

FOUR NEW GENERA OF MARINE ISOPOD CRUSTACEANS (SPHAEROMATIDAE) FROM EASTERN AND SOUTHERN AUSTRALIA

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Abstract

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Four new genera of sphaeromatid isopods (subfamily Sphaeromatinae) are described: *Benthosphaera* gen. nov., *Xynosphaera* gen. nov., *Bregmotypta* gen. nov., and *Cercosphaera* gen. nov. *Benthosphaera* is recorded from tropical north-eastern Australia (off Townsville), to south-eastern Australia (off Tasmania), and is represented by *Benthosphaera arkoola* sp. nov. (type species), *B. guaware* sp. nov. and *B. reburra* sp. nov. The genus occurs at depths between 150 and 1200 metres. *Xynosphaera colemani* gen. et sp. nov. is recorded burrowing into *Aleyonacca* stems, from the northern Great Barrier Reef, the Philippines and Madagascar. *Bregmotypta* gen. nov. is characterized by the anterior margin of the head being greatly elongated. The genus is recorded from the central New South Wales coast (*B. pavicula* sp. nov.) and an undescribed species also occurs in the southern Great Barrier Reef.

Cercosphaera gen. nov. is represented by five species, three described here: *Cercosphaera wirritin* sp. nov. (type species), *C. dilkera* sp. nov. and *C. coloura* sp. nov. The genus is recorded from shallow water habitats to a depth of 50 m, and its range extends from sub-tropical western Australia (27°) eastwards to Victoria.

Introduction

Recent publications on Australian sphaeromatids have revised the Cassidininae (Bruce, 1994b), and documented new and poorly known genera of Sphaeromatinae and Dynameninae (Bruce, 1992, 1993, 1994a; Poore, 1994).

This contribution results from searches of the collections held by the Australian Museum, the Museum of Victoria, Queensland Museum and the South Australian Museum, specifically to locate previously undescribed Australian genera. Genera of the Sphaeromatinae are described here but do not include new genera that may result from the splitting up of larger genera such as *Cymodoce* Leach.

The following abbreviations are used: Australian Museum (AM), Museum of Tropical Queensland (MTQ), Museum of Victoria (NMV), South Australian Museum (SAM), Zoologisk Museum, University of Copenhagen, New South Wales (NSW), Queensland (Qld), South Australia (SA), Tasmania (Tas.), Victoria (Vic.), Western Australia (WA), body length (BL), immature (imm), plumose marginal setae (PMS), plumose setae (PS), simple marginal setae (SMS).

Benthosphaera gen. nov.

Type species. Benthosphaera arkoola sp. nov., here designated.

Diagnosis of male. Body moderately vaulted, variably smooth or setose. Cephalon with distinct rostrum separating antennule bases. Pereonites 1–6 of about equal width, pereonite 7 narrower than (*B. arkoola* sp. nov., *B. reburra* sp. nov.) or as wide as pereonite 6 (*B. guaware* sp. nov.); coxae angled laterally, those of pereonites 2–4 or 2–6 (*B. guaware* sp. nov.) distally narrowed; all coxae with distinct suture, ventrally with complex interlocking ridge and groove system. Pleonite 1 entire, prominently visible; pleonites 2–4 indicated by 2 separate sutures; posterior margin of pleon with 2 prominent keys. Posterior margin of pleotelson arcuate, without foramen or distinct exit channel, emarginate, with slight ventral depression present.

Epistome anterior margin projecting, rounded or distally subtruncate; mesially constricted. Antennule peduncle articles 1 and 2 robust, article 3 slender; article 2 short, about 0.3 as long as article 1. Antenna peduncle with 5 articles, article 5 of which is longest. Mandible

incisor multi- or single cusped; left mandible with large trieuspid lacinia mobilis and spine row; molar process prominent, surface serrate or nodular, proximal margin with teeth. Maxillule with 12 nodular spines on lateral lobe, mesial lobe with 3 large and 1 short stout plumose spine with further 2 simple spines. Maxilla with all lobes spinose, some spines of which are smooth, others serrate. Maxilliped palp articles 2-4 with mesial lobes; endite distal margin with plumose spines.

Pereopods all ambulatory, posterior margins of ischium to propodus of pereopods 2-6 with setulose fringe; posterior margins of pereopods 2-6 with serrate spines and also attenuated plumose spines; pereopods 1 and 7 with prominently serrate spines; pereopods 1-7 daetylus without flattened scales on posterior margin, accessory unguis simple.

Penes paired present, not fused, about 6 times as long as basal width.

Pleopods 1-4 with PMS; pleopods 3-5 exopods with transverse suture. Pleopod 1 endopod triangular, with proximomesial point. Pleopod 2 appendix masculina sub-basal in position; apex acuminate, bent mesially; longer than endopod. Endopods of pleopods 3-5 with thickened ridges varying from very weak (*B. arkoola*) to obvious (*B. guaware*); lateral margin of exopods of pleopods 4 and 5 with SMS; pleopod 5 with 3 or 4 scale patches, 2 proximal to suture, and third apical patch (*B. guaware* with fourth subapical patch). Uropods anterolateral, rami flat, subequal in length; exopod apex acuminate.

Female. Mouthparts not metamorphosed; ovigerous females with 3 pairs of oostegites arising from the coxae 2-4, and meeting at midline; males and females otherwise similar.

Distribution. East of Tully, north-eastern Queensland to east of Babel I., Tasmania; 150-1117 m.

Etymology. The Greek *benthos* (deep sea, sea bottom) and *-sphaera* (for the family) (feminine).

Remarks. There exists a group of sphaeromatine genera characterised primarily by having the posterior margin of the pleotelson flat, ventrally thickened, arcuate, and lacking a clear exit channel or groove. These genera lack developed cephalic or peroneal ornamentation, and pleotelson ornamentation is weak or absent. All have lamellar uropods, with only *Neosphaeroma* having the exopod conspicuously shorter than

the exopod. Diagnoses have recently been given by Harrison and Holdich (1984) and Jacobs (1987) but the diagnoses are not compatible and the characters that separate these genera are few. Their principle distinguishing characters can be summarised, without referring to character polarisation, as follows.

Exosphaeroides Holdich and Harrison, 1983. Pleopods 4 and 5 thickened, without ridges or folds; female with 2 pairs of oostegites. Otherwise as for *Exosphaeroma*.

Exosphaeroma Stebbing, 1900. There is no recent detailed diagnosis for this genus, although it too was rediagnosed against *Sphaeroma* and *Lekansphaera* by Jacobs (1987). Characters here are derived from Jacob (1987) and Brandt and Wägele (1989). Pleopods 1-3 lamellar, pleopods 4 and 5 endopods usually with thickened ridges. Uropod rami flat and simple; maxilliped palp articles 2-4 with mesial lobes; pereopods without stiff setae, pereopods 4-7 subsimilar; penes short.

Lekansphaera Verhoeff, 1943. Pleopods 1-3 lamellar, pleopods 4 and 5 endopods with thickened ridges. Uropod exopod lanceolate, apically acute, lateral margin smooth or variably serrate; maxilliped palp articles 2-4 with mesial lobes; pereopods 1-3 with stiff setae on anterior margins of ischium and merus, pereopods 4-7 subsimilar; penes short.

Neosphaeroma Baker, 1926. Pleopods 1-2 lamellar, pleopods 3-5 endopods with thickened ridges. Uropod exopod short, lateral margin excised; maxilliped palp articles 2-4 with mesial lobes; pereopods 1-3 without stiff setae, pereopods 4-7 subsimilar; penes long.

Sphaeroma Bosc, 1802. Pleopods 1-3 lamellar, pleopods 4 and 5 endopods with thickened ridges. Uropod exopod lanceolate, apically acute, lateral margin obviously serrate; maxilliped palp articles 2-4 without mesial lobes; pereopods 1-3 with stiff setae on anterior margins of ischium and merus, pereopods 4 and 5 shorter and more robust than 6 and 7; penes short.

It can be seen that the important distinguishing characters are to be found the morphology of uropods, maxilliped palp, pereopods and pleopods. Although pleopod ridges may be secondarily lost (as in *Cymodocella* Pfeffer, 1887, Dynameninae, see Brandt and Wägele, 1989), their presence and arrangement is significant. Differences shown in uropod morphology are also regarded as of generic significance.

Benthosphaera gen. nov., *Neosphaeroma* Baker, 1926 and *Caecocassidias* Kussakin, 1967 are the only sphaeromatid genera known to have thickened ridges on the endopod of pleopod 3 (Harrison and Holdich, 1984). *Neosphaeroma*, while being readily distinguished by the short excised uropodal exopod, anteriorly acute episome which does not project, and an evenly rounded or subtruncate pleotelson posterior margin, is otherwise similar. *Neosphaeroma* currently has only two species (Harrison and Holdich, 1984), and I am aware of at least one further species, and all of these species lack dorsal setae; three of the four species of *Benthosphaera* have setose dorsal surfaces. *Caecocassidias*, distinguished by its hugely expanded cephalon, otherwise bears little resemblance to *Benthosphaera*. Other characters typical of *Benthosphaera* are the presence of slender recurved plumose spines on the posterior margin of the pereopods and the maxillule mesial lobe with one short and three long spines.

As revisionary studies of the Sphaeromatidae continue, it has become apparent that in several genera (e.g., *Exosphaeroma*, *Cymodoce* Pfef-

fer, 1887, *Cymodoce* Leach, 1818) the characteristic ridges or folds of pleopods 4 and 5 or 3–5 may be reduced or absent in one or more species. In the case of *Benthosphaera arkoola*, it results in the species keying to *Exosphaeroma* in Harrison and Ellis (1991). *Exosphaeroma* is a large genus with about 40 species ascribed to it but Harrison and Ellis (1991: 939) allowed only four as belonging with certainty. *Exosphaeroma* ("sensu strictu", description given by Brandt and Wägele, 1989) can be separated from *Benthosphaera* by pleonite 1 having two posteriorly directed submedian flat lobes (see Menzies, 1962: figs 43B, C) (versus *Benthosphaera* with pleonite 1 without lobes), by lacking dorsal setae (versus with setae), the coxae being ventrally directed (versus laterally directed), the appendix masculina being simple (versus acuminate, narrowed, with apex bent), and the uropod exopod is simple (versus apically falcate).

Sphaeromatidae are poorly represented beyond the continental shelf, Harrison and Ellis (1991) listing only six genera with representatives at depths greater than 400 m (Table 1). One of these, *Cassidina*, probably does not occur

Table 1. Sphaeromatidae recorded from depths of 400 m and greater.

Species	Location	Depth (m)	Reference
<i>Benthosphaera arkoola</i> sp. nov.	eastern Australia	150–400	present report
<i>Benthosphaera guaware</i> sp. nov.	northeastern Australia	1117	present report
<i>Benthosphaera reburra</i> sp. nov.	northeastern Australia	458–500	present report
<i>Caecocassidias patagonica</i>	off Argentina	400–680	Kussakin, 1967
<i>Ceratocephalus grayanus</i>	southeastern Australia	32–498	Bruce, 1994a
<i>Cymodoce acanthiger</i>	South Africa	600	Barnard, 1914
<i>Cymodoce africana</i>	South Africa	160–600	Barnard, 1914
<i>Cymodoce allegra</i>	off New Zealand	0–615	Hurley and Jansen, 1977
<i>Cymodoce australis</i>	New Zealand	0–611	Hurley and Jansen, 1977
<i>Cymodoce japonica</i>	Japan	1547	Harrison and Holdich, 1984
<i>Cymodopsis impudica</i>	New Zealand	425–1225	Hurley and Jansen, 1977
<i>Cymodopsis sphyracephalata</i>	off New Zealand	611	Hurley and Jansen, 1977
<i>Cymodopsis torminosa</i>	off New Zealand	549–1225	Hurley and Jansen, 1977
<i>Dynameniscus carinata</i>	western Atlantic	804–1033	Richardson, 1905
<i>Moruloidea darwini</i>	off Argentina	70–700	Kussakin, 1967
<i>Naesicopea abyssorum</i>	Indonesia	1957	Beddard, 1886; Stebbing, 1893
<i>Paracassidina anasilla</i>	southeastern Australia	32–466	Bruce, 1994b
<i>Parasphaeroma prominens</i>	South Africa	300–460	Stebbing, 1902
<i>Waiteolana tuberculata</i>	off Argentina	400–500	Kussakin, 1967

beyond about 100 m (Bruce, 1994b), while *Cymodoce japonica* Richardson, 1906 has been recorded from the continental slope at 1547 m (Harrison and Holdich, 1984). Records of other *Cymodoce* species from deep localities are of species that probably do not belong to that genus, and none exceeds about 600 m. The records for *Caecocassidias* Kussakin, 1967,

Dynameniscus Richardson, 1905, *Waiteolana* Baker, 1926, *Naesicopea* Stebbing, 1893, and *Cymodopsis* Baker, 1926 (Hurley and Jansen, 1977) are all reliable. Thus *Benthosphaera* is one of only four sphaeromatid genera that are primarily slope-dwelling and *Benthosphaera guaware* is only the sixth species of sphaeromatid to be recorded from beyond 1000 m.

Key to species of *Benthosphaera*

1. Dorsal surfaces smooth, without setae; pleotelson posteriorly acute; uropod endopod posteriorly truncate *B. guaware*
- Dorsal surface with varying degrees and arrangements of setae; pleotelson posteriorly rounded or subtruncate; uropod endopod posteriorly rounded or falcate 2
2. Dorsal surfaces covered by mass of setae; pereonite 7 only slightly narrower than 6; uropod rami extending beyond posterior of pleotelson .. *B. reburra*
- Dorsal surfaces with setal tufts or fine pilosity; pereonite 7 distinctly narrower than 6; uropod rami not extending to posterior margin of pleotelson ... 3
3. Dorsal surfaces with tufts of setae; coxae splayed laterally; posterior margin of pleotelson with shallow notch *B. arkoola*
- Dorsal surfaces with fine pilosity; coxae weakly extended laterally; posterior margin of pleotelson without notch *B. sp.*

Benthosphaera arkoola sp. nov.

Figures 1–5

Material examined. Holotype. Vic. south of Point Hicks (38°17.7'S, 149°11.3'E) 24 Jul 1986, 400 m, coarse sand, gravel, mud, many sponges, M.F. Gomon et al., NMV J36939 (♂ 5.2 mm).

Paratypes. Same data as holotype: NMV J19162 (2 specimens), ZMUC CRU167 (♂ 5.0, dissected, 3 slides; imm. 4.5 mm; 7 e ovig. 5.7, 5.2, 4.0, 3.7 mm, non-ovig. 5.7, 5.4, 5.0 mm; 9 sex indeterminate 4.3–3.7 mm; 26 manca 2.0–3.0 mm). NSW, east of Eden (37°06'S, 150°20.7'E) 21 Jul 1986, 363 m, coarse shell, G.C.B. Poore et al., NMV J19161 (♂ 5.2 mm, 4 manca). Tas, 50 km northeast of Babel I. (30°40.3S, 148°46.5E) 27 Mar 1979, 293 m, rock, coarse sand, G.C.B. Poore, NMV J26304 (♂ 5.8 mm, ♀ ovig. 5.4 mm).

Other Material. Qld. east of Lady Elliot I. (24°03.7'S, 152°49.4'E) 4 Jun 1984, 150 m, rubble and solitary corals, P. Colman, S. Keable and G. Hangay, AM P42560 (♂ 4.9 mm).

Description of male. Body about 1.7 times as long as wide, dorsum smooth, with tufts of setae on coxae, pereonite lateral margins, cephalon and pleotelson; widest at pereonite 5; pereonite 7 narrower than 6, not extending to lateral body margin. Cephalon with single anteromedian

tubercle; and obscure low transverse ridge posteriorly; eyes lateral, round, facets distinct. Pereonite 1 longer (1.2 in lateral view) than pereonite 2, pereonites 2–6 subequal in length, 7 slightly shorter than 6; coxae of pereonites 2–3 distally narrowed.

Antennule peduncle article 2 longest, about 3 times as long as article 2 and about 2.2 as long as article 3; flagellum of 8 articles, about 0.7 times as long as peduncle, extending to pereonite 2; peduncle article 1 with numerous plumose setae, and anterodistal margin with distinct ridge. Antenna flagellum with 10 articles, subequal in length to peduncle. Mandible with prominent molar and multicusped incisor; left mandible with prominent 3-cuspid lacinia mobilis, spine row of 8 spines; right mandible with lacinoid spine and spine row of 7 spines; palp with 5 biserrate setae on distomesial margin of article 2, 16 biserrate setae on mesial margin of article 3, distal 2 of which are longest. Maxilla lateral lobe with 4 finely serrate setae; middle lobe with 6 prominently serrate setae; mesial lobe with dense mass of smooth and plumose spines. Maxillule lateral lobe with 12 stout nodular spines and 1 slender articulating spine on gnathal surface; mesial lobe with 2 short simple spines in

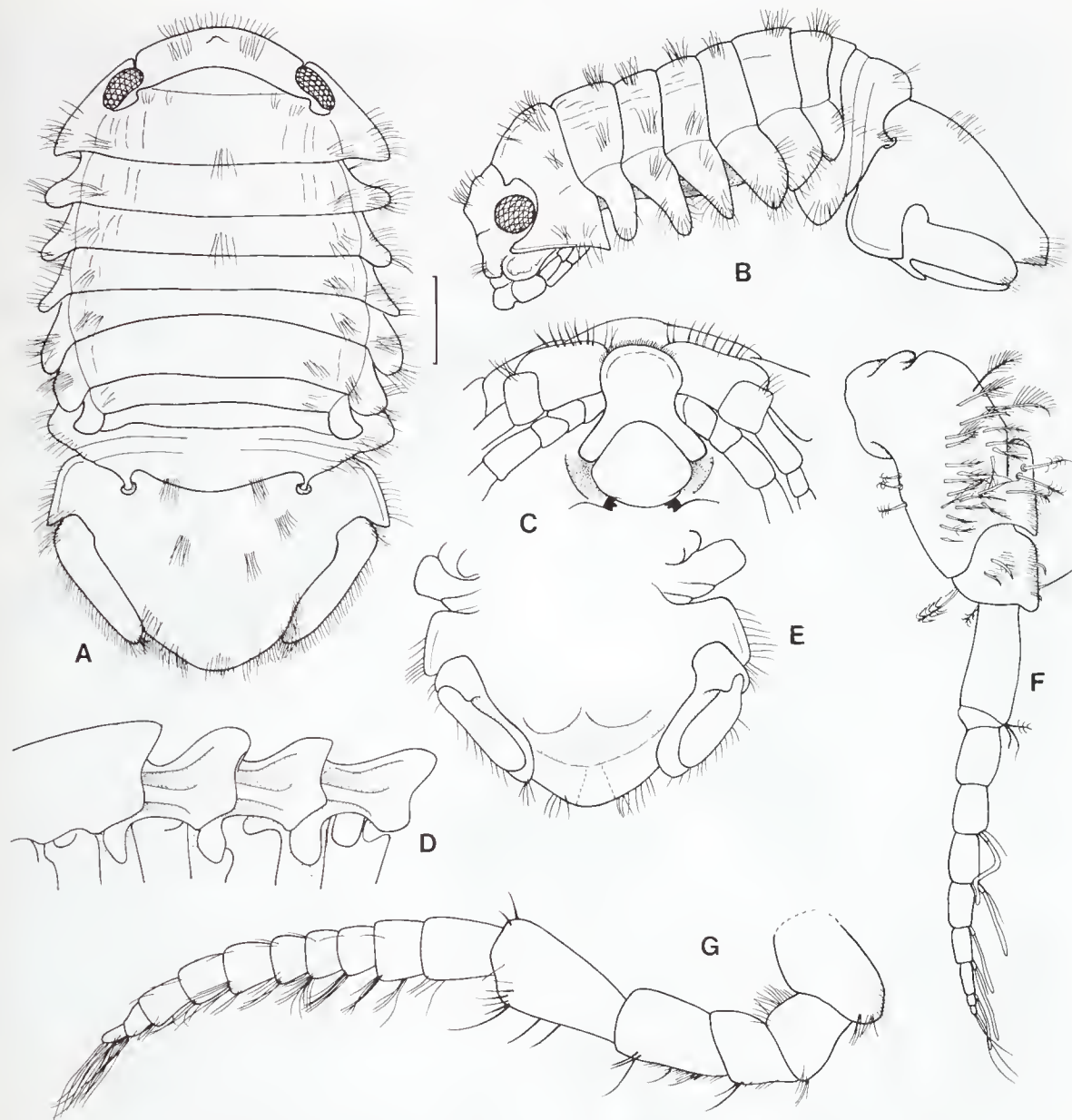


Figure 1. *Benthosphaera arkoala* sp. nov. Figs A-E holotype, remainder ♂ 5.0 mm, NMV J19162. A, dorsal view; B, lateral view; C, frons; D, pleonites 2-4, ventral aspect; E, pleotelson, posterior margin, in ventral view; F, antennule; G, antenna. Scale 1.0 mm.

addition to 4 major spines. Maxilliped palp articles 2-5 with about 7, 9, 10, and 12 setae respectively; endite distal margin with single row of 6 plumose spines, and single stout simple spine at mesiodistal angle; dorsal distomesial margin with 3 plumose spines.

Pereopod 1 shorter than 2, pereopods 2-5 and 7 shorter than 6; pereopods 1-3 with setulose

fringe on posterior margins of merus and carpus, weak setulose fringe on ischium and propodus; pereopods 6 and 7 with weak setulose fringe on basis and ischium. Pereopod 1 with stout acute spines on posterior margins of merus, carpus and propodus; spines on pereopods 2 and 3 slender. Pereopod 6 with serrate and plumose spines on posterior margin of merus and carpus, serrate



Figure 2. *Benthosphaera arkoola* sp. nov. All figs δ 5.0 mm, NMV J19162. A, left mandible; B, right mandible, apex; C, left mandible, apex; D, maxillule; E, maxillule, lateral lobe detail; F, maxillule, medial lobe detail; G, maxilla; H, maxilliped; I, penes.

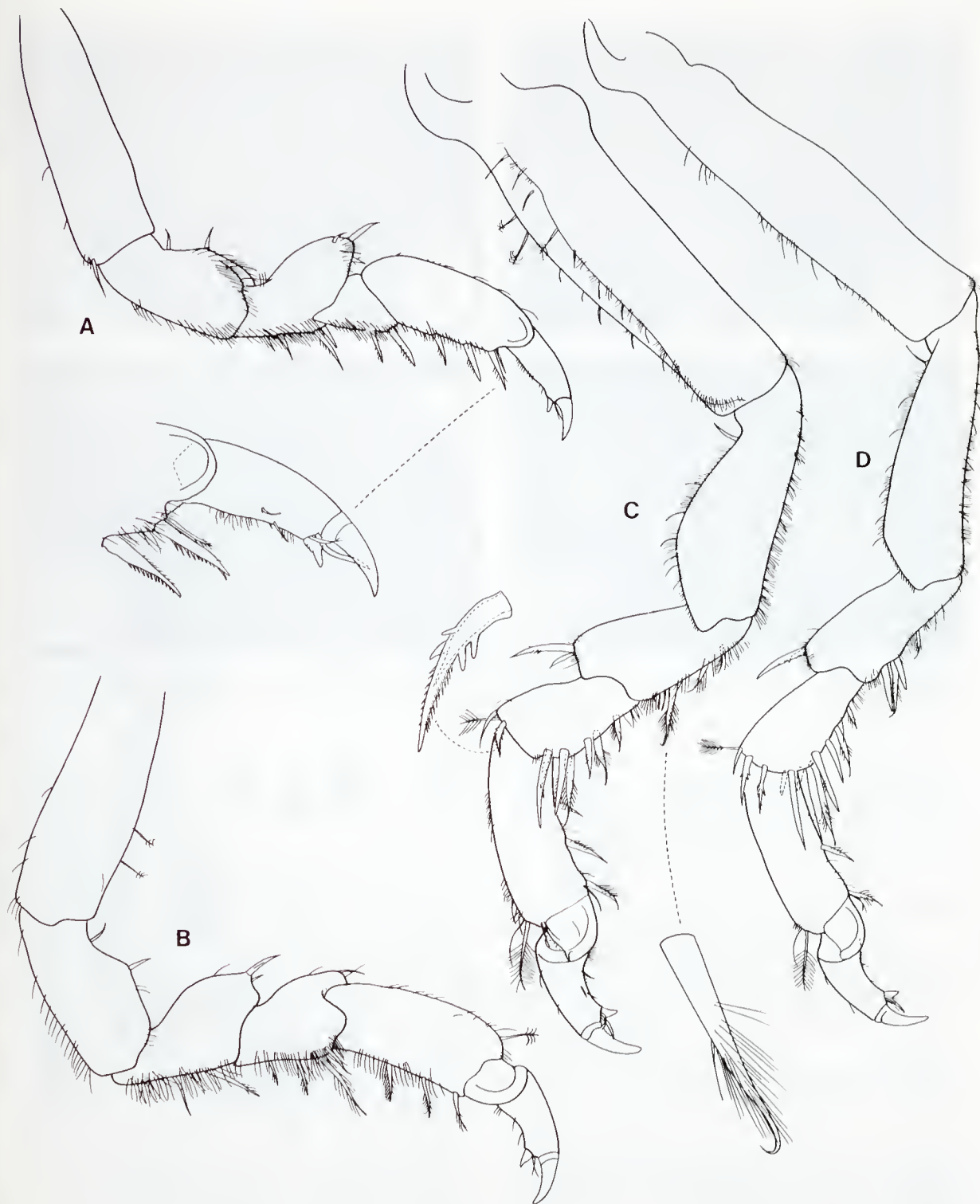


Figure 3. *Benthosphaera arkoola* sp. nov. All figs δ 5.0 mm, NMV J19162. A–D, pereopods 1, 2, 6, 7, respectively.

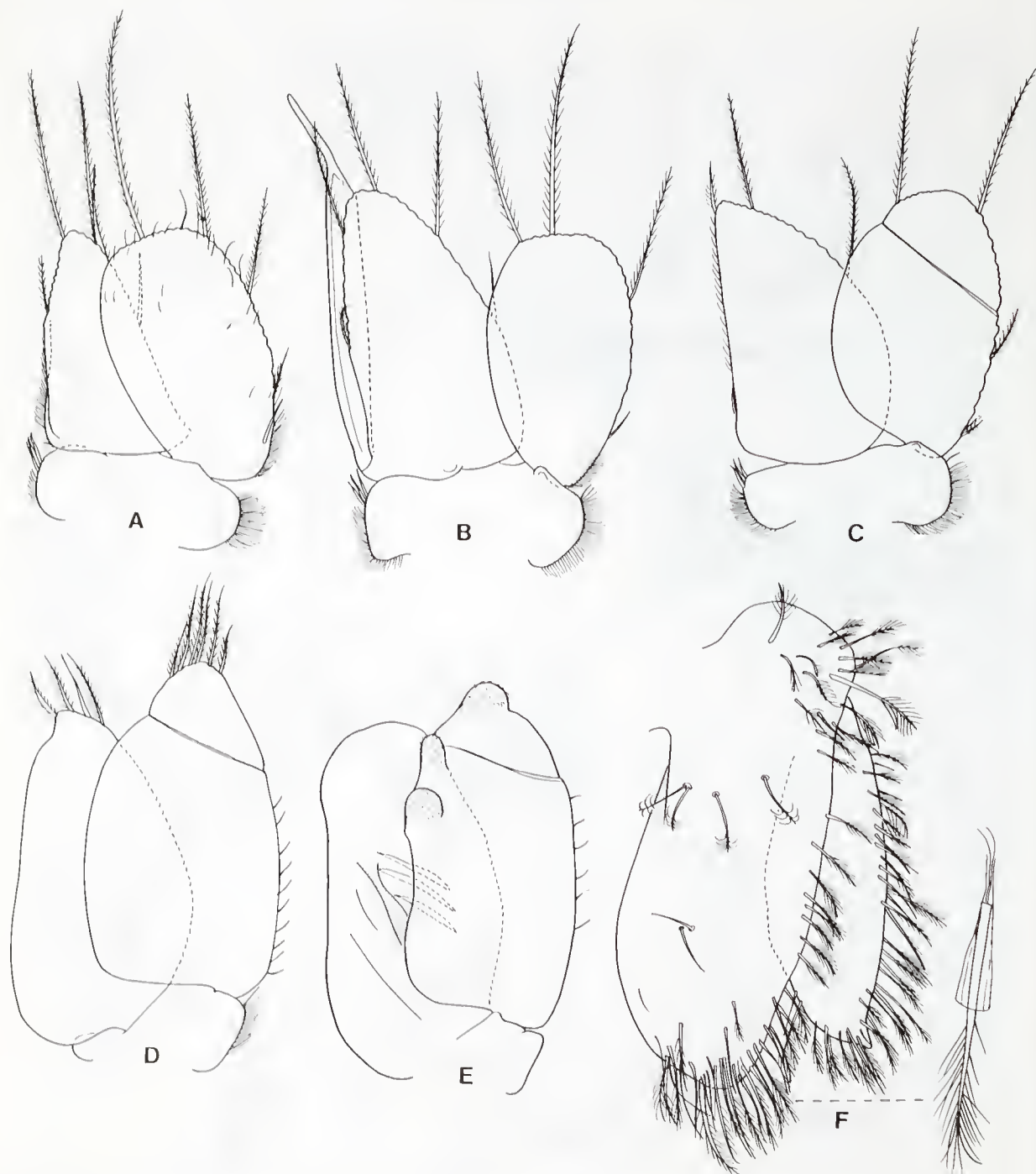


Figure 4. *Benthosphaera arkoala* sp. nov. All figs δ 5.0 mm, NMV J19162. A-E, pleopods 1-5, respectively; F, uropod.

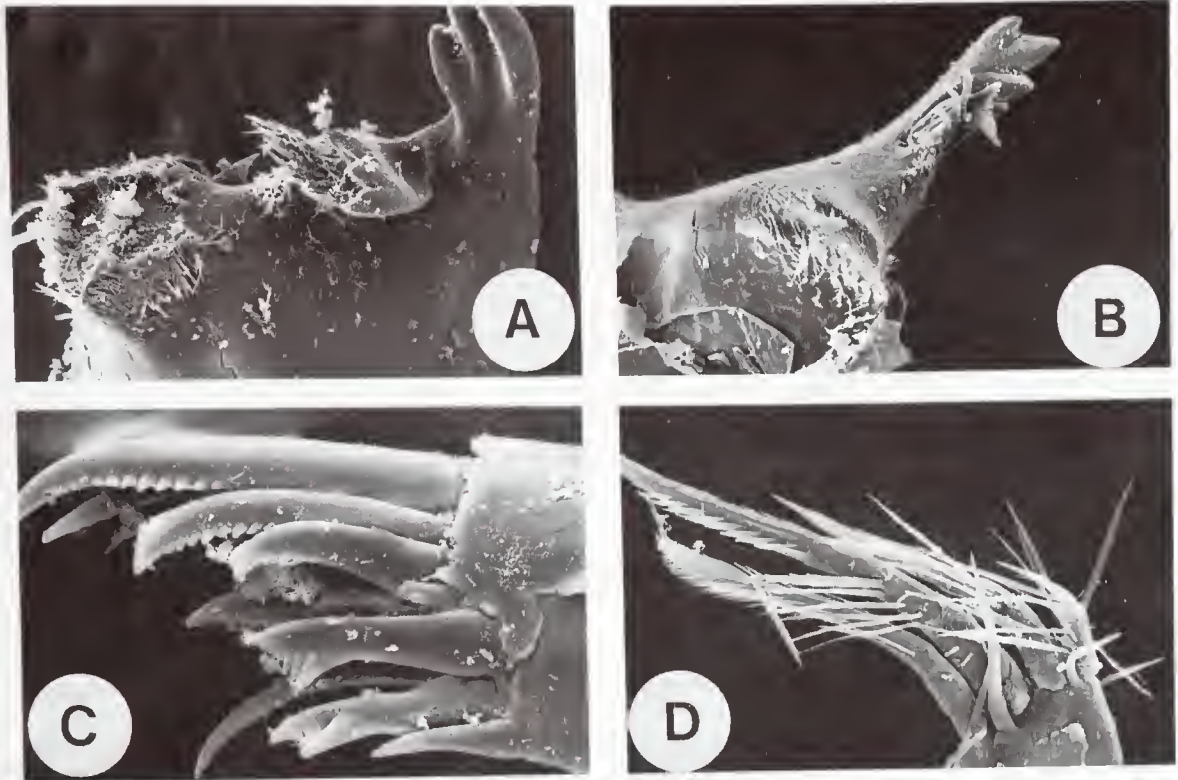


Figure 5. *Benthosphaera arkoala* sp. nov. SEMs. A, left mandible (430 \times); B, right mandible (350 \times); C, maxillule, lateral lobe (1200 \times); D, maxillule, medial lobe (1000 \times).

spines only on anterior margin. Pereopod 7 with elongate spines on distal and posterior margin of merus.

Penes elongate, about 5 times as long as basal width; apically folded over.

Pleopod 1 with about 20 and 27 PMS on endopod and exopod respectively; exopod with prominent simple spine present at proximolateral angle. Pleopod 2 endopod and exopod with about 32 and 30 PMS respectively; appendix masculina about 1.3 times as long as endopod, abruptly narrowing just beyond point of endopod distal margin to form distinct elongate narrowed tip, 0.26 of total length. Pleopod 3 endopod and exopod with 17 and 28 PMS respectively; endopod with extremely faint thickenings scarcely visible. Pleopod 4 endopod and exopod with 4 and 6 PMS respectively on distal margin only, faint ridges visible on endopod. Pleopod 5 with faint ridges visible. Uropod endopod about 2.5 times as long as greatest width, distally bluntly rounded; exopod about 0.7 times as long as endopod, distally narrowed with laterally angled acuminate apex; both rami with abun-

dant PS on dorsolateral surfaces, particularly dense on distolateral surface of endopod.

Female. Similar to male, oostegites on coxae 2–4.

Colour. All specimens are pale cream to white, without evident chromatophore pattern.

Size. Males 5.0–5.8 mm, one immature male measured 4.5 mm; ovigerous females 3.7–5.7 mm, non-ovigerous females 5.0–5.7 mm; man-eas 2.0–3.0 mm.

Distribution. Eastern Australia from off Lady Elliot I., southern Great Barrier Reef to off Tasmania; 150–400 m.

Etymology. An Aboriginal word meaning hair (noun in apposition).

Remarks. This species, the only one of the genus known from more than one specimen, is readily recognized by the tufted setae over the dorsal surfaces, and the narrow pereonite 7 which does not form part of the lateral body margin. *Benthosphaera reburra* is densely covered by setae,

and has the uropods extending beyond the posterior margin of the pleotelson, while the very much larger *B. guaware* is devoid of dorsal setae, has an anteriorly subacute epistome, and a truncate uropodal endopod (and many other differences). The most similar species is the undescribed *Benthosphaera* sp. (see below).

Benthosphaera reburra sp. nov.

Figures 6, 7

Material examined. Holotype. Qld, east of Innisfail (17°35'S, 146°53'E) 15 May 1986, 458–500 m, sledge, M. Pichon, P. Arnold and A. Birtles on R.V. *Cidaris*, MTQ W13595 (♂ 8.4 mm).

Description of holotype. Body about 1.5 times as long as wide; exposed dorsal surfaces entirely covered by dense mass of setae; widest at pereonite 6, pereonite 7 not extending to lateral body margins.

Antennule peduncle articles 1 and 2 anteriorly finely nodulose; flagellum of 10 articles, extending to posterior of pereonite 1. Antenna flagellum of 13 articles, extending to pereonite 3. Epistome anteriorly rounded, with fine nodules. Mouthparts generally similar to generic diagnosis and those of type species; maxilliped palp articles 2–5 with about 16, 16, 20 and 20 setae respectively.

Pereopod 1 with 5, 4 and 6 stout acute spines on posterior margin of merus, carpus and propodus respectively; ischium, merus and carpus with indistinct setulose fringe. Pereopods 2–7 distinctly more slender than 1, all with distinct setulose fringe on merus, carpus and propodus, with slender plumose spines set amid setules; additional stout acute spines present on distal margin of carpus of pereopods 6 and 7.

Pleopod 1 endopod and exopod with about 34 and 50 PMS respectively; ventral surface of exopod with scattered short simple setae. Pleopod 2 endopod and exopod with about 40 and 50 PMS respectively; appendix masculina narrowing at point just short of distal margin of endopod, about 1.3 times as long as endopod, narrowed apex, 0.28 of total length. Pleopods 3–5 all damaged; weak folds visible on endopod of pleopod 3, distinct on pleopod 5.

Uropod rami extending to or just beyond posterior margin of pleotelson; exopod with falcate acute apex.

Colour. White, chromatophores not apparent.

Distribution. Known only from the type locality.

Etymology. The Latin word *reburra*, meaning one with bristling hair.

Remarks. This species is immediately recognized by the dense mass of setae that covers all the exposed dorsal surfaces. Additionally the uropods extend to the posterior of the pleotelson in contrast to the other species in which the uropods fall short of the posterior margin of the pleotelson.

Benthosphaera guaware sp. nov.

Figures 8–11

Material examined. Holotype. Qld, east of Tully (18°08'S, 148°15'E) 7 May 1986, 1117 m, trawled, R.V. *Cidaris*, MTQ W13395 (♂ 18.5 mm).

Description of holotype. Body about 1.6 times as long as wide, dorsally smooth, unornamented; coxae of pereonites 2–5 strongly narrowed and splayed laterally; lateral margin of pereonite 1 and coxae 2–6 with sparse setae and small tubercles; widest at pereonite 6; pereonite 7 extending to lateral body margin. Pleotelson posteriorly acute.

Antennule and antenna as for genus; antennule peduncle articles 1 and 2 with scattered small nodules. Epistome anteriorly subtruncate, anterior portion granular. Mouthparts similar to type species except for: maxillule lateral lobe spines less nodulose, mesial lobe spines more densely serrate; maxilliped palp articles 2–5 with some stout marginal setae not distally tapered.

Pereopod 1 stout, robust; pereopods 2–7 with extremely dense ("fur-like") setulose fringe which largely conceals spination; pereopod 7 with stout acute spines on posterior margin of merus and carpus, and distal margin of carpus.

Pleopod 1 endopod and exopod with about 45 and 60 PMS respectively; mesial margin of endopod with recessed groove. Pleopod 2 endopod and exopod with about 38 and 60 PMS respectively; appendix masculina basally swollen, apex bent mesially, about 1.1 times as long as endopod, narrowed apex about 0.16 of total length. Pleopod 3 endopod and exopod with about 26 and 60 PMS respectively, endopod with distinct setule patch on mesial margin, with distinct thickened ridges. Pleopod 4 endopod and exopod with about 12 and 31 PMS respectively; endopod with distomesial setule; exopod with SMS on proximal lateral margin. Pleopod 5 with distinct thickened ridges on endopod, 2 distal and 2 medial scale patches.

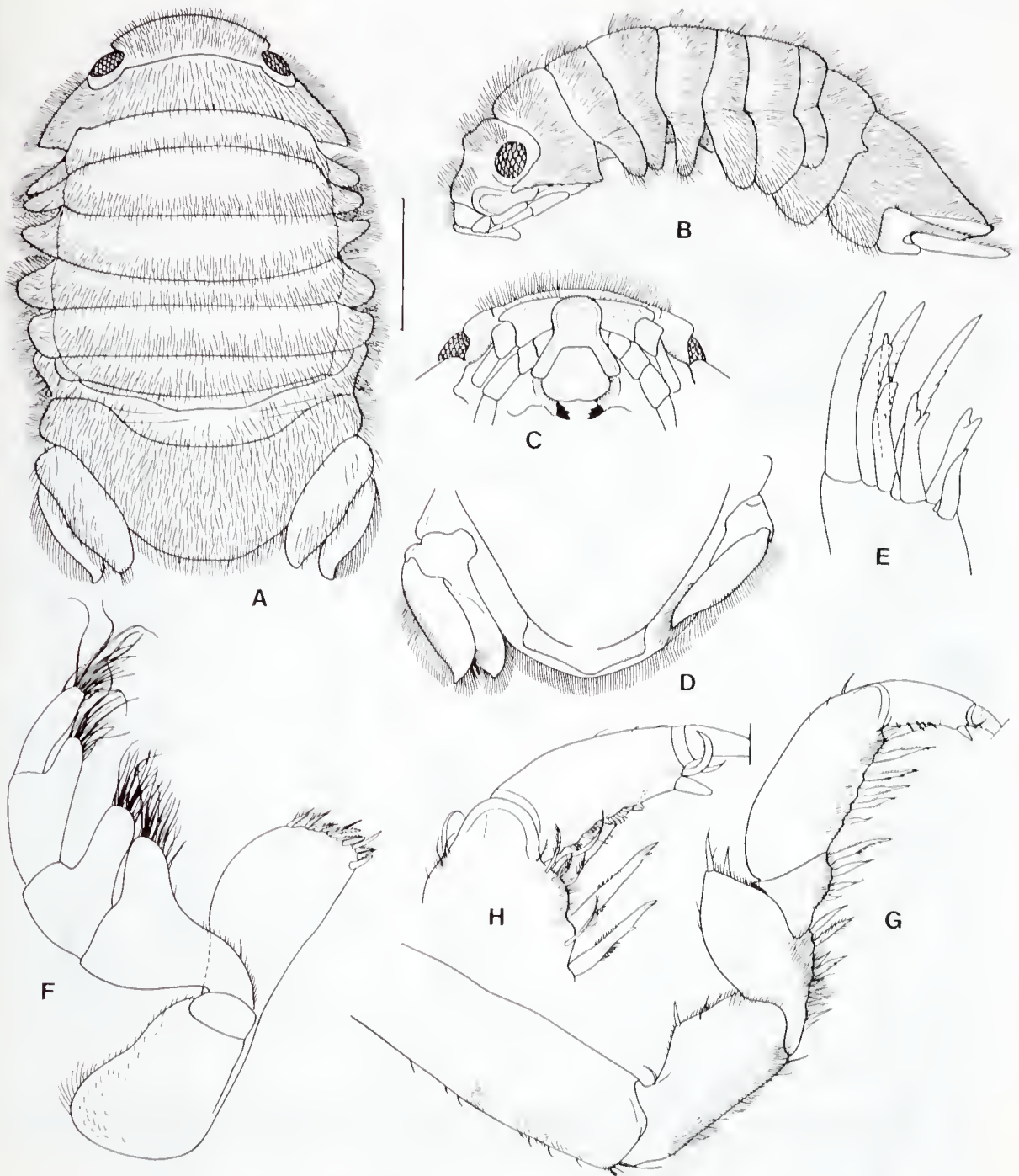


Figure 6. *Benthosphaera reburra* sp. nov., holotype. A, dorsal view; B, lateral view; C, frons; D, pleon, ventral view; E, maxillule, apex of lateral lobe; F, maxilliped; G, pereopod I; H, pereopod I dactylus. Scale 2.0 mm.



Figure 7. *Benthosphaera reburra* sp. nov., holotype. A, pereopod 2; B, pereopod 7; C, pereopod 6; D-F, pleopods 1-3 (pleopod 2 endopod folded over).

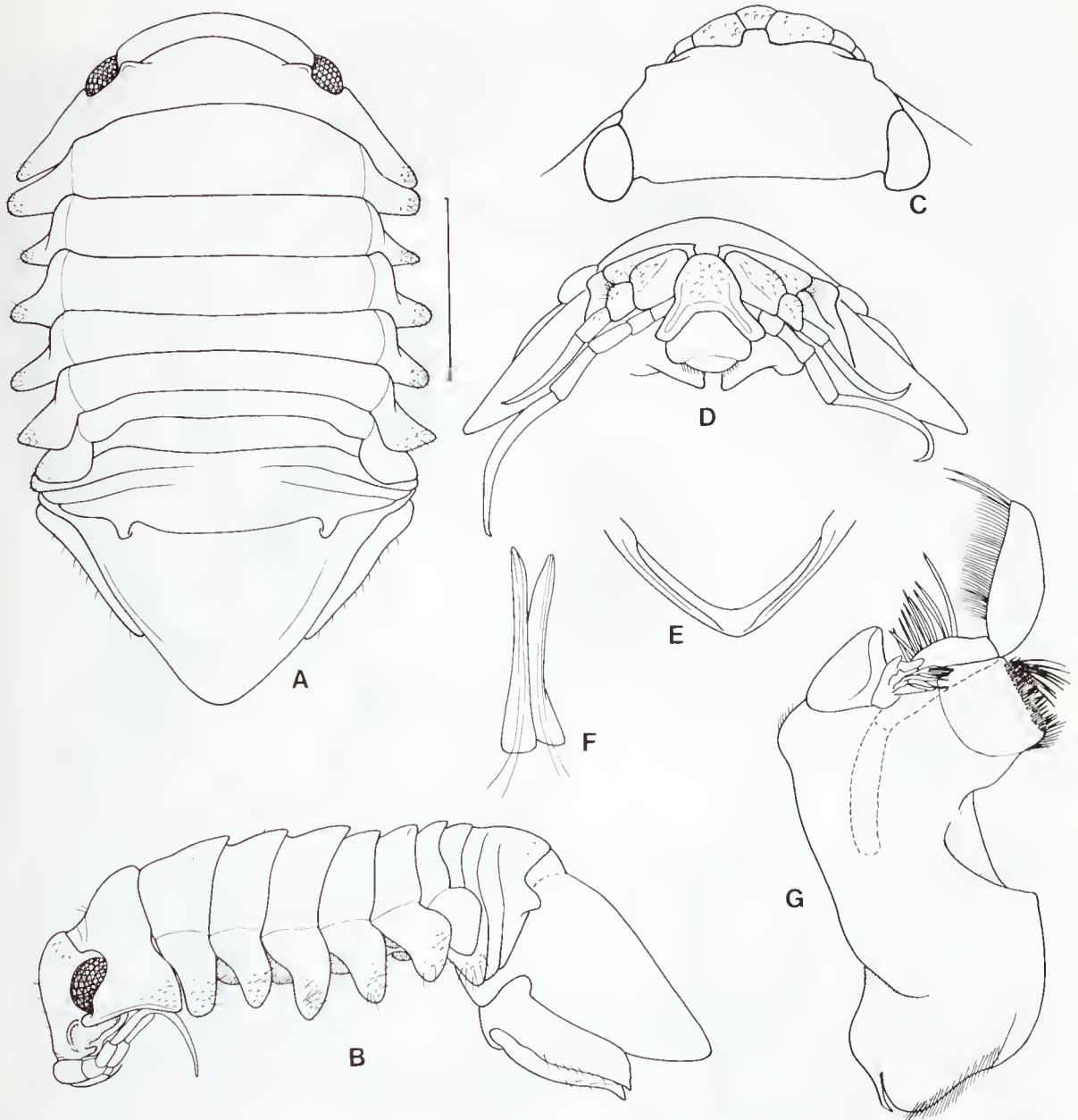


Figure 8. *Benthosphaera guaware* sp. nov., holotype. A, dorsal view; B, lateral view; C, cephalon, dorsal view; D, frons; E, ventral posterior margin of pleon; F, penes; G, mandible. Scale 5.0 mm.

Uropod endopod lateral margin weakly sinuate, apex subtruncate, indented; exopod apex bent laterally also subtruncate; neither ramus extending to posterior margin of pleotelson.

Colour. Pale tan, chromatophores not apparent.

Distribution. Known only from the type locality.

Etymology. An Aboriginal word meaning deep (noun in apposition).

Remarks. *Benthosphaera guaware*, at nearly 2 cm, is a large sphaeromatid, and is one of few sphaeromatids collected beyond a depth of 1000 metres (Table 1). Its large size, smooth dorsum, acute pleotelson, strongly splayed coxae distinguish it from its congeners.

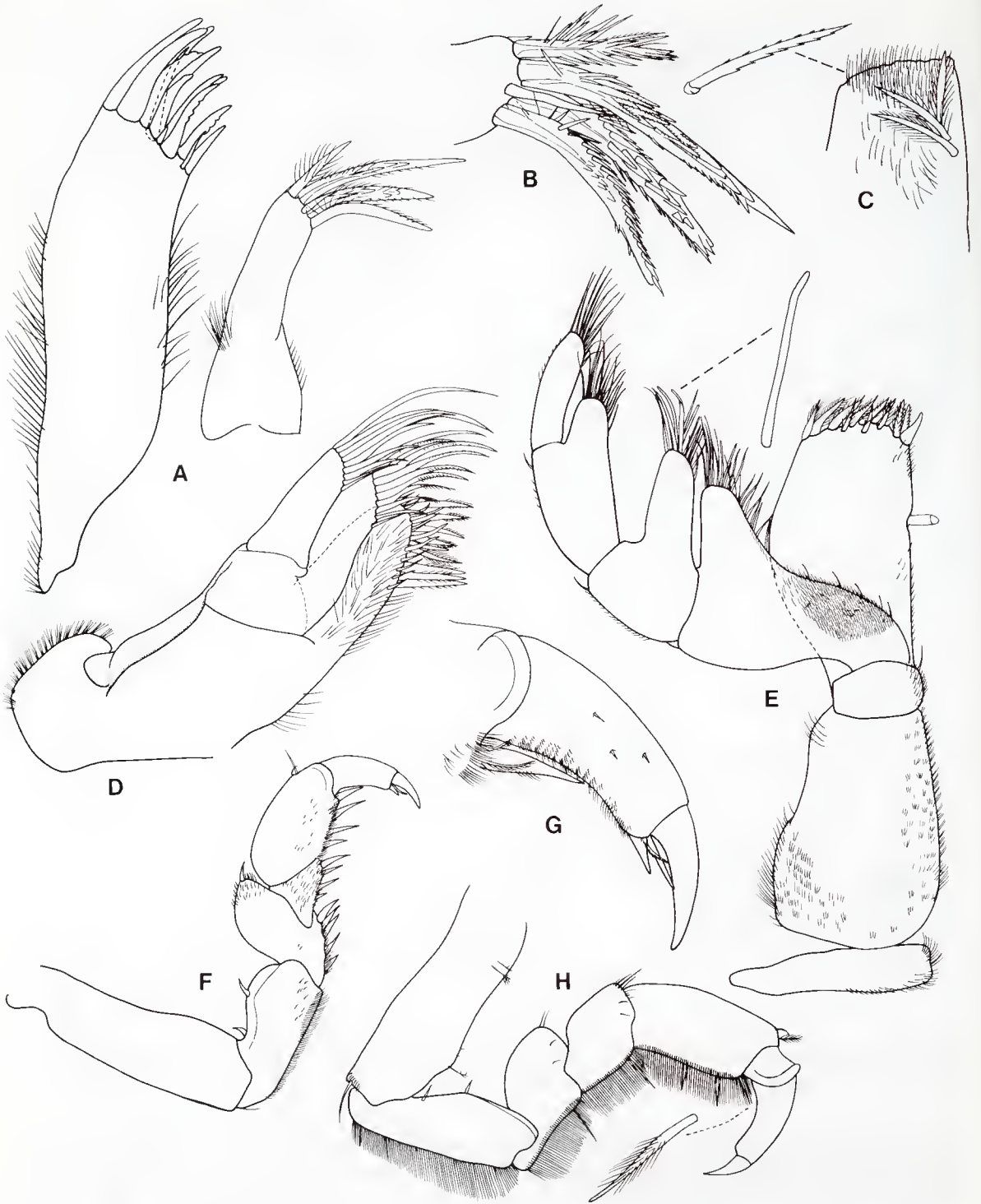


Figure 9. *Benthosphaera guaware* sp. nov., holotype. A, maxillule; B, maxillule, medial lobe; C, maxilliped endite, dorsal surface; D, maxilla; E, maxilliped; F, pereopod 1; G, pereopod 1, dactylus; H, pereopod 2.

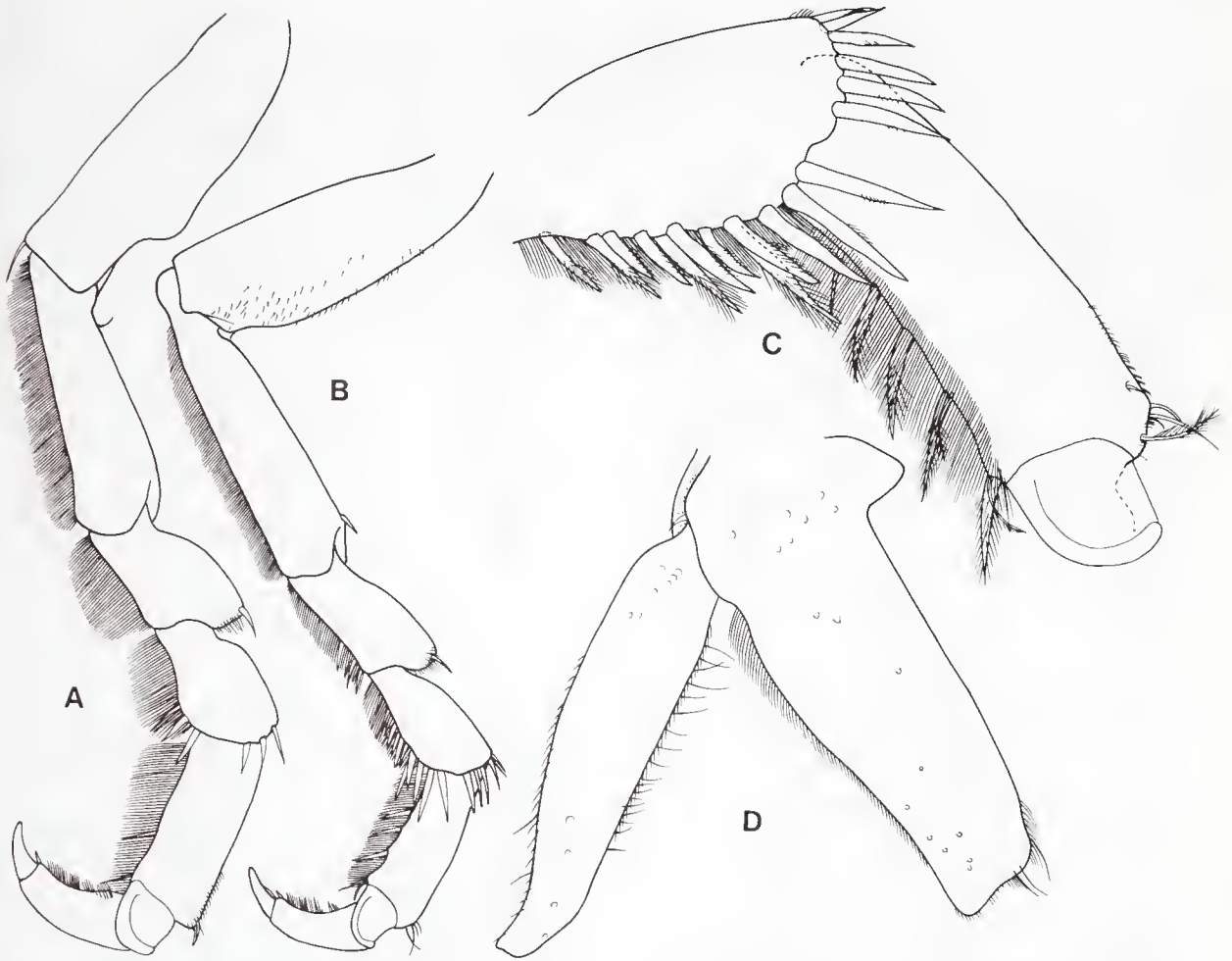


Figure 10. *Benthosphaera guaware* sp. nov., holotype. A, pereopod 6; B, pereopod 7; C, pereopod 7, distal carpus, propodus; D, uropod, *in situ*.

Benthosphaera sp.

Material examined. NSW, off Port Hacking (34°11.1'S, 151°26.0'E) 5 Oct 1982, 198 m. W. Ponder and R.T. Springthorpe on R.V. *Tangaroa*, AM P42561 (♀ non-ovig, 3.6 mm).

Remarks. This single specimen, which was taken within the distributional range of *B. arkoola*, differs in several characters from it. It lacks dorsal tufts of setae, having instead a fine pilosity, the posterior margin of the pleotelson is narrower and lacks any trace of a ventral notch, antennule peduncle articles 1 and 2 are relatively longer, and the coxae are angled more ventrally.

Dorsal setation on *Benthosphaera arkoola* varies, as does the prominence of the cephalic tubercle. It therefore seems prudent to draw attention to a fourth species in the genus, and so

avoid its confusion with *B. arkoola*, but defer description until more material is available.

Xynosphaera gen. nov.

Type species. *Xynosphaera colemani* sp. nov., here designated.

Diagnosis of male. Body strongly vaulted, smooth, without processes or cuticular ornamentation. Cephalon without distinct rostrum, but antennule bases separate; eyes large. Pereonites 2–6 subequal in length, pereonite 7 shorter (0.7) than 2–6; coxae each with distinct suture, distally subtruncate, not narrowed; coxae of pereonite 7 rounded. Pleonite 1 entire, largely concealed by pereonite 7, pleonites 2–4 indicated by 2 separate sutures running to posterior margin of

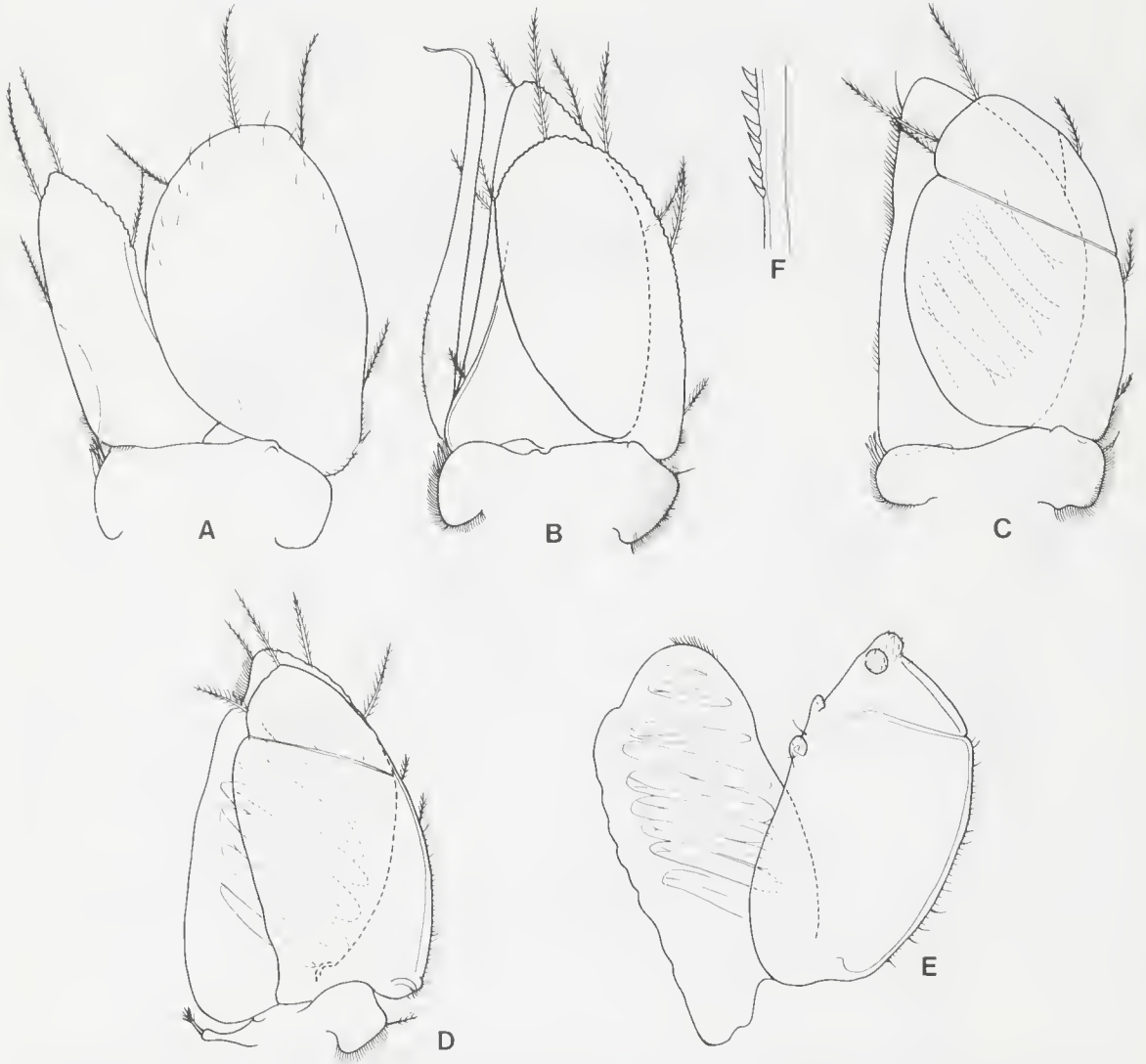


Figure 11. *Benthosphaera guaware* sp. nov., holotype. A-E, pleopods 1-5, respectively; F, pleopod 2 exopod, medial margin, showing scales.

pleon. Pleotelson posterior margin entire, without foramen or ventral exit channel; apex with prominent caudomedial point.

Antennule peduncle not flattened or otherwise expanded, articles 2 and 3 subequal in length. Antenna peduncle with 4 articles. Mandible robust, incisor a single truncate cusp in ventral view; lacinia mobilis single simple cusp on right mandible; spine row absent; molar reduced to simple setose swelling. Maxillule lateral lobe with 11 simple stout spines, mesial lobe reduced, without spines. Maxilla with all lobes

with blade-like, finely serrate spines. Maxilliped palp articles 3 and 4 with mesial lobes; mesial margins of palp articles 3-5 with blade-like spines, article 2 with single spine; lateral margins without spines; endite with 3 simple and 4 serrate blade-like spines on distal margin.

Pereopods all robust, largely without setae, setules and cuticular scales. Pereopod 1 with stout dactylus, which has prominent simple accessory unguis and stout short acute spines on propodal palm and posterior margin of merus; pereopods 2-6 with few spines or setae, distal

margin of merus partly fused to propodus; pereopod 7 with long blade-like spines on posterior margins of ischium-propodus and distal margins of carpus and merus.

Paired penes present on posterior of sternite 7 in submedian position, not fused, about 4 times as long as basal width.

Pleopod 1 not operculate, not indurate. Pleopod 2 appendix masculina not observed. Pleopods 1–3 both rami with PMS; pleopods 3–5 exopods with transverse suture; pleopods 4 and 5 endopods with prominently thickened fleshy folds; exopod of pleopod 5 with 2 large scale patches. Uropod exopod longer than endopod, both rami prominently setose.

Female. Similar to the male. Mouthparts not metamorphosed. Brood pouch formed from oostegites arising from coxae 2–4, overlapping at midline and provided with stout supports.

Distribution. Recorded from north-eastern Australia (Great Barrier Reef) Madagascar and the Philippines.

Etymology. From the Greek *xynos*, a companion or partner, alluding to its symbiotic habitat (feminine).

Remarks. This genus can easily be recognised by its strongly humped appearance and smooth body surfaces, together with the shape of the pleotelson which has a prominent caudomedial point, and by the shape of the uropodal rami.

This is the only sphaeromatid genus that appears to be an obligate internal symbiont of a marine organism. Species of the "*Cymodoce tuberculosa* group" are frequently recorded from sponges, and some clearly burrow into the sponge tissue (personal observation), but these species are apparently also taken in free-living habitats, and show no special morphological features that could be recognised as adaptations to symbiosis. Known external commensals include *Waiteolana gibbera* Harrison, 1984 (on gorgonians), *Neosphaeroma australe* (Whitelegge) (see Harrison and Holdich, 1984, on black coral) and an undescribed species of *Neosphaeroma* (from crinoids).

Xynosphaera, which shows a strong superficial similarity in body shape to *Cartetolana* (Cirolanidae, see Bruce, 1986), shows several characters that can be recognised as adaptations to a symbiotic habit: lack of cuticular ornamentation, almost total lack of setules, setae and spines, and the spines that there are, are blade-like and serrate (though there are no hooked

spines as in the fish parasitic isopod families Aegidae and Cymothoidae).

Xynosphaera colemani sp. nov.

Figures 12–14

Material examined. Holotype, Qld, off Mrs Watson's Beach, Lizard I. (14°40'S, 145°28'E) Nov 1975, in burrow in green soft coral, 5 m. N. Coleman, AM P41871 (♂ 11.5 mm).

Paratypes. Collected with holotype, AM P25202 (♀ ovig. 13.3 mm). Philippines, Tubajon Bay, Dinigat (10°20'N, 125°32'E) 19 July 1951, intertidal coral reef, R.V. *Galathea*, ZMUC CRU165 (manca 5.8 mm).

Other material. Madagascar, Nosy-Bé, S of Ambariobé (13°24.4'S, 48°22.9'E), under intertidal rocks with sponges, alcyonarians, anemones etc, J. Rudloc, 15 Jan 1964 USNM (3 immature specimens, 3.1, 3.4, 4.0 mm).

Description of holotype. Cephalon anterior margin blunt. Epistome anteriorly truncate in ventral view, with anterior portion projecting between antennule bases in frontal view.

Antennule peduncle article 1 as long as combined lengths of articles 2–4, subequal in length to peduncle; flagellum with 10 articles, article 1 of which is longest. Antenna peduncle articles 1 and 4 subequal in length and longer than articles 2 and 3 which are also subequal in length; flagellum with 8 articles, slightly longer (1.2) than peduncle. Mandible palp article 2 with 10 setae, article 3 with about 12 plumose setae. Maxilla lateral lobe with 6 spines, middle with 8, and mesial with 10 spines. Maxilliped palp articles 2–5 with 1, 7, 7 and 4 spines respectively.

Pereopod 1 merus with one short spine at anterodistal angle, and one slender spine at posterodistal angle; merus with 2 spines on posterodistal margin; propodus with 4 stout acute spines on palm. Pereopods 2–6 subsimilar. Pereopod 2 with single spine on posterior margin merus, additional small spines on distolateral margin of merus and carpus; carpus distal margin fused with propodus. Pereopod 6 with sparse setae on anterior margin of basis; merus with 3 setae and 2 acute spines, carpus with 3 acute spines, propodus with small setae on palm, small spine on distolateral margin; carpus partly fused with propodus. Pereopod 7 more slender and longer than pereopods 2–6; posterior margins of ischium to propodus with 5, 9, 5 and 5 acute spines respectively, those of propodus being more robust than remainder; anterodistal margin of merus and carpus with 4 and 6 spines respectively.

Pleopod 1 exopod with about 37 PMS, and

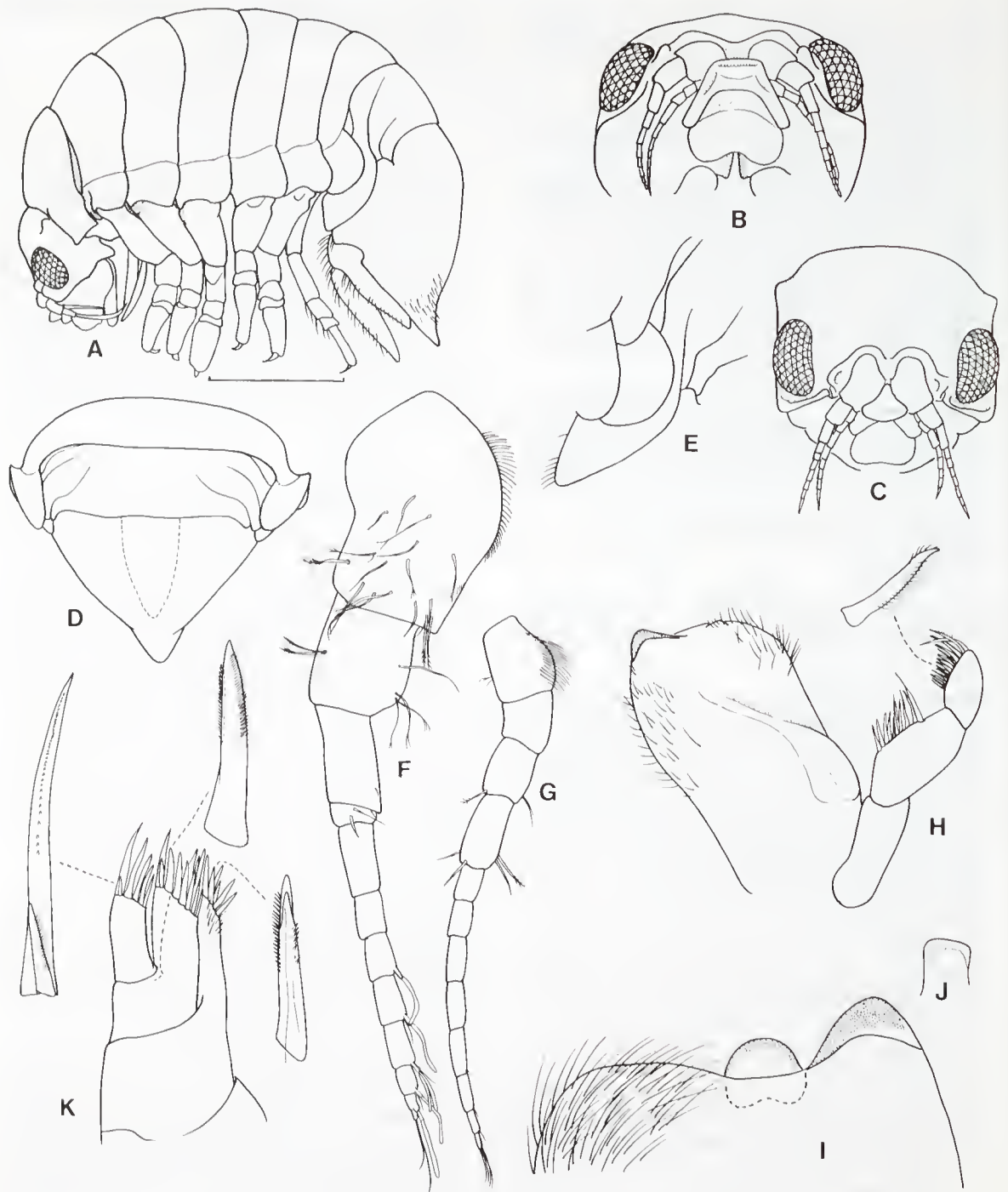


Figure 12. *Aynosphaera colemani* sp. nov. A, B and J, holotype, remainder paratype. A, lateral view; B, frons; C, cephalon, anterior view; D, pleon and pleotelson, dorsal view; E, pleon, lateral view, showing sutures; F, antenna; G, antennule; H, right mandible; I, left mandible, distal margin; J, mandible incisor, drawn *in situ*; K, maxillule. Scale 3.0 mm.



Figure 13. *Xynosphaera colemani* sp. nov. A-D, female paratype, remainder holotype. A, maxilliped; B, maxilliped endite, distal margin; C, maxillule; D, maxillule, lateral lobe; E-H, pereopods 1, 2, 6, 7, respectively; I, pereopod 7, merus posterior spines; J, pereopod 7, distal margin of propodus.

scattered setules on ventral surface; endopod distally tapering, slightly longer than exopod, with about 27 PMS. Pleopod 2 exopod and endopod with about 60 and 27 PMS respectively; mesial margin of endopod with incipient appendix masculina. Pleopod 3 exopod and endopod with about 54 and 22 PMS respectively. Pleopod 4 without PMS, exopod with short SMS on proximal lateral margin. Pleopod 5 exopod with 3 scale patches, distal patch being large; proximal lateral margin short SMS. Uropod endopod straight, narrowing evenly to rounded apex, with finely serrate mesial margin; with abundant long SMS; exopod lateral margin strongly sinuate, apex narrow; lateral margin with abundant setae; exopod distinctly longer (1.6) than endopod.

Female. As for genus.

Colour. Photographs taken by Neville Coleman show the animal to be entirely creamy white, the eyes also being without pigment.

Size. Adults 11.5–13.3 mm.

Distribution. Philippines, northeastern Australia, northern Madagascar.

Habitat. The two adult specimens were collected by Neville Coleman, who "squeezed them from a small burrow with a slit-like aperture" on the stem of the aleyonarian. The aleyonarian has been identified, from colour photographs, as probably belonging to the family Nephthyidae (Aleyonacea).

Etymology. The epithet honours Mr Neville Coleman, photographer and collector of this unusual isopod.

Remarks. The rarity of collected specimens is almost entirely attributable to its cryptic way of life. It is readily identified by the generic characters, and cannot be confused with any other isopod.

Bregmotypta gen. nov.

Type species. *Bregmotypta pavicula* sp. nov., here designated.

Diagnosis of male. Anterior of cephalon produced into a conical process; ventral rostral process present, separating antennules; eyes lateral, facets distinct. Pereonite 1 longest, about twice as long as pereonite 2; posterior margins of pereonites 1–7 with nodular ridge; coxae indistinct, sutures not visible; overlapping anterior to posterior. Pleon of 4 segments, with 2 separate

sutures running to posterolateral margins; pleonite 1 present, visible in lateral view. Pleotelson prominently bidomed, apex indistinctly trilobed, with indistinct ventral exit channel.

Epistome short, laterally constricted, not separating antennule bases. Antennule peduncle article 1 robust, article 2 very short, article 3 slender; flagellum shorter than peduncle. Antenna peduncle slender, articles 4 and 5 longest, subequal in length; flagellum shorter than peduncle. Mandible incisor unicuspid; left mandible with laeina mobilis, spine row absent, right mandible with spine row of 2 or 3 spines; both mandibles with prominent molar process with flat mesial face, not obviously ornamented or rugose. Maxillule lateral lobe with 10 unornamented spines, mesial lobe spines with elubbed spinulations. Maxilla with all lobes spinose, some spines simple, some serrate. Maxilliped palp articles 2–4 with medial lobes; endite distal margin with plumose spines.

Pereopod 1 robust, shorter than 2–7 which are subsimilar. Pereopod 1 posterior margin of merus, carpus and propodus with prominent, stout apically trifid spines. Pereopods 2–7 with setulose fringe on posterior margin of merus and carpus.

Penes elongate, basally in contact, not fused; apices acute, extending beyond pleopod 1 peduncle.

Pleopod 1 endopod triangular, mesial margin dorsally recessed, accommodating penial process, exopod oblique, distally subtruncate. Pleopod 2 appendix masculina basal in position, extending beyond distal margin of endopod. Pleopods 1–3 with PMS; pleopods 3–5 with entire transverse suture. Pleopod 4 exopod lateral margin with SMS, distal margin with 2 short PMS; proximo-medial lobe present. Pleopod 5 exopod lateral margin with SMS; mesial margin with 2 proximal sealed lobes, distomesial margin entirely sealed, ventral surface with further prominent sealed lobe. Uropodal rami short, not reaching posterior margin of pleotelson; exopod small, subcylindrical, articulating laterally on endopod.

Female. Not known.

Etymology. The Greek words *bregma* (front of the head) and *typto* (beat, strike), in other words, head-banger (feminine).

Remarks. The unique characters that immediately serve to identify the genus are the strongly produced cephalon, bidomed pleotelson, pleotelson lacking a defined ventral exit channel or

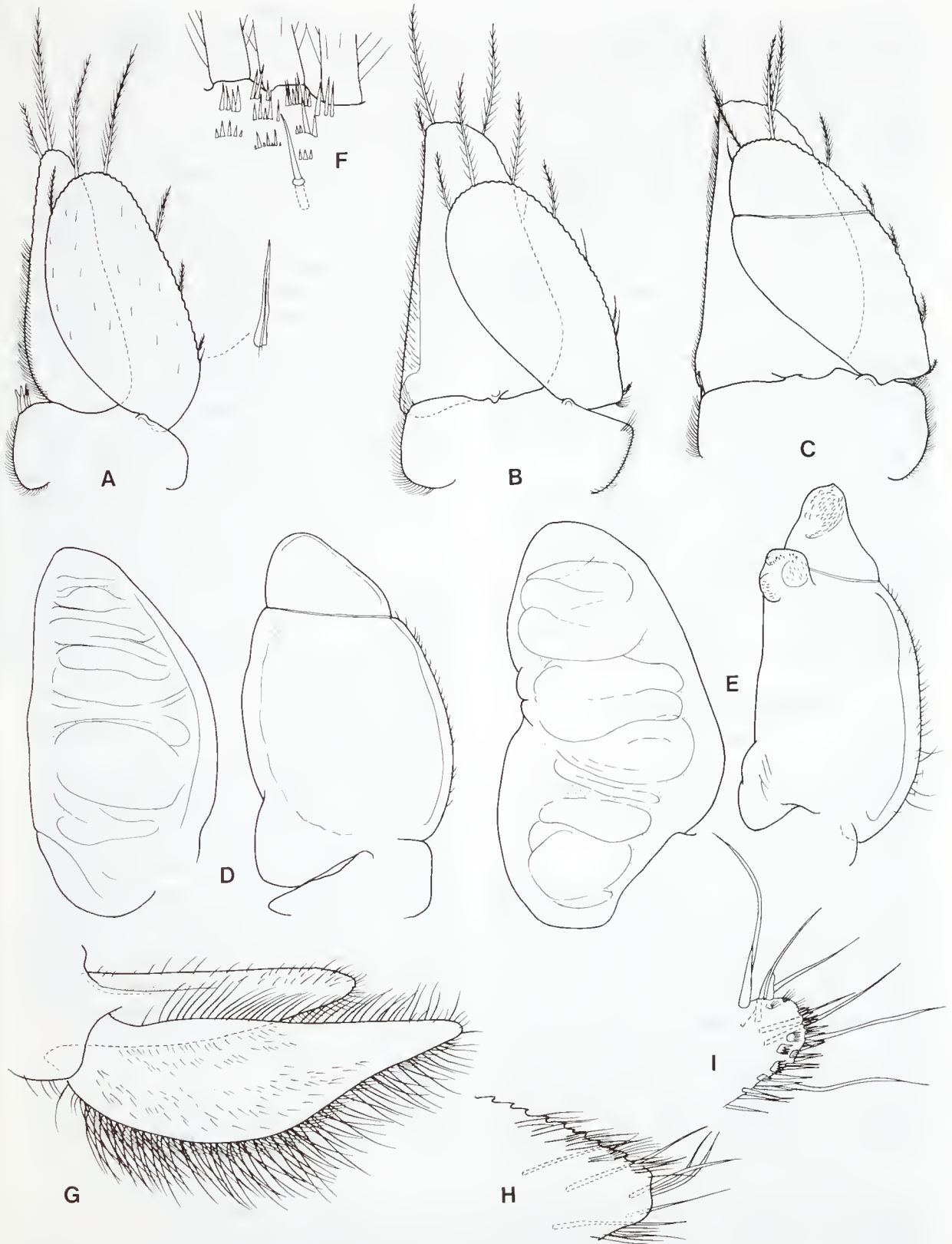


Figure 14. *Xynosphaera colemani* sp. nov., female paratype. A-E, pleopods 1-5, respectively; F, distal margin of pleopod 1 exopod showing scales; G, uropod; H, uropod endopod, apex; I, uropod exopod, apex.

notch, and the short uropod rami, with a reduced exopod. Although the dorsal ornamentation and prominence of the pleotelsonic bosses also identify the species, such ornamentation has in some cases been demonstrated to be unreliable as a defining generic character (Harrison and Holdich, 1982; Bruce, 1994b — *Paracassidina*). The shape of the cephalon is here not regarded as ornamentation, comparable to the nodules and bosses shown by the genera cited above, and the presence of a second species (Masthead I.) indicates that this should be regarded as a defining character for the taxon.

The position of *Bregmotypta* in relation to other genera is not clear, although penial (elongate and distally narrow) and pleopod morphology (pleopod 1 medial margin with groove) suggest the genus belongs to the group of loosely similar genera that includes *Waiteolana* Baker, 1926, *Ceratocephalus* Woodward, 1877 and *Kranosphaera* Bruce, 1992.

Baker (1926: 279 (caption), plate 47, figs. 10, 11) recorded a similar unnamed dry specimen (Sphaeromatidae) from Masthead I., Capricorn Group, southern Great Barrier Reef. I have not been able to locate this specimen, which is now presumed lost but if, as seems probable, this specimen belongs to this genus, its range extends to the subtropical coast of eastern Australia.

***Bregmotypta pavicula* sp. nov.**

Figures 15–17

Material examined. Holotype. NSW, Jibbon Head (34°05'S, 151°10'E) Sep 1976, 23 m, algae on reef, J.E. Watson, NMV J36943 (♂ 8.2 mm).

Paratype. Same data as holotype, NMV J26421 (♂ 7.8 mm, dissected, 3 slides).

Description of male. Body strongly vaulted, about twice (2.1) as long as greatest width; cephalon 25% of total BL; surface of cephalon proximally coarsely pitted, anteriorly coarsely and irregularly ridged. Posterior margin of pereonite 1 with 4 prominent nodules, pereonites 2–7 each with 6, each nodule with apical pit containing setae; laterally pereonites 2–7 with prominent subrectangular lobe, each with apical pit, and large coxal boss. Pleon posterior margin with raised rim, with 2 prominent submesial nodules, each with an apical pit. Pleotelson with

2 bilaterally compressed bosses, concealing posterior margin of pleotelson; pleotelson with 3 obscure nodules dorsal to ill-defined wide notch.

Antennule peduncle article 1 large robust, article 2 short, about 0.4 (0.38) length of article 1; article 3 slender, about 4 times as long as wide, longer than article 2 (1.4); flagellum of 12 articles. Antenna peduncle article 3 shortest; flagellum with 12 articles. Mandible palp articles 2 and 3 with 9 and 18 biserrate setae respectively. Maxilla lateral and middle lobes with 9 and 10 finely serrate setae respectively; mesial lobe with abundant plumose, serrate and simple spines. Maxilliped palp with 18–20 setae each on articles 2–5; endite with blunt biplumose and sinuate acute spines on distal margin.

Pereopod 1 posterior margin of merus, carpus and propodus with 5, 3 and 4 spines respectively; dactylus posterior margin with proximal scales; accessory unguis blunt; anterodistal margin of ischium with 3 acute spines; anterodistal angle of merus with 2 acute spines. Pereopod 2 ischium with 2 acute spines on anterior margin; posterior margins of merus and carpus with dense setule fringe, each with 3 stout acute spines; propodus posterior margin with 4 spines. Pereopod 7 more slender than 2–6, with additional and longer spines on posterior margin of merus, carpus and propodus and distal margin of carpus.

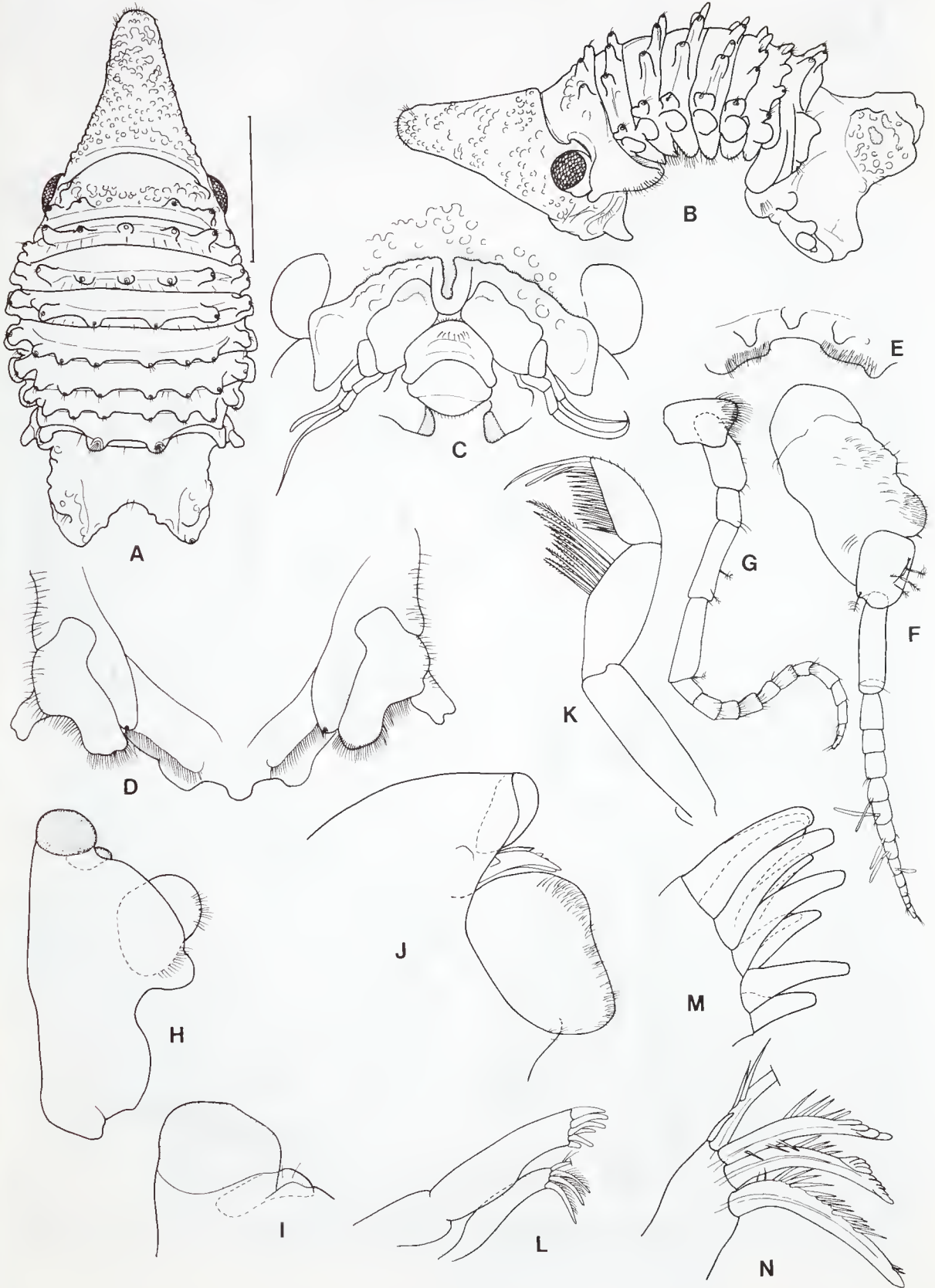
Penes about 4 times as long as basal width, covered with fine scales.

Pleopod 1 with ventral surface with abundant short setules; endopod with about 26 PMS, exopod with about 40 PMS. Pleopod 2 endopod and exopod with about 24 and 44 PMS respectively; proximolateral margin of endopod with small lobe; appendix masculina slightly longer than endopod. Pleopod 3 endopod and exopod with about 21 and 45 PMS respectively. Pleopods 4 and 5 exopods with folds very large and fleshy. Uropod endopod with distal margin subtruncate, lateral margin indenting distal to exopod; exopod short, subcylindrical, about one third (0.34) length of endopod.

Female. Not known.

Distribution. Known only from the type locality.

Figure 15. *Bregmotypta pavicula* sp. nov. A–E holotype, remainder paratype. A, dorsal view; B, lateral view; C, frons; D, pleon, ventral view; E, posterior margin of pleon in posterior view; F, antennule; G, antenna; H, left mandible; I, left mandible, incisor and lacinia mobilis; J, right mandible, distal part; K, mandible palp; L, maxillule; M, maxillule, lateral lobe apex; N, maxillule, medial lobe spines. Scale 2.0 mm.



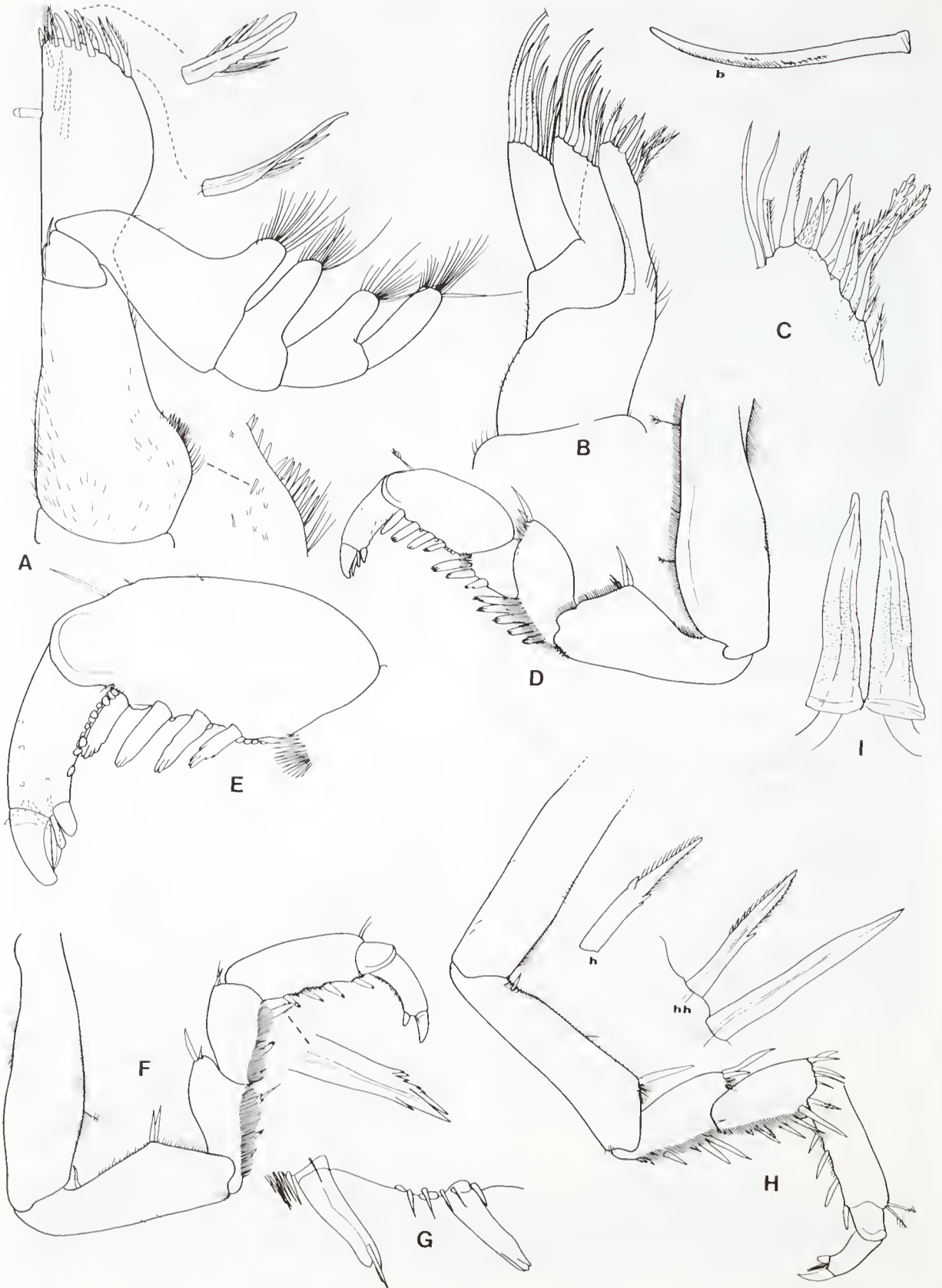


Figure 16. *Bregmotypta pavicula* sp. nov., paratype. A, maxilliped; B, maxilla, b, spine from maxilla lateral lobe; C, maxilla, medial lobe margin; D, pereopod 1; E, pereopod 1 propodus; F, pereopod 2; G, pereopod 2, distal propodal margin; H, pereopod 7, h, spine from anterodistal angle of carpus; hh, spines from posterodistal angle of carpus; l, penes.

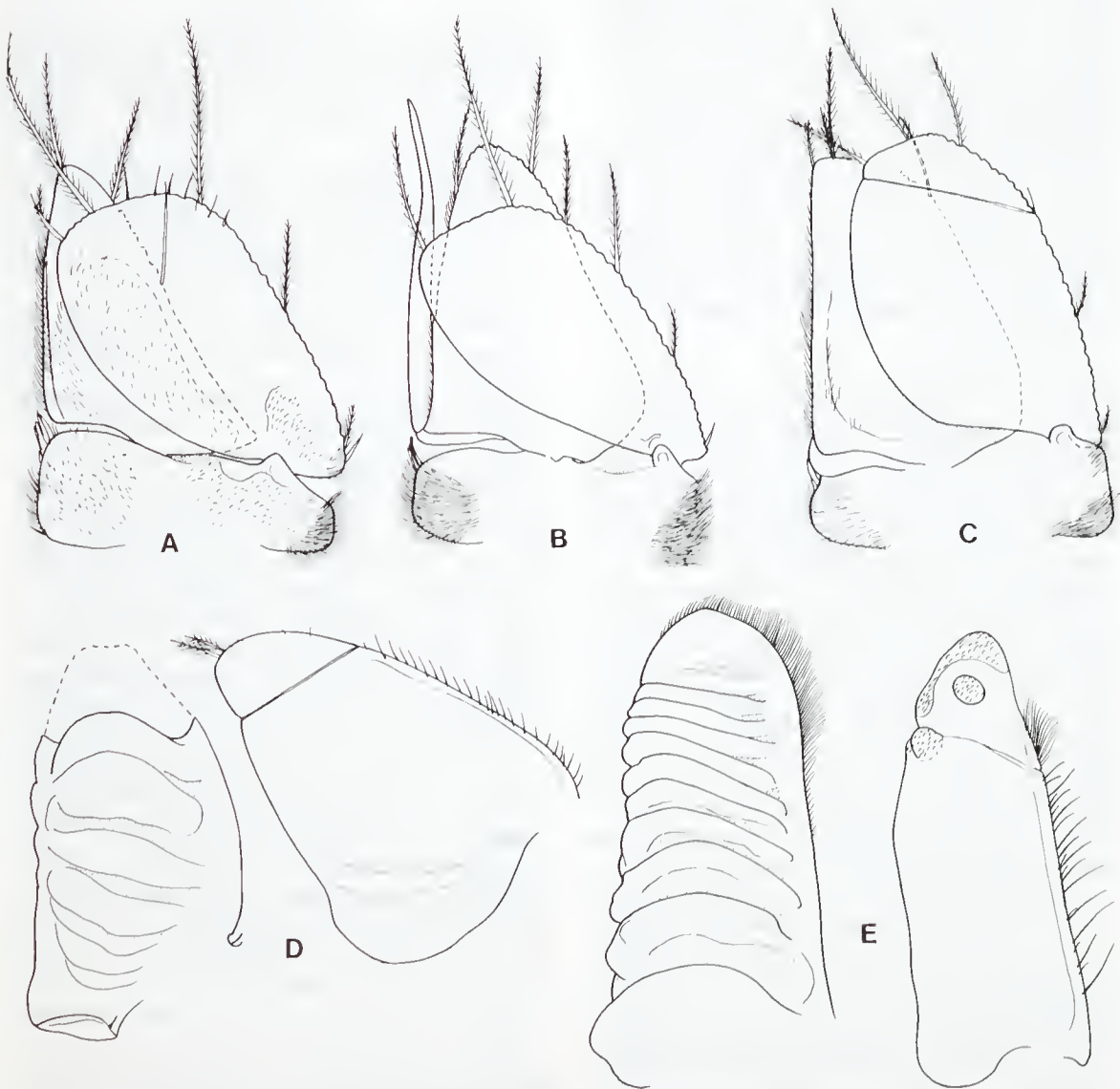


Figure 17. *Bregmotypta pavicula* sp. nov., paratype. A-E, pleopods 1-5, respectively.

Etymology. The epithet is a Latin word meaning rammer.

Remarks. The species can be identified on the basis of generic characters. The undescribed species recorded from Masthead I. has much larger pleonal processes and smaller telsonic bosses, and lacks prominent nodules on the anterior pereonites.

Cercosphaera gen. nov.

Type species. *Cercosphaera wirritin* sp. nov., here designated.

Diagnosis of male. Body rugose, nodular, strongly vaulted. Cephalon with ventral rostral process; eyes round, facets distinct. Pereonites 1 and 3, 4 or 5 usually with pair of sublateral bilaterally flattened flanges; coxae on pereonites 2–7 without distinct sutures, overlapping anterior to posterior; pereonite 7 slightly narrower than 6. Pleon composed of 4 segments, segment 1 entire, 2 sutures extending to lateral margin, dorsally with 2 prominent flattened submesial keels. Pleonal sternite absent. Pleotelson prominently bidomed, with posteriorly directed median process on posterior margin; distinct median ventral notch present.

Epistome anteriorly triangular, not extending between antennule bases. Antennule peduncle article 1 massive, calcified, with anteriorly directed process; article 2 short calcified; article 3 slender. Antenna slender; peduncle with article 3 shortest, 4 and 5 longest. Mandible incisor unicusped; molar surface finely granular or smooth, mesial margin with (*C. wirritin* sp. nov.) or without scales (other species); lacinia mobilis present on left mandible; spine row present on right mandible only (type species) or on both mandibles (other species). Maxillule lateral lobe with 11–12 spines on gnathal surface, some of which are feebly serrate, lateral lobe with 4 long spines, robustly serrate. Maxilla with all lobes spinose, many of which are distinctly serrate. Maxilliped palp articles 2–4 mesial margins produced; endite distal margin with peg-like and slender plumose spines.

Pereopods ambulatory, all robust, with prominent setulose fringe; accessory unguis of dactylus simple; pereopod 1 with stout acute serrate spines on posterior margin of merus carpus and propodus.

Penes elongate, folding into groove on mesial margin of pleopod 1 endopod; basally adjacent, not fused.

Pleopods 1–3 both rami with PMS; pleopod 4 exopod with 1–3 apical short PMS. Pleopod 2

appendix masculina attached basally. Pleopod 1 endopod triangular, exopod oblique, subtruncate. Pleopods 3–5 exopod with entire transverse suture. Pleopods 4 and 5 exopods with SMS on lateral proximal margin; pleopod 4 exopod with distomesial margin indented; pleopod 5 with distal margin scaled, 1–2 prominent to scaled lobes on distal part, 1 or 2 scaled lobes present on distomesial angle of proximal part. Uropod exopod nodulose, not extending to posterior of pleon; short, about half as long as endopod, articulating anterolaterally.

Female. Similar to male, but antennule peduncle without anterior process; mouthparts metamorphosed; oostegites arising from coxae of pereopods 1–3, possibly 4 (pereopods are very deep set, the single ovigerous specimen is brittle, and mesial margin of the coxa 4 could not be seen clearly) overlapping at midline.

Distribution. The genus appears to be restricted to southern and south-western Australian coasts from Dongara, W.A. to Victoria. Given the scarcity of mature specimens, it is probable that habitat of adults is yet to be located.

Etymology. The Greek word *kerkos* (tail) in combination with the ending *-sphaera* (feminine).

Remarks. The genus is easily separated from all other Sphaeromatinae by the presence of a posteriorly directed telsonic process arising from the posterior point of the pleotelson. The presence of short uropodal rami with the endopod larger than the exopod immediately separates it from those species of the *Cilicæa-Cilicæopsis* group with a prominent median point in or above the pleotelsonic notch. *Kranosphaera* Bruce, 1992 is similar but the apex of the pleotelson is only weakly produced, and the unique morphology of pereopods 5 and 6 and lack of a uropodal exopod readily separates that genus.

Only the type species is represented by both sexes and immature stages. The adults, immature and manca stages all have similar ornamentation and morphology, except that very small mancans are not as nodular. The species are therefore recognizable by body ornamentation at all stages of development, although it is not known if all species are sexually dimorphic in the ornamentation of the antennule.

Two undescribed species are represented by mancans only. One, from Bass Strait (Fig. 23) at 52 m is similar to *Cercosphaera wirritin* and the other, from off Flinders I., S.A. (NMV J36942), is similar to *Cercosphaera dilkera* sp. nov., but has large keels on pereonite 1.

Key to species of *Cercosphaera*

1. Pleon with prominent submedian dorsal flanges; body ornamentation of smoothly edged nodules; pleotelsonic process short 2
- Pleon with inconspicuous flanges; body ornamentation of granular nodules; pleotelsonic process long *C. wirritin*
2. Pleonal flanges anteriorly smooth; nodules weak on pereonites 2, 3, 6 and 7; pleotelsonic process distally truncate *C. dilkera*
- Pleonal flanges dorsally irregularly trilobed; nodules weak on pereonites 3, 6 and 7; pleotelsonic process bilaterally narrowed *C. coloura*

Cercosphaera wirritin sp. nov.

Figures 18–22

Material examined. Holotype, WA, Seven Mile Beach, north of Dongara (29°12.00'S, 114°53.00'E) 24 Apr 1986. 1 m, epiphytes on *Amphibolis*, NMV J36938 (♀ non-ovig. 5.0 mm).

Paratypes, WA, 1 km west of Red Bluff, Kalbarri (27°42'S, 114°09'E) 9 Jan 1984, 18 m, bryozoa among *Ecklonia*, J.K. Lowry, AM P41121 (♂ 4.5 mm, broken, 2.9 mm). WA, west end of Michaelmas I. (35°02.80'S, 118°01.40'E) 17 Apr 1986. 15 m, G.C.B. Poore and H.M. Lew Ton, NMV J26167 (♀ non-ovig. 6.0 mm). Vie, Laurence Rocks, Portland (38°24.0'S, 141°40.1'E) 30 Apr 1988, 23 m. R.T. Springthorpe and P.B. Berents, AM P41367 (♀ ovig. 5.1 mm).

Description of male. Body with coarse tubercles over dorsal surface, cuticular surfaces between tubercles appearing glassy; about 1.7 times as long as wide, widest at pereonite 1; pleotelsonic process about 13% BL; cephalon with anteriorly positioned submedian pair of tubercles more prominent than remaining tubercles; pereonite 1 with lateral margins laterally extended, with prominent sublateral flattened tubercles; pereonite 5 with sublateral prominent tubercles; pereonites 6 and 7 with tubercles weak. Pleon and pleotelsonic each with pair of prominent elongate submedian tubercles; pleotelsonic process distally blunt, provided with several acute tubercles. Coxae overlapping anterior to posterior, coxal sutures not visible.

Antennule peduncle article 1, nearly half total length of antennule, anterodistal margin produced forming curved horn-like process; article 2 about 0.3 length of article 1; article 1 anterior process about 0.3 length of article; flagellum of 10 articles, each with aesthetascs. Antenna as for genus.

Epistome anterior margin forming blunt point; each anterolateral angle with nodule. Mandible lacinia mobilis simple, blunt; spine row of right mandible with 5 spines, absent on left; mandible palp articles 2 and 3 with 7 and 15

biserrate setae respectively. Maxillule lateral lobe with 12 simple spines; mesial lobe with 4 elongate sparsely plumose spines as well as 2 short simple spines. Maxilla with 5 and 6 setae on lateral and middle lobes respectively, lateral lobe appearing fused to middle lobe; mesial lobe with simple, biserrate and plumose spines. Maxilliped palp articles 2–5 each with about 18–20 setae; endite with 4 feebly sinuate plumose and 3 peg-like plumose spines on distal margin; distomesial angle with single simple spine and dorsally a large serrate spine; endite dorsal surface with dense elongate serrate scale setae (Fig. 19 F).

Pereopod 1 stout, merus with anterodistal margin somewhat produced; anterodistal angles of ischium and merus each with single acute spine; posterior margin of merus and carpus with setulose fringe on distal part; posterior margin of merus, carpus and propodus respectively with 3, 2 and 3 stout apically bifid serrate spines; posterior margin of dactylus with flat cuticular scales. Pereopods 2–7 more elongate than pereopod 1, spines generally more slender and acute; pereopod 2 with 2, 1 and 2 spines respectively on posterior margin of merus, carpus and propodus; anterodistal angles without spines. Pereopod 6 similar, but with acute single spine present on anterior margin of ischium and anterodistal angles of merus and carpus; posterior margin of merus, carpus and propodus with 2, 3 and 3 spines respectively. Pereopod 7 slender, ischium more elongate than 6, almost devoid of setules; spination similar to that of pereopod 6.

Penes slender, about 11 times as long as basal width.

Pleopod 1 endopod and exopod with about 14 and 29 PMS respectively; peduncle distolateral angle with acute spine; proximolateral angle of exopod without acute spine. Pleopod 2 endopod and exopod with about 15 and 30 PMS respectively; appendix masculina straight, extending a little beyond distal margin of endopod, about

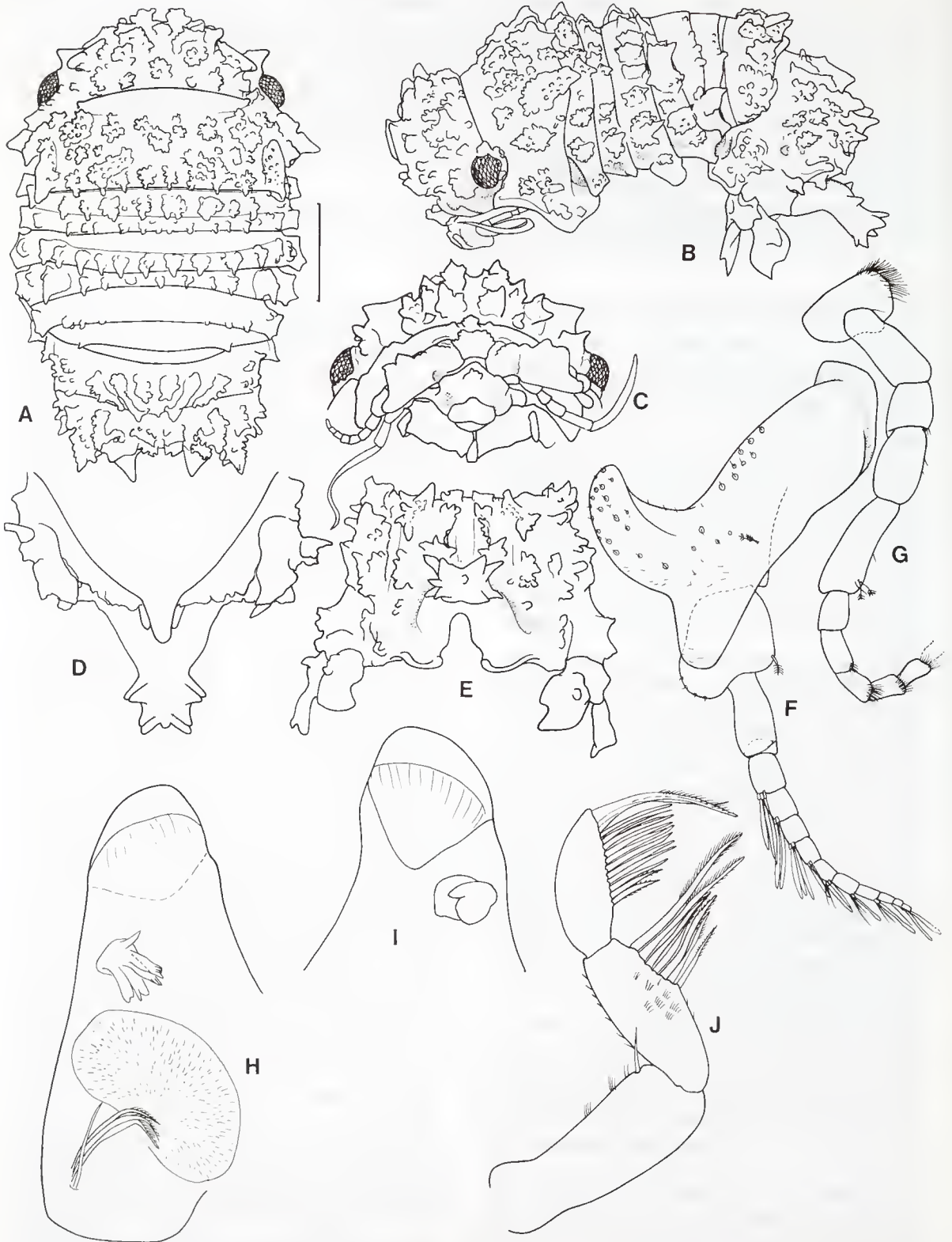


Figure 18. *Cercosphaera wirritin* sp. nov. A-E holotype, remainder δ paratype 4.5 mm, AM P41121. A, dorsal view; B, lateral view; C, frons; D, pleotelson, ventral view; E, pleotelson, posterior view; F, antennule; G, antenna; H, right mandible; I, left mandible; J, mandible palp. Scale 1.0 mm.



Figure 19. *Cercosphaera wirritin* sp. nov. All figs of δ paratype, AM P41121. A, maxilla; B, maxillule; C, maxillule, endopod apex; D, maxillule, exopod apex; E, maxilliped; F, maxilliped endite, distal margin cuticle f, setule from endite distal margin; G-J, pereopods 1, 2, 6, 7, respectively; K, pereopod 1, dactylus.

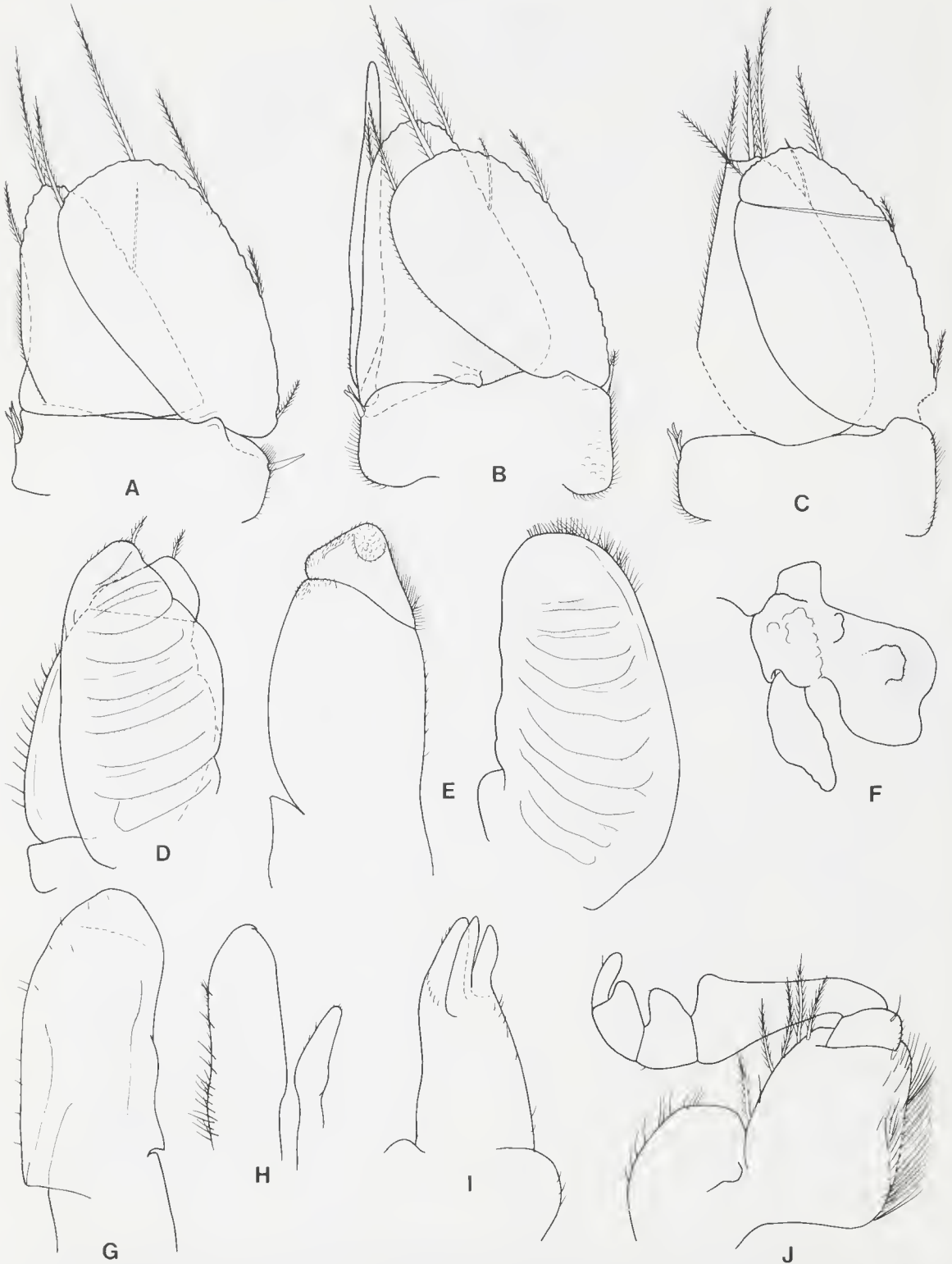


Figure 20. *Cercosphaera wirritin* sp. nov. A-F ♂ paratype, AM P44121. G-J ovig. ♀ paratype, AM P41367. A-E, pleopods 1-5, respectively; F, uropod; G, mandible; H, maxillule; I, maxilla; J, maxilliped.

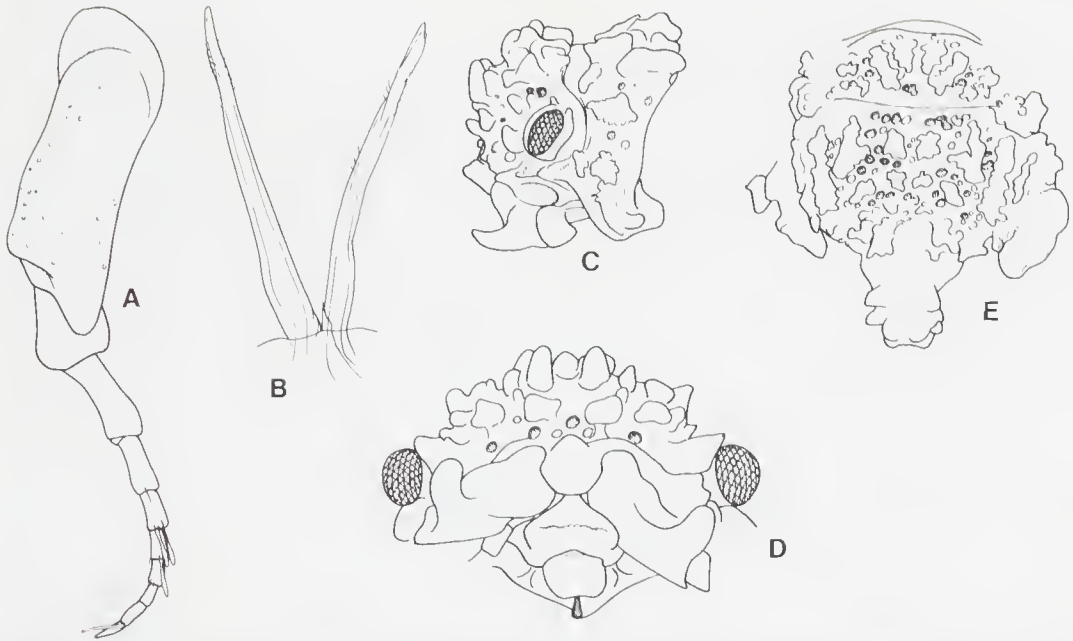


Figure 21. *Cercosphaera wirritin* sp. nov. A ♀, AM P41367, remainder ♂ paratype 4.5 mm, AM P41121. A, antennule; B, penes; C, cephalon, lateral view; D, cephalon, frons; E, pleotelson, dorsal view.

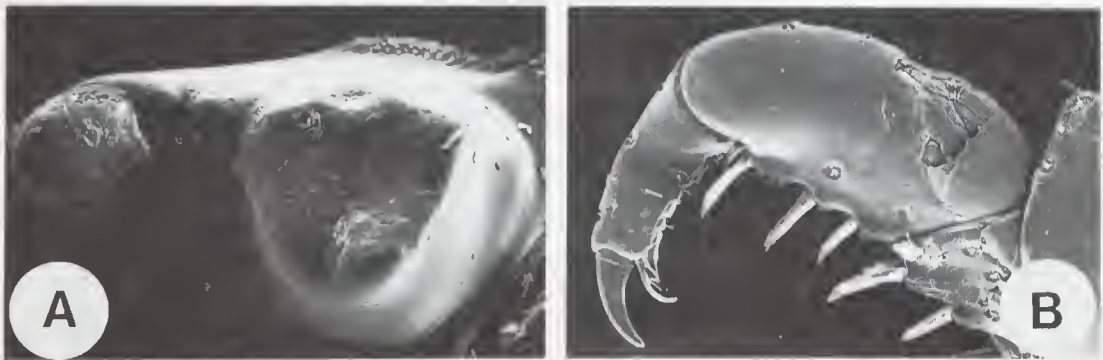


Figure 22. *Cercosphaera wirritin* sp. nov. SEMs. A, right mandible, showing incisor and molar process (190 ×); B, pereopod 1, propodus (200 ×).

1.3 times as long as endopod. Pleopod 3 endopod and exopod with about 10 and 28 PMS respectively. Pleopod 4 both rami each with single short apical PMS. Pleopod 5 with scale patches at distomesial angle of proximal part and a ventral scaled lobe; distal margin all scaled. Uropod endopod nodular, widest posteriorly, rounded with distal indentation and lateral flat lobe; exopod curving, with narrowly rounded apex, set separately to and not overlapping endopod.

Female. Similar body ornamentation to the male but lacking the anterior process on antennule peduncle article 1. Mouthparts (Fig. 20) and brood pouch as for the genus.

Colour. White, pereopods 4–6 with band of dark brown chromatophores on ischium and propodus of some specimens.

Size. A small male, with anterior process, measured 2.9 mm, otherwise adults 4.5–6.0 mm.

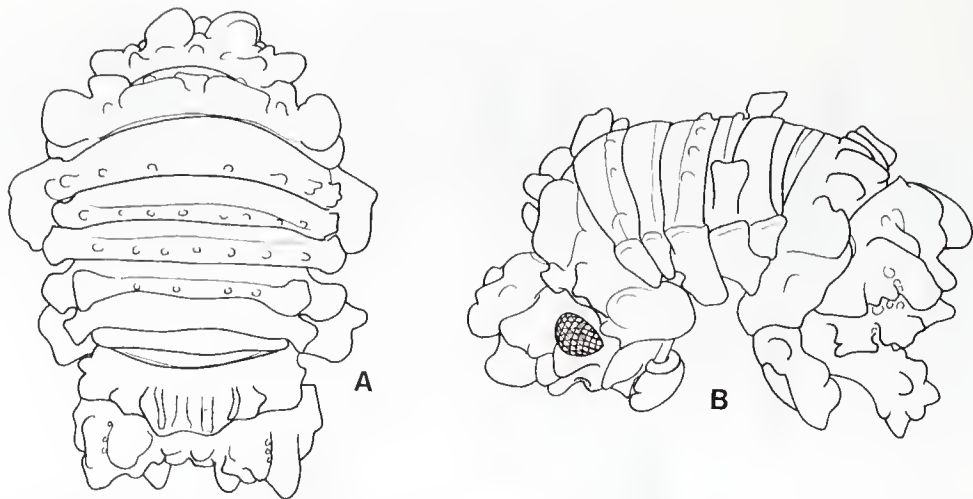


Figure 23. *Cercosphaera* sp., NMV J36941. A, dorsal view; B, lateral view.

Distribution. Mid-western coast of Western Australia south and eastwards to Victoria.

Etymology. An Aboriginal word meaning rough (noun in apposition).

Remarks. The jagged and rough surface of the dorsal tubercles and the glassy appearance of the cuticular surfaces immediately identifies this species, as does the elongate and spiked telsonic process. Compared to other species of the genus the pleonal flanges are small.

The asymmetry of the spine row is extreme compared to the other species of the genus and applies equally to males and non-ovigerous females.

***Cercosphaeroma dilkera* sp. nov.**

Figures 24–26

Material examined. Holotype. WA, Seven Mile Beach, north of Dongara (29°12.00'S, 114°53.00'E) 22 Apr 1986, 0.5 m, sand patch in *Halophila*, air lift, G.C.B. Poore and H.M. Lew Ton, NMV J26178 (♂ imm. 4.2 mm, 7 slides).

Paratypes. WA, same data as holotype, NMV J37344 (manca 1.5 mm); WA, same data as holotype, except 1.0 m, mixed algae beneath overhang on reef, NMV J26153 (manca 3.0 mm, 1 slide). SA, northeast side of Topgallant I., Investigator Group (33°43.00'S, 134°36.60'E) 21 Apr 1986, 20.0 m, on *Cystophora* spp. and *Plocamium*, G.K. Brandon and G.C.B. Poore, NMV J26201 (manca 2.8 mm). WA, 15 km south of Port Fain (38°32.0'S, 142°28.6'E) 20 Nov 1981, 52 m, medium sand, R. Wilson, ZMUC CRU166 (manca 2.2 mm).

Description of male. Body about twice as long as

wide, widest at pereonite 1; dorsal surface covered with well spaced rounded nodules; particular prominent, forming "shoulders" at lateral margins of pereonites 2–6; paired prominent submedian nodules present on pereonites 1 and 4; nodules dorsally weak on pereonites 2, 3 and 6, 7. Pleon with very prominent pair of submedian flanges which have smoothly curving anterior margin. Pleotelson process short, about 7% BL, apex medially indented, distinctly truncate in lateral view.

Epistome anteriorly narrowed and blunt. Antennule peduncle article 1 with anterodistal margin weakly produced. Mouthparts similar to type species except mandible: left mandible with prominent lacinia mobilis and spine row of 5 serrate spines, molar with fringe of acute scales and finely punctate surface; right mandible similar to left but lacking lacinia mobilis; spine row with a clubbed spine.

Pereopods similar to type species but setulose fringe entirely absent, and all spines acute.

Pleopods similar to type species but pleopod 1 exopod with acute spine at proximolateral angle and spine on lateral margin of peduncle. Uropod rami flat, distally both rami subtruncate, exopod folds under endopod, about 0.6 length of endopod.

Size. Present material consisted of one immature male (4.2 mm) and several mancas (1.5–3.0 mm).

Distribution. Mid-western coasts of Western Australia, eastwards to South Australia and Victoria.

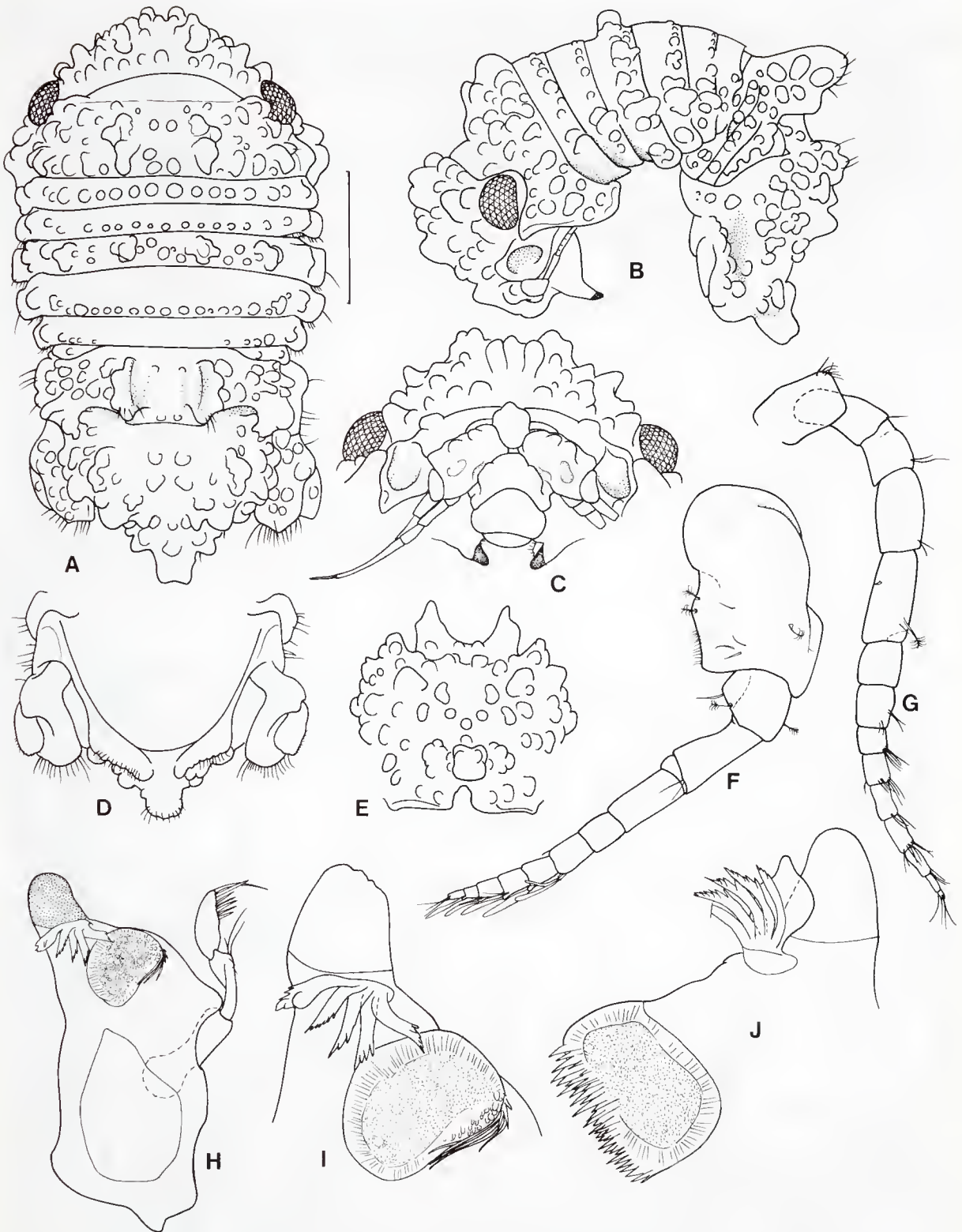


Figure 24. *Cercosphaera dilkera* sp. nov. A-E holotype, remainder 3.0 mm paratype, NMV J26153. A, dorsal view; B, lateral view; C, frons; D, pleon, ventral view; E, pleon, posterior view; F, antennule; G, antenna; H, right mandible; I, right mandible, distal part; J, left mandible, distal part. Scale 1.0 mm.



Figure 25. *Cercosphaera dilkera* sp. nov. A–C paratype, NMV J26153, remainder holotype. A, maxilliped; B, maxillule; C, maxilla; D, pereopod 1; E, pereopod 1, distal propodus and dactylus; F, pereopod 2; G, pereopod 6; H, pereopod 6, spines on anterodistal angle of carpus; I, pereopod 7.

Etymology. *Dilkera* is an Aboriginal word meaning shore (noun in apposition).

Remarks. The short truncate pleotelsonic process and large pleonal flanges readily separates manca and immature specimens. The characters of body ornamentation are persistent through all observed growth stages for the other

species of the genus, and adults should equally be recognized by these characters.

***Cercosphaera coloura* sp. nov.**

Figures 27–30

Material examined. Holotype. SA, northeast side of Topgallant I., Investigator Group (33°43.00'S,

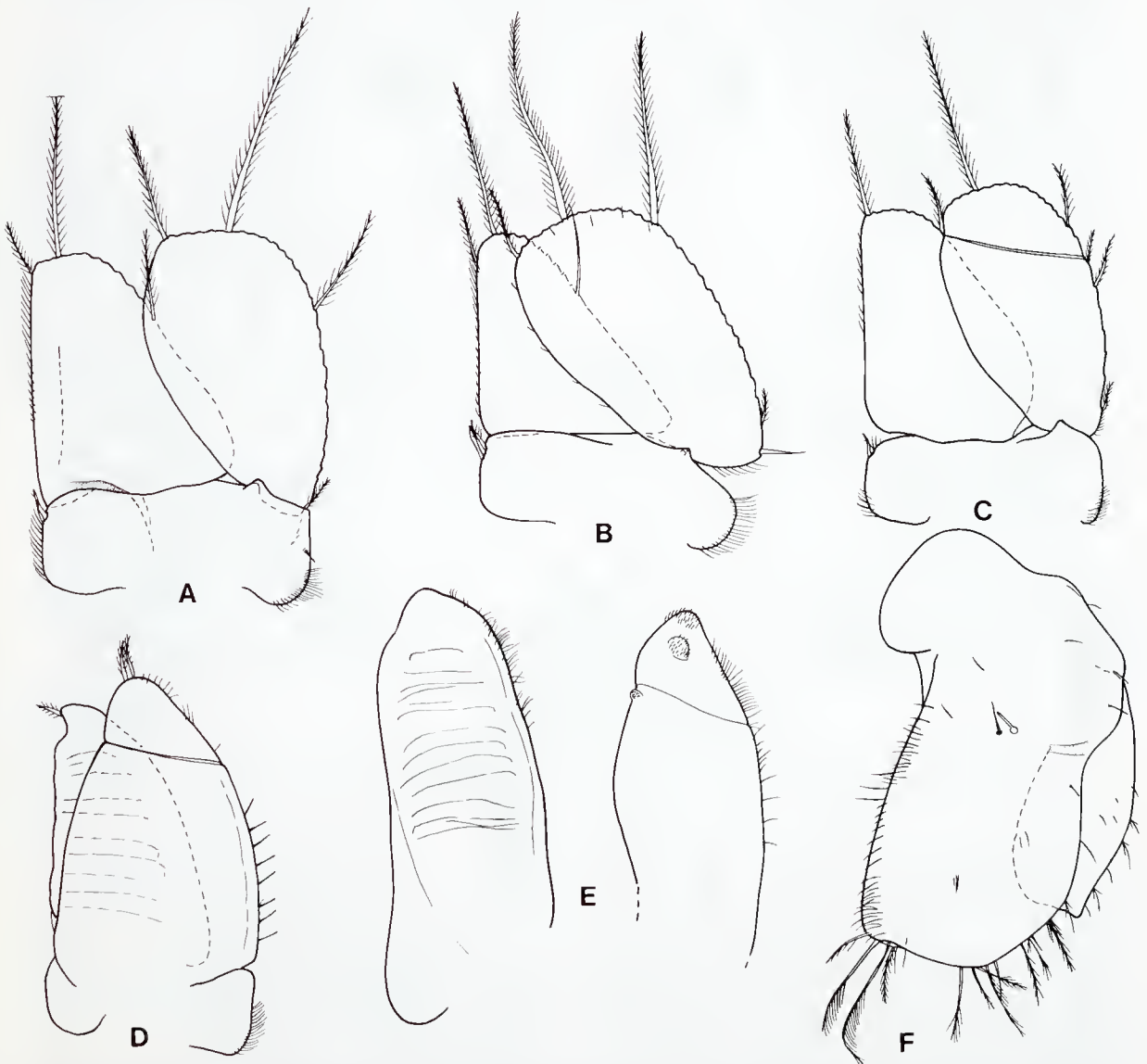


Figure 26. *Cercosphaera dilkera* sp. nov. A–E holotype, remainder paratype, NMV J26153. A–E, pleopods 1–5, respectively; F, uropod.

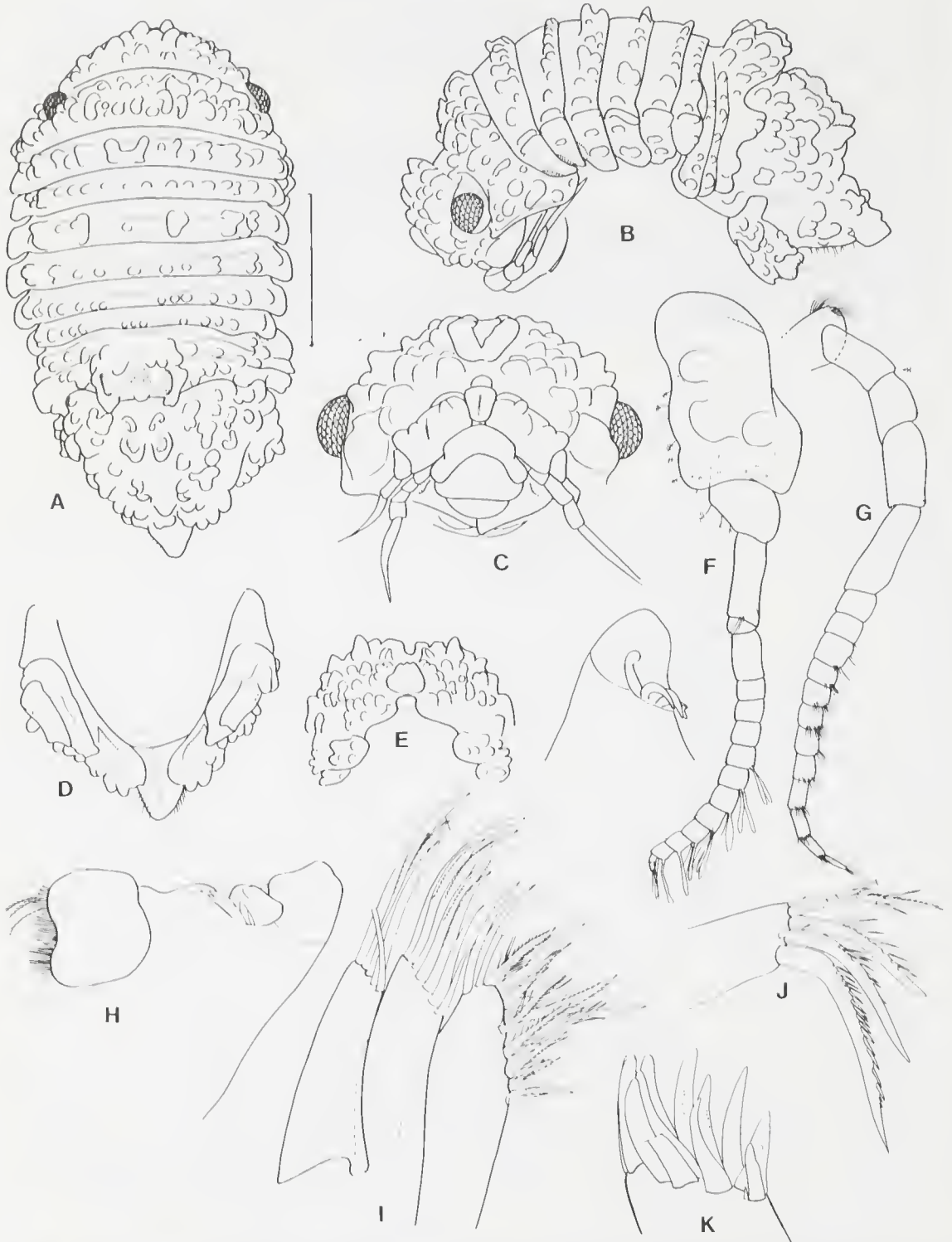


Figure 27. *Cercosphaera coloura* sp. nov. A-F holotype, remainder paratype, SAM C5544. A, dorsal view; B, lateral view; C, frons; D, pleon, ventral view; E, pleon, posterior view; F, antennule; G, antenna; H, left mandible; I, right mandible; J, maxilla; K, maxillule endopod; L, maxillule, exopod. Scale 2.0 mm.



Figure 28. *Cercosphaera coloura* sp. nov. All figs paratype, SAM C5544. A, maxilliped; B, pereopod 1; C, pereopod 1, dactylus; D, pereopod 2; E, pereopod 6; F, pereopod 7.

134°36.60'E) 22 Apr 1985, 16 m, *Cystophora*, S. Shepherd and G.C.B. Poore, NMV J36937 (♂ imm. 7.8 mm).

Paratypes. SA, Pearson I., Investigator Group, 9 Jan 1969, 50 m, coarse gravel, S.A. Shepherd, (SAM C5544) (♂ imm. 6.8 mm). SA, Stokes Bay, off Kangaroo I. (35°37'S, 137°12'E) 4 Mar 1978, 7 m, mixed algae on vertical rock, I. Loch, AM P41146 (♂ juv. 7.3 mm). Vic, northwest side of Henty Reef, Mounts Bay, Apollo Bay (38°47.0'S, 143°40.5'E) 18 m, red algae on

boulder, R.T. Springthorpe and P.B. Berents, AM P41376 (2 manca).

Description of male. Body about 1.8 times as long as wide, widest at pereonites 2–5; dorsal surface covered in rounded low nodules; lateral margin of pereonites 2–7 with nodules forming more distinct carinate ridge; large sublateral and submedian tubercles present on pereonite 4 and prominent sublateral tubercle on pereonite 5;

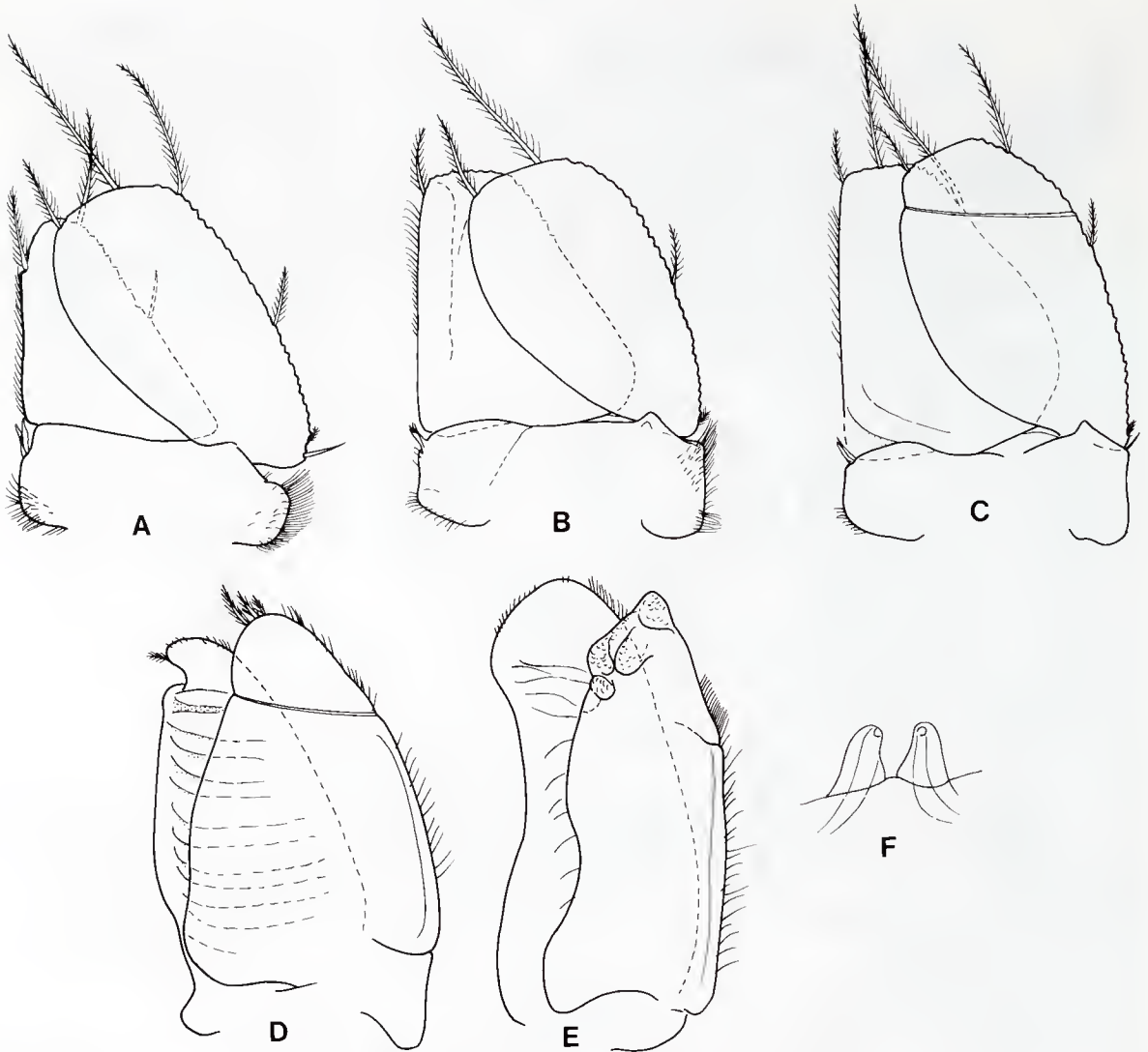


Figure 29. *Cercosphaera coloura* sp. nov. All figs paratype, SAM C5544. A-E, pleopods 1-5, respectively; F, penes.

nodules dorsally weak on pereonite 7. Pleon with prominent pair of submedian flanges, which have an irregular dorsal surface. Pleotelsonic process short, about 6% BL, distally forming a point in dorsal view, truncate in lateral view.

Epistome, antennule and antenna similar to *C. dilkera*. Mouthparts similar to *C. dilkera* except maxillule mesial lobe spines with few spinules.

Pereopods similar to *C. dilkera*, but generally with more and more slender spines.

Paired penes present on sternite 1.

Pleopods similar to *C. dilkera*, but pleopod 5 exopod with weak transverse suture and more prominently scaled distal margin. Uropod rami nodular, endopod narrowing distally to oblique posterior margin; endopod distal margin concave, dorsolateral margin with prominent tubercle; exopod 0.66 length of endopod.

Female. Adult females not observed.

Size. 6.8-7.8 mm.

Distribution. Investigator Archipelago and Kangaroo I., South Australia; Apollo Bay, Victoria.

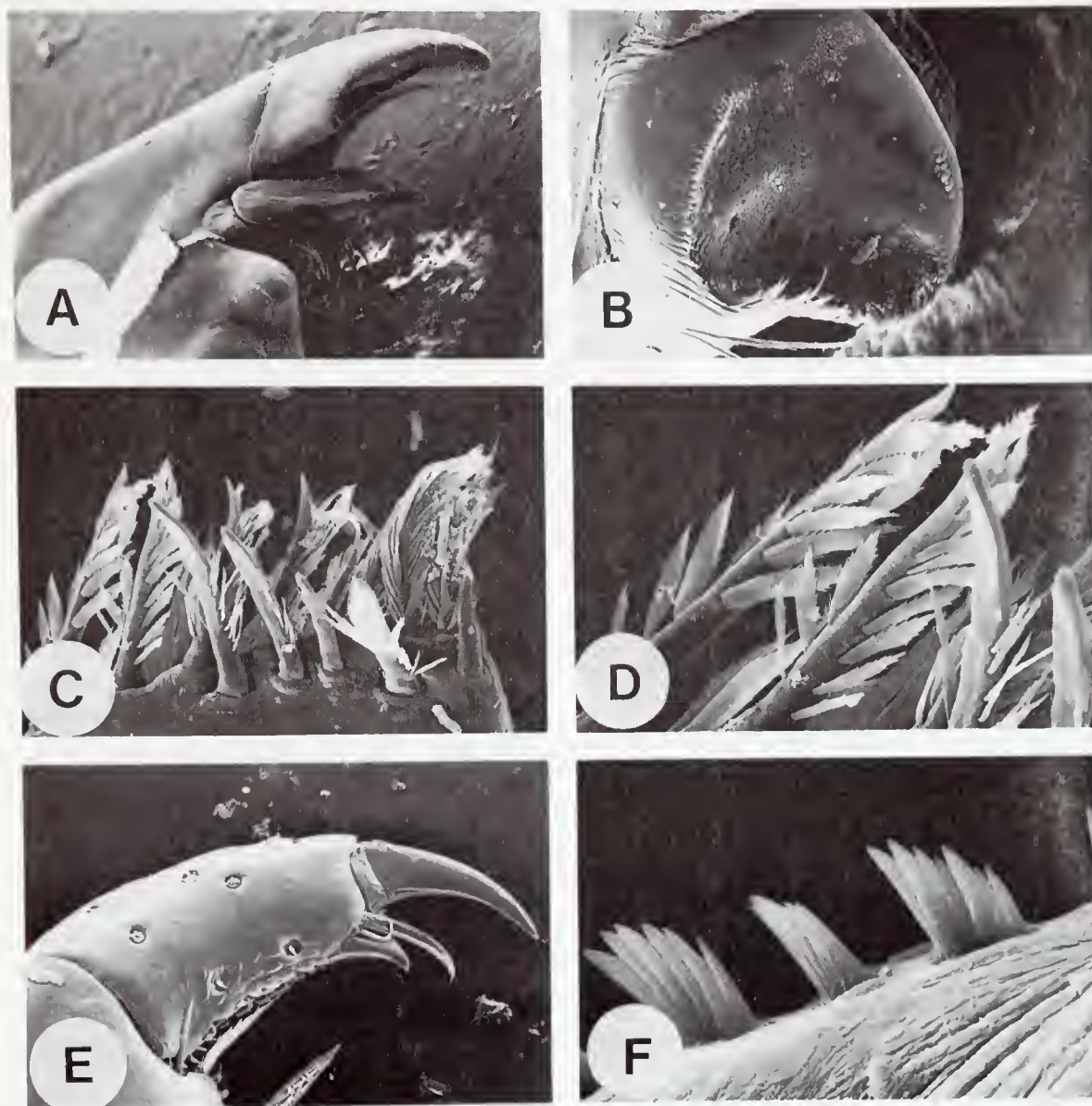


Figure 30. *Cercosphaera coloura* sp. nov. SEMs. A, left mandible (180 \times); B, mandibular molar process (350 \times); C, maxilliped endite, distal margin (550 \times); D, maxilliped endite, distal bipectinate seta (1000 \times); E, pereopod 1, propodus (270 \times); F, pereopod 1, cuticular scales on posterior margin of merus (3000 \times).

Etymology. The Greek word *kolouros* meaning bobtailed.

Remarks. This, the largest species of the genus, is recognized by the arrangement and distribution of the tubercles, and by the shape of the pleonal flanges and pleotelsonic process. The prominence of the flanges and short pleotelsonic process separate *C. coloura* from *Cercosphaera dilkera*, which being about half the size of *C.*

coloura, is otherwise similar. The flanges on *C. coloura* arise abruptly and have an irregularly trilobed distal surface while those of *C. dilkera* are larger and curve smoothly from the anterior with a swept-back appearance. The pleotelsonic process of both species also differ, that of *C. coloura* being bilaterally acute, while that of *C. dilkera* is blunt or subtruncate with a median indentation. The appendages of the two species, which have overlapping ranges, are similar.

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