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Peltidiidae (Copepoda, Harpacticoida) from the Weddell Sea (Antarctica)

HANS-UWE DAHMS

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Alteutha polarsternae sp.n. is described and *Eupelte villosa* (Brady, 1910) is redescribed in detail. The distribution of both these species in the Weddell Sea is recorded.

Hans-Uwe Dahms, Universität Oldenburg, Fachbereich 7, Arbeitsgruppe Zoomorphologie, D-2900 Oldenburg, Germany.

Introduction

Meiofauna was collected during expeditions with RV *Polarstern* along the Antarctic Peninsula (Ant III in 1985) and in the Weddell Sea (Ant V/3 in 1986) in the Antarctic. Two harpacticoid copepod species from two genera of the family Peltidiidae Sars, 1904 were found and are described in this paper. According to the most recent review of the Peltidiidae (Hicks 1986a), the family comprises eight genera; *Paraltheutha* T. Scott, 1912 was synonymized with *Eupelte* Claus, 1860 by Hicks (1986a). Bodin (1988) lists nine species of the *Alteutha* Baird, 1845, while the genus *Eupelte* Claus, 1860 is said to contain 10 species.

Material and methods

Meiofauna was collected using Agassiz-trawl (AGT), Beyer sledge net (BSL), dredge (D), or grab core (BG), at various locations in the Weddell Sea during the German Ant III and Ant V/3 expeditions (Fig. 1). Substrate was stirred in a beaker and decanted over a 80 μm mesh. Specimens were preserved in 4% formaldehyde and transferred to W 15 (C. Zeiss) embedding medium. Habitus was drawn from wholemounts, and body characters were measured before dissection. All figures were drawn with the aid of a *camera lucida*.

The terms *pars incisiva, pars molaris*, and *lacinia mobilis* are not used in the descriptions (cf. Mielke 1984). Abbreviations used in the text are: *P1–P6* thoracic locomotory appendages 1–6; *Enp 2* 2nd segment of endopodite; *C VI* adult. The formula for the armature of the antennula is in the form: 0.–3ǂAc.- . . ., meaning 1st segment with no seta/2nd segment with 3 setae plus one aesthetasc.

Alteutha polarsternae sp.n. (Figs 2–7)

Type material. Female holotype (K-34334), male allotype (K-34335), both in Zoologische Museum Hamburg, from sediment 450 m, 74°06.1′S and 24°39.7′W, taken during cruise Ant V/3 (RV *Polarstern*).

Etymology. The species name refers to the German research vessel *Polarstern*, which has made possible a number of successful expeditions to the polar regions since 1983.

Description

Female. Holotype. Body length 1065 μm excluding rostrum and caudal rami; 1100 μm including rostrum and caudal rami; body width 520 μm. Body (Fig. 2A) flattened, weakly arched along midline, ellipsoid, tapering posteriorly, without complex, strongly developed pattern of chitinous thickenings. Dorsal cuticle of all somites sculptured in a reticulate pattern. Cephalothorax and first three free thoracic somites adorned with evenly distributed sensillae (Fig. 2B, C). The posterior dorsal rim of all somites bears one row of sensillae. Posterior border of somites serrate (Fig. 2B). Rostrum weakly triangular with rounded tip, well defined at base, tip pointing ventrally with a pair of delicate sensillae at 1/3 of tip (cf. Fig. 6B, male).

Abdominal somites 1 and 2 partially fused to the genital double-somite; suture line visible dorsally.

Genital field with chitinous excrescenses and 3 diminutive setae on each side.

Caudal rami (Fig. 3B) slightly longer than wide, with oblique posterior border. Armature consists of 7 setae. Principal terminal seta standing apart. Outermost seta stout and spiniform. Dorsal seta basally biarticulated. A field of dorsal spinules extending from dorsal seta to the inner distal corner.

Antennule (Fig. 2D) nine-segmented; segments plain except for the 1st segment which is covered with two fields of spinules. Segments 4 and 9 with 1 aesthetasc each. Armature:
1.–13.–9.–4 + Ae.–2.–4.–2.–2.–7 + Ae.

Antenna (Fig. 3A) basis rectangular, twice as long as wide. Endopodite segment 1 as long as allobasis but somewhat wider. Endopodite segment 2 narrow elongate; with 3 spinulose setae, the distal 2 spiniform, placed in the distal third of the inner margin; 7 setae distally, 4 of these are geniculate. Exopodite 2-segmented with 2 spinulose setae on the 1st and 3 on the 2nd segment.

Mandible (Fig. 3E) distal and (cutting edge) with 4 unidentate thick spines, 5 serrate spines and 1 spinulose seta. Coxa-basis of palp about 2 times as long as greatest width, with 2 spinulose setae on an inner bulge midlength. Endopodite unisegmented with 5 spinulose setae, one arising from the proximal third of inner edge. Exopodite unisegmented, with 3 spinulose setae of different length, one of these arising midway up article.

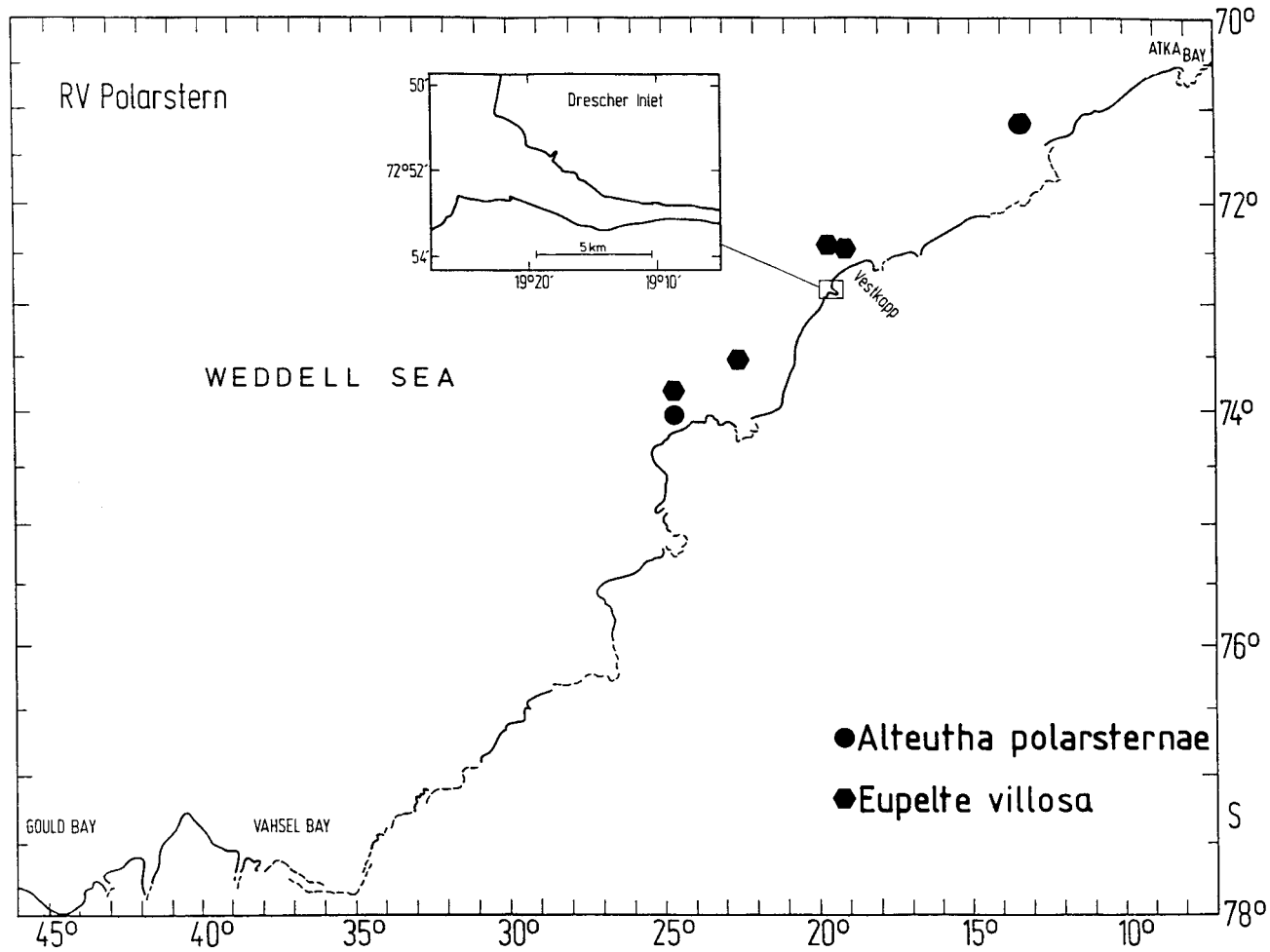

Fig. 1. Map of stations in the eastern Weddell Sea (Antarctica) where peltidiids have been found.

Maxillule (Fig. 3F) arthrite of praecoxa well developed with 9 spine-like setae distally, 2 posterior setae in the distal third and a band of spinules along the inner edge. Basis with 4 terminal setae. Endopodite unisegmented, with 3 setae.

Maxilliped (Fig. 3C) prehensile. Basis elongate, narrow, with a subproximal circle of spinules on anterior and a subdistal group of spinules on posterior face; 2 plumose setae arising subdistally from posterior surface. First endopodite segment (palm) elongate, inflated proximally and slightly concave distally on inner margin. Claw, representing 2nd endopodite segment, as long as 1st segment, elongate, slender and strongly curved; 2 bare diminutive setae on anterior and 3 setae on posterior face at base of claw.

P 1 (Fig. 4A) coxa robust, 1.5 times as long as wide, with a row of long spinules on outer and of shorter spinules on inner margin as well as along distal edge. Basis with spinulose subdistal setae and rows of spinules on inner and outer margins, respectively. Exopodite 3-segmented; segments 1 and 2 of equal length, the former with 1 and the latter with 2 subdistally placed setae; segment 3 short, longer than wide, with 5 outwardly curved and one-sided spinulose setae of increasing length from proximalmost to the distalmost; at base of the proximalmost seta there is a shortened chitinized setiform structure (probably a sensory element). Endopodite 3-segmented, not reaching to end of exopodite; first two segments each with an inner seta; 3rd segment with 2 inner, 2 terminal and 1 subterminal outer setae.

P 2 (Fig. 4B), P 3 (Fig. 5A) and P 4 (Fig. 5B) all with 3-segmented exopodites and endopodites as in P 1.

Setal formulae:

	Exopodite	*Endopodite*
P 1	0:1:032	1:1:221
P 2	1:1:223	1:2:221
P 3	1:1:323	1:2:321
P 4	1:1:323	1:2:221

P 5 (Figs 2A, 3D) 2-segmented, suture distinct. Baseoendopodite short, about 1.5 times as long as wide, with 3 setae arising from the ventrodistal edge, the distalmost more than half as long as exopodite, another short spinulose seta on dorsal surface. Exopodite elongate, more than 4 times longer than basal width; dorsal cuticle reticulated; 1 bare seta in the proximal third on the outer margin and 5 stout setae with spinulose margins in distal fourth, 2 of which arise subdistally from the inner margin. The remaining distal ones are bifid at their tips.

Male. Allotype. Body length 950 μm excluding rostrum and caudal rami, 980 μm including rostrum and caudal rami; body width 460 μm. Body like that of female but not tapering posteriorly (Fig. 6A) as much as female. Ornamentation of anal operculum differs in respect to chitinous surface reticulation (Fig. 7B).

Spermatophore elongate and tubular (Fig. 6A).

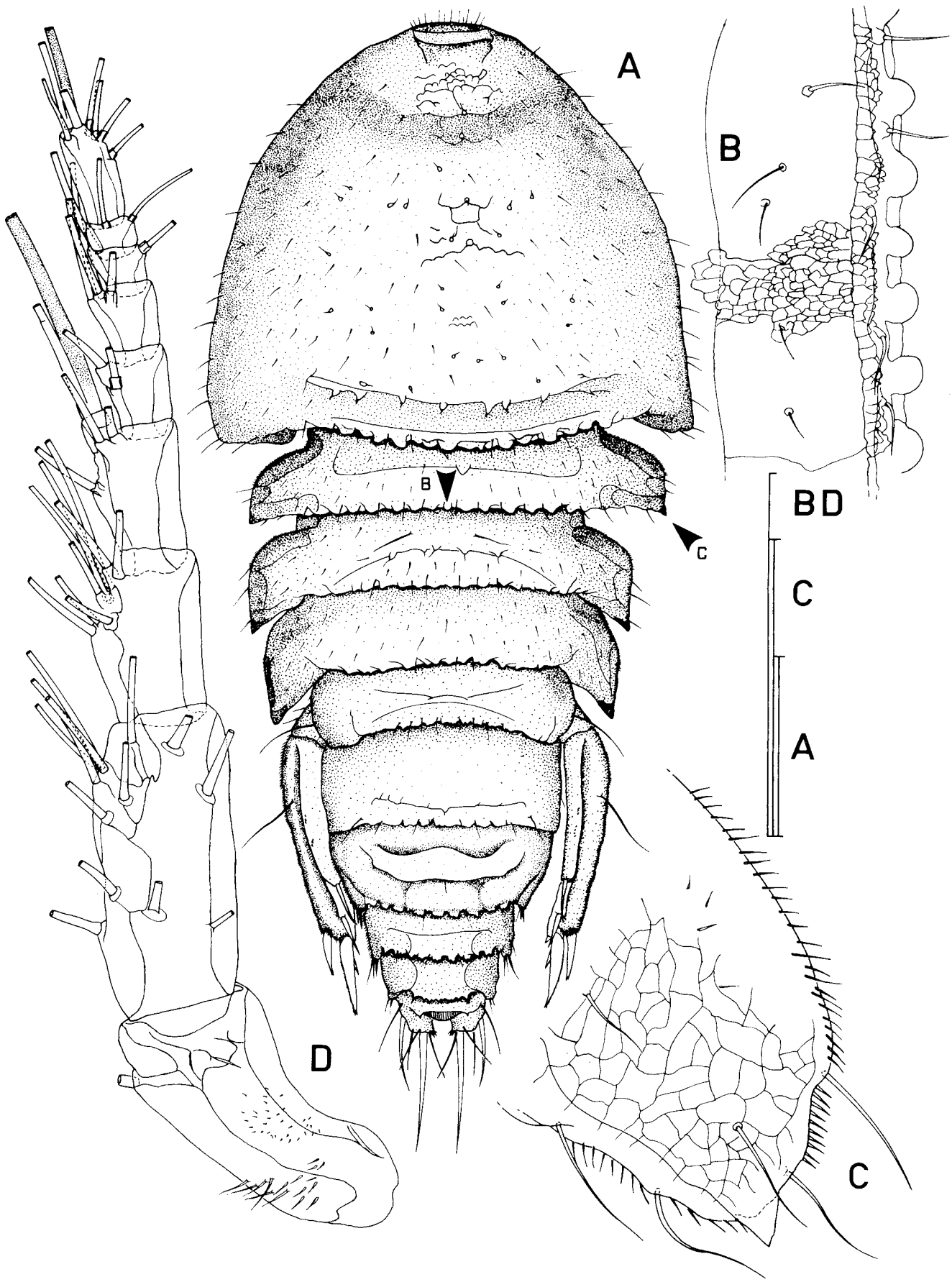

Fig. 2. Alteutha polarsternae sp.n. Female. —*A*. Habitus, dorsal.—*B*. Caudal rim of first free thoracic somite (arrow in Fig. 2A).—*C*. Lateral tip of first free thoracic somite (arrow in Fig. 2A).—*D*. Antennule. Scale bar 100 μm, except for *A* where it is 200 μm.

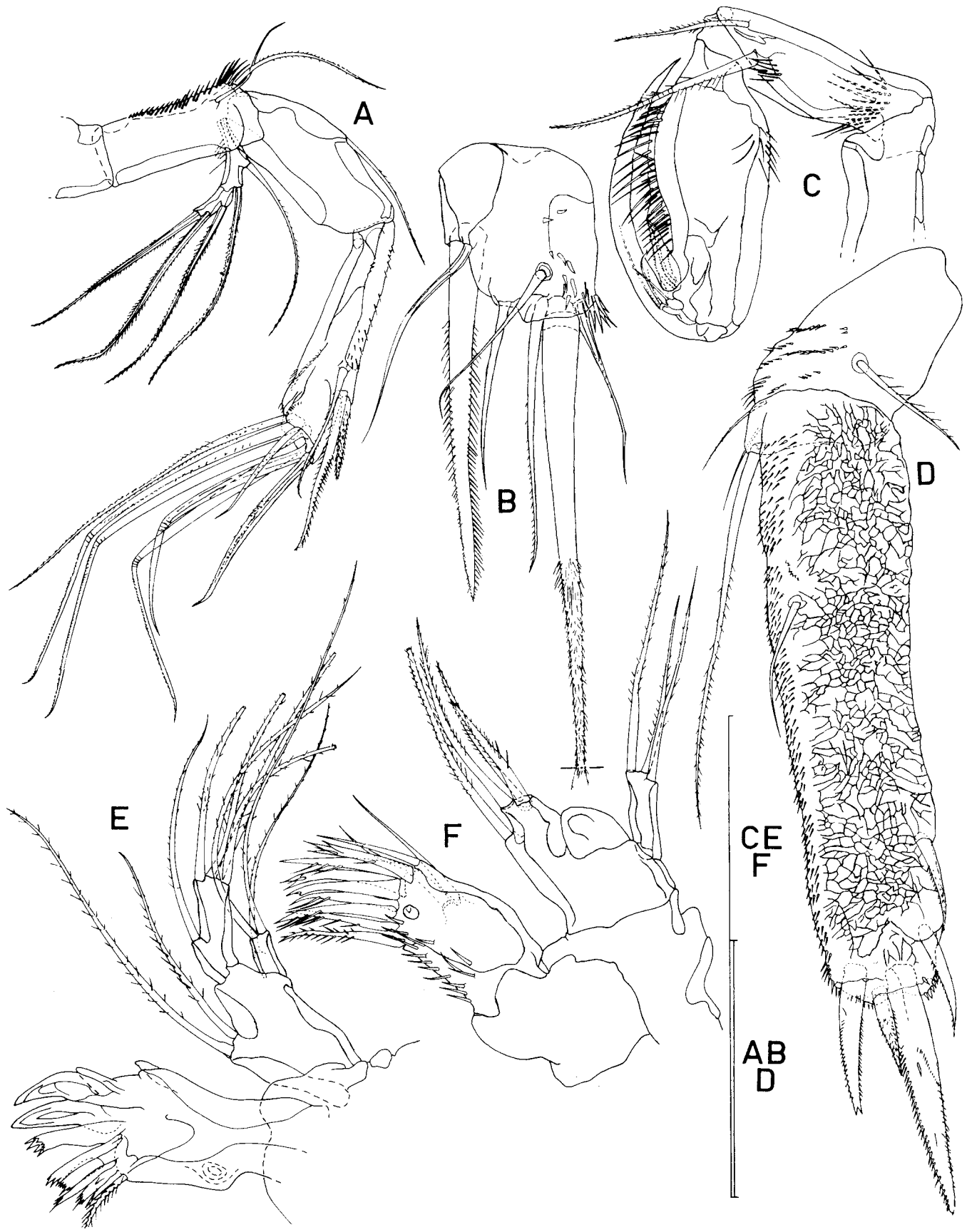

Fig. 3. Alteutha polarsternae sp.n. Female.—*A*. Antenna.—*B*. Left caudal ramus in dorsal view.—*C*. Maxilliped.—*D*. P 5.—*E*. Mandible.—*F*. Maxillule. Scale bar 100 μm.

Sexual dimorphism of appendages in antennule, P 2–4, P 5 and P 6.

Antennule (Fig. 6B) subchirocerate, 6-segmented; segments 3, 4 and 6 with aesthetascs; segment 5 with 2 proximal chitinous cleats.

P 2–P 4 (Fig. 7D) as in female except for outer distal corner of endopodite segment 1 which is produced in a spine-like manner, whereas it is more rounded in the females (Fig. 7E).

P 5 (Fig. 7A) 2-segmented with distinct suture. Baseoendopodite armed as in female. Exopodite slightly inwardly curved with 5 spiniform and spinulose setae, 3 of

Fig. 4. Alteutha polarsternae sp.n. Female.—*A*. P 1.—*B*. P 2. Scale bar 100 μm.

which situated along outer margin, the remaining 2 of distal position.

Eupelte villosa (Brady, 1910) (Figs 8–13)

Material examined. One nonovigerous female from Ant V/3 cruise of RV *Polarstern* by grab core (BG 10/53), sediment from 450 m depth at 74°06.1′S and 24°39.7′1W (25 October 1986): male from Ant V/3 by Beyer sledge net (BSL 10/592) from about 230 m depth at 73°55.0′1S and 22°58.6′1W (14 November 1986); 2 nonovigerous females (Ant V/3, BSL 10/592, 230 m depth, 14 November 1986, 73°55.0′1S and 22°58.6′1W); 2 nonovigerous females (Ant V/3, AGT 10/553, 376 m depth, 31 October 1986, 74°02.4′1S and 24°22.7′1W); 1 ovigerous female (84 eggs) Ant III/2, AGT, 200–300 m depth, 62°04.95′1S and 57°39.82′1W); 1 nonovigerous female and 1 male (Ant III/2, AGT, 225 m depth, 71°21.61′1S and 13°24.50′1W); 1 male (Ant V/3, BSL 10/613,

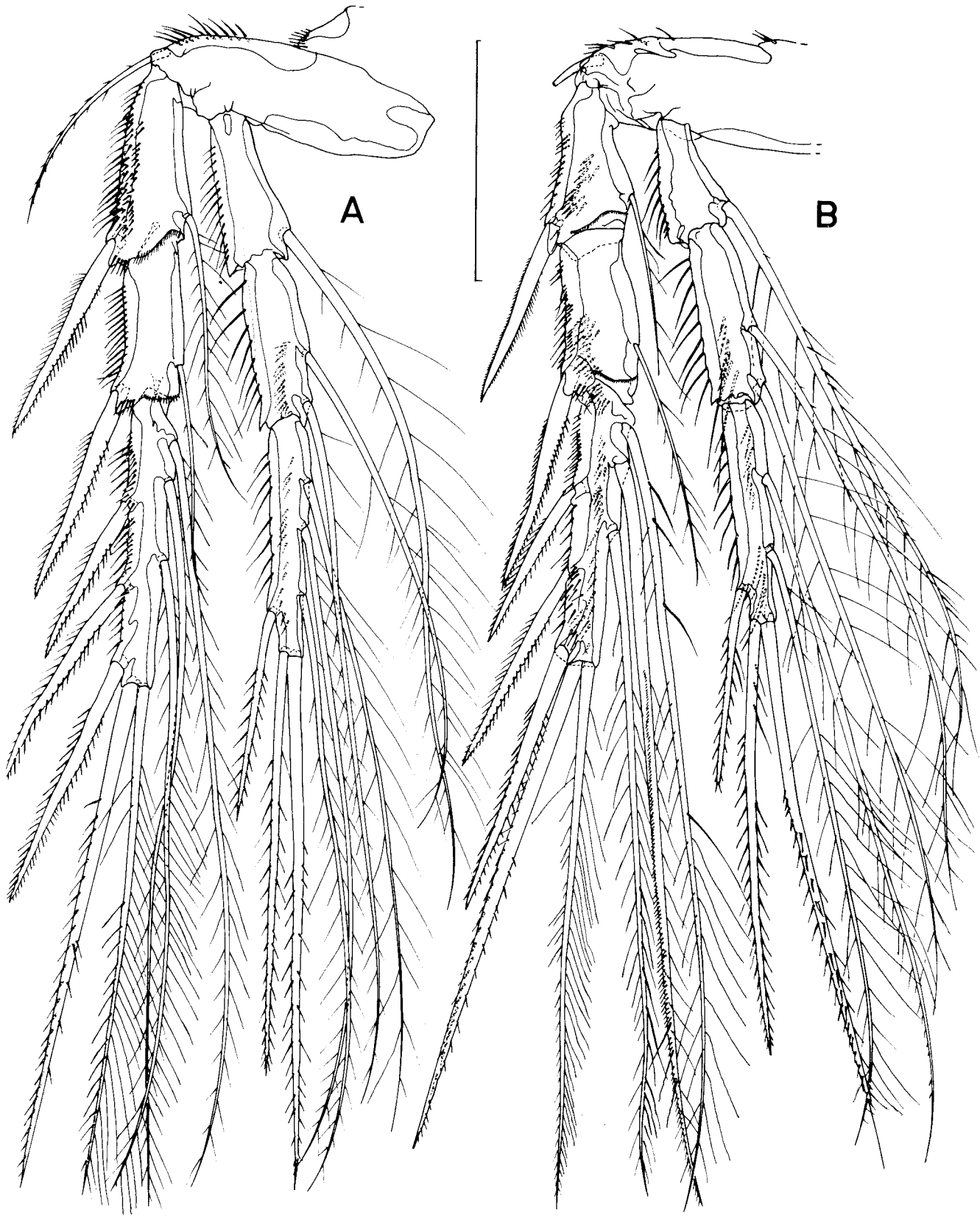

Fig. 5. Alteutha polarsternae sp.n. Female.—*A*. P 3.—*B*. P 4. Scale bar 100 μm.

300 m depth, 20 November 1986, 72°52.0′1S and 19°23.7′1W); 2 males with 1 spermatophore each (Ant V/3, D 10/508, 450 m depth, 15 October 1986, 72°49.3′1S and 19°25.0′1W); 1 male (Ant V/3, BG 10/527, 293 m depth, 22 October 1986, 72°23.5′1S and 16°37.4′1W).

Redescription

Female. Body length 1280 μm excluding rostrum and caudal rami and 1510 μm including rostrum and caudal rami; body width 830 μm. Body (Fig. 8A) flattened, weakly arched along midline, ovoid, without complex, strongly developed pattern of chitinous thickenings. Cephalothorax, rostrum (Fig. 8B) and all somites adorned with evenly distributed sensillae and a coat of minute spinules.

The dorsal posterior rim of all somites finely serrate and with one row of sensillae.

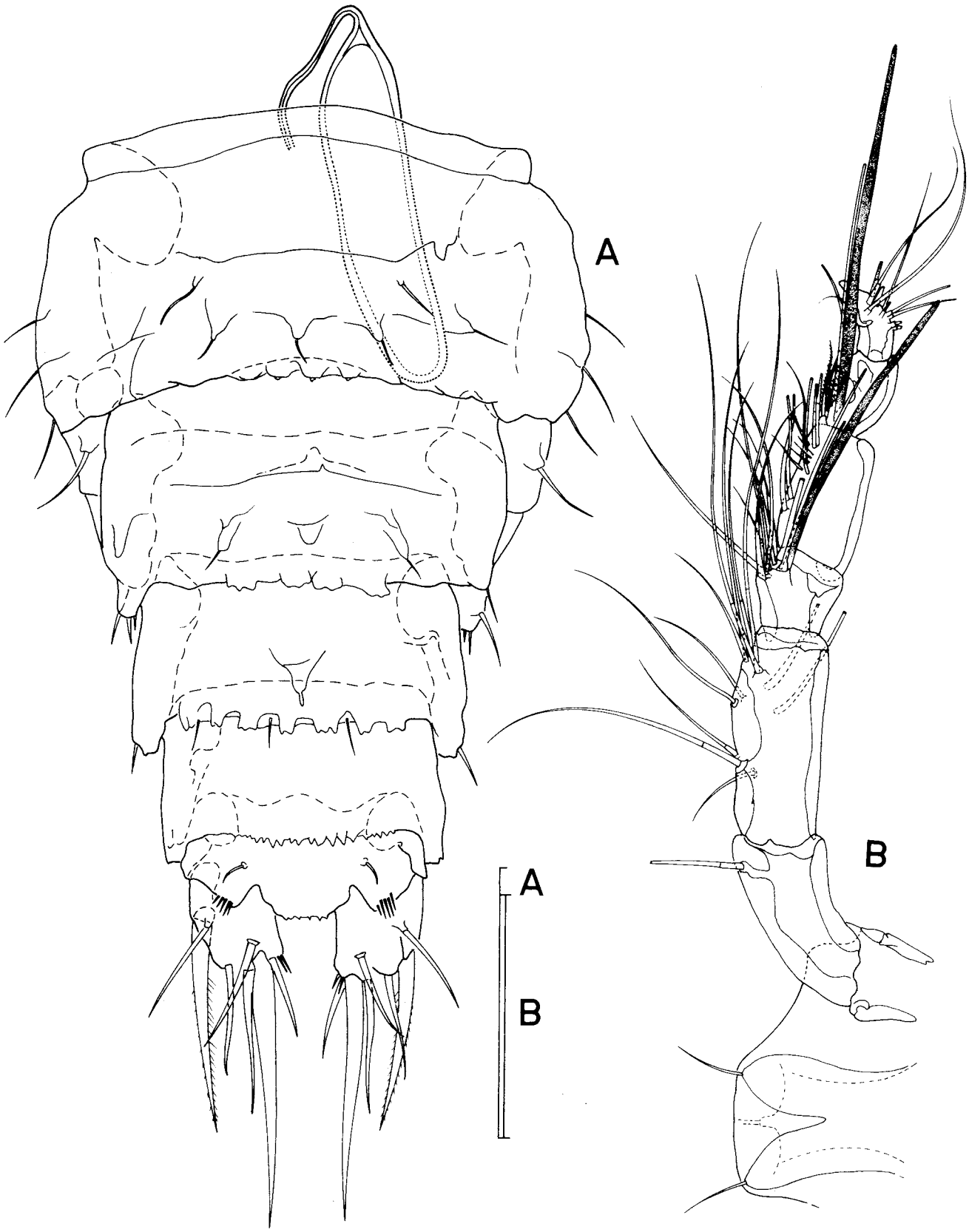

Fig. 6. Alteutha polarsternae sp.n. Male.—*A*. Abdomen, dorsal.—*B*. Rostrum and antennule. Scale bar 100 μm.

Rostrum rectangular and broad (Fig. 8B); not defined at base, tip pointing forwards.

Abdominal somites 1 and 2 are somewhat fused dorsally but to a lesser degree than in *Alteutha polarsternae* sp.n.

Genital field with chitinous excrescences and 2 + 1 tiny bare setae on each side (Fig. 8C).

Caudal rami as in male (Fig. 13D) about as wide as long, with oblique posterior border; with 7 spinulose setae of different lengths; 1 spine-like seta in the outer corner. Two bundles of long spinules are present subdistally on the posterior face.

Antennule (Fig. 10B) 9-segmented; first four segments covered with minute spinules on anterior face. Segments

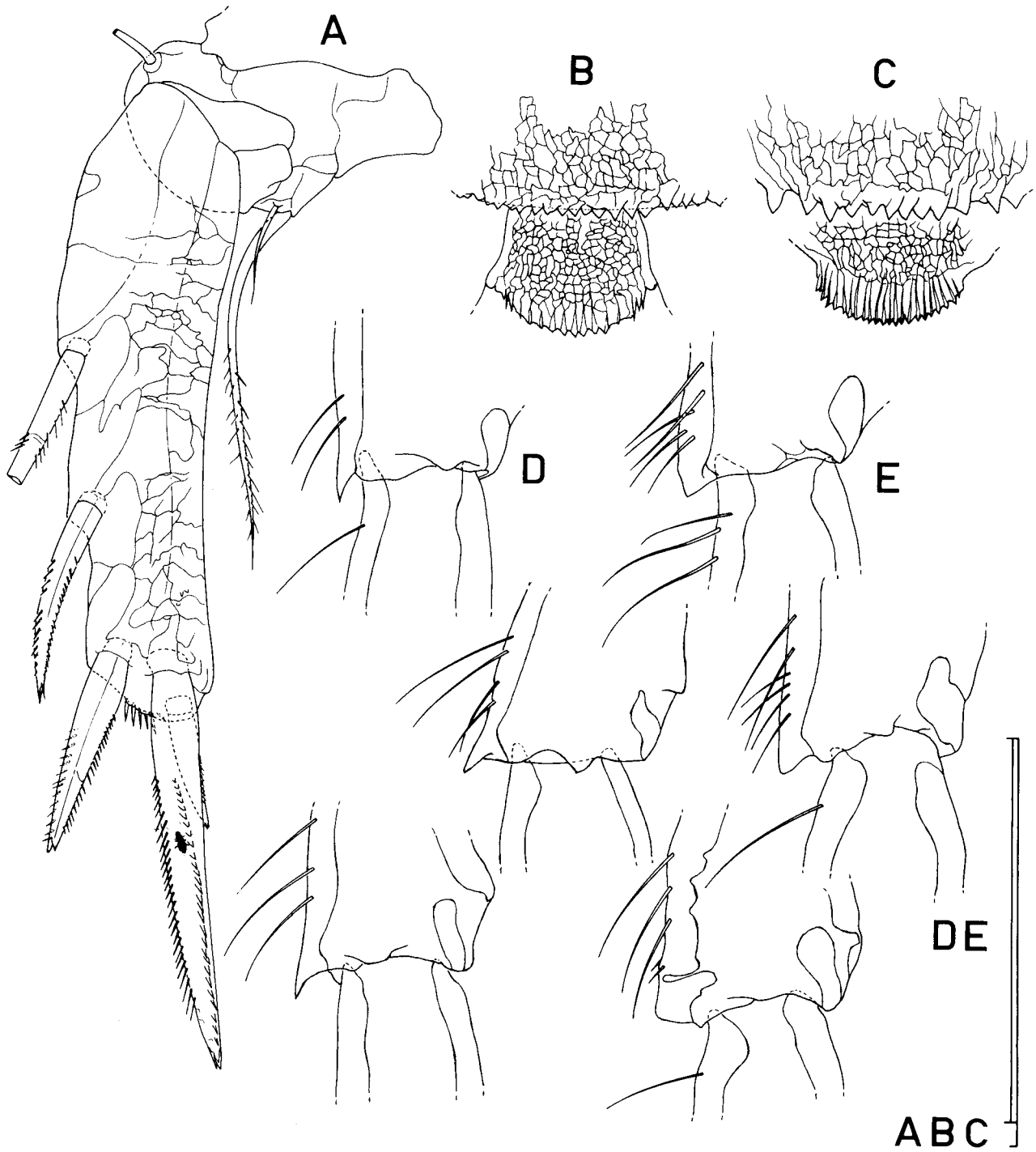

Fig. 7. Alteutha polarsternae sp.n.—*A*. Male P 5.—*B*. Anal operculum, male.—*C*. Anal operculum, female.—*D*. P 2–4 endopodite 1 in vertical row, male.—*E*. P 2–4 endopodite 1 in vertical row, female. Scale bar 100 μm, except for *D* and *E* where it is 50 μm.

3, 4 and 9 with 1 aesthetasc each. Some setae on the first three segments are plumose, all the others are bare. Armature:

1.–12.–9 + Ae.–4 + Ae.–2.–4,–2.–2.–7 + Ae.

Antenna (Fig. 8D) basis rectangular, twice as long as wide, with a protrusion on ventral side and 1 spinulose seta at inner distal corner. Endopodite segment 1 as long as basis but somewhat wider, with 1 inner spinulose seta midlength on the inner margin. Endopodite segment 2 narrow, elongate; with 3 spinulose spiniform setae and 1 plain slender seta placed in the distal third of the inner margin; 7 setae distally, 4 of these are geniculate. Exopodite 2-segmented, with 1 spinulose seta on the 1st and 3 spinulose setae on the 2nd segment.

Mandible as in male (Fig. 12B); praecoxa (*corpus mandibulae*) elongate and slender; distal end (cutting edge) with 1 bidentate, 1 tetradentate, 6 spines of different architecture, 1 spinulose seta and 2 small setae at its anterior base. Coxa-basis of palp about 1.5 times as long as greatest width, with 3 spinulose setae on an inner bulge and 1 setule proximal to these. Endopodite with 5 spinulose setae of different lengths, one arising midlength on inner margin. Exopodite with 3 spinulose setae of equal lengths.

Maxillule (Fig. 9B) arthrite of praecoxa well developed, with 11 spine-like setae of different architecture distally and several spinules along inner edge. Coxa with 4 spinulose setae. Basis with 4 spinous setae. Endopodite

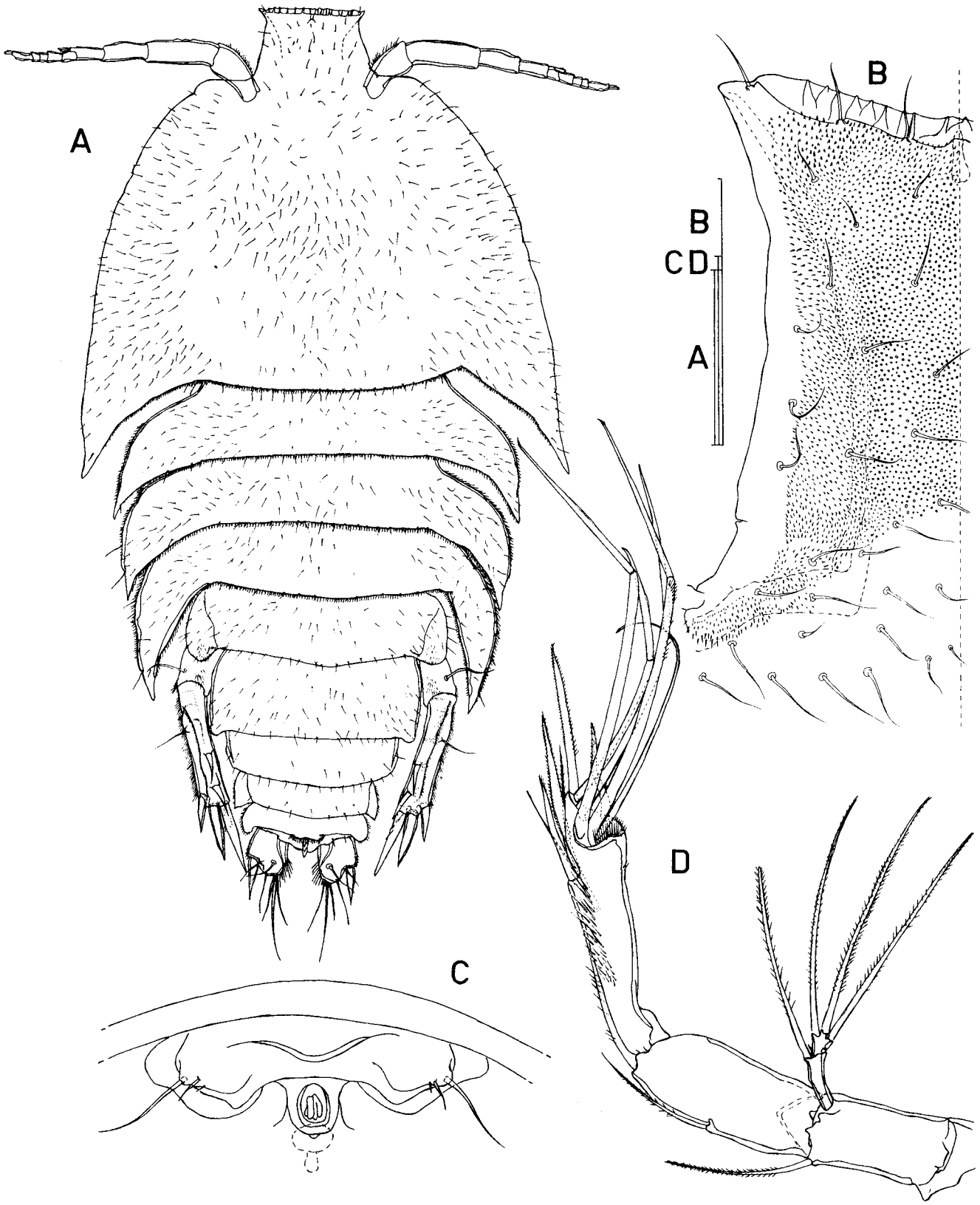

Fig. 8. Eupelte villosa (Brady, 1910). Female.—*A*. Habitus, dorsal.—*B*. Rostrum, left half, dorsal.—*C*. Genital field.—*D*. Antenna. Scale bar 100 μm, except for *A* where it is 300 μm.

represented by 2 spinulose setae. Exopodite well defined, bearing 3 spinulose setae.

Maxilla (Fig. 9C) syncoxa flattened, rectangular with 3 endites; proximal one bearing 3 spinulose and 1 bare seta, second and third endite with 2 and 3 spinulose setae, respectively. Endopodite diminutive with 3 setae, 2 of which are spinulose. Basal endite narrow with 1 strong terminal unguiform spine and 3 spinulose setae.

Maxilliped (Fig. 9D) prehensile. Basis elongate, narrow with 2 spinulose setae subdistally on inner ventral margin; the anterior face with a field of long spinules. First endopodite segment (palm) elongate, inflated proximally and slightly concave on inner margin distally. Claw as long as 1st segment, elongate, slender and strongly curved; 2 bare small setae on anterior and 3 diminutive setae on posterior face at base of claw.

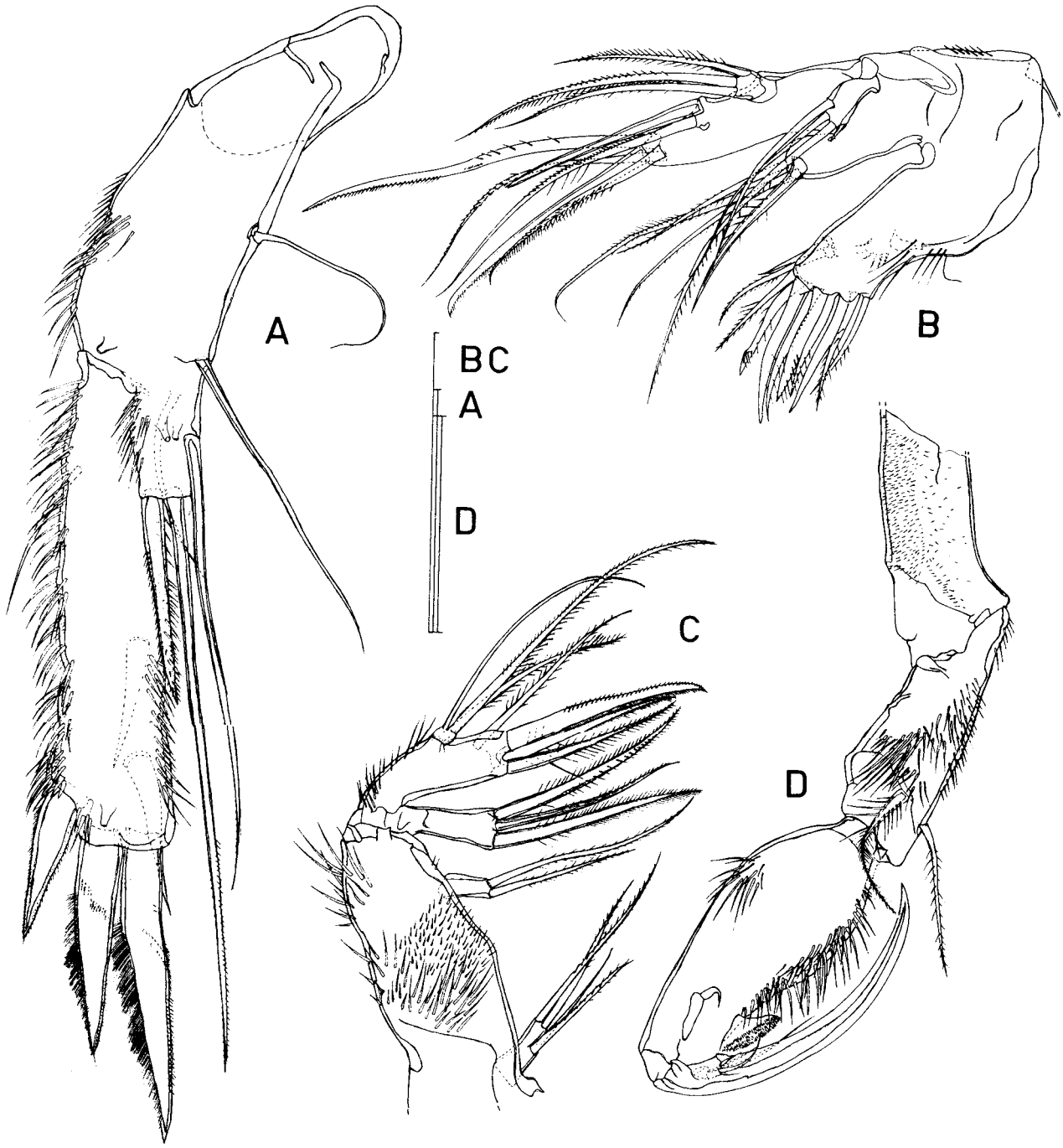

Fig. 9. Eupelte villosa (Brady, 1910). Female.—*A*. P 5.—*B*. Maxillule.—*C*. Maxilla.—*D*. Maxilliped. Scale bar 100 μm.

P 1 (Fig. 10A) coxa elongate, 2.5 times as long as wide. Basis with 1 spinulose seta subapically on outer margin and 1 shorter spinulose seta at the inner corner. Exopodite 3-segmented; segments 1 and 2 of equal lengths, the former with 1 and the latter with 2 subdistally placed setae; segment 3 short, longer than wide with 5 outwardly curved setae, the 3 distalmost setae being one-sided spinulose. Endopodite 2-segmented; there is a weak suture visible proximal to the proximalmost seta on inner margin of the 2nd segment, indicating the formerly 3-segmented condition of this ramus.

P 2 (Fig. 10C), P 3 (Fig. 11A) and P 4 (Fig. 11B) all with 3-segmented exopodites and endopodites.

Setal formulae:

	Exopodite	*Endopodite*
P 1	0:1:023	1:221
P 2	0:1:223	1:2:221
P 3	0:1:323	1:2:221
P 4	0:1:323	1:2:221

P 5 (Figs 8A and 9A) 2-segmented, suture distinct. Baseoendopodite about twice as long as wide with 6 setae, 4 along the inner margin and 2 distally, the outermost of which spiniform and half as long as the innermost. Exopodite elongate, over 4 times as long as basal width; bands of spinules covering the outer and the inner margin; 1 dorsal hairy seta in the proximal third, 5 spiniform setae present in the distal half, 3 of which are located distally.

Male. Body length 1280 μm excluding rostrum and caudal rami and 1500 μm including rostrum and caudal rami; body width 940 μm.

Otherwise body very much like that of female (Fig. 13C). Sexual dimorphism of appendages in antennules P 5 and P 6.

Antennule (Fig. 12A) subchirocerate, 6-segmented; segments 3, 4 and 6 with one aesthetasc each; segment 5 with 2 proximal chitinous cleats.

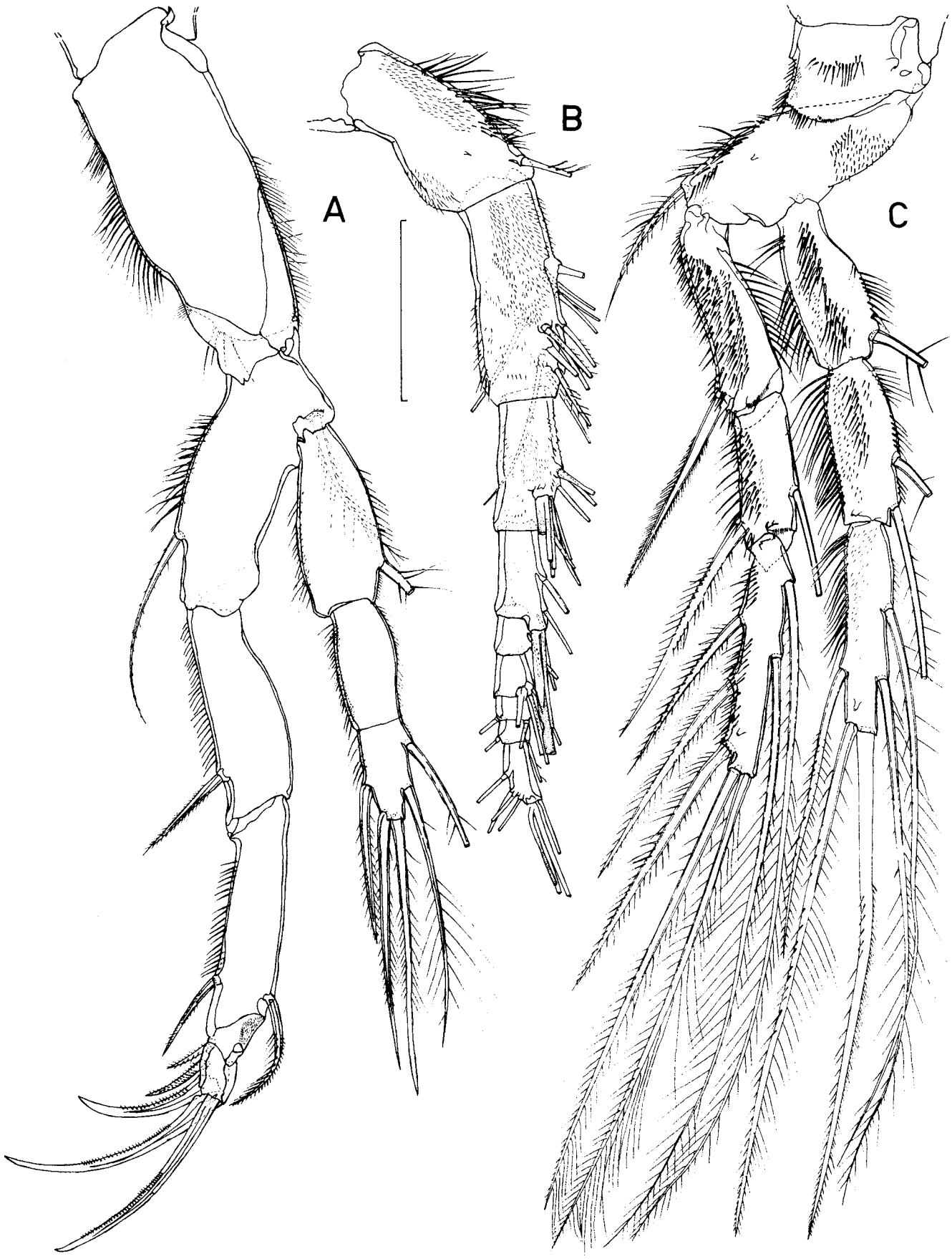

Fig. 10. Eupelte villosa (Brady, 1910). Female.—*A*. P 1.—*B*. Antennule.—*C*. P 2. Scale bar 100 μm.

P 5 (Fig. 13A) 2-segmented with distinct suture. Baseoendopodite with 1 rigid and straight seta exceeding in length the distal edge of the exopodite. Exopodite slightly inwardly curved with 1 one-sided spinulose seta midlength on outer margin and 3 spines distally increasing in length from the outermost to the innermost.

P 6 (Fig. 13B) consisting of a bulge with 1 long spiniform seta terminally and 1 shorter posterior seta.

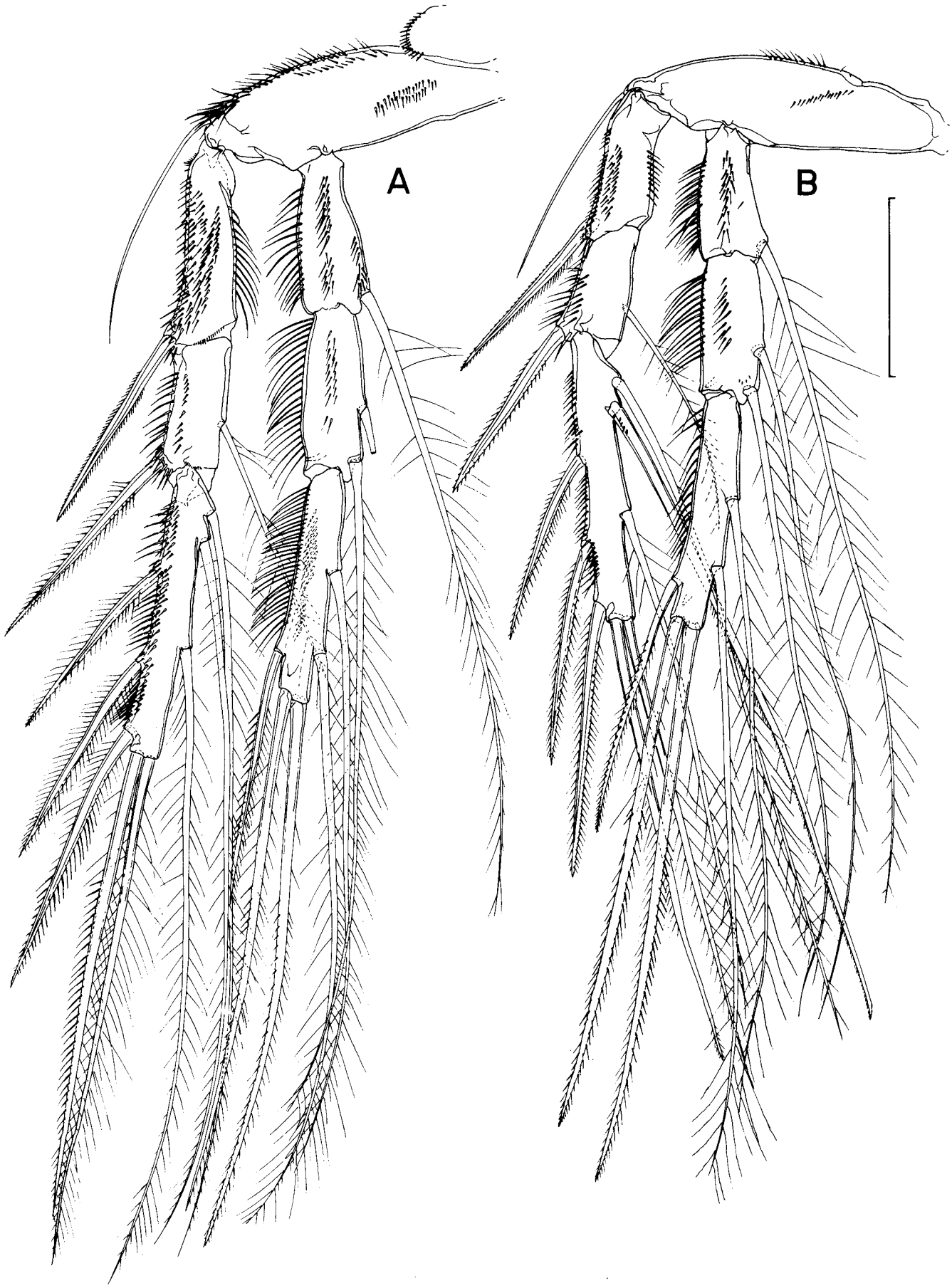

Fig. 11. Eupelte villosa (Brady, 1910). Female.—*A*. P 3.—*B*. P 4. Scale bar 100 μm.

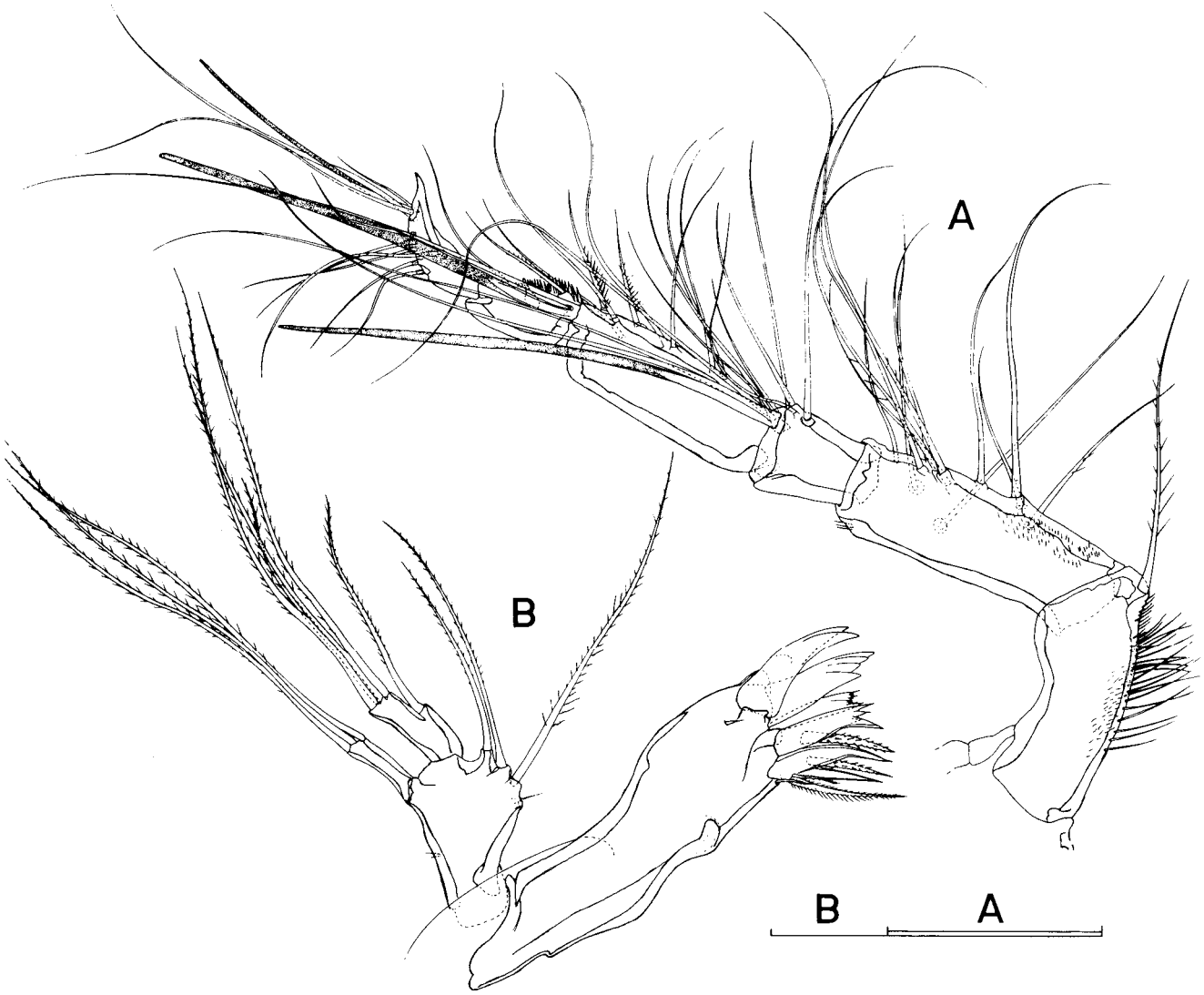

Fig. 12. Eupelte villosa (Brady, 1910). Male.—*A*. Antennule.—*B*. Mandible. Scale bar 100 μm.

Distribution

The species so far has been reported only from the Atlantic sector of the Southern Ocean. Weddell Sea: as shown in Fig. 1 and recorded above. South Georgia: Klein Jasonbucht (Pesta 1930). South-Orkneys: Scotia Bay (T. Scott 1912). Gauss-Station (Brady 1910). The species seems not to be restricted to deeper waters, for Pesta (1930) reported it from 20 to 25 m depth.

Discussion

Alteutha polarsternae sp.n. belongs to the species group of the genus bearing an inner seta on P2–P4 Exp 1. According to Hicks (1986a) all other genera of Peltidiidae except *Alteuthoides* have lost this inner seta. However, Hicks concludes that the presence of this may be an unstable character upon which to base phylogenetic comparisons. The endopodite of the maxillule is peculiar in bearing reduced setation on the outer portion of the basis. In other species of *Alteutha* there is an armed endopodite [cf. *A. interrupta* (Goodsir, 1845)], whereas in *A. polarsternae* there is a heavily cuticularized hump bare of any armature. Unfortunately, the maxillule of most other species of *Alteutha* is not or insufficiently described.

As in other representatives of the Peltidiidae, there are five claw setae present on P 1 Exp 3; none is geniculate. The short chitinized structure on P 1 Exp 3 which is described here for the first time may be, provided it has not been overlooked in other species, a unique character for the new species. The number of setae belonging to the caudal ramus is seven in both the species described. This is in contrast with previous descriptions, where less than seven were mentioned (cf. Lang 1948). Seta number and configuration correspond to the scheme of caudal armature given by Huys (1988). The sexual dimorphism reported for the caudal rami of another species of *Eupelte* (as *Paralteutha minuta*) by Ramirez (1971) does not hold for *E. villosa*.

The specimens of *Eupelte villosa* found in the Weddell Sea have been compared with the type-specimen of Brady (1910) and found to be identical with the specimens from east Antarctic Gauss Station. However, it has to be mentioned that careful reinvestigation was hampered by the dessicated condition of the slide material. The specimens redescribed herein differ from the description of the species by Pallares (1975) in maxilliped, P 5 and genital field of the females. The maxilliped of the specimens described by Pallares (1975) is not as concave distally on the palm than in the species described here. Also, the

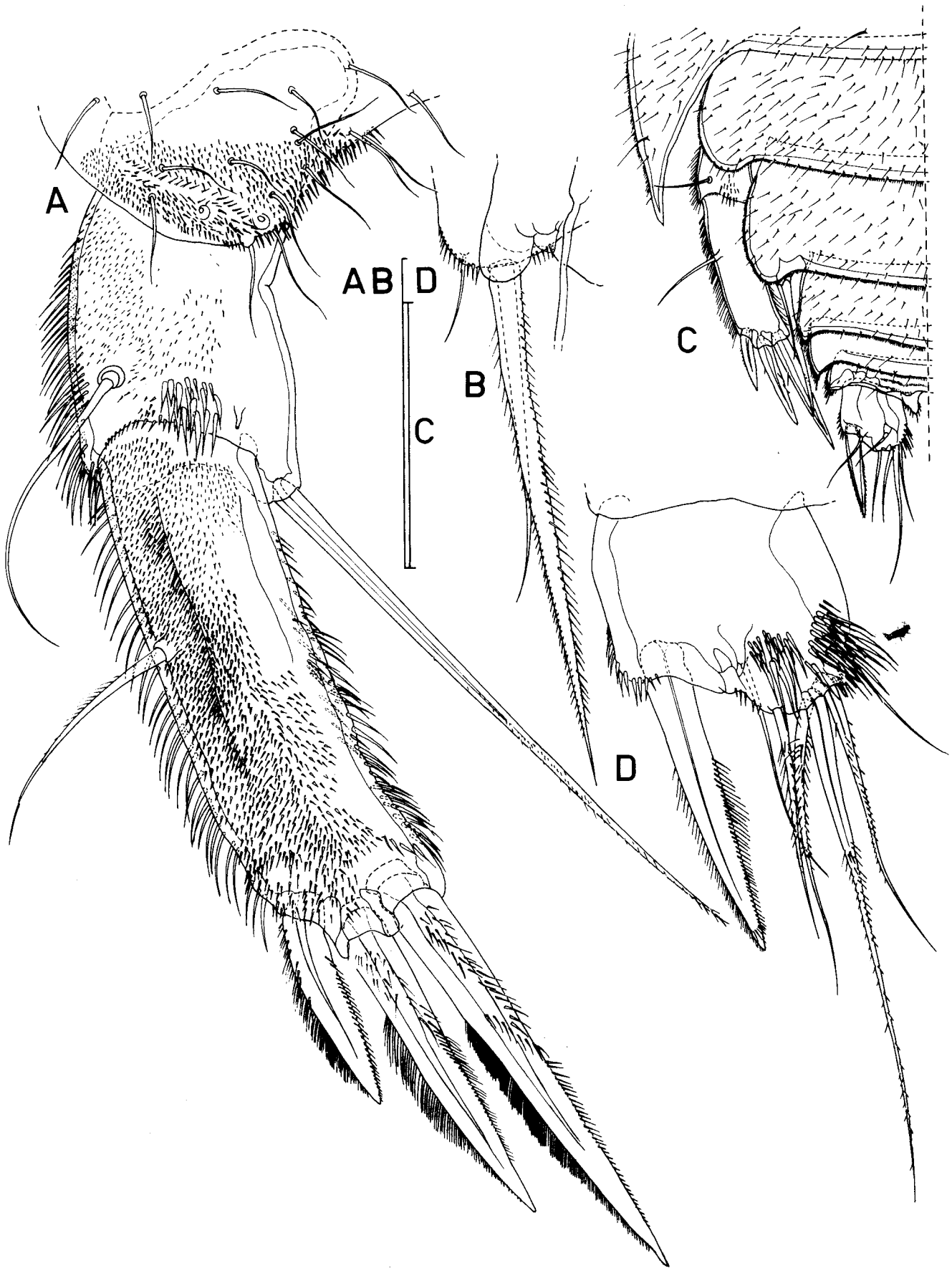

Fig. 13. Eupelte villosa (Brady, 1910). Male.—*A*. P 5.—*B*. P 6.—*C*. Abdomen, left side, dorsal.—*D*. Caudal ramus, right side, ventral. Scale bar 100 μm, except for *C* where it is 300 μm.

spinules on the palm are stronger in the specimens described by Pallares. The P 5 of the female is much stouter and the proximalmost-but-one seta situated on the terminal inner corner in Pallares' description is situated much more subterminally in the specimens described here. In particular, the baseoendopodite of Pallares' description ends distally in a straight line, whereas it bears a process with two terminal setae on the inner margin in the specimens of the present study. Pallares showed the genital field of the females without any armature but two symmetrical, bottle-shaped structures, whereas there are three setae on the vestigial, symmetrical P 6 covering the separate genital pores of the females studied herein. The caudal ramus shown by Pallares is much more rounded and the outer edge and seta is covered by a fur of fine spinules, whereas it is more straight and with fewer but stronger spinules in the specimens described here.

These differences may justify the erection of a new species for the specimens described by Pallares (1975) from Isla de Los Estados (Tierra del Fuego). However, careful reinspection of this material would be necessary before doing so. All the other characters of previous descriptions are very similar to those of the specimens reinvestigated here. Unfortunately, it was not possible to re-examine Pesta's (1930) material from the Subantarctic.

The suture in the distal half of the Enp 2 of P 1 in *Eupelte villosa*, if interpreted as a vestige, is a clear indication of the derived state of the genus in this respect assuming a three-segmented state of the ramus as being plesiomorphic. However, the presence of a suture line is variable among specimens. It is possible that it has been overlooked in other species of *Eupelte*. Hicks (1986) estimated the P 1 endopodite as a stable character in the Peltidiidae and considered it a key evolutionary character, for it is not so much predisposed to habitat-induced selection as the exopodite. Thus, he grouped *Eupelte* together with *Neopeltopsis* and *Alteuthellopsis* for their derived 2-segmented endopodite.

The distinctly developed aesthetasc having a common base with an accompanying seta on the 3rd segment of the female in *E. villosa* is a very unusual feature. Its presence on this segment together with the aesthetascs on the 4th and the terminal segment is a condition to my knowledge only known from females of *Paramphiascopsis weihonu* by Hicks (1986b). On the other hand, an aesthetasc on the 3rd antennular segment is a common feature for C VI males not only of the family Peltidiidae but at least also of the Clytemnestridae, Tegastidae, Tachidiidae, Harpacticidae, Diosaccidae and Thalestridae (Dahms 1988, 1989).

Hicks (1986a) mentioned the associated life-style of *Alteuthella, Alteuthoides* and *Alteuthellopsis* and showed the most probable convergent development of adaptive morphological characters among these genera. In this context it has to be pointed out that in the present study many individuals of *Eupelte villosa* were caught in the large bottom gear together with other macroinvertebrates. Furthermore, some individuals were caught with the Beyer sledge net which never contains sediment but usually hexactinellid sponges and bryozoa entrapped while the gear is gliding across the bottom. This suggests a trend for an associated life with one or both of these groups also for *Eupelte*.

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