites are bordered with fine spinules, the rows are interrupted on the dorsal surface. The fifth (anal) somite has some small spinules near the insertion of the furca; the anal plate is rounded. The furcal rami are slightly wider than long and have 5 marginal setae and 1 appendicular seta each. The appendicular seta and setae 1, 4 and 5 are fine and short; setae 2 and 3 are lengthened and thickened but not swollen at the base. Some spinules occur on the internal border of each furcal ramus.

The antennules are short and 6-segmented; they reach one-third the length of the cephalic somite. The setation is represented in fig. 13f; the cone on segment 4 is only moderately developed and carries a thick aesthetask.

The antenna (fig. 13g) has an allobasis with a single seta. The endopodite has 7 marginal setae and one internal seta; 4 of the marginal setae are geniculate. The exopodite is 2-segmented, the number of setae is 2 on the first and 5 on the second exopodal segment.

No satisfactory preparation of the mandible and the maxillule were obtained. The praecoxa and the coxa of the maxilla (fig. 13h) are fused and have a total of 3 endites, each with 3 very small, thin setae. The basal endite is well developed and fused with a large, curved spine. At the base of that spine there are 2 fine setae. The endopodite is completely reduced and represented by 2 setae inserting on the basal endite; no trace of endopodal segments can be observed.

The maxillipede (fig. 13i) is chelate; the coxa has a single internal seta, the basis is moderately swollen and has a single short internal seta; in addition a part of the internal margin of the basis is set with stiff hairs. The endopodite is 1-segmented and represented by a slightly curved, pointed digit, slightly shorter than the basis.

The first leg (fig. 13a) has a 3-segmented exopodite and a 2-segmented endopodite. The basis has a strong external and a smaller internal spine, the insertion of the endopodite is bordered with spinules. Exopodal segments 1 and 2 have about the same length, the first has no internal seta, the second has a fine seta inserting at the middle of the internal border. The third exopodal segment is short and carries 5 appendages and some spinules. The first endopodal segment is 1.5 times as long as the exopodite and 4 times as long as wide; there is a seta slightly under the middle of the internal margin. The second endopodal

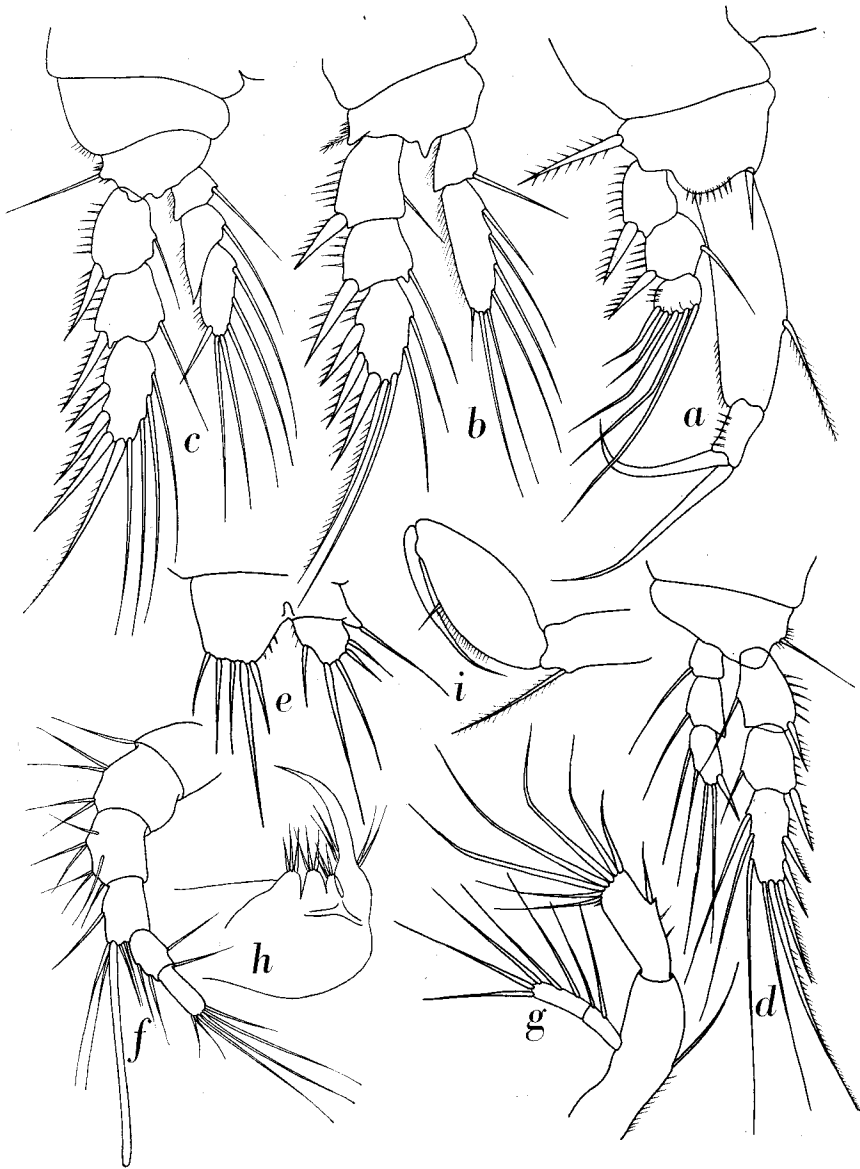


Fig. 13. *Dactylopodella clypeata* G. O. Sars, adult female. a, first leg; b, second leg; c, third leg; d, fourth leg; e, fifth leg; f, antennule; g, antenna; h, maxilla; i, maxillipede. $\times 540$.

segment is small; it has 2 well developed appendages: a strong, curved spine and a slightly longer, strong seta. In addition there are some spinules on the second endopodal segment.

The particulars of the legs 2 to 4 appear from fig. 13 b-d, the setal formulae and the following notes:

Setal formulae:

	endopodite	exopodite
leg 2	1. 421	1. 1. 223
leg 3	1. 1. 321	1. 1. 323
leg 4	1. 1. 221	1. 1. 323

The external margin of the exopodites and the outer edge of the external marginal spines of legs 2 to 4 are strongly spinulose.

Leg 2 (fig. 13b) has a 2-segmented endopodite; the second endopodal segment apparently is composed of 2 fused segments. The internal margin of the endopodite is haired.

Leg 3 (fig. 13c) has a 3-segmented endopodite, the second endopodal segment has the external margin drawn out in a strong point; the apex of the endopodite just reaches the articulation between exopodal segments 2 and 3.

Leg 4 (fig. 13d) has a 3-segmented endopodite; this endopodite is slightly shorter than the combined lengths of exopodal segments 1 and 2.

The exopodite of leg 5 is very small; it carries 5 appendages, the shape of which appears from fig. 13e. The baso-endopodite is well developed and reaches two-thirds the length of the exopodite, bearing a total of 5 appendages. The external lobe is well developed and has a long, fine seta. There is a small but distinct hyaline spot at the articulation of the exopodite.

REMARKS. I have checked the particulars of the present female specimen very closely with Sars' description and figures of *Dactylopodella clypeata* and the only noteworthy difference appears to be the fact that in Sars' specimens the external border of the distal segment of the endopodite of leg 2 is concave and slightly notched in the middle, whereas in the present specimen it is perfectly straight. The Noumea specimen is slightly larger, Sars' female specimens measuring 410 μ . I have little doubt that the Atlantic and Pacific specimens are conspecific.

This is quite a rare species, which so far has only been recorded from 2 localities along the southern coast of Norway, viz. Farsund and Korshavn, where it was found at a depth of 20 to 50 fms., on sandy bottom. The occurrence of a female of this species in a Pacific sample is very surprising and considerably extends the area of distribution.

Genus *Amphiascus* G. O. Sars, 1905*Amphiascus angustipes* GURNEY, 1927

(figs. 14 a, b, 15, 16)

Stenhelius minuta THOMPSON & A. SCOTT, 1903, p. 262, pl. 6 figs. 21-24.*Amphiascus angustipes* GURNEY, 1927, p. 520, fig. 140; NICHOLLS, 1939, p. 262; SEWELL, 1940, pp. 358, 361; NICHOLLS, 1941, pp. 79, 81; LANG, 1948, p. 658, fig. 266; NOODT, 1955, p. 66, figs. 19, 20; PETKOVSKI, 1955, p. 218, fig. 22.*Amphiascus sinuatus* var. *indistinctus* BRIAN, 1927, p. 37, figs. 18-27.*Amphiascus Thompsoni* MONARD, 1928, p. 385.

MATERIAL. Four adult females of 495, 480, 442 and 400 μ length. One adult male of 360 μ length. The description of the female is based on the specimen of 442 μ length; both this female and the male specimen have been figured, described and dissected, the slides are in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden.

DESCRIPTION. Adult female, total length 442 μ , of which 225 μ for the cephalothorax (minus the fifth thoracic somite) and 217 μ for the abdomen (including the fifth thoracic somite). Length of the longest furcal seta 175 μ . The general shape of the body is cylindrical, with the greatest diameter in the middle of the cephalic somite and gradually narrowing posteriorly; the division between the abdomen and the cephalothorax is distinctly marked (fig. 14 a). The head and the first thoracic somite are fused to form the cephalic somite, which has about the same length as the thoracic somites 2 to 4 combined. The line of the back in this specimen is smoothly curved and continues gradually in the rostrum (fig. 14 b), in dorsal view the frontal part of the head gradually narrows into the rostral base, which is just visible in front of the head. The thoracic somites 2 and 3 have about the same length; as the cephalic somite they are backward produced in the mid-dorsal line (fig. 14 a). The fourth thoracic somite has about the same length as somites 2 or 3 but it is not produced backward. The epimeral plates of the thoracic somites 2 to 4 are rounded and hyaline. The lateral parts of the cephalic somite are considerably produced and rounded, covering the larger part of the oral appendages.

The fifth thoracic somite is short but distinctly visible both dorsally and laterally. The abdominal somites 1 and 2 are fused to form the genital complex which is about as long as wide and shows a distinct, chitinized ridge along the sides, indicating the line of fusion. There are several rows of spinules on the genital complex. On the sides there are three rows of spinules: one immediately in front of the line of fusion and 2 on the sides of the second somite. In addition there is a dorso-lateral row on the posterior part of the genital complex. The second and third abdominal somites have about the same length; on the third somite there is a row of spinules on each side and a dorso-lateral row on the

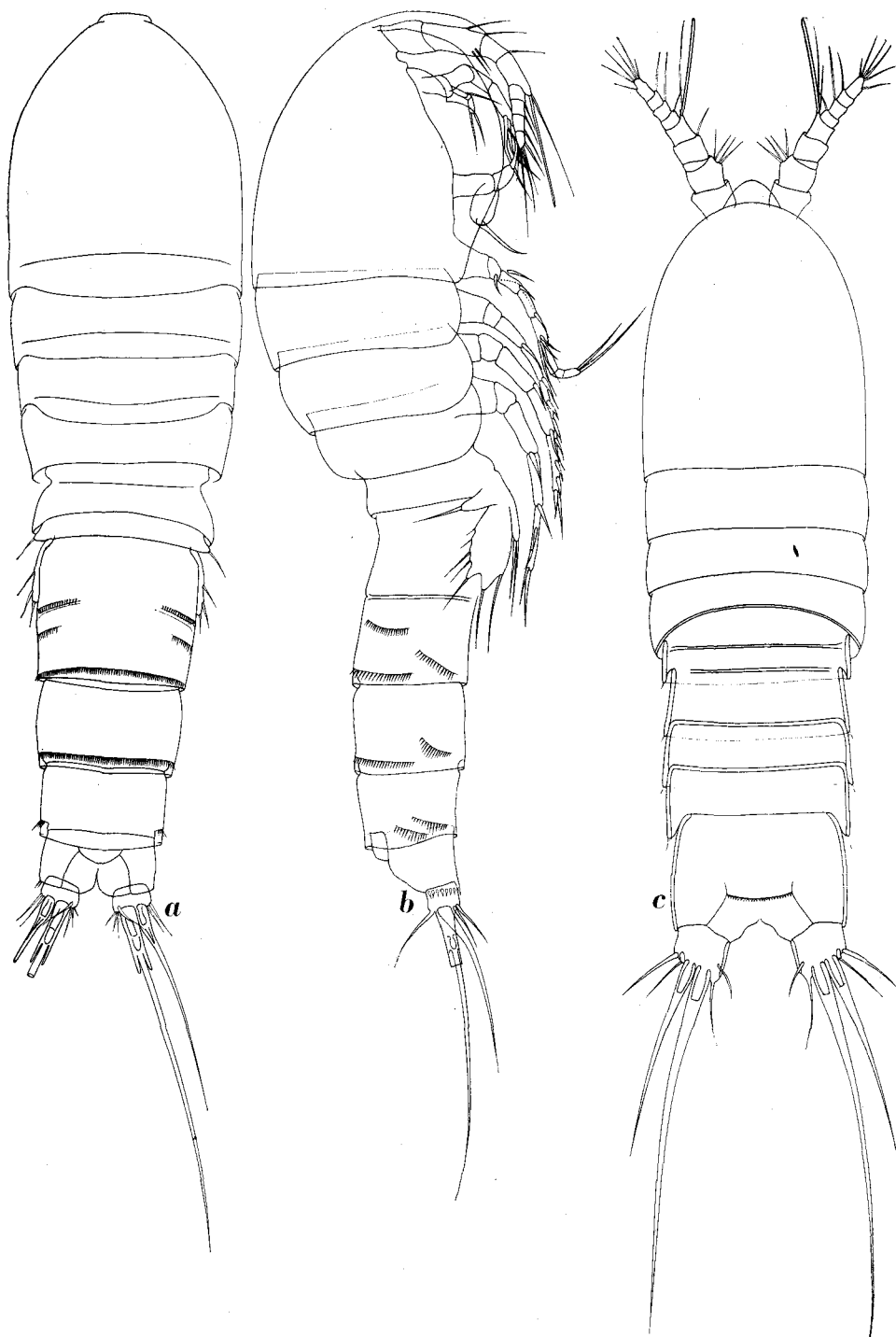


Fig. 14. a, b, *Amphiascus angustipes* GURNEY, adult female, first specimen; a, whole animal, dorsal view; b, whole animal, lateral view from right side. c, *Paramphiascella pacifica* nov. spec., female, cop. st. V, whole animal, dorsal view. $\times 275$.

posterior part of the somite. The fourth somite has two rows of spinules on each side. The anal somite is slightly shorter than the somites 3 or 4; the anal plate is distinct and rounded. A row of strong spines borders the ventro-lateral part of the insertion of the furcal rami. Each furcal ramus is about twice as broad as long and, in addition to the appendicular seta, carries 5 marginal setae. The appendicular seta and setae 1, 4 and 5 are fine and short. Seta 2 is greatly lengthened and has a curious basal insertion, inserting, as it were, from a basal tubiform part, surrounding the proximal part of the seta like a glove (fig. 14 a, b). Seta 3 is shorter and swollen at the base. The peculiar structure of seta 2, though observed on both sides, may be the result of some abnormality in the development of this seta as it is absent in other female specimens.

Unfortunately this specimen proved to be very brittle, so that the dissection was not completely successful. The appendages that were mounted are described below.

The antennules are 8-segmented, the lengths of the segments appear from fig. 16f, which also shows the setation. Segment 4 is fairly long and has a distinct cone bearing the aesthetasc and 2 setae.

The maxillule (fig. 16g) has a well developed arthrite with 8 teeth and spiniform setae. There is only one endite with 2 setae. The epipodite is well developed and bears 2 setae. The endopodite is unsegmented and bears at least 4 setae. The exopodite has 4 setae.

The praecoxa and coxa of the maxilla (fig. 16h) are fused and have a total of 3 endites, bearing 1, 3 and 3 setae respectively. There is a small basal endite, coalescent with a strong, curved spine, at the base of which a fine seta is to be found. The endopodite is rudimentary and appears to bear 4 setae in all.

The basis of leg 1 (fig. 16a) has a spine at the external margin and one at the internal margin, close to the insertion of the endopodite. The exopodite is 3-segmented, the segments have about the same length. The second exopodal segment has an internal seta; the third segment is longer than the exopodite and has a strong internal seta. The third endopodal segment is about twice as long as segment 2 and carries a dagger-shaped spine, a geniculated seta and a fine internal seta. The particulars of legs 2 to 4 follow the setal formulae, fig. 16 b-d, and the following notes.

Setal formulae:

	endopodite	exopodite
leg 2	1. 2. 121	1. 1. 223
leg 3	1. 1. 321	1. 1. 223
leg 4	1. 1. 221	1. 1. 323

The exo- and endopodites of legs 2 (fig. 16b) and 3 (fig. 16c) have about the same length; the apex of the endopodite of leg 4 (fig. 16d) reaches the middle of the third exopodal segment of that leg. The distal seta on the internal margin

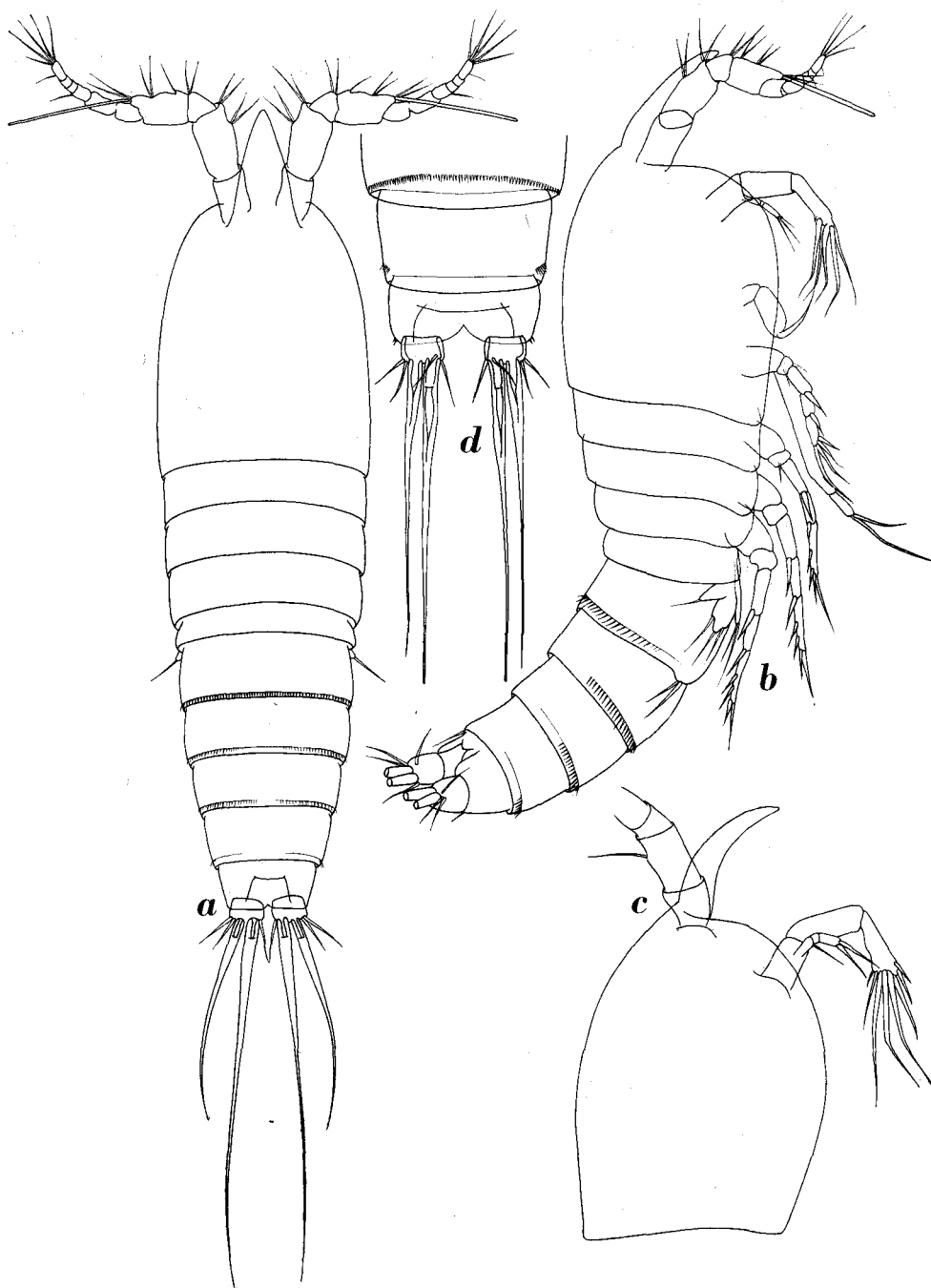


Fig. 15. *Amphiascus angustipes* GURNEY. a, b, adult male; a, whole animal, dorsal view; b, whole animal, lateral view from right side. c, d, adult female, second specimen; c, cephalic somite and rostrum, lateral view from right side; d, caudal part abdomen, dorsal view. $\times 325$.



Fig. 16. *Amphiascus angustipes* GURNEY. a-h, adult female, first specimen; a, first leg; b, second leg; c, third leg; d, fourth leg; e, fifth leg; f, rostrum and antennule; g, maxillule; h, maxilla. i-l, adult male; i, first leg; j, second leg; k, fifth leg; l, antennule. $\times 500$.

of the third exopodal segment of leg 4 is very small and easily overlooked.

Leg 5 (fig. 16e) in this specimen is fairly broad, being about 1.5 times as long as broad. There are 6 marginal setae and some stiff hairs along the internal margin; the arrangement appears from fig. 16e. The apex of the baso-endopodite reaches the middle of the exopodite; there are 5 well spaced spiniform setae. The external lobe is distinct and has a fine seta.

The rostrum (fig. 16f) in this specimen is fairly long, being equal in length to segments 1 and 2 of the antennule. Its curvature follows that of the back, so that it points downwards (fig. 14b).

The specimen of 400μ length differs from the first in rostral and furcal structure; the spinulation of the abdomen is identical.

The rostrum, though just as long as in specimen 1, points forward and only very slightly downward, so that the lateral and ventral aspect of the head is completely different (fig. 15c). The second seta on each side of each furcal ramus is normally developed, it has no basal investing tube but its proximal part is distinctly swollen (fig. 15d).

In this specimen the antennular exopodite is 3-segmented, but the intermediate exopodal segment is very small and has no seta. The total number of setae on the exopodite is 3:1 on the basal segment and 2 on the apical segment.

Adult male, total length 360μ , of which 195μ for the cephalothorax and 165μ for the abdomen. The greatest diameter is 90μ , the furcal setae are broken.

This male specimen (fig. 15a, b) has the same general appearance as the adult female, it is, however, a trifle slenderer. It differs furthermore in the following details:

1. The rostrum is separated from the cephalothorax by a distinct groove, particularly visible in lateral aspect. It is curved and points obliquely forward.

2. The abdomen is differently developed, first of all by the separation of the first and second abdominal somites, but also by the differently developed spinules. On segment 1 there is a distal row on back and sides, on the second segment there is a distal row on the ventral and lateral parts, whilst on the third and fourth segments there are only spinules on the ventral surface, running slightly upwards on the sides. The insertion of the furca is ventrally fringed with big spinules. The furcal structure is identical with that of the female of 400μ length described above.

3. The antennules are subchirocerate and 8-segmented (fig. 16l). The jointing is present between segments 5 and 6; the setation is represented fig. 16l. The fourth segment has a distinct conical process bearing an aesthetasc and 2 setae.

4. The internal spine at the basis of leg 1 is strong and is accompanied, at its base, by two smaller spines (fig. 16i).

5. The endopodite of leg 2 is modified. Segment 1 of that endopodite is as

in the female, but segment 2 is drawn out in a long point, reaching slightly beyond the apex of the exopodite. In addition there is a big external spine on endopodal segment 2 with a fine seta near its insertion, one fine seta some distance from the base of the apical prolongation and 2 short internal setae (fig. 16j). Legs 3 and 4 are as in the female, but the distal internal seta of the third exopodal segment is very fine and short.

6. Leg 5 (fig. 16k) is much smaller than in the female. The exopodite is ovate, slightly longer than wide and with 4 marginal setae, 3 of which are very strong. In addition there are 3 spiniform hairs along the external margin of the exopodite. The baso-endopodite, which reaches about halfway along the exopodite, externally runs into a short spine. In addition there are 2 strong, spiniform setae. The external lobe is long and carries a fine seta.

Leg 6 is represented by a well-shaped lobe bearing 2 setae.

REMARKS. *Amphiascus angustipes* is undoubtedly closely related to *Amphiascus propinquus* and the distinction between both forms is difficult. After careful comparison of the present specimens with the existing descriptions, principally those of LANG (1948), I have brought my specimens to *A. angustipes*. The male has 3 distinct spines (two small and 1 large) on the basis of leg 1, though according to LANG only two are present in *A. angustipes*. In this respect the present specimens agree with those described by GURNEY (1927, p. 520).

The area of distribution of *Amphiascus angustipes* includes the Bermuda Islands, the Mediterranean Sea (including the Sea of Marmara) and Ceylon. The present record extends the distributional range of this species in the western Pacific. *Amphiascus propinquus* so far has only been recorded from the northern Atlantic.

Genus *Paramphiascella* LANG, 1944

The principal feature which separates this genus from *Amphiascella* is the aberrant structure of the endopodite of leg 2 in the male. The species originally included by LANG in the genus *Paramphiascella* possessed a short endopodite of leg 1, the first segment of this endopodite being shorter than the combined lengths of all three exopodal segments. Additional species, that unmistakably belong to *Paramphiascella*, as the structure of the male proves, have longer endopodites on the first leg so that at times the females of both genera, in absence of males, cannot be separated. The type of *Paramphiascella* is *Stenhelia hispida* BRADY, 1880.

The following species of *Paramphiascella* are now known to exist:

females	males
<i>Stenhelia hispida</i> BRADY, 1880	<i>Stenhelia hispida</i> BRADY, 1880
<i>Stenhelia intermedia</i> T. SCOTT, 1896	<i>Stenhelia intermedia</i> T. SCOTT, 1896
(= <i>Dactylopus Strömi</i> var. <i>faröensis</i> T. SCOTT, 1902)	

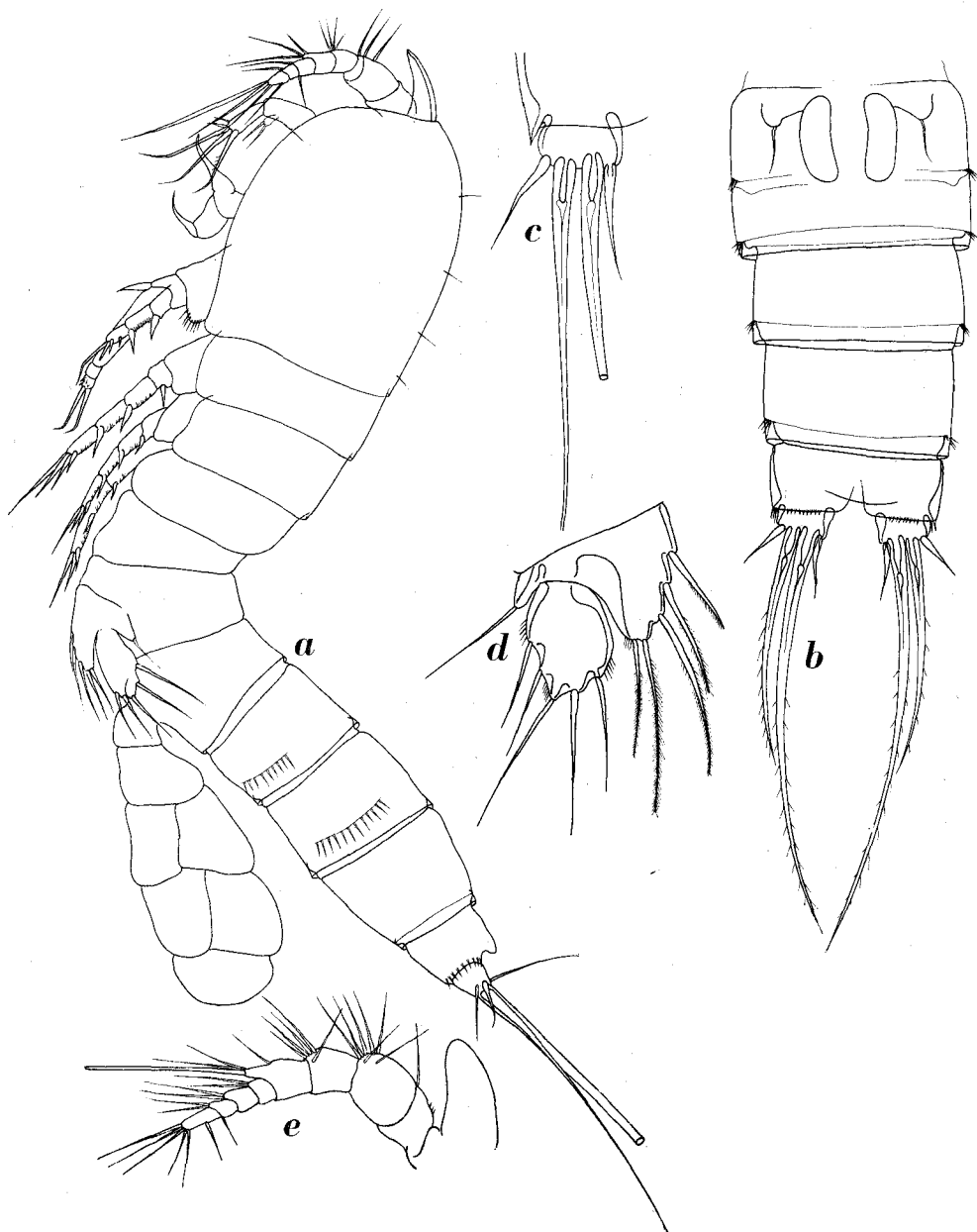


Fig. 17. *Paramphiascella pacifica* nov. spec., adult female, holotype. a, whole animal, lateral view from left side; b, abdomen, ventral aspect; c, right furcal ramus, ventral surface; d, fifth leg; e, antennule and rostrum. a, b, $\times 200$; c-e, $\times 325$.

and 10 males are deposited in the collections of the Ōsaka Museum as paratypes; 12 female and 9 male paratypes are in the collection of the Rijksmuseum van Natuurlijke Historie. In addition there are 25 immature females and males; these are all in the Ōsaka Museum collection. The females vary in length between 555 and 630 μ , the males between 490 and 585 μ length. The males and females in the Vth copepodite stage are 390–435 μ long.

In addition to the above-mentioned specimens there is one adult male from the mantle cavity of *Ascidia sydneyensis samea* (OKA), sent to Dr. PAUL L. ILLG along with some notodelphyoid copepods.

DESCRIPTION OF HOLO- AND ALLOTYPE. Adult female, total length 615 μ . Length of the cephalothorax (including the fifth thoracic somite) 345 μ , length of the abdomen 270 μ . Length of the longest furcal seta 290 μ ; greatest diameter of the cephalothorax 145 μ .

The general shape of the body, in dorsal aspect, is fairly slender, with the demarkation between the cephalothoracic and abdominal portions only indistinctly visible (fig. 19b). The head and the first thoracic somite are fused to form the cephalic somite; the body reaches its greatest diameter at the end of that cephalic somite. In lateral aspect the back is gently and smoothly curved, there are some fine hairs along the back, the ventral border is rounded and the rostrum is separated from the frontal part of the cephalic somite by a distinct groove (fig. 17a). The rostrum is, in dorsal view, a slender, triangular structure, pointing forwards and slightly downwards, as long as the first two antennular segments; at the apex it is rounded and no trace of an incision is visible. The thoracic somites 2 to 4 have about the same length, their epimeral plates are slightly developed and rounded. The fifth thoracic somite is much shorter than somites 2 to 4 and scarcely visible in dorsal view; it is, however, very distinct in lateral view.

The abdominal somites in the holotype are stretched, the first and second somites are fused to form the genital complex, but a distinct line of fusion, particularly visible on the sides, indicates the borders of the original somites. Spinules occur on the genital complex near the line of fusion, where they occur mainly on the sides, and at the end of the second somite, where they form a ventrally closed row extending also to the sides of the somite. The third and fourth somites have about the same length and each have a lateral row of spinules near the end of the segment. The fifth or anal somite has half the length of the preceding somite; the anal plate is broadly rounded and nude. A row of fine spinules encircles the insertion of the furcal rami on the anal somite.

The furcal rami are about twice as broad as long; there are 5 marginal setae along the caudal border and one appendicular seta on the dorsal surface of each ramus. The setae 1, 4 and 5 are short and more or less spiniform; the setae 2 and 3 are lengthened and thickened, the basal parts, however, are scarcely swollen.

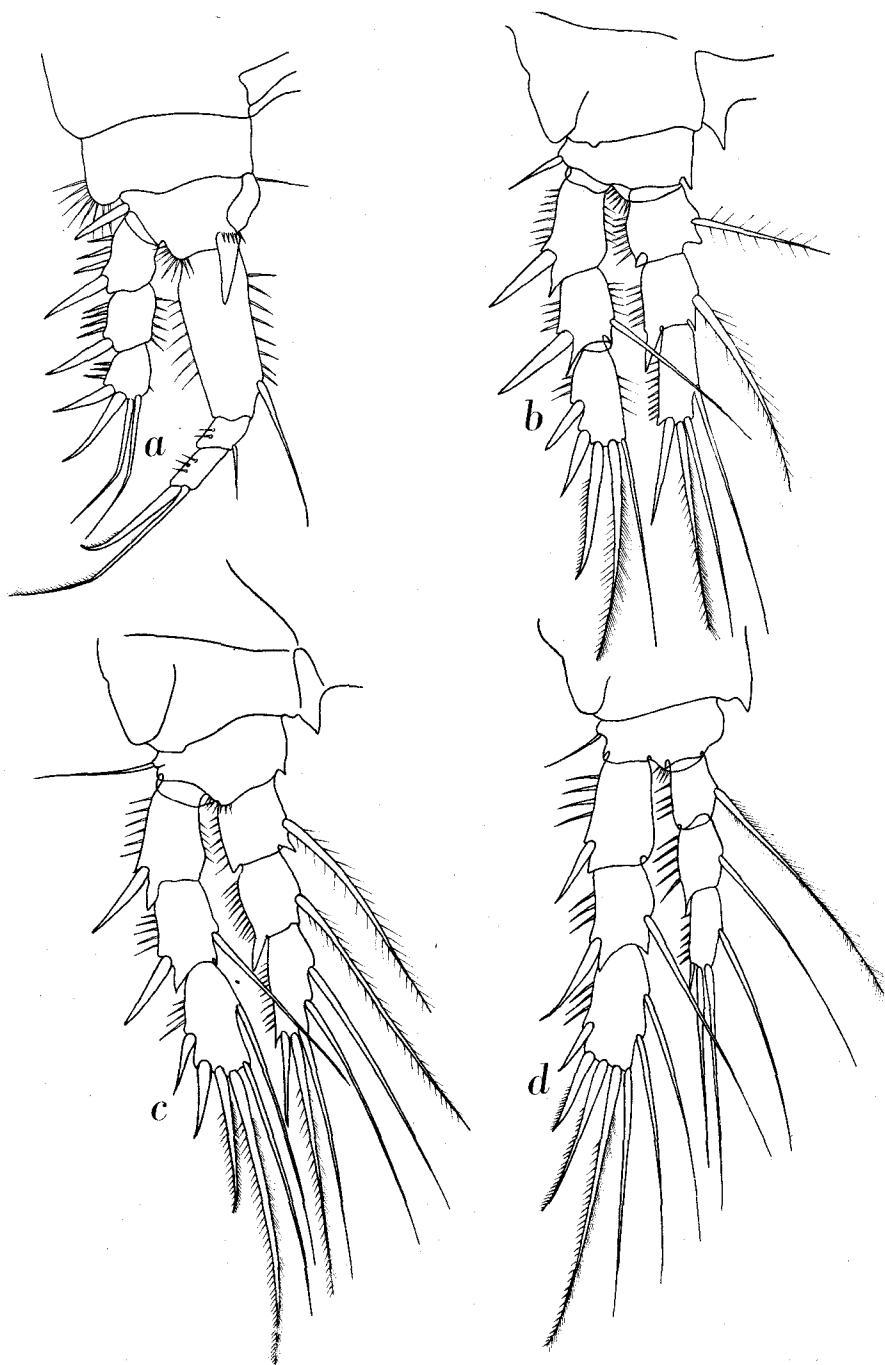


Fig. 18. *Paramphiascella pacifica* nov. spec., adult female, holotype. a, first leg ; b, second leg ; c, third leg ; d, fourth leg. $\times 475$.

Seta 2 reaches the length of the abdomen; setae 3 is shorter. Both setae are set with short hairs (fig. 17b).

The antennules are 8-segmented and reach half the length of the cephalic somite. The setation appears clearly from fig. 17e; the fourth segment has a conical process bearing the aesthetasc and 2 setae. There are some distinct spinules on the internal wall of the first antennular segment.

The antenna has an allobasis with a strong hair and a seta along the external border. The exopodite is 3-segmented with a total of 4 setae, distributed as follows: first segment styliform with one seta; second segment very short and without seta; third segment styliform and with one basal seta and 2 apical setae, one of which is short. Endopodite with two spines at the internal border and 6 marginal setae; their structure appears from fig. 23d.

The mouthparts show practically no difference from those of *Paramphiascella hispida* (BRADY) as figured by SARS (1906, pl. 107); they will not be described in detail here. The basis of the maxillipede seems to be more swollen in the present species (see fig. 23g), but the setation is identical, as is also the length of the endopodite.

The coxa of the first leg (fig. 18a) has a distinct, spinulose tubercle at the external border. The basis has a strong external spine and at the internal border it carries a strong, dagger-shaped spine with a row of smaller spinules at its base. The endopodite inserts on a distinct socle; the external border of this socle is spinulose. Both exo- and endopodite are 3-segmented. The total length of the exopodite is only very slightly superior to that of the first endopodal segment, but as the endopodite inserts on a socle, the exopodite reaches exactly as far as the distal border of the first endopodal segment. The first and second exopodal segments have spinulose external borders terminating in a strong spine; the third exopodal segment has a total of four appendages, two of which are hooked setae. The first endopodal segment has a strong internal seta nearly at its apex; the second and third endopodal segments have about the same length; the second has a short internal seta, the third has two appendages: a long, hooked seta and a slender, slightly curved spine.

For the particulars of legs 2 to 4 I refer to fig. 18b-d, to the setal formulae and to the following notes.

Setal formulae:

	endopodite	exopodite
leg 2	1. 1. 121	0. 1. 023
leg 3	1. 1. 221	0. 1. 123
leg 4	1. 1. 121	0. 1. 223

All rami have strongly spinulose external borders; there are 3 external marginal spines on the third exopodal segments of all these legs.

The endopodite of leg 2 (fig. 18b) is only slightly shorter than the exopodite.

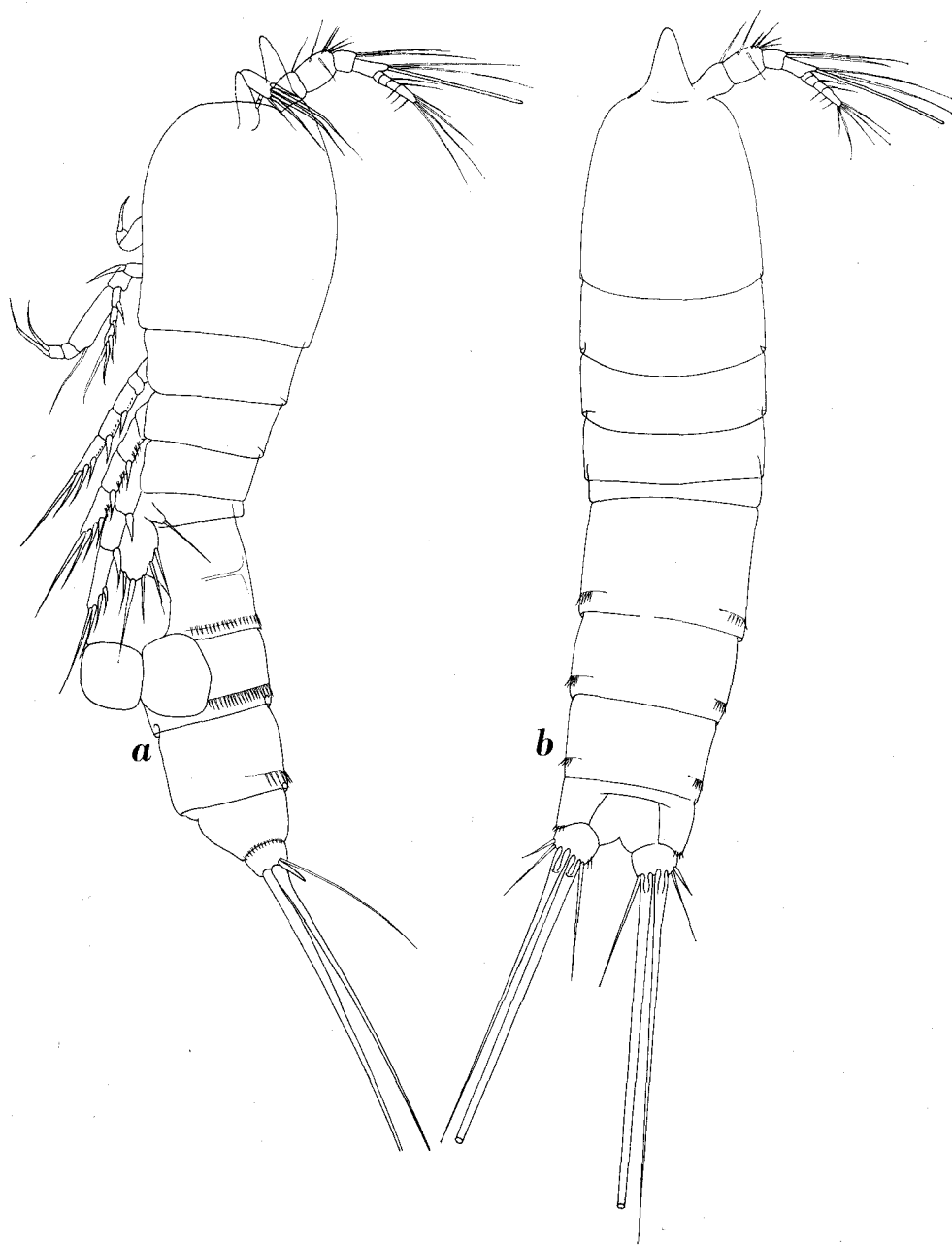


Fig. 19. *Paramphiascella pacifica* nov. spec., adult female, paratype. a, whole animal, lateral view from left side; b, whole animal, dorsal view. $\times 200$.

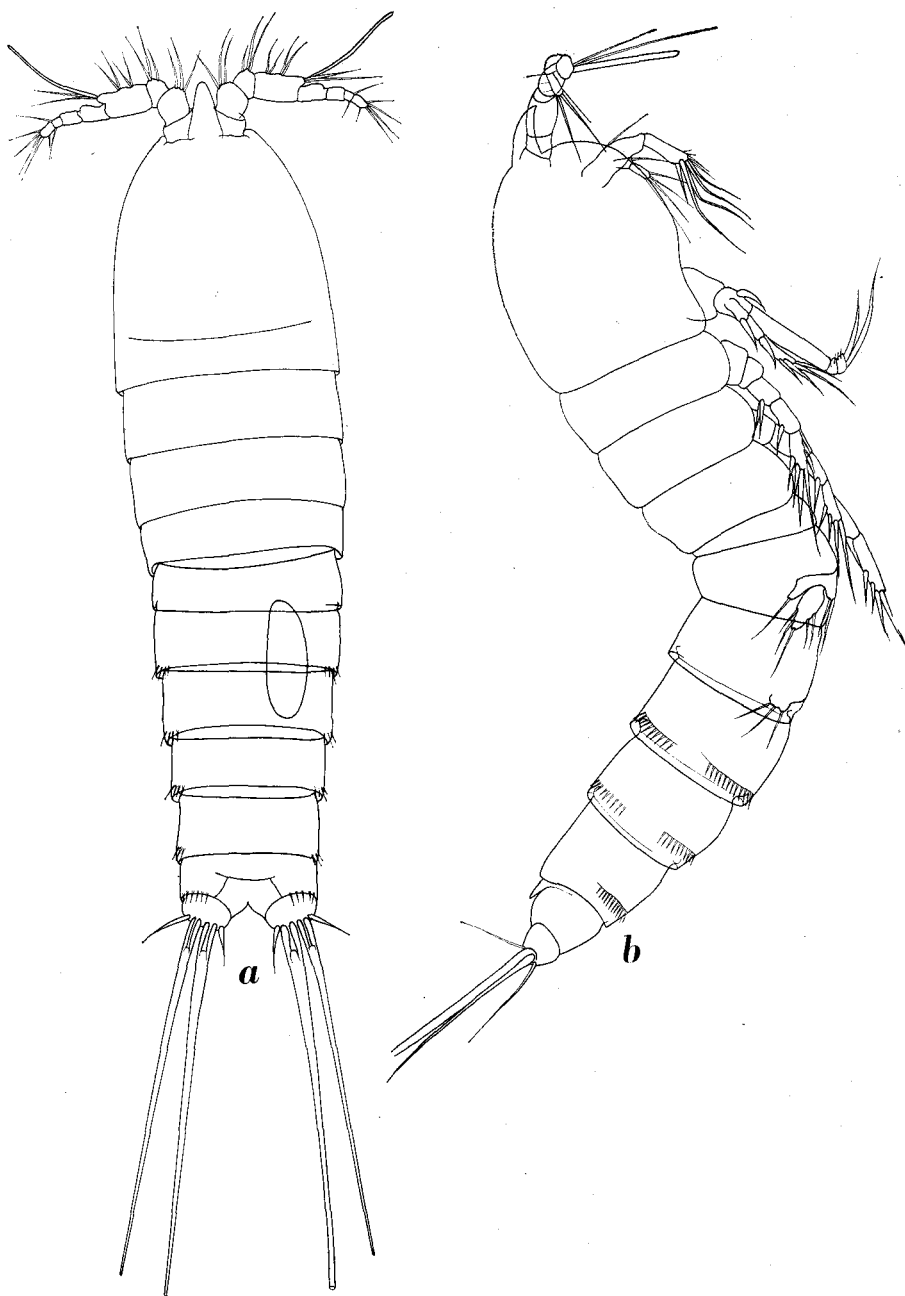


Fig. 20. *Paramphiascella pacifica* nov. spec., adult male. a, allotype, whole animal, dorsal view; b, paratype, whole animal, lateral view from right side. $\times 200$.

The seta at the external margin of the basis is spiniform.

The endopodite of leg 3 (fig. 18c) is only slightly shorter than the exopodite. The seta at the external margin of the basis is normally developed.

The endopodite of leg 4 is short, it just reaches the articulation between the second and third exopodal segments (fig. 18d).

The left and right fifth legs are well separated; the exopodites too are distinctly set off from the baso-endopodites. The external lobe is moderately developed and has a fine seta. The baso-endopodite reaches slightly beyond the middle of the exopodite; there are 5 setae, the development of which appears best from fig. 17d. The exopodite is broadly ovate, the greatest diameter is two-thirds the total length. The external wall is cut off obliquely, the internal border is broadly rounded. There are 5 setae along the border, the lengths of which again appear best from fig. 17d; the intermediate seta is fine and slender. Both exopodite and baso-endopodite have a large hyaline area; the apex of the exopodite is slightly produced.

The genital plates are developed as small lobes, one on each side of the genital aperture, carrying two fine setae. There are two egg sacs each containing 5 large eggs. The oval structures figured on fig. 17b are spermatophores, which remained attached to the genital field after removal of the egg sacs.

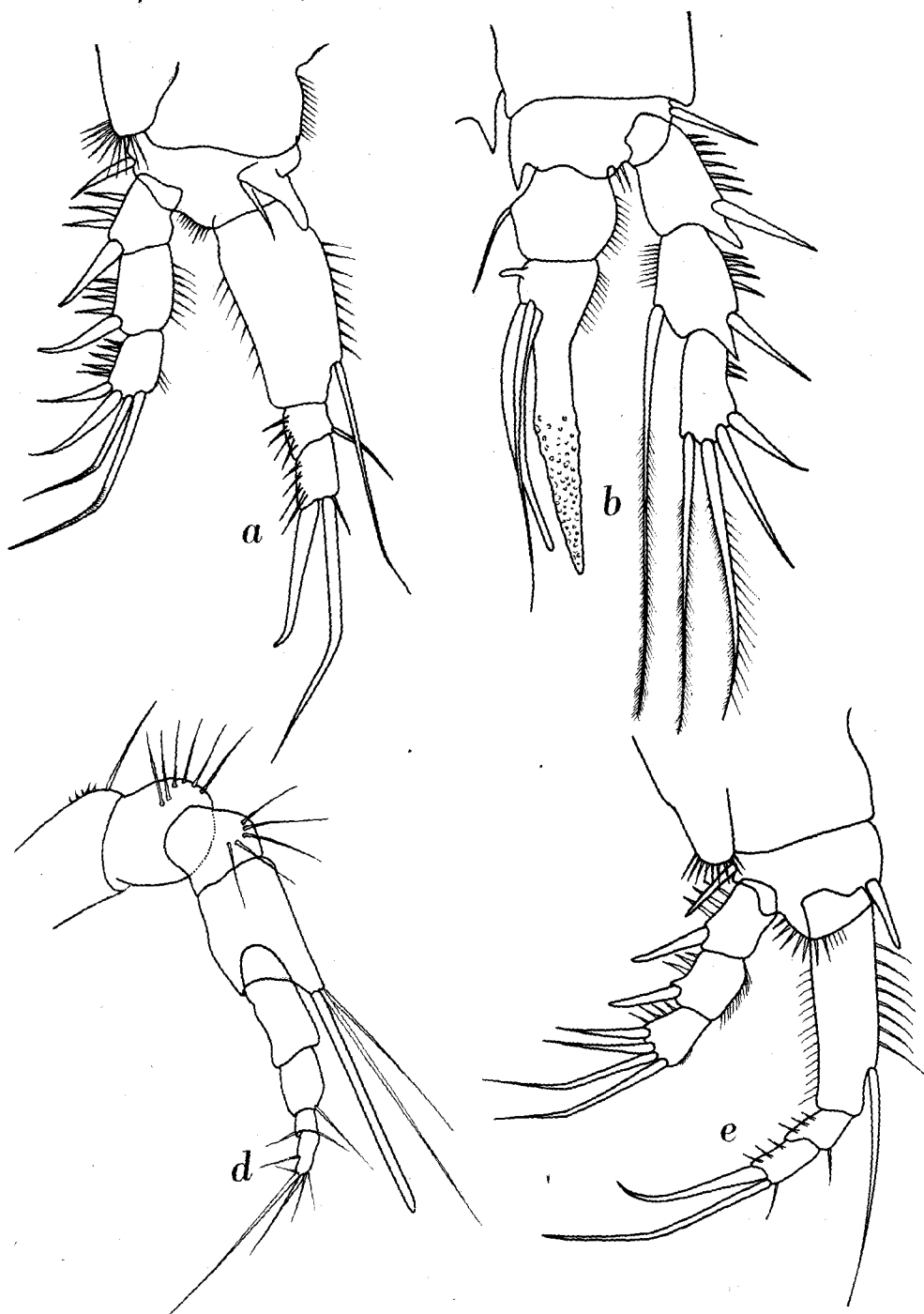
Adult male, total length 495μ ; length of the cephalothorax (including the fifth thoracic somite) 280μ , length of the abdomen 215μ . The general shape of the body resembles that of the female very closely; it is, however, more robust (figs. 20, 22a). The cephalic somite, as in the female, is composed of the fused head and first thoracic somite, the line of fusion is very distinct on the back. The first and second abdominal somites are separate, the spines on the abdominal somites occur in the same positions as those in the female, but are smaller. The furca is as in the female. There is no difference in rostral structure between both sexes.

The antennules, in the male, are a trifle shorter than those of the female. The apical three segments form a claw, the jointing is between segments 5 and 6. The fourth segment is strongly developed and has a big conical process bearing the aesthetask and 2 setae. The third segment is small. The setation of the antennule appears best from fig. 21d.

No differences have been observed in the structure of the antennae and mouthparts.

The first leg (fig. 21a) differs from that of the female by the stronger development of the spine on the internal border of the basis. This spine inserts on a strongly chitinized socle, it is curved and has a rounded apex. A fine spine or spiniform seta occurs on the socle near the insertion of the bigger spine.

The endopodite of the second leg is modified, as appears clearly from fig. 21a. This endopodite is 2-segmented, the first segment has a small internal seta.



For explanation see next page.

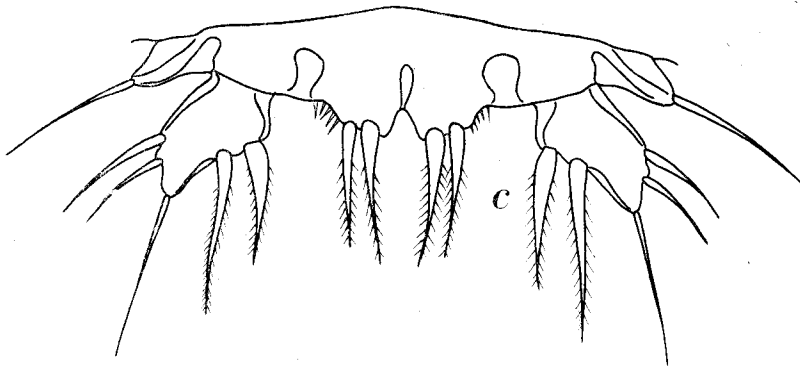


Fig. 21. *Paramphiascella pacifica* nov. spec. a-d, adult male, allotype; a, first leg; b, second leg; c, fifth pair of legs; d, antennule. e, adult female, paratype, first leg. $\times 625$.

Segment 2 is drawn out into a dagger-shaped point, reaching beyond the apex of the exopodite and at its distal half with a large number of chitinous tubercles giving the spine a warty appearance. The basal part of the second endopodal segment has a short internal spine; near this spine a strong, slightly curved claw inserts, which is a trifle shorter than the spine on the endopodite. In addition there is a fine seta inserting on the base of the second endopodal segment.

There are no differences in the structure of legs 3 and 4.

The baso-endopodites of the left and right fifth legs are fused and only slightly elevated; each side has 2 short spiniform setae (fig. 21c). The external lobe is well developed and has a fine seta. The shape of the exopodite appears from fig. 21c; the segment is about twice as long as wide and distinctly produced at the apex. There are 5 appendages on each exopodite; the two internal setae are short and spiniform, the median seta is long and fine and the external setae are short and normally developed.

Copepodite stage V, female (figs. 14c, 23). Total length 390μ , the greatest diameter is 120μ and the length of the longest furcal seta is 270μ .

The general appearance of this stage is as in the adult female, though they differ externally in the following points.

1. The abdomen is incompletely developed, the first and second abdominal somites are separate, but the fourth and fifth are fused to form a large anal complex. The spinulation of the abdomen is either completely absent or so indistinctly developed that it cannot be distinctly observed, though the extreme margin of the abdominal somites appears to show some spinules when viewed from above. The caudal margin of the anal plate is set with distinct spines. The furcal structure is identical with that of the adult female.

2. The antennules, though 8-segmented, are much shorter than those of the adult stage; the setation has been represented in fig. 23c. In this specimen they point obliquely forward. The antenna (fig. 23d) is as in the adult female.

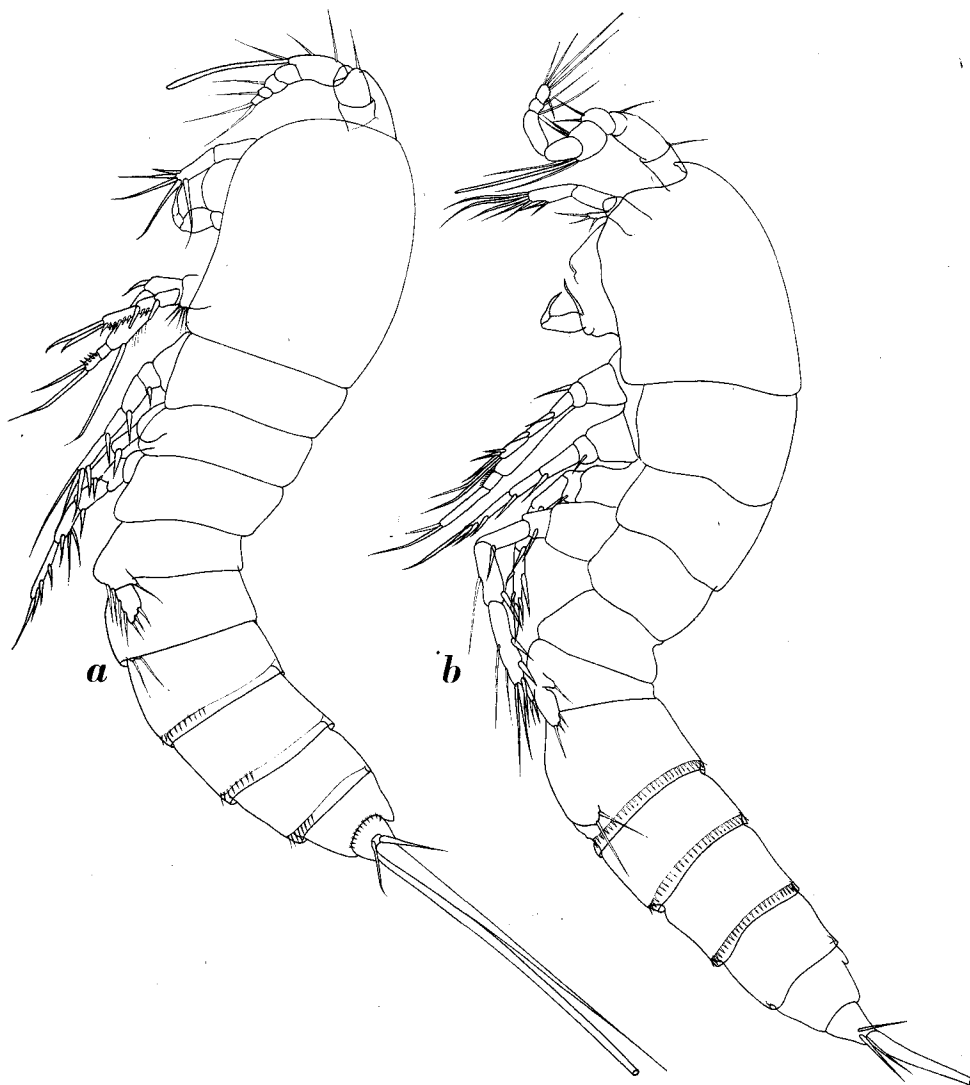


Fig. 22. a, *Paramphiascella pacifica* nov. spec., adult male, allotype, whole animal, lateral view from left side. b, *Ameira parvula* (CLAUS), adult male, whole animal, lateral view from left side. a, $\times 200$; b, $\times 325$.

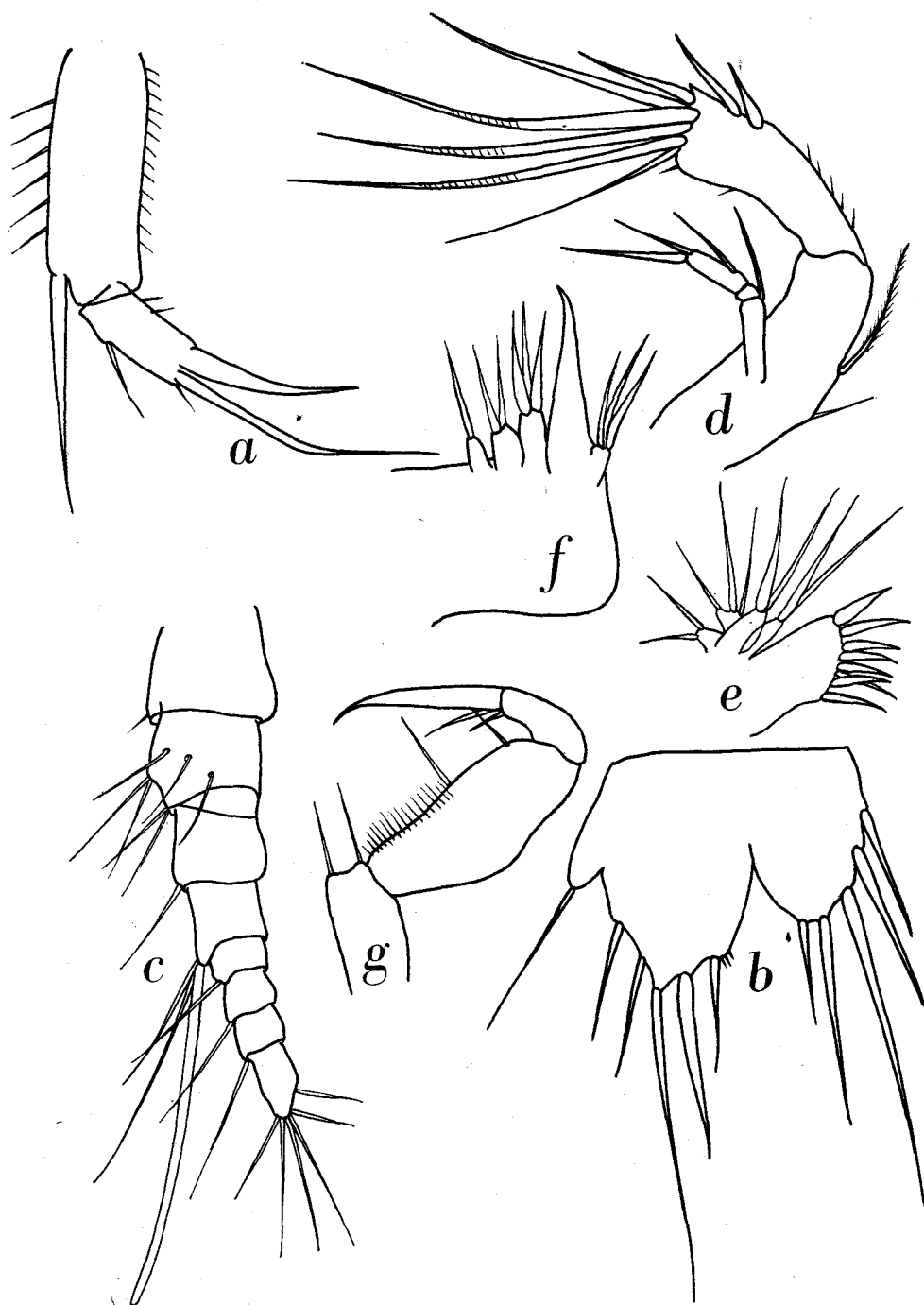


Fig. 23. *Paramphiascella pacifica* nov. spec., female, cop. st. V. a, endopodite of first leg; b, fifth leg; c, antennule; d, antenna; e, maxillule; f, maxilla; g, maxillipede. $\times 750$.

3. The maxillule (fig. 23e) has 7 strong setae on the arthrite; the two endites have 2 setae each. The endopodite is much reduced and carries 3 setae. There are 2 setae on a small lobe, apparently representing the exopodite.

4. The endopodite of the maxilla (fig. 23f) has a total of 3 setae. There are four endites in all, one of which, the distal, undoubtedly represents the basal endite, coalescent with a big spine. The number of setae on the remaining endites is 3, 2 and 1 respectively. The maxillipede (fig. 23g) is as in the adult female.

5. The segmentation between the second and third endopodal segments of leg 1 is incomplete, so that the whole endopodite appears to be 2-segmented (fig. 23a).

6. The segmentation between the exopodite and the rest of leg 5 is indistinct; there are 5 spiniform setae on the baso-endopodite and 5 on the exopodite. The external lobe is well developed and provided with a single seta.

REMARKS. The present new form shows great structural conformity with *Paramphiascella commensalis* (SEIWELL), though the differences in the structure of legs 1 and 5 in the female and leg 2 in the male certainly warrant specific distinction. *P. commensalis* is one of the few harpacticoids that have been found in association with ascidians, as it was obtained from the mantle cavity of *Amaroucium* spec. Only a single (male) specimen of *Paramphiascella pacifica* was found under comparable conditions, but in the collection, which was obtained from collecting bottles of ascidians, *P. pacifica* is of such predominating occurrence, that some form of association with ascidians seems reasonable. It does not appear improbable to me that *P. pacifica* lives on the outside of the mantle of large solitary ascidians, hovering around the openings and occasionally being introduced in the ascidians with the ingestion of water.

Genus *Ameira* BOECK, 1865

Ameira parvula (CLAUS, 1866)

(figs. 22b, 24a, b, 25)

Canthocamptus parvulus CLAUS, 1866, p. 30, pl. 5 figs. 1-6.

Ameira parvula LANG, 1948, p. 790, fig. 316 no. 3.

MATERIAL. Four adult females of 375-410 μ length and two adult males of 315 and 360 μ length.

DESCRIPTION OF THE MATERIAL. In my paper on the copepods of Ifaluk atoll (VERVOORT, in press) the female of this species will be described from Pacific material. The present females are in so complete agreement with this description that it is unnecessary to redescribe these here. It will suffice, therefore, to note some of the salient features.

Adult female, total length 410 μ , of which 225 μ for the cephalothorax and

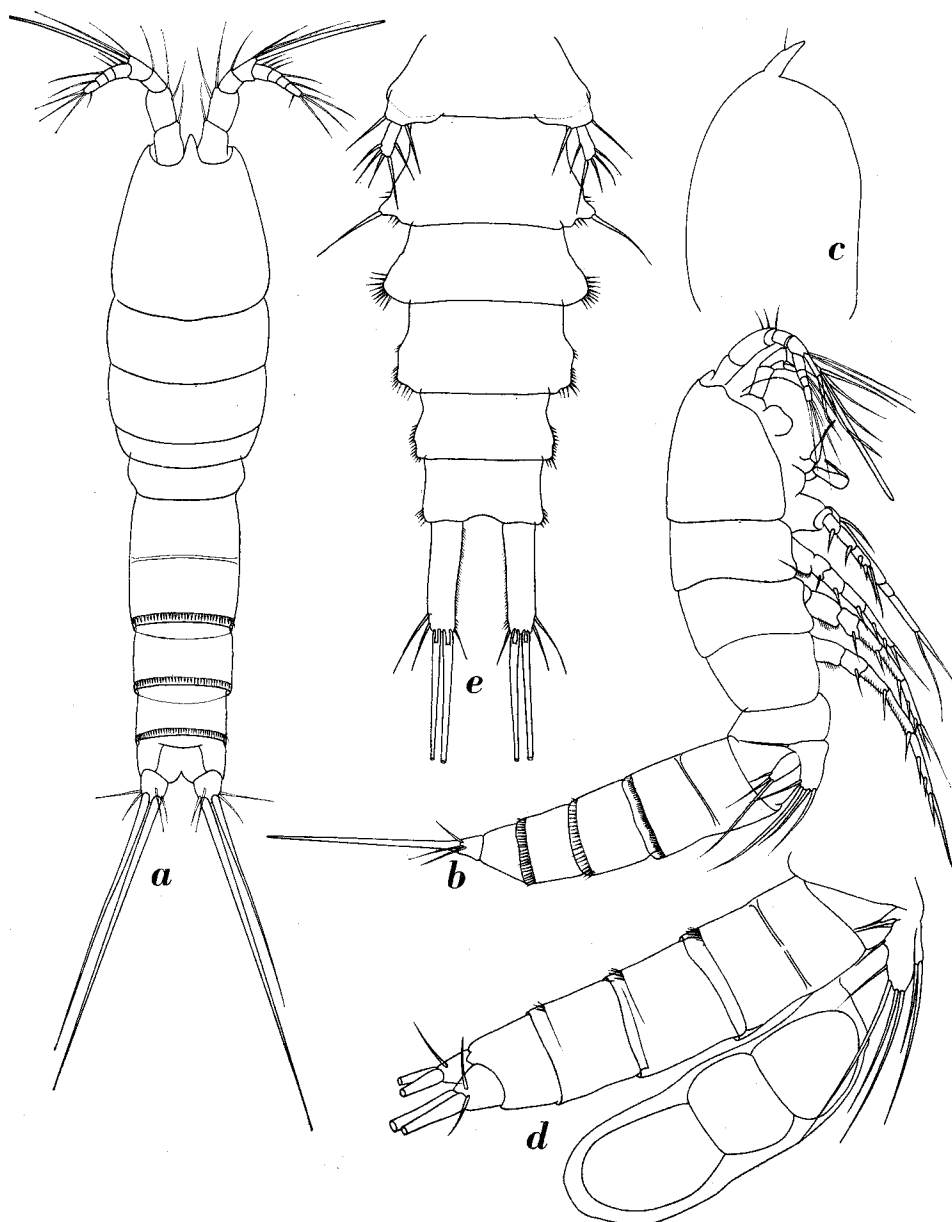


Fig. 24. a, b, *Ameira parvula* (CLAUS), female; a, whole animal, dorsal view; b, lateral view from right side. c, d, *Psyllocamptus minutus* G. O. SARS; c, cephalic somite and rostrum, lateral view from right side; d, fifth thoracic somite and abdomen, lateral view from right side. e, *Laophonte thoracica* BOECK, abdomen of adult male, ventral surface. a, b, $\times 200$; c-e, $\times 325$.

195 μ for the abdomen. The greatest diameter of the cephalic somite is 90 μ , the longest furcal seta is 330 μ . The general shape of the body is cylindrical and very slender, particularly in dorsal aspect (fig. 24a). The cephalic somite is slightly shorter than the combined lengths of thoracic somites 2 and 3. The rostrum is a short, pointed prominence between the antennules, in line with the general curvature of the back and half as long as the first antennular segment (fig. 24b). The length of the rostrum appears exaggerated in my figure of the animal in dorsal aspect (fig. 24a) as the cephalothorax is fairly strongly curved. The antennules are as long as the cephalic somite. The armature of the abdomen is more or less as in the Ifaluk specimens, i.e., there are completely encircling rows of spinules at the end of the genital complex and the third abdominal somite, but in addition there are some spinules on the ventral distal end of the fourth abdominal somite and at the ventral surface of the anal somite.

The three segments of the exopodite of leg 1 (fig. 25a) have about the same length, the third segment has a total of 5 appendages. The length of the first endopodal segment slightly surpasses that of the whole exopodite, the third endopodal segment is twice as long as segment 2.

The setal formulae are:

	endopodite	exopodite
leg 2 (fig. 25b)	1. 1. 121	0. 1. 223
leg 3 (fig. 25c)	1. 1. 221	0. 1. 223
leg 4 (fig. 25d)	1. 1. 221	0. 1. 223

The structure of leg 5 can best be judged from fig. 25e: there are 4 setae on the baso-endopodite and a total of 5 on the exopodite; the internal margin of the exopodite has a distinct proximal bulge.

Adult male, total length 360 μ , of which 195 μ for the cephalothorax and 165 μ for the abdomen. The greatest diameter is 80 μ , the longest furcal seta has a length of 120 μ .

The general shape of this male specimen (fig. 22b) is almost as in the female, with the same very slender, cylindrical body. The first and second abdominal somites are separate and both have a row of fine spinules completely encircling the distal end of the somites. In addition such a row of spinules is to be found on the third abdominal somite. The fourth and anal somites are nude. The appendages of this male specimen have not been studied in detail.

REMARKS. *Ameira parvula* is widely distributed in the tropical, subtropical and temperate parts of the Atlantic; the Ifaluk specimens referred to above are the first to be recorded from the Pacific. The occurrence of this species in the tropical parts of the Indo-westpacific is confirmed by its presence in the Noumea collection.

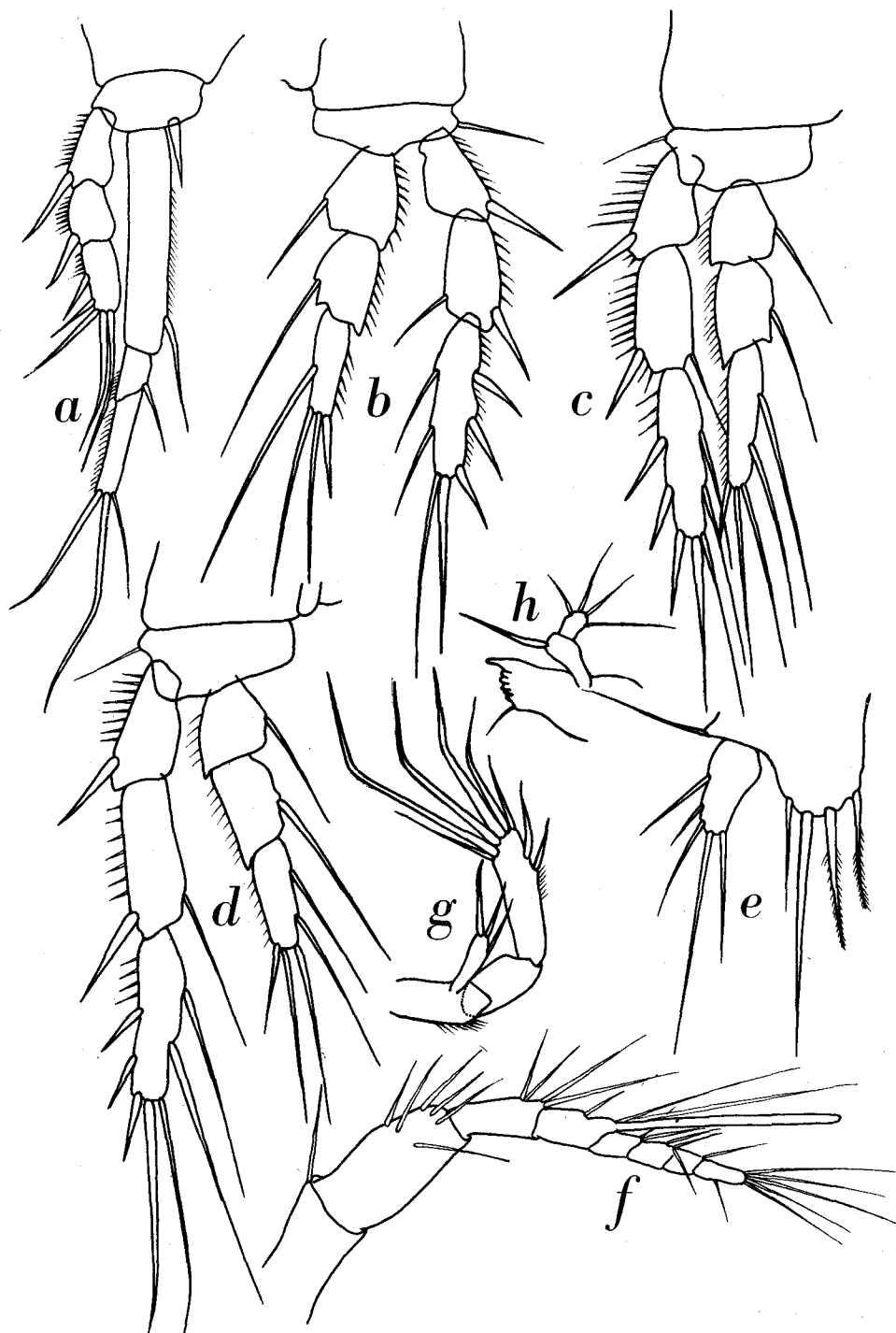


Fig. 25. *Ameira parvula* (CLAUS), adult female. a, first leg; b, second leg; c, third leg; d, fourth leg; e, fifth leg; f, antennule; g, antenna; h, mandible. $\times 625$.

Genus *Nitocra* BOECK, 1865*Nitocra affinis* GURNEY, 1927

Nitocra affinis GURNEY, 1927, pp. 545, 546, fig. 154; LANG, 1948, p. 820, fig. 328 no. 1.

MATERIAL. One adult female of 525μ length.

REMARKS. In my paper on the copepods of Ifaluk atoll (Vervoort, in press) the female and the male of this species will be completely redescribed and figured. The present female is in complete agreement with the Ifaluk specimens of that sex and will not be described in detail here. The cephalothorax of this female (minus the fifth abdominal somite) is 285μ long; the abdomen (including the fifth thoracic somite) 240μ . The Ifaluk specimens were the first to be recorded from the Pacific; the present record confirms the occurrence of this species in the Indo-westpacific area.

Genus *Psyllocamptus* T. SCOTT, 1899*Psyllocamptus minutus* G. O. SARS, 1911

(figs. 24 c, d, 26)

Psyllocamptus minutus G. O. SARS, 1911, p. 423, suppl. pl. 44; LANG, 1948, p. 827, fig. 330 no 2; NOODT, 1952, p. 120; KUNZ, 1954, p. 228; NOODT, 1955, p. 80, figs. 55-64; WELLS, 1961, p. 269.

MATERIAL. One adult, ovigerous female of 390μ length. This specimen has been dissected and mounted, the slides are in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

DESCRIPTION. Adult female, total length 390μ , of which 210μ for the cephalothorax and 180μ for the abdomen. Unfortunately the specimen is very dirty, so that it could not be figured dorsally and laterally. The general shape of the body, however, is very slender and cylindrical, very slightly narrowing caudally in dorsal aspect, with the division between cephalothoracic and abdominal portions indistinctly marked. The head and the first thoracic somite are fused to form the cephalic somite; the back is slightly curved and there is a small but unmistakable rostrum, separated from the head by a shallow groove (fig. 24c). The rostrum is acuminate and has two distinct hairs; it is about as long as the first antennular segment. The first and second abdominal somites are fused to form the genital complex. There are some spinules on the caudal part of the dorsal wall of the abdominal somites 2 to 4. The furcal rami are about as long as wide (fig. 26f) and slightly tapering; there are 5 marginal setae and a fine appendicular seta on the dorsal parts of the ramus. Of the marginal setae 1, 4 and 5 are small, setae 2 and 3 are lengthened and thickened, especially seta 2. The anal operculum is nude.

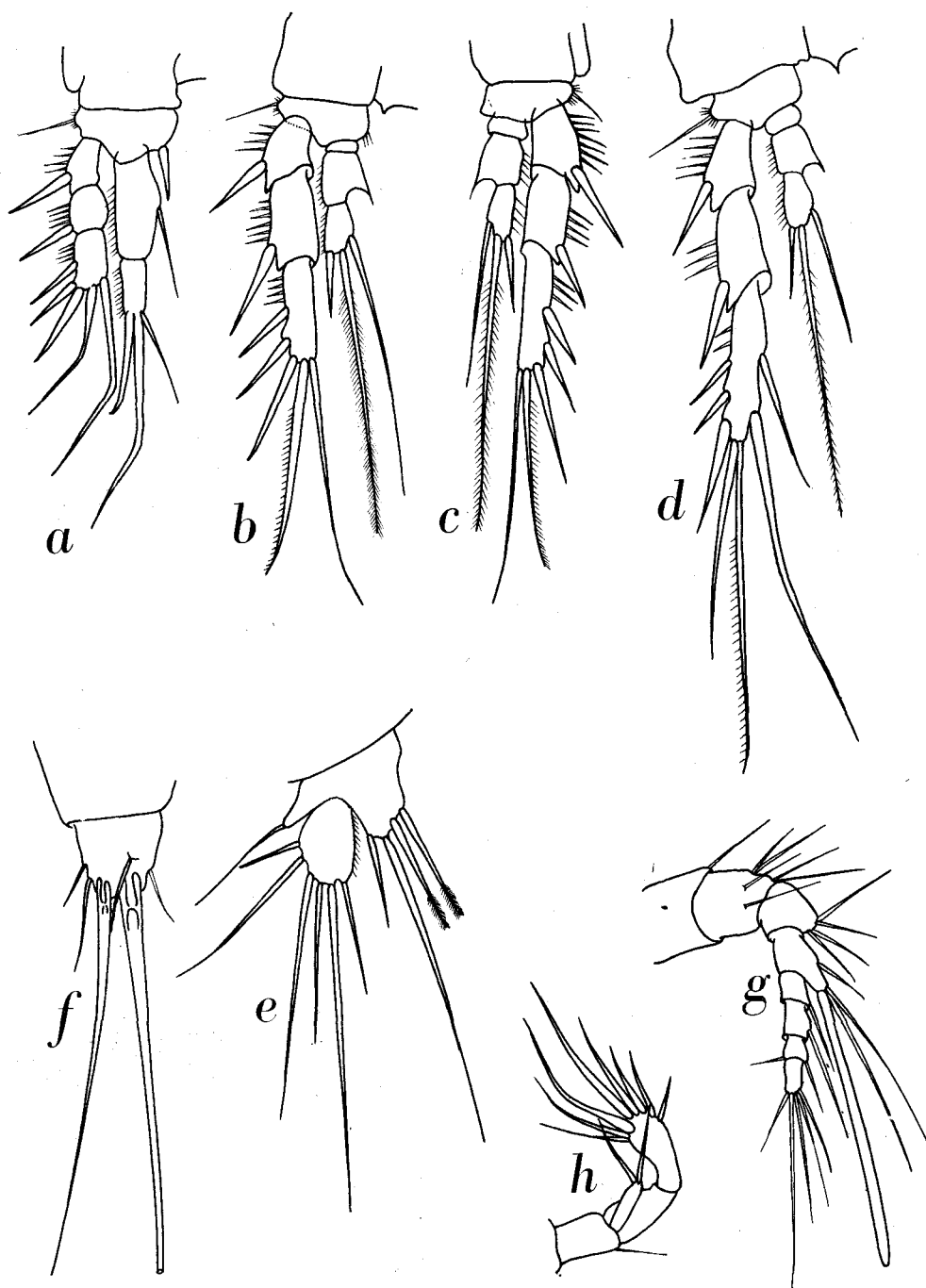


Fig. 26. *Psyllocamptus minutus* G. O. Sars, adult female. a, first leg; b, second leg; c, third leg; d, fourth leg; e, fifth leg; f, left furcal ramus, dorsal view; g, antennule; h, antenna. $\times 625$.

The antennules are 8-segmented and decidedly shorter than those figured by G. O. Sars (1911, suppl. pl. 44); the basal 4 segments, particularly, are shorter. The setation has been represented in fig. 26g. The aesthetascer on segment 4 is very strong.

The basis and the first endopodal segment of the antenna are separate. The endopodite is 1-segmented and styliform; it carries two thick and short apical setae. The total number of spiniform setae on the endopodite is 7, 4 of which are geniculate (fig. 26h).

The endopodite of leg 1 is 2-segmented and slightly longer than the 3-segmented exopodite. The basis has a strong internal spine and a fine external seta. The first endopodal segment has an internal seta halfway along the margin; the second endopodal segment is short and carries 3 appendages: a strong spine, a geniculate, strong seta and a fine seta. The total number of appendages on the third exopodal segment is 5. The external margin of the exopodite is strongly spinulose (fig. 26a).

The legs 2 to 4 are characterized by 3-segmented exo- and endopodites. The endopodites are remarkable by the very short, asetose first segment. The second endopodal segment is internally produced in a point, bearing a short seta. The external margins of the exopodites are strongly spinulose.

The setal formulae are:

	endopodite	exopodite
leg 2 (fig. 26b)	0. (1). 111	0. 0. 023
leg 3 (fig. 26c)	0. (1). 111	0. 0. 023
leg 4 (fig. 26d)	0. (1). 111	0. 0. 223

The distal seta at the external margin of the third exopodal segment of leg 4 is very strong.

The exopodite of leg 5 (fig. 26e) is ovate and about 1.25 times as long as wide. There are 5 strong marginal setae, their distribution appears from fig. 26e. The baso-endopodite reaches about halfway along the exopodite and carries 4 setae. The external lobe is well developed and has a fine seta.

REMARKS. The present specimen differs from the female described and figured by G. O. Sars in the following points:

1. There is a distinct rostrum.
2. The antennules are decidedly shorter.
3. There are fine spinules on the dorsal part of the abdomen, whilst Sars' specimen, to judge from the figures, has been unarmed.
4. The exopodite of leg 5 is broader, the two internal setae of the baso-endopodite are normally developed. The exopodite of leg 5 in Sars' specimen is about twice as long as broad, whilst the two internal setae of the baso-endopodite are bifid at the apex.

Specimens identical with those mentioned by Sars have been described by

NOODT (1955, p. 80), though the abdomina in NOODT's specimens were ventrally armed with small spinules.

NOODT (1955, p. 78) has made it clear that KUNZ' genus *Mesochrella* (KUNZ, 1951, p. 81, type *Mesochrella gelatinosa* KUNZ, 1951) is identical with *Psyllocamptus* G. O. SARS, 1911 and that *Mesochrella* KUNZ, 1951 must disappear as a junior subjective synonym of *Psyllocamptus* G. O. SARS, 1911. NOODT (1952, p. 120) originally expressed the opinion that the type of *Mesochrella*, *M. gelatinosa* KUNZ, 1951, p. 81, could not be separated from *Psyllocamptus minutus* G. O. SARS, but after the renewed study of KUNZ' original material he has separated KUNZ' form as a subspecies (*Psyllocamptus minutus gelatinosus* (KUNZ, 1951)) from the typical form (*Psyllocamptus minutus minutus* G. O. SARS, 1911). A comparison of the present specimen with the descriptions of both subspecies in NOODT's (1955) paper shows, that it conforms with *P. minutus gelatinosus* but for the structure of the furca, which here is about as long as broad and has no spinules. As I have only a single specimen at my disposal I have left the question of its subspecific position undecided, the more so since this is the first records of the species and the genus from the Pacific area.

Psyllocamptus minutus minutus is known from a number of Atlantic localities: Korshavn, southern Norway (SARS, 1911), Gullmar Fjord (LANG, 1948), German Bight (Deutsche Bucht, KUNZ, 1954) and the Isles of Scilly (WELLS, 1961). Its occurrence in the Mediterranean has been doubted by LANG but has now been definitely established by NOODT (1955), who found the species in the Sea of Marmara.

Psyllocamptus minutus gelatinosus has so far only been recorded from Lüderitz Bay, South-west Africa (KUNZ, 1951, as *Mesochrella gelatinosa*). The females of this subspecies measure 560 μ .

Genus *Laophonte* PHILIPPI, 1840

Laophonte thoracica BOECK, 1865

(fig. 24e, 27)

Laophonte thoracica BOECK, 1865, p. 278; SEWELL, 1940, p. 310; NICHOLLS, 1941, pp. 99, 100, 102, 107; DAHL, 1948, p. 100; LANG, 1948, p. 1352, fig. 543 no. 6; KLIE, 1950, p. 118; Marine Biological Association, 1957, p. 170; ROE, 1958, p. 232; PÓR, 1959, p. 361.

MATERIAL. One adult male, total length 375 μ . This specimen has been dissected; the slides are in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

REMARKS. Only a single male specimen of this Atlantic form occurs in the collection. Unfortunately it is so densely covered with dirt that it could not be figured in dorsal or lateral view, so that I can only give drawings of the principal appendages and of the abdomen. On comparison of these appendages with the

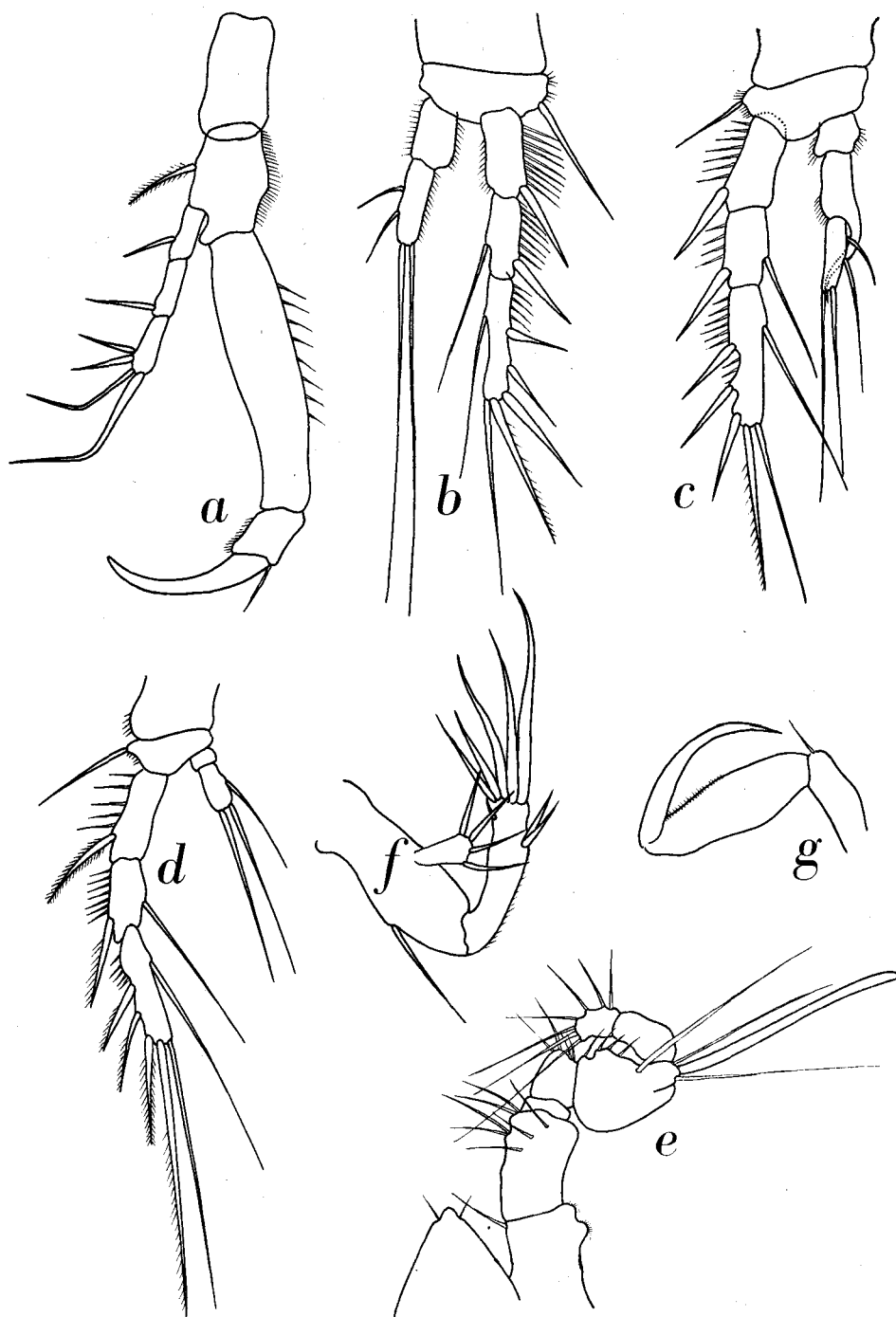


Fig. 27. *Laophonte thoracica* BOECK, adult male. a, first leg; b, second leg; c, third leg; d, fourth leg; e, antennule; f, antenna; g, maxillipede. $\times 625$.

drawings of North Atlantic individuals by G. O. Sars (1907, pl. 161) only some small differences have been observed, which I have listed below but which do not, in my opinion, justify specific separation of this first Pacific specimen.

The abdomen is just as figured by Sars, the furcal rami are tubular and about 3.5 times as long as wide; the position of the setae can best be observed from fig. 24e. The appendicular setae, though they are present, have not been figured in the ventral aspect of the abdomen. The antennule (fig. 27e) is subchirocerate; the first segment has a hairy external tubercle but no spine. The position of the setae and the development of segment 4 appears from fig. 27e. The rostrum is a triangular prominence between the antennules, with a rounded knob between the frontal hairs. The exopodite of the antenna (fig. 27f) is 1-segmented and provided with 4 strong setae. The basis of the maxillipede is slender and the endopodite, reduced to form an unsegmented claw, is as long as the basis (fig. 27g).

The coxa, basis and endopodite of leg 1, compared with Sars' figure of the corresponding leg of the female, are fairly short and compactly built (fig. 27a). The legs 2 to 4 have the following setal formulae:

	endopodite	exopodite
leg 2 (fig. 27b)	0. 220	0. 1. 123
leg 3 (fig. 27c)	0. 0. 220 (modified)	0. 1. 123
leg 4 (fig. 27d)	0. 120	0. 1. 123

The endopodite of leg 3 is modified and 3-segmented. Segment 2 is, at its internal apex, produced into a curved, strong spine, reaching slightly beyond the apex of the third endopodal segment. The endopodite of leg 4 is very short.

The exopodite of leg 5 is small and about twice as long as wide; there are 5 setae: one at the internal margin, one dagger-shaped, setiform spine at the apex and 3 at the external margin. The baso-endopodite is much reduced and carries a single spiniform seta. The sixth legs form a distinct lobe on each side of the body, bearing a strong seta.

The geographical distribution of this species is principally restricted to the eastern side of the temperate and northern Atlantic (Lang, 1948). Additional records, that have become available since the publication of Lang's monograph, are: Öresund (Dahl, 1948), the Plymouth area (Marine Biological Association, 1957) and Dalkey, Co. Dublin, Irish East coast (Roe, 1958). Only some records from the Mediterranean are available (Lang, 1948). This is the first record of the species from the Pacific Ocean.

Genus *Paralaophonte* Lang, 1948

I have briefly discussed this genus in my paper on the Ifaluk copepods and enumerated the various species. The present collection contains a female and a male specimen of a species that does not fit the descriptions of any of the known

species, nor does it conform with any of the groups distinguished by LANG. For the present I have left its exact position in the genus *Paralaophonte* undecided.

Paralaophonte obscura nov. spec.

(figs. 28-30, 31c)

MATERIAL: One adult female of 448 μ length (holotype) and one adult male of 435 μ length (allotype). Both specimens have been dissected and the appendages mounted (collection Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands).

DESCRIPTION OF THE HOLO- AND ALLOTYPE. Adult female, total length 448 μ , greatest diameter 135 μ . Length of the longest furcal seta 225 μ .

The general shape of the body is slender, slightly depressed dorso-ventrally and with the greatest diameter at the end of the cephalic somite. The body is slightly delated in the region of the genital complex (fig. 28a). The head and the first thoracic somite are fused to form the cephalic somite, this is as long as the combined lengths of the thoracic somites 2 to 5. The back, in lateral view, is almost straight and runs into the short rostral plate (fig. 28b). The rostrum is about as long as the first antennular segment, it is triangular with a bluntly rounded apex. The sides of the cephalic somite are produced to cover the oral field. The walls of the cephalic somite, in dorsal aspect, are slightly sinuous and carry some dispersed hairs. The thoracic somites 2 to 4 gradually narrow; their epimeral plates are rounded. The fifth thoracic somite is slightly broader than the fourth; both somites, in dorsal view, have rounded sides.

The abdominal somites 1 and 2 are fused to form the genital complex; the epimeral plates of both somites are distinctly laterally produced and bordered with short spines (fig. 29f). The epimeral plates of abdominal somite 3 are also backward produced. There is a distinct line of fusion visible on the dorsal part of the genital complex. The third abdominal somite, much narrower than the genital complex, also has laterally and backward produced epimeral plates bordered with spines. The fourth abdominal somite is normally developed and set laterally with some hairs. The fifth (anal) somite is about as long as the preceding somite and has a broadly rounded anal flap. The furcal rami are 1.5 times as long as wide; they carry a row of spinules near their insertion on the anal somite. Each ramus has 5 marginal setae and one appendicular seta; setae 1, 4, 5 and the appendicular seta are fine, setae 2 and 3 are lengthened. Seta 2 reaches the length of the abdomen, seta 3 is shorter. In addition each furcal ramus has some dispersed hairs. The whole tegument is covered with short hairs, particularly visible on the cephalic somite.

Unfortunately this unique specimen appeared to be badly preserved, so that during dissection some of the appendages disintegrated; their description, therefore, is not complete.

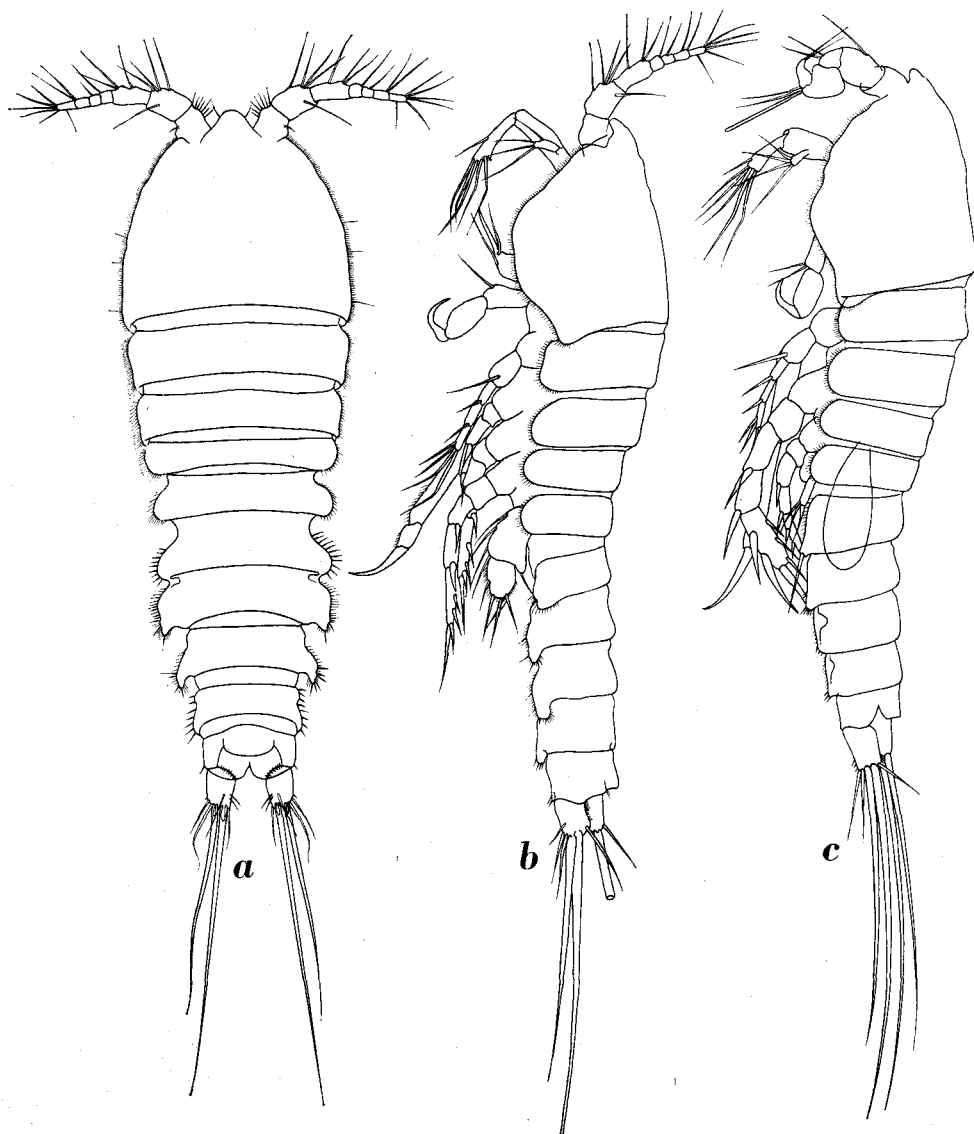


Fig. 28. *Paralaophonte obscura* nov. spec. a, b, adult female, holotype; a, whole animal, dorsal view; b, whole animal, lateral view from left side. c, adult male, allotype, whole animal, lateral view from left side. $\times 200$.

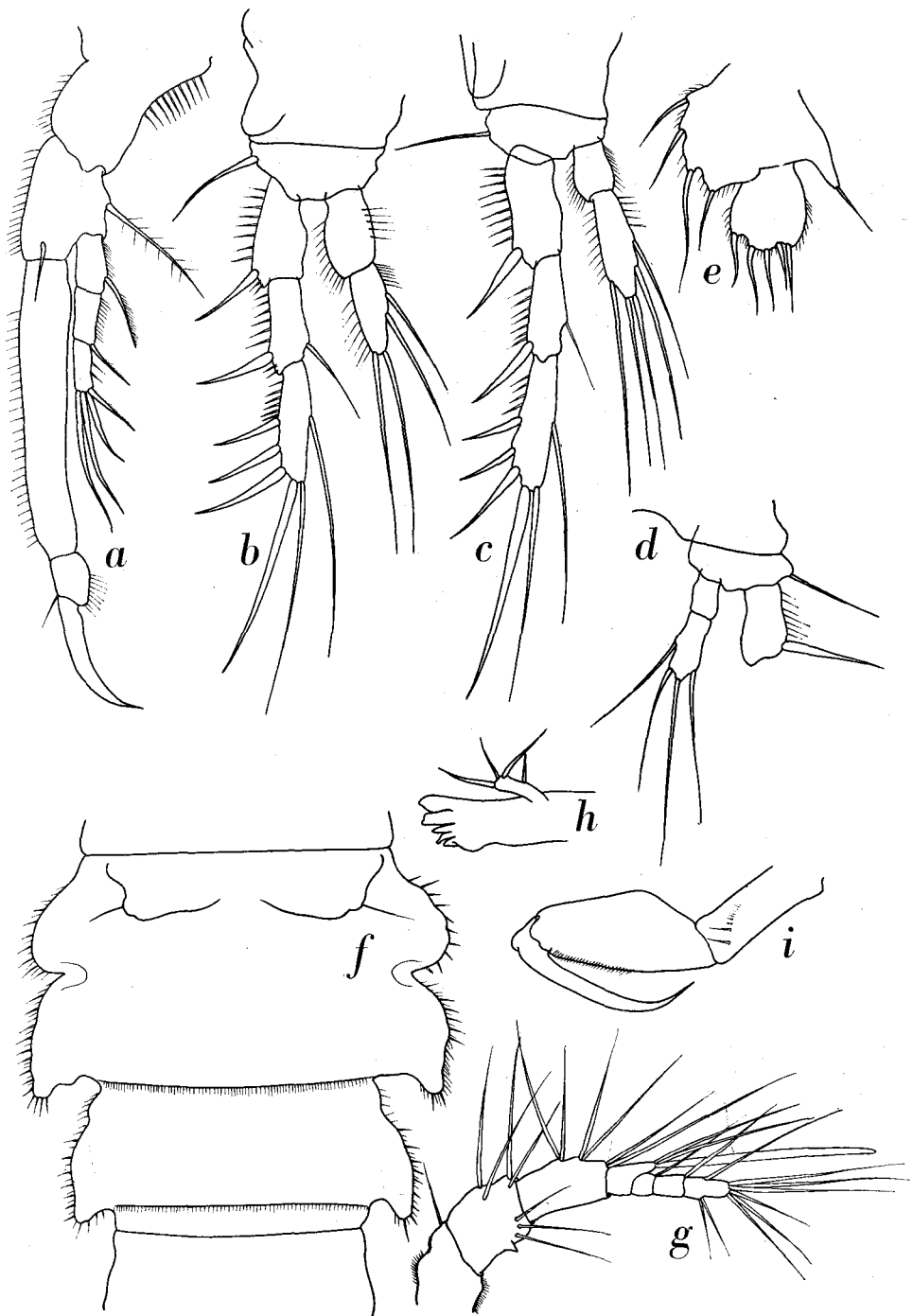


Fig. 29. *Paralaophonte obscura* nov. spec., adult female, holotype. a, first leg; b, second leg; c, third leg; d, basal portion of fourth leg; e, fifth leg; f, proximal part abdomen, ventral surface; g, antennule; h, mandible; i, maxillipede. $\times 500$.

The antennules are slightly shorter than the cephalic somite and 7-segmented. The segments 2 and 3 have about the same length; segment 2 has a small externally directed tooth. Segment 4 has a small conical process bearing the aesthetask and 2 setae. The complete setation is represented in fig. 29g.

The antennae were damaged, but there is a distinct, 1-segmented exopodite bearing 4 setae.

The mandibular praecoxa is well developed; the cutting edge has 5 teeth and a seta; the palp is reduced and 1-segmented, there are 4 setae in all (fig. 29h).

No suitable dissections of the other oral appendages were obtained, with the exception of the maxillipedes (fig. 29i). These are well developed, prehensile organs with a fairly long coxa with an oblique row of spinules. The basis is moderately swollen and has a pectinate row of hairs at the distal end of the internal margin. The endopodite is 1-segmented and shaped as a curved claw; there are no auxiliary setae on the claw.

The exopodite of leg 1 (fig. 29a) is 3-segmented; the coxa is spinulose along both margins and the basis has a small socle bearing the endopodite. In addition the basis has a spinulose seta at the external margin and a small, short spine near the insertion of the endopodite. The exopodite reaches halfway along the first endopodal segment; there are 4 setae in all on the third exopodal segment. The first endopodal segment is 7 times as long as wide, the internal margin is haired. The second and third endopodal segments are fused to form a big claw; there is a small seta near the line of fusion between the second and third endopodal segments.

The structure of the legs 2 to 4 appears from the setal formulae, fig. 29 b-d and the following notes.

Setal formulae:

	endopodite	exopodite
leg 2	0.220	0.1.123
leg 3	0.221	0.1.123
leg 4	0.121	damaged

The external margins of the exopodites of legs 2 to 4 spinulose.

The second leg (fig. 29b) has a 2-segmented endopodite. There is only a single internal seta on the third exopodal segment.

The third leg (fig. 29c) has a 2-segmented endopodite with a total of 5 setae. There is a single internal seta on the third exopodal segment.

The fourth leg (fig. 29d) has a 2-segmented endopodite with a total of 4 setae. The exopodite is damaged, but the setal formula most probably was: 0.1.123.

The baso-endopodite of leg 5 (fig. 29e) is moderately produced and reaches the upper third of the exopodite. There are 4 setae along the internal margin of the baso-endopodite. The external lobe is well produced and carries a fine seta. The exopodite is small, the distal margin more or less truncate and with

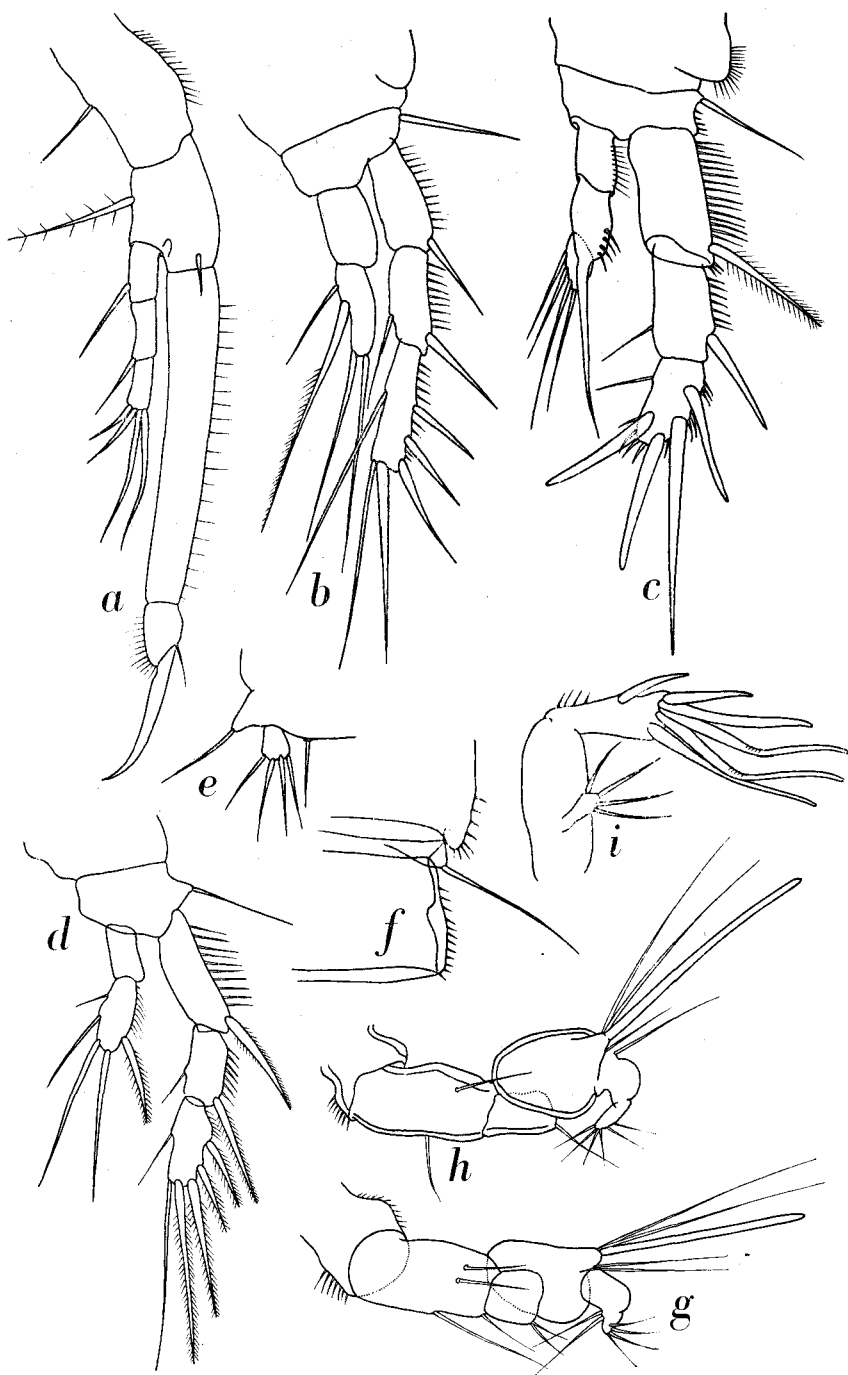


Fig. 30. *Paralaophonte obscura* nov. spec., adult male, allotype. a, first leg; b, second leg; c, third leg; d, fourth leg; e, fifth leg; f, first and second abdominal somite, ventral view of left part; g, h, antennule; i, antenna. $\times 500$.

a total of 5 setae, the development and distribution of which appears clearly from fig. 29e. The margins of exopodite and baso-endopodite are haired.

The ventral aspect of the genital field is represented in fig. 29f.

Adult male, total length 435μ ; greatest diameter (at the third thoracic somite) 135μ ; length of longest furcal seta 240μ .

In general appearance the male is not unlike the adult female; the body is a trifle more slender with the division between cephalothorax and abdomen more distinctly marked because of the narrower fifth thoracic somite (fig. 31c). The head and the first thoracic somite are fused; the length of the cephalic somite equals the combined lengths of thoracic somites 2 to 5. The development of the rostrum is as in the female; the sides of the cephalic somite are less produced. The lateral parts of somites 2 to 5 are rounded in dorsal view; the development of the epimeral plates is as in the female. As already pointed out the fifth thoracic somite is narrower than in the female.

The first and second abdominal somites are separate; in dorsal aspect their appearance differs from that of the corresponding somites of the female by the almost complete absence of lateral flaps (fig. 30f). Their dorsal outline in the male is rounded, bordered by hairs and small spinules. The sixth feet are distinctly visible dorsally. The abdominal somites 3 and 4 have about the same length; the third has no laterally produced flaps and is fringed with spiniform hairs. The development of the anal somite and the furcal rami with their setae is as in the female. The whole carapace is shortly haired, no big hairs occur on the cephalic somite. A large spermatophore is visible on the left side of the body.

The antennules are subchirocerate, strongly modified clasping organs, about half the length of the cephalic somite and 6-segmented (fig. 30g, h). The second segment is fairly long, the fourth strongly swollen and with a small conical process bearing the aesthetasc and 2 setae. There are 2 indistinctly separated apical segments. The setation of the antennule is represented in fig. 30g, h, though possibly the number of setae in this small and compactly built organ is not accurately given.

The antennae are as in the female (fig. 30i).

I obtained no satisfactory preparation of the mouthparts, with the exception of the maxillipedes, that are identical with those of the female.

The first leg (fig. 30a) is identical with that of the female; all the remaining legs are more or less modified.

The exopodite of leg 2 (fig. 30b) is as in the female, but the second endopodal segment, though it is as long as in the female, is narrower; the inferior internal marginal seta is modified and represented by a thick, spiniform seta, spinulose along the internal margin.

Both exo- and endopodites of leg 3 (fig. 30c) are modified. The 3 exopodal segments are short and thick, the external marginal spines are strongly chitinized

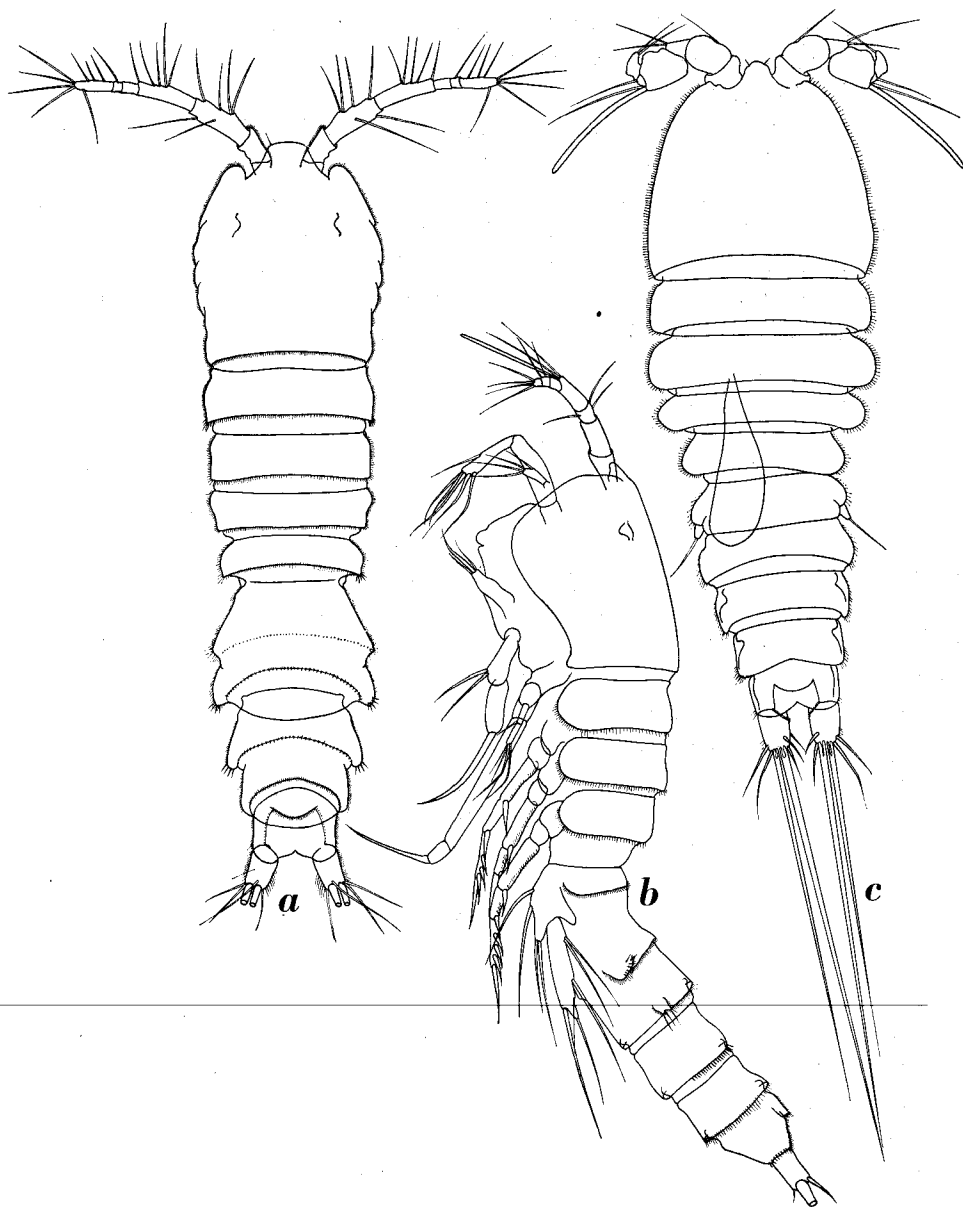


Fig. 31. a, b, *Esola bulligera* (FARRAN), adult female; a, whole animal, dorsal view; b, whole animal, lateral view from left side. c, *Paralaophonte obscura* nov. spec., adult male, allotype, whole animal, dorsal view. $\times 200$.

and bluntly pointed, that of segment 1 is spinulose along both margins. There is one internal seta on segment 2 and one on segment 3. The external margins of the exopodal segments are spinulose, on the third segment these spinules mix with the big spines of that margin. The endopodite is 3-segmented; segment 1 has no setae but is haired externally. The internal apex of the second endopodal segment is drawn out in a long, gradually tapering point, reaching the apex of the exopodite. In addition there are some spinules along the external margin. The third endopodal segment is short and cut off obliquely, bearing 4 setae along that oblique margin.

The exopodite of leg 4 (fig. 30d) is 3-segmented, the first exopodal segment is elongated. All marginal spines of the three exopodal segments and the apical spine are spinulose along both margins. A single internal seta occurs along the internal margin of the exopodal segments 2 and 3. The endopodite is 2-segmented, the second endopodal segment, as in the female, has four setae. The external seta is dagger-shaped and spinulose; at the internal margin there is also a strong hair that may give the impression of a small seta.

The fifth feet (fig. 30e) are very small. The baso-endopodite is scarcely elevated and bears a single seta placed on a rounded socle. The external lobe is well developed and carries a fine seta. The exopodite is small and 1.5 times as long as the greatest diameter; the free margin has 4 setae.

The genital plates (sixth feet) are visible dorsally and ventrally; in ventral view they are represented by slightly backward produced flaps bearing a single strong seta (fig. 30f).

REMARKS: The present new species cannot be fitted into any of the groups of the genus *Paralaophonte* described by LANG (1948, p. 1386); in the setation of its legs it is intermediate between the "brevirostris" group and the "gracilipes" group. It particularly resembles *Paralaophonte meinerti* (BRADY, 1899) of the "brevirostris" group in general appearance, though in the structure of the appendages it shows more affinities with *Paralaophonte gracilipes* (BRADY, 1910). For the present I have left the systematic position of the new species undecided.

Genus *Esola* EDWARDS, 1891

Esola bulligera FARRAN, 1913

(figs. 31a, b, 32)

Laophonte bulligera FARRAN, 1913, p. 14, pl. 1 figs. 5-10, pl. 2 fig. 11; FARRAN, 1915, p. 53;

SEWELL, 1940, p. 312; NICHOLLS, 1941, pp. 97, 98, 100, 101.

Esola bulligera LANG 1948, p. 1412, figs. 571 no. 5, 573 no. 4.

MATERIAL. One adult female, 480 μ total length.

DESCRIPTION OF THE ADULT FEMALE. Total length 480 μ , length of the cephalothorax 240 μ , length of the abdomen (including the fifth thoracic somite)

240 μ . Greatest diameter 120 μ . Furcal setae damaged. The specimen has been dissected and the appendages mounted (collection Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.).

The general shape of the body is slender, especially in dorsal aspect (fig. 31a). The head and the first thoracic somite are fused to form the cephalic somite, this as long as the combined lengths of the thoracic somites 2 to 4. The body is distinctly contracted behind the fifth thoracic somite and expanded again in the region of the genital complex. The cephalic somite is fairly short and, in dorsal aspect, it has irregularly shaped lateral borders. The rostral plate is short and broad, it reaches halfway along the first antennular segment; the apex is set with two fine hairs. There are two cup-shaped depressions in the tegument of the cephalic somite to the left and right sides of the mid-dorsal line. In lateral aspect the sides of the thoracic somite appear to be produced, covering a part of the greatly protruding oral field (fig. 31b). The whole cephalic somite is shortly haired. The thoracic somites 2 to 4 have about the same length, the epimeral plates are rounded. The fifth thoracic somite is slightly shorter than the preceding somites, the epimeral plates are less produced.

The abdominal somites 1 and 2 are fused to form the genital complex; a line of fusion, bordered with small spinules, is visible dorsally and laterally. Both first and second abdominal somites laterally have a backward directed, small flap bordered with some teeth. The abdominal somites 3 to 5 have about the same length; the third is slightly produced latero-caudally and there it is set with some teeth. The anal plate is semicircular and set with fine hairs. The posterior borders of the second and third abdominal somites are set with small teeth, that of the fourth is set with fine hairs. The whole tegument is finely haired.

The furcal rami are 1.5 times as long as wide; the in- and external margins are haired. There are 5 setae and an appendicular seta on each ramus. Setae 1, 4, 5 and the appendicular seta are short and fine; setae 2 and 3 are thickened and apparently have been lengthened; both are damaged in this specimen.

The antennules (fig. 32g) are as long as the cephalic somite and 6-segmented. The first segment apically has a shallow depression with a small tooth; the second and third segments are fairly long. The fourth segment has a slender conical process bearing a thick aesthetask and two setae. The apical (sixth) segment is fairly long. The setation appears from fig. 32g.

The antenna (fig. 32h) has a single seta on the allobasis. The exopodite is small and 1-segmented; it carries four dagger-shaped setae. The endopodite has 2 setae along the internal margin and 5 geniculate marginal setae; in addition there is an appendicular seta.

The praecoxa of the mandible (fig. 32i) is greatly developed; the cutting edge has 5 strong teeth and a basal seta. The palp is reduced and styliform, it is apparently 2-segmented, each of the segments has 3 setae.



Fig. 32. *Esola bulligera* (FARRAN), adult female. a, first leg; b, second leg, left side; c, right endopodite of second leg; d, third leg; e, fourth leg; f, fifth leg; g, antennule; h, antenna; i, mandible; j, maxillule; k, maxilla; l, maxillipede. $\times 500$.

The maxillule (fig. 32j) is small, with the praecoxal arthrite as the best developed structure, distinctly articulating with the rest of the maxillule. The arthrite carries 5 strong teeth and 2 setae. Only one of the endites is developed and carries 3 setae. The basis is elongated and styliform; it carries 4 setae, one of which is strong. The exopodite too is elongated and bears a total of 3 setae, 2 of which are very fine.

The maxilla (fig. 32k) has 2 (coxal) endites, with 2 and 3 setae respectively. In addition there are some strong spinules on the praecoxa and a strongly haired, swollen tubercle at the margin. The basal endite is well developed and more or less coalescent with a strong spine; in addition there are 2 fine setae. The endopodite is completely reduced and represented by two setae inserting on the basal endite.

The maxillipede (fig. 32l) is comparatively big; the coxa has two apical setae and the basis is slightly swollen and without appendages. The endopodite is represented by a long, slender, curved claw, longer than the basis.

The first leg (fig. 32a) has a 2-segmented exopodite and a strongly developed, 3-segmented endopodite, inserting on a huge apophysis of the basis. The basis also carries two setae, one external and one internal. The first exopodal segment has one external seta, the second exopodal segment has a total of 5 appendages. The length of the whole exopodite is one third of that of the first endopodal segment. This endopodal segment is styliform, 12 times as long as wide and haired along the internal border. The second and third endopodal segments are more or less fused to form a claw with a small seta at the line of fusion between the second and third segments.

The structure of the legs 2 to 4 appears from the setal formulae, fig. 32 b-c and the following notes.

Setal formulae:

	endopodite	exopodite
leg 2	1. 2(3)20	0. 1. 123
leg 3	1. 321	0. 1. 223
leg 4	0. 221 (modified)	0. 1. 223

The endopodite of leg 2 (fig. 32 b, c) is 2-segmented, the apex of the endopodite reaching some distance along the third exopodal segment. The second endopodal segment has a total of 4 setae on the right and of 5 on the left side; none of these setae occurs on the external border.

The endopodite of leg 3 (fig. 32d) reaches the articulation between the second and third exopodal segments.

The exopodite of leg 4 (fig. 32e) is lengthened, the 2-segmented endopodite is very short, reaching the articulation between the exopodal segments 1 and 2. The first endopodal segment has no setae; the second segment is distinctly

modified; it carries a total of 5 setae. It either carries a glandular apparatus secreting a mass of mucous substance or a patch of exceedingly fine hairs.

The baso-endopodite and the exopodite of leg 5 (fig. 32f) are long and well developed. The number of setae on the baso-endopodite is 4; the external lobe is conical and has a fine seta. The exopodite is 8 times as long as wide and more or less styliiform; there are 6 setae in all, 4 of which occur along the external border, one at the apex and one at the internal border. The whole leg is covered with long hairs.

REMARKS. There can be no doubt that this is the species described by FARRAN (1913) as *Laophonte bulligera*; there is complete agreement in every detail, even in the structure of the endopodite of leg 4. The occurrence of this species at Noumea is very surprising as it has so far only been recorded from Blacksod Bay, Co. Mayo, Irish Atlantic coast, where it occurred between 1 and 3 fms. depth. FARRAN's female specimens measured 530 μ . The male of this species is unknown.

REFERENCES¹⁾

- BOCQUET, CH. 1951. Recherches sur *Tisbe* (= *Idyaea*) *reticulata*, n. sp. Arch. Zool. exp. gén., vol. 87, pp. 335-416, figs. 1-14, pls. 4-6.
- BOECK, A. 1865. Översigt over de ved Norges Kyster jagttagne Copepoder henhörende til Calanidernes, Cyclopidernes og Harpacticidernes Familier. Forh. Vidensk. Selsk., Krist., 1864, pp. 226-282 (this paper is usually cited as 1864; there can be no doubt, however, that it was issued in 1865 as is distinctly indicated on the front page of the volume).
- BOWMAN, T. E. 1962. *Tisbe monozota*, a new Harpacticoid Copepod from Florida. Proc. Biol. Soc. Washington, vol. 75, pp. 125-132, figs. 1-23.
- BOŽIĆ, B. 1955. Copépodes Harpacticoides des sables des environs de Roscoff. Description de quelques formes nouvelles. Arch. Zool. exp. gén., vol. 92, notes et revue, pp. 1-12, pls. 1-4.
- DAHL, E. 1948. On the smaller Arthropoda of marine Algae, especially in the polyhaline waters off the Swedish west coast. Lund, pp. 1-93, figs. 1-42, tabs. 1-24.
- FARRAN, G. P. 1913. Plankton from Christmas Island, Indian Ocean. II. On Copepoda of the Genera *Oithona* and *Paroithona*. Proc. zool. Soc. Lond., 1913, pp. 181-193, pls. 27-31.
- GRICE, G. D. 1960. Calanoid and Cyclopoid Copepods collected from the Florida Gulf coast and Florida Keys in 1954 and 1955. Bull. Mar. Sci. Gulf Carib., vol. 10 no. 2, pp. 217-226, fig. 1.
- 1960a. Copepods of the Genus *Oithona* from the Gulf of Mexico. Bull. Mar. Sci. Gulf Carib., vol. 10 no. 4, pp. 485-490, figs. 1-18.
- HUMES, A. G. 1954. *Tisbe celata* n. sp., a Harpacticoid Copepod from the mantle cavity of the Edible Mussel in New Brunswick. J. fish. Res. Bd. Canada, vol. 11, pp. 816-826, pls. 1-3.
- 1957. Deux Copépodes Harpacticoides nouveaux du genre *Tisbe*, parasites des Holothuries de la Méditerranée. Vie et Milieu, vol. 8, pp. 9-22, figs. 1-53.
- JAKOBI, H. 1954. Harpacticoida (Cop. Crust.) da microfauna de substrato areno-lodoso do "Mar de Dentro" (Ilha do Mel-Baía de Paranaguá-Brasil). Dusenía, vol. 5, pp. 209-232, figs. 1-15.
- JAKOBI, H. & M. H. NOGUEIRA 1960. Descrição de uma nova espécie de *Ectinosoma* encontrada em águas salobras de Ilha de Santa Catarina (Copepoda-Harpacticoida). Bol. Univ. Paraná, Fac. Fil. Ciênc. Letr., Zool., no. 5, pp. 1-10, fig. 1.

1) This list contains only those papers that are not included in the bibliographies of LANG (1948), VERVOORT (1946) and VERVOORT (1957).

- KIEFER, F. 1929. Crustacea Copepoda. II. Cyclopoida Gnathostoma. Das Tierreich, pt. 53, pp. 1-102, figs. 1-42.
- KLIE, W. 1941. Marine Harpacticoiden von Island. Kiel. Meeresforsch., vol. 5 pt. 1, pp. 1-44, figs. 1-48, tab. 1.
- 1949. Harpacticoida (Cop.) aus dem Bereich von Helgoland und der Kieler Bucht. I. Kiel. Meeresforsch., vol. 6, pp. 90-128, figs. 1-52.
- KUNZ, H. 1951. Marine Harpacticiden aus dem Küstensand von Südwestafrika. Kiel. Meeresforsch., vol. 8 pt. 1, pp. 76-81, pls. 23-26.
- 1954. Beitrag zur Kenntnis der Harpacticoiden der Deutschen Bucht. Kiel. Meeresforsch., vol. 10, pp. 224-228, pls. 27-29.
- LANG, K. 1948. Monographie der Harpacticiden. Stockholm, vol. 1, pp. 1-896, figs. 1-361; vol. 2, pp. 897-1682, figs. 362-607, maps. 1-378.
- LINDBERG, K. 1955. Cyclopoides (Crustacés Copépodes) du Mexique. Ark. Zool., n. s., vol. 7 no. 23, pp. 459-489, figs. 1-5.
- MARCUS, A. & F. D. PÓR 1960. Die Copepoden einer Probe aus dem Felsbiotop von Yalta (Krimhalbinsel). Trav. Mus. Hist. Nat. Gr. Antipa, vol. 2, pp. 145-163, figs. 1-7.
- & ——— 1961. Die Copepoden der polyhalinen Lagunen Sinoe (Schwarzen Meer-Rumänische Küsten). Acta Mus. Maced. Sci. Nat., vol. 7, no. 6, pp. 105-126, pls. 1-3.
- MARINE BIOLOGICAL ASSOCIATION 1957. Plymouth Marine Fauna, third edition. Plymouth, pp. 1-457, charts 1-4.
- NICHOLLS, A. G. 1939. Marine Harpacticoids and Cyclopoids from the shores of the St. Laurens. Nat. Canad., vol. 66, pp. 241-316, figs. 1-28.
- 1941. Littoral Copepoda from South Australia. (1) Harpacticoida. Rec. S. Austr. Mus., vol. 6, pp. 381-427, figs. 1-23.
- 1941 a. A Revision of the families Diosaccidae Sars, 1906 and Laophontidae T. Scott, 1905 (Copepoda, Harpacticoida). Ibid. vol. 7, pp. 65-110.
- 1942. Marine Copepoda from Western Australia 1. Littoral Harpacticoids from Rottnest Island. J. roy. Soc. W. Aust., vol. 27, pp. 135-141, figs. 1-4.
- 1944. Littoral Copepoda from the Red Sea. Ann. Mag. Nat. Hist. (11), vol. 11, pp. 487-503, figs. 1-9.
- NOODT, W. 1952. Marine Harpacticiden (Cop.) aus dem eulitoralischen Sandstrand der Insel Sylt. Abh. math.-nat. Kl. Akad. Wiss. Mainz, 1952, pp. 105-142, figs. 1-99.
- 1955. Marine Harpacticoiden (Crust. Cop.) aus dem Marmara Meer. Rev. Fac. Sci. Univ. Istanbul, vol. 20B, pp. 49-94, figs. 1-103.
- PETKOVSKI, T. K. 1955. Weitere Beiträge zur Kenntnis der Grundwasser Copepoden der Adriatischen Küste. Acta Mus. Maced. Sci. Nat., vol. 3, pp. 209-225, figs. 1-30.
- ROE, K. M. 1958. The littoral Harpacticoids of the Dalkey (Co. Dublin) area with descriptions of six new species. Proc. R. Irish Acad., vol. 59B, pp. 221-255, figs. 1-150.
- 1960. Some Harpacticoids from Lough Ine, with descriptions of two new species. Proc. R. Irish Acad., vol. 60B, pp. 277-289, figs. 1-44.
- SHEN, C. J. & S. A. BAI 1956. The marine Copepoda from the spawning ground of *Pneumatophorus japonicus* (Houttuyn) off Chefoo, China. Acta zool. Sinica, vol. 8, pp. 177-234, pls. 1-13.
- TANAKA, O. 1956. The pelagic Copepods of the Izu region, Middle Japan. Systematic account II. Families Paracalanidae and Pseudocalanidae. Publ. Seto Mar. Biol. Lab., vol. 5 pt. 3, pp. 367-406, figs. 6-22.
- 1960. Pelagic Copepoda. In: Biological Results of the Japanese Antarctic Research Expedition, no. 10. Spec. Publ. Seto Mar. Biol. Lab., pp. 1-95, pls. 1-40.
- VERVOORT, W. 1946. The Bathypelagic Copepoda Calanoida of the Snellius Expedition. I. Families Calanidae, Eucalanidae, Paracalanidae, and Pseudocalanidae. Biological Results of the Snellius Expedition, XV. Temminckia, vol. 8, pp. 1-181, figs. 1-10.
- 1957. Copepods from Antarctic and Subantarctic samples. B.A.N.Z. Antarctic Research Exped., (B) vol. 3, pp. 1-160, figs. 1-138.
- in press. Sand-dwelling Copepods from Ifaluk Atoll, Caroline Islands. Bull. U.S. Nat. Mus. No. 234.
- WELLS, J. B. J. 1961. Interstitial Copepods from the Isles of Scilly. Crustaceana, vol. 2, pp. 262-274, figs. 1-4.