

## Contribution to the knowledge of the genus *Phyllopodopsyllus* T. Scott (Copepoda, Harpacticoida) from Africa with description of two new species

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### Abstract

Two new species of marine, sand-dwelling harpacticoids are described: *Phyllopodopsyllus pallaresae* n. sp. from Namibia, and *P. hartmannorum* n. sp. from Tanzania. The hitherto unknown male of *P. xenus* (Kunz) is described from Namibia. Further remarks are made on *P. furciger* Sars from Tanzania.

### Zusammenfassung

Zwei neue sandbewohnende Harpacticoiden-Arten werden beschrieben: *Phyllopodopsyllus pallaresae* n. sp. von Namibia und *Phyllopodopsyllus hartmannorum* n. sp. von Tansania. Außerdem wird das bisher unbekannte Männchen von *Phyllopodopsyllus xenus* (Kunz) von Namibia beschrieben. Morphologische Merkmale von *Phyllopodopsyllus furciger* Sars werden anhand eines Fundes von Tansania ergänzt.

### Introduction

The family of Tetragonicipitidae Lang, 1944, contains seven marine genera of which the genus *Phyllopodopsyllus* T. Scott, 1906 is the most speciose. It consists, including the here described species, of 51 species and 7 subspecies. Most of them inhabit coarse sand and shell gravel of the intertidal zone where strong water turbulences prevail.

The fifth thoracic leg in the female is very large, foliaceous forms a bivalved brood pouch containing eggs or embryos.

Two new species from the southwestern and eastern coast of Africa are described in this paper. Additionally, the descriptions of two previously known species are completed.

### Material and methods

The material has been collected in 1967 by Gerd Hartmann and Gesa Hartmann-Schröder along African coasts (Namibia and Tanzania) and by my wife and

myself along the Croatian coast in 1986. It has been deposited in the Zoological Museum of the University of Hamburg. The registration numbers are indicated in the text where the species are treated.

The specimens were fixed in a mixture of 3.5% formalin (80%) and glycerin (20%) and mounted on slides in polyvinyl lactophenol with Orange G for staining.

The following abbreviations are used: A1: antennule, A2: antenna, Anop: anal operculum, Enp: endopodite, Exp: exopodite, Fu: furca, Gs: genital double somite, Md: mandible, Mdp: palpus of mandible, Mx1: maxillula, Mx2: maxilla, Mxp: maxilliped, P1–P6: first to sixth leg, R: rostrum, i: inner edge.

The length of the animals is measured from the tip of the rostrum to the end of the caudal rami.

Species studied in this paper:

*Phyllopodopsyllus furciger* Sars from Tanzania,  
*Phyllopodopsyllus xenus* (Kunz) from Namibia,  
*Phyllopodopsyllus pallaresae* n. sp. from Namibia,  
*Phyllopodopsyllus hartmannorum* n. sp. from Tanzania.

## Results

### *Phyllopodopsyllus furciger* Sars, 1907 (Figs 1, 2A)

Locality and material. Indian Ocean, Tanzania, Tanga: Coral reef at the entrance to the port, between coral fragments, depth 3 m, 5 XI 1967, 2 females; 1 female juv., 1 male: leg. Hartmann, Nr. K-34912 (11a-g, 12a-d, 44).

Apart from the original description by Sars, there are descriptions by Sewell (1940), Bodin (1964), Por (1964), and especially Mielke (1989). Differences will be compared with the specimens from Tanzania.

#### Female

Length 0.48–0.49 mm. My specimens are smaller than all those of the other authors (0.58–0.80 mm). The caudal rami of my specimens diverge (Fig. 1A) like those described by Mielke (Sars: parallel). Inner edges of Fu have no hairs (Fig. 1B), in accordance with Sars and Mielke (while Sewell and Por indicate a continuous row of hairs). Enp P1: Length ratio of first to terminal segment 3.6: 1 (Fig. 2A) (Sars 2.7: 1, Sewell 3.1: 1, but Mielke 6.3: 1). Exp P4: Terminal segment with 6 setae (Sewell 6, Por 5, Bodin and Mielke 7) (Fig. 1C).

#### Male

Length 0.40 mm (Mielke 0.45–0.58). Exp P4: Terminal segment with 6 setae (Fig. 1D), in accordance with Mielke. Enp P2–P4 (Figs 1E–G) more squat than in Mielke's specimens, especially pronounced at Enp P3, where the inner seta of the basal segment is also considerably shorter than in Mielke's description. Also the P5 looks more squat (Exp twice as long as wide, Mielke: 2.5).

My studies indicate, that *P. furciger* has a tendency to develop locally differing populations. The present specimens may represent a dwarf population.

Geographical distribution. Southern coast of Norway (Sars, 1907), Marseille (Bodin, 1964), Israel (Por, 1964), Southern coast of the Arabian Peninsula (Sewell, 1940), Madras/India (Krishnaswamy, 1957), Kanton/China (Zhang & Li, 1976), Galapagos (Mielke, 1989),? Angola (Delamare-Deboutteville & Chappuis, 1957), Bermuda Platform (Coull, 1968).

### *Phyllopodopsyllus xenus* (Kunz, 1951) Figs 2B-F, 3A-B)

Locality and material. Atlantic, Namibia, Luderitz, Fjord: Küstengrundwasser, coarse sand between gravel and stones: 21 VIII 1967, 3 females, 4 males; leg. Hartmann, Nr. K-34914 (14a-c, 15a-g, 46).

The hitherto unknown male is described.

Length 0.50 mm. Anop with pointed denticles (Fig. 2B), Fu 3.7 times as long as wide, broadest near insertion (Fig. 2B). A1 strongly chitinous, with backwardly directed hook on the second and fourth segment.

P1, Exp P2 and Exp P3 as in female.

Enp P2 2-segmented. First segment: inner edge without seta, outer edge with a few spinules. Terminal segment with 3 apical setae. The outer one is not separated at base (Fig. 2C).

Enp P3 2-segmented. Second segment with one spine at the outer edge and two plumose setae terminally. At the level of the outer spine the segment is constricted (Fig. 3A).

P4: Exp: Terminal segment with 6 setae, the third (counting from the inner edge) is especially delicate (Fig. 3B). Enp 2-segmented, basal segment short, without seta on inner edge, terminal segment with 2 dagger-shaped setae, the inner one especially strong (Fig. 2D).

P5 2-segmented, confluent (Fig. 2E). Basoendopodite with 2 setae. Exp 1.7 times as long as wide, with 4 setae, 1 at the outer edge, 1 at the inner edge, 2 apical.

P6 a small plate with 3 setae, the inner one especially robust and spinulose (Fig. 2F).

Geographical distribution. Namibia (Kunz 1951).

### *Phyllopodopsyllus pallaresae* n. sp. (Figs 3C–E, 4–8, 9A)

Localities and material. Atlantic, Namibia, Luderitz Bay, Essy Bay: Küstengrundwasser, shell-gravel, between rocks: 21 VIII 1967, 11 females, 3 males: leg. Hartmann, holotype (female) Nr. K-34918 (21a-d); allotype (male) Nr. K-34918 (23a-e), paratypes Nr. 34918 (22a-f, 24a-f, 50); Luderitz Bay, Fjord, coarse sand between gravel and stones, Küstengrundwasser, 21 VIII 1967, 1 male, leg. Hartmann.

#### Description

##### Female

Length 0.66 mm. R broad, rectangular (Fig. 4A). Anop with fine denticles (Fig. 6A). Fu (Figs 6B–D)

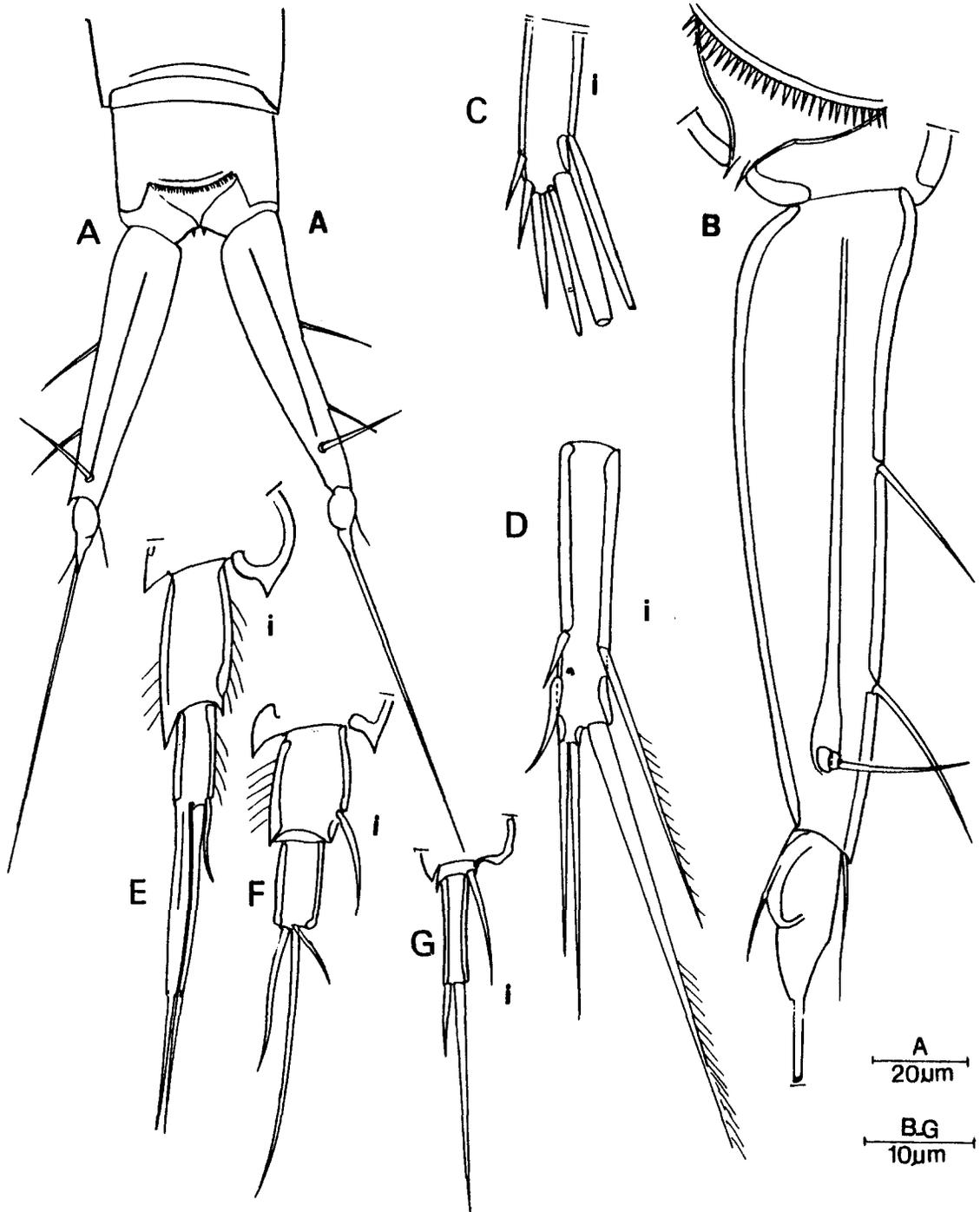


Fig. 1. *Phyllopodopsyllus furciger* Sars: A Anal somite and Fu (female) dorsal; B Fu (female), dorsal; C Exp P4 (female), terminal segment; D Exp P4 (male), terminal segment; E Enp P2 (male); F Enp P3 (male); G Enp P4 (male).

in dorsoventral view about 2.2 times as long as wide, tapering slightly towards the end. Inner edge slightly convex. A high keel dorsally. Outer edge with 2 setae. At 9/10 of the length of the Fu dorsally near inner edge

a robust seta, biarticulated at base. Midlength on inner edge a tuft of long hairs, near the end a row of hairs. Terminal seta well developed, at the basis bulbiform

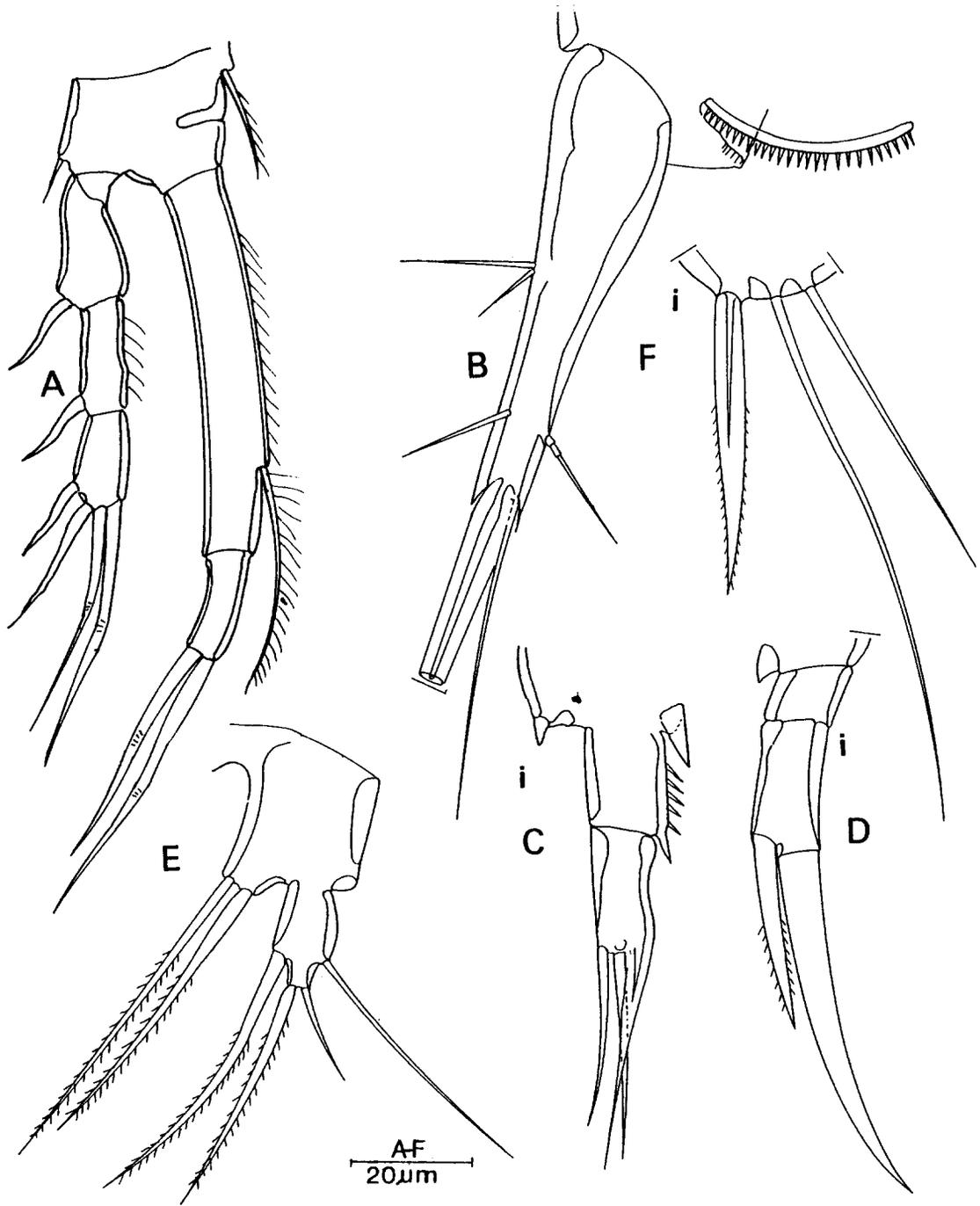


Fig. 2. A *Phyllopodopsyllus furciger* Sars: P1 (female). B–F *Phyllopodopsyllus xenus* (Kunz) (male): B Fu, dorsal; C Enp P2; D Enp P4; E P5; F P6.

and carrying a fine seta. Another fine seta next inside to terminal seta.

A1 (Fig. 4A) 9-segmented. Basal segment as long as the next 5 segments together. Second segment with

pointed, backwardly directed hook. Aesthetascs on fourth and last segment.

A2 (Fig. 4B) with basis. Exp one-segmented with one lateral and 2 terminal setae. Second segment Enp

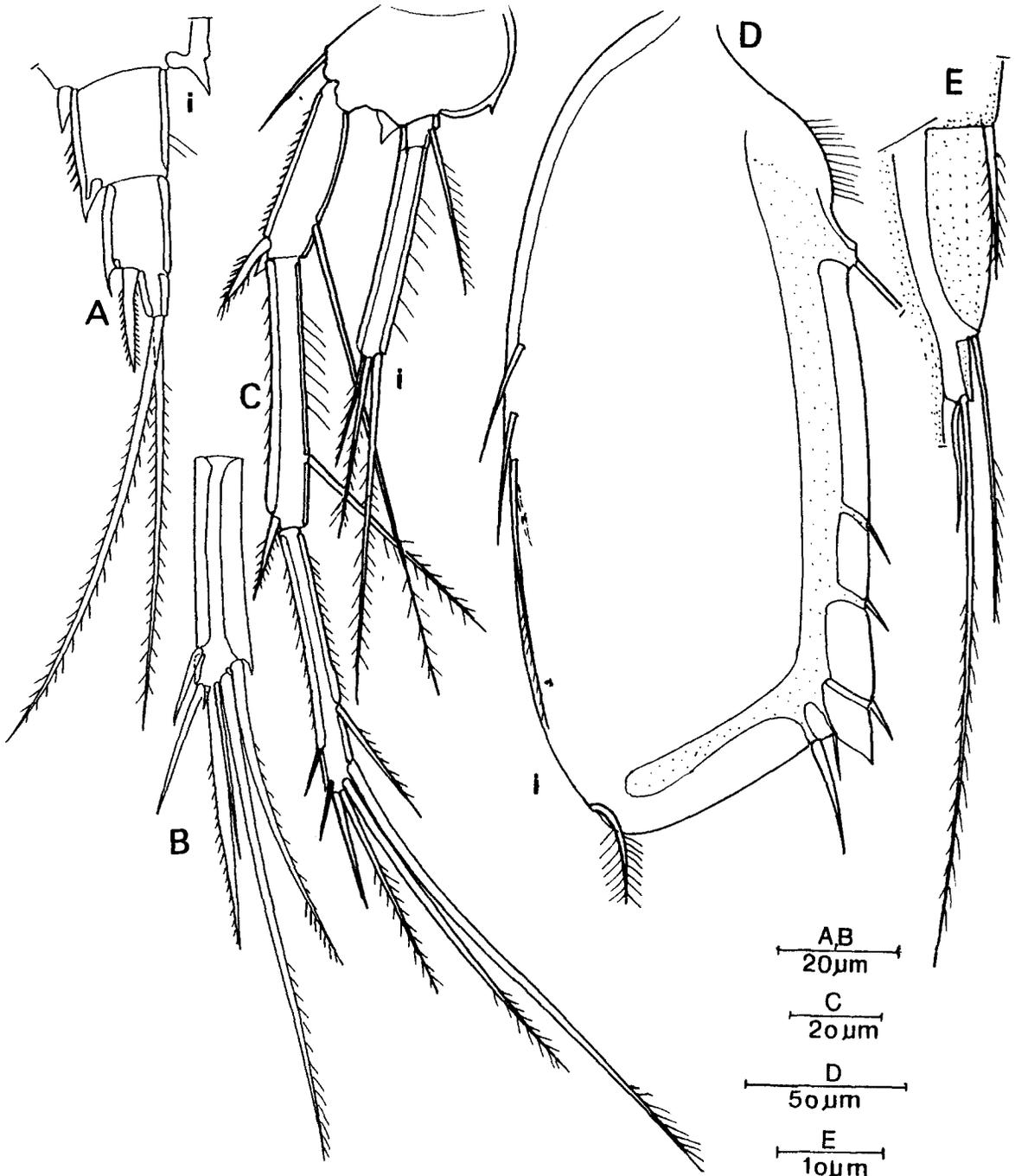


Fig. 3. A–B *Phyllopodopsyllus xenus* (Kunz) (male): A Enp P3; B Exp P4, terminal segment. C–E *Phyllopodopsyllus pallaresae* n. sp. (female): C P4; D P5; E P5, setae on inner edge.

with 6 robust, partly geniculate, and 2 thin setae; laterally and terminally combs of fine spinules forming a calyciform projection.

Mdp (Fig. 5A). Basis with 2 rows of hairs and 3 plumose setae. Exp slender, with 1 lateral and 3 terminal setae. Enp one-segmented, with 2 lateral and 7 terminal setae.

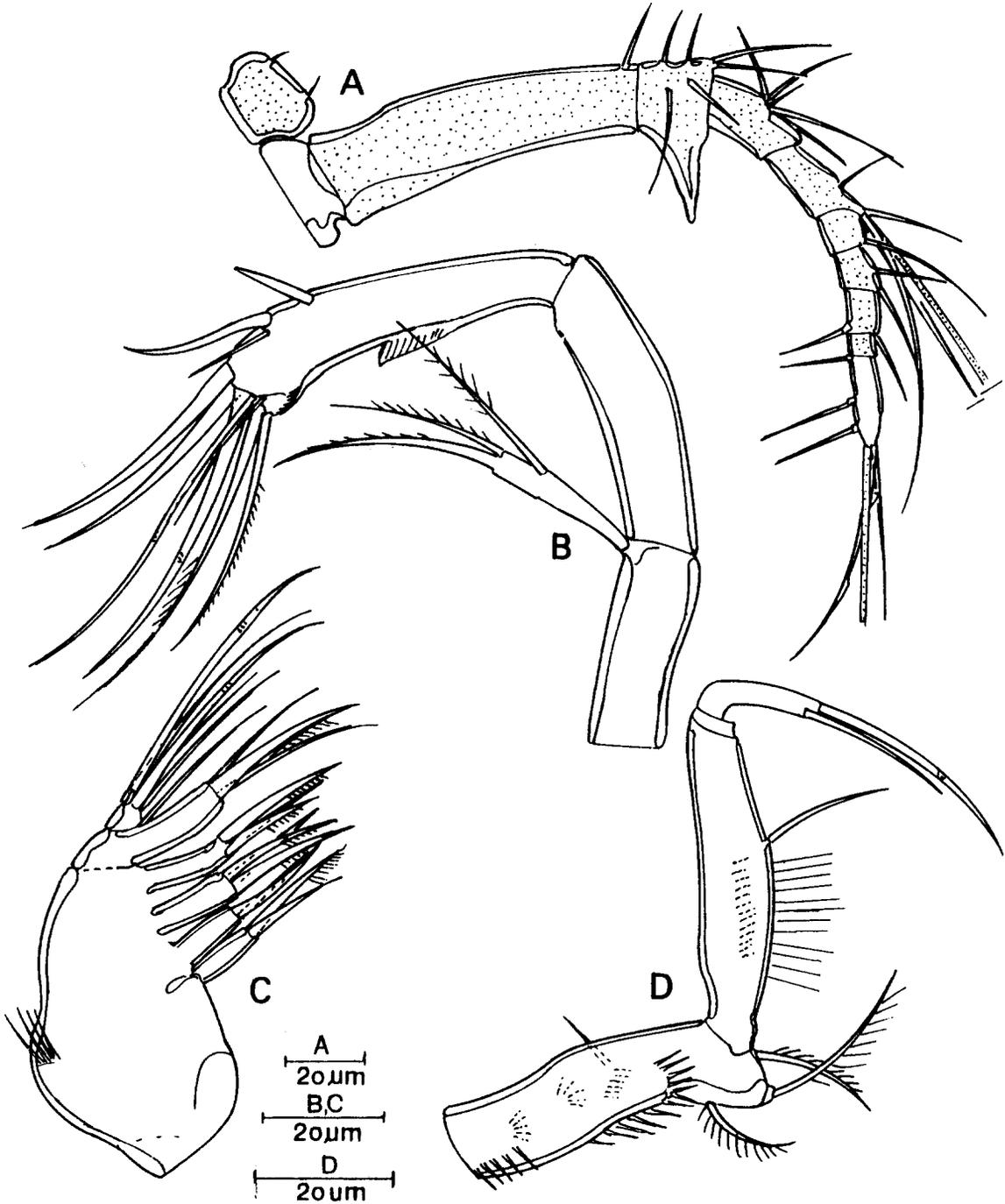


Fig. 4. *Phyllopodopsyllus pallaresae* n. sp. (female): A A1; B A2; C Mx2; D Mx1.

Mx1 (Fig. 5B). Arthrite of praecoxa laterally with 2 setae, terminally with a number of claw-like setae. Coxa with 4 terminal setae and one strong backwardly directed plumose seta. Basis with 8 terminal setae. Exp

with row of hairs and 3 plumose terminal setae. Enp with one lateral and 3 terminal setae.

Mx2 (Fig. 4C). Syncoxa with 4 endites, furnished with 2,1,3,3 setae respectively, beginning with prox-

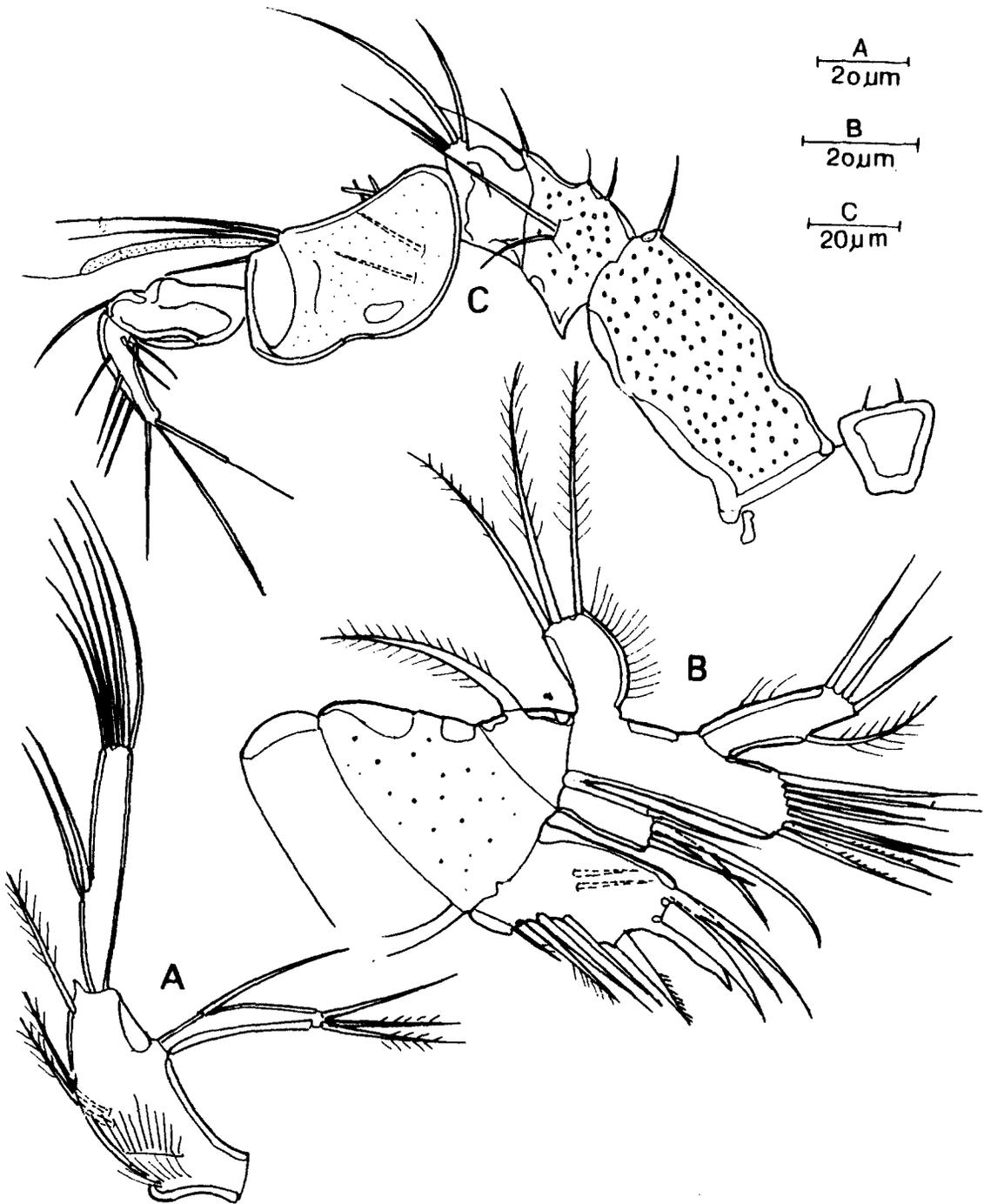


Fig. 5. *Phyllopodopsyllus pallaresae* n. sp. : A Mdp (female); B Mx1 (female); C A1 (male).

imal endite. Basis with 3 setae. Enp indistinctly segmented with in total 6 setae.

Mxp (Fig. 4D). Syncoxa with some rows of delicate setae and, near to the distal end, with 3 plumose setae.

Basis with a row of hairs and one seta. Enp slender, with a distal claw and 1 subapical seta.

P1 (Fig. 7A). Exp 3-segmented. Enp 2-segmented. Basal segment of Enp somewhat longer than the whole Exp and about 3.9 times longer than the terminal seg-

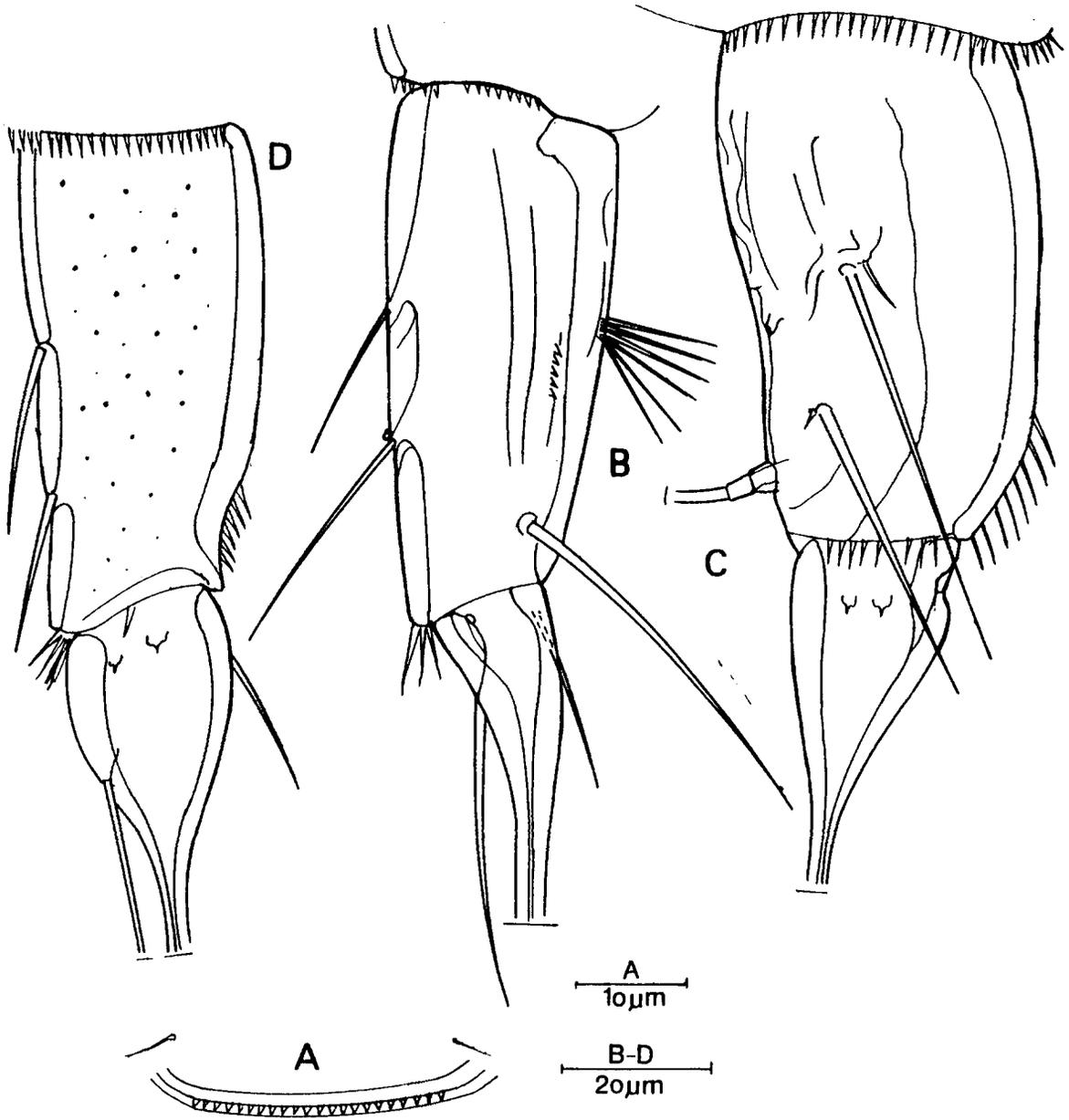


Fig. 6. *Phyllopodopsyllus pallaresae* n. sp. (female): A Anop; B Fu, dorsal; C Fu, lateral; D Fu, ventral.

ment of Enp. Basal segment Enp with one plumose seta on inner edge, terminal segment Enp with 2 geniculated terminal setae.

P2-P4 (Figs 3C, 7B-D). Exp 3-segmented, Enp 2-segmented. Setal formula:

	Exp	Enp
P2	1.0.122	0.021
P3	1.0.222	1.021
P4	1.1.223	1.111

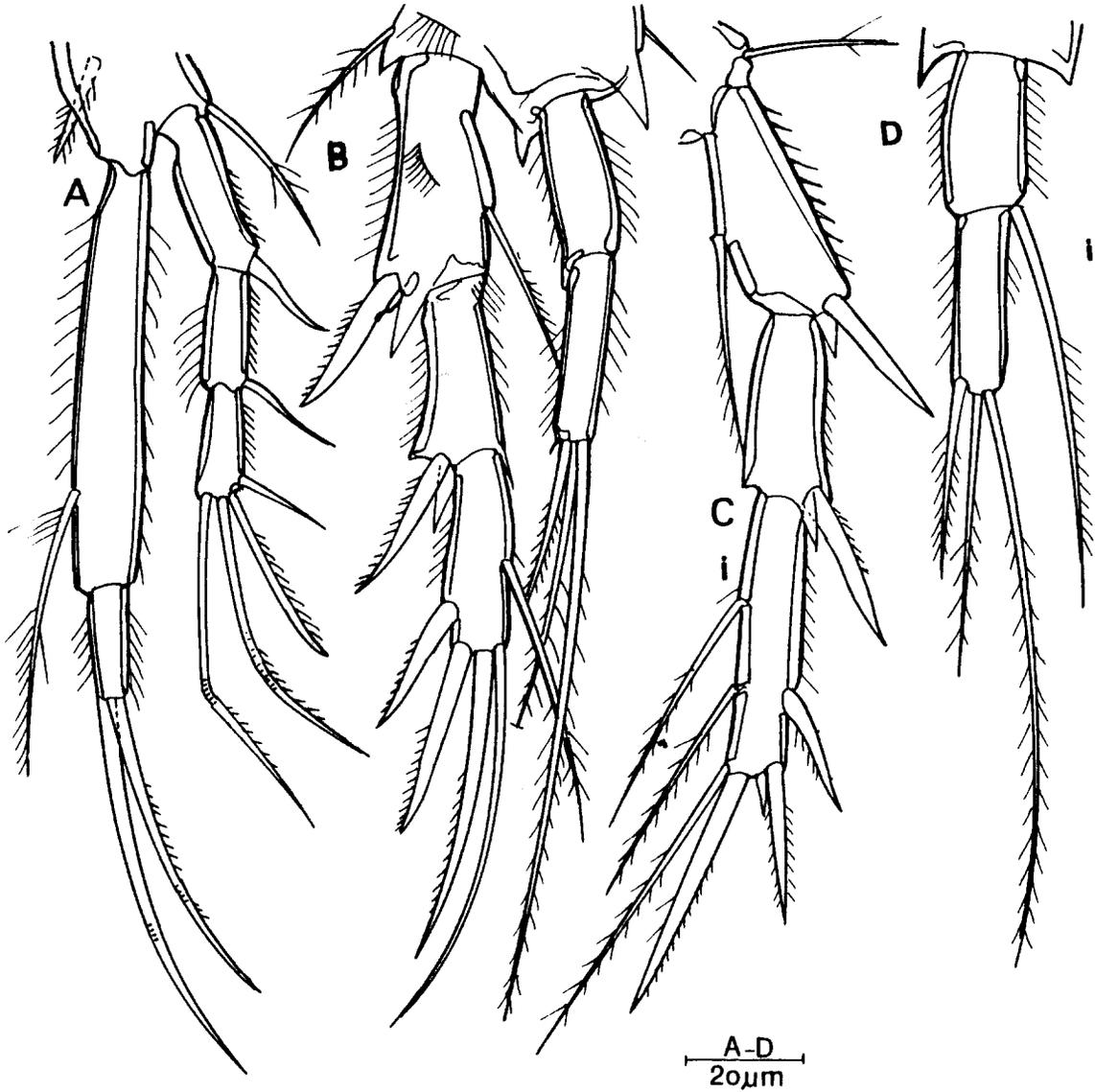


Fig. 7. *Phyllopodopsyllus pallaresae* n. sp. (female): A P1; B P2; C Exp P3; D Enp P3.

Of the 3 setae on the terminal segments of Enp, the innermost is always the longest, the outermost the shortest.

P5 foliaceous (Fig. 3D–E) with a protrusion at outer distal corner. 11 setae in total, 4 of which on the inner edge, 3 terminal, and 4 on the outer edge.

#### Male

Caudal rami divergent, very slender, 9 times as long as wide, largest width at the insertion point (Fig. 8A). Outer edge with 2 well developed setae. Dorsally near distal end one seta, articulated at base. Terminal seta

strong with a thin seta arising from it dorsally and with a thin accompanying seta basally at inner corner.

A1 6-segmented (Fig. 5C). Second segment with a backwardly directed hook. Fourth segment swollen, with aesthetasc.

P2–P4 (Figs 8B–E). Enp unlike those of female. Outer and middle seta on terminal segment of Enp P2 tapering abruptly. On terminal segment of Enp P3 the middle seta points obliquely inwards and is shorter than corresponding seta of female. Terminal segment Enp P4 with 2 setae. The inner one especially robust and slightly sickle-shaped.

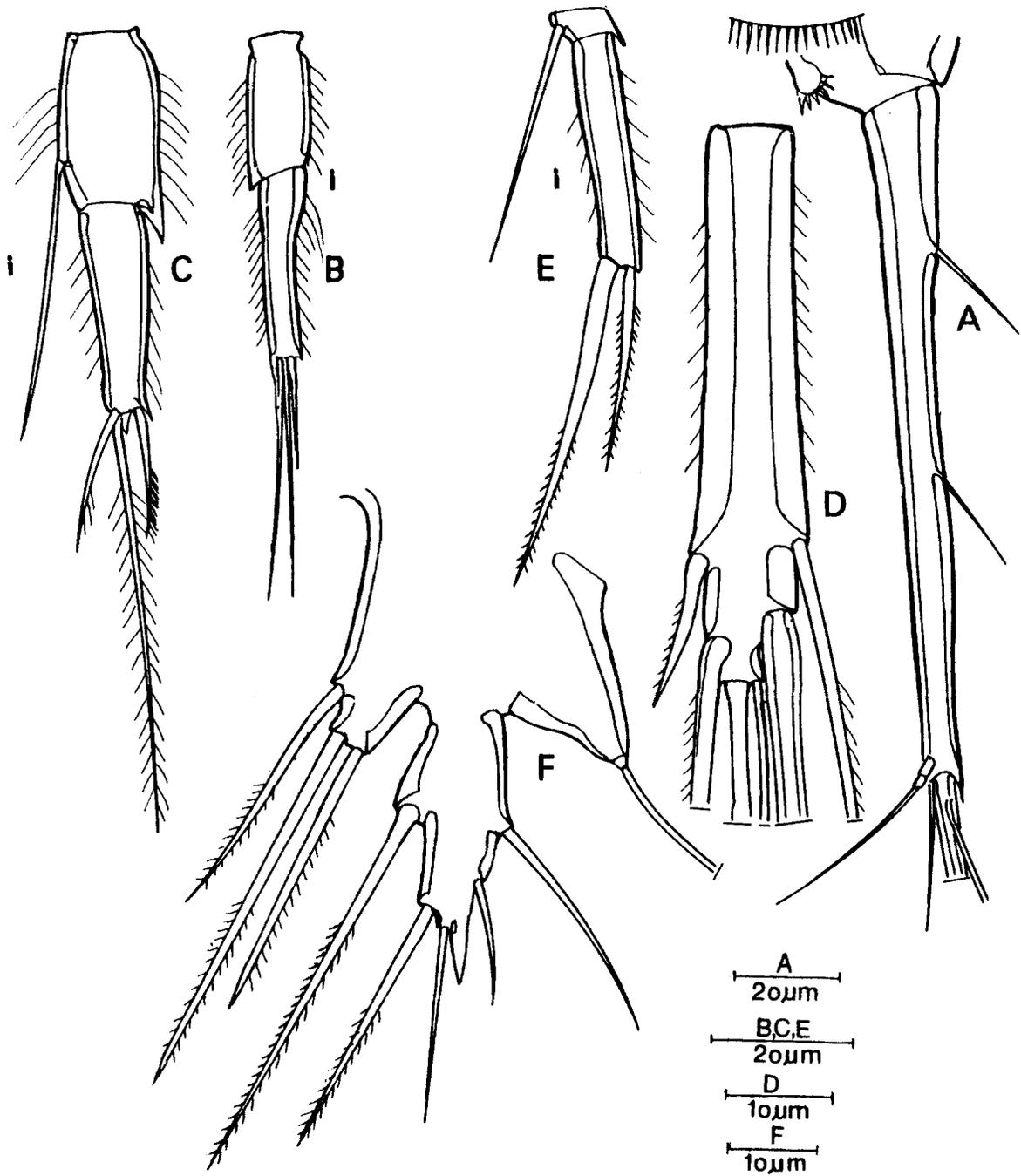


Fig. 8. *Phyllopodopsyllus pallaresae* n. sp. (male): A Fu, dorsal; B Enp P2; C Enp P3; D Exp P4; E Enp P4; F P5.

P5 2-segmented (Fig. 8F). Basoendopodite with 3 setae. Exp with 5 setae, the two on the inner edge being particularly robust. A pointed, tooth-like process next to terminal seta.

P6 (Fig. 9A). Consisting of a plate with 3 setae, the inner one especially robust and dagger-shaped.

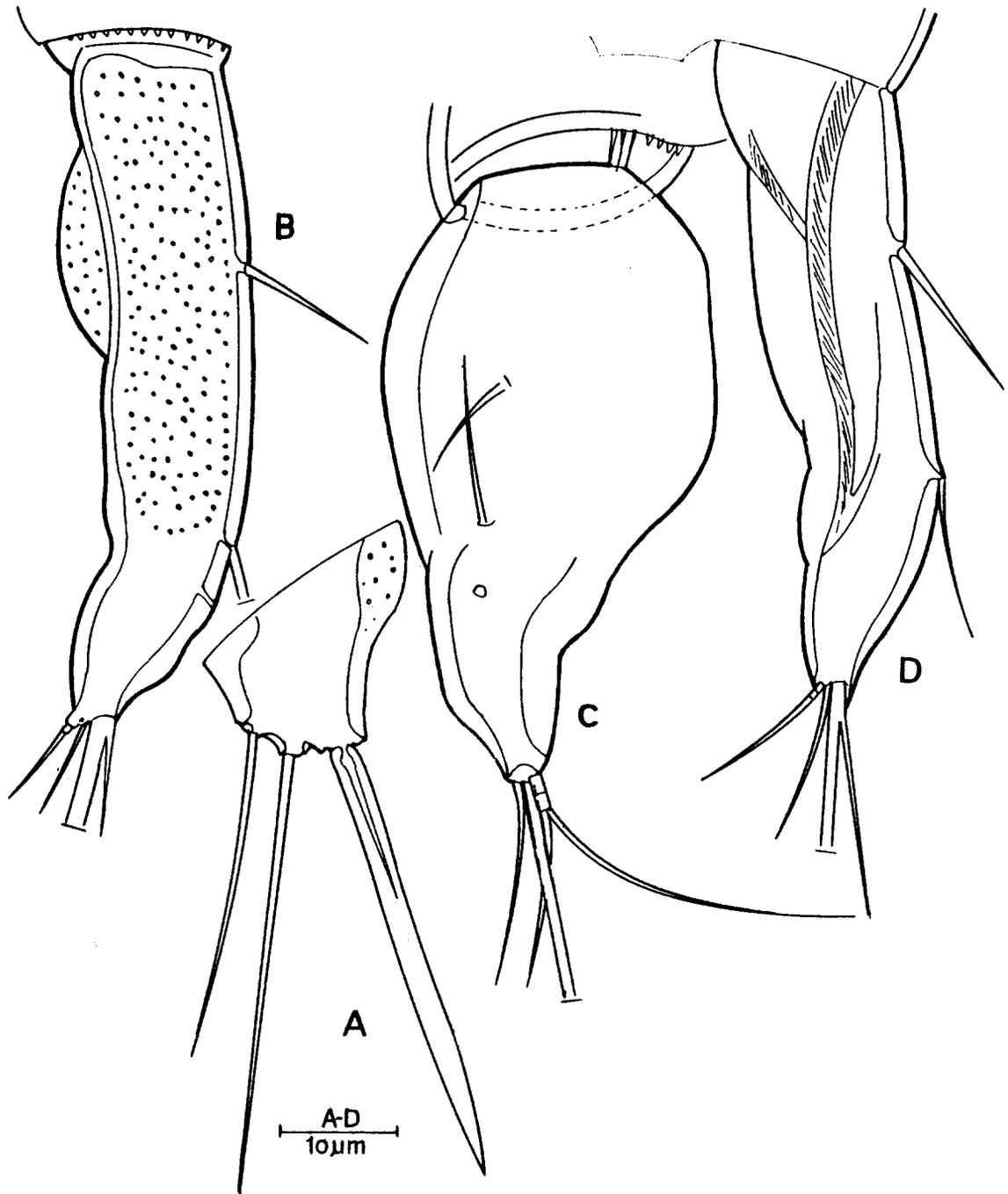


Fig. 9. A *Phyllopodopsyllus pallaresae* n. sp. P6 (male). B-D *Phyllopodopsyllus hartmannorum* n. sp. (female): B Fu, ventral; C Fu, lateral; D Fu, dorsal.

#### Etymology

Named in honour of Dr Rosa E. Pallares, Buenos Aires, for her contributions to the knowledge of marine harpacticoids of southern regions.

#### Discussion

*P. pallaresae* and *P. bradyi* (T. Scott, 1892) are closely related, sharing the 9-segmented A1 with a pointed, backwardly directed hook and the setal formula of the

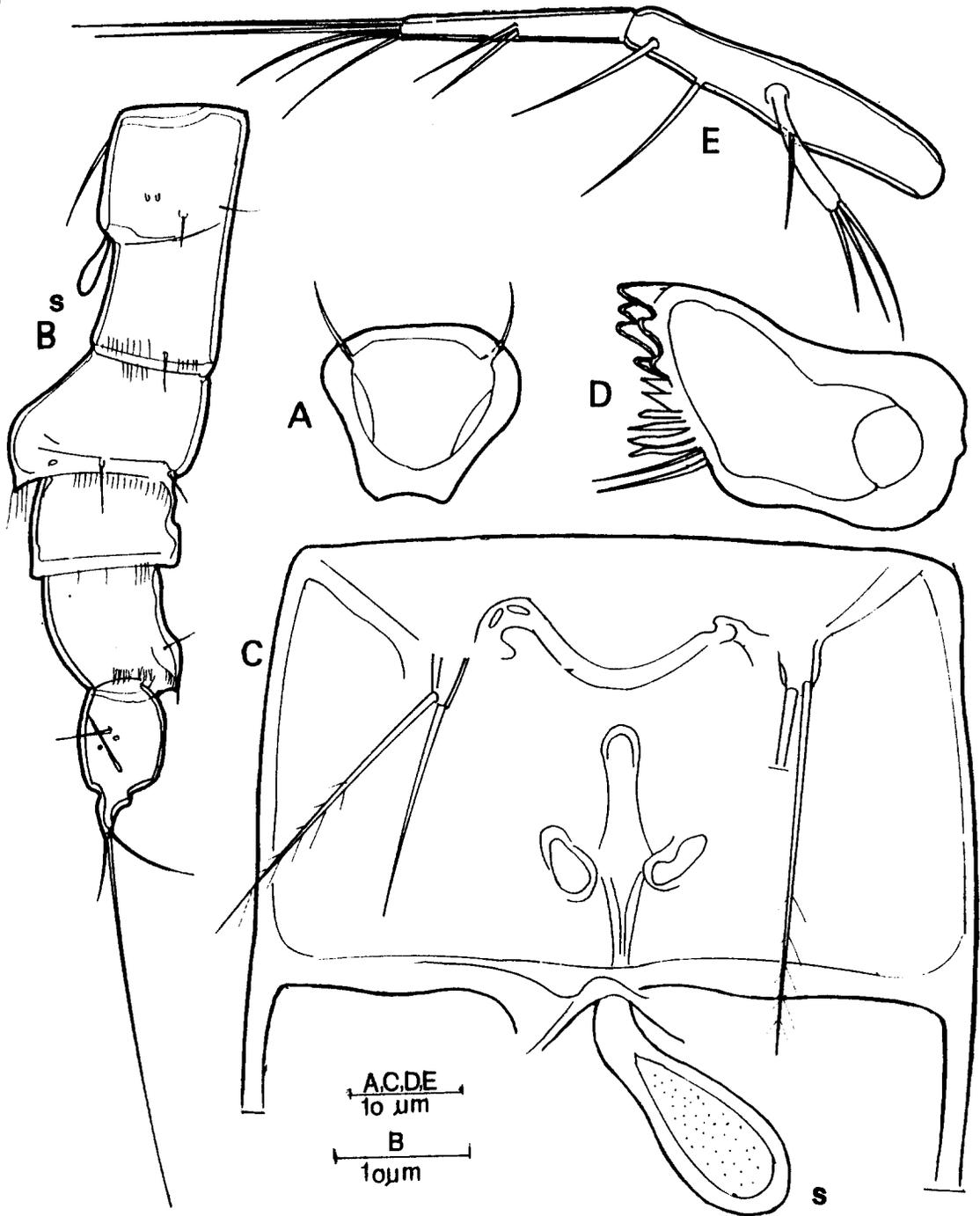


Fig. 10. *Phyllopodopsyllus hartmannorum* n. sp. (female): A R; B abdomen, lateral; C Gs; D gnathobase; E Mdp.

swimming legs in the female. There is also a close similarity with the male P5.

In the female the main difference between both species is the shape and the armature of the Fu. In *bradyi* the proximal half of the inner edge is distinctly

convex, as figured by T. Scott (1892), Brady (1905) and Sars (1911). In *pallaresae* the whole inner edge is weakly convex. On the inner edge of the Fu in *bradyi* there is a continuous, long row of hairs according to Sars, but according to Brady the row is short. In *pal-*

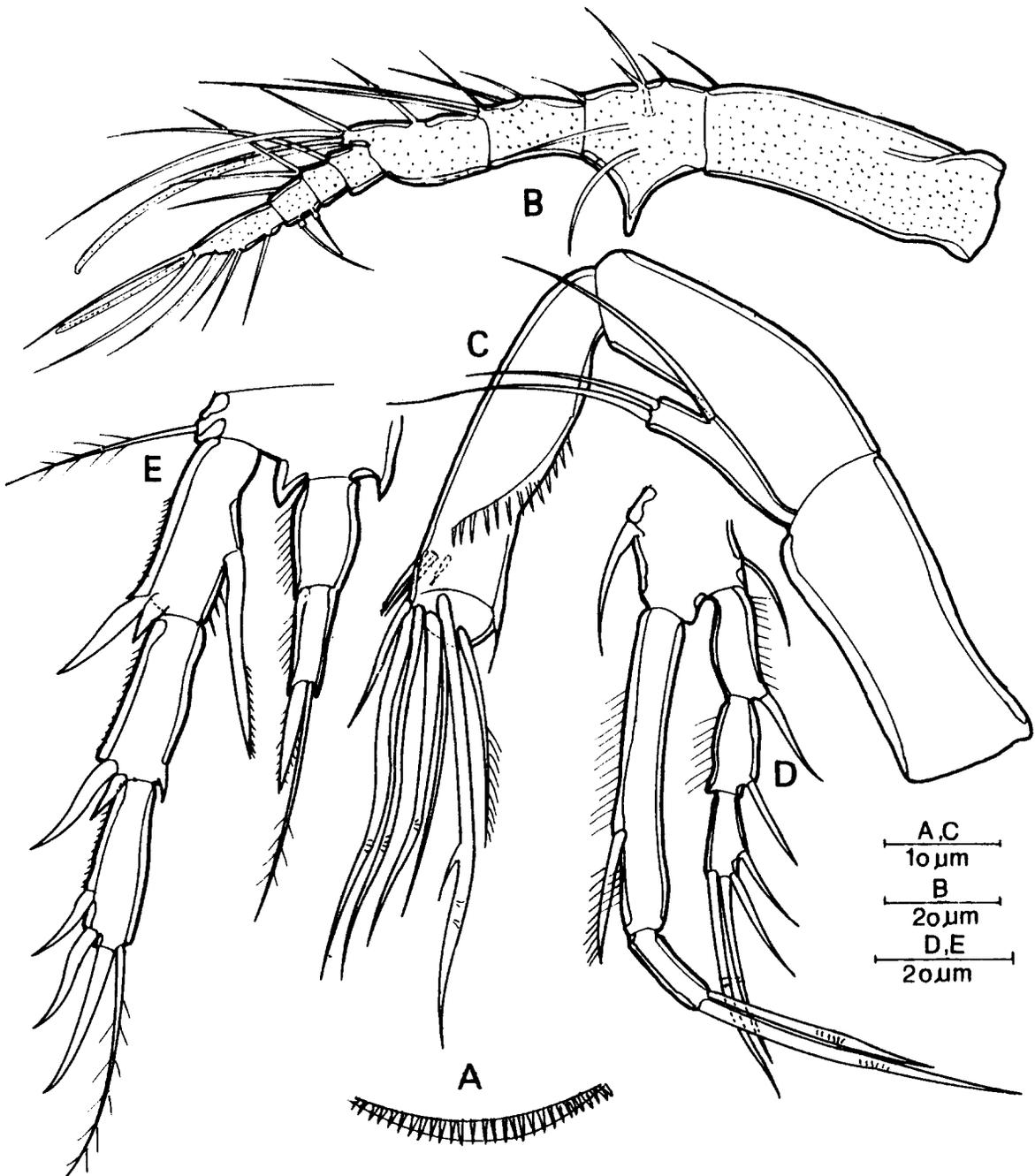


Fig. 11. *Phyllopodopsyllus hartmannorum* n. sp. (female): A Anop; B A1; C A2; D P1; E P3.

*laresae* there is a tuft of long hairs in the middle of the inner edge. Ventrally near the inner edge of the Fu of *pallaresae* there is a short row of hairs, which is not figured for *bradyi* by Scott, Sars and Brady.

The males (that of *bradyi* is described for the first time by Sars 1911, P1. 37) differ in the following characters: (1) terminal segment Enp P2 with 2 setae (*bradyi*) resp. 3 setae (*pallaresae*); (2) the 3 setae on Enp P3 like those of the female (*bradyi*) resp. modified

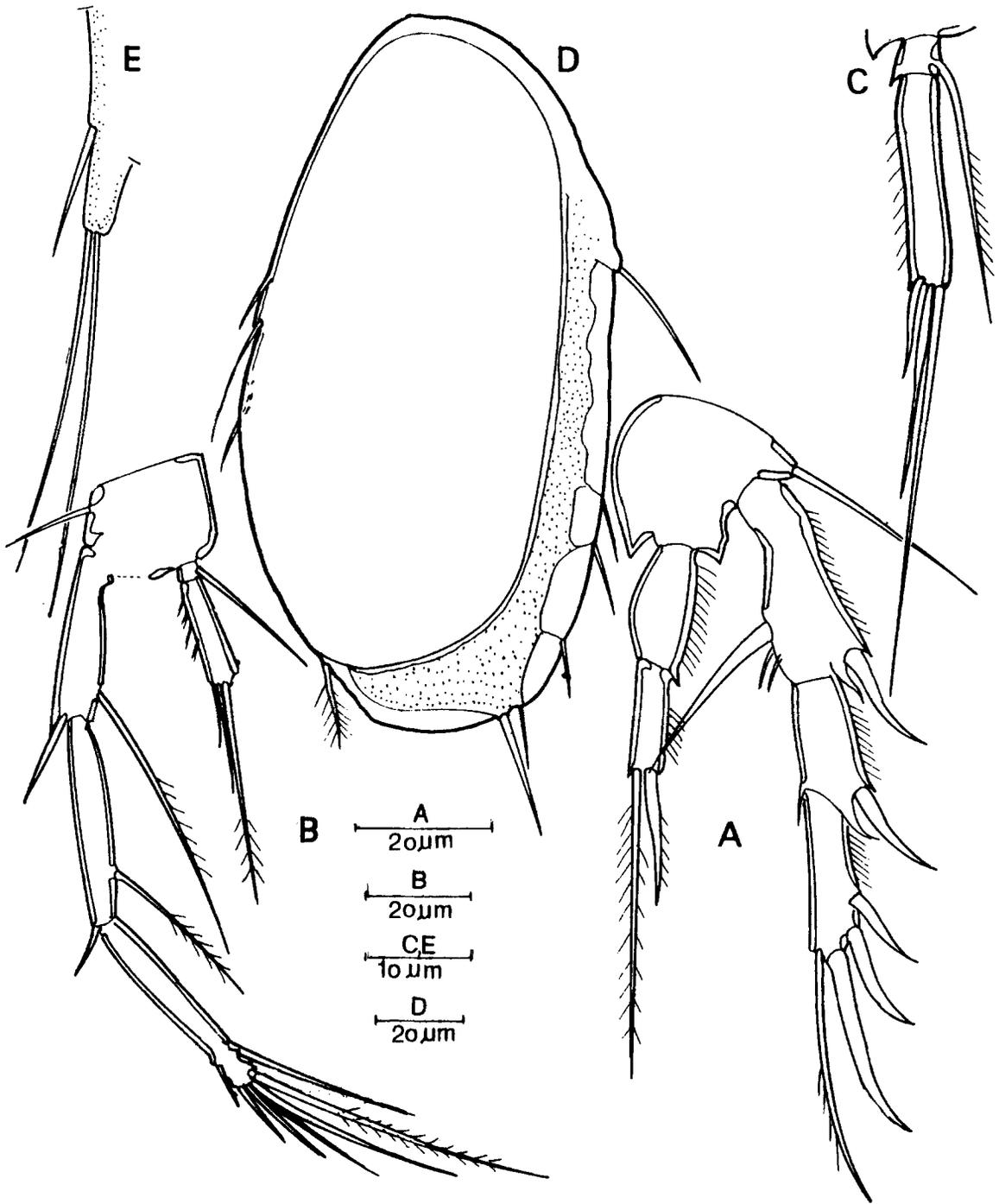


Fig. 12. *Phyllopoposyllus hartmannorum* n. sp. (female): A P3; B P4; C Enp P4; D P5; E P5, setae on inner edge.

(*pallaresae*); (3) P6, the outermost seta considerably shorter than the middle one (*bradyi*) resp. of nearly the same length (*pallaresae*).

*P. longicaudatus* A. Scott, 1909 sensu Vervoort (1964) is also closely related to *pallaresae*. They share

the setal formula except for one seta missing on the terminal segment Exp P4 female in *longicaudatus*. The main difference between the two species is the structure of the female caudal ramus, which is 7 times as long as wide and has a continuous row of fine hairs nearly all

along the inner edge (*longicaudatus*), resp. is 2.2 times as long as wide and has a tuft of hairs on the inner edge (*pallaresae*).

*Phyllopodopsyllus hartmannorum* n. sp. (Figs 9B–D, 10–12)

Localities and material. Indian Ocean, Tanzania, Tanga: Coral reef at the entrance to the port, between coral fragments, depth 3 m; 5 XI 1967, 1 female, holotype; leg. Hartmann, Nr. K-34939 (25a–f).

### Description

#### Female

Length 0.58 mm. Dorsal surface of body with fine pores. R trapezoid (Fig. 10A). Gs incompletely divided (Fig. 10C). P6 a small operculum with 2 setae, of which the inner one is bare, the outer plumose and longer. Third abdominal somite projecting ventrally (Fig. 10B). Abdominal somites laterally with rows of spinules (Fig. 10B). Anop with pointed denticles (Fig. 11A). Fu (Figs 9B–D) in dorsoventral view about 3.6 times as long as wide, with high keel dorsally. Outer edge of Fu convex, inner edge weakly concave, outer edge with a seta at 1/4 and 2/3 of the length, respectively. Fu terminally with a well developed seta, upon which arises another short seta, and with a small seta inside. Near end of Fu, a dorsal seta, biarticulated at base.

A1 8-segmented, with aesthetascs on fourth and last segments (Fig. 11B). First segment nearly as long as the following three combined. Second segment with a strong, backwardly directed hook.

A2 (Fig. 11C). Basis smooth. Exp 1-segmented with one strong seta on inner edge and 2 terminal setae. Basal segment Enp smooth. Terminal segment with an obliquely directed row of hairs, running across distal half of the surface. On inner edge near distal end 2 spines. Terminally 4 geniculate strong setae and two slender setae.

Md (Figs 10D–E). Gnathobasis (Fig. 10D). Mdp with 2 setae on basis. Exp with one seta on inner edge and 3 terminal setae (Fig. 10E). Enp with two laterally juxtaposed setae and three setae terminally.

Mx1 as in preceding species.

P1 (Fig. 11D). First segment of Enp 1.1 times longer than Exp and 3.4 times longer than terminal segment Enp. Inner edge of basal segment of Enp and inner edge of middle segment of Exp with a row of hairs

each. Terminal segment Enp with 2 weakly geniculate setae.

P2–P4 (Figs 11E, 12A–C). Exp 3-segmented, Enp 2-segmented. P2 and P3 uniform. Outer seta on terminal segments of Enp P2 and P3 dagger-shaped and considerably shorter than inner one. Setal formula:

	Exp	Enp
P2	1.0.112	0.020
P3	1.0.112	0.020
P4	1.1.223	1.021

P5 (Figs 12D–E). Very large, strongly curved. Outer edge with 4 setae; 3 setae terminally, the innermost plumose; on inner edge 3 setae discernible.

Male unknown.

Etymology. Named in honour of Dr Gesa Hartmann-Schröder and Prof. Dr Gerd Hartmann, Hamburg.

### Discussion

*P. hartmannorum* belongs to the *pauli*-group (Kunz, 1984), which consists of *P. pauli* Crisafi, 1960, *P. danielae* Bodin, 1964, *P. simplex* Kitazima, 1981, *P. tenuis* Wells & Rao, 1987, *P. ancylus* Mielke, 1992 and *P. kunzi* Mielke, 1992. *P. hartmannorum* differs from all those in the structure of Fu and the setation of Enp P2 female and P3 female.

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