

PLAKARTHRIUM AUSTRALIENSE, A THIRD SPECIES OF
PLAKARTHRIIDAE (CRUSTACEA: ISOPODA)

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Abstract

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The Plakarthriidae share with four genera of Sphaeromatidae a flat habitus and a marginal row of setae on antenna 1, coxae and uropods, modified to maintain contact with the substrate. They do not possess areas of scales on pleopod 5, a probable sphaeromatid synapomorphy. The possibility exists that Plakarthriidae are a highly derived offshoot of a clade that also gave rise to the flattened “cassininiine” sphaeromatids. *Plakarthrium australiense* sp. nov. is described from the southern Australian marine shelf and compared with the only two other species of the genus and family. The new species differs from *P. typicum* from New Zealand and *P. punctatissimum* from subantarctic islands of the South Atlantic and Antarctic Peninsula in having pleonite 1 fully indicated dorsally, only pleonite 2 indicated laterally and pleotelson tapering to 80% of its anterior width posteriorly.

Introduction

The Plakarthriidae Hansen, 1905 are previously known from only two species, *Plakarthrium typicum* Chilton, 1883 and *P. punctatissimum* (Pfeffer, 1887). The family is confined to shallow marine shores in cool-temperate and cold environments of the Southern Hemisphere. *Plakarthrium typicum* was described from New Zealand and has been reported as far south as The Snares islands (48°S) (Hurley, 1961; Poore, 1981) but not from Macquarie Island (GCBP collections in Museum Victoria). It has also been reported from southern Chile (Jaramillo, 1977) but this record is more likely to be the second species, *P. punctatissimum*, if not an undescribed Chilean endemic. *Plakarthrium punctatissimum* is reported from subantarctic islands of the South Atlantic and Antarctic Peninsula, namely South Georgia (type locality), South Orkneys, Petermann I., Booth-Wandel I. and Anvers I. (Richardson, 1906, 1913; Tattersall, 1921; Pesta, 1928; Wilson et al., 1976). A third species from southern Australia is here reported.

The taxonomic affinities of *Plakarthrium* Chilton, 1883 to other “flabelliferan” isopods has remained enigmatic. Hansen (1916) erected the Plakarthriinae as a subfamily of Sphaeromatidae and Menzies (1962) believed them to belong in the “platybranchiata” group of this family, a group more or less equivalent to Cassidininae

Hansen, 1905 (Iverson, 1982; Harrison and Ellis, 1991; Bruce, 1994). The monophyly of this and other sphaeromatid subfamilies remains doubtful (N.L. Bruce, pers. comm.). The affinities of Plakarthriidae were reviewed with a redescription of *P. typicum* by Wilson et al. (1976) who concluded “that the Plakarthriidae are unique with no close affinities with any other family.” Wägele (1989) placed the family within his suborder Sphaeromatidea, sister taxon to a clade including Serolidae, Bathynataliidae and Sphaeromatidae. Brusca and Wilson (1991) also assessed their position, placing the family as sister taxon to Serolidae, and possibly Keuphyliidae and Bathynataliidae. This paper, describing a new Australian species, also addresses some newly recognised characters which may have a bearing on plakarthriid relationships to Sphaeromatidae in particular.

Pfeffer’s (1887) generic name *Chelonidium* is a junior synonym of *Plakarthrium* Chilton, 1883, a fact realised by Richardson (1904: 6; 1906: 6) who synonymised the two. Plakarthriidae (erected by Hansen (1905) as Plakarthriinae, a subfamily of Sphaeromatidae Latreille, 1825) is the family name to have been used by most authors and, under ICZN (1999) Article 40, replaces Pfeffer’s (1887) family name, Chelonidiidae. Both dates should be cited for the family. Wilson et al. (1976) who incorrectly attributed

the family name to Richardson (1904) reviewed later accounts of plakarthriids by Richardson (1906, 1913), Tattersall (1921), Pesta (1928), Nierstrasz (1931), Menzies (1962), Glynn (1970) and Kussakin (1973).

Material is lodged in Museum Victoria, Melbourne (NMV) and the Zoological Institute and Museum, Hamburg (ZMH).

Plakarthriidae Hansen, 1905 (1887)

Chelonidiidae Pfeffer, 1887: 85.—Pesta, 1928.

Plakarthriinae Hansen, 1905: 100.—Nierstrasz, 1931: 192.

Plakarthriidae.—Richardson, 1906: 6.—Richardson, 1913: 7.—Wilson et al., 1976: 334 (see above for other references).

Diagnosis. First coxa free and articulating. Margin of the body being defined by peduncular articles 1 and 2 of antenna 1, peduncular articles 3 and 4 of antenna 2, all coxae, uropodal rami. Pleotelson completely fused and without articulation.

Composition. There is only one genus.

Remarks. The family was rediagnosed by Wilson et al. (1976) and is recognised by the combination of characters given in the diagnosis. Only the second character, the arrangement of the marginal segmentation, is unique. Similar patterns involving an expanded peduncle of antenna 1 and uropods are seen in some genera of "cassidiniine" Sphaeromatidae, in particular, *Amphoroidella* Baker, 1908, *Leptosphaeroma* Hilgendorf, 1885, *Paraleptosphaeroma* Buss and Iverson, 1981, and *Platysphaera* Holdich and Harrison, 1981. In all four genera the body is flattened as in Plakarthriidae but antenna 2 does not contribute to the body margin and the uropodal structure is typically sphaeromatid with peduncle and endopod fused. Further, all possess the cuticular scale patches on the end of the exopod of pleopod 5 which may be a sphaeromatid synapomorphy absent in Plakarthriidae (N.L. Bruce, 1993, fig. 1F; pers. comm.). The four genera are unquestionably sphaeromatids and similarity to Plakarthriidae seems on this evidence to be convergent. Another similarity, an adaptation to maintaining a smooth profile and minimum resistance to water movement, is what Buss and Iverson (1981) have called the membrana cingula, a fringe around the edge of the body of webbed marginal setae. The membrana cingula of *Paraleptosphaeroma glynni* was illustrated in SEMs by Buss and Iverson (1981: fig. 4) and of the two other species of this genus in line drawings by Müller (1990) and

Kussakin and Malyutina (1993). Bruce (1994: fig. 50B) figured the membrana cingula for *Platysphaera membranata* Holdich and Harrison, 1981. Kwon (1990) figured a similar structure in *Leptosphaeroma gottschei* Hilgendorf and we have observed the same in Museum Victoria material of *Amphoroidella elliptica* Baker. While there is a strong similarity between the membrana cingula in the four sphaeromatid genera, the equivalent structure in Plakarthriidae comprises broad separate fringed overlapping setae and is complemented by a free skirt-like flange of webbed setae underneath and parallel to the margin of the body.

Within Flabellifera the pleon fully fused to the pleotelson is seen in at least one species of Sphaeromatidae, *Maricoccus brucei* Poore, 1994. This and similar genera, *Juletta* Bruce, 1993 and *Margueritta* Bruce, 1993 (both with free pleonite 1), are placed in the Dynameninae and any similarity to *Plakarthrium* is coincidental.

The possibility exists that Plakarthriidae are a highly derived early offshoot of a clade which also gave rise to flattened "cassidiniine" sphaeromatids. In this scenario some reversals may have occurred (e.g. free coxa 1) as well as numerous synapomorphies in limbs and pleotelson.

Plakarthrium Chilton, 1883

Plakarthrium Chilton, 1883: 74.—Hansen, 1905: 115.—Menzies, 1962: 128.—Wilson et al., 1976: 334–335. (type species: *Plakarthrium typicum* Chilton, 1883 by monotypy).

Chelonidium Pfeffer, 1887: 86 (type species *Chelonidium punctatissimum* Pfeffer, 1887 by monotypy).

Remarks. The genus has the characters of the family. Only Chilton (1883) gave a diagnosis.

Plakarthrium australiense sp. nov.

Figures 1–5

Material examined. Holotype. Australia, Tasmania, Bicheno, granite reef 50 m offshore, N end of "The Gulch" (41°53'S, 147°18'E), 7 m, encrusting foliose alga, SCUBA, G.C.B. Poore and H.M. Lew Ton, 22 Mar 1988 (stn TAS-87), NMV J47067 (1 ovigerous female, 3.2 mm, with 3 slides).

Paratypes. Collected with holotype: NMV J27472 (1 male, 2.2 mm; 8 females, 1.9–2.8 mm, 1.9–3.2 mm); NMV J47021 (1 male, 2.4 mm); NMV J47068 (2 females, 3.2, 2.3 mm); ZMH K-39833 (3 females).

Other material. Tasmania, Waterhouse Point, NMV J47066 (1 juvenile, 1.9 mm). Western Bass Strait, 6 km W of Currie, King I., (39°54.7'S, 143°43.4'E), 49 m, NMV J23890 (8 specimens, 1.0–1.6 mm). Pegleg Cove, Deal I., between Pulpit Cove and Winter Cove (39°28'S, 147°22'E), 6 m, NMV J23891 (1 male, 1.7

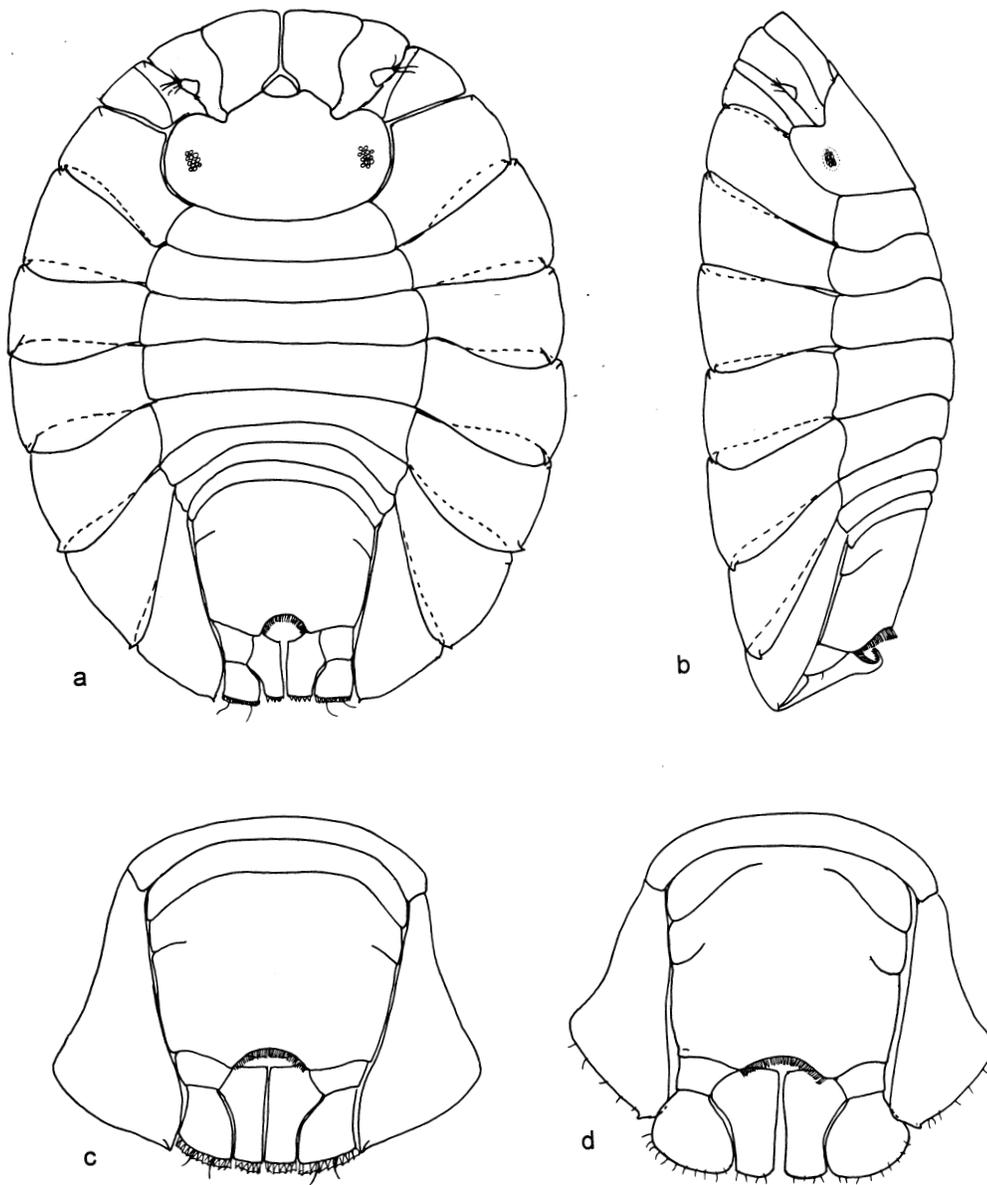


Figure 1. *Plakarthrium australiense* sp. nov. Holotype, NMV J47067: a, b, dorsal and lateral views. c, pereonite 7, pleotelson and uropods.

Plakarthrium typicum Chilton. Male, NMV J683: d, pereonite 7, pleotelson and uropods.

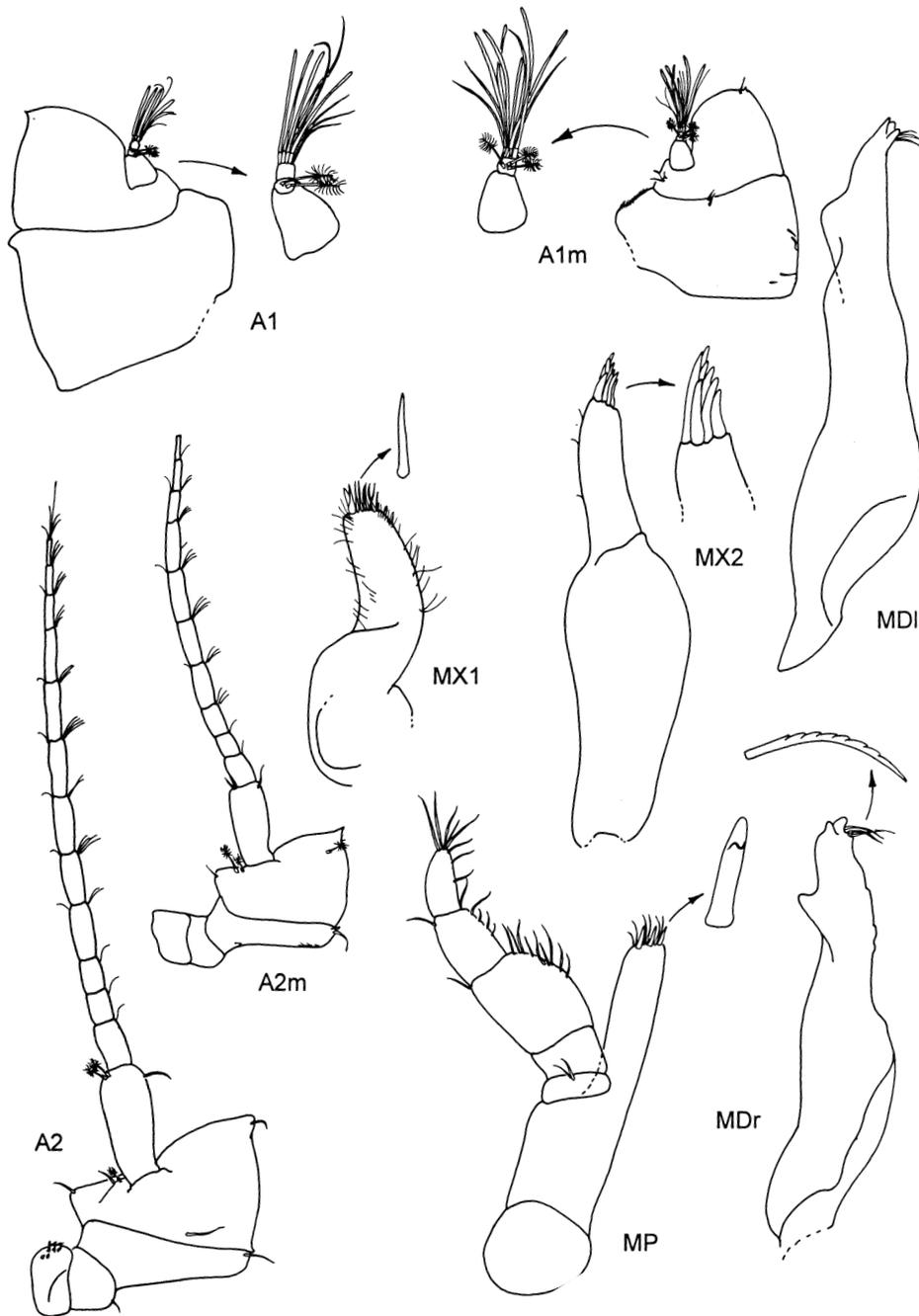


Figure 2. *Plakarthrium australiense* sp. nov. Holotype, NMV J47067: A1, A2, antennae 1, 2; MDl, MD r, left and right mandibles; MX1, MX2, maxillae 1, 2; MP, maxilliped. Paratype male, NMV J47021: A1m, A2m, antennae 1, 2.

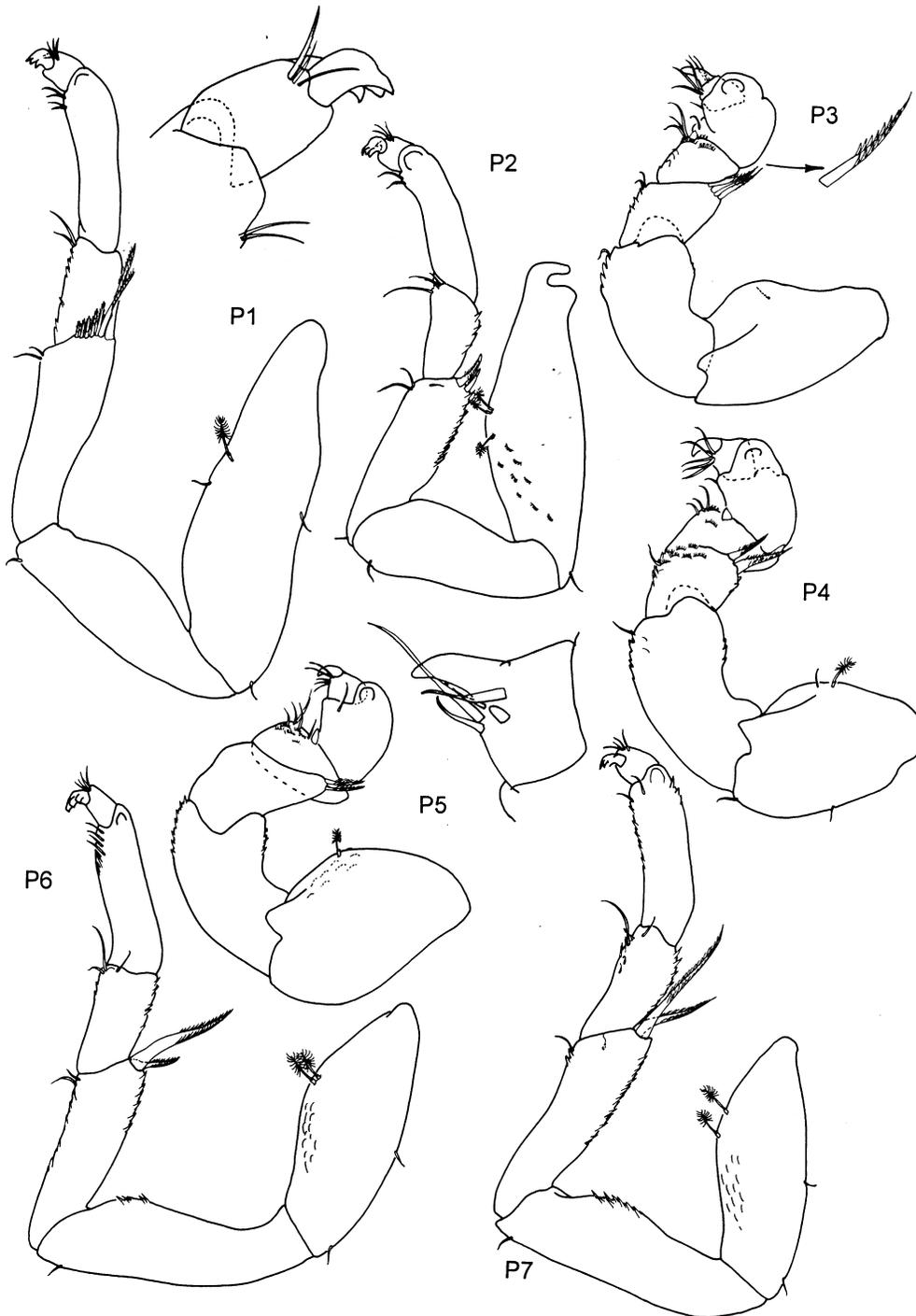


Figure 3. *Plakarthrium australiense* sp. nov. Holotype, NMV J47067: P1–P7, pereopods 1–7.

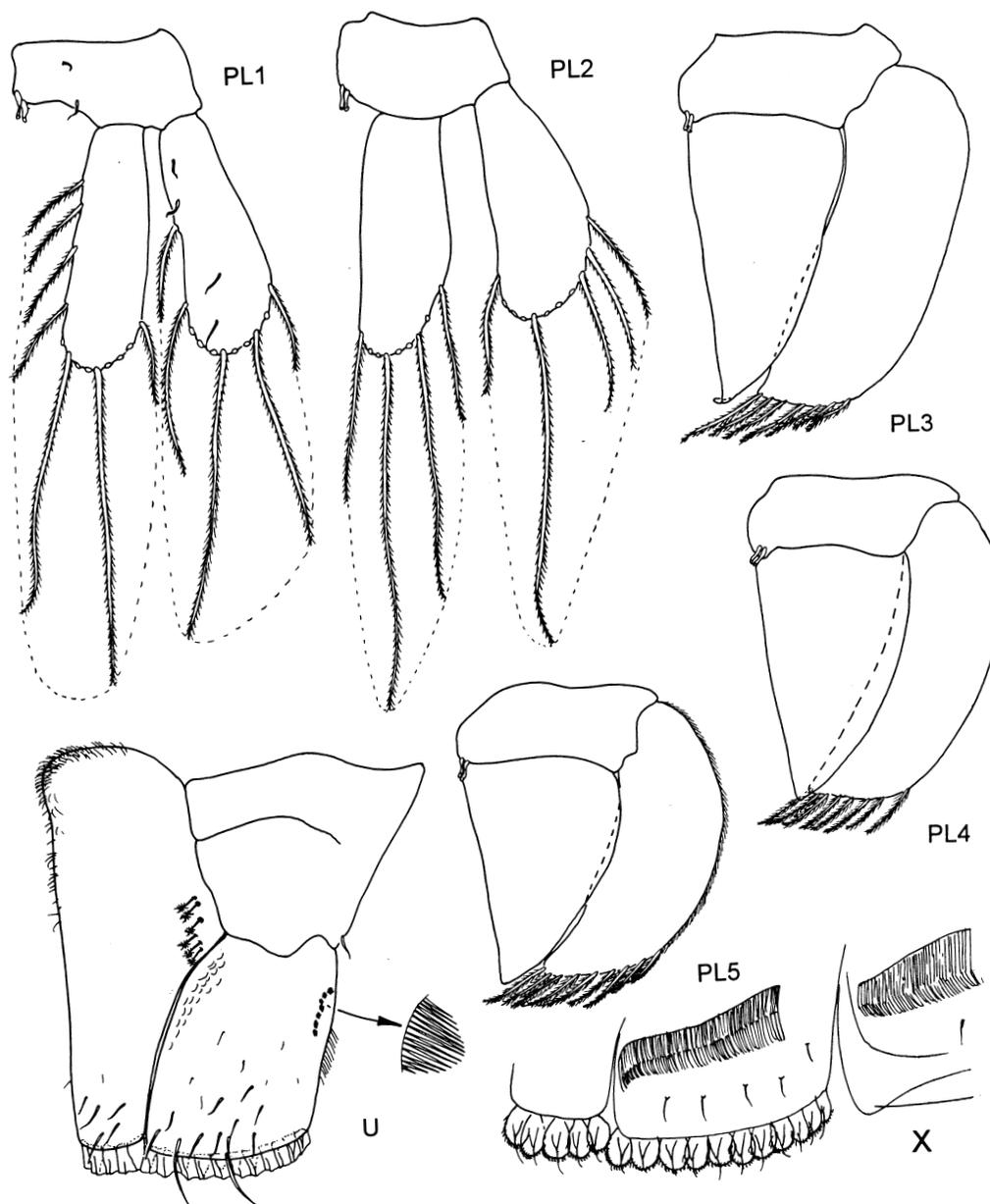


Figure 4. *Plakarthrium australiense* sp. nov. Holotype, NMV J47067: PL1–PL5, pleopods 1–5; U, right uropod; X, ventral view of margins of left uropod and coxa 7.

mm). Hogan I., Landing Beach (39°13'S, 146°59'E), ZMH K-39834 (1 male, 2.0 mm).

Victoria, 75 m SW of Eagles Nest, Venus Bay (38°40'S, 145°40'E), 8 m, NMV J23893 (1 male, 3.0 mm; 1 female, 2.0 mm, 2.0–3.0 mm). 1 km E of Harmers Haven, 500 m offshore (38°34'S, 145°40'E),

11 m, NMV J23896 (1 male, 2.1 mm; 1 female, 2.0 mm, 2.0–2.1 mm). Cape Paterson, E side (38°41'S, 145°36'E), 6–3 m, NMV J23895 (1 male, 1 female, 4 immature). 50 m S of Twin Reefs, Venus Bay (38°41'S, 145°39'E), 9 m, NMV J23894 (1 male, 2.0 mm). Wilsons Promontory, Hobbs Head, NE shore (39°2'S,

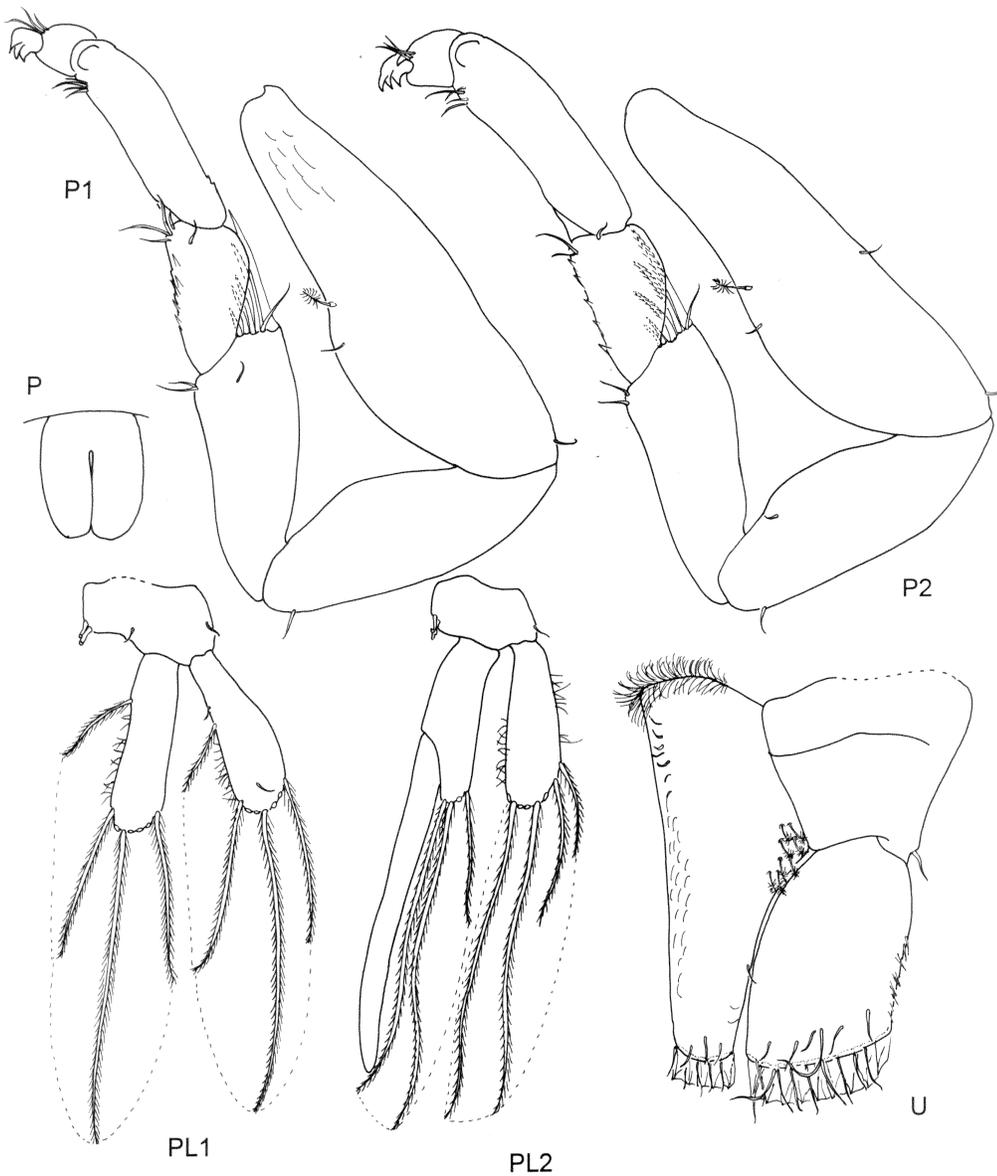


Figure 5. *Plakarthrium australiense* sp. nov. Paratype male, NMV J47021: P1, P2, pereopods 1, 2; PL1, PL2, pleopods 1, 2; P, penes; U, uropod.

146°28'E), NMV J47063 (1 female, 2.6 mm), Dutton Way, Portland (38°18.4'S, 141°36.4'E), 3 m, NMV J47065 (1 ovigerous female, 3.0 mm).

South Australia, Beachport, Snapper Point (37°29.3'S, 139°59.6'E), 6 m, NMV J20434 (1 female, 2.4 mm). NE side of Topgallant I., Investigator Group (33°43.00'S, 134°36.60'E), 12 m, NMV J23892 (1 male, 1.8 mm).

Western Australia, Breaksea I., SW corner (35°3.90'S, 118°2.50'E), 15 m, NMV J23887 (2 manca, 1 male, 1.0–1.9 mm); NMV J23888 (1 immature; 1 female, 2.1 mm; 4 males, 1.9–2.0, 1.6–2.1 mm). King George Sound, N of False I. (35°0.70'S, 118°10.10'E), 27 m, NMV J23889 (4 males, 1.7–2.6 mm; 2 females, 1.9, 3.0 mm, 1.7–3.0 mm).

Other species. *P. typicum*. New Zealand. Auckland region, Tawharanui Peninsula, 6 m, *Carpophyllum flexuosum*, R. Taylor, 3 Jun 1992, NMV J37102 (14). Opposite Edward Percival Marine Station, Kaikoura (42°25'S, 173°42'E), 2 m, algae on boulders, G.C.B. Poore et al., 23 Mar 1997 (stn NZ97-022), NMV J39561-J39654 (25). The Snares Islands, D.S. Horning, NMV J682 (male, with 3 slides); NMV J683 (several).

P. punctatissimum. South Georgia, Royal Bight, Moltke Harbour (54°30.58'S, 36°0.45'W), leaves of *Macrocystis*, Dr Karl von den Steinen, NMV J47311 (3 syntypes donated by Zoological Institute and Museum, Hamburg).

Diagnosis. Pleotelson with pleonite 1 fully indicated dorsally (not articulating), only pleonite 2 indicated laterally; pleotelson tapering to 80% of anterior width posteriorly. Distal margins of uropods aligned with margin of coxae. Coxae with acute posterior corners.

Description. Holotype female. Body c. 1.35 times as long as wide; ration of lengths of antenna 1 : head : pereon : pleotelson : uropod in midline = 13 : 18 : 33 : 27 : 9; widest at coxa 4 where each coxa comprises c. 27% of width. Head 1.9 times as wide as long, evenly rounded laterally, with excavated triangular front with triangular clypeus; eyes with c. 10 ommatidia. Pereonite 1 narrower than head; pereonite 3 widest; pereonites 6 and 7 shorter than others. Pleotelson with pleonite 1 fully indicated dorsally (not articulating), only pleonite 2 indicated laterally; pleotelson tapering to 80% of anterior width posteriorly; posterior notch semicircular, about third width of posterior margin, bordered by fine setae. Marginal articles of antennae 1 and 2 and coxae of pereopods 1–7 each with small triangular lobe on anterodistal and posterodistal corners; lower surface with flattened marginal surface (c. fifth of coxal length) defined proximally by a free skirt-like flange parallel to margin.

Antenna 1 peduncle with broad article 1, triangular article 2 and smaller tapering article 3 inserted in notch on lateral margin of article 2; flagellum of 2 articles, first ring-like with 2 pappose setae, second with 4 aesthetascs and 5 simple setae. Antenna 2 peduncle with small articles 1 and 2; article 3 short, broad; article 4 4-sided; article 5 cylindrical, longer than wide, inserting on underside of margin of article 4; flagellum of 12 cylindrical articles.

Mandible incisor with 2–3 obscure blunt teeth; spine row of 3 spines; without palp or molar. Maxilla 1 with single lobe having 7 short apical robust setae. Maxilla 2 with single lobe with 8 short apical setae. Maxilliped without epipod;

endite 4 times as long as wide, with 3 apical robust setae and 6 slender setae; palp with short article 1, longer article 2, substantially longer and broader article 3, convex and setose mesially, article 4 0.6 times as wide as article 4, article 5 as long as and shorter than article 4, with 9 mesial and distal setae.

Pereopod 1 elongate, longer than similar pereopod 2; pereopods 3–5 compact; pereopods 6–7 more elongate. Pereopod 1 merus with anterodistal row of complex setae; carpus half as long as merus, with minute tubercles on posterior margin; propodus narrow; dactylus compact with 3-toothed unguis. Pereopod 2 c. 85% length of pereopod 1; merus with 2 distal robust setae; compact dactylus with 3-toothed unguis. Pereopod 3 less than half length of pereopod 1; ischium with posterodistal denticles; merus with anterodistal row of complex setae; carpus almost triangular, with posterodistal short robust seta; propodus swollen; dactylus short, with simple curved unguis. Pereopods 4 and 5 similar to pereopod 3, 5 the most compact. Pereopod 6 about as long as pereopod 2; merus with 1 very stout and 1 shorter complex anterodistal setae; propodus with row of 4 simple posterior setae distally; short dactylus with 3-toothed unguis. Pereopod 7 longer but similar to pereopod 6.

Pleopod 1 peduncle twice as wide as long, with 2 coupling hooks on mesiodistal corner; rami attached on lateral half, not overlapping; endopod and exopod with 13 and 11 mesial and distal plumose setae respectively. Pleopod 2 peduncle wider than long, with 2 coupling hooks; rami not overlapping; endopod and exopod with 10 and 12 distal plumose setae respectively. Pleopod 3 with peduncle wider than long, with 2 coupling hooks; endopod triangular, without setae; exopod adjacent to endopod, with 7 distal plumose setae. Pleopods 4 and 5 similar to pleopod 3 but smaller and relatively wider; exopods with 8 and 9 distal plumose setae respectively.

Uropod peduncle strongly tapering; endopod attached mesially to peduncle, 2.5 times as long as greatest width, triangular in lateral view, with setose rounded margin anteriorly bordering respiratory orifice strongly produced vertically, with 6 pappose setae near articulation with peduncle, mesial margin straight, posterior margin curved and with c. 5 overlapping shingle-like scales; exopod c. 1.5 times as long as wide, with curved mesial margin against endopod, straight lateral margin, convex distal margin with c. 11 overlapping shingle-like scales.

Male. Differing slightly from female in some

proportions. Pleotelson more elongate. Antenna 1 with article 2 of peduncle more rounded; flagellum with 6 aesthetascs. Antenna 2 with flagellum of 10 articles. Pereopods 1 and 2 slightly more robust. Pleopod 2 endopod with appendix masculinis twice as long as endopod, attached two-thirds way along. Uropod with narrower peduncle and rami than in female. Penes oval, fused basally, attached to posterior margin of pereonite 7.

Distribution. Southern Australia, from central Victoria to southern Western Australia, including Tasmania; 6–49 m, on *Amphibolis*, *Ecklonia* holdfasts, red algae. No records from New South Wales (P. Berents, Australian Museum, pers. comm.).

Remarks. The Australian species differs from the other two species of *Plakarthrium* in having a clear demarcation dorsally of pleonite 1. In *P. typicum* (see Fig. 1d) and *P. punctatissimum* pleonite 1 is indicated only laterally. *Plakarthrium australiense* differs from *P. typicum*, which it most resembles, in having the pleotelson tapering rather than more or less parallel-sided, and the distal margins of the uropods aligned with the margin of the coxae. In *P. typicum*, the New Zealand species, the uropodal exopods are more oval and protrude beyond the end of coxae of pereopods 7 (Fig. 1d). *Plakarthrium typicum* lacks the acute corners of the coxae seen in the Australian species.

Plakarthrium australiense differs from *P. punctatissimum* more markedly. The latter has pleonites 1–4 indicated laterally and uropods produced more posteriorly.

The new species has a more pronounced lower marginal contact surface on coxae, antennae and uropods than the other species. This surface seals the underside of the animal and is made more effective by the skirt-like fringe along its inner edge.

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