

REVISION OF THE STEGOCEPHALID GENERA *PHIPPSIA* AND *TETRADEION*
(CRUSTACEA: AMPHIPODA) WITH DESCRIPTION OF FOUR NEW SPECIES

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Abstract

Berge, J. and Vader, W., 2000. Revision of the stegocephalid genera *Phippsia* and *Tetradieion* (Crustacea: Amphipoda) with description of four new species. *Memoirs of Museum Victoria* 58(1): 149–178.

The stegocephalid (Crustacea: Amphipoda) genus *Phippsia* Stebbing, 1906 is revised to include six species, of which three are new to science. One new species of the genus *Tetradieion* Stebbing, 1899 is also described. A key to all species of the two genera is presented.

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Introduction

In 1883, Sars described *Aspidopleurus gibbosus* (the name was later changed to *Phippsia gibbosa* by Stebbing in 1906) from the west coast of Norway, and in 1925, Schellenberg described *P. roemeri*. Both species have a strictly northern distribution, found only in the North Atlantic and the Arctic (Berge and Vader, 1997). From the littoral zone in New Zealand, *Cyproidea crassa* Chilton, 1883 was placed in *Tetradieion* by Chilton (1924), and redescribed by Hurley (1955) and Barnard (1972). Although the latter species is clearly distinct from both *P. gibbosa* and *P. roemeri*, all three species do share some striking similarities that appear to have been overlooked in the literature. Pending a total revision and a phylogenetic analysis of the family (Berge and Vader, in prep.), the two genera are kept separate

to minimise changes in classification. However, a preliminary cladistic analysis indicates that the eight species treated herein do form a monophyletic group but that their relationships are still unclear.

In the present paper, one new species of *Tetradieion* is described. The number of species in *Phippsia* is increased from two to six. The present study is primarily based on material from Museum Victoria, Melbourne, Australia (NMV) but additional material also comes from the Natural History Museum, London, UK (NHM), Museum für Naturkunde, Berlin, Germany (ZMB), and Darling Marine Center, University of Maine, Walpole, USA (DMC).

All dissected appendages were mounted in polyvinyl-lactophenol, and stained with rosebengal. Figures of these appendages were made using a Leica compound microscope. Mature and

immature females were distinguished from males by the presence of oostegites. The classification of setae follows that of Berge (in press a, b). Scales attached are all 0.1 mm. Symbols used in the figures are as follows: A1, A2: antennae 1, 2;

EP3: epimeral plate 3; L: labium; LBR: labrum; LMND: left mandible; M: male; MX1, MX 2: maxillae 1, 2; MXP: maxilliped; P1–P7: pereopods 1–7; PLP: palp; RMND: right mandible; ST: setal-teeth; T: telson; U1–U3: uropods 1–3.

Key to species of *Phippsia* and *Tetradeion*

1. Pereopod 7 with number of articles reduced.....*Tetradeion* .. 2
- Pereopod 7 with all articles present.....*Phippsia* .. 3
2. Pereopod 7 with 2 articles (plus coxa).....*Tetradeion crassum*
- Pereopod 7 with 4 articles (plus coxa).....*Tetradeion quatro*
3. Metasome segment 3 dorsally smooth..... 4
- Metasome segment 3 dorsally produced.....*Phippsia gibbosa*
4. Telson entire.....5
- Telson cleft..... 6
5. Maxilliped palp article 2 rectangular (not produced distally), labrum elongate and triangular (clearly longer than broad).....*Phippsia angustipalpa*
- Maxilliped palp article 2 distally produced, labrum not longer than broad, rounded.....*Phippsia dampieri*
6. Epimeral plate 3 distally without serrations.....*Phippsia roemeri*
- Epimeral plate 3 distally serrate7
7. Antenna 2 peduncle article 3 shorter than broad, epistomal plate absent.....
-*Phippsia vanhoeffeni*
- Antenna 2 peduncle article 3 elongate, epistomal plate large.....
-*Phippsia unihamata*

Phippsia Stebbing

Aspidopleurus Sars, 1895: 203 (homonym, Pisces)
Phippsia Stebbing, 1906: 89 (replacement name)

Type species. Stegocephalus gibbosus Sars, 1883 (original designation).

Species. Phippsia angustipalpa sp. nov., *P. dampieri* sp. nov., *P. gibbosa* (Sars, 1883), *P. roemeri* Schellenberg, 1925, *P. unihamata* sp. nov. and *P. vanhoeffeni* (Schellenberg, 1926).

Distribution. North Atlantic and Arctic Oceans (*P. gibbosa* and *P. roemeri*), Antarctic (*P. unihamata* and *P. vanhoeffeni*), and Australia (*P. angustipalpa*, *P. dampieri* and *P. vanhoeffeni*).

Remarks. Sars (1895) erected *Aspidopleurus* as a monotypic genus for *Stegocephalus gibbosus* mainly based on the morphology of the mouthparts. *Phippsia gibbosa* has the second article of the maxilliped palp distally produced, and its inner plate is long and rectangular. Furthermore, the setae on the outer plate of maxilla 2 have double hooks distally (referred to in the descriptions as a distal cleft, in addition to the hooks, see MX2 in Fig. 6), and the palp of maxilla 1 is reduced. All these characters, together with the conspicuous epistomal plate are characters that have, until

present, separated the two northern species of the genus from all other known stegocephalid species.

However, with the inclusion of *Stegocephalopsis vanhoeffeni* (Schellenberg, 1926) and the three new species, the genus no longer appears so well separated from other genera in the family. None of the last mentioned four species possesses the “doubled hooked setae” on maxilla 2, and all other character states described above vary between the different species. Furthermore, the accessory flagellum of antenna 1 varies between well developed (e.g., type species) and rudimentary (e.g., *P. dampieri*), and the telson varies between 80% cleft (e.g., *P. vanhoeffeni*) and entire (e.g., *P. angustipalpa*). On the other hand, the labrum is partly fused with the epistome in all six species, and the arrangements of different maxillipedal setal-groups (Berge, in press a) indicate a strong relationship between the taxa, and between *Phippsia* and *Tetradeion*. Most species of the two genera possess an elongate and geniculate peduncle of antenna 2. The only character that separates *Phippsia* (as treated herein) from *Tetradeion* is the lower number of articles on pereopod 7. Otherwise, all characters discussed above are also (variably) present in *Tetradeion*.

Thus, the genus appears a weakly defined group kept together mainly by a large coxa 4, short and stout antennae and narrow basis on pereopod 6. As a revision of the family and a cladistic analysis is in preparation by us, phylogenetic relationships will not be discussed further.

Stegocephalopsis pacifica (Bulycheva, 1952) probably also belongs in *Phippsia*, but due to the lack of material and adequate descriptions, *S. pacifica* is not transferred. *Stegocephalopsis pacifica* was originally described in *Phippsia* but later transferred to *Stegocephalopsis* by Gurbanova (1962). The maxilliped and maxilla 1 resemble those of both *P. angustipalpa* and *P. vanhoeffeni*. Furthermore, the mouthparts seem to be elongate and the species has strong affinities to *P. angustipalpa*.

***Phippsia gibbosa* (Sars)**

Stegocephalus gibbosus Sars, 1883.

Aspidopleurus gibbosus.—Sars, 1895: 203.

Phippsia gibbosa.—Stebbing, 1906: 89.—Berge et al., in press.

Remarks. The species is figured and described by Berge et al. (in press).

***Phippsia angustipalpa* sp. nov.**

Figures 1, 2

Material examined. Holotype. Australia, Tasmania, eastern Bass Strait, 100 km NE of North Point, Flinders Island (38°52.6'S, 148°25.2'E), 130–52 m, fine sand, R. Wilson on RV *Tangaroa*, 15 Nov 1981 (stn BSS 170), NMV J45336 (immature female, 3 mm).

Paratypes. Collected with the holotype, NMV J47018 (4 immature specimens).

Description. Rostrum very small.

Antennae short. Antenna 1 shorter than antenna 2; flagellum 4-articulate; accessory flagellum rudimentary. Antenna 2 peduncle (articles 3–5) longer than flagellum; article 3 elongate, articles 3 and 4 geniculate; article 4 longer than article 5.

Epistome curved (convex) and smooth. Epistomal plate (medial keel) produced, but small.

Mouthparts elongate; pointed and narrow. Mandible incisor lateral; toothed; left lacinia mobilis powerful, laterally expanded. Maxilla 1 palp 1-articulate; rectangular; apex not reaching above the apex of outer plate; outer plate distally rectangular; ST in a pseudocrown; ST first row with 6 setae (ST 1–5, ST 7); ST 1 ordinary (similar to ST 2–4); gap between ST 5 and ST 7 present; ST A present; located distally, part of first

row; ST B and C present; part of second row; inner plate with a well developed shoulder; setae pappocuspitate. Maxilla 2 gaping and geniculate; outer plate setae with distal hooks present; distal cleft absent; inner plate setal row A covering the entire margin; appressed to row B; row A setae pappopectinate; row B setae proximally pappose; distally with cusps present; row C present; row D absent.

Maxilliped palp 4-articulate; article 2 distally unproduced; dactylus distally simple (pointed); inner plate not exceeding base of palp article 4; 2 nodular setae; medial setal-row present; not reduced; vertical; setae pectinate; distal setal-row present; inner setal-row present; row reduced to 1 or 2 setae; outer plate outer setal-row present; submarginal; setae attached normally; setae long; strongly curved upwards (hooks); inner setal-row absent; distal setal-group present; setae attached in a deep hollow; setae short simple. Labrum elongate; lobes symmetrical; right lobe reduced; left lobe reduced. Labium distally narrowing.

Coxal plates and basis on pereopods smooth. Coxae 1–3 contiguous. Pereopod 1 coxal plate not as deep as basis; propodus subovate. Pereopod 2 general appearance like pereopod 1; ischium not elongate, ratio length:breadth not exceeding 1.5; distal posterior margin plumose setae present; propodus subovate; palm absent. Pereopod 4 coxa posteroventral lobe very large, reaching beyond the base of the pereonite 7; basis anterior margin with long setae absent; posterior margin with long setae present; plumose setae on distal anterior and posterior margins present; ischium plumose setae on posterior distal margin present. Pereopod 6 basis posteriorly unexpanded; with a row of long plumose setae present. Pereopod 7 basis anterior margin straight; distally rounded; medial row of setae present; setae short and robust.

Oostegites on pereopods 2–5, gills on pereopods 2–7.

Pleonites 1–3 dorsally smooth.

Urosome: articulation between urosomites 2 and 3 absent. Uropod 1 peduncle longer than rami; outer ramus longer than inner. Uropod 2 peduncle longer than rami; outer ramus as long as inner. Uropod 3 peduncle longer than half length of rami; outer ramus 2-articulate, longer than inner.

Telson longer than broad; longer than peduncle uropod 3; submarginal setae on apex absent; entire; apically rounded.

Males: Unknown.

Etymology. *Angustipalpa* describes the unproduced article 2 on the palp of the maxilliped,

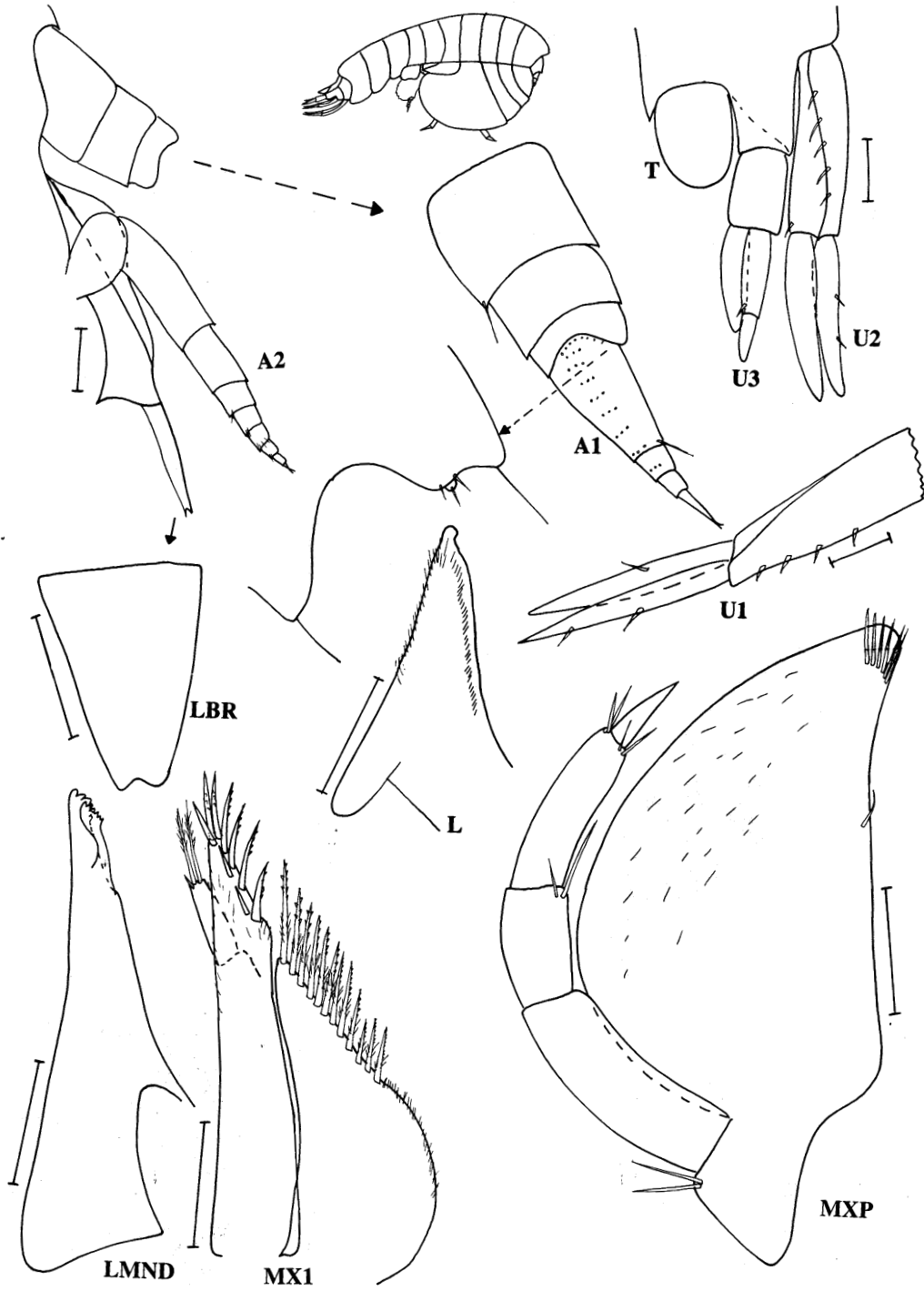


Figure 1. *Phippsia angustipalpa* sp. nov. Holotype, except habitus: paratype immature female, 3 mm.

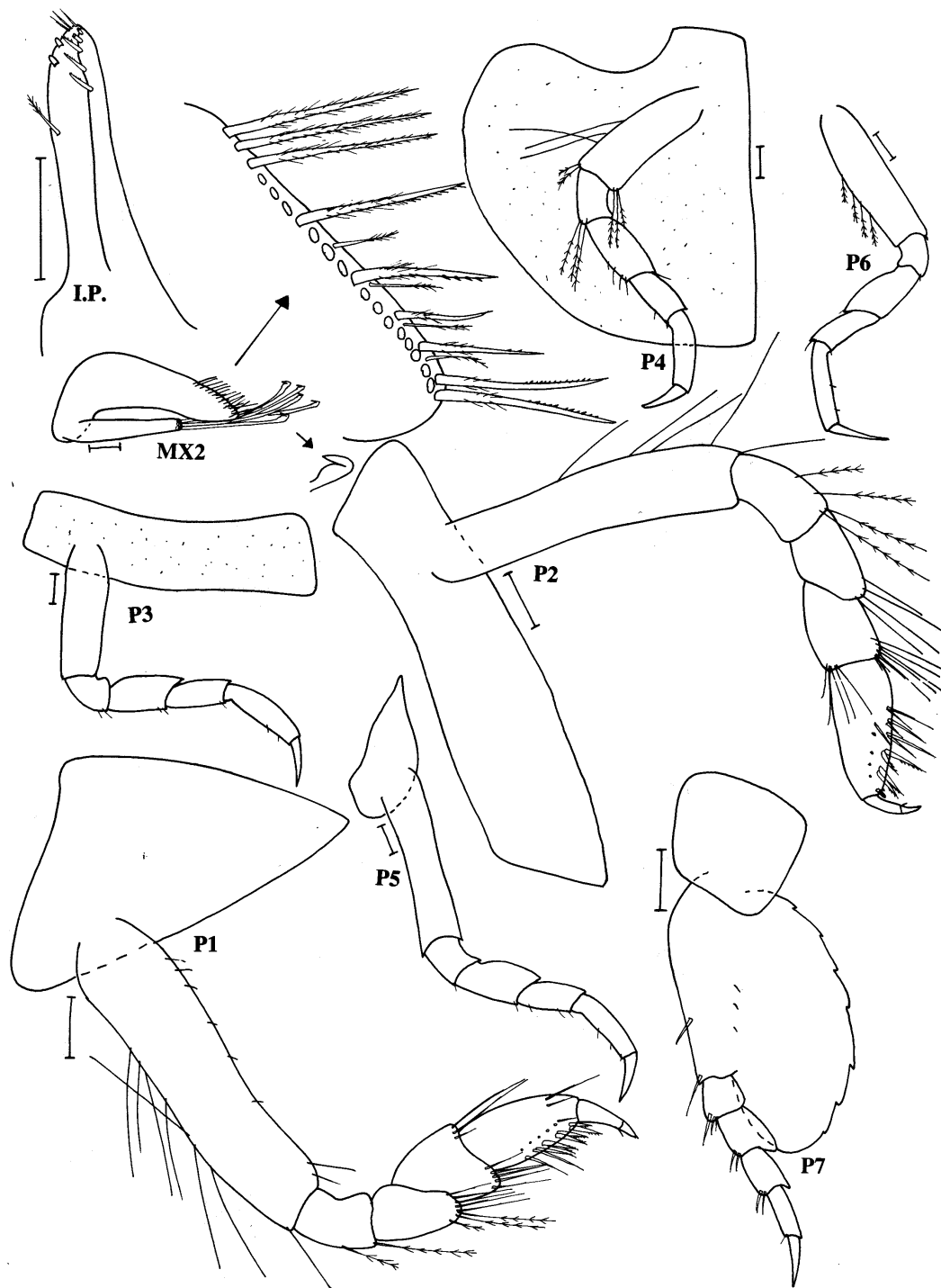


Figure 2. *Phippsia angustipalpa* sp. nov. Holotype.

a character state not found in any other species of the genus.

Distribution. Australia, Bass Strait (known only from the type locality).

Remarks. This is a not a typical member of the genus in that the palp of the maxilliped is slender (hence the name) and the mouthparts are elongate and thus are more similar to those of both *Tetradeion crassum* (Chilton, 1883) and a new species of *Stegocephalina* (Berge, in press b). Based on arrangement of the different setal-groups on the maxilliped, rudimentary accessory flagellum, rounded and entire telson, and geniculated peduncle (between articles 3 and 4) on antenna 2, the species is assigned for the moment to *Phippsia*.

Phippsia dampieri sp. nov.

Figures 3–5

Material examined. Holotype. Australia, Western Australia, Northwest Shelf, between Port Hedland and Dampier (18°41'S, 118°39'E), 134 m, muddy sand, WHOI epibenthic sled, G.C.B. Poore and H.M. Lew Ton on RV *Soela*, 4 Jun 1983 (stn NWA 21), NMV J47019 (female, 8 mm).

Paratypes. Collected with holotype, NMV J47019 (7 specimens, male and females).

Description. Rostrum very small.

Antennae short. Antenna 1 shorter than antenna 2; flagellum 6-articulate; accessory flagellum rudimentary. Antenna 2 peduncle (articles 3–5) longer than flagellum; article 3 elongate, articles 3 and 4 geniculate; article 4 longer than article 5.

Epistome curved (convex) and smooth; epistomal plate produced into a large conspicuous medial keel.

Mouthparts not elongate or pointed. Mandible incisor lateral; toothed; left lacinia mobilis powerful, laterally expanded. Maxilla 1 palp 2-articulate; rectangular; apex not reaching above the apex of outer plate; outer plate distally rectangular; ST in a pseudocrown; ST first row with 6 setae (ST 1–5, ST 7); ST 6 absent; gap between ST 5 and ST 7 present; ST A present; located distally, part of first row; ST B present; part of second row; ST C present; inner plate with a well developed shoulder; setae pappocuspitate. Maxilla 2 gaping and geniculate; outer plate setae with distal hooks present; distal cleft absent; inner plate setal row A covering the entire margin; appressed to row B; row A setae pappopectinate; row B setae proximally pappose; distally with cusps present; row C present; row D absent. Maxilliped palp 4-articulate; article 2 distally conspicuously produced; dactylus distally simple

(pointed); inner plate not exceeding base of palp article 3; 3 nodular setae; medial setal-row present; not reduced; vertical; setae pectinate; distal setal-row present; inner setal-row present; row reduced to 1 or 2 setae; outer plate outer setal-row present; submarginal; setae attached normally; setae long robust; straight; inner setal-row present; well developed; setae long robust; pappose; proximally parallel to outer, distally transverse; distal setal-group present; setae attached in a deep hollow; setae long robust. Labrum about as long as broad; lobes asymmetrical; right lobe not reduced; left lobe reduced. Labium distally narrowing.

Coxal plates and basis on pereopods covered with setae; setae very short. Coxae 1–3 contiguous. Pereopod 1 coxal plate not as deep as basis; propodus subovate. Pereopod 2 general appearance like pereopod 1; ischium not elongate, ratio length:breadth not exceeding 1.5; ischium distal posterior margin plumose setae present; propodus subovate; palm absent. Pereopod 4 coxa posteroventral lobe very large, reaching beyond the base of the pereonite 7; basis anterior margin with long setae absent; posterior margin with long setae present; plumose setae on distal anterior and posterior margins present; ischium plumose setae on posterior distal margin present. Pereopod 6 basis posteriorly unexpanded; with a row of long plumose setae present. Pereopod 7 basis anterior margin straight; distally rounded; medial row of setae present; setae short and robust.

Oostegites on pereopods 2–5, gills on pereopods 2–7.

Pleonites 1–3 dorsally smooth.

Urosome: articulation between urosomites 2 and 3 absent. Uropod 1 peduncle longer than rami; outer ramus longer than inner. Uropod 2 peduncle longer than rami; outer ramus longer than inner. Uropod 3 peduncle longer than half length of rami; outer ramus 2-articulate, longer than inner.

Telson longer than broad; longer than peduncle uropod 3; submarginal setae on apex present; entire; apically rounded.

Males: Pereopod 2 propodus larger in males than in females; Urosome ordinary (similar to females).

Etymology. Named after the British pirate and explorer William Dampier who visited this shore.

Distribution. Northwestern Australia. Known only from type locality.

Remarks. *Phippsia dampieri* is, to the authors' knowledge, the first stegocephalid reported from

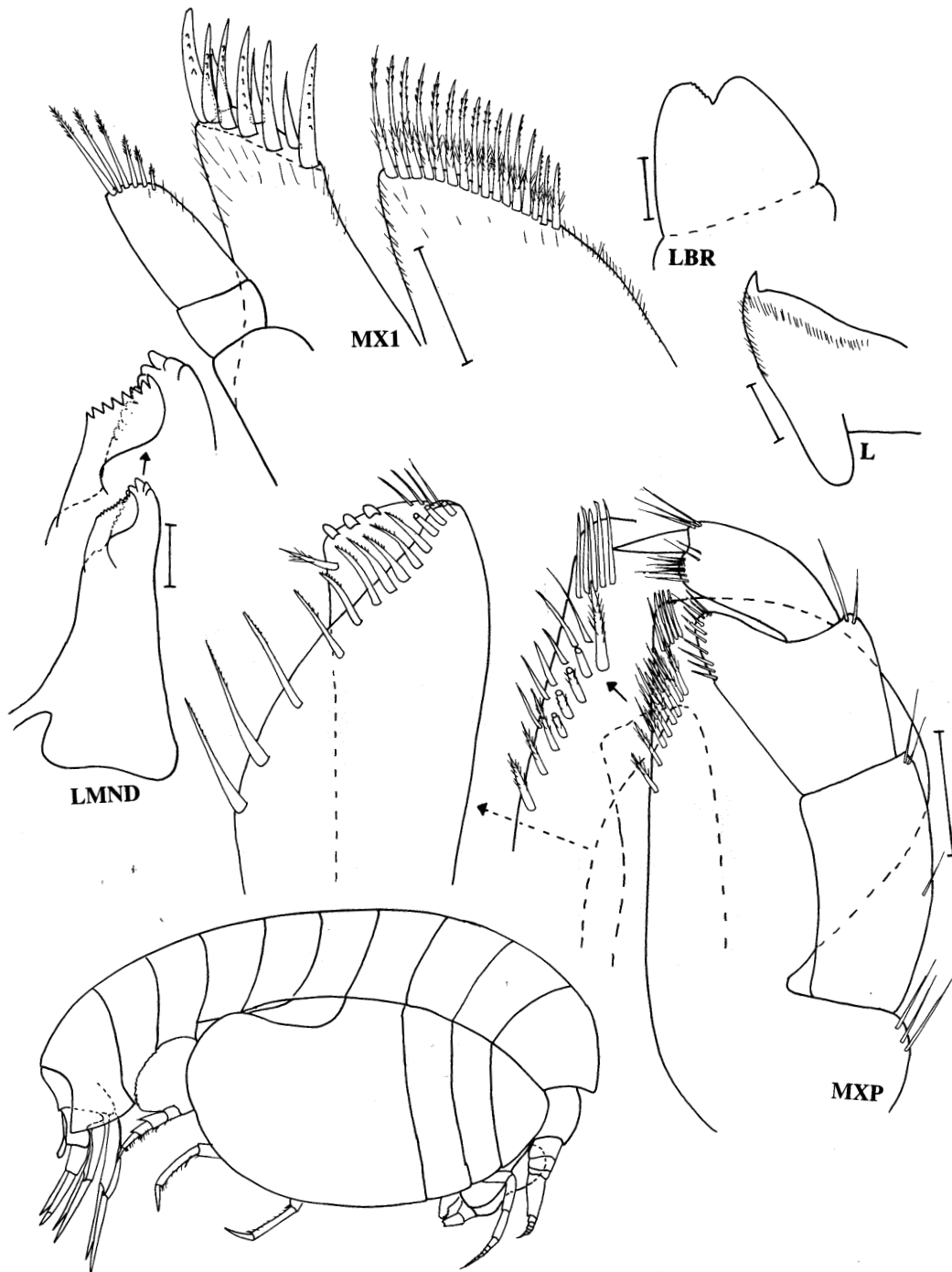


Figure 3. *Phippsia dampieri* sp. nov. Paratype male, 5 mm, except habitus: holotype female, 8 mm.

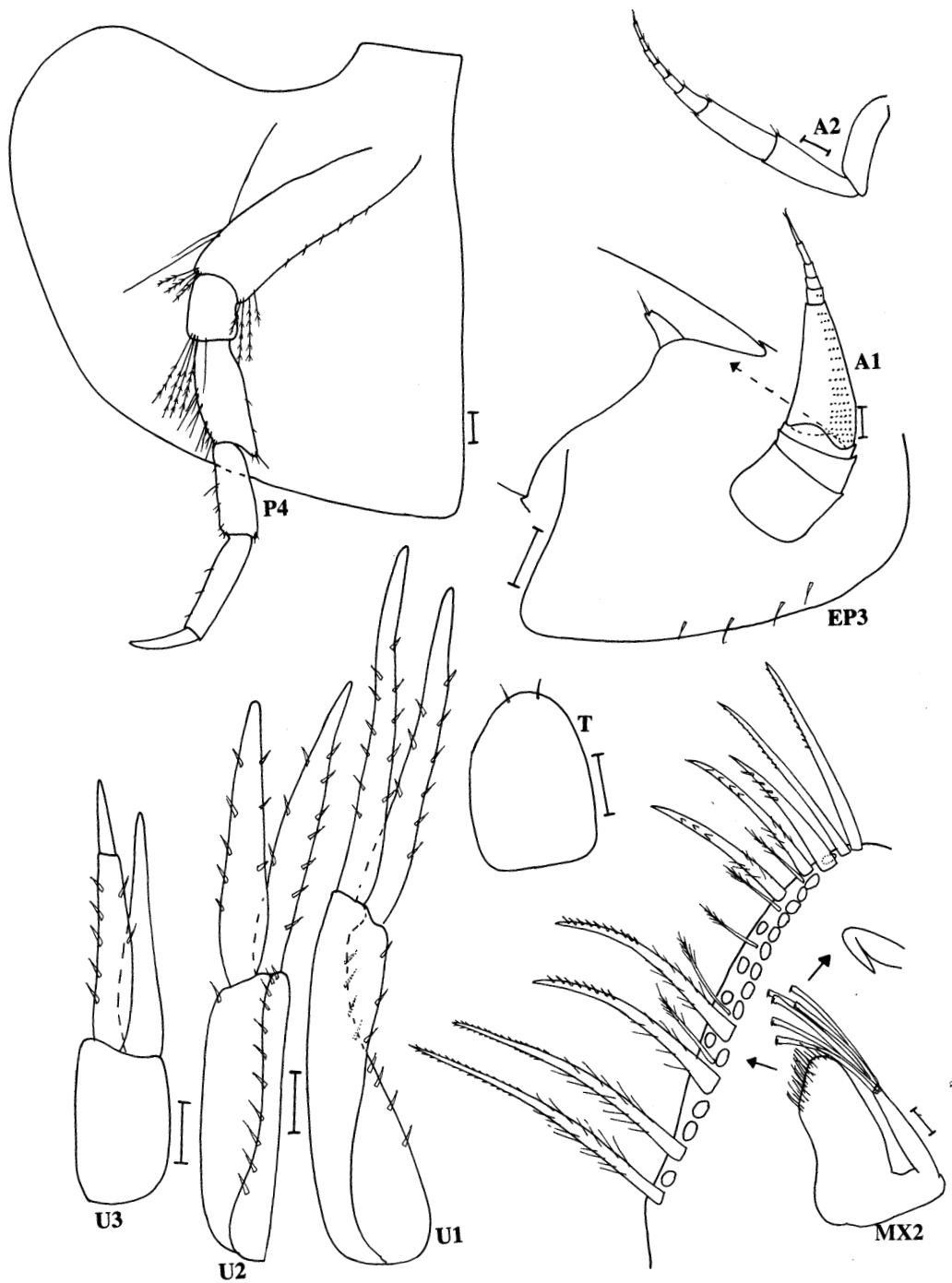


Figure 4. *Phippsia dampieri* sp. nov. Paratype male.

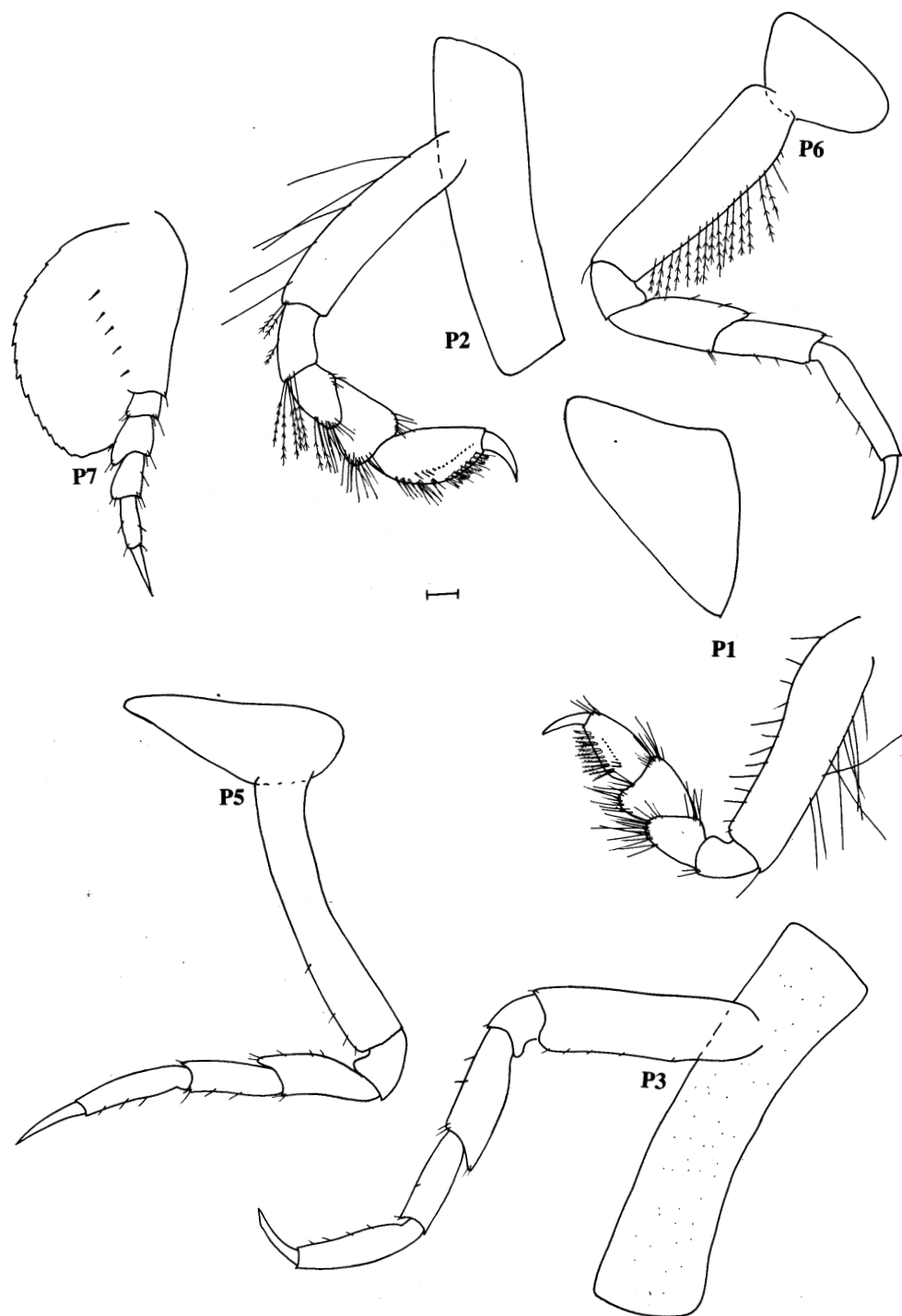


Figure 5. *Phippsia dampieri* sp. nov. Paratype male.

the west coast of Australia or the eastern Indian Ocean. There are records of the family from the western and northern Indian Ocean and from Papua New Guinea. The species is separated from its congeners by the combination of an entire telson and a distally produced maxilliped palp article 2.

***Phippsia roemeri* Schellenberg**

Figures 6–8

Phippsia roemeri Schellenberg, 1925: 197.—Stephensen, 1925: 133.

Material examined. About 200 specimens from BIO-FAR and BIOICE programmes (Berge and Vader, 1997).

Description. Rostrum very small.

Antennae short. Antenna 1 as long as antenna 2; flagellum 6-articulate; accessory flagellum well developed, article 2 absent. Antenna 2 peduncle (articles 3–5) as long as flagellum; article 3 short, about as long as broad; article 4 shorter than article 5.

Epistome curved (convex) and smooth; epistomal plate produced into a large conspicuous medial keel.

Mouthparts not elongate or pointed. Mandible incisor lateral; toothed; left lacinia mobilis powerful, laterally expanded. Maxilla 1 palp 2-articulate; rectangular; apex not reaching above the apex of outer plate; outer plate distally rectangular; ST in a pseudocrown; ST first row with 6 setae (ST 1–5, ST7); ST 6 absent; gap between ST 5 and ST 7 absent; ST A present; located distally, part of first row; ST B present; part of second row; ST C present; inner plate with a well developed shoulder; setae pappocuspitate. Maxilla 2 gaping and geniculate; outer plate setae with distal hooks present; distal cleft present; inner plate setal row A covering about two-thirds of the margin; appressed to row B; row A setae pappopectinate; row B setae proximally pappose; distally with cusps present; row C present; row D present; expanded, row elongated towards and beyond row A; with many small cusps distally. Maxilliped palp 4-articulate; article 2 distally conspicuously produced; dactylus distally simple (pointed); inner plate not exceeding base of palp article 4; 4 nodular setae; medial setal-row present; not reduced; vertical; setae pectinate; distal setal-row present; inner setal-row present; row reduced to 1 or 2 setae; outer plate outer setal-row present; submarginal; setae attached normally; setae long; straight; inner setal-row present; well developed; setae long robust; pappose; proximally parallel to outer, distally transverse; distal

setal-group present; setae attached in a deep hollow; setae short simple. Labrum about as long as broad; lobes asymmetrical; right lobe not reduced; left lobe reduced. Labium distally narrowing.

Coxal plates and basis on pereopods smooth. Coxae 1–3 contiguous. Pereopod 1 coxal plate not as deep as basis; propodus subovate. Pereopod 2 longer and thinner than pereopod 1; ischium not elongate, ratio length:breadth not exceeding 1.5; ischium distal posterior margin plumose setae present; propodus subrectangular; palm absent. Pereopod 4 coxa posteroventral lobe very large, reaching beyond the base of the pereonite 7; basis anterior margin with long setae absent; posterior margin with long setae present; plumose setae on distal anterior and posterior margins absent; ischium plumose setae on posterior distal margin present. Pereopod 6 basis posteriorly unexpanded; with a row of long plumose setae present. Pereopod 7 basis anterior margin straight; distally rounded; medial row of setae absent.

Oostegites on pereopods 2–5, gills on pereopods 2–7.

Pleonites 1–3 dorsally smooth.

Urosome: articulation between urosomites 2 and 3 absent. Uropod 1 peduncle longer than rami; outer ramus longer than inner. Uropod 2 peduncle longer than rami; outer ramus longer than inner. Uropod 3 peduncle longer than half length of rami; outer ramus 2-articulate, longer than inner.

Telson longer than broad; as long as peduncle uropod 3; submarginal setae on apex of each lobe absent; cleft; apically rounded.

Males: Pereopod 2 propodus equally sized in males and females. Urosome ordinary (similar to females).

Distribution. An abundant species in North Atlantic and Arctic Oceans that appears to be limited to cold waters (Berge and Vader, 1997).

Remarks. *Phippsia roemeri* appears to be close to the type species both taxonomically and zoogeographically. The two species possess a similar maxilliped and maxilla 2, in addition to the non-geniculate peduncle of antenna 2 and a cleft telson. Furthermore, they are both endemic to the North Atlantic (and subarctic), and are the only species from the Northern Hemisphere.

***Phippsia unihamata* sp. nov.**

Figures 9–12

Material examined. Holotype. Weddell Sea, Antarctica (72°25.40'S, 16°26.63'W), 198–260 m, ZMB A 25 (female, 7 mm).

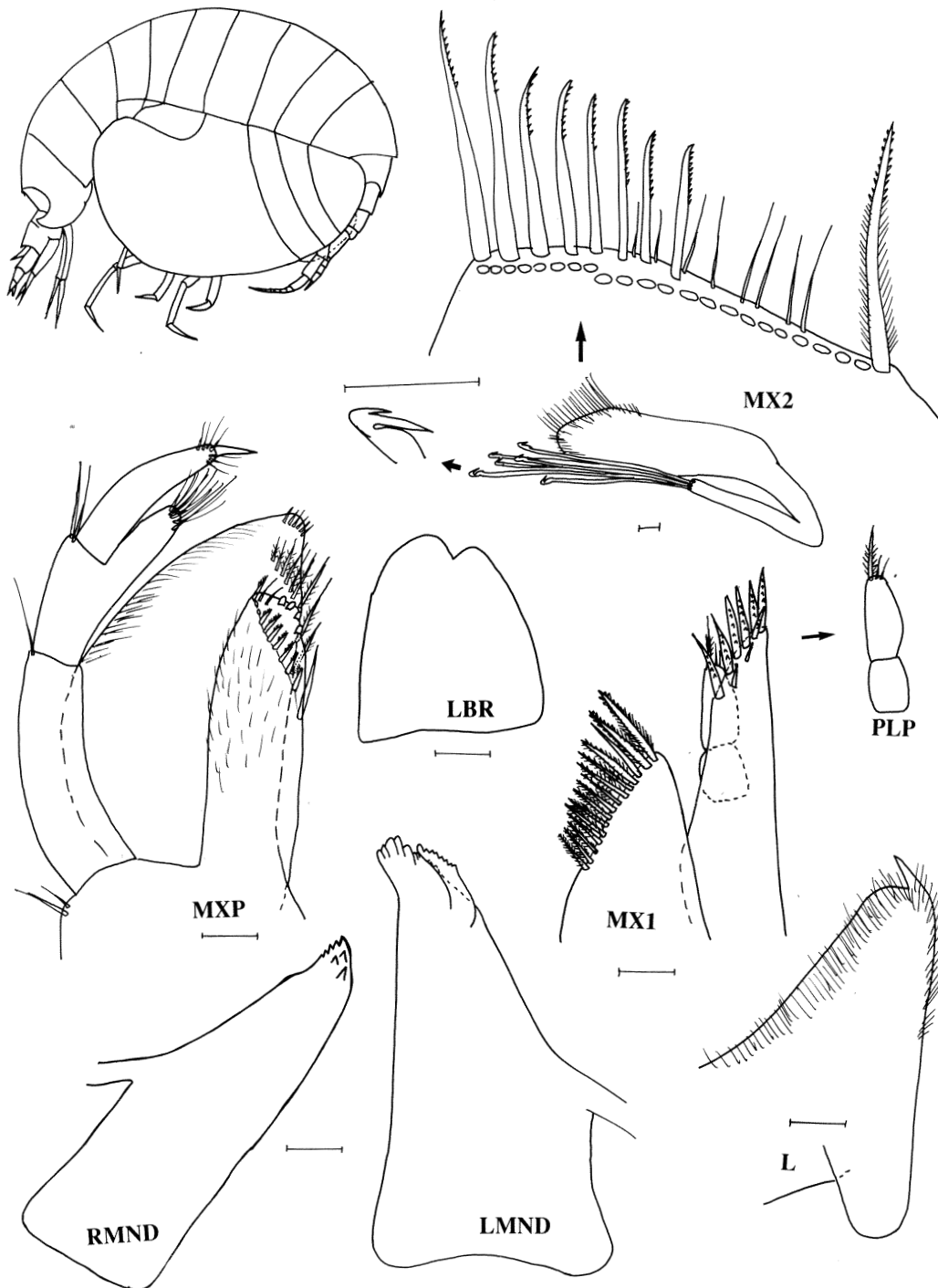


Figure 6. *Phippsia roemeri* Schellenberg, 1925. BIOFAR stn 172, female.

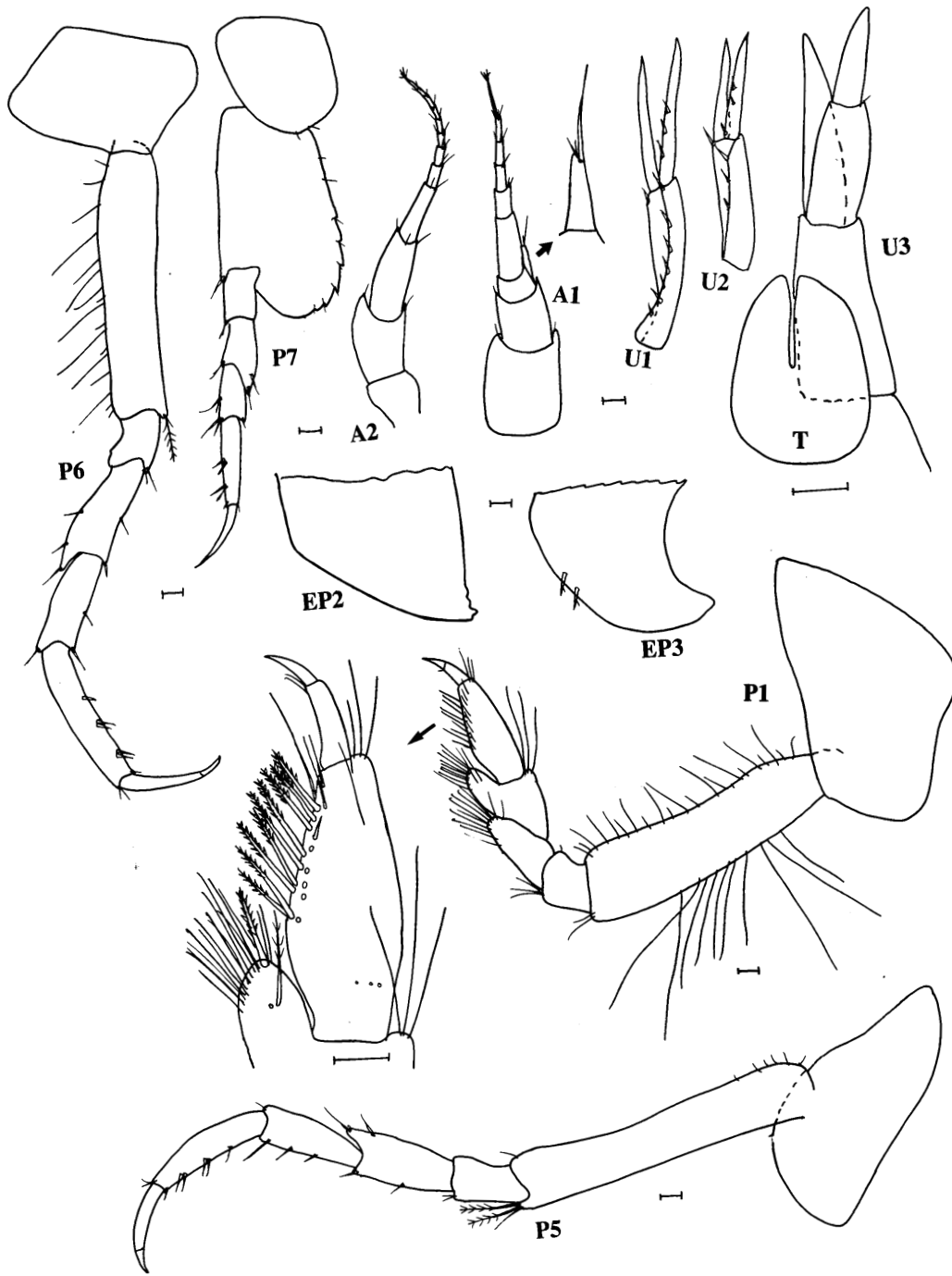


Figure 7. *Phippsia roemeri* Schellenberg, 1925. BIOFAR stn 172, female.

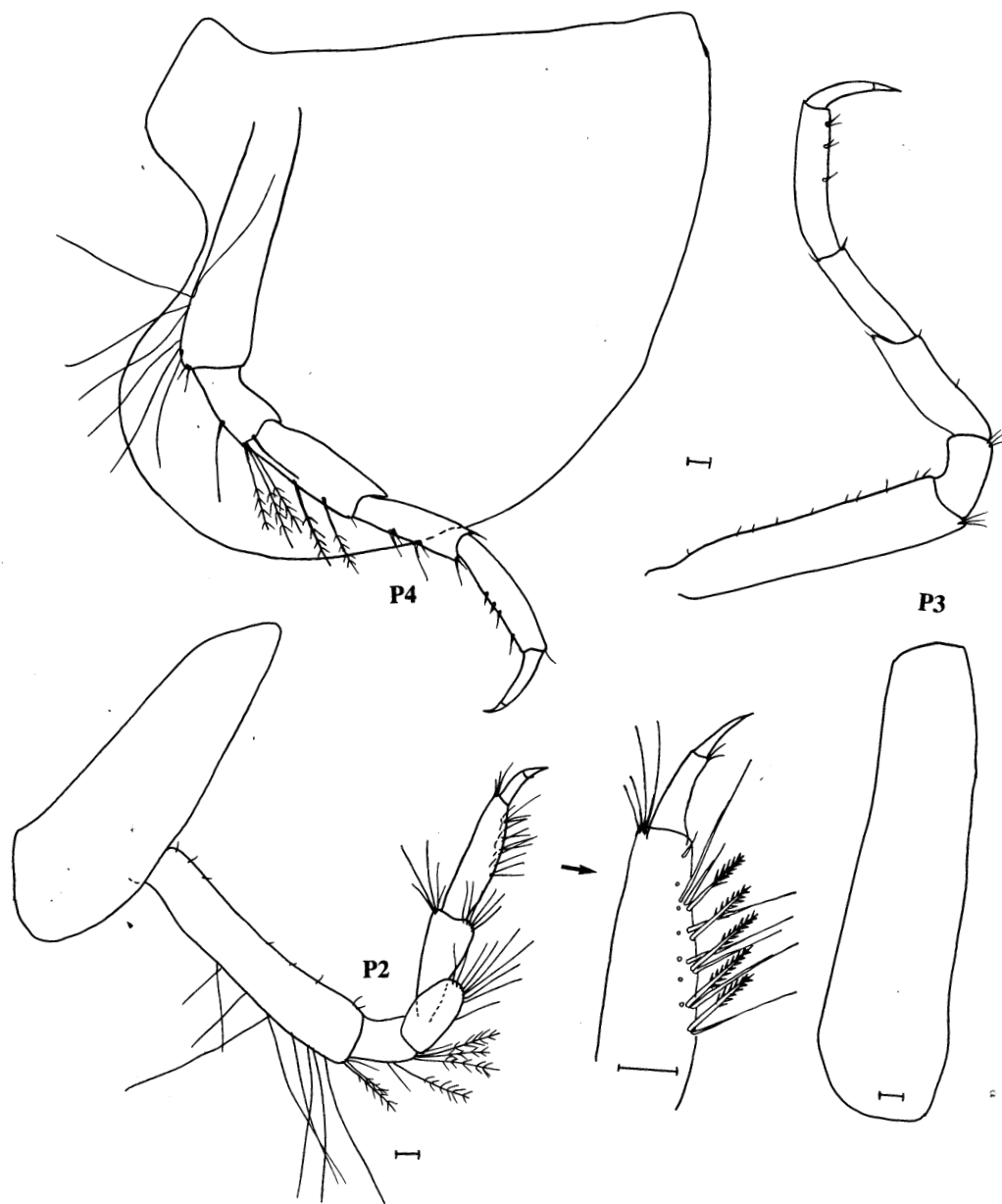


Figure 8. *Phippsia roemeri* Schellenberg, 1925. BIOFAR stn 172, female.

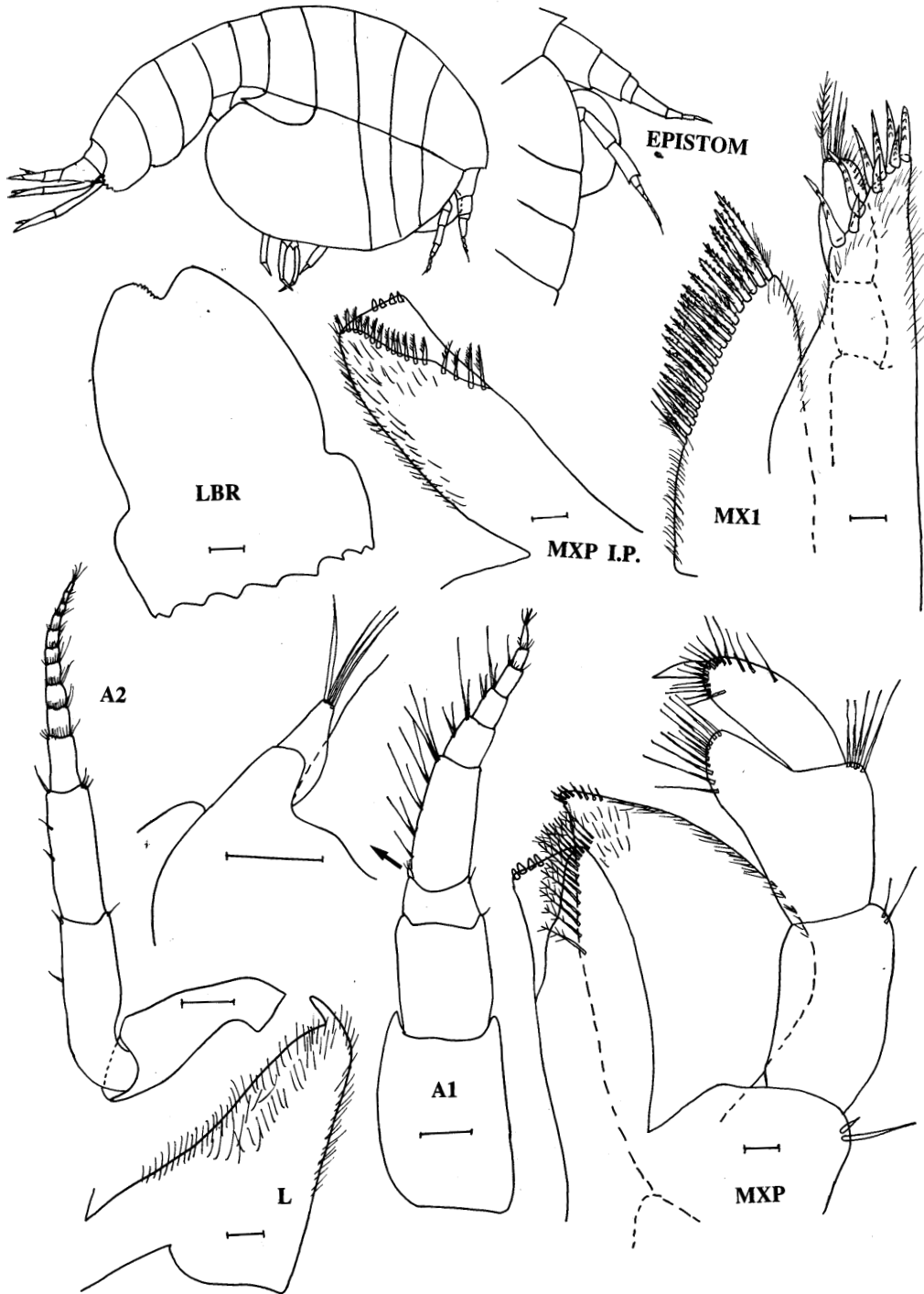


Figure 9. *Phippsia unihamata* sp. nov. Holotype.

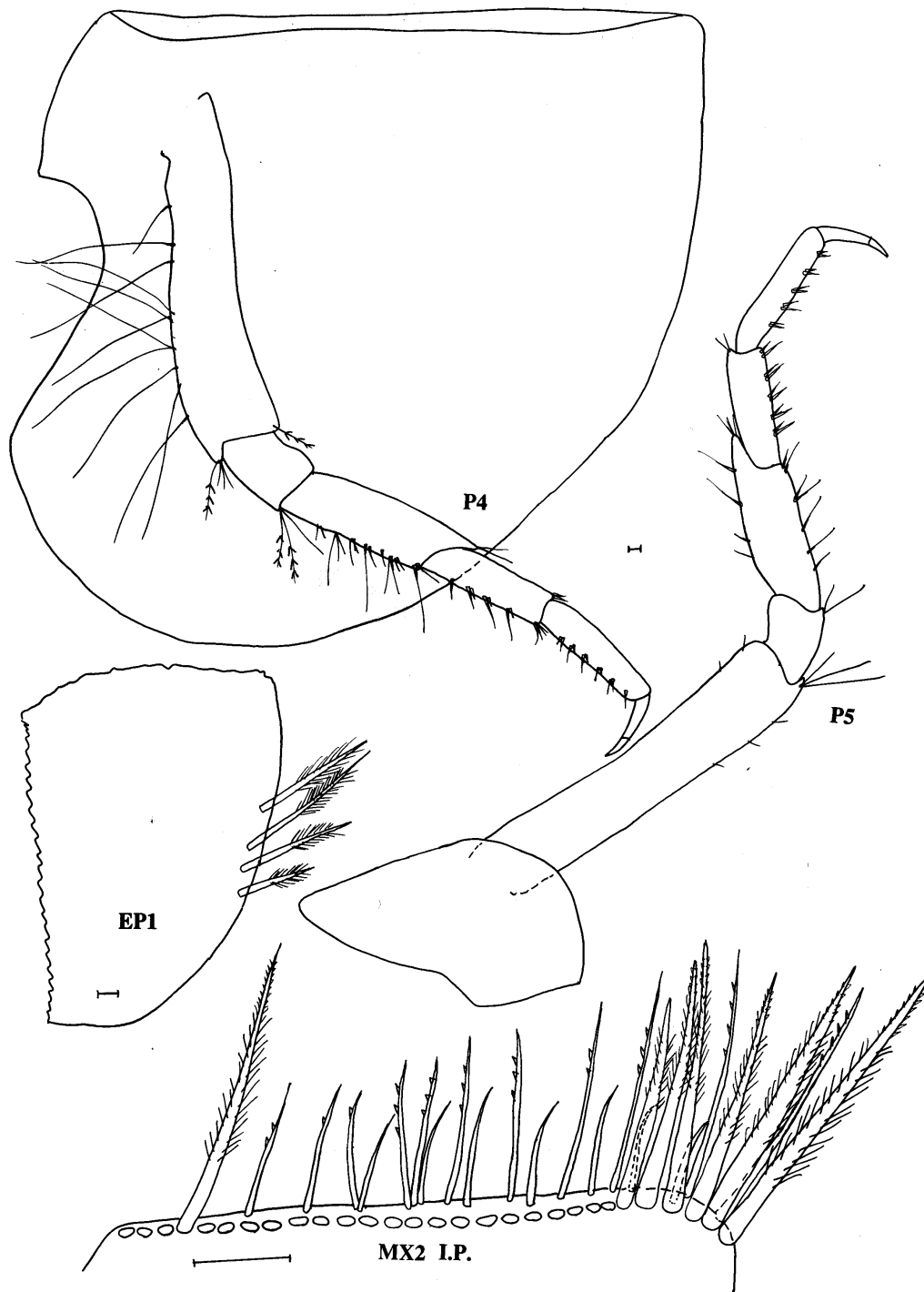


Figure 10. *Phippsia unihamata* sp. nov. Holotype.

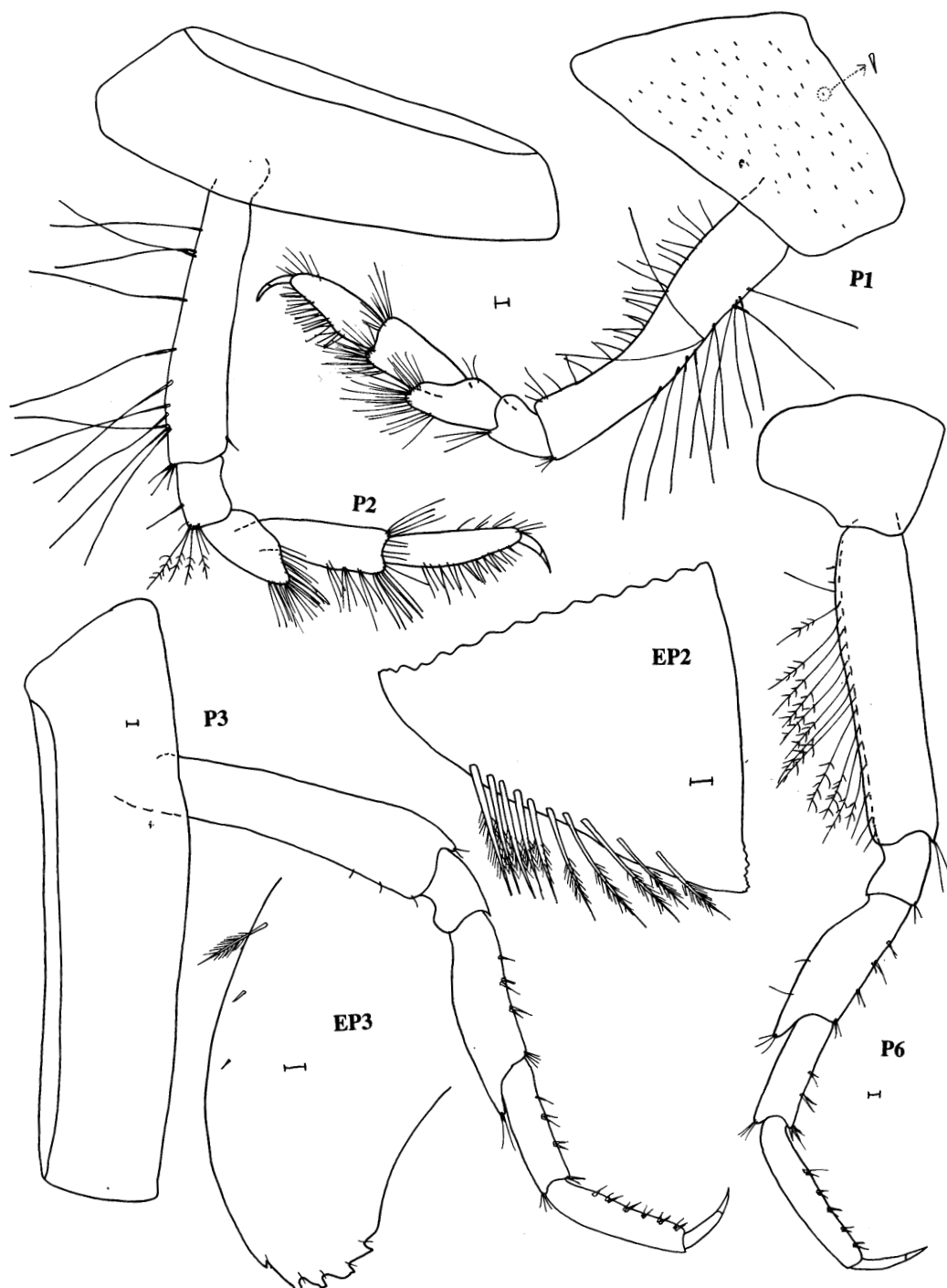


Figure 11. *Phippsia unihamata* sp. nov. Holotype.

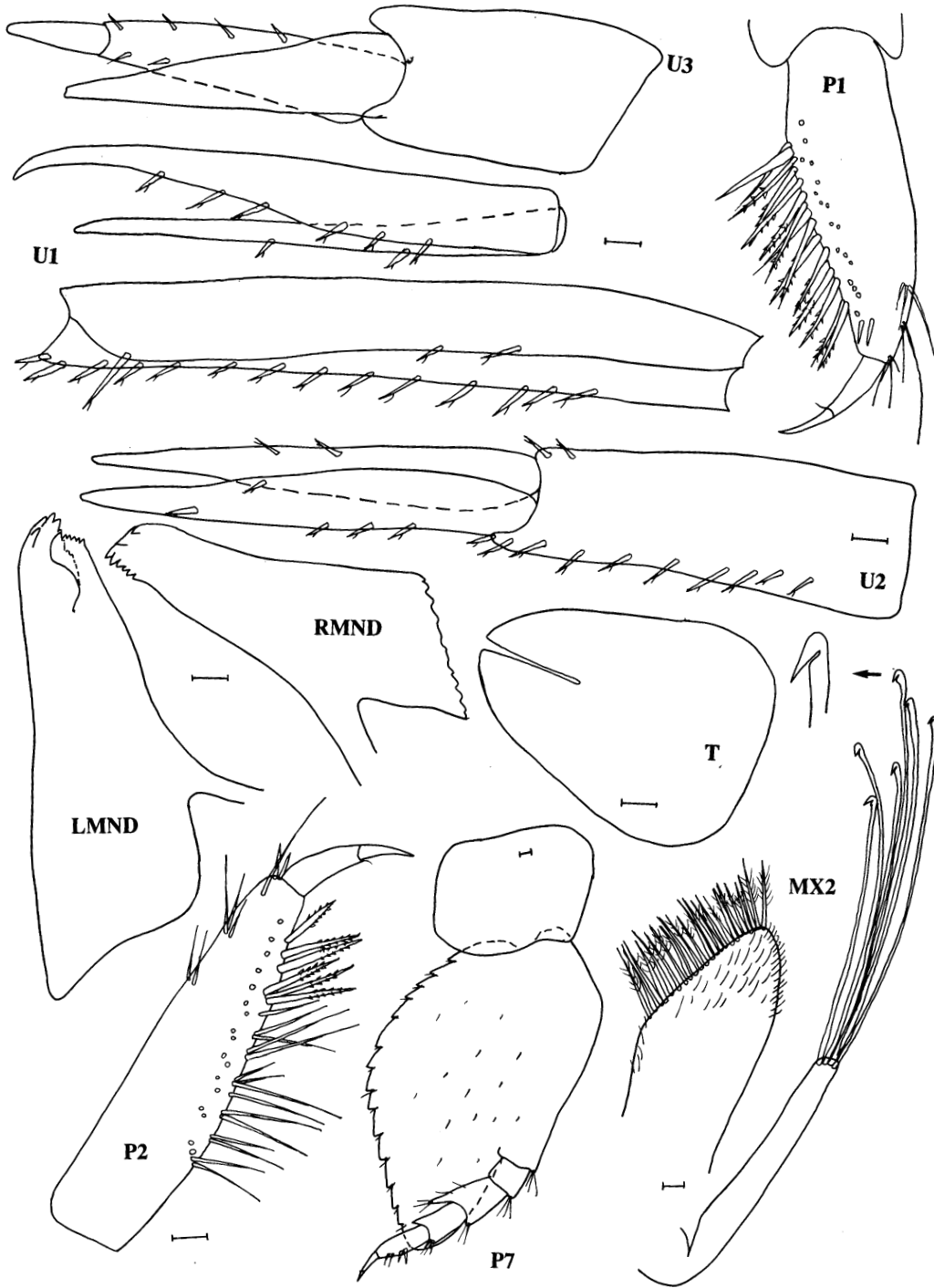


Figure 12. *Phippsia unihamata* sp. nov. Holotype.

Additional material. Weddell Sea, Antarctica (72°27.28'S, 17°32.94'W), 455–473 m, ZMB A III/41 (female, 6 mm); Weddell Sea, Antarctica (72°53.10'S, 19°29.33'W), 421–429 m, ZMB A III/44 (immature, 3 mm); Antarctica (66°S, 49°E), NHM unregistered (female, 6 mm).

Description. Rostrum very small.

Antennae short. Antenna 1 shorter than antenna 2; flagellum 6-articulate; accessory flagellum rudimentary. Antenna 2 peduncle (articles 3–5) shorter than flagellum; article 3 elongate, articles 3 and 4 geniculate; article 4 longer than article 5.

Epistome curved (convex) and smooth; epistomal plate produced into a large conspicuous medial keel.

Mouthparts not elongate or pointed. Mandible incisor lateral; toothed; left lacinia mobilis powerful, laterally expanded. Maxilla 1 palp 2-articulate; rectangular; apex not reaching above the apex of outer plate; outer plate distally rectangular; ST in a pseudocrown; ST first row with 6 setae (ST 1–5, ST 7); ST 6 absent; gap between ST 5 and ST 7 present; ST A present; located distally, part of first row; ST B present; part of second row; ST C present; inner plate with a well developed shoulder; setae pappocuspitate. Maxilla 2 gaping and geniculate; outer plate setae with distal hooks present; distal cleft absent; inner plate setal row A covering about two-thirds of the margin; appressed to row B; row A setae pappopectinate; row B setae proximally pappose; distally with cusps present; row C present; row D present; expanded, row elongated towards and beyond row A; with many small cusps distally. Maxilliped palp 4-articulate; article 2 distally produced; distal inner margin greatly produced; dactylus distally simple (pointed); inner plate not exceeding base of palp article 3; nodular setae 4; medial setal-row present; not reduced; vertical; setae pectinate; distal setal-row present; inner setal-row absent; outer plate outer setal-row present; submarginal; setae attached normally; setae long; straight; inner setal-row present; well developed; setae long robust; pappose; proximally parallel to outer, distally transverse; distal setal-group present; setae attached in a deep hollow; setae short simple. Labrum about as long as broad; lobes symmetrical; right lobe reduced; left lobe reduced. Labium distally narrowing.

Coxal plates and basis on pereopods covered with setae; setae very short. Coxae 1–3 contiguous. Pereopod 1 coxal plate not as deep as basis; propodus subovate. Pereopod 2 longer and thinner than pereopod 1; ischium not elongate, ratio length:breadth not exceeding 1.5; ischium distal

posterior margin plumose setae present; propodus subovate; palm absent.

Pereopod 4 coxa posteroventral lobe very large, reaching beyond the base of pereonite 7; basis anterior margin with long setae absent; posterior margin with long setae present; plumose setae on distal anterior and posterior margins present; ischium plumose setae on posterior distal margin present. Pereopod 6 basis posteriorly expanded; rudimentary; with a row of long plumose setae present. Pereopod 7 basis anterior margin straight; distally rounded; medial row of setae absent.

Oostegites on pereopods 2–5, gills on pereopods 2–7.

Pleonites 1–3 dorsally smooth;

Urosome: articulation between urosomites 2 and 3 absent. Uropod 1 peduncle longer than rami; outer ramus longer than inner. Uropod 2 peduncle shorter than rami; outer ramus as long as inner. Uropod 3 peduncle longer than half length of rami; outer ramus 2-articulate, longer than inner.

Telson longer than broad; longer than peduncle uropod 3; submarginal setae on apex of each lobe absent; cleft; apically rounded.

Males: Unknown.

Etymology. The name refers to the fact that this was the first species we discovered without a double-hooked setae on the outer plate on maxilla 2 (MX2, Fig. 6).

Distribution. Antarctica, 198–473 m (possibly circumpolar).

Remarks. This and *P. vanhoeffeni* are the only species in the genus occurring in Antarctica. Both are separated from their congeners by the strongly produced and serrate hind margin of the third epimeral plate. *Phippsia unihamata* differs from *P. vanhoeffeni* in the long and geniculate peduncle of antenna 2.

***Phippsia vanhoeffeni* (Schellenberg, 1926)**
comb. nov.

Figures 13–15

Stegocephaloides vanhoeffeni Schellenberg, 1926: 299.—K.H. Barnard, 1930: 328.

Stegocephalopsis vanhoeffeni.—Barnard and Karaman, 1991: 681.

Material examined. Syntype. Eastern Antarctica (Wilhelm II land), 385 m, ZMB 20388 (female, 6 mm).

Additional material. Australia, Victoria, S of Point Hicks (38°21.90'S, 149°20.00'E), 1000 m, WHOI epibenthic sled, G.C.B. Poore et al. on RV *Franklin* 23 Jul 1986 (stn SLOPE 32), NMV J24057 (4 males and females, 4–5mm).

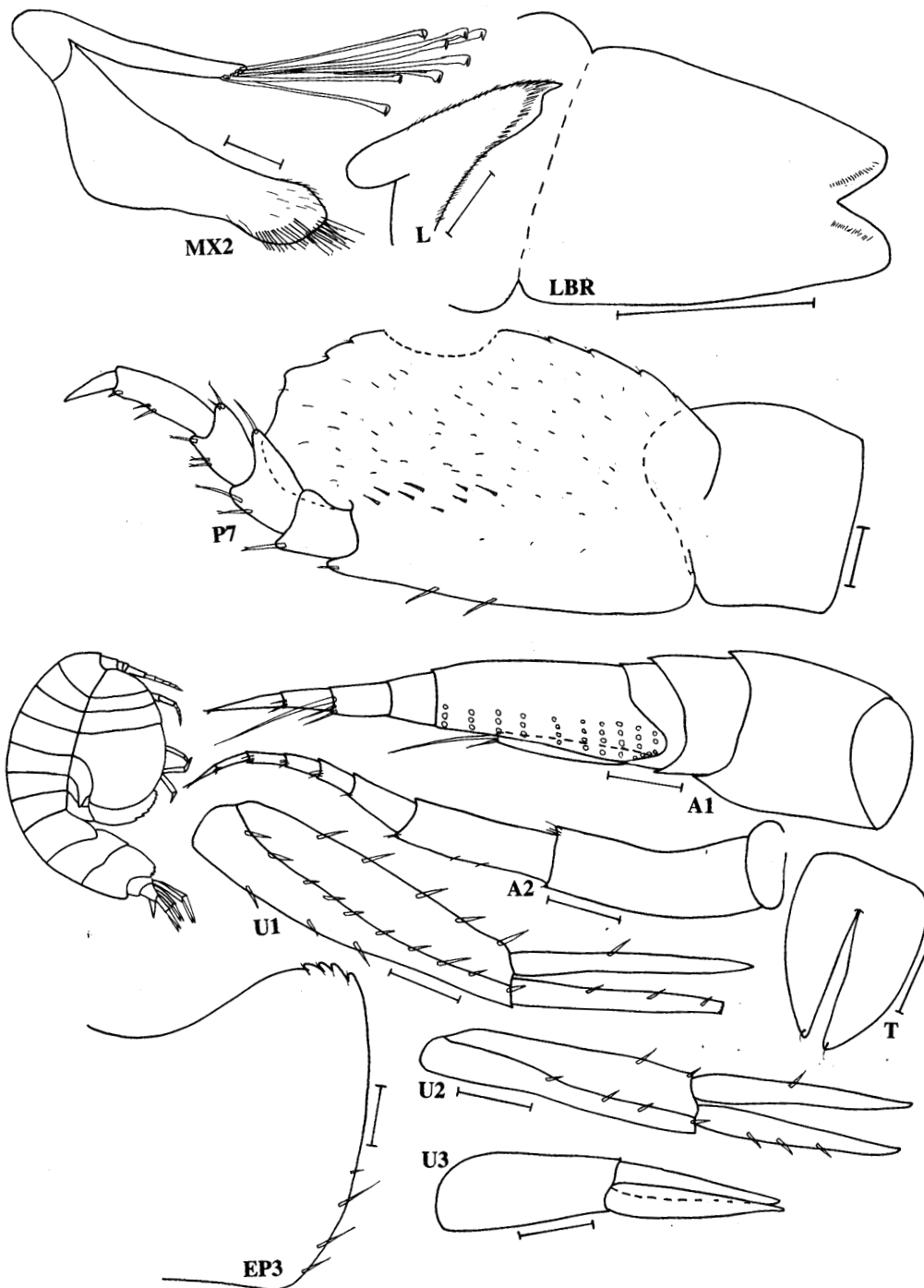


Figure 13. *Phippsia vanhoeffeni* (Schellenberg, 1926). NMV J24057, female A.

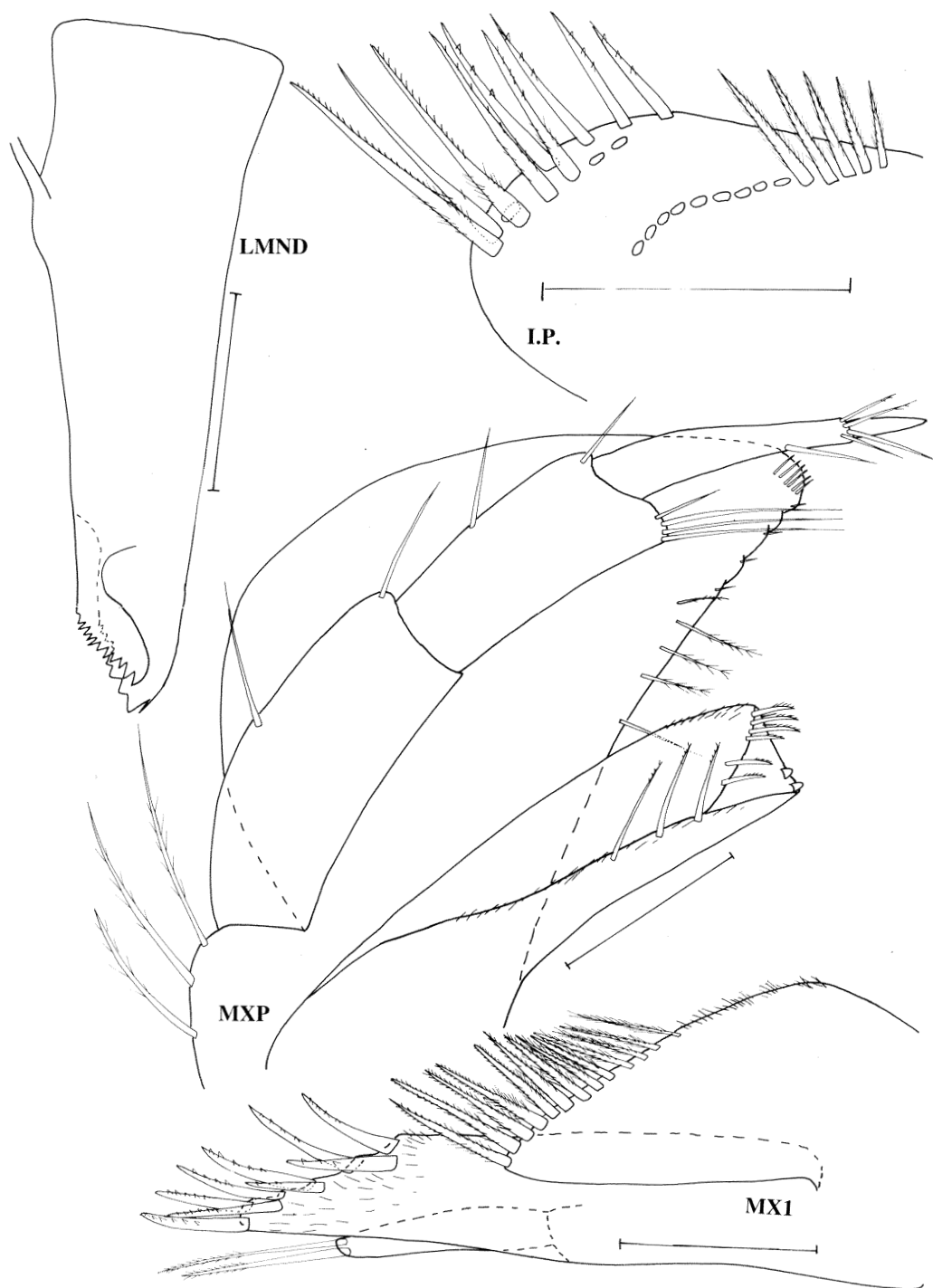


Figure 14. *Phippsia vanhoeffeni* (Schellenberg, 1926). NMV J24057, female A.

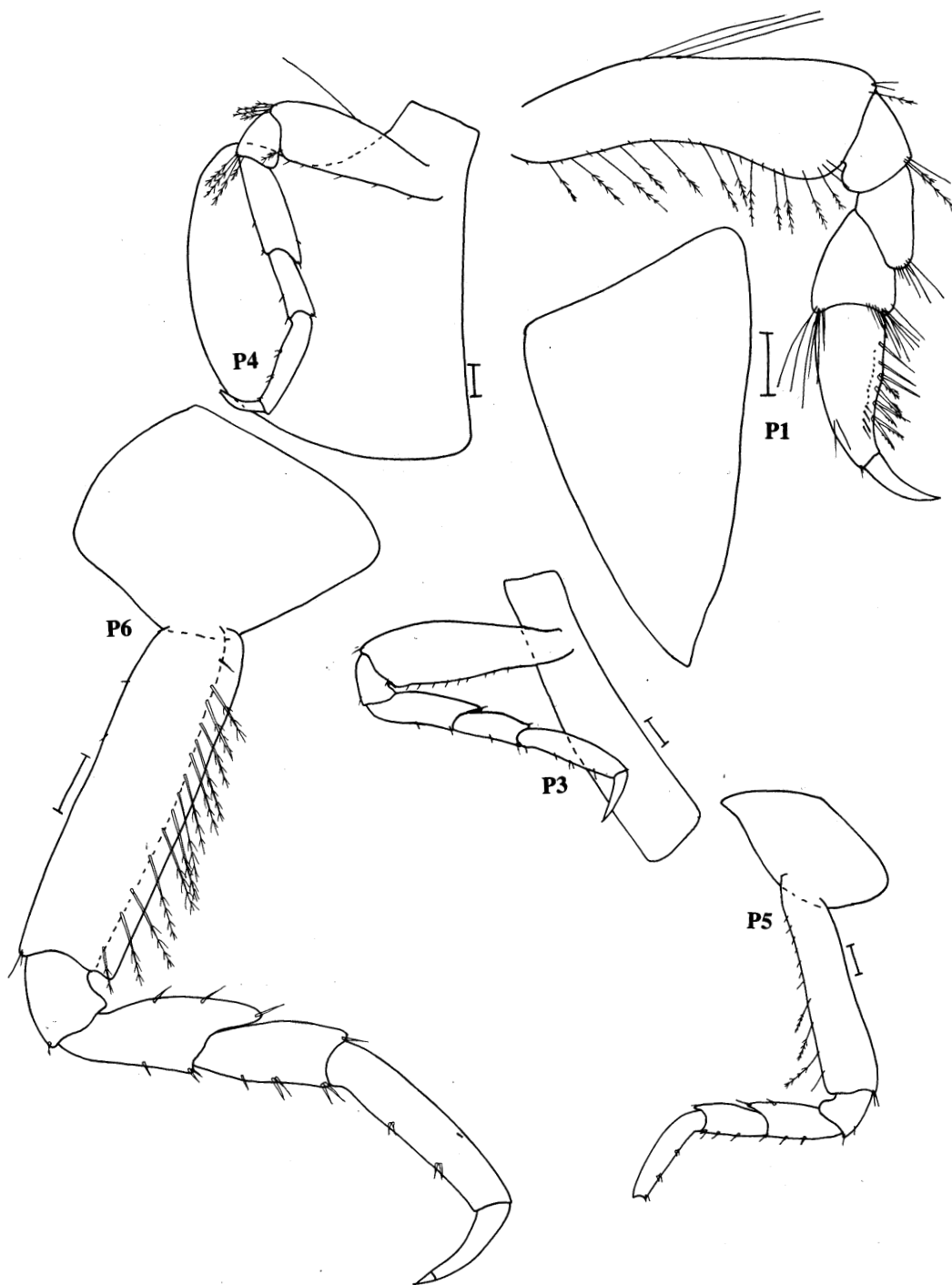


Figure 15. *Phippsia vanhoeffeni* (Schellenberg, 1926). NMV J24057, female A.

Description. Rostrum very small.

Antennae short. Antenna 1 longer than antenna 2; flagellum 5-articulate; accessory flagellum well developed, article 2 absent. Antenna 2 peduncle (articles 3–5) longer than flagellum; article 3 short, about as long as broad; article 4 longer than article 5.

Epistome curved (convex) and smooth; epistomal plate (medial keel) not produced.

Mouthparts not elongate or pointed. Mandible incisor lateral; toothed; left lacinia mobilis powerful, laterally expanded. Maxilla 1 palp 1-articulate; rectangular; apex not reaching above the apex of outer plate; outer plate distally rectangular; ST in a pseudocrown; ST first row with 6 setae (ST 1–5, ST 7); ST 6 absent; gap between ST 5 and ST 7 absent; ST A present; located distally, part of first row; ST B present; part of second row; ST C present; inner plate with a well developed shoulder; setae pappocuspitate. Maxilla 2 gaping and geniculate; outer plate setae with distal hooks present; distal cleft absent; inner plate setal row A covering about two-thirds of the margin; clearly separated from row B; row A setae pappopectinate; row B setae proximally pappose; distally with cusps present; row C present; row D present; expanded, row elongated towards and beyond row A; with many small cusps distally. Maxilliped palp 4-articulate; article 2 distally produced; distal inner margin weakly produced; dactylus distally simple (pointed); inner plate not exceeding base of palp article 3; nodular setae 2; medial setal-row present; not reduced; vertical; setae pectinate; distal setal-row present; inner setal-row absent; outer plate outer setal-row present; marginal; setae attached in a deep hollow; setae short; strongly curved upwards (hooks); inner setal-row present; well developed; setae long robust; pappose; proximally parallel to outer, distally transverse; distal setal-group present; setae attached in a deep hollow; setae short simple. Labrum about as long as broad; lobes symmetrical; right lobe not reduced; left lobe not reduced. Labium distally narrowing.

Coxal plates and basis on pereopods covered with setae; setae very short. Coxae 1–3 contiguous. Pereopod 1 coxal plate deeper than basis; propodus subovate. Pereopod 2 longer and thinner than pereopod 1; ischium not elongate, ratio length:breadth not exceeding 1.5; ischium distal posterior margin plumose setae present; propodus subrectangular; palm absent. Pereopod 4 coxa posteroventral lobe large, reaching about the base of pereonite 7; basis anterior margin with long setae absent; posterior margin with long setae present; plumose setae on distal anterior and

posterior margins present; ischium plumose setae on posterior distal margin present. Pereopod 6 basis posteriorly expanded; rudimentary; with a row of long plumose setae present. Pereopod 7 basis anterior margin straight; distally rounded; medial row of setae present; setae short and robust.

Oostegites on pereopods 2–5, gills on pereopods 2–7.

Pleonites 1–3 dorsally smooth.

Urosome: articulation between urosomites 2 and 3 absent. Uropod 1 peduncle longer than rami; outer ramus longer than inner. Uropod 2 peduncle longer than rami; outer ramus as long as inner. Uropod 3 peduncle longer than half length of rami; outer ramus 1-articulate, as long as inner.

Telson longer than broad; longer than peduncle uropod 3; submarginal setae on apex of each lobe present; cleft; apically pointed.

Males: Pereopod 2 propodus equally sized in males and females; Urosome ordinary (similar to females).

Distribution. Eastern Antarctica (type locality) and south of Point Hicks, Victoria, Australia.

Remarks. This species is distinct from others of *Phippsia* in several respects, by its uniarticulate outer ramus of uropod 3, the weakly produced article 2 of the maxilliped palp, and the arrangement of setal-rows A, B and D on maxilla 2 (Berge, in press a). However, the species is transferred from *Stegocephalopsis* Schellenberg, 1925 on the following characters: 1, articulation between labrum and epistome partly absent; 2, inner plate of maxilliped long and rectangular; 3, articulation absent between urosomites 2 and 3; and 4, epimeral plate 3 produced and strongly serrate.

Tetradeion Stebbing

Tetradeion Stebbing, 1899: 207

Type species. *Cyproidea crassa* Chilton, 1883.

Species: *Tetradeion crassum* (Chilton, 1883); *T. quatro* sp. nov.

Distribution. Australia, New Zealand and subantarctic region.

Remarks. *Stegocephalus latus* Haswell, 1879 was described from shallow water Tasmania, Australia. Although the species was inadequately described and the two syntypes no longer exist (Springthorpe and Lowry, 1994), the descriptions by Haswell (1879, 1885) strongly resemble those of *T. crassum*. The conspicuous eyes, large coxae 1–4, reduced pereopod 7 (although all articles

appears to be present in *S. latus*), and absence of an articulation between urosomites 2 and 3 are similar. *Stegocephalus latus* was transferred to *Stegocephalopsis* by Barnard and Karaman (1991), but there are however, good reasons to suspect that it belongs in the same genus as *T. crassum*. Pending a revision of the family (Berge and Vader, in prep.), and due to inadequate information of this species' morphology, it is not herein transferred to *Tetradion*.

***Tetradion crassum* (Chilton)**

Figure 16

Cyproidea crassa Chilton, 1883: 80.

Tetradion crassum.—Stebbing, 1899: 207.—Stebbing, 1906: 157.—Chilton, 1924: 631.—K.H. Barnard, 1930: 329.—Hurley, 1955: 197.—J.L. Barnard, 1972: 155.

Material examined. New Zealand. North Cape (precise location unknown), 3 m, 1 Sep 1911, *Terra Nova* stn 135 (see K.H. Barnard, 1930: 329), NHM 1930.8.1.95–104 (15 specimens, 2.5–3.5 mm). Auckland Islands (50°52'S, 166°42'E), 135–139 m, 9 Feb 1965, *Elantin* Cruise 16 (stn 1425), DMC (female, 2 mm).

South Atlantic, S of Falkland Islands (54°43'S, 56°37'W), 339–357 m, 14 Mar 1966, *Eltanin* Cruise 22 (stn 1593), DMC (immature, 2 mm).

Description. Rostrum very small.

Antennae short. Antenna 1 shorter than antenna 2; flagellum 6-articulate; accessory flagellum rudimentary; peduncle elongate. Antenna 2 peduncle (articles 3–5) longer than flagellum; article 3 elongate, articles 3 and 4 geniculate; article 4 shorter than article 5.

Epistome curved (convex) and smooth; epistomal plate (medial keel) produced, but small.

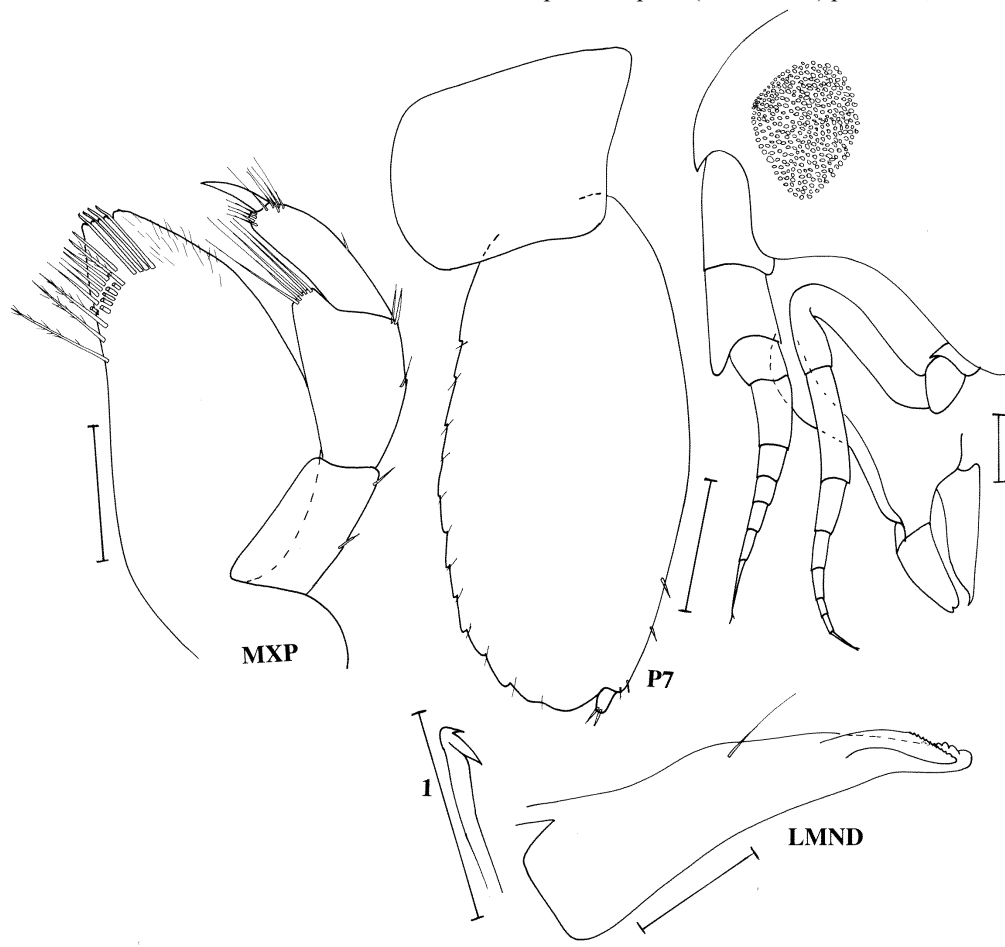


Figure 16. *Tetradion crassum* (Chilton, 1883). NHM 1930.8.1.95–104 female.

Mouthparts elongate; pointed and narrow. Mandible incisor lateral; toothed; left lacinia mobilis powerful, laterally expanded. Maxilla 1 palp 2-articulate; rectangular; apex not reaching above the apex of outer plate; outer plate distally rectangular; ST in a pseudocrown; ST first row with 6 setae (ST 1–5, ST 7); ST 6 absent; gap between ST 5 and ST 7 present; ST A present; located distally, part of first row; ST B present; part of second row; ST C present; inner plate with a well developed shoulder; setae pappocuspitate. Maxilla 2 gaping and geniculate; outer plate setae with distal hooks present; distal cleft present; inner plate setal row A covering about two-thirds of margin; appressed to row B; row A setae pappopectinate; row B setae proximally simple; distally with cusps present; row C present; row D present; expanded, row elongated towards and beyond row A; with many small cusps distally. Maxilliped palp 4-articulate; article 2 distally produced; distal inner margin greatly produced; dactylus distally simple (pointed); inner plate not exceeding base of palp article 3; 3 nodular setae; medial setal-row present; not reduced; vertical; setae pectinate; distal setal-row present; inner setal-row present; row reduced to 1 or 2 setae; outer plate outer setal-row present; submarginal; setae attached normally; setae long; straight; inner setal-row present; well developed; setae long robust; pappose; proximally parallel to outer, distally transverse; distal setal-group present; setae attached in a deep hollow; setae long robust. Labrum elongate; lobes asymmetrical; right lobe not reduced; left lobe reduced. Labium distally narrowing.

Coxal plates and basis on pereopods covered with setae; setae very short. Coxae 1–3 contiguous. Pereopod 1 coxal plate not as deep as basis; propodus subovate. Pereopod 2 general appearance like pereopod 1; ischium not elongate, ratio length:breadth not exceeding 1.5; ischium distal posterior margin plumose setae present; propodus subovate; palm absent.

Pereopod 4 coxa posteroventral lobe very large, reaching beyond the base of the pereonite 7; basis anterior margin with long setae absent; posterior margin with long setae present; plumose setae on distal anterior and posterior margins present; ischium plumose setae on posterior distal margin present. Pereopod 6 basis posteriorly unexpanded; with a row of long plumose setae present. Pereopod 7 strongly reduced, only 2 articles present; basis anterior margin straight; distally rounded; medial row of setae present; setae short and robust.

Oostegites on pereopods 2–5, gills on pereopods 2–7.

Pleonites 1–3 dorsally smooth.

Urosome: articulation between urosomites 2 and 3 absent. Uropod 1 peduncle longer than rami; outer ramus longer than inner. Uropod 2 peduncle longer than rami; outer ramus longer than inner. Uropod 3 peduncle at least as long as rami; outer ramus 1-articulate, longer than inner.

Telson longer than broad; shorter than peduncle uropod 3; submarginal setae on apex absent; entire; apically rounded.

Males: Unknown.

Distribution. Circumpolar in the subantarctic region including New Zealand, 0–357 m.

Remarks. *Tetradeion crassum* was thoroughly described and figured by Chilton (1924), Hurley (1955) and Barnard (1972).

The strongly reduced pereopod 7 and large red eyes are two distinctive features distinguishing this species from all other known stegocephalid species. The morphology of maxillae 1 and 2 and the maxilliped indicate phylogenetic relationships with *Phippsia* (see also above).

Tetradeion quatro sp. nov.

Figures 17–20

Material examined. Holotype. Australia, Victoria, eastern Bass Strait, 8 km S of Southeast Point, Wilsons Promotory, (39°12.9'S, 146°27.3'E), 65 m, medium sand, R. Wilson on RV *Tangaroa*, 18 Nov 1981 (stn BSS 180), NMV J47020 (female, 7 mm).

Paratypes. Collected with holotype, NMV J45337 (30 specimens, males and females, 3–8 mm).

Additional material. Australia, Victoria, eastern Bass Strait, 8 km S of Southeast Point, Wilsons Promotory, (39°12.9'S, 146°27.3'E), 65 m, medium sand, R. Wilson on RV *Tangaroa*, 18 Nov 1981 (stn BSS 180), NMV J45342 (female, 6 mm).

Description. Rostrum very small.

Antennae short. Antenna 1 shorter than antenna 2; flagellum 7-articulate; accessory flagellum rudimentary. Antenna 2 peduncle (articles 3–5) longer than flagellum; article 3 elongate, articles 3 and 4 geniculate; article 4 as long as article 5.

Epistome curved (convex) and smooth; epistomal plate produced into a large conspicuous medial keel.

Mouthparts not elongate or pointed. Mandible incisor lateral; toothed; left lacinia mobilis powerful, laterally expanded. Maxilla 1 palp 2-articulate; rectangular; apex not reaching above the apex of outer plate; outer plate distally rectangular; ST in a pseudocrown; ST first row

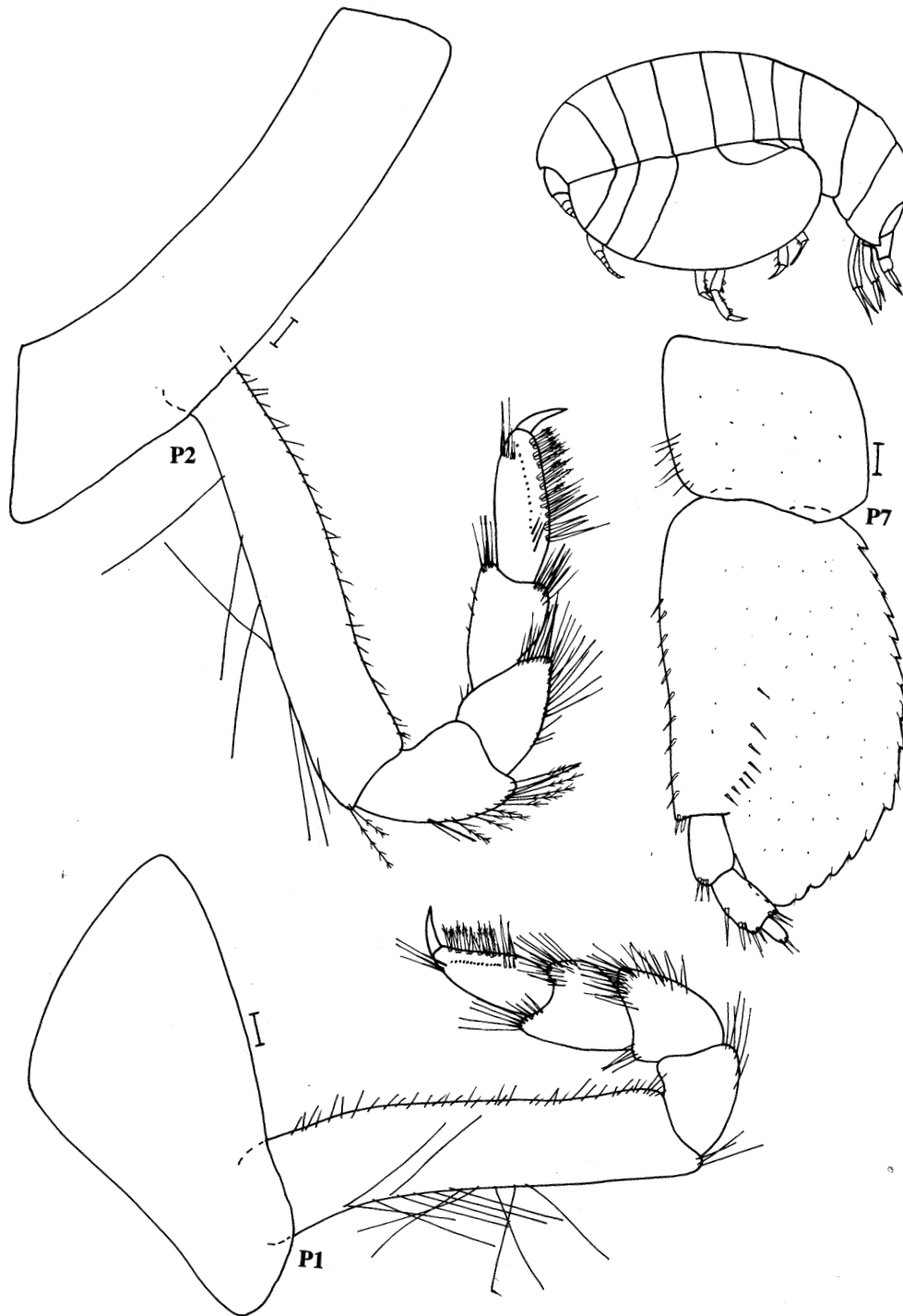


Figure 17. *Tetradion quatro* sp. nov. Holotype except habitus: paratype female, 4 mm.

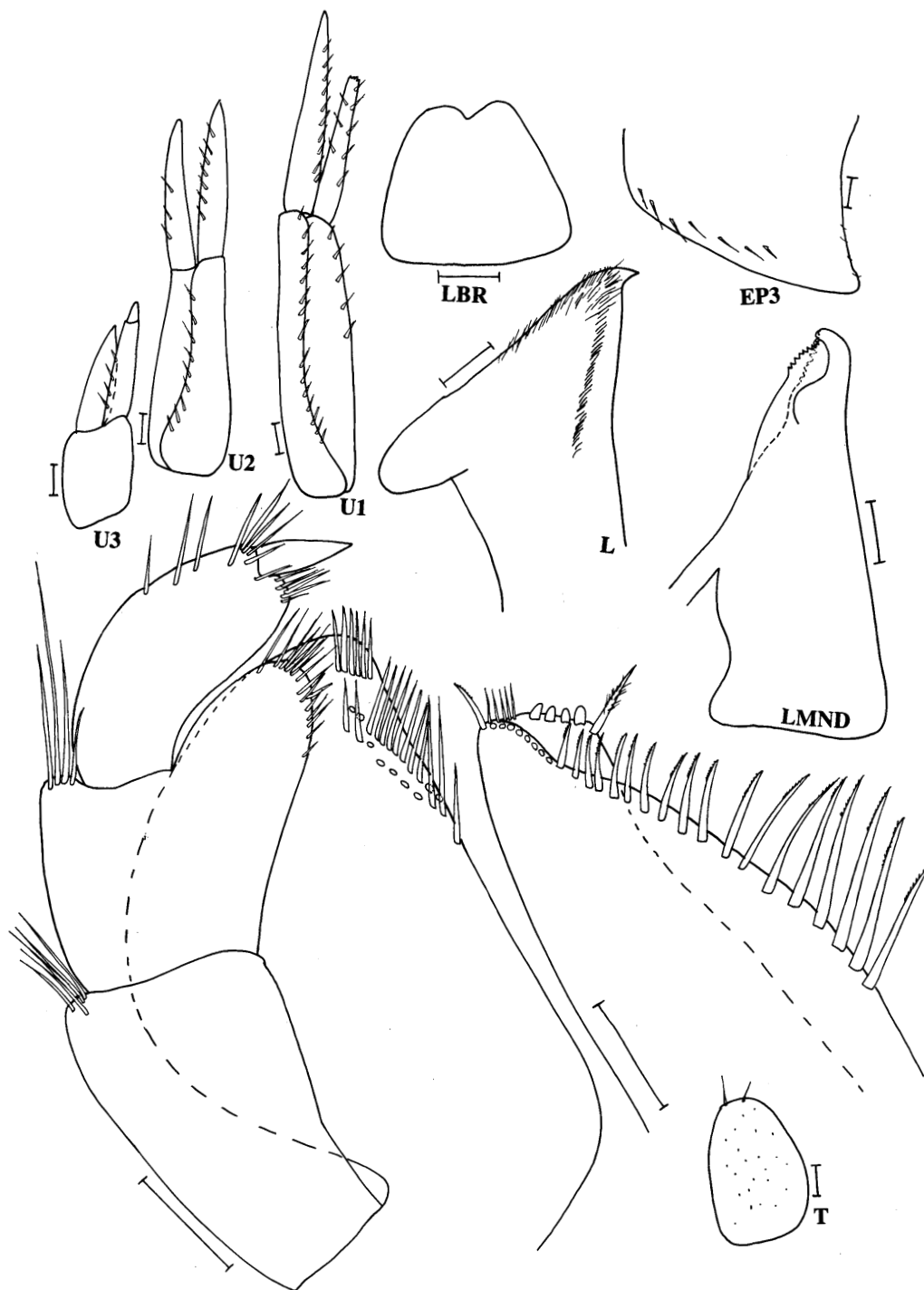


Figure 18. *Tetradeion quatro* sp. nov. Holotype.

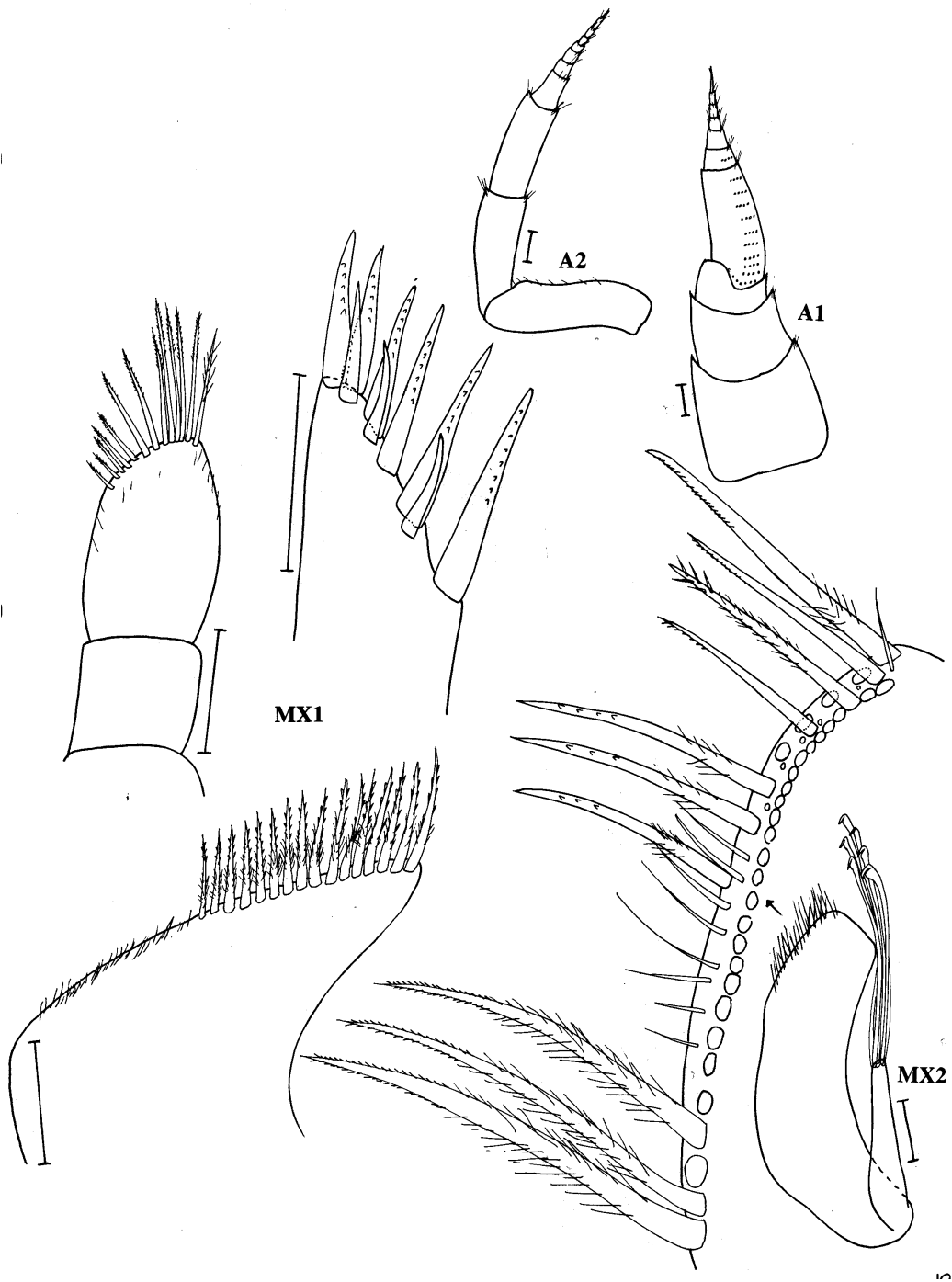


Figure 19. *Tetradion quatro* sp. nov. Holotype.

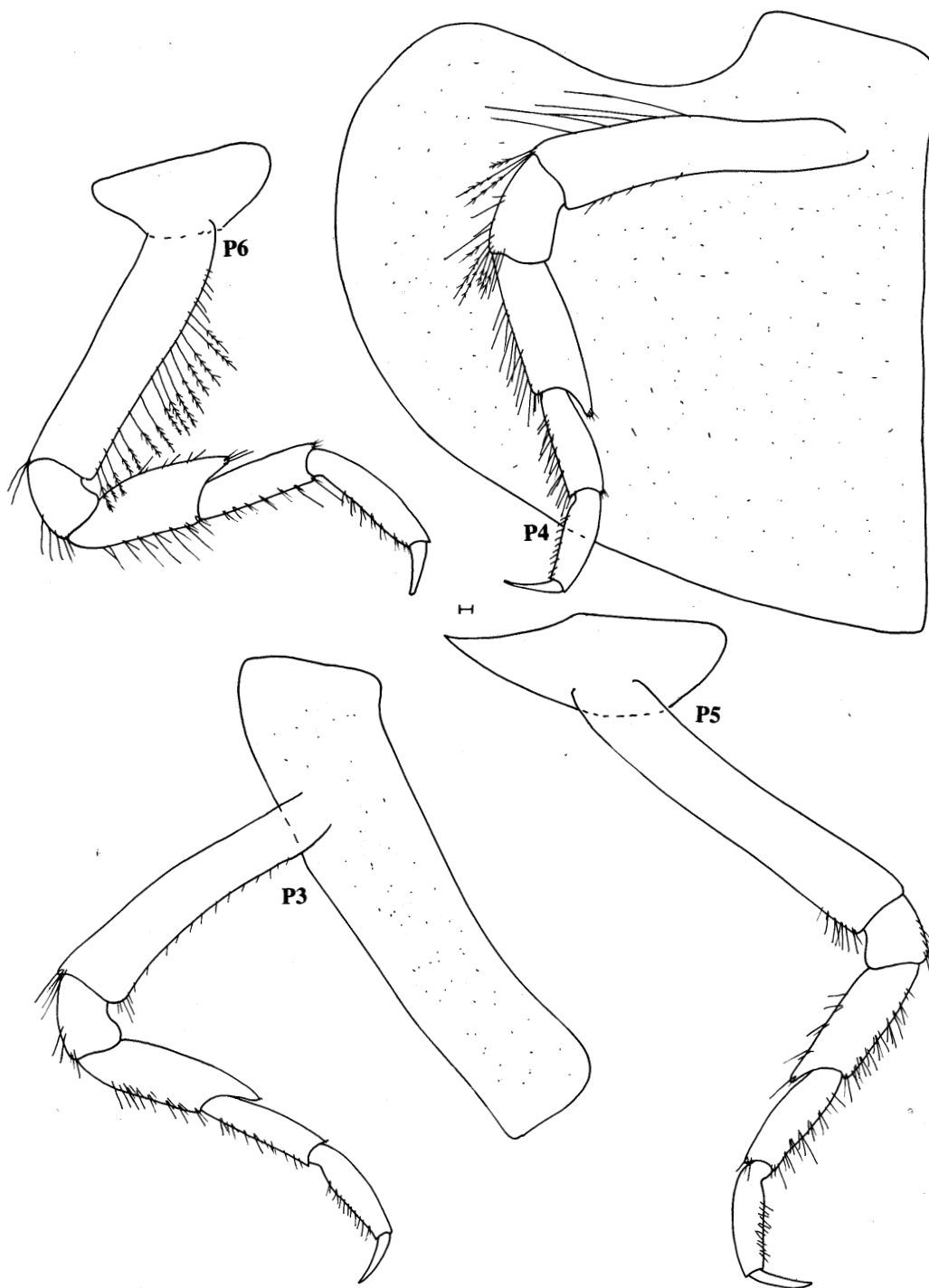


Figure 20. *Tetradeion quatro* sp. nov. Holotype.

with 6 setae (ST 1–5, ST 7); ST 6 absent; gap between ST 5 and ST 7 present; ST A present; located distally, part of first row; ST B present; part of second row; ST C present; inner plate with a well developed shoulder; setae pappocuspitate. Maxilla 2 gaping and geniculate; outer plate setae with distal hooks present; distal cleft absent; inner plate setal row A covering the entire margin; appressed to row B; row A setae pappopectinate; row B setae proximally pappose; distally with cusps present; row C present; row D present; reduced, 1–3 long setae distally; with many small cusps distally. Maxilliped palp 4-articulate; article 2 distally produced; distal inner margin greatly produced; dactylus distally simple (pointed); inner plate not exceeding base of palp article 4; nodular setae 4; medial setal-row present; not reduced; vertical; setae pectinate; distal setal-row present; inner setal-row present; row reduced to 1 or 2 setae; outer plate outer setal-row present; submarginal; setae attached normally; setae long robust; straight; inner setal-row present; well developed; setae long robust; slender; proximally parallel to outer, distally transverse; distal setal-group present; setae attached in a deep hollow; setae long robust. Labrum about as long as broad; lobes symmetrical; right lobe reduced; left lobe reduced. Labium distally narrowing.

Coxal plates and basis on pereopods covered with setae; setae very short. Coxae 1–3 contiguous. Pereopod 1 coxal plate not as deep as basis; propodus subovate. Pereopod 2 general appearance like pereopod 1; ischium not elongate, ratio length:breadth not exceeding 1.5; ischium distal posterior margin plumose setae present; propodus subovate; palm absent.

Pereopod 4 coxa posteroventral lobe very large, reaching beyond the base of pereonite 7; basis anterior margin with long setae absent; posterior margin with long setae present; plumose setae on distal anterior margin absent; plumose setae on distal posterior margin present; ischium plumose setae on posterior distal margin present. Pereopod 6 basis posteriorly unexpanded; with a row of long plumose setae present. Pereopod 7 strongly reduced, only 4 articles present; basis anterior margin straight; distally rounded; medial row of setae present; setae short and robust.

Oostegites on pereopods 2–5, gills on pereopods 2–7.

Pleonites 1–3 dorsally smooth.

Urosome: articulation between urosomites 2 and 3 absent. Uropod 1 peduncle longer than rami; outer ramus longer than inner. Uropod 2 peduncle longer than rami; outer ramus longer

than inner. Uropod 3 peduncle longer than half length of rami; outer ramus 2-articulate, longer than inner.

Telson longer than broad; longer than peduncle uropod 3; submarginal setae on apex present; entire; apically rounded.

Males: Pereopod 2 propodus larger in males than in females, urosome ordinary (similar to females).

Etymology. The species name reflects the presence of just four articles on pereopod 7.

Distribution. Eastern Bass Strait, Victoria (known only from type locality).

Remarks. The presence of just four articles (in addition to coxa) is a unique character state within the family; *T. crassum* has just two articles, all other stegocephalid species have six articles on pereopod 7 (in addition to coxa).

Acknowledgements

We thank Drs Jim Lowry and Penny Berents (Australian Museum, Sydney), Dr Gary Poore (Museum Victoria, Melbourne), Dr Oliver Coleman (Zoological Museum, Berlin), Dr Les Watling (Darling Marine Center, Maine), Dr Geoff Boxshall and Ms Miranda Lowe (The Natural History Museum, London) for their kind help in providing the material for this study.

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