

# New and interesting copepods (Crustacea, Copepoda) from brackish waters of Laing Island (Northern Papua New Guinea) Léopold III Biological Station, Laing Island - Contribution n° 96

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## Summary

In the paper at hand, eight copepods are described from two small temporary brackish water pools at Laing Island (Papua New Guinea). Included are one cyclopoid: *Neocyclops papuensis* n.sp. and seven harpacticoids: *Darcythompsonia inopinata* SMIRNOV, *Leptocaris mucronatus* n.sp., *Schizopera brusinae* PETKOVSKI, *Nitocra lacustris pacifica* YEATMAN, *Nitocra laingensis* n.sp., *Phyllopodopsyllus alatus* n.sp. and *Actinocletodes woutersi* n.gen., n.sp.

## Résumé

Dans cet article les Copépodes provenant de deux petits étangs saumâtres temporaires de l'île de Laing (Nord de la Papouasie Nouvelle-Guinée) sont décrits. Il s'agit d'un Cyclopoïde: *Neocyclops papuensis* n.sp. et de sept harpacticides: *Darcythompsonia inopinata* SMIRNOV, *Leptocaris mucronatus* n.sp., *Schizopera brusinae* PETKOVSKI, *Nitocra lacustris pacifica* YEATMAN, *Nitocra laingensis* n.sp., *Phyllopodopsyllus alatus* n.sp. et *Actinocletodes woutersi* n.gen., n.sp.

## Introduction

Laing Island is a small coral island situated in the Hansa Bay, northern coast of Papua New Guinea, at some 2.5 km from the coast. It is almost 800 m long and maximum 100 m wide. There are two small temporary brackish water pools, one at the most northern end and one at the southern end.

In the dry season (from May to October) both pools dry up, and only after continued rainfall in the wet season (November to April) they are filled up again.

During a stay of Dr. K. WOUTERS (K.B.I.N., Brussels) at Laing Island Biological Station, in 1982, he collected several samples in both pools. Besides interesting ostracodes (see WOUTERS, 1984) eight copepod species were found. In the present paper the description is given of a new cyclopoid: *Neocyclops papuensis* n.sp., and of four new harpacticoids: *Leptocaris mucronatus* n.sp., *Nitocra laingensis* n.sp., *Phyllopodopsyllus alatus* n.sp. and *Actinocletodes woutersi* n.gen., n.sp. Furthermore,

numerous specimens of *Darcythompsonia inopinata* SMIRNOV, 1934, *Schizopera brusinae* PETKOVSKI, 1954 and *Nitocra lacustris pacifica* YEATMAN, 1983 were found. Additional information on the integumental structures of the latter species is given.

## Material and methods

Seven samples were collected with a handnet (mesh: 180 µm). The samples were directly fixated with a buffered formaldehyde solution. In table I, the samples are listed with additional information on the temperature, the salinity and the number of specimens of each species. The salinity was measured with a salinity refractometer.

Drawings are made with a camera lucida. Abbreviations and terminology are adopted from LANG (1948, 1965). Dissected specimens are mounted in lactophenol. The specimens are deposited in the collections of the Recent Invertebrates Section of the "Koninklijk Belgisch Instituut voor Natuurwetenschappen" at Brussels.

Ordo Cyclopoida  
Family Cyclopidae  
*Neocyclops papuensis* n.sp.  
(Fig. 1: a-i, 2: a-i)

### Holotype:

One female from sample 3386, dissected and mounted on three slides, labelled COP 1571 A, B and C.

### Paratypes:

Two females and one male dissected (COP 1572-1574); all other paratypes preserved in alcohol (COP 1575).

### Etymology:

The specific name *papuensis* refers to Papua New Guinea.

Table 1:

*Copepods in the northern and southern brackish pools of Laing Island (numbers of specimens listed as 30,15,10, meaning 30 females, 15 males and 10 juveniles).*

	Sample	n° date	t. C°	Sal. ‰	<i>Neocyclops papuensis</i> n.sp.	<i>Leptocaris mucronatus</i> n.sp.	<i>Darcy-thompsonia inopinata</i>	<i>Schizopera brusinae</i>	<i>Nitocra lacustris pacifica</i>	<i>Nitocra laingensis</i> n.sp.	<i>Phyllopo-dopsyllus alatus</i> n.sp.	<i>Actino-cletodes woutersi</i> n.gen., n.sp.
Northern pool	3001	25.4.82	27	6					> 100		1, 0, 0	3, 1, 0
	3002	25.4.82	27	14	30,15,10		14, 6, 0		7, 1, 1			
	3064	03.5.82	22	31	24, 9, 5		1, 1, 1		> 100	15, 1, 0		
	3065	03.5.82	27	30								
Southern pool	3008	26.4.82	27	10		2, 1, 0		3, 1, 0			2, 4, 0	2, 0, 0
	3386	20.5.82	27	35	9, 7, 1		3, 1, 0					
	3387	20.5.82	27	35	3, 5, 2	4, 2, 0		5, 2, 2	> 100	5, 0, 0		5, 5, 0

### Description:

Female (holotype): habitus (Fig. 1a): typical cyclopoid shape; length, including furcal rami, 930 µm; cephalothorax with the largest width at the posterior margin; length of the cephalothorax about one third of the body length; ratio of the abdomen to the length: 1 to 2.4; genital segments (Fig. 1c, d and g) with a lateral thorn in the anterior half; ratio of the genital segment: 1 to 0.95; anal operculum slightly convex and sealed with small spinules along the margin; integument of the cephalothorax and the segments smooth; hyaline fringe of the segments not incised; postero-ventral margin of the anal segment furnished with small spinules.

Furcal rami: three times as long as broad; dorsal seta implanted near the apical margin of the ramus; lateral seta implanted in the apical third of the external margin; outer apical seta spiniform and spinulose; inner apical seta only slightly longer than the outer one and spinulose.

Genital field (Fig. 1c): represented as a curved transversal band in the antero-ventral half of the genital segment; P<sub>6</sub> (Fig. 2e) situated near the lateral thorn and composed by two short, blunt spines and one slender smooth seta.

Rostrum (Fig. 1h) directed ventrally with a slightly rounded tip.

Antennule (Fig. 2a): twelf-segmented, reaching to the middle of the cephalothorax; aesthetascs implanted on the ninth and the eleventh segment.

Antenna (Fig. 2c): basis with a proximal row of minute teeth; exopodite represented as a long spinulose seta; endopodite three-segmented.

Mandible (Fig. 2b): gnathobasis with strong teeth, additional spines and two feathered setae; mandibular palp minute, bearing two short setae and one long and feathered one.

Maxillule (Fig. 2f): arthrite as in *N. remanei* s.l.; basis with three setae of which one is smooth; endopodital segment confluent with the basis and bearing three setae; exopodite represented as a single setae.

P<sub>1</sub> - P<sub>3</sub>: as in *N. remanei* s.l.

P<sub>4</sub> (Fig. 2i): prae-coxa small; coxa bearing a densely feathered inner seta; inner margin of the basis furnished with hairs and extended in a sharp tooth; exopodite three-segmented; endopodite two-segmented; second segment still showing the shape of the two composing segments; setal formula and setal shape of both rami as in *N. remanei* s.l.

P<sub>5</sub> (Fig. 2g): coxae and intercoxal plate present; basis with an outer smooth seta; exopodite two and the half times as long as wide; outer spine spinulose; apical outer spine shorter than the inner one (ratio: 2 to 3); median apical seta slender and smooth.

Male - habitus (Fig. 1b) almost identical to the female, differing only in the free genital segments; length: 640 µm.

Antennule (Fig. 2d) with fifteen segments.

Mouthparts and legs as in the female.

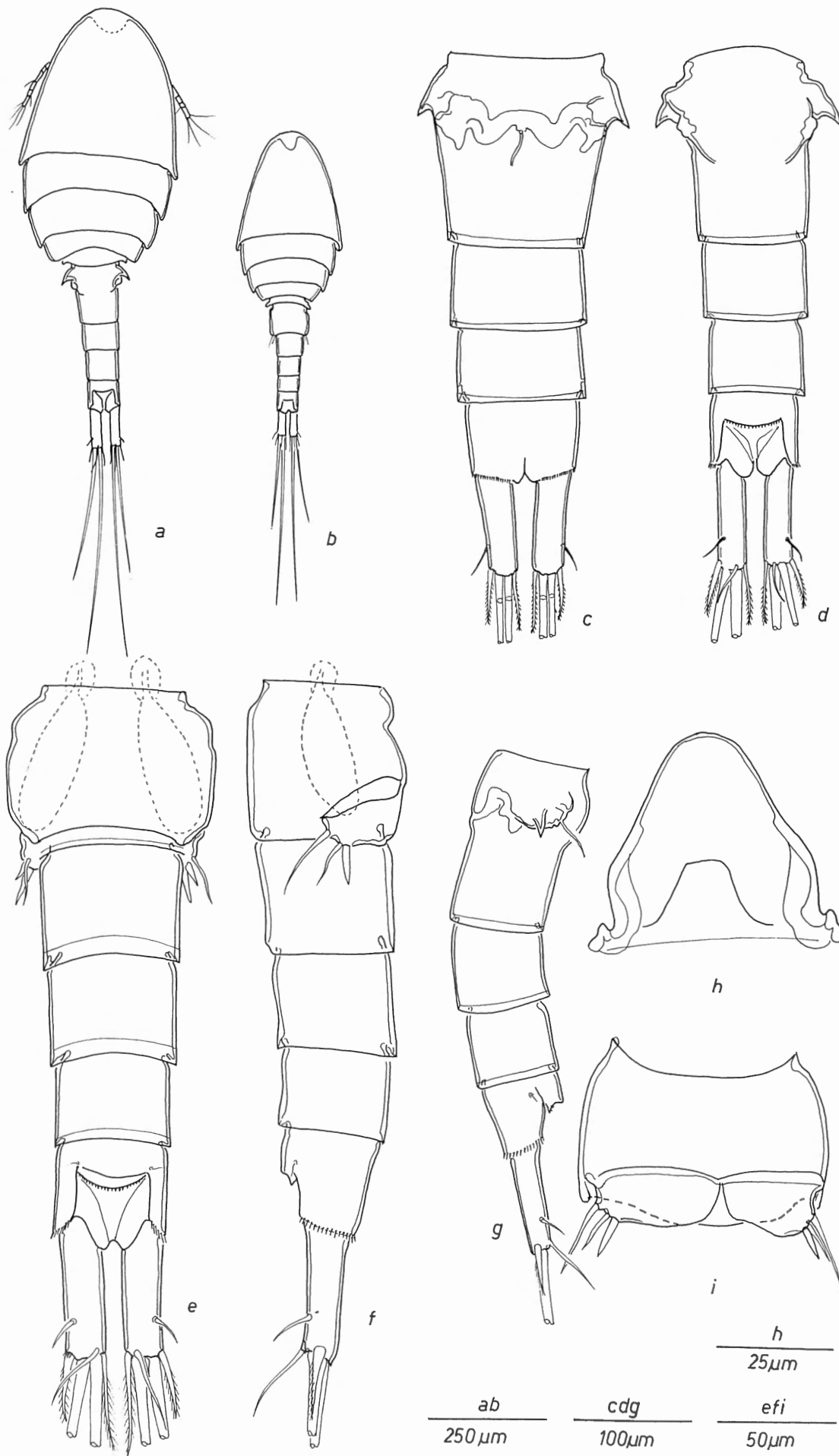
P<sub>5</sub> (Fig. 2h): coxa and basis as in the female; exopodite two-segmented; first exopodital segment with an inner and an outer spine; second segment with a median seta and two marginal spines; apical spines with the same proportional length as in the female.

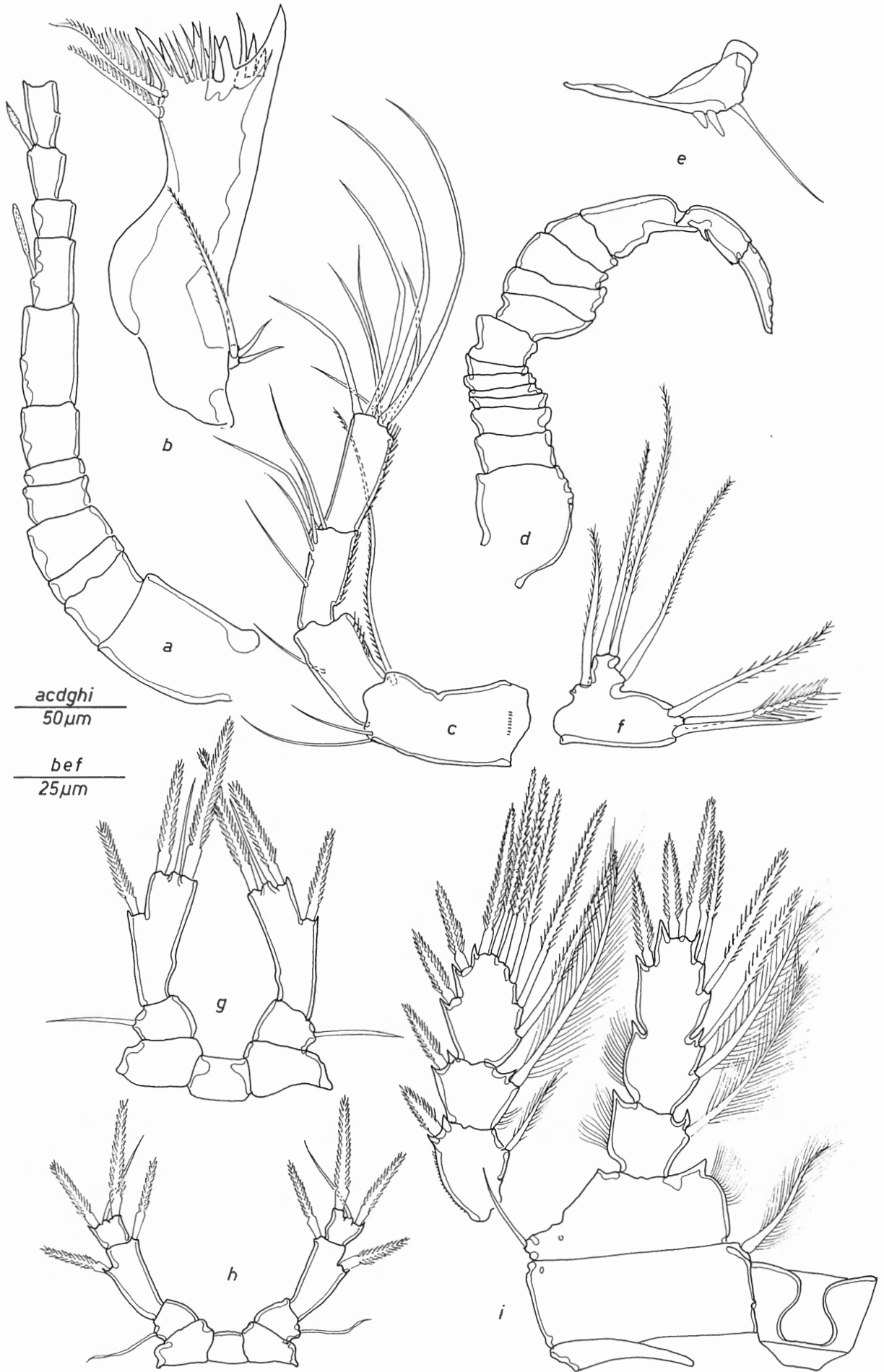
P<sub>6</sub> (Fig. 1f and i): represented as a large ovate plate bearing two setae and one spine, all implanted along the external edge of the supporting plate.

### Variability:

Variability was only observed in the length of the body, ranging from 895 µm to 950 µm in the female and from 630 µm to 660 µm in the male. The

Fig. 1. *Neocyclops papuensis* n.sp.: a. habitus of the female; b. habitus of the male; c. abdomen of the female in ventral view; d. abdomen of the female in dorsal view; e. abdomen of the male in dorsal view; f. abdomen of the male in lateral view; g. abdomen of the female in lateral view; h. rostrum in ventral view; i. first genital segment of the male in ventral view. ▷





Length-width ratio of the furcal rami varies from 2.90 to 3.25.

#### DISCUSSION

*Neocyclops papuensis* n.sp. is closely related to *N. remanei* s.l. (HERBST, 1952). Both species share a number of important features: the antennule, the maxille, the maxilliped and the P<sub>1</sub> - P<sub>3</sub>. *N. papuensis* n.sp. however, is easily distinguishable from *N. remanei* s.l. by the two-segmented endopodite of the P<sub>4</sub> and the setation of the mandibular palp.

As a matter of fact, both features are unique in the genus *Neocyclops* (sensu PLESA, 1981). The presence of three setae have only been found in the sub-families Euryteinae, Halicyclopininae, Cyclopininae and Eucyclopininae.

The presence of three setae on the mandibular palp in *N. papuensis* n.sp. illustrates the doubtful status of this feature as a diagnostic character in generic and family discrimination.

#### Ordo Harpacticoida

#### Family Darcythompsoniidae

#### *Darcythompsonia inopinata* SMIRNOV, 1934

#### Material:

One dissected female, mounted on three slides and labelled COP 1597, other specimens preserved (COP 1598).

#### Remarks:

*Darcythompsonia inopinata*, originally described from Vladivostok by SMIRNOV (1934), was only recently reported for the second time by YEATMAN (1983) from Fiji and Western Samoa. Besides the specimens from Papua New Guinea, I found several females and males of *D. inopinata* in Lac Salé (Grande Comore, south-east of Mitsamiouli).

Comparison between the Papuan specimens, the specimens of the Comores and the specimen of YEATMAN, revealed no differences. As far as can be judged from the few records, *D. inopinata* seems to be distributed along the coasts of the Western Pacific and the Indian Ocean.

#### *Leptocaris mucronatus* n.sp.

(Fig. 3 a-i)

#### Holotype:

One dissected female (COP 1576) from sample 3387.

#### Paratypes:

One dissected female (COP 1577), three females and three males preserved in alcohol (COP 1578).

#### Etymology:

The specific name *mucronatus* (Latin, meaning terminating in a point) alludes to the setae on the furcal rami and on the P<sub>5</sub> in the male.

#### Description:

Female (holotype): habitus (Fig. 3a and b): typical vermiform shape: length, including rostrum and furcal rami, 600 µm; cephalothorax tapering in the anterior third; integument of the cephalothorax, thoracic and abdominal segments smooth; hyaline fringe transversally striated; genital segments fused, fusion marked by two small ventro-lateral cuticular thickenings; anal segment 1.5 times as long as wide; anal operculum strongly convex with a smooth margin; rostrum entirely fused with the cephalothorax and slightly prominent.

Furcal rami tapering towards the posterior margin and about two times as long as wide; dorsal surface of the rami with a strong carina; two lateral setae, one dorsal seta, one inner and one outer seta; principal terminal seta not bulbous.

Antennule (Fig. 3d) four-segmented; first segment with two small combs of spinules; aesthetasc implanted on the third segment and as long as the whole antennule.

Antenna (Fig. 3i): exopodite represented as two setae; external margin with a strong seta, barbed most apically; endopodite with strong spinules and three lateral spines; distal margin of the endopodite with two spines, two smooth setae and a long distally armed seta.

Mandible and maxillule as in *L. trisetosus* KUNZ.

Maxille (Fig. 3h): syncoxa with one strongly armed endite, bearing two slender setae; prolonged basis with two setae; vestigial rami represented as two setae.

P<sub>1</sub> - P<sub>4</sub>: setal formula and shape of the rami and setae as in *L. trisetosus* KUNZ.

P<sub>5</sub> (Fig. 3f) with three setae; middle seta shortest. Male - habitus (Fig. 3c) as in the female; length: 595 µm; last thoracic segment and first abdominal segment not fused.

Antennule (Fig. 3e): five-segmented; first segment with two combs of small teeth; aesthetasc implanted on the third segment.

Mouthparts and legs as in the female.

P<sub>5</sub> (Fig. 3g) resembling closely that of *L. trisetosus* KUNZ, but having slender and pointed setae instead of blunt ones as in *L. trisetosus*.

## DISCUSSION

*Leptocaris mucronatus* n.sp. clearly belongs to the *brevicornis*-group (KUNZ, 1983) and seems to be most related to *L. trisetosus* (KUNZ, 1935). *L. mucronatus* n.sp. differs from his congener mainly in the slender furcal setae and in the spiniform spines on the P<sub>5</sub> in the male.

Besides these differences several aspects discriminates *L. mucronatus* n.sp. from the other species of the *brevicornis*-group. In *L. mucronatus* n.sp. the furcal rami bear six setae. Only *L. vermicularis* (OLIVIERA, 1957) has six setae while the other species of the *brevicornis*-group have lost one or more lateral setae.

A strong seta arises on the basis of the antenna of *L. mucronatus* n.sp. This peculiarly shaped seta is also found in *L. sibericus* (BURUTSKI, 1952) but is absent in the other members of this group.

## Family Diosaccidae

*Schizopera brusinae* PETKOVSKI, 1954*Material:*

One female dissected, labelled COP 1595, the remaining specimens preserved in alcohol (COP 1596).

*Remarks:*

Species discrimination within the genus *Schizopera* is a difficult task mainly through the small differences between the species. *Schizopera brusinae* PETKOVSKI however, is easily recognizable through the setation of the legs and the P<sub>5</sub> (see KUNZ, 1975). The present specimens correspond in all details to the description and figures of *S. brusinae*, except for the length/width ratio of the furcal rami. The Papuan specimens show a shorter furcal ramus (L/W 1.5 : 1) than the specimens found by PETKOVSKI (1954), MARINOV (1973) and KUNZ (1975) where the L/W-ratio seems to be invariably 2 : 1 (measured from the drawings).

*Schizopera brusinae* is reported from the mediterranean Sea (PETKOVSKI, 1954 and 1955; KUNZ, 1975) and the Black Sea (MARINOV, 1973). The discovery of this species along the coasts of Papua New Guinea, indicates that *S. brusinae* must be distributed through (at least) the Indian Ocean. Unfortunately, as far as I know, no records of this species from this area are available at present.

## Family Ameiridae

*Nitocra lacustris pacifica* YEATMAN, 1983  
(Fig. 4 a-f)*Material:*

Six females and two males dissected (slides COP 1579 - COP 1586), other specimens preserved in alcohol (COP 1587).

*Remarks:*

Because no morphological differences were found between the specimens of Papua New Guinea and the description of *N. lacustris pacifica* by YEATMAN (1983), drawings of the appendages are not given here. Integumental structures, however, are of great interest in species discrimination in the genus *Nitocra*. Therefore, information on the abdominal integumental structures is added.

*Description:*

Female: abdomen (Fig. 4a and c) with a transversal row of spinules on each abdominal segment; each row interrupted ventro-lateral; hyaline fringe of the segments deeply incised, forming long sharp teeth; anal segment having strong spinules implanted near the articulation with the furcal rami.

Anal operculum (Fig. 4c, d and e) having mostly four strong spinules but specimens with three or two spines are not rare.

Furcal rami (Fig. 4c): about 1.5 times as long as wide, bearing spinules on the inner apical edge, along the outer margin and near the apical margin; dorsal seta articulating on two basal parts and implanted on a small elevation arising near the inner apical edge.

Male: abdomen (Fig. 4b): first and second abdominal segments with uninterrupted rows of spinules; third segment and anal segment furnished as in the female; spinules on the abdominal segments clearly stronger as in the female.

P<sub>5</sub> (Fig. 4f): baseoendopodite with an armed inner spine and a smooth outer seta; exopodite with a pore in the external margin; most apical exopodite seta armed, lateral setae smooth.

*Variability:*

Variability was only observed in the number of spinules on the anal operculum. The specimen, figured by YEATMAN in the original description, have eight spinules. The papuan specimens have at most four spinules while three or even two spinules are not rare.

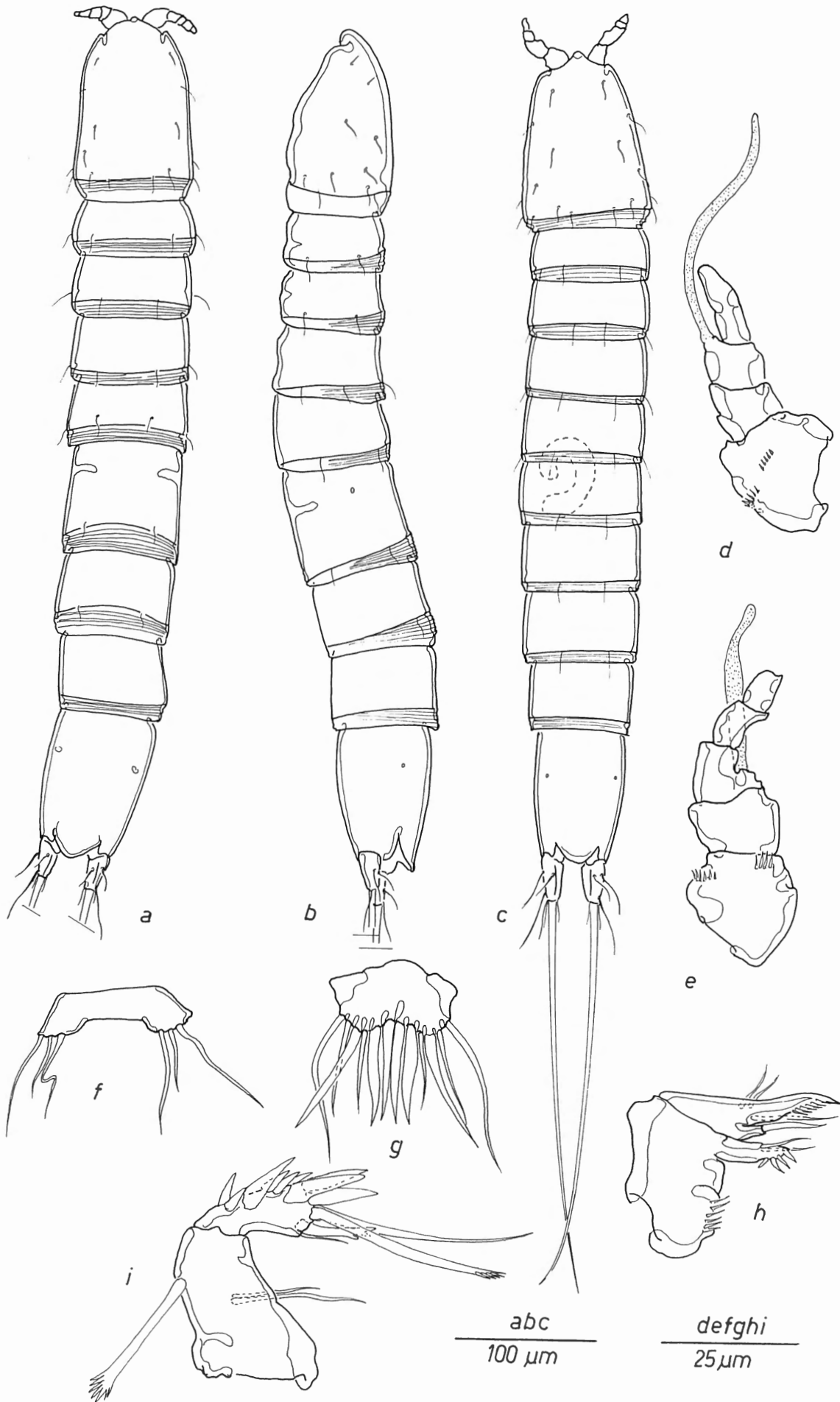
*Nitocra laingensis* n.sp.

(Fig. 5 a-d; 6 a-f)

*Holotype:*

One dissected female (COP 1588) from sample 3064.

Fig. 3. *Leptocaris mucronatus* n.sp.: a. habitus of the female in dorsal view; b. habitus of the female in lateral view; c. habitus of the male in lateral view; d. antennule of the female; e. antennule of the male; f. P<sub>5</sub> of the female; g. P<sub>5</sub> of the male; h. maxilla; i. antenna.



*Paratypes:*

One dissected female (COP 1589) and one dissected male (COP 1590). The remaining paratypes preserved in alcohol (COP 1591).

*Etymology:*

Named after Laing Island, the type-locality.

*Remarks:*

*N. laingensis* n.sp. and *N. reunionensis* BOZIC have many features in common. The description of the new species deals exclusively with the structures which are different between both species.

*Description:*

Female (holotype): genital segments (Fig. 5a, b and c) fused, fusion marked dorsally with a fragile transversal band; first and second segment with a row of spinules along the posterior margin, interrupted in the middle; second genital segment with a complete transversal row; hyaline fringe slightly incised forming a crenate margin; second and third abdominal segments (Fig. 5c) each with a lateral row of spinules, situated in the middle of the segments, and with a transversal row along the posterior margin.

Anal operculum with six large spinules.

Genital field (Fig. 5d) bearing two strong setulose setae on each side.

Mandible (Fig. 6c): endopodite with four apical setae and one short seta implanted along the lateral margin.

P<sub>3</sub> (Fig. 6f): shape as in *N. reunionensis*, but differing in the setal formula (see Table 2).

Table 2:

Setal formula of *Nitocra laingensis* n.sp.

	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>
Exo	0 - 1 - 223	0 - 1 - 223	0 - 0 - 223
End	1 - 1 - 121	1 - 1 - 221	1 - 1 - 221

P<sub>5</sub> (Fig. 6e) in general as in *N. reunionensis* but with two pores ("soie tronquée" *sensu* BOZIC, 1969, p. 877).

Male - Adomen (Fig. 6e): integument with transversal uninterrupted rows of spinules; last thoracic segment as in the female; anal operculum with four large spinules. Mouthparts, shape of the legs and setal formula as in the female.

## DISCUSSION

*Nitocra laingensis* n.sp. differs from *N. reunionensis* BOZIC, 1969 mainly in the setal formula. In the former the endopodite of the P<sub>3</sub> has a additional seta on the first segment and along the inner margin of the third one. Furthermore, in contrast with *N. reunionensis*, *N. laingensis* n.sp. lacks any trace of sexual dimorphism in the setation of the legs. Besides the above mentioned differences, both species show more minor differences in the setation of the mandible, the number of spinules on the anal operculum and the genital field of the female.

## Family Tetragonicipitidae

*Phyllopodopsyllus alatus* n.sp.

(Fig. 7 a-f; 8 a-g)

*Holotype:*

One dissected female, mounted on three slides (COP 1592), from sample 3386.

*Paratypes:*

One dissected male, mounted on two slides (COP 1593). The other paratypes preserved in alcohol (COP 1594).

*Etymologie:*

The specific name *alatus* (Latin, meaning winged) refers to the wing-shaped structures on the genital and abdominal segments.

*Remarks:*

The description of this species deals only with those structures which differ from *P. thiebaudi* PETKOVSKI, 1955.

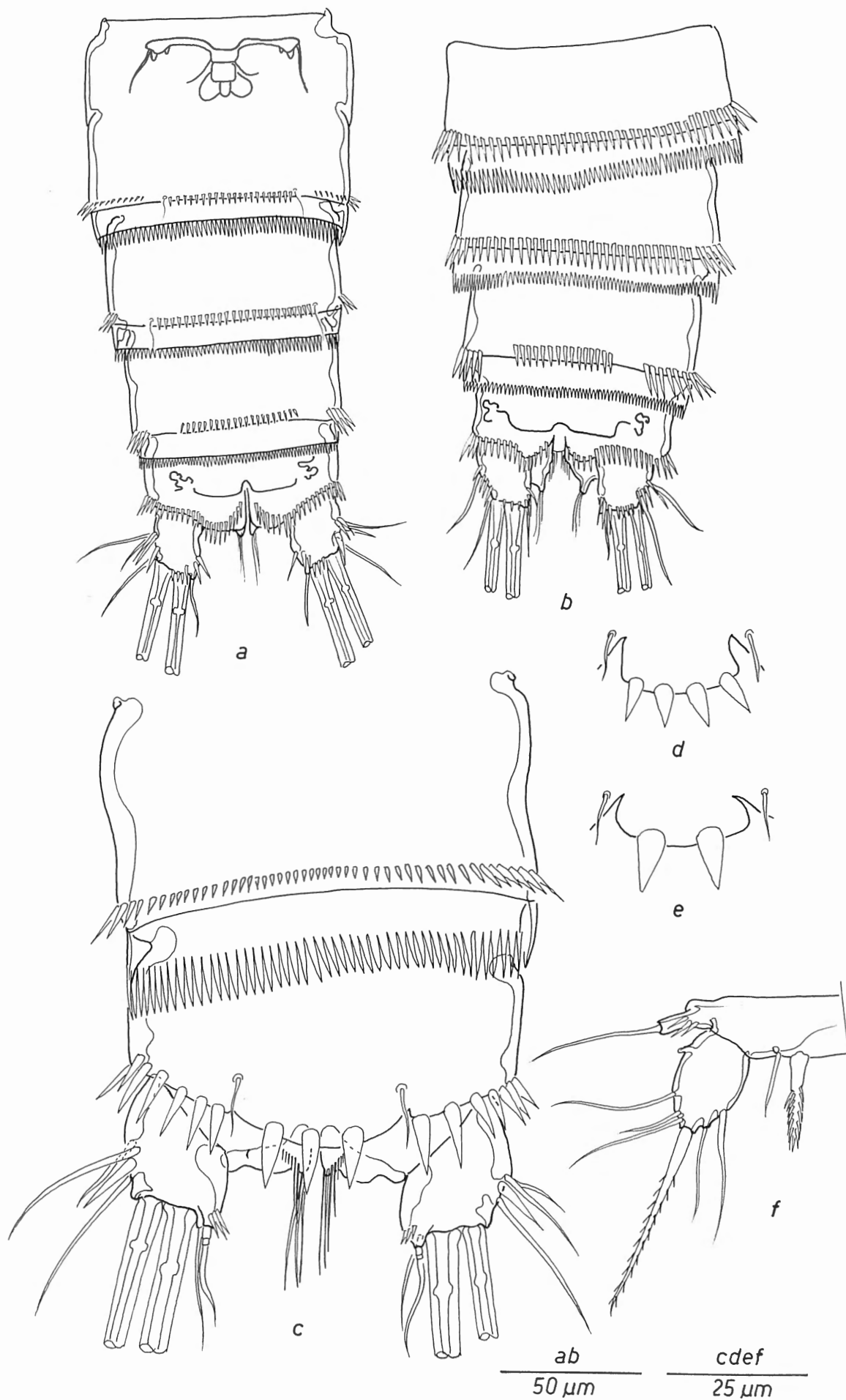
*Description:*

Female (holotype): habitus (Fig. 7 a and b): length, 650 µm; cephalothorax with a pitted integument; posterior margin of the cephalothorax with a smooth area and furnished with blunt spinules; integument of the thoracic and abdominal segments as in the cephalothorax; genital segments fused, fusion marked by a row of teeth, interrupted in the middle; first and second genital segment and second abdominal segment with dorso-lateral extensions; third abdominal segment without; postero-dorsal edges of the anal segment elevated and furnished with long spinules; anal operculum with minute teeth and slightly convex.

Furcal rami (Fig. 7a) as in *P. thiebaudi* but with long hairs along the external margin and on the proximal and median dorsal surface; external apical

Fig. 4. *Nitocra lacustris pacifica* YEATMAN: a. abdomen of the female in ventral view; b. abdomen of the male in ventral view; c. last abdominal segments of the female in dorsal view; d. anal operculum of an other specimen; e. idem; f. P<sub>5</sub> of the male.





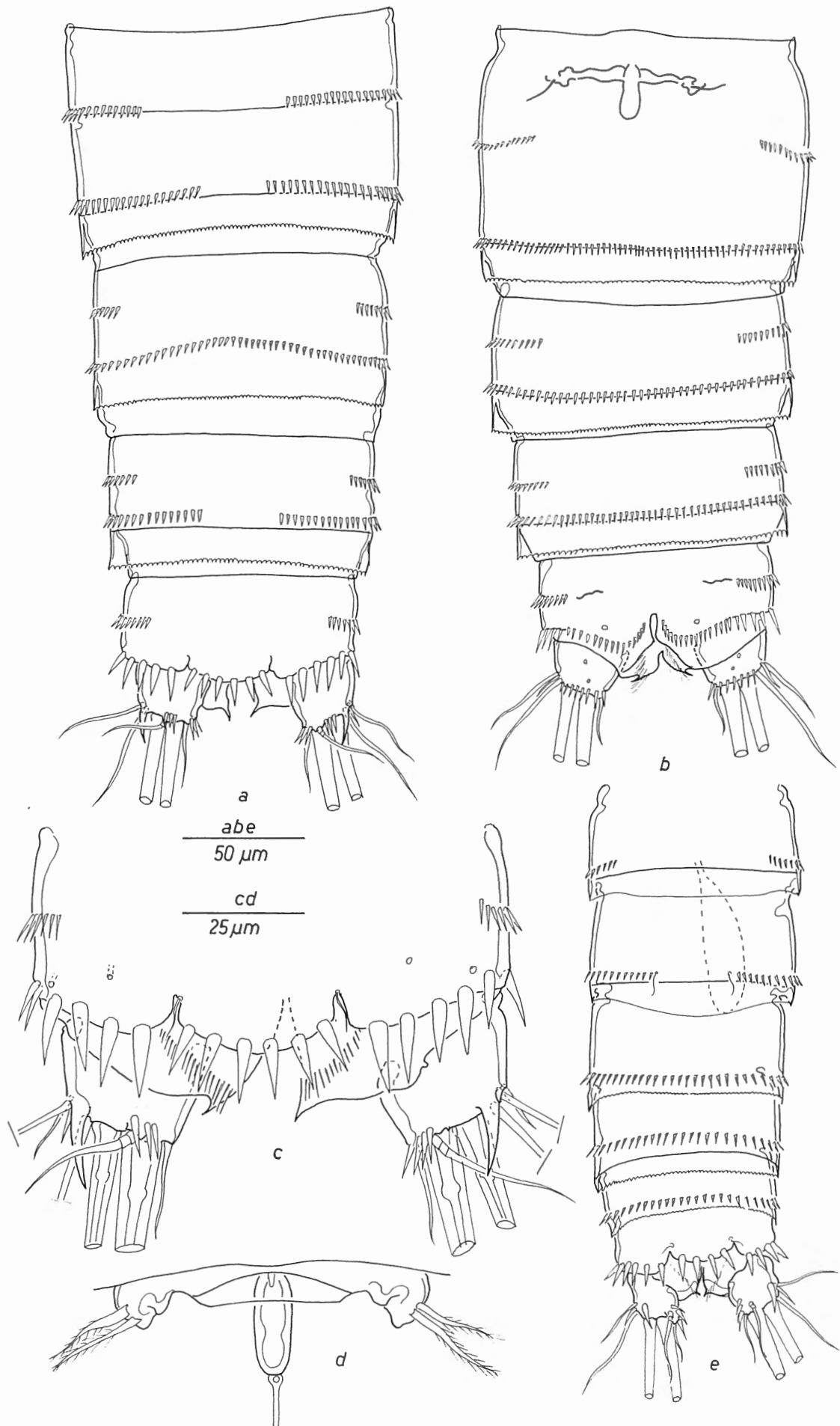


Fig. 5. *Nitocra laingensis* n.sp.: a. abdomen of the female in dorsal view; b. abdomen of the female in ventral view; c. anal segment of the female; d. genital field; e. abdomen of the male in dorsal view.



Fig. 6. *Nitocra laingensis* n.sp.: a. endopodite of the P<sub>2</sub> of the female; b. endopodite of the P<sub>4</sub> of the female; c. mandible; d. intercoxal plate of the P<sub>2</sub>; e. P<sub>5</sub> of the female; f. P<sub>3</sub> of the female.

seta confluent with the principal one; stem of the principal seta setulose in the apical third.

Antennule, mouthparts and legs as in *P. thiebaudi*. P<sub>5</sub> (fig. 8d and e) typical for the genus, bearing eleven setae.

Genital field (Fig. 8g): P<sub>6</sub> with three setae, outermost long and feathered, the median and innermost ones smooth and equal in length; the most posterior region of the genital area close to the posterior margin of the second genital segment.

Male - habitus as in the female but with free genital segments and different furcal rami; length: 580 µm. Anal operculum (Fig. 7c) with an almost straight posterior margin.

Furcal rami (Fig. 7c): length/width-ratio: 2.5/1; integument of the rami pitted.

Antennule and mouthparts as in *P. thiebaudi*.

P<sub>2</sub> (Fig. 7f): second endopodital segment with an inner and a median spiniform seta, articulating with the segment; outer seta not articulating with the segment.

P<sub>3</sub> (Fig. 8b): second endopodital segment with an outer, blunt extension with the sub-apical seta implanted on it; both apical setae smooth and rather strong.

P<sub>4</sub> (Fig. 8c): third exopodital segment with a different setal formula as in the female (see table 3); second endopodital segment with two apically implanted armed setae.

Table 3:

Setal formula of *Phyllopodopsyllus alatus* n.sp.

	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub> ♀	P <sub>4</sub> ♂
Exo	1 - 0 - 122	1 - 0 - 122	1 - 1 - 322	1 - 1 - 222
End ♀	1 - 030	1 - 030	1 - 030	
End ♂	1 - 030	1 - 021		1 - 020

P<sub>5</sub> (Fig. 8f): baseoendopodite distinct, bearing three setae; endopodite squarish, having four setae and a fragile tubular pore between the outermost and apical seta.

#### DISCUSSION

*Phyllopodopsyllus alatus* n.sp. is close with *P. thiebaudi* PETKOVSKI, 1955 in many ways. Both species shown similarities in the general appearance, the mouthparts and the shape of the legs. Several details, however, listed in table 4, allow discrimination between both species.

*P. alatus* n.sp. belongs undoubtedly to the *aegypticus*-group (see KUNZ, 1984, p. 38). Together with *P. thiebaudi* PETKOVSKI, 1955 and *P. intermedius*

NOODT, 1955, *P. alatus* n.sp. represents the most primitive branch of the *aegypticus*-group. Those three species may be discriminated from *P. aegypticus* (NICHOLLS, 1944), *P. gertrudi* KUNZ, 1984 and *P. angolensis* KUNZ, 1984, by the presence of an inner seta on the first endopodital segments of the P<sub>2</sub> and P<sub>3</sub> (sympleisiomorphy *sensu* KUNZ). In contrast with LANG's conclusion (LANG, 1965, p. 387) I consider *P. intermedius* NOODT as a distinct species from *P. thiebaudi*. *P. thiebaudi* and *P. intermedius* obviously share a lot of common characters but have interesting differences in the P<sub>5</sub> and the sexual dimorphism. The implantation places of the setae of the female P<sub>5</sub> differ significantly. Furthermore, the differences between species of the *aegypticus*-group are more obvious in the males than in the females. *P. intermedius* seems to have lost sexual dimorphism in the setation of the P<sub>4</sub> exopodite while *P. alatus* n.sp. and *P. thiebaudi* still show a dimorphic setal formula.

#### Family Cletodidae *Actinocletodes* n.gen.

#### Diagnosis:

A large cletodid with robust body; pleurotergites and integument of the cephalothorax with large depressions; posterior margins of the somites with strong extensions; rostrum fused and small; genital segments fused in the female and free in the male; principal furcal setae bulbous in the female, setose in the male; antennule seven-segmented, haplocer

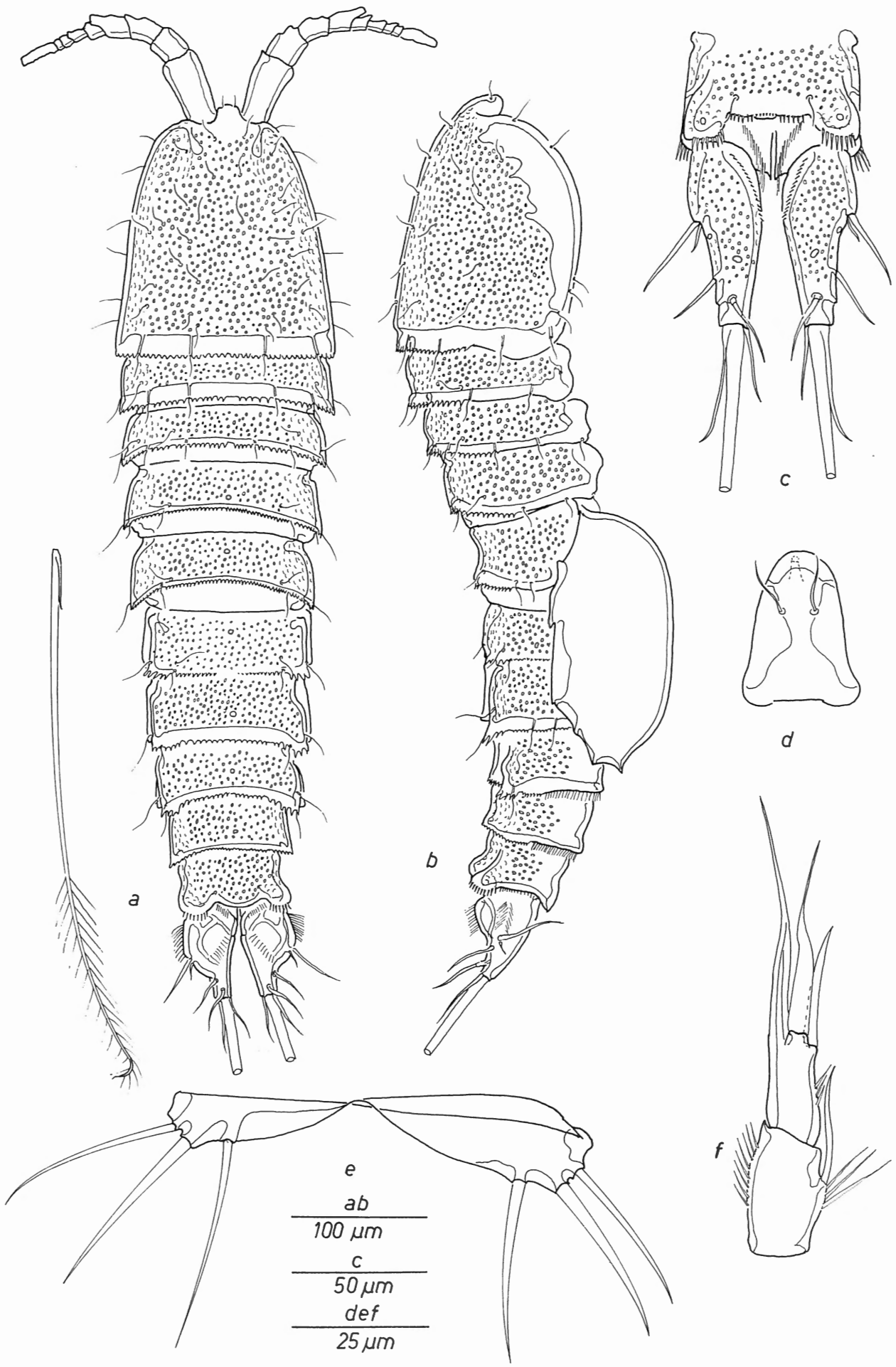
Table 4:

Comparison between *P. alatus* n.sp., *P. thiebaudi* and *P. intermedius*

	<i>P. thiebaudi</i> PETKOVSKI	<i>P. intermedius</i> NOODT	<i>P. alatus</i> n.sp.
abdomen	without extensions	without extensions	with extensions
Furcal rami	without long hairs	without long hairs	with long hairs
P <sub>5</sub> ♀	10 setae*	10 setae	11 setae
P <sub>6</sub> ♀	?	2 setae	3 setae
Furcal rami ♂/L/W	4 : 1	4.3 : 1	2.5 : 1
Sex. dimorp			
exo P <sub>4</sub>	present	absent	present
Anal oper. ♀	convex	straight	convex
♂	convex	convex	straight

\* Marinov (1971) figures an additional seta on the most apical margin of the P<sub>5</sub>

Fig. 7. *Phyllopodopsyllus alatus* n.sp.: a. habitus of the female in dorsal view; b. habitus of the female in lateral view; c. anal segment and furcal rami of the male; d. rostrum; e. P<sub>6</sub> of the male; f. endopodite of the P<sub>2</sub> of the male.



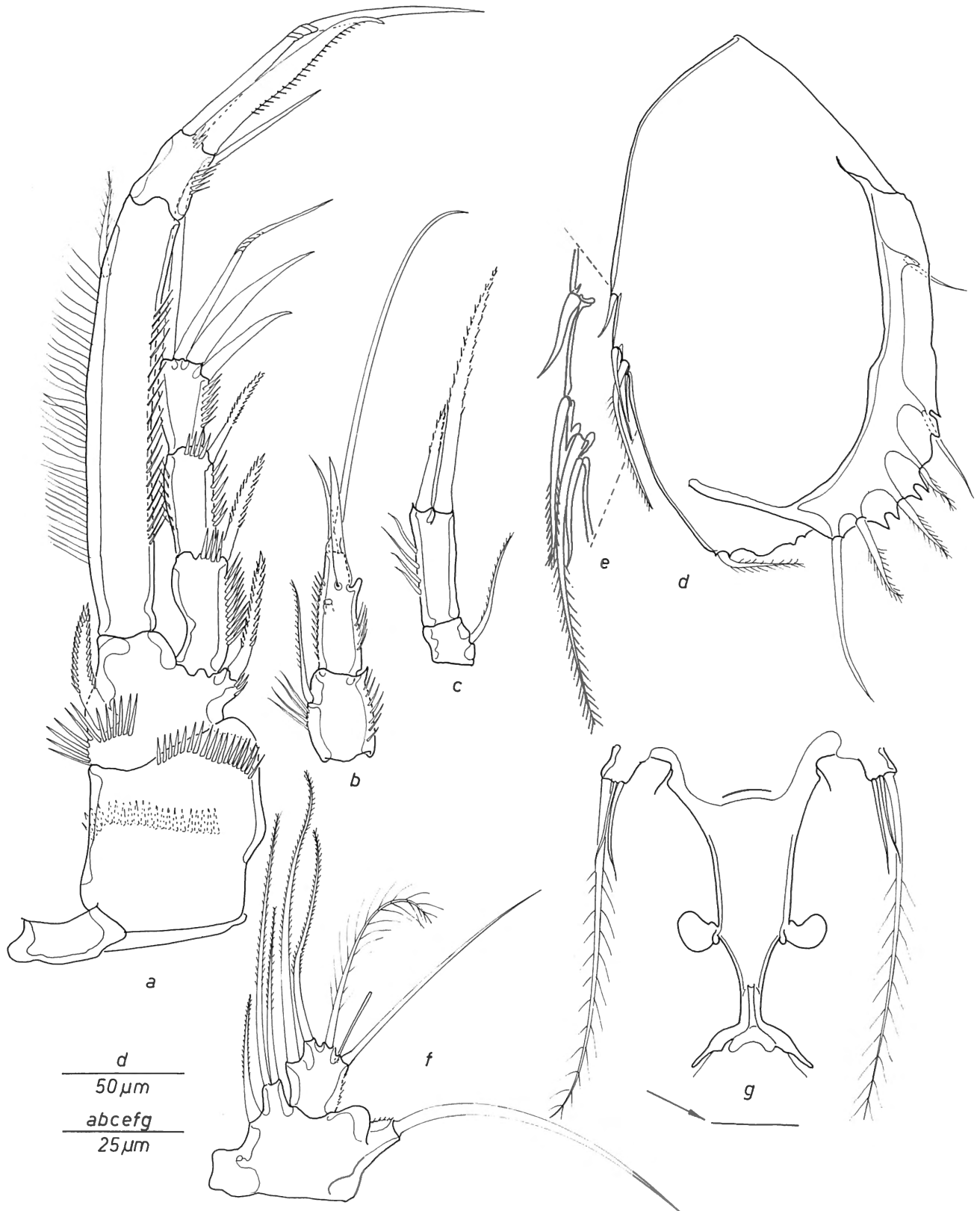
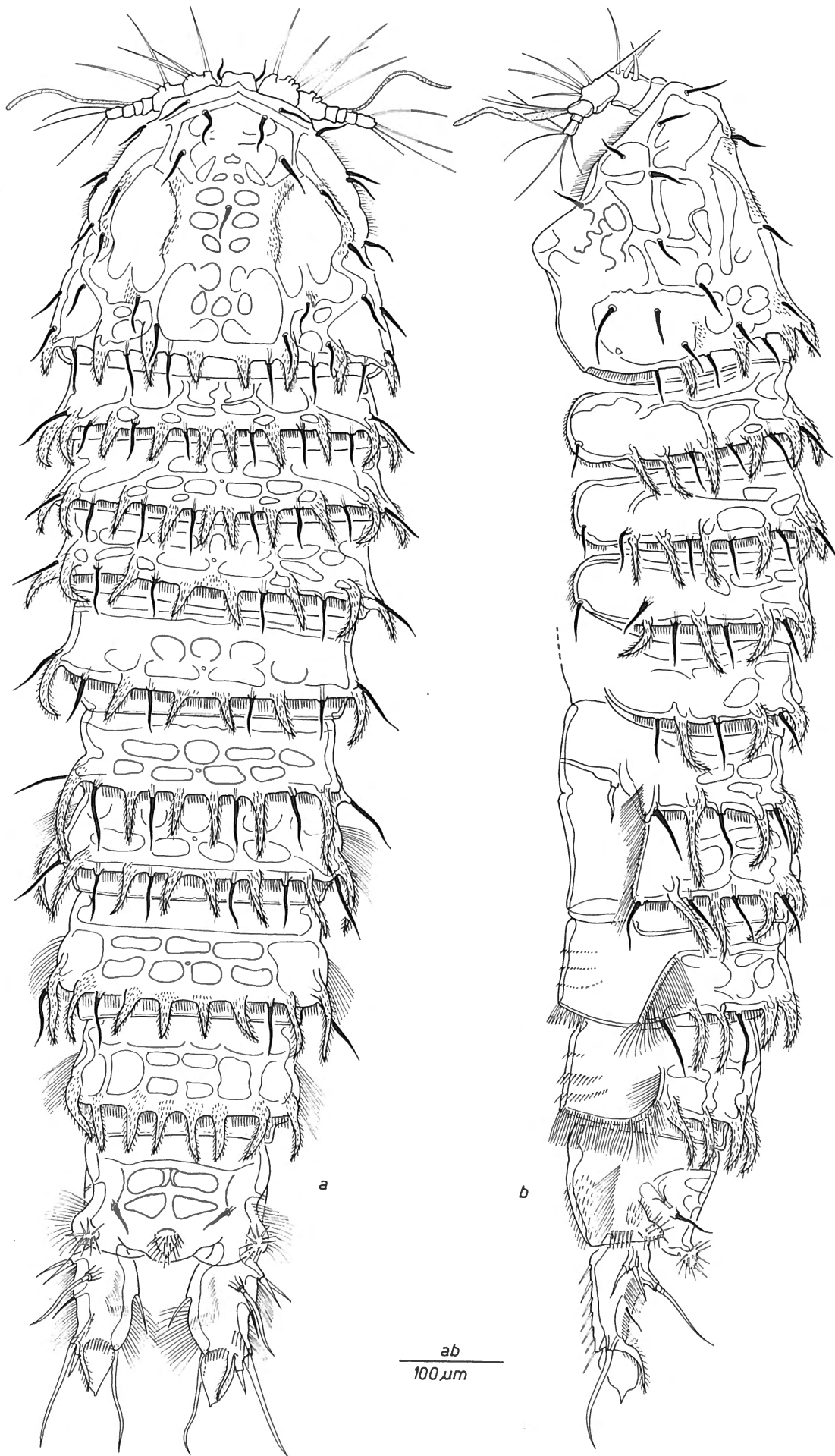


Fig. 8. *Phyllopodopsyllus alatus* n.sp.: a.  $P_1$  of the female; b. endopodite of the  $P_3$  of the male; c. endopodite of the  $P_4$  of the male; d.  $P_5$  of the female; e. inner margin of the  $P_5$  of the female; f.  $P_5$  of the male; g. genital field of the female, arrow indicating the posterior margin of the segment.

Fig. 9. *Actinocletodes woutersi* n.gen., n.sp.: a. habitus of the female in dorsal view; b. habitus of the female in lateral view. ▷



in the male; antenna with basis, exopodite one-segmented; mandibular palp reduced, without exo- or endopodite; maxilliped not prehensil; basis and endopodite confluent; exopodital rami of the legs three-segmented, endopodites two-segmented; endopodite of the  $P_3$  in the male, three-segmented, middle segment with a large apophysis;  $P_5$  of the female with a distinct baseoendopodite and exopodite, the former with five, the latter with six setae;  $P_5$  of the male with a strongly reduced baseoendopodite bearing three setae; exopodite distinct having five setae.

*Type-species:*

*Actinocletodes woutersi* n.sp., here designated.

*Etymology:*

The generic name *Actinocletodes* is a compound of *Actino-* (Greek root, meaning spine) and *Cletodes*. The name refers to the remarkable extensions on the postero-dorsal margins of the pleurotergites. Gender: feminine.

*Actinocletodes woutersi* n.sp.

(Fig. 9 a, b; 10 a-h; 11 a-e; 12 a-e; 13 a-c)

*Holotype:*

One dissected female dissected on three slides, labelled COP 1599.

*Paratypes:*

One dissected female (three slides, COP 1600), one dissected male (three slides COP 1601) and the remaining paratypes preserved in alcohol (COP 1602).

*Etymology:*

The specific name is chosen in honour of Dr. K. WOUTERS, who offered me this interesting material to study.

*Description:*

Female: (Fig. 9 a and b) length: 1200  $\mu$ m; cephalothorax bell-shaped in dorsal view; length of the cephalothorax less than a quarter of the body length; largest width near the posterior margin; surface with large depressions and partially furnished with small hairs; posterior margin with eight posteriorly directed extensions, all covered with small spinules; thoracic somites with parallel margins; each pleurotergite with posteriorly directed spinulose extensions (thoracic som. two to six: 10, 10, 8, 6 and 6); integument of each pleurotergite with large depressions; posterior margin of the thoracic segments sealed with small spinules between the extensions.

Genital segments (Fig. 10a): fused, fusion marked dorsally with the same ornamentations as in the other segments; ventral side of the genital segments

smooth; postero-ventral margin of the abdominal segments sealed with small spinules; postero-dorsal margin of the abdominal segments each with eight spinulose extensions; ventral surface of the abdominal segments with transversal parallel rows of teeth; lateral margins furnished with long hairs; postero-ventral margin of the second abdominal segment hairy, that of the third one spinulose; anal segment with a spinulose elevation near the postero-dorsal edge; lateral margins with a row of long hairs; ventral margin with two short rows of hairs; anal operculum with a spinulose spine and a smooth posterior margin; anal area triangular, furnished with hairs. Furcal rami almost twice as long as wide and clothed with several rows of hairs; outer posterior margin extended in a spinulose extension; two lateral seta implanted in the anterior third; one seta in the middle of the external margin and one seta implanted near the external posterior edge; inner apical seta smooth; principal terminal seta bulbous; other setae-like structures are tube-pores; dorsal seta implanted on a sockle and articulating on a basalt part. Rostrum small, fused with the cephalothorax, with a straight anterior margin.

Antennule (Fig. 10 b): seven-segmented; segments with rows of strong hairs or spinules; several setae feathered; setae on the ultimate segment articulating on a basal part; aesthetasc implanted on the fourth segment and accompanied with two seta.

Antenna (Fig. 10 c): praecoxa large; coxa with an outer row of spinules; basis bearing an outer seta; exopodite one-segmented having three setae; endopodite with three strong distal smooth spines, three smooth setae and two small spines along the outer margin.

Mandible (Fig. 10 d): gnathobasis strong, having two rows of spinules, five articulating teeth and one sensorial seta; mandibular palp strongly reduced, bearing one feathered seta and four smooth setae.

Maxillule (Fig. 10 e and h): praecoxa with two rows of spinules; arthrite bearing seven armed spines and two setae; ventral side of the arthrite with two combs of fairly long spinules; coxa and basis fused; coxa with one, basis with two setae; vestigial rami each represented as two setae.

Maxilla (Fig. 10 f and g): syncoxa with three endites; proximal endite represented as a strongly armed seta; median and distal endite with three setae; surface of the syncoxa furnished with several rows of spinules; basis prolonged in a strongly armed hook, bearing two setae; endopodite represented as two setae.

Maxilliped (Fig. 13 b): not prehensil; basis and first endopodital segment confluent; one strong seta near the distal edge of the basis; second endopodital segment small, bearing three feathered setae; external and internal margin furnished with spinules.

$P_1$  (Fig. 11 a): exopodite three-segmented; endopodite two-segmented; basis with an inner and outer





Fig. 10. *Actinocletodes woutersi* n.gen., n.sp.: a. abdomen of the female in ventral view; b. antennule of the female; c. antenna; d. mandible; e. maxillule; f. maxilla; g. distal part of the basis of the maxilla; h. arthrite of the maxillule in dorsal view.

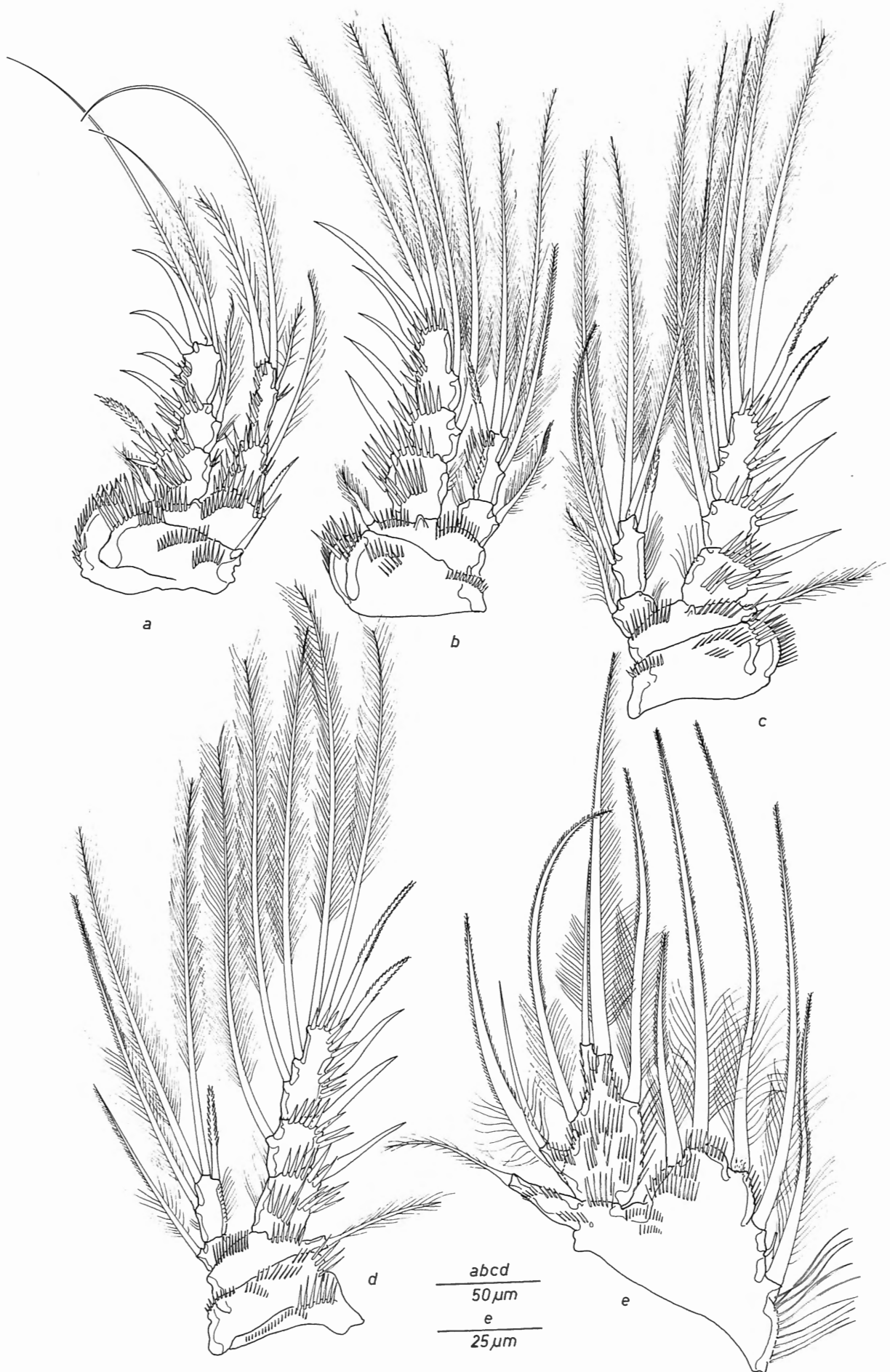


Fig. 11. *Actinocletodes woutersi* n.gen., n.sp.: (female) a.  $P_1$ ; b.  $P_2$ ; c.  $P_3$ ; d.  $P_4$ ; e.  $P_5$ .

spine; surface of the segments covered with strong spinules.

P<sub>2</sub> - P<sub>4</sub> (Fig. 11 b, c and d): exopodites three-segmented and endopodites two-segmented; surface of the protopodites and the rami densely clothed with spinules; setal formula of the legs listed in table 5.

Table 5:  
Setal formula of *Actinocletodes woutersi* n.gen., n.sp.

	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>
Exo	0 - 1 - 122	0 - 1 - 123	0 - 1 - 223	0 - 1 - 223
End	1 - 120	1 - 121	1 - 221	0 - 121

P<sub>5</sub> (Fig. 11 e): basis bearing five setae, having a feathered proximal stem and a spinulose distal part; distal margin of the baseoendopodite reaching only beyond the middle of the exopodite; exopodite with six setae, all feathered as those on the baseoendopodite except for the smooth proximal and distal one; surface of the exopodite with several rows of sharp spinules; inner edge of the baseoendopodite with long hairs while the distal and outer margin is furnished with sharp spinules.

Male - habitus (Fig. 12 a and b) as in the female, except for the free genital segments and the terminal furcal setae; length: 1000µm; ventral surface of the abdominal segments clothed with parallel rows of sharp spinules; posterior margins with long spinules.

Antennule (Fig. 13 a): indistinctly six-segmented; first segment with two rows of strong spinules; second segment bearing feathered setae; fourth segment, very robust and having the aesthetasc; penultimate and ultimate segments short and indistinctly separated.

Mouthparts, P<sub>1</sub>, P<sub>2</sub> and P<sub>4</sub> as in the female.

P<sub>3</sub> (Fig. 12 c) exopodite as in the female; endopodite three-segmented; middle segment prolonged in a long and sharp spine; third segment short and bearing two setae.

P<sub>5</sub> (Fig. 12 d): baseoendopodite small, bearing three spinulose setae and two rows of spinules; exopodite with five setae of which only the inner and the median one are furnished with setules.

P<sub>6</sub> (Fig. 12 c): both sides bearing three setae, inner and median one smooth, the outer one furnished along one side.

## DISCUSSION

*Actinocletodes woutersi* n.gen., n.sp. is unique in the family Cletodidae in the combination of advanced and primitive characteristics. The strongly reduced maxilliped and mandibular palp together with the primitive setal formula, the seven-segmented antennula and the aberrant shape of the

female P<sub>5</sub>, clearly differentiate this genus from the actually known genera in the family Cletodidae.

Reduction of the maxilliped happened frequently in the Cletopodidae and shows two trends: reduction of the endopodite (*Neoargestes*, *Paranannopus*) or a well developed endopodite showing a strong sexual dimorphism (*Metahuntemannia*). The maxilliped of *Actinocletodes* n.gen. belongs to the first group but is distinct from it because the articulation between the basis and the endopodite is absent and the endopodital claw is strongly reduced.

Reduction of the mandibular appendages is frequently observed in the family. If reduction occurs, however, it is restricted to the endopodite and/or the exopodite of the mandibular appendage. As far as I know the extreme reduction (almost vestigial) of the coxa-basis in *Actinocletodes* n.gen. is unique. Besides these advanced features, *Actinocletodes* n.gen. has a primitive setal formula and a rather aberrant P<sub>5</sub>. Whereas the setal formula indicates some relationship with genera such as *Heteropsyllus* and *Eurycletodes*, the baseoendopodite and the exopodite of the P<sub>5</sub> lacks any resemblance with other known species.

Through this remarkable combination of characteristics it seems impossible, at present, to define properly the systematical position of the genus *Actinocletodes* n. gen. within the family Cletodidae.

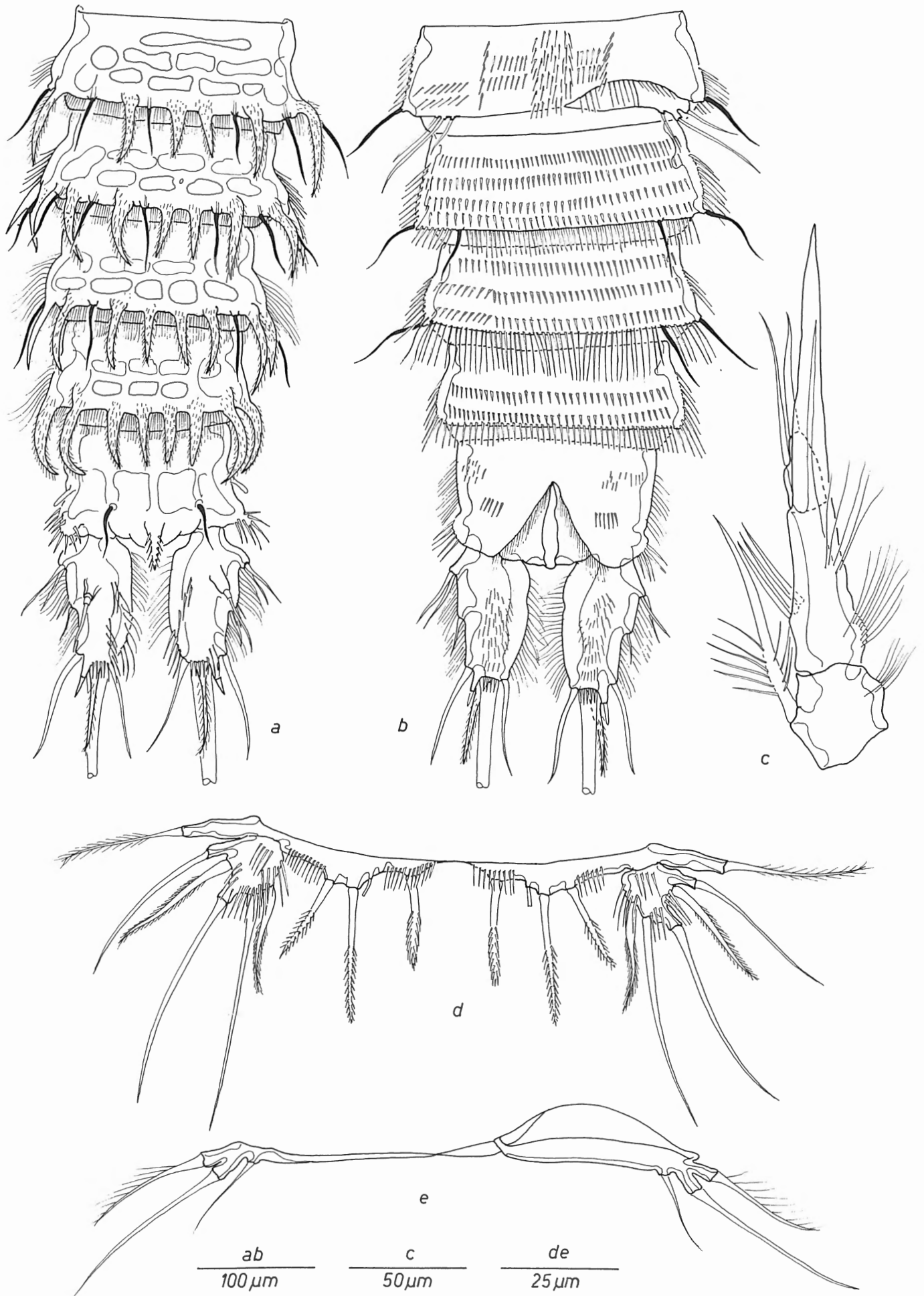
## Conclusion

In contrast with the fauna of the Atlantic Ocean and the Mediterranean Sea, the copepod fauna of the Pacific Ocean is rather poorly known. Only a few papers dealing with harpacticoid copepods from the Central and West Pacific were published (PESTA, 1932; VERVOORT, 1964; YEATMAN, 1983; KUNZ, 1984).

Without rushing to a conclusion, one can say that the harpacticoids found in both brackish water pools at Laing Island are of a particular interest and show a strong affinity with the copepod fauna known from the Indian Ocean and the Mediterranean Sea.

*Darcythompsonia inopinata* is here recorded from the Indian Ocean and *Schizopera brusinae* occurs in the Mediterranean Sea. Because *D. inopinata* is also found in Vladivostok and some islands in the Pacific, this rare species seems to be widely distributed through the Indian ocean, the coasts of the Western Pacific and the seas around the Melanesian Islands.

Three new species, *Leptocaris mucronatus* n.sp., *Nitocra laingensis* n.sp., *Phyllopodopsyllus alatus* n.sp., and *Nitocra lacustris pacifica* have close relatives in the Indian Ocean and the Mediterranean Sea.



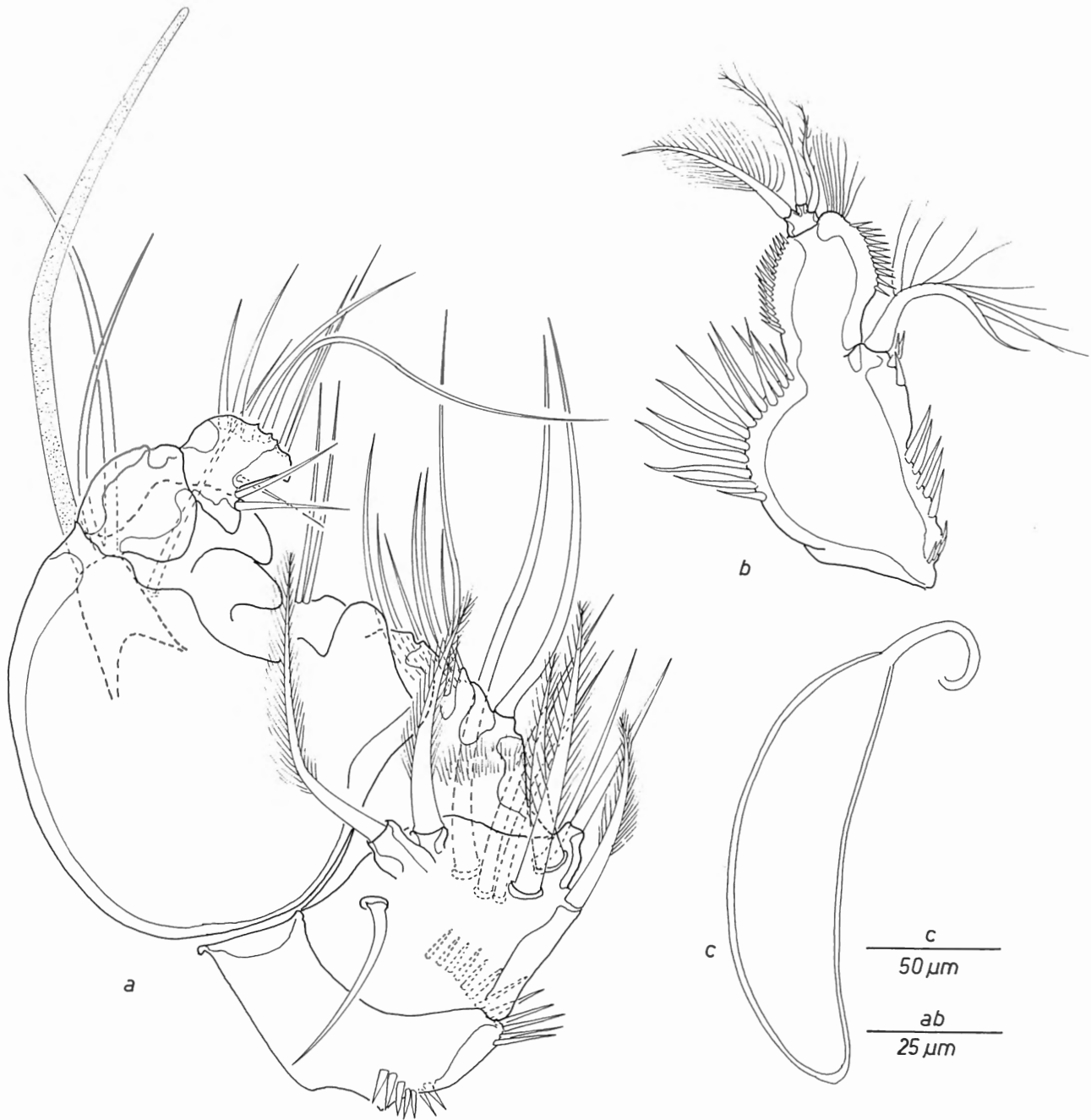


Fig. 13. *Actinocletodes woutersi* n.gen., n.sp.: a. antennule of the male; b. maxilliped; c. spermatheca.

Except for two species, *Neocyclops papuensis* n.sp. and *Actinocletodes woutersi* n.gen., n.sp. of which the affinities are still unclear, it seems that the copepod fauna of the northern Coast of Papua New Guinea shows a remarkable resemblance to the fauna of the Indian Ocean.

#### Acknowledgements

I am much indebted to Dr. K. WOUTERS (K.B.I.N. Brussels) for offering me this interesting Copepod material. Many thanks are due to M. W. VAN-MAELE for preparing the samples and picking out the copepods.

◁ Fig. 12. *Actinocletodes woutersi* n.gen., n.sp.: (male) a. abdomen in dorsal view; b. abdomen in ventral view; c. endopodite of the  $P_3$ ; d.  $P_5$ ; e.  $P_6$ .

## References

- BOZIC, B., 1969. Copépodes Harpacticoides de la Réunion, VI, *Bull. Mus. Nat. Hist. nat.*, 41 (4) : 867-882.
- HERBST, H.V., 1952. Neue Cyclopoida Gnathostoma (Crustacea, Copepoda) des Küstengrundwassers, Kiel, *Meeresforsch.*, 9 (1) : 93-111.
- KUNZ, H., 1935. Zur Ökologie der Copepoden Schleswig-Holsteins und der Kieler Burcht, *Schr. Naturw. Ver. Schleswig-Holstein*, 21 (1) : 84-133.
- KUNZ, H., 1974. Harpacticoiden (Crustacea, Copepoda) aus dem Küstengrundwasser der französischen Mittelmeerküste, *Zool. Scripta*, 3, 1974 : 257-282.
- KUNZ, H., 1978. Zur Kenntnis der Gattung *Leptocaris* (Copepoda, Harpacticoida, Darcythompsoniidae), *Crustaceana*, 35 (1) : 41-49.
- KUNZ, H., 1983. Harpacticoiden (Crustacea: Copepoda) aus dem Litoral der Azoren, *Revista Universitaria Açores*, 4 : 117-208.
- KUNZ, H., 1984. Systematik der Familie Tetragonicipitidae LANG (Crustacea, Harpacticoida), *Mit. Zool. Mus. univ. Kiel*, 2 (2) : 33-48.
- LANG, K., 1948. *Monographie der Harpacticiden*, H. Ohlsson, 2 vol., 1682 pp.
- LANG K., 1965. Copepoda Harpacticoida from the Californian Coast, *Kungl. Svensk. Vetensk. Akad. Handl.*, (4) 10 (2) : 1-560.
- MARINOV, T., 1971. Harpacticoids of the Bulgarian Black Sea coast, *Proc. Inst. Oceanogr. Fish. Varna*, 11 : 43-87.
- NOODT, W., 1955. Harpacticiden (Crus. Cop.) aus dem Sandstrand französischen Biscaya-Küste, Kiel, *Meeresforsch.*, 11 (1) : 86-109.
- PETKOVSKI, T., 1954. Harpacticiden des Grundwassers unserer Meeresküste, *Acta Mus. maced. sci. nat.*, 2 (5) : 93-123.
- PETKOVSKI, T., 1955. Zweiter Beitrag zur Kenntnis der Harpacticiden-Fauna unserer Meeresküste, *Fragm. Balcania*, 1 (15) : 125-139.
- PESTA, O., 1932. Marine Harpacticiden aus dem Hawaiian Inselgebiet, *Zool. Jb. Syst.*, 63 : 145-162.
- PLESA, C., 1981. Cyclopides (Crustacea, Copepoda) de Cuba. In: *Résultats des expéditions biospéologiques cuban-roumaines à Cuba*, 3, Bucaresti, Ad. Acad. : 17-34.
- VERVOORT, W., 1964. Free-living Copepoda from Ifaluk Atoll, in the Carolina Islands, *Smiths. Inst., U.S.A., Nat. Mus.*, 136 : 1-341.
- WELLS, J.B.J. and MCKENZIE, K.G., 1973. Report on a small collection of benthic copepods from marine and brackish waters of Aldabra, Indian ocean, *Crustaceana*, 25 (2) : 133-146.
- WOUTERS, J., 1984. The Renaudocyprinidae (Crustacea: Ostracoda) from Bogia area (Papua New Guinea), *Indo-Malayan Zool.*, 2 : 163-175.
- YEATMAN, H.C., 1983. Copepods from Microhabitats in Fiji, Western Samoa and Tonga, *Micronesia*, 19 (1-2) : 57-90.

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