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Bathycopea (Isopoda: Sphaeromatidea: Ancinidae) from Japan, with descriptions of two new species and redescription of *B. parallela* Birstein

MICHITAKA SHIMOMURA

Kitakyushu Museum of Natural History and Human History, 2-4-1 Higashida, Yahatahigashi-ku, Kitakyushu 805-0071, Japan. E-mail: shimomura@kmnh.jp

Abstract

Two new species of *Bathycopea* Tattersall, 1905 are described from Japan. *Bathycopea oculata* sp. nov. differs from its congeners in having laterally rounded pleonite 1, well-developed eye lobes with 43–57 ommatidia, uropod about 4–4.7 times as long as wide, blunt and broadly rounded distal corner of carpus of pereopod 1, and the propodus of male pereopod 2 about 2.9 times as long as carpus. *Bathycopea dicarina* sp. nov. is distinctive in having pleotelson with two dorsal carinae and the merus and carpus of male pereopod 2 slightly longer than ischium. *Bathycopea parallela* Birstein, 1963 is redescribed using newly collected specimens from the region of the type locality. A key to species of the genus is provided.

Key words: new species, *Bathycopea*, Ancinidae, Sphaeromatidea, Isopoda

Introduction

The Ancinidae is a small family in the suborder Sphaeromatidea with nine species in two genera, all from shallow to deep waters (Kensley *et al.* 1996). The family has been studied mainly by Tattersall (1905), Menzies and Barnard (1959), Birstein, (1963), Loyola e Silva (1971) and Bruce (1991, 1993), and, more recently, by Brandt & Poore (2003). The most important taxonomic character is the uropod shape with 1 long tapering ramus lying alongside telson (Brandt & Poore 2003). *Bathycopea* Tattersall, 1905 is a small genus in the family, now containing four species, all of which occur from a depth of 17 m to 4070 m: *B. typhlops* Tattersall, 1905 from Ireland (type locality), South Africa (Kensley 1978) and southeastern Australia (Bruce 1991); *B. daltonae* (Menzies & Barnard, 1959) from California, USA (type locality), *B. ivanovi* Birstein, 1963 from Kamchatka (type locality), and *B. parallela* Birstein, 1963 from off the Pacific coast of northern Honshu (type locality).

A recent investigation yielded three species of *Bathycopea* from shallow to deep waters of Japan, including two new species. Based on these materials, the present paper herein describes *Bathycopea oculata* sp. nov. and *B. dicarina* sp. nov., redescribes *B. parallela* Birstein, 1963 and provides a key to species of the genus.

Materials and methods

The gear used for the collection was a sledge net, dredge or ORE beam trawl of 3 m span. Sediment samples containing specimens on board were suspended in sea water in plastic containers or buckets, and the suspensions containing light particles such as small organisms were decanted through a sieve with a pore size of 0.1–0.5 mm. The processed sediment samples were fixed in 5–10 % borate buffered formalin sea-water or 70%

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ethanol. Specimens were sorted and preserved in 70% ethanol. Each individual was dissected appendage mounted on glass microslides and observed using a compound microscope. For SEM observation (Hitachi S-3000N), specimens were dissected, dehydrated through an alcohol series, freeze-dried, and sputter-coated with platinum. Australian specimens of *Bathycopea typhlops* Tattersall were borrowed from the Australia from the Australian Museum, Sydney for comparative study. Total length as indicated in "Material examined" was measured from the tip of the head to the end of the pleotelson.

Morphological terminology used herein follows that of Bruce (2003). The following abbreviations are used in the text: KMNH = Kitakyushu Museum of Natural History and Human History, CBM = Natural History Museum and Institute, Chiba.

Systematics

Family Ancinidae Dana, 1852

Genus *Bathycopea* Tattersall, 1905

Bathycopea Tattersall, 1905: 12; Loyola e Silva, 1971: 215; Kussakin, 1979: 366; Harrison, 1984: 370; Harrison & Ellis, 1991: 933.
Ancinella Hansen, 1905: 114.
Type species. *Bathycopea typhlops* Tattersall, 1905, by monotypy.
Other species. *B. daltonae* (Menzies & Barnard, 1959), *B. parallela* Birstein, 1963, *B. ivanovi* Birstein, 1963.

Diagnosis. Pleon and pleotelson without process. Pleotelson posterior margin entire, ventrally excavate, without exit channel; posterior margin with short posterior projection at each side. Antennule peduncle article 1 twice as long as article 1, articles 1 and 2 robust; article 3 slender. Maxilliped: endite broad; articles 3 and 4 of palp without medial lobes. Pereopod 1 markedly subchelate; propodus sub-rectangular. Pleopods 1–3 with both rami longitudinally oblique. Male pleopod 2: exopod well-developed, ovate, reaching to half of endopod. Uropodal protopod widened laterally; endopod not stylet-shaped.

Key to species of *Bathycopea*

1. Pereonites 1–5 increasing in width posteriorly 2
- Pereonites 1–5 subequal in width ..... *B. parallela* Birstein
2. Uropods having large serrations on lateral margin ..... *B. ivanovi* Birstein
- Uropods smooth on lateral margin, without large serrations 3
3. Ommatidia and pigments of eyes present 4
- Ommatidia and pigments of eyes absent 5
4. Pleotelson abruptly decreasing in width; uropod about 5.4 times as long as width, without short tooth medial-distally ..... *B. daltonae* (Menzies & Barnard)
- Pleotelson gradually decreasing in width; uropod 4–4.7 times as long as width, with short tooth medial-distally ..... *B. oculata* sp. nov.
5. Pleotelson with double carina dorsally; merus and carpus of male pereopod 2 longer than ischium ..... *B. dicarina* sp. nov.
- Pleotelson with single carina dorsally; merus and carpus of male pereopod 2 shorter than ischium ..... *B. typhlops* Tattersall

***Bathycopea oculata* sp. nov.**
Figs 1–7

Material examined. Holotype. Male, 2.6 mm (KMNH IvR 700,033), dissected and mounted on glass slides, St.4-2, off Cape Toi, Miyazaki Prefecture, 31º26.20'N, 131º39.84'E-31º25.65'N, 131º39.62'E, 528–523 m, sand, 3 m ORE beam trawl, TRV *Toyoshio-maru*, 18 May, 2004, collected by MS.

Paratypes. Ovigerous female, 4.5 mm (KMNH IvR 700,030), dissected and mounted on glass slides, ovigerous female, 4.5 mm (KMNH IvR 700,031), dissected and mounted on aluminum stubs for SEM observation, ovigerous female with 17 juveniles, 4.5 mm (KMNH IvR 700,032), dissected and mounted on glass slides, TRV *Toyoshio-maru*, St. 9, off Mi-shima Island, Yamaguchi Prefecture, Sea of Japan, 34º47.40'N, 131º19.80'E, 99 m, sand and mud, sledge net, 18 November, 1999, collected by MS; 3 non-ovig. females, 1.7 mm (KMNH IvR 700,252), 1.4 mm (KMNH IvR 700,253), 1.2 mm (KMNH IvR 700,254), whole specimens in glass bottle, St. X(5'), off Amami-oshima, Kagoshima Prefecture, 28º22.37'N, 129º15.97'E-28º22.28'N, 129º15.43'E, 290 m, sand, 3 m ORE beam trawl, 21 May, 2004, collected by Dr. S. Ohtsuka.

FIGURE 1. *Bathycopea oculata* sp. nov. holotype male (KMNH IvR 700,033), habitus, dorsal.

Diagnosis. Body dorsally smooth. Pereonites 1 to 7 increasing in width posteriorly, without dorsal keels. Pereonite 2 broadly projected anterior-laterally. Pleonite 1 strongly arched dorsally; lateral margins broadly rounded. Pleotelson gradually decreasing in width posteriorly, with single dorsal carina. Eye lobes well-developed, with 43–57 ommatidia. Uropod moderately broad, about 4–4.7 times as long as width, with short tooth medial-laterally, without large serrations on lateral margin. Epistome triangular in shape, apically rounded,

not surpassing frontal margin of antennule peduncular article 1; margins straight. Pereopod 1: distal corner of carpus blunt, broadly rounded. Pereopod 2 in male: merus and carpus shorter than ischium; propodus about 2.9 times as long as carpus, slightly curved inward, without proximal projections, with 3 sensory robust setae ventral-proximally and simple seta ventral-distally, ventral-distally denticulated; dactylus as long as propodus, curved inward, with few short simple setae.

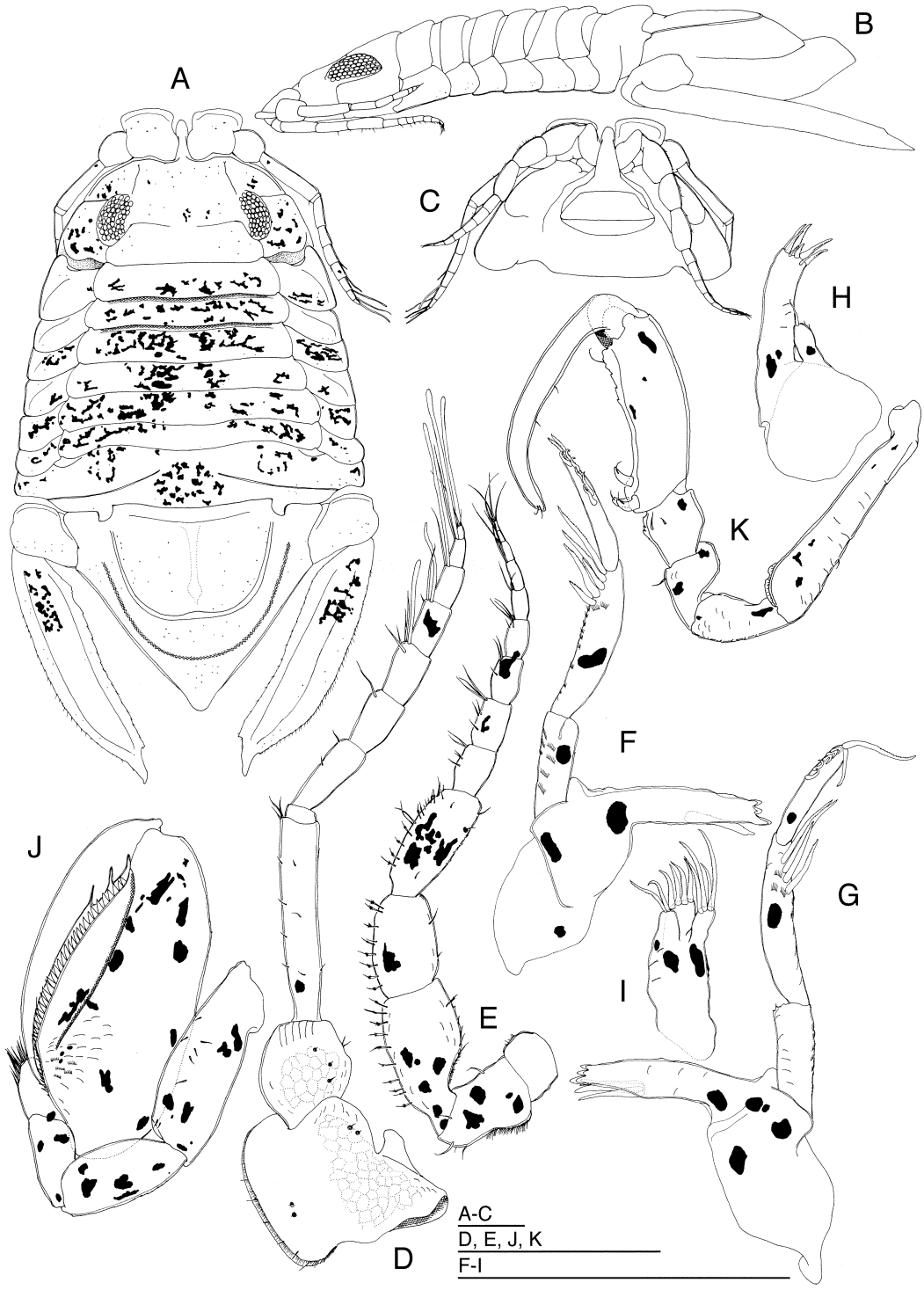

FIGURE 2. *Bathycopea oculata* sp. nov. A–K, holotype male (KMNH IvR 700,033): A, habitus, dorsal; B, habitus, lateral; C, head, ventral; D, right antenna 1, dorsal; E, right antenna 2, dorsal; F, left mandible, ventral; G, right mandible, ventral; H, right maxilla 1, ventral; I, right maxilla 2, dorsal; J, right pereopod 1, medial; K, right pereopod 2, medial. Scale = 300 μm.

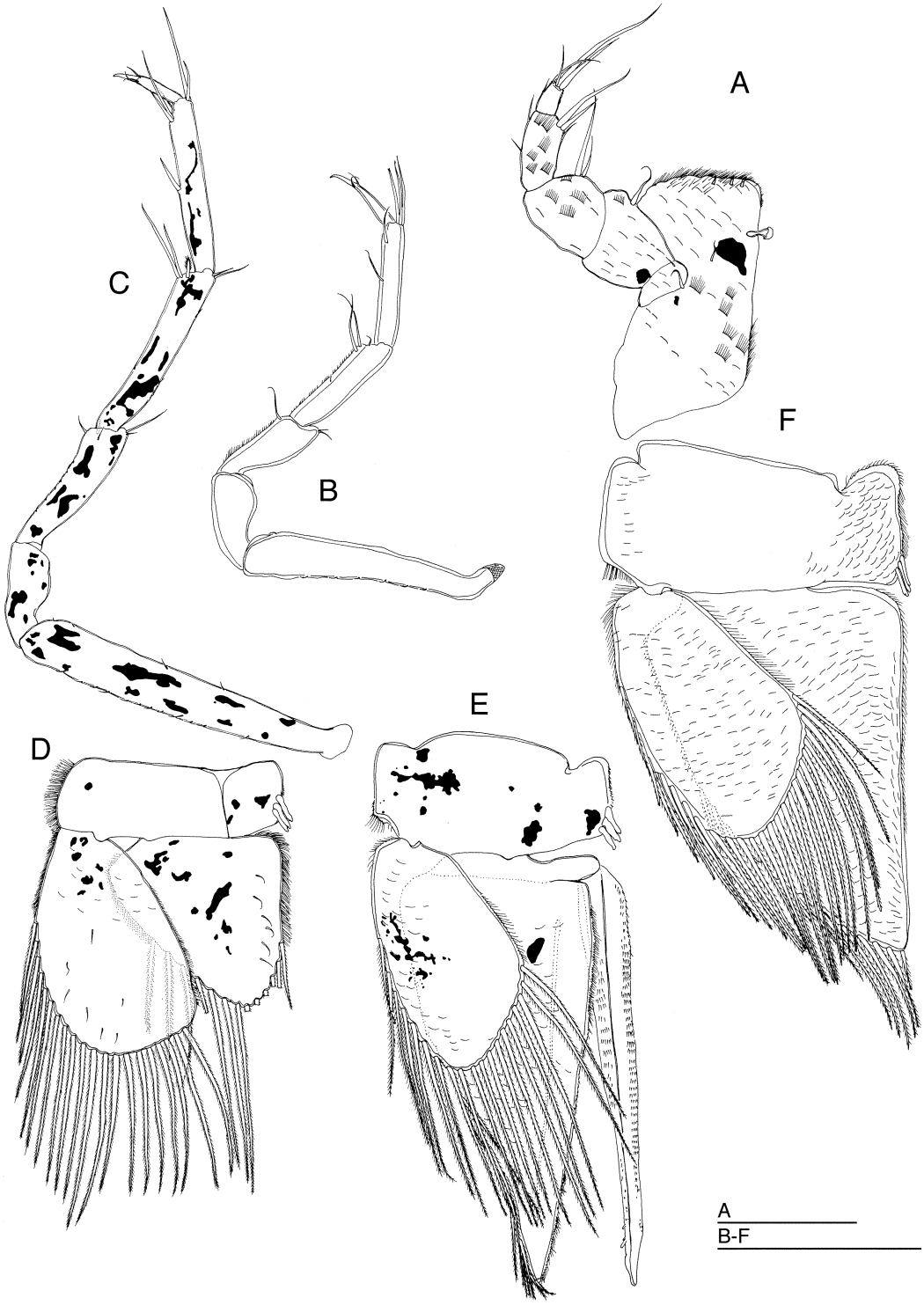

FIGURE 3. *Bathycopea oculata* sp. nov. A, C–E, holotype male (KMNH IvR 700,033), B, F, paratype female (KMNH IvR 700,030): A, right maxilliped, ventral; B, right pereopod 2, medial; C, right pereopod 7, medial; D, right pleopod 1, ventral; E, right pleopod 2, ventral; F, right pleopod 2, ventral. Scales = 300 μm.

Description of the holotype male. *Body* (Fig. 2A, B) about 1.6 times as long as maximum width. Head (Fig. 2A) partly fused with pereonite 1. *Pleon* (Fig. 2A, B) slightly broader than pereonite 7. *Pleotelson* (Fig. 2A) about 1.2 times as broad as long, apically rounded; central part distinguished by ridge smooth and flattened dorsally. *Uropod* (Fig. 2A) marginally crenulated, with many short setae laterally.

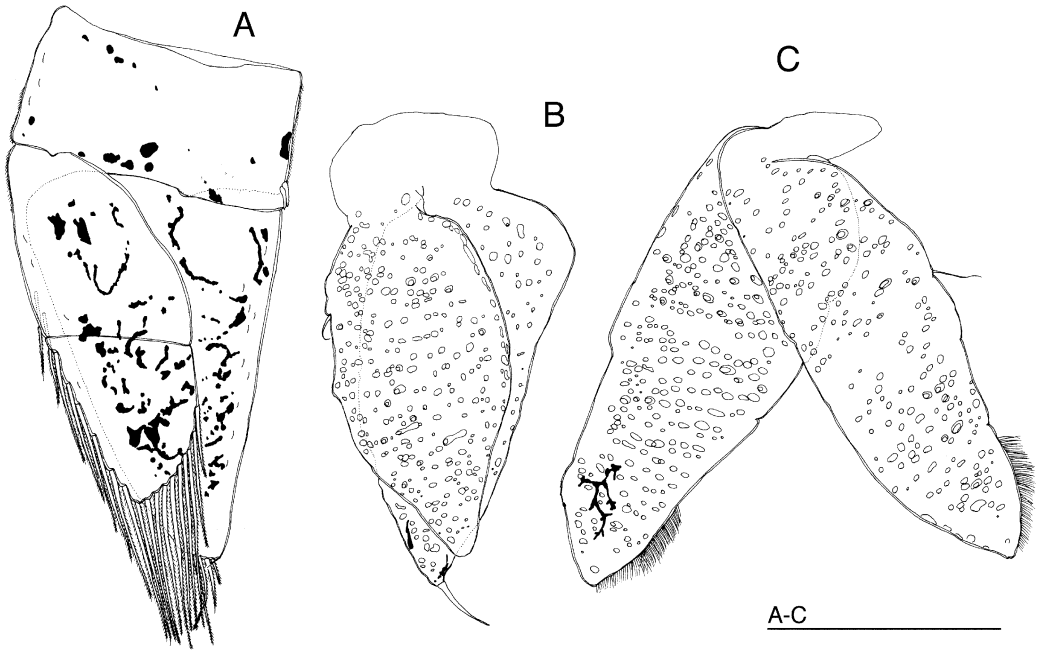

FIGURE 4. *Bathycopea oculata* sp. nov. A–C, holotype male (KMNH IvR 700,033): A, right pleopod 3, ventral; B, right pleopod 4, ventral; C, right pleopod 5, ventral. Scale = 300μm.

Antennule (Fig. 2A, D) peduncular article 1 about as long as broad, dorsally with 4 short setae and 11 simple scales, cuticularized on medial margin; article 2 with 5 short setae and few simple scales, strongly ridged distal-dorsally, cuticularized on medial margin; article 3 longest, with few short medial, lateral and dorsal setae. Flagellum of 8 articles, shorter than peduncle: article 1 minute; article 2 shorter than peduncular article 2; article 3 half as long as article 2, with medial seta; articles 4 to 8 decreasing in length gradually, each articles with some simple setae and aesthetascs distally.

Antenna (Fig. 2C, E) article 1 with fine setae laterally; article 2 broadest at nearly proximal base, with several setae medially and simple seta laterally and distally; article 3 longest and widest, with 10 setae medially and 1 setae and many fine setae laterally; article 4 as long as article 2, with 9 setae medially and 2 simple setae laterally. Flagellum about as long as peduncle: articles 1–3 with some simple scales; article 1 slightly longer than peduncular article 4, with many setae medially and few setae laterally; article 2 about 0.3 times as long as article 1, with 5 setae medially; article 3 as long as article 2, with 6 medial setae; articles 4 to 10 decreasing in length, each with some simple setae.

Left mandible (Fig. 2F) article 1 of palp robust, with some setulated scales, with simple seta ventrally; article 2 about 1.5 times as long as article 1, with 5 pectinate setae, and some setulated scales; article 3 shortest, with 8 pectinate setae. Incisor slender, widest at middle part. Right mandible (Fig. 2G): article 1 of palp robust, with some setulated and simple scales; article 2 with 4 pectinate setae, some simple and setulated scales; article 3 about 0.3 times as long as article 2, with 7 pectinate setae.

Maxillule (Fig. 2H) with mesial lobe bearing 1 apical long and few fine setae; lateral lobe with 6 apical stout serrate and 2 simple setae, and few setulated scales.

Maxilla (Fig. 2I) with mesial lobe bearing 2 apical simple spines and 3 setulated scales; middle lobe with 4 apical pectinate setae; lateral lobe with 4 apical simple setae.

Maxilliped (Fig. 3A) article 1 with ventral seta and few simple scales; article 2 trapezoidal, about 3 times as long as article 1, with 1 medial seta, and setulated scale and many simple scales; article 3 as long as article 2, with 2 long distal-medial setae and 4 setulated and 4 simple scales; article 4 narrow, slightly shorter than article 3, with 3 distal-medial and 2 lateral setae, and 6 setulated scales; article 5 minute, with 4 apical long

and few lateral short setae; endite trapezoidal, bearing many fine marginal setae, with many setulated and simple scales ventrally, and coupling hook medially.

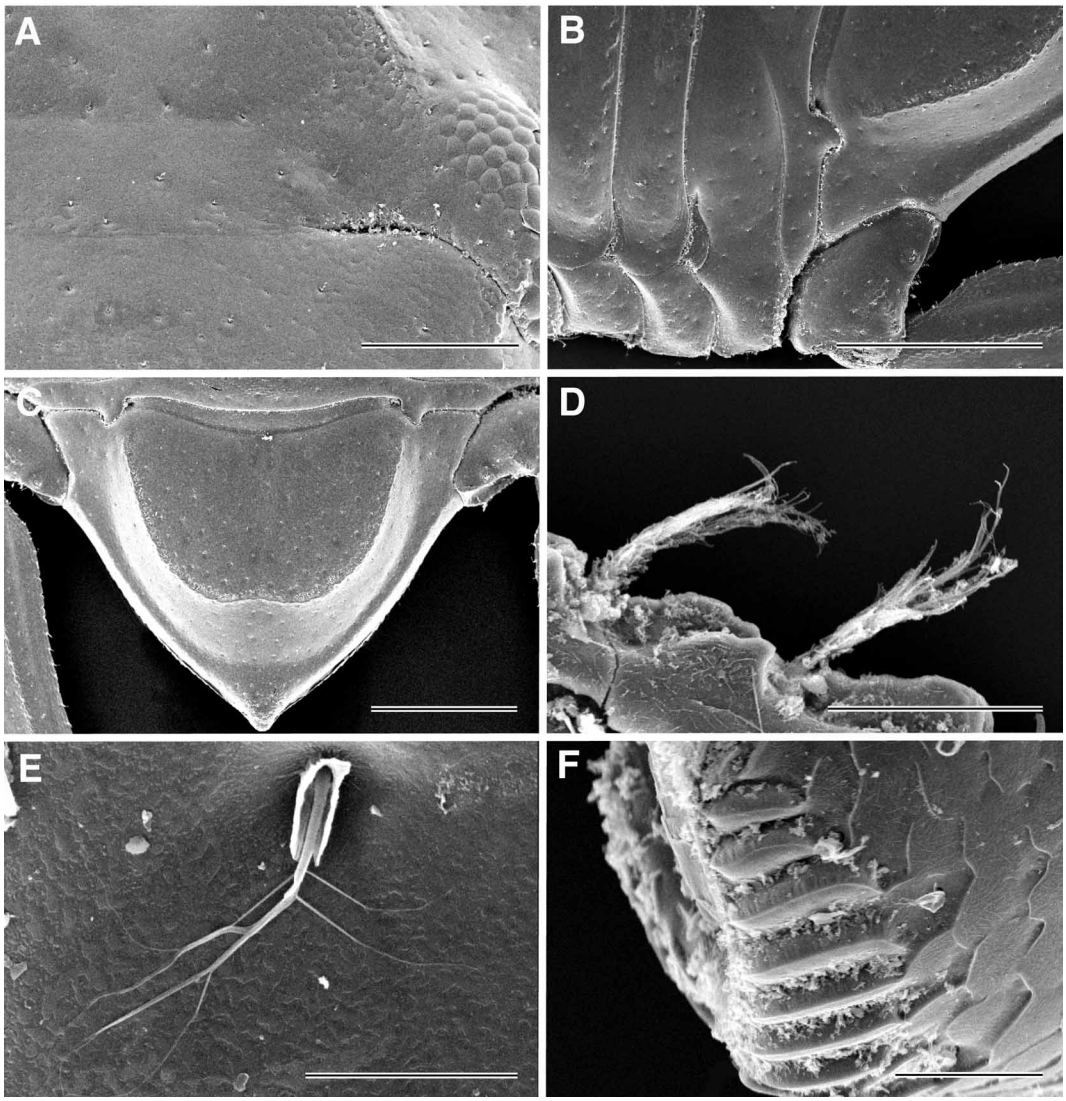

FIGURE 5. *Bathycopea oculata* sp. nov. A–F, paratype female (KMNH IvR 700,031): A, surface of head and pereonite 1, dorsal; B, lateral part of pereonites 5–7 and pleon, dorsal; C, pleotelson, dorsal; D, penicillate setae on upper lateral margin of uropod; E, branched seta in socket-like sheath on pereonite 7, dorsal; F, file-like structure of article 2 of antenna 2, dorsal. Scales = A, 180 µm; B, C, 600 µm; D, F, 30 µm; E, 12 µm.

Pereopod 1 (Fig. 2J) basis robust, dorsally with 8 short setae; ischium about 0.7 times as long as basis, without setae; merus trapezoidal, about half as long as ischium, without setae; carpus as long as merus, distally rounded, distally with many short setae; propodus with row of triangular robust setae on palm, proximal-medially with some setulated and simple scales; dactylus stylet-like, with 2 blunt teeth proximal-ventrally, reaching to carpus, without setae.

Pereopod 2 (Fig. 2K) basis with short simple seta and many simple scales; ischium about 0.3 times as long as basis, with few simple scales; merus subtriangulate, shorter than ischium, with simple seta ventral-distally; carpus trapezoidal, about as long as merus, with 2 simple setae medially, ventral-distally denticulated; propodus robust, slightly curved inward, with 3 robust sensory setae ventral-proximally and simple seta ventral-distally, ventral-distally denticulated; dactylus slender, about as long as propodus, curved inward, with 2 ventral and 2 apical short simple setae.

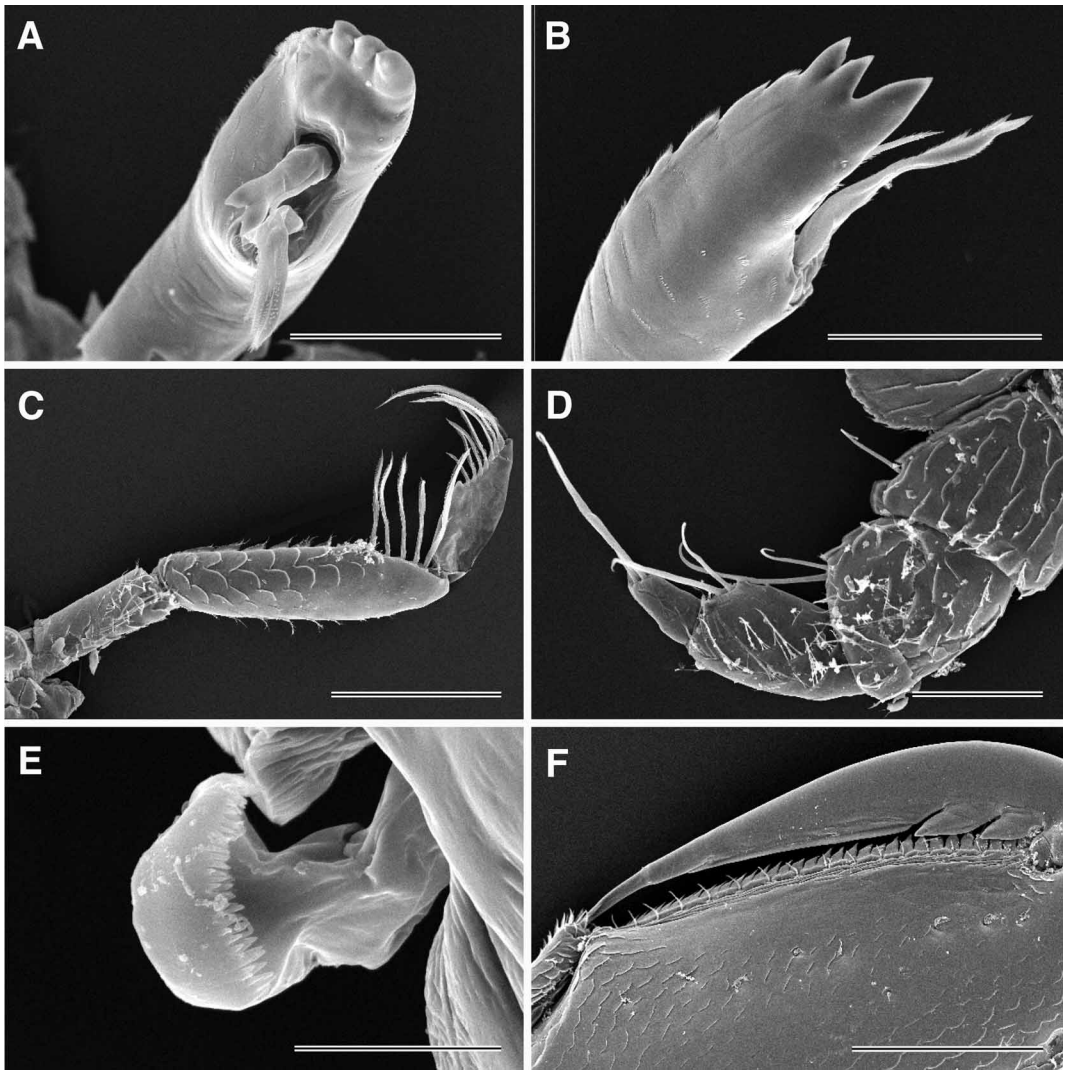

FIGURE 6. *Bathycopea oculata* sp. nov. A–F, paratype female (KMNH IvR 700,031): A, incisor of left mandible, medial; B, incisor of right mandible, lateral; C, palp of left mandible, ventral; D, palp of right maxilliped, ventral; E, coupling hook of right maxilliped, ventral; F, palm of left pereopod 1, lateral. Scales = A, B, D, 60 µm; C, 120 µm; E, 12 µm; F, 180 µm.

Pereopod 7 (Fig. 3C) basis with 12 short ventral and 4 dorsal setae; ischium about 0.3 times as long as basis, without setae; merus about twice as long as ischium, with 1 long and 6 short setae ventrally, 2 simple setae dorsal-distally and simple seta medial-distally and lateral-distally; carpus longer than merus, distal-ventrally with 2 long setae and broom seta, and with 2 setae dorsal-distally; propodus about 0.9 times as long as carpus, with 3 long distal-ventral, 1 long ventral and 2 long distal-dorsal setae; dactylus narrowest article; distally with 3 short simple seta and unguis

Pleopod 1 (Fig. 3D) with some simple scales ventrally: peduncle about 2.8 times as broad as long, with 3 coupling hooks distal-medially and few fine setae medially, and many short setae laterally; endopod about 2.1 times as long as peduncle, slightly broader than long, bearing many long plumose marginal setae and fine simple setae; exopod narrower than endopod, longer than endopod, with many long plumose setae and many fine setae marginally and few simple short setae ventrally.

Pleopod 2 (Fig. 3E) with some simple scales ventrally: peduncle about 2.1 times as broad as long, with 3 coupling hooks distal-medially and many fine setae marginally; endopod moderately narrow, triangulate, about 2.3 times as long as broad, 3.6 times as long as peduncle, bearing some long plumose and fine simple

setae; appendix masculina as long as endopod, with fine microtrichs ventrally; exopod ovate, about 0.6 times as long and about 0.7 times as wide as endopod, with many long plumose and many fine setae marginally.

Pleopod 3 (Fig. 4A) with some simple scales ventrally: peduncle longer than those of pleopods 1 and 2, about 2.1 times as broad as long, with 2 coupling hooks distal-medially and many fine short setae marginally; endopod broad, about 2.3 times as long as peduncle, longer than broad, bearing 4 short plumose setae apically; exopod articulated, bearing many plumose marginal setae.

Pleopod 4 (Fig. 4B): endopod longer than exopod, tapering to apex, with simple seta apically; exopod pyriform in shape, about twice as long as broad, bearing simple seta laterally.

Pleopod 5 (Fig. 4C): endopod about 2.3 times as long as broad, with 2 notches proximal-medially and many fine setae distal-medially; exopod as long as endopod, with simple seta medially and many fine setae distal-medially.

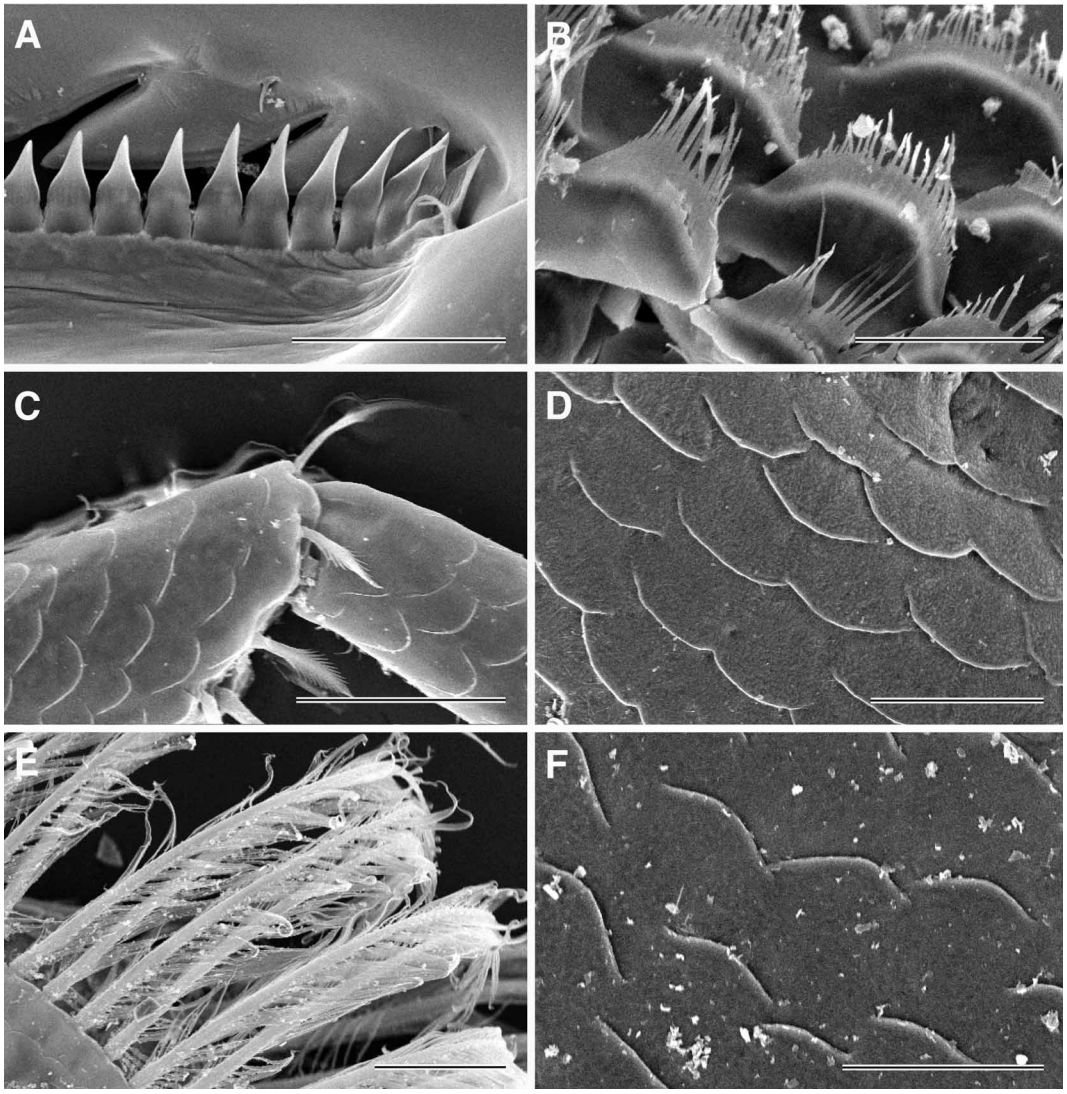

FIGURE 7. *Bathycopea oculata* sp. nov. A–F, paratype female (KMNH IvR 700,031): A, blunt teeth and triangulate spines on right pereopod 1, medial; B, setulated scales on propodus of right pereopod 1, dorsal; C, feather-like setae on right pereopod 7, lateral; D, simple scales on pereopod 7, dorsal; E, plumose setae on pleopod 1, dorsal; F, simple scales on pleopod 1, dorsal. Scales = A, C, E, 60μm; B, 18 μm; D, E, 30 μm.

Description of the paratype female. *Pereopod 2* (Fig. 3B): basis with 6 short ventral and 1 dorsal-distal setae; ischium about 0.3 times as long as basis, without setae; merus as long as ischium, with 1 long and many fine setae ventrally and 2 short setae dorsally; carpus longer than merus, with 2 long ventral-distal and many

fine ventral setae; propodus as long as carpus, with 2 long ventral and 3 dorsal-distal setae; dactylus narrowest article; with 2 distal setae and curved unguis.

Pleopod 2 (Fig. 3F) with many simple scales ventrally: peduncle about 2.1 times as broad as long, with 3 coupling hooks distal-medially and many fine setae marginally; endopod broad, about 3 times as long as peduncle, longer than broad, bearing many long plumose marginal setae and fine simple setae; exopod ovate, about 0.8 times as long as endopod, with many long plumose and many fine setae marginally.

Additional notes on paratype. One paratype female was observed with SEM (Figs. 5–7).

Body (Fig. 5A–C) moderately smooth: setation scattered. Cephalon (Fig. 5A) completely fused with pereonite 1 at middle part. Dorsal setae (Fig. 5E) on pereon branched, arising from sheath. Marginal setae on uropods (Fig. 5D) penicillate. Dorsal-distal part of antennule peduncular article 2 (Fig. 4F) strongly ridged. Incisors of right mandible (Fig. 6A) with many scales having row of short setae; lacinia mobilis with 2 cusps, branched at its base; molar process setulated distally. Incisor with left mandible (Fig. 6B) with many scales, with setulate robust seta and molar process. Mandibular palp (Fig. 6C): article 2 with 23 curved simple scales, marginally setulated; article 3 triangulate, distally pointed, without scales. Maxilliped palp (Fig. 6D): scales on article 2 nearly straight, without setae; scales on articles 3 and 4 nearly straight, with long setae; article 5 without scales. Coupling hook of maxilliped (Fig. 6E) curved ventrally; inner margin denticulate. Pereopod 1 (Figs. 6F, 7A, B): palm of propodus with row of many short simple setae and triangulate setae; scales of propodus with many setae agglutinated on basis. Pereopod 7 (Fig. 7C, D): distal setae on carpus feather-like, broad apically; scales simple without setae. Pleopod 1 (Fig. 7E, F): plumose setae consisting of robust trunk and many thin, membranous setae; scales rudimentary, without setae.

Colour. Colour in life (Fig. 1) yellowish white, with dark brown chromatophores. Eyes: pigment colour brownish red.

Remarks. Both *Bathycopea oculata* sp. nov. and *Bathycopea daltonae* from the shallow-water habitats in California have eyes. *B. oculata* is, however, distinguished from *B. daltonae* by the following features (those of *B. daltonae* in parentheses): uropod about 4–4.7 times as long as width, with short tooth medial-laterally (5.4 times as long as width, without short tooth medial-laterally) and pleotelson gradually decreasing in width posteriorly (more sharply decreasing).

Etymology. From the Latin *oculus*, referring to the well-developed eyes with many ommatidia.

Bathycopea dicarina **sp. nov.**

Figs 8–13

Material examined. Holotype. Male, 4.1 mm (KMNH IvR 700,255), dissected and mounted on glass slides, RV *Tansei-maru*, St. BT-1, Tosa Bay, Kochi Prefecture, 33º11.1'N, 133º40.1'E-33º11.9'N, 133º41.0'E, 518–522 m, 3 m ORE beam trawl, 25 June, 2000, collected by Dr. T. Akiyama.

Paratypes. 2 males, 4.0 mm (KMNH IvR 700,256), dissected and mounted on aluminum holders for a SEM observation, 4.4 mm (KMNH IvR 700,257), non-ovig. female, 2.6 mm (KMNH IvR 700, 258), whole specimens in glass bottle, same data as holotype; male, 4.2 mm (KMNH IvR 700,259), non-ovig. female, paratype, 4.3 mm (KMNH IvR 700,260), dissected and mounted on glass slides, RV *Tansei-maru*, St. EN-5, Enshu-nada, Shizuoka Prefecture, 34.05º42.80'N, 137º57.28.70'E-34.04º66.70'N, 137º56.30.80'E, 952–1060 m, 3 m ORE beam trawl, 3 May, 2004, collected by Dr. T. Akiyama.

Diagnosis. Body dorsally smooth. Pereonites 1 to 7 increasing in width posteriorly, without dorsal keels. Pereonite 2 anterior-laterally projected: lateral projection broad. Pleonite 1 tapering laterally, slightly arched dorsally. Pleotelson gradually decreasing in width posteriorly, with double carina dorsally. Eye lobes rudimentary, without ommatidia. Epistome apically pointed, narrow, reaching to frontal margin of antennule peduncular article 1; margins curved laterally. Uropod moderately narrow, about 7.5 times as long as width, without

large serrations on lateral margin. Pereopod 1: distal corner of carpus pointed. Pereopod 2 in male: merus and carpus slightly longer than ischium; propodus about 1.2 times as long as carpus, nearly straight, without proximal projection, with 5 robust sensory setae and some simple scales ventrally; dactylus slender, about 0.7 times as long as propodus, curved inward, with few apical short simple setae.

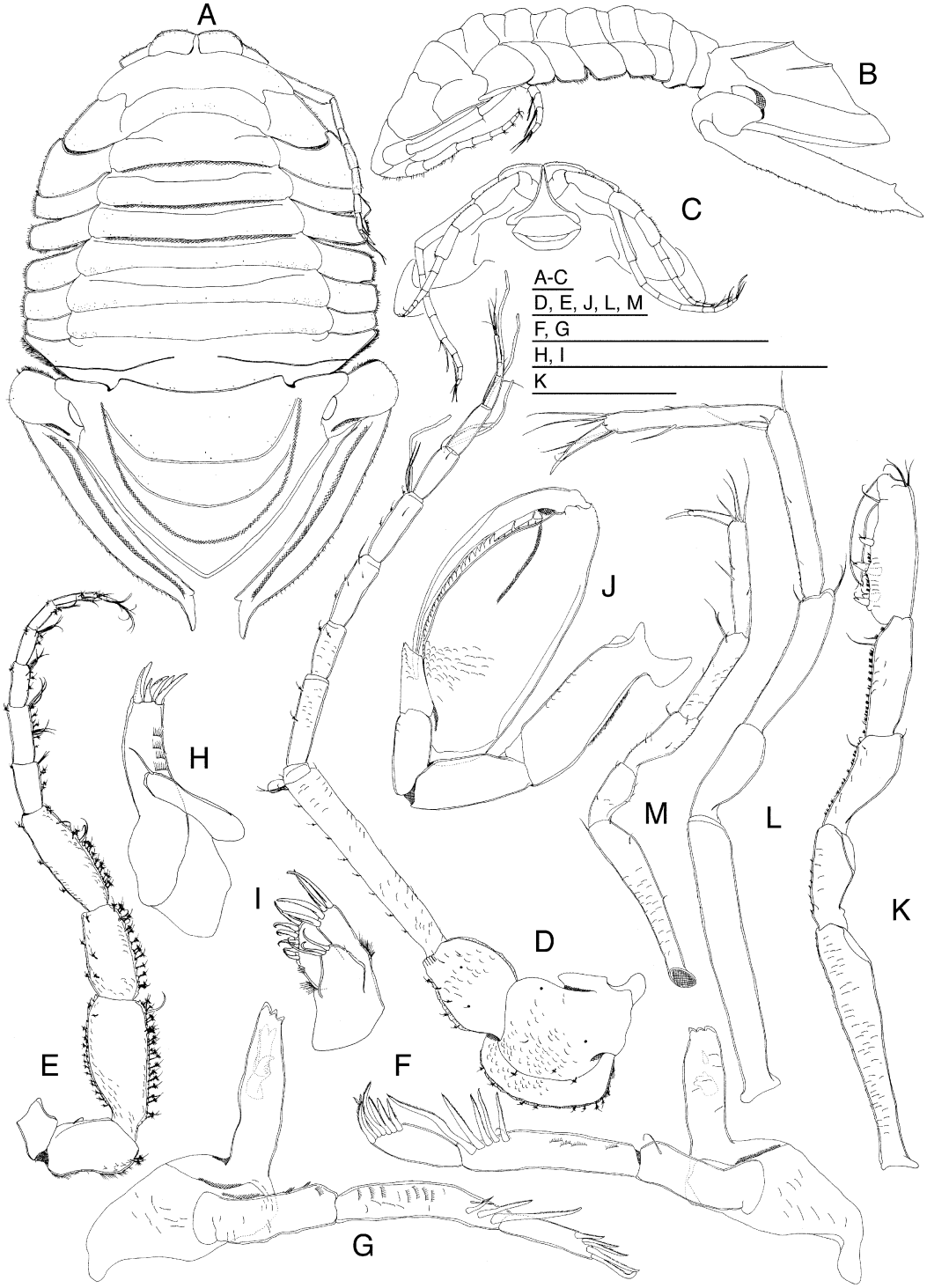

FIGURE 8. *Bathycopea dicarina* sp. nov. A–L, male (KMNH IvR 700,255), M, female (KMNH IvR 700,260): A, habitus, dorsal; B, habitus lateral; C, head, ventral; D, right antenna 1; dorsal; E, right antenna 2, ventral; F, right mandible, lateral; G, left mandible, lateral; H, right maxilla 1, ventral; I, right maxilla 2, medial; J, right pereopod 1, medial; K, left pereopod 2, lateral; L, right pereopod 7, medial; M, right pereopod 2, medial. Scales = 300 µm.

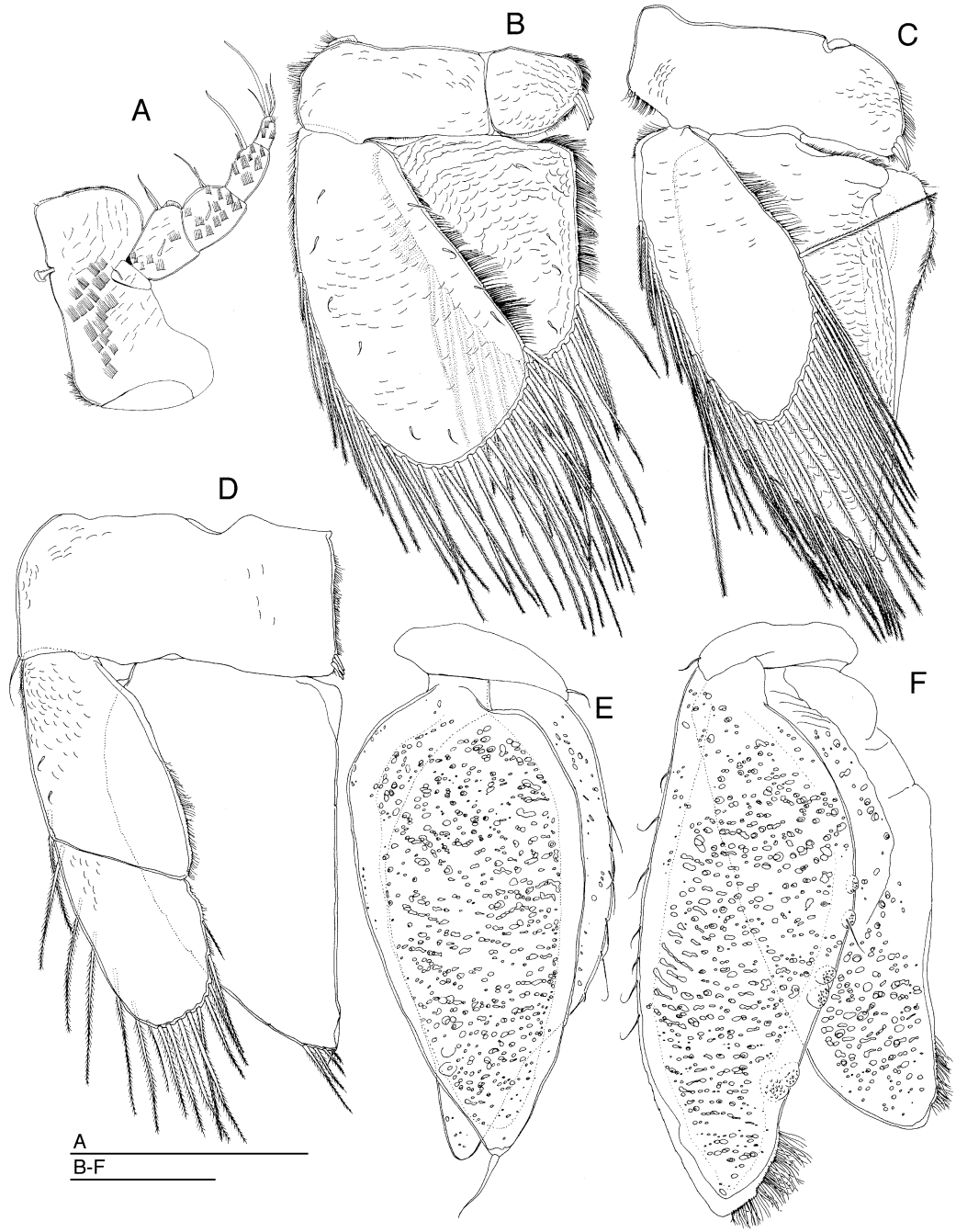

FIGURE 9. *Bathycopea dicarina* sp. nov. A–F, male (KMNH IvR 700,255): A, left maxilliped, ventral; B, right pleopod 1, ventral; C, right pleopod 2, ventral; D, right pleopod 3, ventral; E, right pleopod 4, dorsal; F, right pleopod 5, ventral. Scales = 300 µm.

Description of the holotype male. *Body* (Fig. 8A, B) about 1.5 times as long as maximum width. Head (Fig. 8A) fused with pereonite 1 at middle. Pleon (Fig. 8A) slightly broader than pereonite 7; dorsum nearly flattened. Pleotelson (Fig. 8A, B) about 1.6 times as broad as long, apically rounded; dorsum arched. Uropodal sympod with protuberance dorsal-proximally; endopod (Fig. 8A) marginally crenulated, with many short setae laterally and short tooth distal-medially.

Antennule (Fig. 8A, D): peduncular article 1 dorsally with few short setae and many simple scales, ridged distal-dorsally; article 2 about 0.8 times as long as article 1; article 3 longest, with some short medial and long distal setae. Flagellum consisting of 10 articles: article 1 minute; article 2 slightly shorter than peduncular arti-

cle 2, with 2 medial setae; article 3 half as long as article 2, with 2 distal setae; article 4 slightly longer than article 3, with 2 medial and dorsal short setae; article 5 as long as article 4, with 3 medial fringed setae and 1 dorsal simple seta, and with 2 long simple setae and 1 long aesthetasc distally; article 6 shorter than article 5, distally with 2 long and 1 short simple setae, and 2 long aesthetascs; articles 7 to 10 decreasing in width, each with some simple setae and long aesthetascs distally.

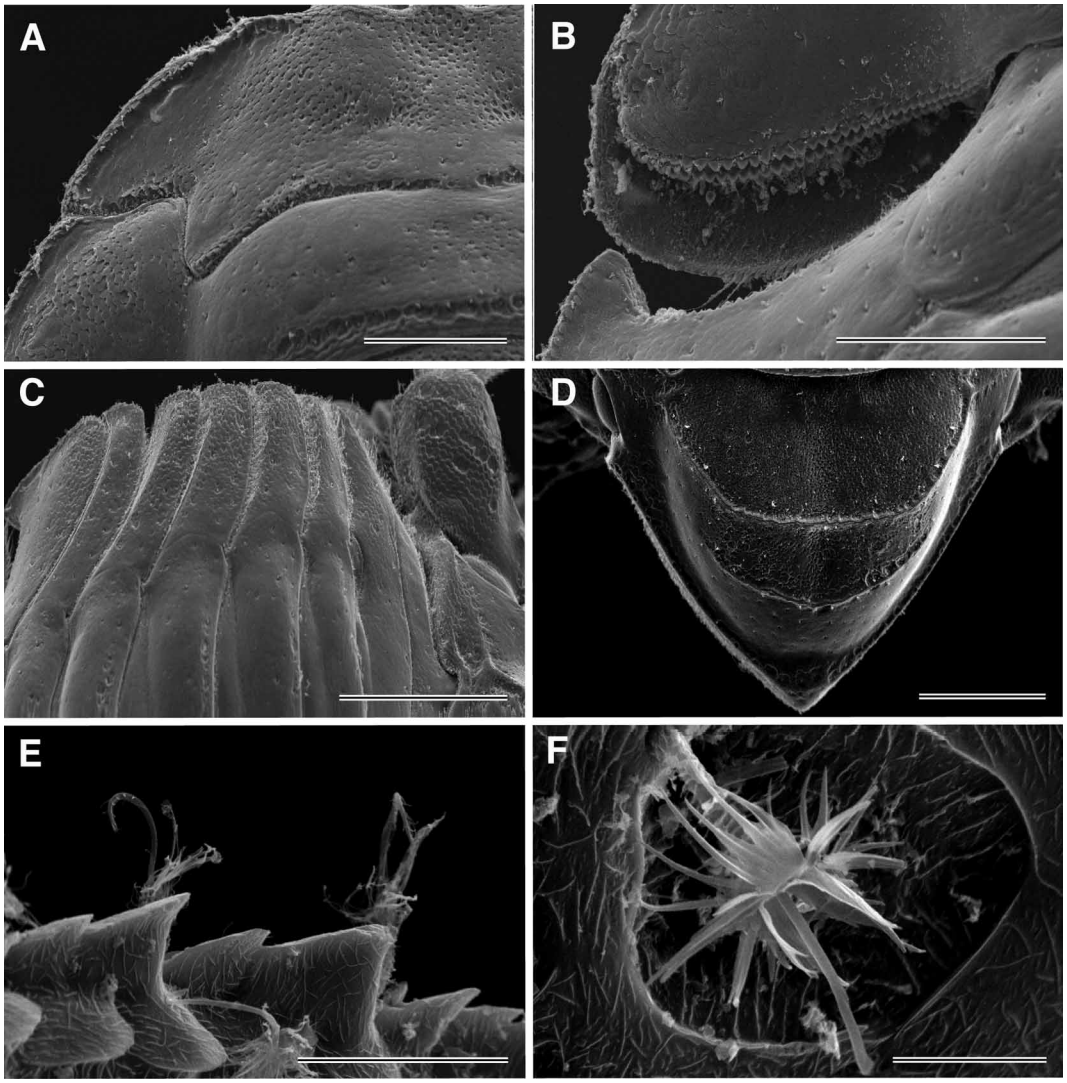

FIGURE 10. *Bathycopea dicarina* sp. nov. A–F, male (KMNH IvR 700,256): A, surface of head and pereonite 1, dorsal; B, lateral part of pereonites 1 and 2, dorsal; C, lateral part of pereon and pleon, dorsal; D, pleotelson, dorsal; E, setae on upper lateral margin of uropod; F, seta on pereonite 5, dorsal. Scales = A, B, 300 µm; C, D, 600 µm; E, 30 µm; F, 12 µm.

Antenna (Fig. 8C, E): peduncular article 2 with many medial and 1 lateral setae; article 3 longest and widest, with many medial and lateral fringe setae, and simple scales; article 4 as long as article 2, with many medial and lateral fringe setae, and simple scales. Flagellum consisting of 10 articles: article 1 slightly longer than peduncular article 4, with many medial and few lateral fringe setae, and many simple scales; article 2 to 10 decreasing in length and width, each with some fringe and simple setae.

Left mandible (Fig. 8F): article 1 of palp robust, with 1 distal seta; article 2 longest, about 1.4 times as long as article 1, with 5 pectinate setae and few simple scales; article 3 about half as long as article 2, with 7 pectinate setae. Incisor slender, with 3 teeth; lacinia mobilis with 3 teeth; setal row with robust setae. Right mandible (Fig. 8G): article 1 of palp with some setulated scales, without setae; article 2 with 1 simple short seta and 3 pectinate setae, and some setulated scales; article 3 with 5 pectinate setae.

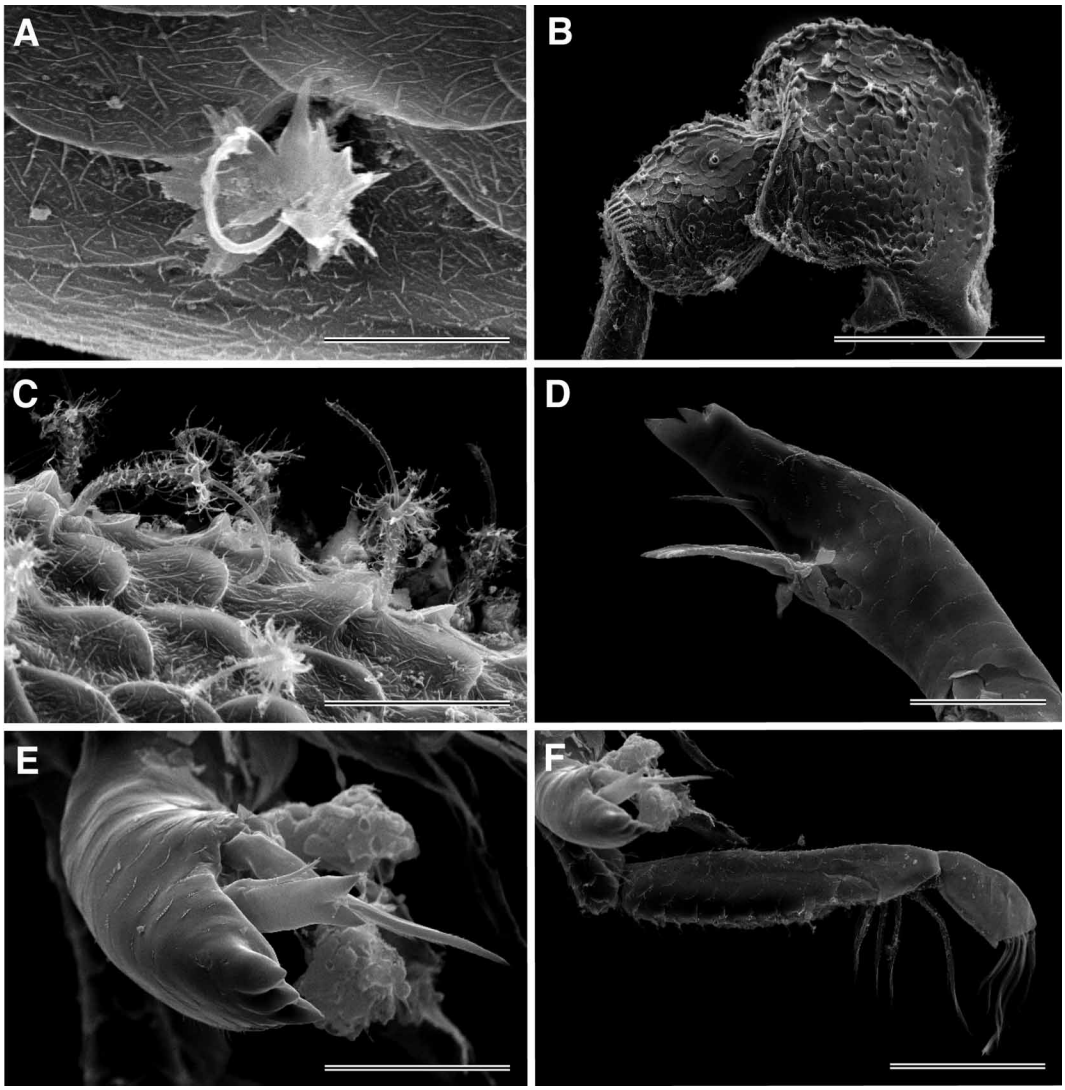

FIGURE 11. *Bathycopea dicarina* sp. nov. A–F, male (KMNH IvR 700,256): A, seta on pleon, dorsal; B, peduncle articles 1 and 2 of left antenna 1, dorsal; C, setae on medial margin of left antenna 2; D, incisor of right mandible, dorsal; E, incisor of left mandible, frontal; F, mandibular palp of left mandible, dorsal. Scales = A, 18 µm; B, 300 µm; C, 30 µm; D, E, 60 µm; F, 120 µm.

Maxillule (Fig. 8H) with inner lobe bearing 1 apical long seta; outer lobe with 6 apical robust setae and few setulated scales.

Maxilla (Fig. 8I) with inner lobe bearing 3 apical robust setae; medial lobe with 6 apical pectinate setae; outer lobe with 4 apical robust setae.

Maxilliped (Fig. 9A): article 1 with 1 ventral seta and few simple scales; article 2 trapezoidal, twice as long as article 1, with 2 medial and 1 ventral setae, and 8 simple and 6 setulated scales; article 3 as long as article 2, with 2 medial setae and 11 setulated scales; article 4 narrow, slightly shorter than article 3, with 2 distal-medial setae, and 8 setulated scales; article 5 minute, with 4 apical long setae and 4 setulated scales; endite trapezoidal, bearing many fine marginal setae, with many setulated and simple scales ventrally, and coupling hook medially.

Pereopod 1 (Fig. 8J): basis robust, ventrally setulose; ischium about 0.7 times as long as basis, without setae; merus trapezoidal, about 0.8 times as long as ischium, without setae; carpus shorter than merus, without distal setae; propodus with row of triangulate fringes on palm, proximal-medially with some setulated and simple scales; dactylus stylet-like, with 2 blunt teeth proximal-ventrally, reaching to carpus, without setae.

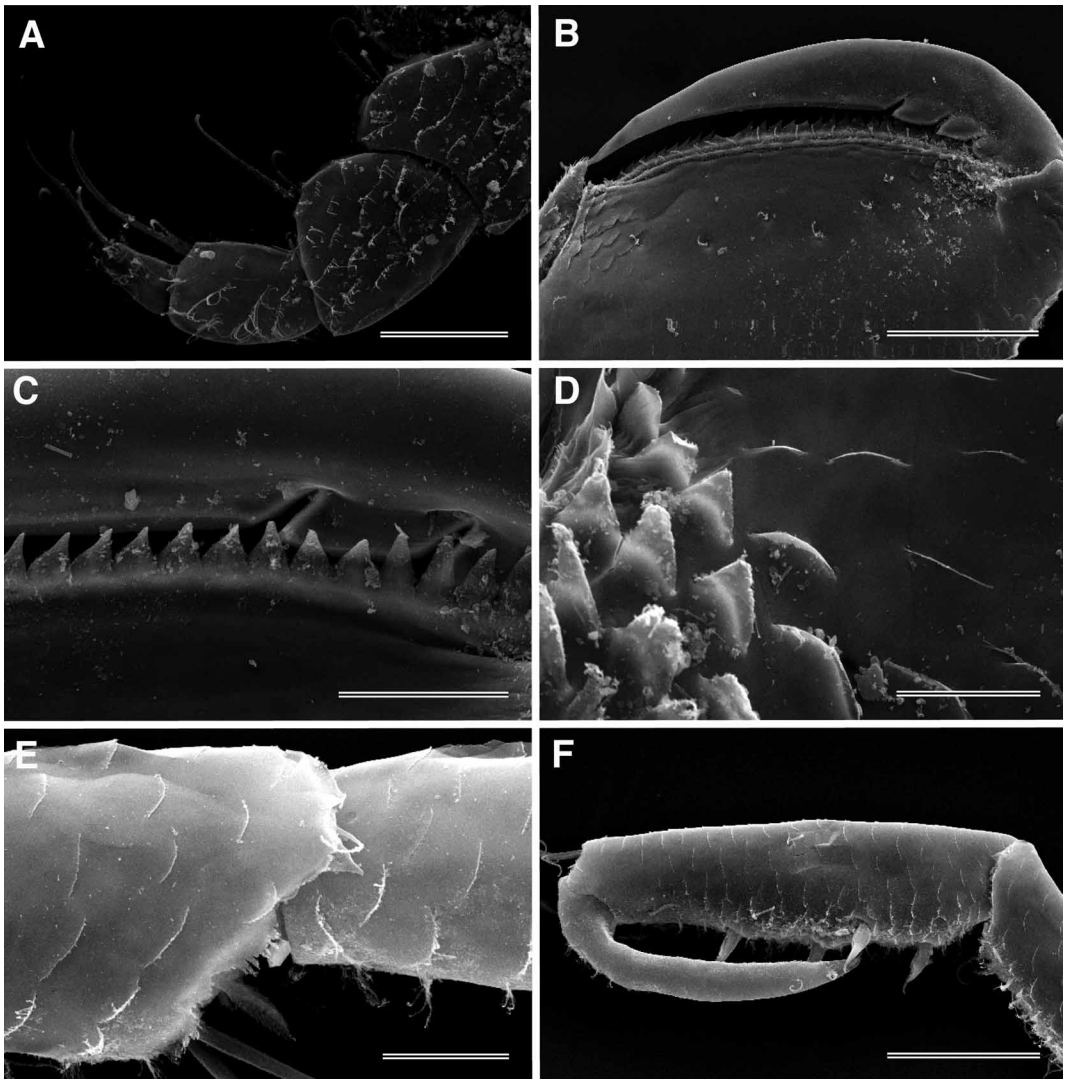

FIGURE 12. *Bathycopea dicarina* sp. nov. A–F, male (KMNH IvR 700,256): A, palp of right maxilliped, ventral; B, right pereopod 1, medial; C, left pereopod 1, lateral; D, simple scales of right pereopod 1, dorsal; E, merus and propodus of right pereopod 3, medial; F, left pereopod 2, lateral. Scales = A, C, 60 µm; B, 180 µm; D, E, 30 µm; F, 120 µm.

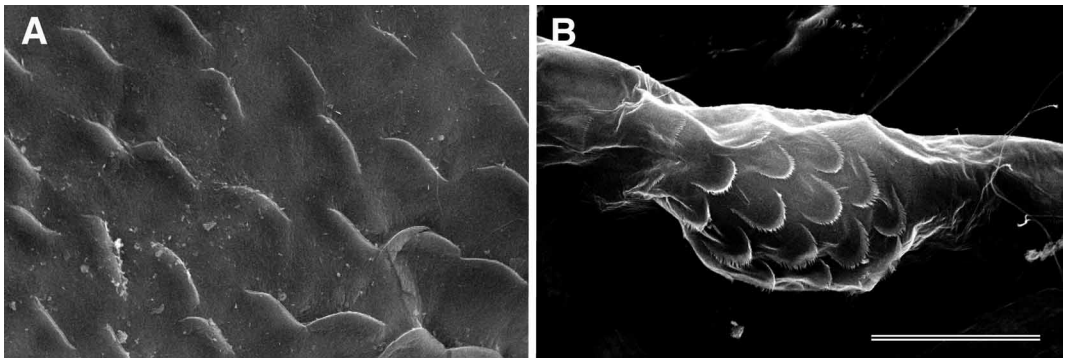

FIGURE 13. *Bathycopea dicarina* sp. nov. A, B, male (KMNH IvR 700,256): A, endopod of right pleopod 1, ventral; B, scale patch on pleopod 5, dorsal. Scale = 30 µm.

Pereopod 2 (Fig. 8K) with many simple scales; ischium about 0.4 times as long as basis, with some short simple setae and few simple scales ventrally; merus as long as ischium, ventrally setulose, with long simple seta and some simple scales ventrally and simple seta distal-dorsally; carpus slightly longer than merus, ven-

trally setulose, with 2 simple setae and some simple scales ventrally; propodus longer than carpus, with 5 robust sensory setae and some simple scales ventrally, with long simple seta ventral-distally and 4 long simple setae dorsal-distally; dactylus slender, shorter than propodus, curved inward, with 2 apical short simple setae.

Pereopod 7 (Fig. 8L): basis longest article, unarmed; ischium 1/3 longer than basis, unarmed; merus about 1.5 times as long as ischium, with long and short setae distal-ventrally and 2 long setae distal-dorsally; carpus longer than merus, with long and short setae distal-ventrally, and 2 short setae ventrally, and with long seta distal-dorsally; propodus shorter than carpus, with 2 distal-ventral, 1 ventral, 3 distal-dorsal long setae and 2 dorsal short setae; dactylus narrowest article; distally with 2 short setae and unguis

Pleopod 1 (Fig. 9B) with many simple scales ventrally: peduncle about 3.3 times as broad as long, with 3 coupling hooks distal-medially and many fine setae medially, and many short setae laterally; endopod subtriangulate, about 2.6 times as long as peduncle, slightly broader than long, bearing many long plumose and fine simple setae; exopod as broad as endopod, longer than endopod, with many long plumose and many fine setae marginally and few simple short setae ventrally.

Pleopod 2 (Fig. 9C) with many simple scales ventrally: peduncle about 2.4 times as broad as long, with 3 coupling hooks distal-medially and many fine setae marginally; endopod broad, trapezoidal, about 2.1 times as long as broad, 4.1 times as long as peduncle, bearing some long plumose and fine simple setae; appendix masculina as long as endopod, with fine setae proximal-ventrally; exopod ovate, about 0.7 times as long and about 0.8 times as wide as endopod, with many long plumose and fine setae marginally.

Pleopod 3 (Fig. 9D) with some simple scales ventrally on peduncle and exopod: peduncle longer than those of pleopods 1 and 2, about 2.2 times as broad as long, with 3 coupling hooks distal-medially and many fine short setae medially; endopod broad, about 2.5 times as long as peduncle, longer than broad, bearing 4 short plumose setae and short simple seta apically; exopod articulated, bearing many plumose setae.

Pleopod 4 (Fig. 9E): endopod as long as exopod, tapering to apex, with 1 simple seta apically; exopod similar to endopod in shape, about 2.1 times as long as broad, bearing 6 simple setae laterally.

Pleopod 5 (Fig. 9F): endopod about 2.3 times as long as broad, with 3 shallow notches proximal-medially and many fine setae distal-medially; exopod longer than endopod, with 6 scale patches medially, 7 short simple setae laterally and many fine setae distal-medially.

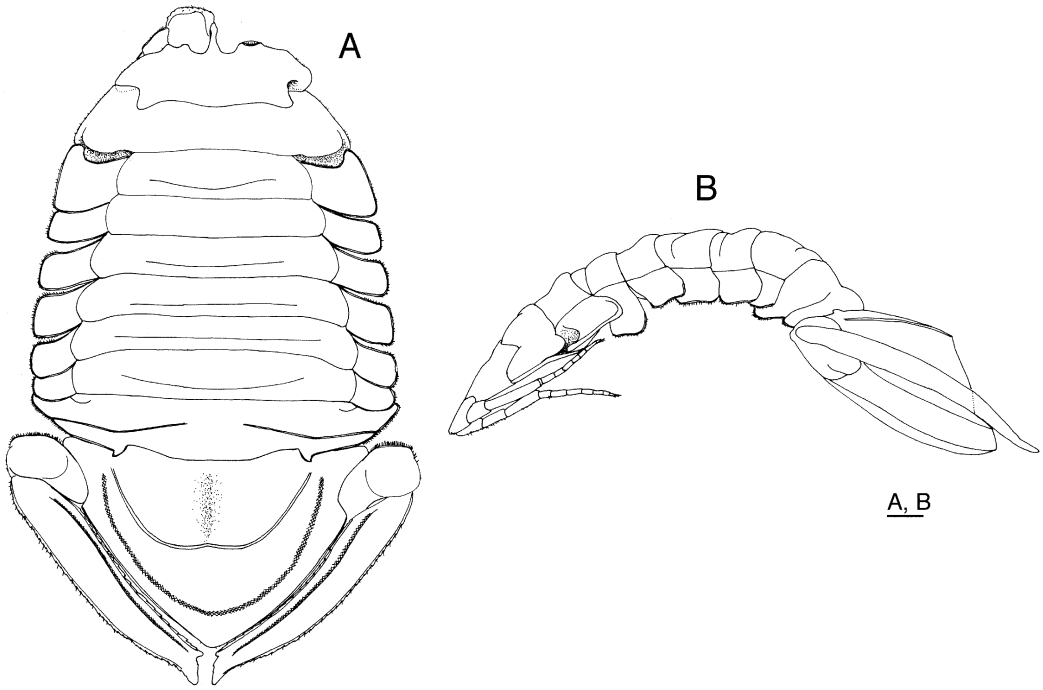

FIGURE 14. *Bathycopea typhlops* Tattersall: female (Australian Museum, P. 37255, identified by Dr. N. Bruce): A, habitus, dorsal; B, habitus, lateral. Scale = 300µm.

Additional notes on paratype. One paratype male was observed with SEM (Figs. 10–13).

Body (Fig. 10A–D) setation scattered. Dorsal seta (Fig. 10F) on pereonite 5 branched, arising from shallow pit; dorsal seta (Fig. 11A) on pleon strongly curved inward, with broad membranaceous fringe. Marginal setae on uropods (Fig. 10E) penicillate. Antennule peduncular articles 1 (Fig. 11B) ridged distal-dorsally. Setae on medial margin of antenna (Fig. 11C) with many fine setae on half of its base. Incisors of mandibles (Fig. 11D, E) with many setulated scales. Mandibular palp (Fig. 11F): article 2 with many simple scales, marginally setulated; article 3 distally truncate, without scales. Maxilliped palp (Fig. 12A): articles 2–4 with many scales bearing long fine setae; article 5 without scales. Pereopod 1 (Fig. 12B, C, D): palm of propodus with rows of 18 short setae and triangulate fringes; dactylus without rudimentary unguis; scales of propodus simple, agglutinated on basis. Pereopod 2 (Fig. 12F): propodus with many simple scales medially and setulated scales on palm; dactylus with few short setae subdistally and setulated scales proximally. Pereopod 3 (Fig. 12E): scales on merus and propodus simple medially, setulated on marginal ridge. Pleopod 1 (Fig. 13A): scales rudimentary, simple. Pleopod 5 (Fig. 13B) with scale patch having curved setulated scales.

Remarks. *Bathycopea dicarina* sp. nov. is similar to *B. typhlops* in having pereonites increasing in width posteriorly, eye lobes rudimentary, moderately slender uropod, and pleonite 1 tapering laterally. The two species, however, differ from each other in the following characters (those of *B. typhlops* in parentheses): pleotelson having double carina dorsally (single carina) (see Fig. 14A, B) and merus and carpus of male pereopod 2 longer than ischium (shorter than ischium).

Etymology. Named after for the double carina on the pleotelson.

***Bathycopea parallela* Birstein, 1963**

Figs 15–20

Bathycopea parallela Birstein, 1963: 134–137, figs 66–67, plate III2; Kussakin, 1979: 372–374, figs 232–233.

Material examined. Male, 14.2 mm (KMNH IvR 700,261), dissected and mounted on glass slides, RV *Hakuho-maru*, St. XR-2-1, off Kushiro, Hokkaido, 42º27.52'N, 144º15.47'E-42º26.85'N, 144º12.98'E, 974–965 m, mud, 3 m ORE beam trawl, 15 September, 2001, collected by Dr. S. Ohta and MS; male, 13.8 mm (KMNH IvR 700, 267), dissected and mounted on glass slides, male, 14.6 mm (KMNH IvR 700, 264), dissected and mounted on aluminum holders for a SEM observation, 7 males, 15.6 mm (KMNH IvR 700,262), 15.6 mm (CBM-ZC 9398), 15.5 mm (KMNH IvR 700,263), 15.0 mm (CBM-ZC 9399), 14.5 mm (KMNH IvR 700,265), 14.1 mm (KMNH IvR 700,266), 13.2 mm (KMNH IvR 700,268), whole specimens in glass bottle, 8 ovigerous females, 12.3 mm (KMNH IvR 700,269), 12.2 mm (KMNH IvR 700,270), 12.2 mm (CBM-ZC 9400), 12.1 mm (CBM-ZC 9401), 11.8 mm (KMNH IvR 700,271), 11.7 mm (KMNH IvR 700,272), 10.9 mm (KMNH IvR 700,273), 10.6 mm (KMNH IvR 700,274), whole specimens in glass bottle, 7 non-ovig. females, 12.2 mm (KMNH IvR 700,275), 12.0 mm (KMNH IvR 700,276, 700,277), 11.3 mm (KMNH IvR 700,278), 11.2 mm (KMNH IvR 700279), 11.1 mm (KMNH IvR 700,280), 10.9 mm (KMNH IvR 700,281), whole specimens in glass bottle, RV *Tansei-maru*, St. KM-7, off Otsuchi, Iwate Prefecture, 39º24.39'N, 142º51.55'E, 1650–1687 m, 3 m ORE beam trawl, 8 July, 1996, collected by Mr. E. Tsuchida; male, 14.1 mm (CBM-ZC 9402), non-ovig. female, 11.7 mm (CBM-ZC 9403), whole specimens in glass bottle, TV *Shinyo-maru*, St. 21, Sagami-nada Sea, 34º56.46'N, 139º33.12'E-34º53.88'N, 139º34.56'E, 1039–1300 m, dredge, 24 October, 1996, collected by Dr. T. Komai.

Diagnosis. Body dorsally granular. Pereonites 1–7 subequal in width, each with low dorsal keel having flat apex. Pereonite 2 without anterior-lateral projections. Pleonite 1 laterally broadened; slightly arched dorsally. Pleotelson gradually decreasing in width posteriorly, without dorsal carina. Eye lobes well-developed, without ommatidia. Pereopod 1: distal corner of carpus without projection. Epistome anteriorly moderately

blunt, with rounded apex, slightly surpassing frontal margin of antennule peduncular article 1; margins straight. Uropod broad, about 4.6 times as long as width, apically bifid, without large serrations on lateral margin. Pereopod 2 in male: merus and carpus as long as ischium; propodus about twice as long as carpus, slightly curved inward, projected proximally, with many robust sensory setae ventral-proximally and few simple setae and simple scales; dactylus about 1.3 times as long as propodus, curved inward, with few short simple setae apically.

FIGURE 15. *Bathycopea parallela* Birstein: male (KMNH IvR 700,261): habitus, dorsal (right lateral part of pleon was broken during collecting at sea).

Description of the reference male. *Body* (Fig. 16A, B) about 1.7 times as long as maximum width. Head (Fig. 16A) fused with pereonite 1. Pleon (Fig. 16A, B) slightly narrower than pereonite 7. Pleotelson (Fig. 16A) about 1.9 times as broad as long, apically rounded; dorsum moderately arched, flattened marginally. Uropodal sympod with many fine setae marginally; endopod (Fig. 16A) marginally crenulated, with many short setae laterally and medially.

Antennule (Fig. 16A, D): peduncle with many granules dorsally; article 1 with few short setae dorsally and many setae on margin; article 2 half as long as article 1, with many setae marginally; article 3 longest, with many setae marginally. Flagellum consisting of 13 articles: articles minute, each with few simple setae.

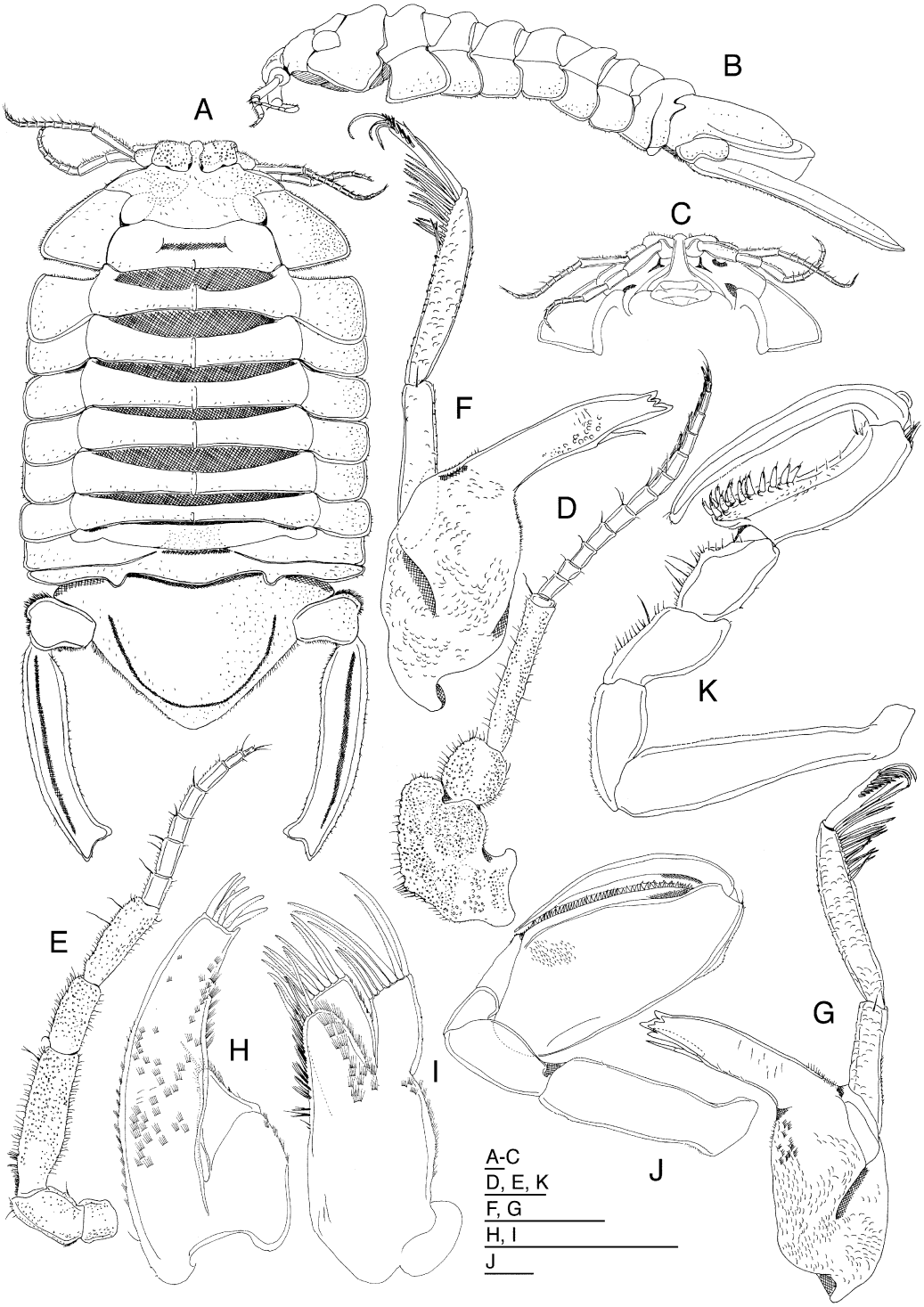

FIGURE 16. *Bathycopea parallela* Birstein: A–K, male (KMNH IvR 700,267): A, habitus, dorsal; B, habitus, lateral; C, head, ventral; D, right antenna 1,dorsal; E, right antenna 2, dorsal; F, right mandible, ventral; G, left mandible, ventral; H, right maxilla 1, ventral; I, right maxilla 2, dorsal; J, right pereopod 1, medial; K, right pereopod 2, medial. Scales = 500 µm.

Antenna (Fig. 16C, E): peduncle with many granules dorsally; article 1 shortest, unarmed; article 2 widest, slightly convex posterior-medially, and with some setae marginally; article 3 longest, with many setae laterally and medially; article 4 as long as article 2, with many setae laterally and medially. Flagellum consisting of 8 articles: article 1 longer than peduncular article 4, with many granules, and with many setae laterally and medially; articles 2 to 8 minute, each with few long setae and many short setae.

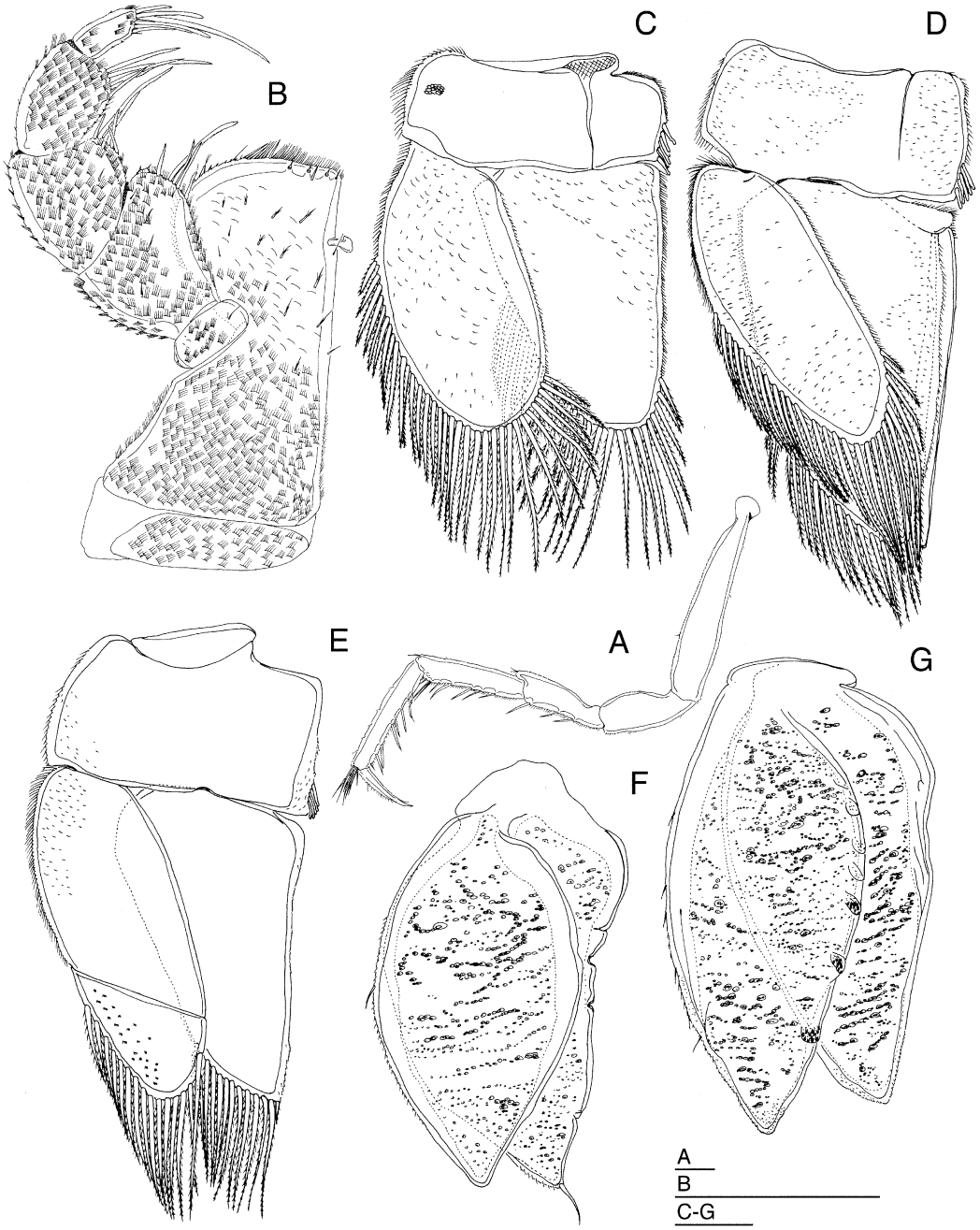

FIGURE 17. *Bathycopea parallela* Birstein: A–G, male (KMNH IvR 700,267): A, right pereopod 4, medial; B, right maxilliped, ventral; C, right pleopod 1, ventral; D, right pleopod 2, ventral; E, right pleopod 3, ventral; F, right pleopod 4, ventral; G, right pleopod 5, ventral. Scales = 500 µm.

Left mandible (Fig. 16F): article 1 of palp robust, with distal seta and many simple scales; article 2 longest, about 1.3 times as long as article 1, with 15 pectinate setae, many simple scales and few setulated scales; article 3 slender, about half as long as article 2, with 3 pectinate setae and some simple short setae. Incisor slender, with 3 teeth, and with long spine medially. Right mandible (Fig. 16G): article 1 of palp with some setulated scales marginally and many simple scales dorsally, and with simple seta distally; article 2 with 14 pectinate setae, and few setulated and many simple scales; article 3 with 3 pectinate setae and some simple short setae.

Maxillule (Fig. 16H) with inner lobe bearing 1 apical long and many lateral fine setae; outer lobe with 6 apical robust setae and many setulated scales and few simple scales.

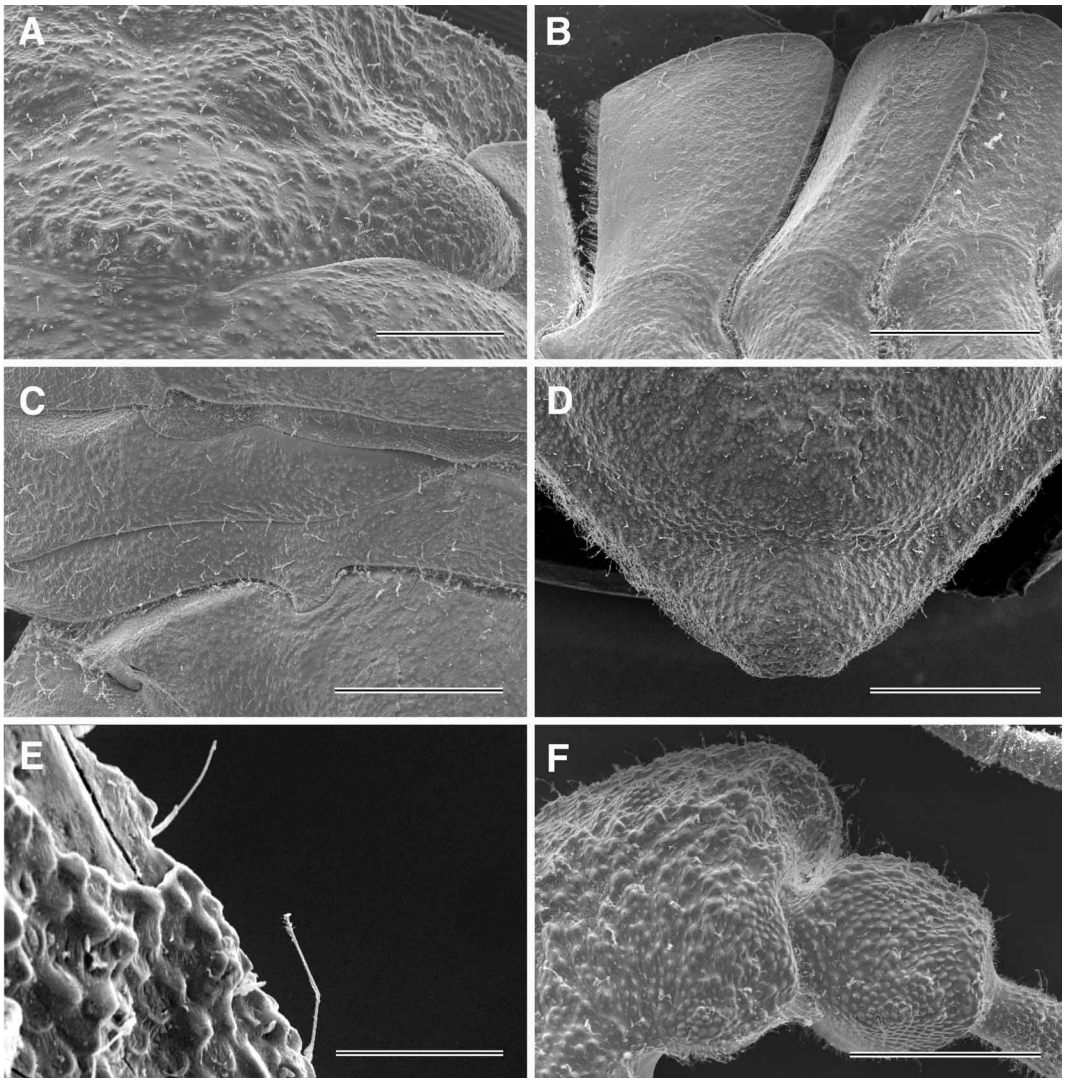

FIGURE 18. *Bathycopea parallela* Birstein: A–F, male (KMNH IvR 700,264): A, surface of head and pereonite 1, dorsal; B, lateral part of pereonites 2–4, dorsal; C, lateral part of pleon, dorsal; D, tip of pleotelson, dorsal; E, setae on upper lateral margin of uropod; F, peduncle articles 1 and 2 of right antenna 1, dorsal. Scales = A, F, 600 µm; B–D, 1.2 mm; E, 120 µm.

Maxilla (Fig. 16I) with inner lobe bearing 3 apical robust setae and many setulated scales laterally; medial lobe with 9 apical pectinate setae; outer lobe with 7 apical robust setae.

Maxilliped (Fig. 17B): article 1 with short ventral seta ventrally; article 2 trapezoidal, about 3.8 times as long as article 1, with 5 pectinate setae distal-medially and few short simple setae ventrally; article 3 shorter than article 2, with 5 pectinate setae distal-medially and few short simple setae ventrally; article 4 narrow, as long as article 3, with 5 pectinate setae distal-medially; article 5 minute, with 6 apical pectinate setae; endite trapezoidal, bearing many fine setae marginally and some trifid setae ventrally, and with many setulated and simple scales ventrally, and coupling hook medially.

Pereopod 1 (Fig. 16J): basis robust, without conspicuous setae; ischium about 4/7 as long as basis, unarmed; merus trapezoidal, about half as long as ischium, unarmed; carpus as long as merus, distally with few short setae, without distal projection; propodus with row of triangulate fringes on palm, with many simple scales medially and few simple setae distally; dactylus stylet-like, shorter than propodus, reaching to carpus, without setae.

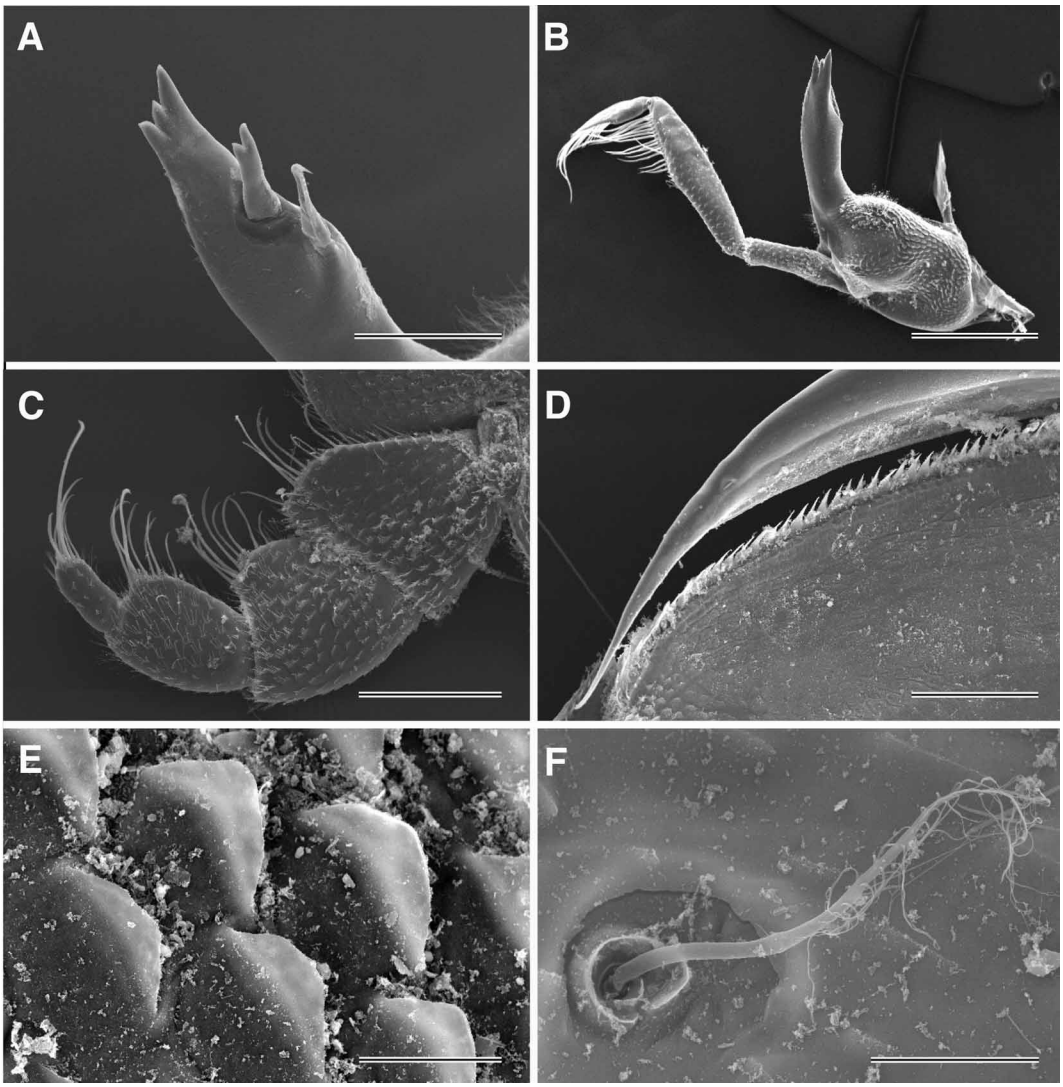

FIGURE 19. *Bathycopea parallela* Birstein: A–F, male (KMNH IvR 700,264): A, incisor of left mandible, medial; B, right mandible, ventral; C, palp of right maxilliped, ventral; D, palm of right pereopod 1, medial; E, simple scales on propodus of right pereopod 1, dorsal; F, filoplume-like seta on basis of right pereopod 2. Scales = A, C, D, 300 µm; B, 600 µm; E, F, 30 µm.

Pereopod 2 (Fig. 16K): basis with some fine setae dorsally; ischium half longer than basis, with few setae ventrally; merus trapezoidal, as long as ischium, with many simple setae ventrally; carpus shorter than merus, projected medially, with many simple setae medially and few short setae laterally; propodus robust, extended proximally, slightly curved inward, with 14 robust sensory setae ventral-proximally and few simple setae and simple scales; dactylus slender, longer than propodus, curved inward, with 4 short simple setae apically.

Pereopod 4 (Fig. 17A): basis with few short setae; ischium about 0.4 times as long as basis, with few short setae ventrally; merus as long as ischium, with 3 long setae and many fine setae ventrally and 2 short setae distal-dorsally; carpus longer than merus, 7 long setae and many fine setae ventrally and few setae dorsally; propodus longer than carpus, with 7 long and many fine setae ventrally, and with 7 long and 5 short setae dorsally; dactylus narrowest article, with many fine setae dorsally and short seta and unguis distally

Pleopod 1 (Fig. 17C) with many simple scales ventrally: peduncle about 2.5 times as broad as long, with 6 coupling hooks distal-medially and many fine setae laterally and medially; endopod about 2.4 times as long as peduncle, longer than broad, bearing many long plumose and fine simple setae; exopod narrower than endopod, as long as endopod, with many long plumose and many fine setae marginally and few simple short setae ventrally.

Pleopod 2 (Fig. 17D) with many simple scales ventrally: peduncle about 2.3 times as broad as long, with 5 coupling hooks distal-medially and many fine setae marginally; endopod broad, triangulate, about 1.8 times as long as broad, 2.6 times as long as peduncle, bearing many long plumose and fine simple setae; appendix masculina as long as endopod; exopod ovate, about 0.9 times as long and about 0.6 times as wide as endopod, with many long plumose and many fine setae marginally.

Pleopod 3 (Fig. 17E) with some simple and setulated scales ventrally: peduncle longer than those of pleopods 1 and 2, about 1.7 times as broad as long, with 5 coupling hooks distal-medially and many fine short setae marginally; endopod broad, subtriangulate, about 1.8 times as long as peduncle, longer than broad, bearing 13 plumose setae apically; exopod with articulated, bearing 15 plumose setae apically.

Pleopod 4 (Fig. 17F): endopod slightly longer than exopod, with simple seta apically and few fine setae subdistally; exopod about 1.8 times as long as broad, bearing moderately long simple seta laterally and many fine short setae laterally.

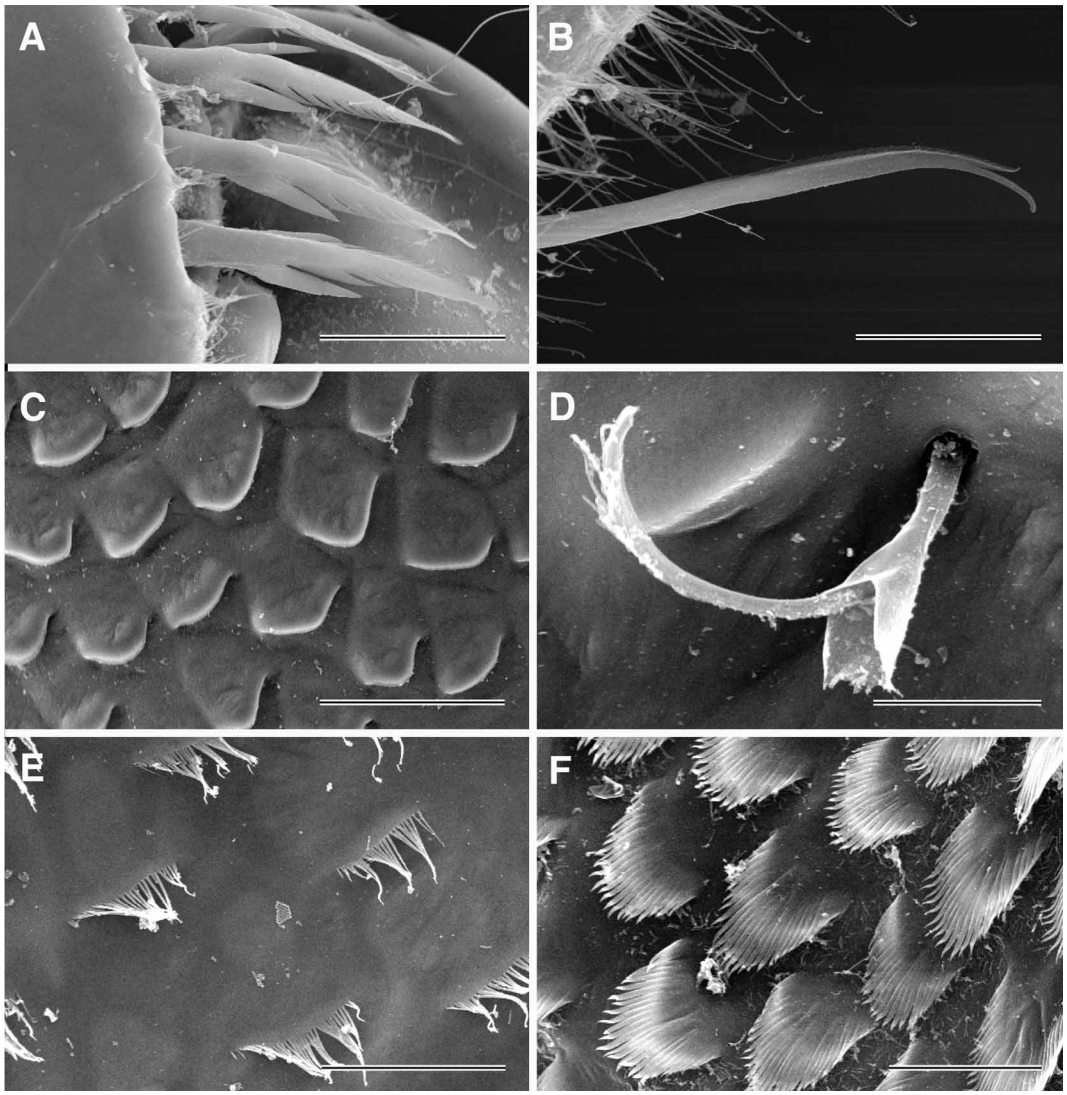

FIGURE 20. *Bathycopea parallela* Birstein: A–F, male (KMNH IvR 700,264): A, robust setae on distal margin of carpus of right pereopod 4, lateral; B, robust sensory setae on disto-ventral margin of carpus of right pereopod 4, dorsal; C, simple scales on exopod of right pleopod 1, dorsal; D, seta on exopod of right pleopod 1, dorsal; E, setulated scales on second article of exopod of pleopod 3, dorsal; F, setulated scales of scale patch on exopod of pleopod 5, dorsal. Scales = A–C, 60 µm; D, 12 µm; E, 30 µm; F, 18 µm.

Pleopod 5 (Fig. 17G): endopod about 2.1 times as long as broad, with notch proximal-medially and many fine short setae distally; exopod slightly longer than endopod, with 6 scale patches medially, some moderately long setae and many fine short setae laterally.

Additional notes on paratype. One male was observed with SEM (Figs. 18–20).

Body (Fig. 18A–D) covered with many granules and short setae on dorsum. Eye lobe (Fig. 18A) granular dorsally, without ommatidia. Marginal setae on uropods (Fig. 18E) biarticulate. Antennule peduncular (Fig. 18F) with several granules. Incisors of mandibles (Fig. 19A) with few scales having row of short setae. Mandibular palp (Fig. 19B): articles 1 and 2 with many scales; article 3 distally truncate, without scales. Maxilliped palp (Fig. 19C) covered with many scales bearing long setae. Pereopod 1 (Figs. 19D, E): propodus with row of acute setae on palm; dactylus without unguis; scales of propodus with many setae agglutinated on basis. Pereopod 2 (Fig. 19F): setae on basis filoplume-like, arising from deep pit. Distal sensory setae on carpus of pereopod 4 (Fig. 20A) feather-like, with acute teeth bilaterally. Long sensory setae on distal-ventral margin of carpus of pereopod 4 (Fig. 20B) apically bifid, setulated on frontal margin. Scales on exopod of pleopod 1 (Fig. 20C) simple, rudimentary. Seta on exopod of pleopod 1 (Fig. 20D) apically penicillate, arising from cuticularized sheath. Scales on second article of pleopod 1 (Fig. 20E) straight, rudimentary, with row of many simple setae. Scales on scale patch of exopod of pleopod 5 (Fig. 20F) well-developed, with row of many teeth.

Colour. Colour in life (Fig. 15) bright pinkish orange; eye lobes having bright pink distinct part.

Remarks. More than forty years after Birstein described *Bathycopea parallela* based on single female specimen collected by the Russian research vessel *Vityaz* from the Pacific coast of northern Honshu, Japan, I collected many specimens of the species in and around the type locality. Characters from which the present specimens were identified with *B. parallela* were as follows: body flat, with parallel lateral margins; pereonites each with low dorsal keel having flat apex; posterior end of pleotelson perfectly spherical, all of which were originally listed as the diagnostic characters of the species, with illustrations (Birstein 1963).

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Literature cited

Birstein, J.A. (1963) Deep-sea isopod crustaceans of the northwestern Pacific Ocean. Institute of Oceanology of the U.S.S.R., Akademii Nauk, Moscow, 213 pp.

Brandt, A. & Poore, C.B. (2003) Higher classification of the flabelliferan and related Isopoda based on a reappraisal of relationships. *Invertebrate Systematics*, 17, 893–923.

Bruce, N.L. (1991) New records of marine isopod crustaceans (Sphaeromatidae, Cirolanidae) from south-eastern Australia. *Memoirs of the Museum of Victoria*, 52, 263–275.

Bruce, N.L. (1993) Two new genera of marine isopod crustaceans (Flabellifera: Sphaeromatidae) from southern Australia, with a reappraisal of the Sphaeromatidae. *Invertebrate Taxonomy*, 7, 151–171.

Bruce, N.L. (2003) New genera and species of sphaeromatid isopod crustaceans from Australian marine coastal waters. *Memoirs of Museum Victoria,* 60(2), 309–369.
Hansen, H.J. (1905) On the propagation, structure and classification of the family Sphaeromidae. *Quarterly Journal of Microscopical Science,* 49, 69–135.
Harrison, K. (1984) The morphology of the sphaeromatid brood pouch (Crustacea: Isopoda: Sphaeromatidae). *Zoological Journal of the Linnean Society,* 82, 363–407.
Harrison, K. & Ellis, J.P. (1991) The genera of the Sphaeromatidae (Crustacea: Isopoda): a key and distribution list. *Invertebrate Taxonomy,* 5, 915–952.
Kensley, B. (1978) Guide to the Marine Isopods of Southern Africa. South Africa Museum, Cape Town, 173 pp.
Kensley, B., Schotte, M. & Schilling, S. (1996) World list of marine, freshwater and terrestrial isopod crustaceans. Smithsonian Institution, Washington, DC, USA. Available from (accessed February 2007).
Kussakin, O.G. (1979) Marine and brackish-water Crustacea (Isopoda) of cold temperate waters of the Northern Hemisphere. Suborder Flabellifera. Opredeliteli po Faune SSR, Izdavaemye Zoologicheskim Muzeem Akademii Nauk 122, 472 pp.
Loyola e Silva, J. (1971) Sôbre os gêneros *Ancinus* Mile Edwards, 1840 e *Bathycopea* Tattersall, 1909, da coleção U.S. Nat. Mus. (Isopoda-Crustacea). *Arquivos do Museu Nacional, Rio de Janeiro,* 54, 209–223.
Menzies, R.J. & Barnard, J.L. (1959) Marine Isopoda on coastal shelf bottoms of Southern California: systematics and ecology. *Pacific Naturalist,* 1, 3–35.
Tattersall, W.M. (1905) The marine fauna of the coast of Ireland. Part V. Isopoda. *Reports of the Department of Agriculture and Technical Instruction for Ireland, Scientific Investigations of the Fisheries Branch, 1904,* 2, 1–90.