

A NEW GENUS OF MARINE ISOPOD (CRUSTACEA: FLABELLIFERA:
SPHAEROMATIDAE) FROM AUSTRALIA AND THE INDO-PACIFIC REGION

NIEL L. BRUCE

Zoologisk Museum, University of Copenhagen, Universitetsparken 15, DK 2100, Copenhagen, Denmark.

Abstract

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Oxinasphaera gen. nov. is established for a group of sphaeromatid species previously placed in the genus *Cymodoce* Leach, 1818. Apomorphic characters allowing easy recognition of genus are (in the male), hardened prominent spikes on the anterior margin of the antennule peduncle, on the epistome (or with a transverse blade), and on the posterior of the pereonites, maxilliped palp articles 3 and 4 with greatly elongated medial margin, article 5 also greatly elongated, all with an obliquely truncate densely setose apex, uropod endopod with deeply bifid toothed apex and uropod endopod with hardened prominent spikes at ventrodistal apex. Additionally, the pleon and pleotelson are dorsally denticulate, the pleotelson usually with a divided posterior margin but without a distinct exit channel. Species transferred from *Cymodoce* are *C. tuberculosa* Stebbing, 1873, *C. tripartita* Richardson, 1910, *C. multidentis* Richardson, 1910, *C. bispinosa* Baker, 1910, and *C. australis* Baker, 1929. The following new species are described: *Oxinasphaera bisubula* sp. nov. (type species), *O. aylostera* sp. nov., *O. copiapoa* sp. nov., *O. corypantha* sp. nov., *O. denmoza* sp. nov., *O. epostoa* sp. nov., *O. frailea* sp. nov., *O. islaya* sp. nov., *O. kensleyi* sp. nov., *O. lobivia* sp. nov., *O. lowryi* sp. nov., *O. matucana* sp. nov., *O. obregonia* sp. nov., *O. parodia* sp. nov., *O. poorei* sp. nov., *O. rebutia* sp. nov., *O. thetisae* sp. nov., *O. tual* sp. nov.

The genus is recorded from South Africa, the Western Indian Ocean, around the Australian coastline, New Caledonia, Indonesia, Papua New Guinea and the Philippines. All species but one are recorded from shallow water at depths from the intertidal generally to within 100 m; one species is recorded from a depth of 400 m. Many specimens and most species are recorded as having been collected from sponges. A phylogenetic analysis of the species is undertaken and brief comments given on the relationships within the genus and on the biogeography of the genus. A key to the named species is given.

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Introduction

The genus *Cymodoce* Leach, 1814 is large, containing a wide array of morphologically diverse species. The genus and the European species, including the type species, were reviewed by Dumay (1972a, b, c, d). The most detailed recent description to the genus is that of Harrison and Holdich (1984), who gave an account of the Australian species, together with extensive comments on the confused taxonomic state of the genus. Harrison and Holdich (1984, appendix 2) also listed the known species and gave further discussion on the status of the numerous misplaced species that, according to their perception, did not appear to belong to the genus.

Among the species that Harrison and Holdich (1984) discussed was a group of distinctive species related to *Cymodoce tuberculosa* Stebbing, 1873. Harrison and Holdich (1984), without giving any reasons or descriptive comments relating to morphological criteria, suggested that these species would "require the formation of a new genus to house them." This group of often common and very distinctive Indo-West Pacific isopods, here defined as a new genus, is easily recognizable by the males having the antennule peduncle article 1 with comb-like arrangement of white prominent downwardly directed spikes, similar prominent spikes on the epistome, and prominent spikes arranged in transverse bands across the dorsum of pereonites 2, 3, or 4-7. The generally very nodular and setose body surfaces and the deeply bifid short uropod exopod and cylindrical spiked uropod endopod also serve to distinguish the genus. Although the new genus can be clearly defined with several unambiguous autapomorphies, the remaining species of *Cymodoce* still present a no less confused assem-

blage, in reality containing species that should be placed in several genera. The arguments and discussion concerning *Cymodoce* have been presented by Harrison and Holdich (1984) and are not repeated here.

The new genus is here defined, and the species described together with an identification key. The genus is can be clearly delimited by several autapomorphies, and as monophyly can therefore reasonably be assumed, a cladistic analysis was performed to examine the relationships between the species, to more objectively discriminate the species groups, and to assess character distribution and apparently homoplasious characters.

Material and methods

Material for study was obtained from Australian state museums, by far the largest proportion being that held by the Museum of Victoria, Melbourne and the Australian Museum, Sydney. Additional material was borrowed from the other institutions listed, but the only unreported material obtained other than from Australia institutions was that which had been collected by Th. Mortensen early this century and held at the Zoologisk Museum, University of Copenhagen.

Methodology follows that of Bruce (1994b), except that dissected appendages were drawn using Nomarski illumination, and the scanning electron microscope used was a Jeol JSM 840. The cladistic analysis was performed using the computer programme PAUP 3.1.1. The data set was run using the heuristic search option (settings tree-bisection-reconnection [TRR] and MULPARS option). Trees and characters were examined using the computer package

MacClade 3.03, and the cladogram figures (Figs 3 and 4) generated using MacDraw II.

Material for each species is categorized according to type status; for named taxa the designation "non-type" refers to the principal study material, and the designation "additional material" refers to specimens that were merely identified as belonging to the taxon after the description had been finalized. The designation "non-type" for new taxa refers to material specifically excluded from type status because of morphological differences, disparate geographic location, or that the specimens were merely identified as belonging to the taxon after the description had been finalized.

Etymologies. Except where otherwise stated, epithets are generic names of cacti and allude to the spinose body surfaces of these isopods; these names are to be treated as nouns in apposition. The names were obtained from Riha and Subik (1987).

Terminology. The species of the genus are in many cases distinguished by the ornamentation of the antennule, epistome, and dorsal body surfaces. Particular terms have been coined to facilitate the description of these features (Fig. 1). *Spikes* — are hardened, usually acute cuticular processes, which occur on antennule

peduncle articles 1 and occasionally 2, anterior margin of the cephalon, epistome, dorsal surface of pereonites, pleon and pleotelson, and also on the uropods; *tubercles* — are low rounded or acute processes, not always as prominent or hardened as spikes, restricted to the pleon and pleotelson; *pleonal boss* — the posteriorly expanded medial part of the pleon posterior margin. Antennule peduncle spikes are identified as (Fig. 1): anterior, posteroproximal, posteromedial and posterodistal.

Descriptions. The type species has been described in full detail, while descriptions of the remaining species contain the principal characters distinguishing species. A representative species typical of each species group has, where sufficient material was available, also been described in more than minimal detail. These species are: *O. tuberculosa* and *O. tripartita*. *Oxinasphaera bispinosa* and *O. islaya* sp. nov. Other distinctive species are similarly treated.

Abbreviations. AM, Australian Museum, Sydney; AMSBS, Australian Museum Shelf Benthic Survey; NMV, Museum of Victoria, Melbourne; TM, Tasmanian Museum and Art Gallery, Hobart; Qld, Queensland, Australia; QM, Queensland Museum, Brisbane; NTM, Northern Territory Museum, Darwin; SAM, South

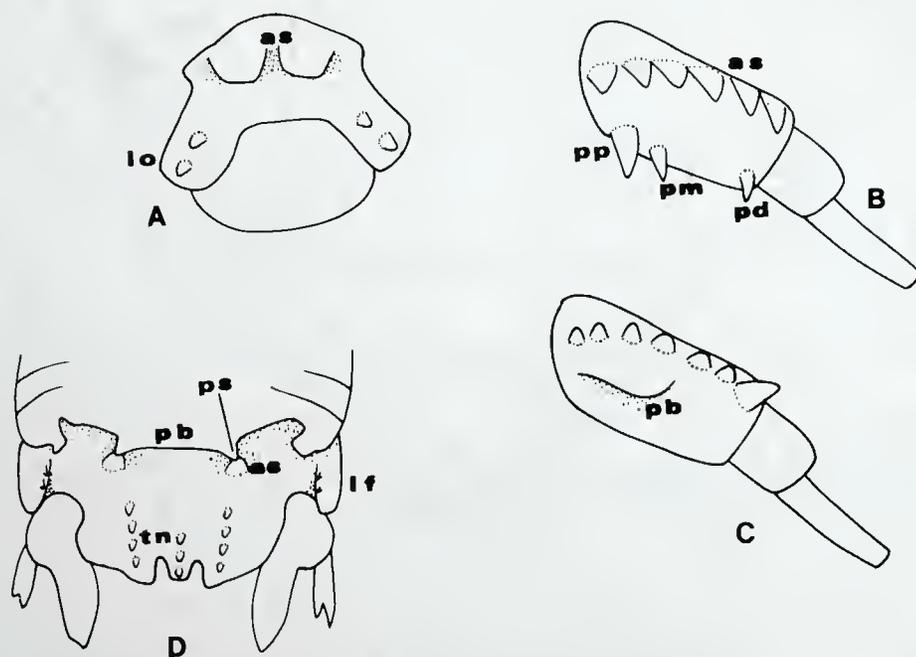


Figure 1. Terminology. A, epistome: as, anterior spikes (or anterior blade when a single transverse ridge); lo, lateral lobe. B, antennule: as, anterior spikes; pp, posteroproximal spikes; pm, posteromedial spikes; pd, posterodistal spikes. C, antennule: anterior spikes irregular; pb, posterior blade; D, pleon and pleotelson: pb, posterior boss; ps, pleonal spike; as, anterior spike; tn, telson nodules; lf, lateral flange.

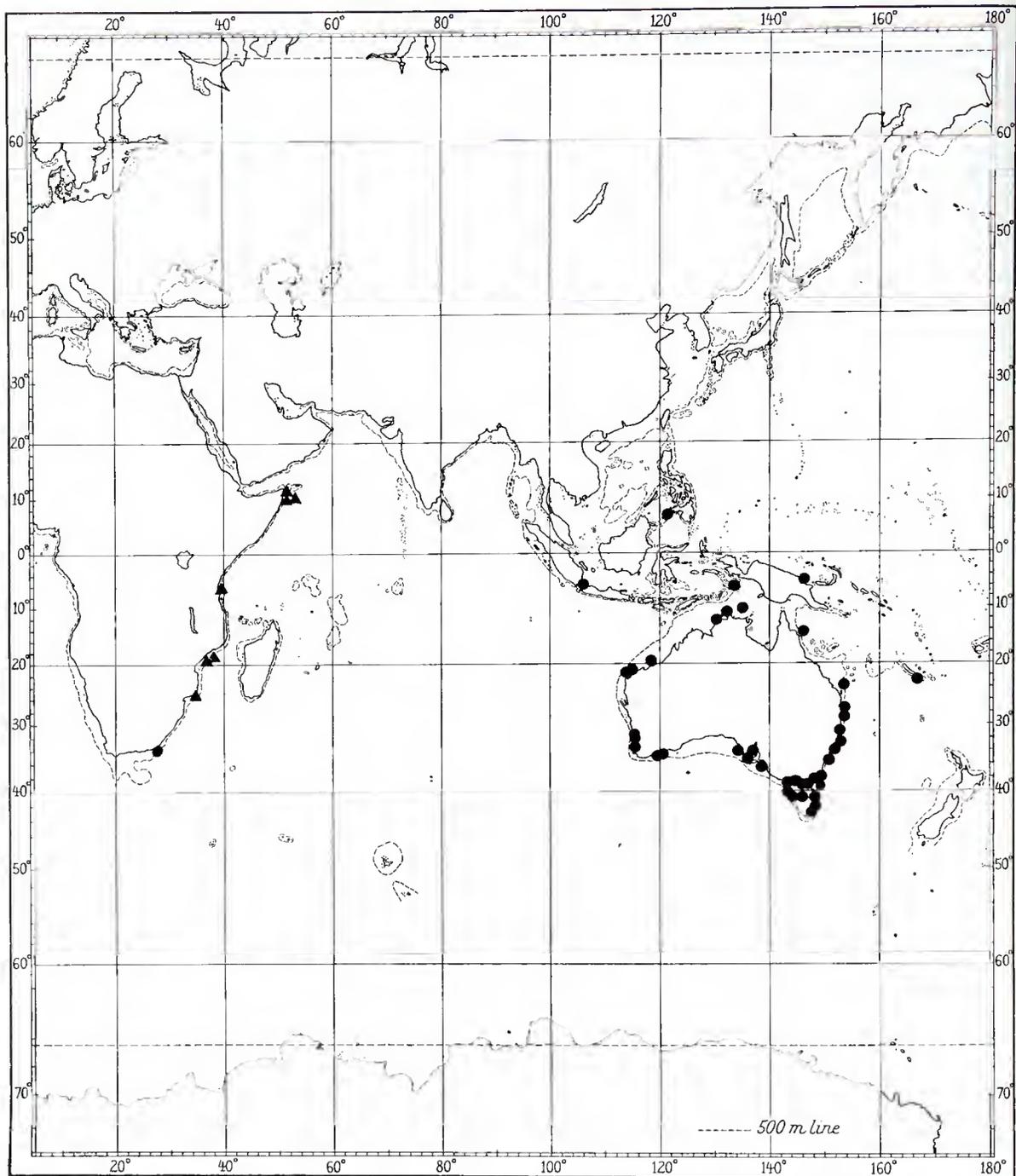


Figure 2. World-wide distribution of *Oxinasphaera*. Dots represent named species, triangles (western Indian Ocean) undescribed species.

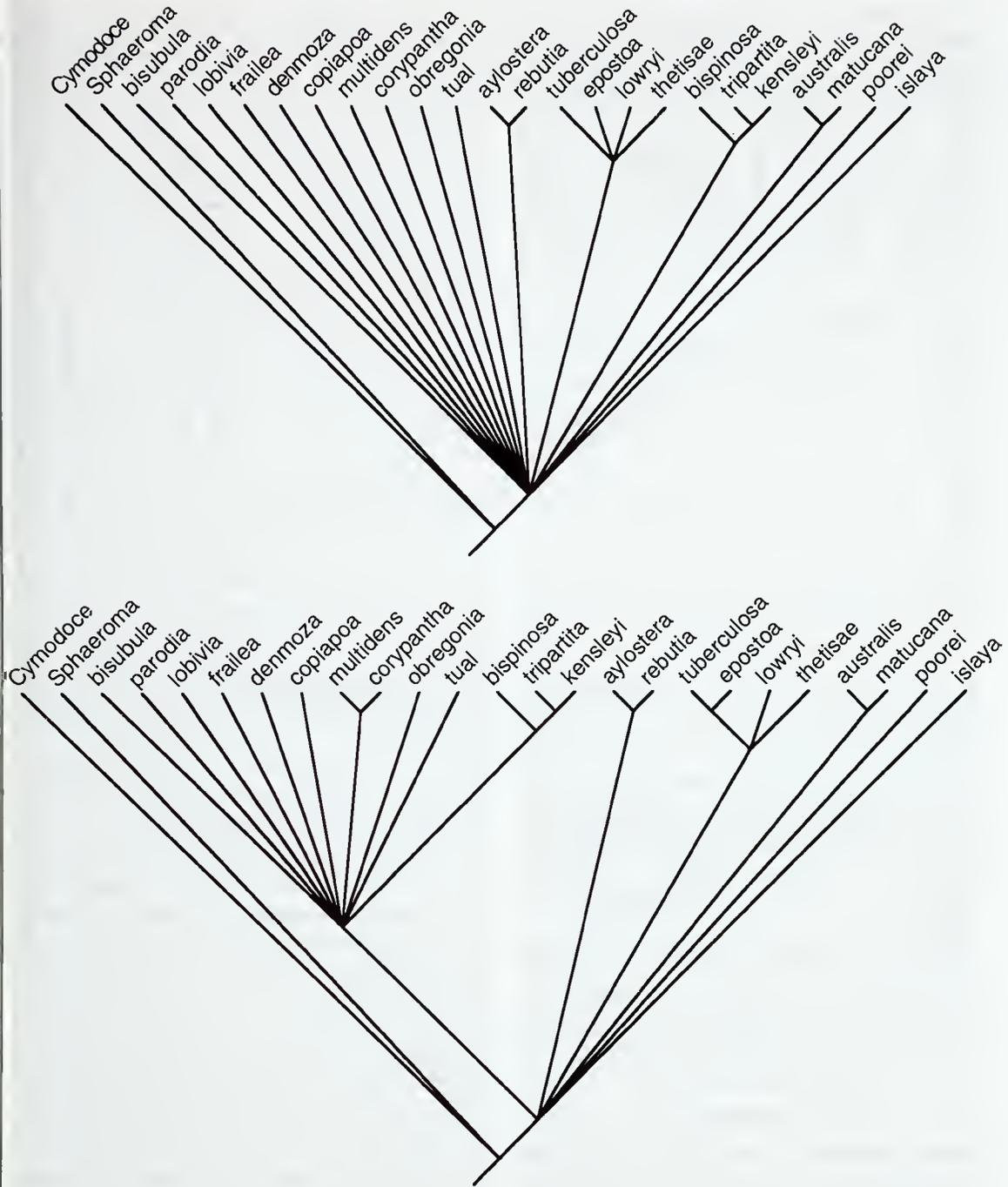


Figure 3. Cladograms of *Oxinasphaera*. A, strict consensus tree, unordered from 84 trees, length, 131; consistency index 0.260; retention index 0.349; homoplasy index 0.740; B, strict consensus tree, character 9 ordered, from 68 trees, length, 108; consistency index 0.315; retention index 0.503; homoplasy index 0.685.

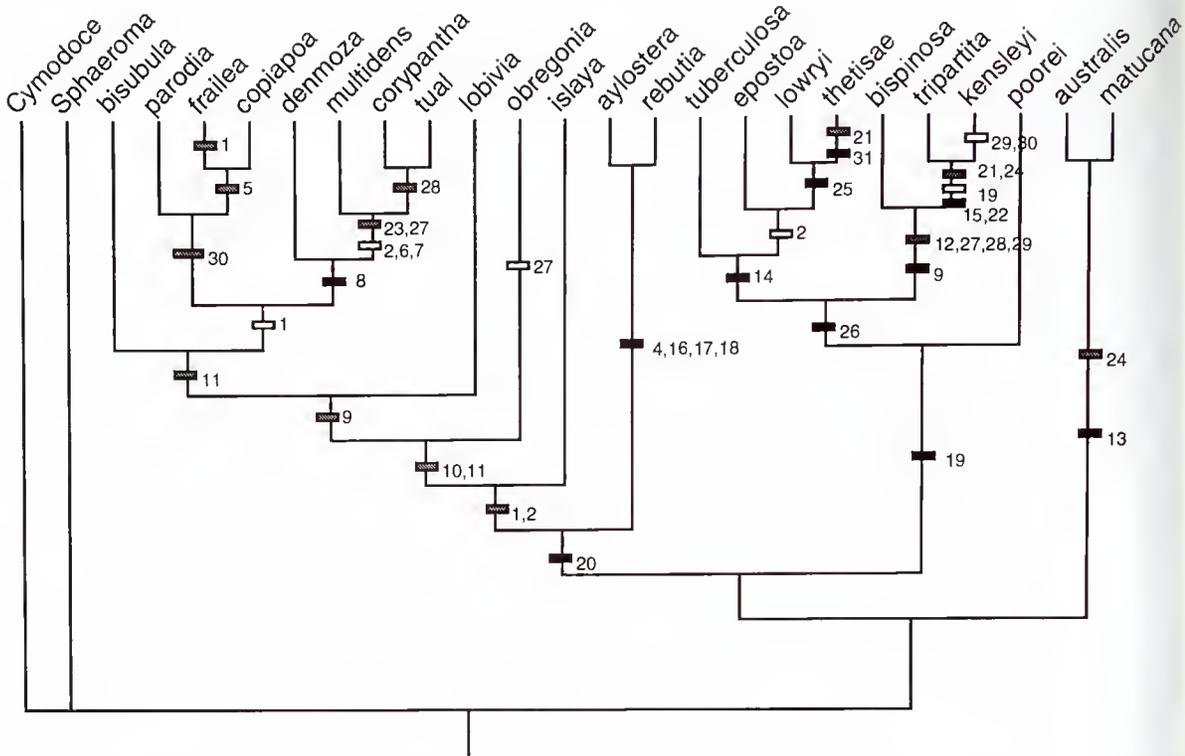


Figure 4. Cladogram of *Oxinasphaera* using successive character weighting. Length, 90; consistency index 0.378; retention index 0.624; homoplasy index 0.622. Solid bars = apomorphy, grey bar = homoplasy, white bar = reversal.

Australian Museum, Adelaide; SAfM, South African Museum, Durban; USNM, National Museum of Natural History, Smithsonian Institution, Washington, DC, USA; WAM, Western Australian Museum; ZMUC, Zoologisk Museum, University of Copenhagen, Denmark.

PMS, plumose marginal setae; CP, circumplumose.

NSW, New South Wales; NT, Northern Territory; Qld, Queensland; SA, South Australia; Vic., Victoria; WA, Western Australia.

Sphaeromatidae Latreille

Sphaeromatinae Latreille

Recent publications have called into question the validity of characters on which the sphaeromatid subfamilies are diagnosed and the difficulty of their interpretation, in particular the presence and absence and development of pleopodal ridges (Bruce, 1993, 1994a, 1994b, 1995; Brusca and Wilson, 1991; Kussakin and Maljutina, 1993; Wägele, 1989). The subfamilies can currently only be considered to be delimited by

their constituent genera. It is currently premature to offer a new diagnosis, and a thorough revision of the Sphaeromatidae will necessitate the relocation of many genera, and the development of new concepts for genera and of generic relationships within the family. Those comments notwithstanding, the new genus described here unequivocally belongs together with that group of genera that form the core of the subfamily Sphaeromatinae and includes, for example, the genera *Sphaeroma* Bosc, 1802, *Neosphaeroma* Baker, 1926, and *Cymodoce*. Two species in *Oxinasphaera*, *O. islaya* sp. nov., and *Oxinasphaera* sp. 1, lack pleopodal ridges.

The development of the ornamentation of the posterior margin of the pleon and pleotelson is as equally variable as the degree of development of the pleopodal ridges. Most species described here have the posterior margin with two submedian excavations, which may also be described as a median excavation in which lies a process (in some species either interpretation is valid), but one species (*O. islaya*) has an almost entire posterior margin, and two (*O. tripartita* and *O. kensleyi*) have a well developed dorsal

lobe overriding a median excision. In the *O. tuberculosa* clade of species the lobe appears dorsal to the posterior notch, but it does not override the notch.

In sphaeromatid taxonomy, the presence of posteriorly directed processes, single or paired, on the posterior margin of the pleon (or pereonite 6 or 7) has long been axiomatically considered to be of generic merit. The generic pairs of *Dynoides* Barnard, 1914 and *Clanella* Boone, 1923 or *Isocladus* Miers, 1876 and *Exosphaeroma* Stebbing, 1900, for example, are distinguished solely by the presence or absence of such a process which, as can be readily demonstrated, show intermediate conditions. Furthermore, such processes can readily be recognized as homoplasious, also occurring in apparently unrelated genera. In the genera *Dynoides* and *Clanella* two species, *D. brevispina* Bruce, 1980 and *D. brevicornis* Kussakin and Maljutina, 1987, have greatly reduced pleonal processes, which then leaves no distinguishing characters between these two genera. The recognition of autapomorphies should allow for a more meaningful interpretation of these variable and homoplasious characters. Such is the case for *Oxinasphaera*, in which the pleonal boss ranges from absent to with a pair of conspicuous elongate processes, but recognition of the diagnostic autapomorphies as the characters of significance allows the retention of those species within one genus.

Oxinasphaera gen. nov.

Type species. Oxinasphaera bisubula sp. nov., here designated.

Diagnosis of male. Pereonites 2–7 with 1 or 2 rows of distinct, usually acute spikes, segments 3–6 usually with 2 rows, anterior row of which is larger than posterior row. Pleotelson posterior margin medially excavate, with median process set within or above indentation, occasionally entire; without shallow open exit channel. Antennule peduncle article 1 anteriorly with row of prominent ventrally projecting spikes, posteriorly with 0–2 spikes. Epistome anterior margin with 1, or 1 pair of prominent ventrally projecting round acute or flat truncate spikes; posterolateral lobes with or without short spikes. Maxilliped palp article 2 medial margin strongly produced, articles 3–4 with medial margins greatly elongated (3–4 times as long as medial width) and finger-like, article 5 elongate, lying parallel to process of article 4; distolateral margins of articles 2–5 provided with abundant long

setae which are distally finely pectinate. Pleopod 2 appendix masculina about as long as endopod, robust (4–9 times as long as maximum width), not extending beyond or only slightly beyond distal margin of ramus. Uropod attached mid-laterally on pleon; exopod short, about half length of exopod, slender, apex deeply bifid, with 2 blade-like points; endopod projecting beyond posterior of pleotelson, round in section, not lamellar, apex with acute point and 1–3 prominent acute spikes, often with additional abundant tubercles.

Description of male. Dorsal surfaces of body granular and nodulose, often pilose. Cephalon anterior margin often with anterolateral row of acute spikes; laterally with distinct subocular groove, a continuation of an anterior ridge, second deep groove below the ridge; eyes large, facets distinct, with prominent posterior lobe. Coxae not distinctly demarcated. Pleon of 4 segments, segment 1 largely concealed by pereonite 7, segments 2–4 indicated by 2 distinct suture lines running to posterolateral margin of pleon; posteromedial margin of pleon with or without boss, with or without posteriorly directed processes. Pleotelson with anterolateral flange. Pleonal sternite present, weakly developed.

Antennule peduncle article 1 more than twice as long as 2, robust, article 3 slender, all articles collinear; flagellum about as long or slightly longer than peduncle, extending to about posterior of pereonite 1. Antenna peduncle article 1 short, articles 2 and 3 shorter than 4–5 which are longest; flagellum short, extending to about posterior of pereonite 1.

Epistome anteriorly acute, narrowly rounded or truncate, medially constricted. Labrum unornamented, may be nodulose or setose. Mandible incisor multicuspid; molar process prominent, crushing, provided with lateral scale teeth; left mandible with prominent lacinia mobilis; both mandibles with spine row of 5 or 6 spines; palp 3-articled, article 1 longest, 3 shortest. Maxillule lateral lobe with about 13 spines on gnathal surface, most of which are prominently serrate, with further 2 biserrate spines and distal surface; medial lobe with 4 prominently serrate and plumose spines, with further 2 short simple spines. Maxilla with all articles well developed, with prominent setae on lateral and middle lobes, medial lobe with several robust CP spines and additional slender spines. Maxilliped endite distal margin with 4 long laterally curving and 4 short CP spines, dorsal distolateral margin with 2–3 CP spines.

Pereopods all ambulatory, pereopods 1–3 sub-similar, and more robust than 4–7; posterior margins of merus and carpus with biserrate spines, without prominent setulose fringe; dactylus posterior margin with euticular seale row, with prominent simple secondary unguis and 1 flattened seta arising at lateral base of secondary unguis; lateral margin with single seta ('propodal organ'), rarely with 2. Pereopods 6 and 7 posterior and distal margins of carpus with conspicuous biserrate and trifold spines.

Penes paired, unfused, medially adjacent at posterior of sternite 7, moderate to elongate in length, extending at least to pleopod peduncles; not conspicuously narrowed or acute.

Pleopods 1–3 both rami with PMS. Pleopod 1 endopod extending beyond exopod; exopod axis oblique to peduncle, with simple spine at proximalateral angle; peduncle with 3 coupling hooks on medial margin. Pleopod 2 with appendix masculina subbasally attached. Pleopods 3–5 exopods with entire transverse suture. Pleopods 4 and 5 exopods with thickened ridges or folds (rarely without), with lateral margin thickened, with row of short simple setae; endopods without thickened ridges or folds. Pleopod 5 exopod with 3 or 4 seale patches.

Female, ovigerous: Body with nodules weakly developed or absent; coxae visibly demarcated. Pleotelson posterior margin entire, upturned, with shallow ventral median depression, without exit channel. Mouthparts metamorphosed. Antennule peduncle article 1 anterior margin finely denticulate, without spikes. Pereopod 7 with spines simple or finely serrate, relatively longer and more slender than those of male. Uropod endopod flat, with apical point.

Brood pouch made up of short oostegites, overlapping slightly at mid-line, and arising from sternites 1–4; eggs held in internal pouches within body.

Female, non-ovigerous: Generally similar to ovigerous female, but may retain trace of male pleonal ornamentation, ventral margin of pleotelson posterior margin with ventrally flat rim, with median depression not reaching posterior margin, without exit channel; dorsal posterior margin not upturned. Mouthpart, pereopodal and pleopod morphology generally similar to that of male.

Remarks. The defining apomorphies for the genus are in the male: antennule peduncular article 1 with hardened prominent spikes on the anterior margin, epistome anteriorly with 1 or 2

hardened prominent spikes or transverse ridge; maxilliped palp articles 3 and 4 each with a greatly elongated medial margin, article 5 also greatly elongated, all with an obliquely truncate densely setose apex; posterodorsal margin of pereonites 2–7 with 1 or 2 rows of conspicuous spikes, uropod exopod with deeply bifid toothed apex and uropod endopod with hardened prominent spikes at ventrodorsal apex. Additionally, the pleon and pleotelson are dorsally denticulate, the pleotelson usually with a divided posterior margin but without a distinct exit channel. The uropod rami are both round in section with the exopod about half as long as the endopod.

Species of this genus are easily recognizable by the males having the antennule peduncle article 1 with comb-like arrangement of prominent white downwardly directed spikes, similar prominent spikes on the epistome, and prominent spikes arranged in transverse bands across the dorsum of pereonites 2, 3, or 4–7. Other characters include the very nodular and setose body surfaces, deeply bifid short uropod exopod and cylindrical spiked uropod endopod.

The recognition of the autapomorphies for the genus allows recognition that the presence or absence of pleonal processes, and differences in morphology of the penial processes, appendix masculina, pleopodal ridges and pleotelson posterior margin are not necessarily of generic merit.

Distribution. Species of *Oxinasphaera* are found throughout the Indo-Pacific Ocean, with recorded localities from the south-western Indian Ocean at South Africa [*Oxinasphaera kensleyi* sp. nov.], to the Philippines in the north-east [*Oxinasphaera multidentis* (Richardson, 1910) and *Oxinasphaera tripartita* (Richardson, 1910)], and to New Caledonia in the east (*Oxinasphaera corypantha* sp. nov.) (Fig. 2). The genus has been widely and commonly collected around the entire Australian coastline with the exception of some remote and difficult to collect localities. Usually collected within the continental shelf, but with one species (*Oxinasphaera parodia* sp. nov.) recorded from a depth of 400 metres. Several undescribed species exist in the North-western Indian Ocean, and are currently under study at the USNM (by B. Kensley and M. Schotte). Other Indo-Pacific regions may well yield further species once collections have been made, and at present I regard the distribution of the genus as incompletely known. The relatively well recorded sphaero-

matid fauna of New Zealand (Hurley and Jansen, 1977) apparently lacks representatives of this genus.

The single most commonly recorded or associated habitat for species of this genus is from, or with, sponges. It is probable that much of the collected material that has not been noted as being taken from sponges is the result of these animals exiting from their host once it has been collected. Large samples taken by trawl or epibenthic sled, such as some of those of *Oxinasphaera bispinosa*, may indicate that some species are also free living.

Etymology. The name is a combination of the Greek *oxina* (harrow or rake, alluding to the antennule peduncle morphology), with the ending *-sphaera*, indicating familial affinity (feminine).

Characters of taxonomic utility and general morphology

Cephalon. The cephalon is frequently ornamented, and may be posteriorly granular or pitted (e.g., Figs 11A-C) or smooth (Fig. 35A). The absence or presence, distribution and form of the spikes along the anterior margin, arrangement of rostral spikes (absent, single or double) and medial nodules should all be noted, the first two characters being critical in species evaluation.

Pereonites. Characters to note are: the arrangement of pereonite spikes, presence of prominent spikes on pereonite 1 or 2, and also which pereonites (e.g., 2-7, 3-7) have spikes. Spike rows are usually double (Fig. 11F), rarely single or triple, with the anterior row more prominent and smaller nodules between the spike rows (Fig. 43B); note also the shape of spikes.

Coxae. Coxae vary little between species, but differences can be seen in the posterolateral margins of 5 and 6, some species being rounded, others straight.

Pleon. There are several important and easily observed characters to note, particularly the presence or absence of posteriorly directed paired processes (Figs 43C, 47C), the presence of a posterior boss with paired lateral spikes (Fig. 11D), and the arrangement of the larger tubercles. The pleonal boss is usually distinct and armed with posteriorly directed spikes at each posterolateral corner. In some species the boss is altogether absent, while others lack a boss but retain the spikes, and in some the boss approaches the state of processes.

Pleotelson. There are a number of important characters to note, including the arrangement of anterior spikes and of the larger tubercles; most species have the dorsal surface covered with papillose nodules (Figs 11E, 14E, 43D), occasionally not evident (Fig. 16D); some species have longitudinal rows of prominent rounded nodules running from the posterior margin and median lobe (Fig. 35C). The shape of the posterior margin is usually with a median excavation in which lies a coplanar lobe. Other conditions of the pleotelson posterior margin are: posterior margin flat and produced with two submedian excavations; almost entire; with distinct dorsal lobe overlying median excavation; median lobe large, laterally flanked by deep grooves. The degree of setation should be noted.

Cuticle. The cuticle is variously polished, smooth or pitted, and ornamented in some form. Some species have papillose nodules (Figs 11C, E, 14F), while in others the nodules are simple (Fig. 21F) or absent (Figs 16F). *Oxinasphaera islaya* has large shallowly domed tubercles interspersed with smaller mushroom-shaped nodules (Fig. 58D). In most species the cuticle surface has scattered globular structures (Fig. 12H), also found in *Discidina* Bruce, 1994b (figs 54A, B). In only *Oxinasphaera bispinosa* were these observed to occur in distinct clearly defined pits (Fig. 43D).

Antennule. The morphology of antennular peduncle article 1 is critical in species discrimination. Characters to note are the number of anterior spikes, number and position of posterior spikes, presence of a posterior blade and whether spikes are regular or irregular. The presence or absence of spikes on antennule peduncular article 2 is useful to note. The relative length and the number of flagellar articles varies slightly between species.

Antenna. Details of the antennal peduncle and flagellum scarcely vary between species. The degree of setosity of peduncular articles 4 and 5, and number of flagellar articles may vary.

Epistome. This character is of critical importance in discriminating species. It should be noted whether the spikes are round in section or antero-posteriorly flattened, close set or set apart, how many spikes are present, and whether the spikes are set on or form a transverse ridge; the presence of secondary spikes on lateral lobes should be noted.

Mouthparts. Mouthparts are consistently uniform throughout the genus and of little use in species discrimination. The mandible (Figs 11G, H, 43D, H) is of the typical generalized sphaeromatid form with a prominent lacinia mobilis on the left mandible, spine rows on both mandibles and a peripherally toothed molar with a flat unornamented surface. The maxilliped palp setae are terminally plumose (Fig. 12B). The endite dorsal surface has abundant setae, laterally with 3 large serrate setae (Fig. 44C).

Pereopods. Pereopods are generally very similar throughout the genus. Differences can be observed in the general robustness, number of spines on the propodal palm, and the relative length of both the carpal spines. Minor differences can be observed in the relative dimensions of the pereopods. The posterior margin of pereopods 1–3 is provided with biserrate spines (Fig. 12E), and distal margins of the carpus of pereopods 6 and 7 with biserrate and trifid spines (Fig. 44E). The dactylus has a robust secondary unguis with 2 associated setae (Figs 12C, 44D), the distolateral margin of the dactylus with a single seta (Fig. 21D) except for *O. lowryi* which has 2.

Penes. These generally extend to the pleopod peduncles. Some species have slender and elongate penes that fit into a groove on the medial margin of pleopod 1 endopod.

Pleopods. Pleopods are very uniform throughout the genus. Pleopod 1 endopod medial margin may be regular or with a ventral groove (when receiving elongate penial process), or with distomedial lobe. Pleopod 2 appendix masculina may be of even width or basally dilated, distally narrowed, straight or curving laterally; the apex varies from apically blunt to acute, usually slightly longer than exopod, in some species not extending beyond distal margin of endopod. Pleopod 5 has 3 patches of distally fringed scales, the distomedial patch being lobate (Fig. 44F, 44G).

Uropods. Often nearly identical among related species; characters to note are the relative length of the exopod in relation to the endopod, the size of the exopod spikes, the number and size of the distal exopod spikes, and the setosity of the rami. Uropodal setae are terminally roughened (Fig. 12F), a character which encourages silt to adhere to the animal. The uropod cuticle is similar to that of the pleotelson, the only appendage for which this is the case.

Relationships

Sister group relationships have yet to be clearly established in the Sphaeromatidae, and the monophyly of many of the larger genera is open to question. *Cymodoce* is one such genus, but the type species and a group of closely related species have been described in detail (Dumay, 1972a, b, c, d) allowing for a clear concept of the genus (*sensu stricto*, based on the type species) to be used when making outgroup comparisons. *Sphaeroma* was chosen as the second outgroup as it is a generally considered to be a monophyletic plesiomorphic genus, and was used to polarise pleon and pleotelsonic character states.

Cymodoce (sensu stricto) is regarded here as the sister group to *Oxinasphaera*. The genus *Cymodoce* has not been assessed in terms of cladistic criteria, and unambiguous synapomorphies with *Oxinasphaera* are difficult to identify, in part because the distribution of these characters beyond the genera in question is not known with certainty. Both genera have a similar mouthparts (particularly the elongate lobes of the maxilliped palp), pereopodal and pleopodal morphology, both commonly have some form of pleonal boss, and both have a median telsonic notch in which usually lies a simple coplanar lobe, all of which are potential synapomorphies. The two genera can immediately and easily be separated by the apomorphies identified (above) for *Oxinasphaera*, and also that *Cymodoce (sensu stricto)* has a lamellar and lanceolate uropodal exopod. Possible apomorphies for *Cymodoce (sensu stricto)* include the pleotelson with 2 subparallel longitudinal ridges, pleotelson apex with two submedian notches, pleotelson with a prominent hardened hemispherical dome anterior to the posterior pleotelsonic notches, uropod endopod flat and thickened (eastern Atlantic species) or cylindrical in section with a single distal apical spike (Australian species). Detailed discussion of character states for *Cymodoce*, a large genus in desperate need of revision, is beyond the scope of the present study.

Character discussion

A generalized illustration of critical characters of the antennules and pleon is given in Fig. 1.

Cephalic spikes (characters 1 and 2): the anterior margin spikes are present in various degrees of prominence, and are scored 0 only when absent or so minute as to be indistinguishable from tubercles; *O. poorei* lacks spikes but

has a distinct anterior flange, and was recorded as ornamented (1) rather than unornamented (0); presence of 3 small rostral spikes was recorded as 1.

Pereonites (characters 3–8): records the spike configuration. Very small spikes are recorded as 0 for characters 5 and 6, although they are not absent. Character 8 is ambiguous, and not clearly definable.

Pleon (characters 9–11): character 9, posteriorly directed processes, was ordered, the paired processes being regarded as derived from a pleonal boss; the plesiomorphic state (smooth, no boss) is supported by outgroup comparison and also developmental evidence as postembryos, manca and immature specimens lack the pleonal boss; paired processes cannot be derived directly from the plesiomorphic state, but the possibility of reversals from state 2 to state 1 is recognized. Posteriorly directed spikes (10) are the spikes at the anterolateral angles of the pleonal boss; lateral acute tubercles (11) are the small tubercles commonly present on the lateral margins of the pleonites 2, 3 and the lateral flange.

Pleotelson (characters 12–18): anterior spikes (12) are those that oppose the pleonal spikes or processes; the presence of a dorsal lobe (15) precludes characters 16 and 17, as the notch is without a median lobe ventrally.

Antennule (characters 19–23) and epistome (characters 24–26) record the spike configuration. The distinction between epistome spikes and a transverse blade is not always clear: in those species with paired acute spikes the spikes are often basally united and flattened; in those species with a blade the transition between a transverse series of tubercles, small spikes and a blade can be equally unclear.

Penes (character 27): penial processes in *Cymodoce* are elongate, but are short in *Sphaeroma*. The plesiomorphic condition is regarded as short and unfused.

Pleopods (characters 28–30): The plesiomorphic condition for pleopod 1 (28) is with a simple medial margin to the endopod as in *Sphaeroma*; in many genera and species the presence of a grooved medial margin is associated with elongate penial processes (e.g., *Cymodoce*), the penes fitting into the groove. This not always so, as shown by *O. obregonia* which has elongate penial processes but no pleopodal groove. The appendix masculina (29 and 30) in both outgroups is elongate and evenly tapered with a slender or narrowly rounded apex; being abruptly narrowed and having a blunt apex are

both regarded as independent plesiomorphic states.

Uropod (character 31): *Sphaeroma* has lamellar uropods which lack terminal spikes. Indo-Pacific species of *Cymodoce* have the uropodal endopod similar to that of *Oxinasphaera*, but with a single terminal spike, and have a longer lamellar exopod that is not apically bifid.

Character list

Outgroups: *Cymodoce*, the probable sister group; *Sphaeroma*, a generalized plesiomorphic genus with regard to the pleon, pleotelson and uropods. * = characters with assumed polarity.

1. Cephalon anterior margin: unornamented (0); with distinct spikes or ridge (1).
2. Rostral spike: absent (0); single (1), double (2).
3. Pereonite 1: unornamented (0); nodular (1).
4. Pereonite 2: without prominent median nodule(s) (0); with prominent median nodule(s) (1).
5. Pereonite 2: without distinct spike rows (0); with distinct spike rows (1).
6. Pereonites 4–7: without distinct spike rows (0); with distinct spike rows (1).
7. Pereonites 4–7: spike rows subequal in size (0); anterior spike row larger than posterior (1).
8. Pereonite 7: posterior margin even (0); posterior margin weakly bilobed (1).
9. Pleon posterior margin: regular, even, not produced (0); posterior margin with medial boss (1), with posteriorly directed processes (2).
10. Pleon posterior dorsal surface: without spikes (0); with spikes (1).
11. Pleon posterolateral surface: without acute tubercles (0); with acute tubercles (1).
12. Pleotelson anterior margin: without pair of submedian spikes (0); with pair of submedian spikes (1).
13. Pleotelson posterior margin: not posteriorly flattened or extended (0); posteriorly flattened and extended (1).
14. Pleotelson posterior margin: entire (0); with simple shallow submedian notches (1), with median notch with deep submedian grooves (2).
15. Pleotelson posterior margin: without dorsal lobe (0); with dorsal lobe projecting over notch (1).
16. Pleotelson posterior margin: median lobe slender, extending to posterior margin (0);

- median lobe short, distinctly rounded, not extending to posterior margin (1).
17. Pleotelson posterior margin: median lobe without distinctly rounded tubercle(s) (0); with such tubercles(s) (1).
 18. Pleotelson posterior margin: shallow, flat in lateral view (0); deep-sided in lateral view (1).
 19. Antennule peduncle article 1*: anterior spikes not markedly flat, distally acute (0); markedly flat, distally blunt or truncate (1).
 20. Antennule peduncle article 1: prominent posterior spikes absent (0); prominent posterior spikes present (1).
 21. Antennule peduncle article 1*: anterior spikes regular in size (0); anterior spikes irregular in size (1).
 22. Antennule peduncle article 1: without posterior blade (0); with posterior blade (1).
 23. Antennule peduncle article 2: without small anterior spike(s) (0); with small anterior spike(s) (1).
 24. Epistome anteriorly*: with spikes (0); with transverse blade (1).
 25. Epistome anteriorly*: with two spikes (0); with single spike (1).
 26. Epistome anterior spikes*: acute, round in section (0); flattened, distally truncate (1).
 27. Penial processes: short, robust (0); elongate, distally slender, extending to pleopod 1 peduncle (1).
 28. Pleopod 1 endopod: medial margin simple (0); medial margin with dorsal groove (1).
 29. Pleopod 2 appendix masculina: evenly tapered (0); distally abruptly narrowed (1).
 30. Pleopod 2 appendix masculina*: distally acute (0); distally bluntly rounded (1).
 31. Uropod endopod: with single prominent distal spike (0); with 2 or more prominent distal spikes (1).

Results of analysis

The matrix of 25 taxa by 31 characters was treated using the programme PAUP 3.1.1. Character transformations were investigated using the *apolist* option and examined using MacClade 3.03. The tree data is given in the captions to figures 3 and 4. Initially 84 trees were obtained, these being used to generate the strict consensus tree (Fig. 3A); with character 9 ordered weighted 68 trees were obtained, the strict consensus tree shown in Fig. 3B. The consensus trees are largely not dichotomously resolved, but the successively weighted tree (Fig.

3B) does demonstrate three distinct clades of the *O. bisubula* polychotomy, the *O. tripartita* clade and the *O. tuberculosa* clade. The successively weighted tree (Fig. 4, character 9 ordered) maintains the principal clades shown by the consensus tree, but the *O. tripartita* clade is shown as part of a larger clade with the *O. tuberculosa* clade. In both cases the level of homoplasy is high, with a homoplasy index of 0.685 and 0.622 respectively.

Discussion of trees

The strict consensus tree (Fig. 3B) demonstrates six dichotomously unresolved clades. The *O. bisubula* clade is defined by two apomorphies: prominent posterior antennule spikes (character 20) and the posterior margin with a boss (character 9). Both of these characters occur as homoplasies in other clades (*O. lowryi*, character 9) or are reversed within the clade (*O. bispinosa*, character 20, *O. obregonia*, character 9). Within this polychotomy there is a distinct clade consisting of the species *O. bispinosa*, *O. tripartita* and *O. kensleyi*. This clade is defined by the following apomorphies: pleon with posteriorly directed processes (character 9), elongate penial processes (character 27), and pleopod 1 endopod with a grooved medial margin (character 28). The latter two character states are homoplasious, character 27 occurring in *O. multidens*, *O. tual* and *O. obregonia*, and character 28 in *O. corypantha* and *O. tual*.

The *O. tuberculosa* clade is defined by the autapomorphies of the deeply grooved pleotelson posterior margin (character 14), flattened antennule spikes (character 19) and flattened epistome spikes (character 26). The latter two characters are homoplasious, also occurring in *O. bispinosa*.

Of the remaining smaller clades, the *O. aylosteria/O. rebutia* clade is discussed below in relation to the successively weighted tree, as is the *O. australis/O. matucana* clade. Both the single taxon clades of *O. poorei* and *O. islayi* inevitably lack unique apomorphies, although both species have a number of defining autapomorphies.

The successively weighted cladogram (Fig. 4) supports the principal clades identified in the consensus tree, but differs in placing the *O. bispinosa* clade as sister group to the *O. tuberculosa* clade. The *O. bisubula* clade is defined by the unique appearance of posterior spikes on the antennule peduncle (character 20). The clade *O. aylosteria* and *O. rebutia*, sister group to the remaining *O. bisubula* clade, is defined by

several autapomorphies: prominent nodules on perconite 2 (character 4), pleotelson median lobe short (character 16), pleotelson median lobe with rounded tubereles (character 17), and the telson being deep in lateral view (character 18). The last two characters are somewhat weak and subjective, and the distribution and distinction of tubereles between species is equally subjective. Although the remaining species of the *O. bisubula* clade are dichotomously resolved, the relationships between these species is far from clear as the nodes are principally defined by homoplasies and reversals, while some of the characters (e.g., character 8) demonstrably show intermediate states.

The *O. tuberculosa* clade is defined by the unique appearance of flattened antennular spikes, although this character reverses in *O. tripartita* and *O. kensleyi*. The clade containing both the *O. tuberculosa* clade and *O. bisubula* clade is defined by the unique appearance of flattened spikes on epistome, again being reversed in *O. tripartita* and *O. kensleyi*.

The clade *Oxinasphaera australis* and *O. matucana* is defined by the posterior margin of the pleotelson being flattened and extended (character 13).

Relationships of the O. bispinosa clade. *Oxinasphaera tripartita* and *O. kensleyi* form a closely related species pair defined by the unique occurrence of a posterior blade on the antennule peduncle and the prominent pleotelsonic lobe that overrides the telsonic sinus. In common with *O. bispinosa*, the two species also have elongate penes, and pleopod 1 endopod with a grooved medial margin. All three species have elongate pleonal processes, a critical synapomorphic character. *Oxinasphaera bispinosa* retains the plesiomorphic condition for the pleotelson posterior margin, while the antennule and epistome spikes (characters 19 and 26) are apomorphic.

Oxinasphaera tripartita and *O. kensleyi* could not be scored for characters 14, 16, 17, 25, and 26. This species pair is also plesiomorphic for

character 19, and therefore lacks the two defining apomorphies (characters 19 and 26) for the *O. tuberculosa* clade. Although the clade appears united by the apparent unique appearance of pleonal processes, close scrutiny of the morphology of these processes suggests that their occurrence in *O. bispinosa* and in the *O. kensleyi/tripartita* pair may also be homoplasious. The shape of the processes in *O. bispinosa* is elongate and the processes are narrow and close-set, with a deep and narrow separation; and the apex is not hardened or spike-like (Figs 40A, 43C). In the *O. kensleyi/tripartita* pair the processes are short, narrowing rapidly to the apical point, widely separate, with a distally hardened (i.e., spike-like) apex (Figs 45A, 47B,C, 48 A,B). This, together with the change in position of the clade shown in the two trees (figs 3B, 4), suggests both that the position of this clade and of the species within it are yet to be fully resolved. It is of interest to note that all the western Indian Ocean species (USNM specimens, personal observation) have elongate pleonal processes.

Distribution of the major clades. The *O. tuberculosa* clade is restricted to Australian coastal waters with the species pair of *O. tuberculosa* and *O. epostoa* occurring on southern and northern tropical coasts respectively. The remaining species in this clade occur in south-eastern Australia.

The *O. bispinosa* clade has a disparate distribution. The species pair *O. tripartita* and *O. kensleyi* occur in the western Pacific and south-eastern South Africa respectively; *O. bispinosa* occurs in south-eastern Australia. Several other undescribed species occur in the western Indian Ocean but the relationships of these species require examination before any comments can be made on their distribution.

The *O. bisubula* clade occurs in Indo-Malayan region and the south-western Pacific. This group of species is absent from the western Indian Ocean and is also absent from south-western Australia.

Key to world species of *Oxinasphaera*

Notes: 1, the key identifies only males; females can be reliably identified only by association with males. 2, antennule, except where otherwise stated, refers to peduncular article 1.

1. Pleotelson posterior margin median lobe in dorsal position, set above posterior notch 2
- Pleotelson posterior margin median lobe in coplanar position, set within posterior notch or lobe absent 7

2. Pleotelson posterior margin median lobe not extending beyond posterior margin, flanked by deep grooves; antennule article 1 without posterior blade or spikes; penes short 3
 — Pleotelson posterior margin median lobe extending beyond posterior margin, not flanked by deep grooves; antennule article 1 with posterior blade; penes elongate 6
3. Pleonal boss present; pereonites 6 and 7 with single row of spikes *O. lowryi*, p. 202.
 — Pleonal boss absent; only pereonite 6 with single row of spikes 4
4. Cephalon and pereonite 1 nodulose; pleon and pleotelson with numerous large spikes; epistome with single short truncate spike *O. thetisae*, p. 205.
 — Cephalon and pereonite 1 unornamented; pleon and pleotelson without numerous large spikes; epistome with 2 truncate spikes 5
5. Pereonites 2 and 3 densely nodulose; pereonite 7 with 2 spike rows; pleon and pleotelson sparsely setose *O. tuberculosa*, p. 195.
 — Pereonites 2 and 3 weakly nodulose; pereonite 7 with 1 spike row; pleon and pleotelson densely setose *O. epostoa*, p. 199.
6. Antennule with 5–7 irregular anterior spikes, elongate posterior blade; pleon posterior margin distinctly concave, processes without ventral spike *O. tripartita*, p. 214.
 — Antennule with 5 irregular anterior spikes, narrow posterior blade; pleon posterior margin weakly concave, processes with ventral spike *O. kensleyi*, p. 218.
7. Pleotelson posterior margin entire, or medial lobe indistinct, very weak; uropod exopod with 3–4 prominent serrations *O. islaya*, p. 237.
 — Pleotelson posterior margin with distinct medial lobe; uropod exopod with ventral nodules only 8
8. Pereonal spikes flattened; cephalon anterior margin with distinct flange on either side of rostrum; antennule with 3 flat anterior and 1 large flat posteromedial spikes *O. poorei*, p. 225.
 — Pereonal spikes rounded; cephalon anterior margin with or without spikes on either side of rostrum; antennule with more than 3 anterior spikes 9
9. Pleon posterior margin with paired processes; epistome with 2 flat truncate spikes *O. hispinosa*, p. 208.
 — Pleon posterior margin without processes, with or without boss; epistome spikes rounded, distally acute 10
10. Pleon posterior margin with boss; pleotelson posterior margin flattened, somewhat produced; antennule without posterior spikes 11
 — Pleon posterior margin regular, without boss; pleotelson posterior margin not flattened or produced; antennule with posterior spikes 12
11. Cephalon anterior margin with 3 prominent spikes, median one rostral; epistome with 3 short spikes; pereonite 1 unornamented, pereonite 2 weakly nodulose *O. australis*, p. 218.
 — Cephalon anterior margin unornamented; epistome with transverse blade; pereonite 1 with anterior pair of submedian nodules, pereonite 2 with 2 spike rows *O. matucana*, p. 222.
12. Pleotelson medial lobe not extending to posterior margin; pereonites 1 or 1 and 2 with prominent median nodules; pleonal boss very weak 13

- Pleotelson medial lobe extending to posterior margin; pereonites 1 and 2 without prominent median nodules; pleonal boss very distinct 14
13. Rostrum with bifid spike; pereonite 1 unornamented; appendix masculina distally blunt *O. aylostera*, p. 193.
- Rostrum without spike; pereonite 1 with prominent median rounded spike, 2 smaller nodules on either side; appendix masculina distally acute *O. rebutia*, p. 191.
14. Cephalon rostral spike distinct and single or absent 5
- Cephalon with distinct bifid, or indistinct trifid rostral spike 18
15. Cephalon without rostral spike; cephalon anterior margin unornamented 16
- Cephalon with single rostral spike; cephalon anterior margin with small spikes 17
16. Pleotelson with 6 large posterolateral tubercles on either side; antennule article 2 with spike; appendix masculina not extending beyond distal margin of endopod *O. multidentis*, p. 184.
- Pleotelson without large posterolateral tubercles; antennule article 2 without spike; appendix masculina extending beyond distal margin of endopod *O. corypantha*, p. 186.
17. Pleonal boss well developed, each angle with 2–3 distinct tubercles; antennule article 2 with single spike; pleopod endopod medial margin with distinct distomedial lobe; appendix masculina distal half abruptly narrowed *O. obregonia*, p. 188.
- Pleonal boss weak, each angle with 1 tubercle; antennule article 2 without spike; pleopod endopod medial margin straight; appendix masculina not abruptly narrowed *O. tual*, p. 188.
18. Rostrum with 3 indistinct small spikes; pleotelson posteriorly somewhat flattened *O. copiapoa*, p. 181.
- Rostrum with 2 distinct spikes; pleotelson not posteriorly somewhat flattened 19
19. Anterior margin of cephalon unornamented; pleotelson without prominent posterior tubercles *O. denmoza*, p. 178.
- Anterior margin of cephalon with spikes; pleotelson with or without prominent posterior tubercles 20
20. Anterior margin of cephalon with 4 prominent, discrete, acute spikes on either side of rostrum; appendix masculina apically irregularly truncated; medial margin of pleopod 1 endopod with stiff dense PS *O. frailea*, p. 176.
- Anterior margin of cephalon with more than 4 spikes on either side of rostrum; appendix masculina apically rounded; medial margin of pleopod 1 endopod PMS not stiff 21
21. Anterior margin of cephalon with continuous row of 6–7 spikes on either side of rostrum; appendix masculina basally wide; pleonal boss with 2 prominent tubercles anterior to posterolateral angles *O. lobivia*, p. 173.
- Anterior margin of cephalon with spikes most prominent laterally; appendix masculina not basally wide; pleonal boss without prominent tubercles anterior to posterolateral angles 22
22. Anterior margin of cephalon with spikes obvious; antennule with 6–7 anterior spikes; appendix masculina apically narrowly rounded; pleotelson with 2 prominent tubercles posterior to those opposing pleonal spikes *O. bisubula*, p. 160.
- Anterior margin of cephalon with spikes weak; antennule with 8–9 anterior spikes; appendix masculina apically bluntly rounded pleotelson without prominent tubercles posterior to those opposing pleonal spikes *O. parodia*, p. 170.

Oxinasphaera bisubula sp. nov.

Figures 5-12

Material examined. Holotype, ♂ (4.7 mm), eastern Bass Strait, 100 km NE of North Point, Flinders Is., Tas., 3852.6'S, 148°25.2'E, 15 Nov 1981, 130 m, fine sand, R. Wilson (NMV J40489).

Paratypes. NSW, 16♂ (3.8-5.1 mm, mean = 4.3 mm), 8♀ (ovig 4.3, 4.3, 4.0, 3.9, 3.8, non-ovig 4.3, 4.1, 3.5 mm), 3 mancas (2.5, 2.0, 1.8 mm), off Moona Moona Creek, Jervis Bay, 35°03.5'S, 150°41.0'E, 19 Jun 1982, 3 m, bivalves encrusted with sponges, J.K. Lowry (AM P41171, slide AM P44214). 3♂ (5.1, 3.9 mm), off Moona Moona Creek, Jervis Bay, 35°03.5'S, 150°41.0'E, 3 Mar 1982, 4.5 m, on ascidian, *Hermania momus*, in *Ecklonia*, P.B. Berents (AM P44199).

Bass Strait. 11♂ (5.0, 4.9, 4.9 SEM dissected, 4.8 SEM, 4.7, 4.5 dissected, 4.0, 4.0, 3.8, 3.5, 3.5 mm), 20♀ (3.8-4.5 mm), topotypes, same data as holotype (NMV J40490, 2♂, 2♀ ZMUC CRU1378). 3♂ (4.3, 4.1, 4.0 mm), 2♀ (ovig 4.5 damaged, dissected, 3.8 mm), 2 mancas (2.5, 1.1 mm), 28 km SSW of Marlo, Vic., 37°59.0'S, 148°27.0'E, 30 Jul 1983, 51 m, muddy sand and fine shell, M.F. Gomon and R.S. Wilson (NMV J26292). 2♂ (4.7, 4.6 mm), 65 km E of Cape Rochon, Three Hummock Is., Tas., 40°10.9'S, 145°23.0'E, 13 Nov 1981, 75 m, shelly sand, R.S. Wilson (NMV J40491). ♂ (4.4 mm), 20 km NNE of North Point, Tas., 40°38.0'S, 144°20.9'E, 4 Nov 1980, 37 m, muddy shell grit, M. Gomon and G.C.B. Poore (NMV J26282). 6♂ (4.6, 4.4, 4.3, 4.3, 4.2, 4.0 mm), 100 km SSE of Cape Liptrap, Vic., 39°45.9'S, 145°33.3'E, 13 Nov 1981, 74 m, muddy fine sand, R. Wilson (NMV J26257). 2♂ (4.2, 4.0 mm), 36 km SSW of Stokes Point, King Is., Tas., 22 Nov 1981, 85 m, medium sand, dredged, R.S. Wilson (NMV J4097).

Vic. 3♂ (4.8, 4.4, 4.0 mm), 6♀ (4.8, 4.4, 4.0, 3.7, 3.5, 3.3 mm), 8 mancas (2.8-0.9 mm), NE shore of Cape Wellington, Wilsons Promontory, 39°3.5'S, 146°28.7'E, 9 Feb 1982, 0 m, various SCUBA samples, G. Smith and L. Rubleman (NMV J26317). 3♂ (4.9, 4.9, 4.8 mm), female? (2.0 mm), Bastion Point, Mallacoota, 37°34.3'S, 149°46.2'E, 6 Apr 1989, 5 m, reef 300 m offshore, hydroids, sponges, bryozoans and red algae, G.C.B. Poore and R.S. Wilson (NMV J26366). 4♂ (4.6, 4.3, 4.3, 4.0 mm), Bastion Point, Mallacoota, 37°34.3'S, 149°46.2'E, 6 Apr 1989, 5 m, reef 300 m offshore, sponges, G.C.B. Poore and R.S. Wilson (NMV J26402).

Tas. 9♂ (4.1-3.5 mm), 4♀ (4.2, 4.0, 4.0, 4.0 mm), eastern side of Waubs Bay, Bicheno, 41°53'S, 147°18'E, 23 Mar 1988, 7 m, reef, sponges on vertical rock face, SCUBA, G.C.B. Poore and H.L. LewTon (NMV J26238).

Non-paratype material: **Qld.** 2♂, off Moreton Bay, 27°27'S, 153°39'E, 29 Mar 1969, 76.8 m, W.F. Ponder on HMAS *Kimbla* (AM P44200).

NSW. ♂, Nelson Head, Port Stephens, 32°43'S, 152°09'E, 27 Oct 1980, 24 m, rubble stones in channel, J. Hall (AM P41173). ♂, 5♀, N of Fly Point, Nelson, 32°43'S, 152°09'E, 8 Nov 1981, 20 m, orange sponge on dead mussel, R.T. Springthorpe and D. Stray (AM P44211). ♂, 2♀, 6 mancas, Fly Point, Nelson Bay,

32°43'S, 152°09'E, 28 Oct 1980, 15 m, algae, J. Hall (AM P41194). 2♂, 6♀, 1 manca, Nelson Head, Port Stephens, 32°43'S, 152°10'E, 27 Oct 1980, 18 m, sand and shell grit, J. Hall and I. Loch (AM P41178). 2♂, 11♀ (3 ovig), 7 mancas, Nelson Head, Port Stephens, 32°43'S, 152°09'E, 27 Oct 1980, 18 m, tufted bryozoans and hydroids, J. Hall (AM P41190). 6♂, 6♀ (3 ovig), 6 mancas, inside Box Head, Broken Bay, 33°33'S, 151°21'E, 22 Nov 1982, two species of sponges, J.K. Lowry and R.T. Springthorpe (AM P41174). ♂, inside Box Head, Broken Bay, 33°33'S, 151°21'E, 21 Nov 1982, from *Echinoclathria* sp., J.K. Lowry and R.T. Springthorpe (AM P44209). 5♂, E of North Head, Port Jackson, Sydney, 33°49'S, 151°18'E, 19 Feb 1973, 19 m, host *Teichonella labrinthica*, AMSBS (AM P22191-P22194). 2♂, E of North Head, Port Jackson, Sydney, 33°49'S, 151°18'E, 1973, 42 m, host *Polymastrea craticia*, AMSBS (AM P22197). 2♂, same data as previous except 19 m, 19 Feb 1973 (AM P22190). 3♂, same data as previous except 32.9 m, 23 May 1973 (AM P22198). 9♂, E of North Head, Port Jackson, Sydney, 33°49'S, 151°18'E, AMSBS (AM P24307). ♂, ovig ♀, Port Hacking, Sydney, 34°03.9'S, 151°07.6'E, 11 Jul 1971, 18 m, rock face, P.A. Hutchings (AM P41203). 2♂, 2 ovig ♀, Port Hacking, Sydney, 34°05'S, 151°10'E, 13 Aug 1981, 15 m, sponge, J.K. Lowry and R.T. Springthorpe (AM P41167). ♂, 4♀, off Moona Moona Creek, Jervis Bay, 35°03'S, 150°41'E, 13 May 1981, 17.7 m, from sponge in scallop beds, P.B. Berents (AM P41192). 5♂, 2 ovig ♀, off Moona Moona Creek, Jervis Bay, 35°03.5'S, 150°41.0'E, 19 Jun 1982, 8 m, mussels, epizoic algae and sponges on sand covered rocks, J.K. Lowry (AM P41169). ♂, ♀, 8 immature and mancas, off Moona Moona Creek, Jervis Bay, 35°03'S, 150°41'E, 19 Jun 1982, 3 m, from sponges, J.K. Lowry (AM P44194). ♂, 8♀, off Moona Moona Creek, Jervis Bay, 35°03.5'S, 150°41.0'E, 19 Jun 1982, 3 m, encrusting sponge, J.K. Lowry (AM P41170). 2♂, ocean side of Bowen Is., Jervis Bay, 35°07'S, 150°46'E, 27 Apr 1971, 36 m, sponges, ascidians, bryozoans and algae from large boulders, P.A. Hutchings and P.B. Weate (AM P41195). 5♂, ovig ♀, ocean side of Bowen Is., Jervis Bay, 35°07'S, 150°46'E, 29 Nov 1971, 36.5 m, marine growth on boulders, P.A. Hutchings (AM P44205). 30+♂, ♀, Darling Point, Jervis Bay, 35°07.6'S, 150°45.6'E, 23 Jan 1973, 18 m, scallops and mussels on sandy bottom, P.A. Hutchings (AM P41204). ♂, several ♀ and imm, 37°05'S, 150°05'E, 30 Nov 1914, 55-91 m, sand, Dr Th. Mortensen's Pacific Expedition 1914-1916, *Endevour* (ZMUC CRU1379).

Vic. 4♂, 9♀, 50 nm SE of Gabo Is., 37°22.3'S, 150°02.2'E, 19 Jun 1962, 75 m, HMAS *Gascoyne* (AM P41181). ♀, Gabo Is., 37°34'S, 159°55'E, 19 Feb 1973, 28 m, sponge community, J.E. Watson and S.A. Shepherd (NMV J40496). ♂, Gabo Is., 37°34'S, 159°55'E, 17 Feb 1973 (NMV J26216). 2♂, 2 mancas, 20 miles SW of Cape Everard, 37°48'S, 149°16'E, 27 Aug 1972 (NMV J26219).

Bass Strait. ♂, 31 km SSW of Cape Otway, Vic., 39°08'S, 143°24'E, 8 Oct 1980, 77 m, medium sand, G.C.B. Poore (NMV J26253). 2♂, 23 km E of Cape Rochon, Three Hummock Is., Tas., 40°22.2'S, 145°17.0'E, 3 Nov 1980, 40 m, mainly sand,

M. Gomon and G.C.B. Poore (NMV J26266). ♂, 47 km E of Cape Rochon, Three Hummock Is., Tas., 40°23.8'S, 145°32.0'E, 3 Nov 1980, 66 m, muddy sand, M. Gomon and G.C.B. Poore (NMV J26289).

Tas. ♂, 2♀, 32 km NW of Devenport, 40°56.04'S, 146°39.00'E, 4 Feb 1980, 66 m, muddy sand, M. Gomon and G.C.B. Poore (NMV J40482). 8♂, 16♀ and imm., 39 km NNE of Devenport, 40°49.75'S, 146°31.33'E, 4 Feb 1980, 68 m, mud with bryozoa and sponges, M. Gomon, G.C.B. Poore and C.C. Lu (NMV J40492). ♂, ♀, 1 km E of Bicheno, Muirs Rock, 41°53.0'S, 148°19.0'E, 21 Apr 1985, 15 m, sponge and bryozoan epifauna, airlift, R.S. Wilson (NMV J26144). ♂, same data as previous, except from red algal turf, infauna (NMV J26145). Many, D'Entrecasteaux Channel, 2.5 km E of Birches Bay, 43°11.0'S, 147°16.0'E, 16 Apr 1985, 10 m, R.S. Wilson (NMV J26140).

Australian Museum, Old Collections. 9♂, 9 km E of Coogee, NSW, 33°57'S, 151°21'E, 15 Mar 1898, 89 m, fine sand, E.R. Waite on HMCS *Thetis* (AM G2274). ♂, 2 km E of Orient Point, NSW, 34°13'S, 150°48'E 20 Mar 1898, 23 m, sand and rock, E.R. Waite on HMCS *Thetis* (AM G2273). 5♂, *Thetis* stn 48, E.R. Waite (AM G3902).

Description of male. Body about 2.2 times as long as greatest width; lateral margins subparallel, maximum width at pereonites 5; dorsal surfaces not polished, generally finely pitted anteriorly, otherwise granular, with scattered setae. Cephalon dorsal surface finely nodulose; anterior margin with series of 5–7 discrete acute tubercles on either side of rostrum, lateralmost being most prominent; with prominent bifurcate spike on rostrum. Pereonite 1 without spikes or ornamentation. Pereonites 2 and 3 each with 2 fine transverse rows of low spikes, pereonites 4–7 each with 2 transverse rows of prominent acute spikes, anterior row larger than posterior row; coxae 5–7 with posterior margins evenly rounded. Pleon posterior margin with posterior boss, posterolateral angles of boss each with prominent posteriorly directed spikes. Plocelson with 2 prominent spikes opposing those of pleon, pair smaller tubercles set immediately posterior to these; posterolateral flange with 1 submarginal and 2 marginal acute tubercles; posterior margin with two prominent submedian indentations either side of median lobe.

Antennule peduncle article 1 with 6 (occasionally 7) anterior spikes; with 1 long proximoposterior spike and 1 short posterior spike; dorsal surface of peduncular articles 1 and 2 provided with numerous roughened setae; flagellum with 6 articles. Antenna peduncle articles 4 and 5 with long setae; flagellum of about 7 articles.

Epistome with 2 prominent widely separated conical spikes set on transverse ridge. Mandible

spine row with 5–6 spines; molar process toothed along margins, surface finely ridged, distal margin not deeply indented; palp article 2 with 7 stout biserrate setae on medial margin, distal 2 being longest, article 3 with 8 short and 4 long stout biserrate setae on medial margin. Maxilla lateral lobe with 9 finely pectinate setae, middle lobe with 6, medial lobe with 5 CP spines and distally a further 6 weakly plumose setae.

Pereopod 1 basis about 2.5 times as long as wide, anterior margin with 2 sensory setae; ischium 0.7 times as long as basis, 2.2 times as long as wide, anterior margin with 2 short proximal spines and 1 distal longer and biserrate spine; merus about half as long as ischium, 1.2 times as long as wide, anterolateral angle with 2 gently curving pectinate spines, posterior margin with 3 spines becoming progressively longer distally and single long simple seta; carpus short, 0.7 times as long as merus, 1.2 times as long as wide, posterior margin with 2 biserrate spines; propodus about equal in length to ischium, widest proximally, about 2.8 times as long as wide, posterior margin with distinct scale spikes and 3 large biserrate spines, row of 3 smaller biserrate spines on medial margin; dactylus 0.6 length of propodus, unguis about 44% length of entire dactylus. Pereopods 2 and 3 similar to 1, differing principally in having the carpus more elongate and propodus more slender. Pereopod 2 basis 3.0 times as long as wide; ischium 2.5 times as long as wide; carpus about equal in length to merus, 1.4 times as long as wide, with further 5 biserrate on distal margin; propodus 0.8 times as long as ischium, 2.9 times as long as wide, margins subparallel, posterior margin with weakly biserrate spines. Pereopods 4–7 generally subsimilar except 6 and 7 provided with more biserrate spines on carpus than 4 and 5. Pereopod 6 similar to 7 except basis slightly longer, carpus distal margin with 3 large trid spines. Pereopod 7 basis 2.5 times as long as wide, posterior margin with prominent scale spikes, with several sensory setae; ischium slightly shorter than basis, 3.7 times as long as wide; merus 0.4 times as long as ischium, 3.7 times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 1 large spine; carpus 1.4 times as long as merus, 2.3 times as long as wide, posterior margin with 6 biserrate spines, distal margin with 2 large trid spines and 6 biserrate spines; propodus about 1.2 times as long as carpus and 0.6 time as long as ischium, about 3.5 times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 2 sensory setae.

Penial processes each about 3.5 times as long as basal width, tapering slightly to an oblique

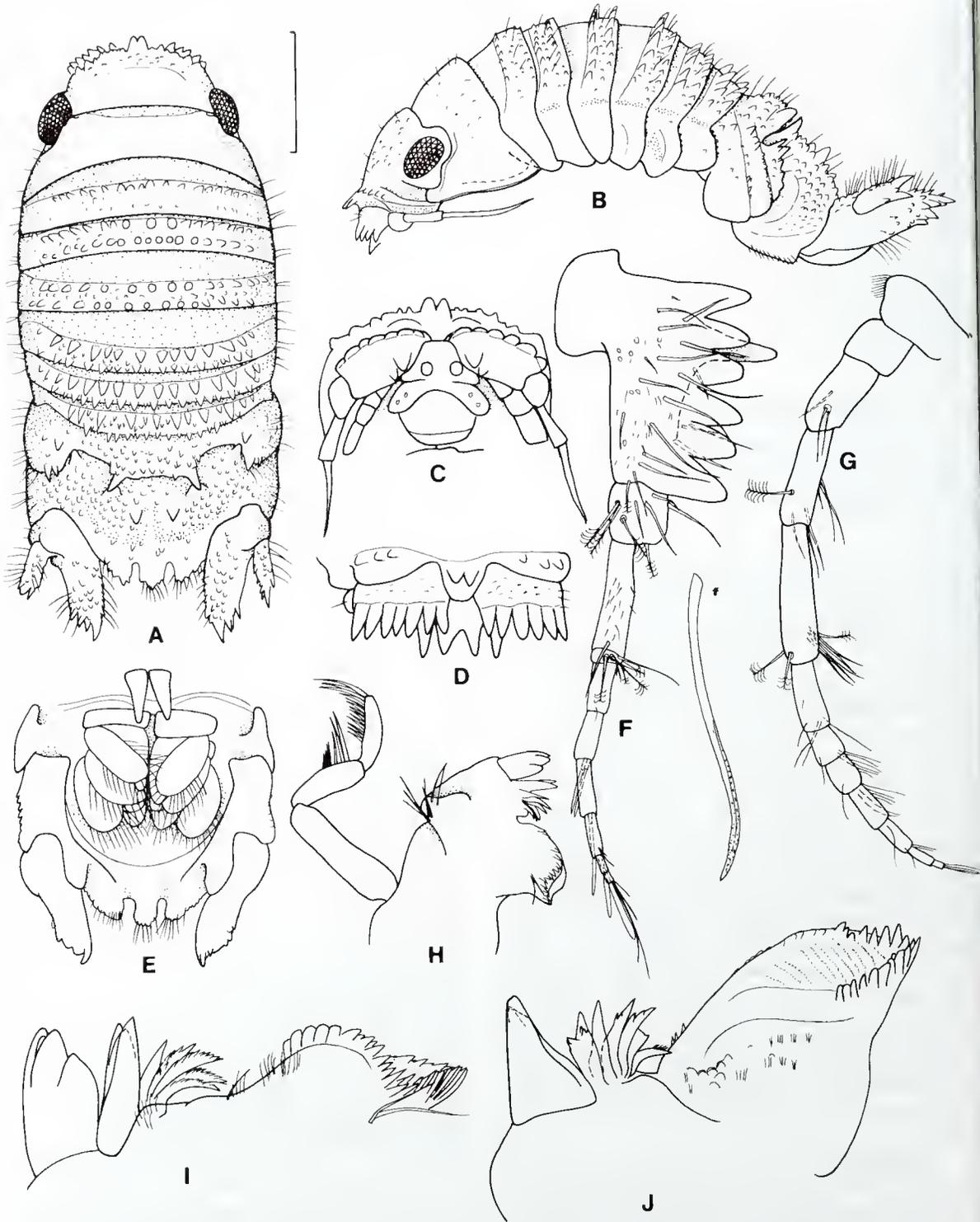


Figure 5. *Oxinasphaera bisubula* sp. nov. A-E, holotype, remainder paratype ♂ 4.5 mm (NMV J40490). A, dorsal view; B, lateral view; C, frons; D, cephalon and antennules, anterior view; E, pleon and pleotelson, ventral view; F, antennule; f, seta from peduncular article I; G, antenna; H, left mandible; I, left mandible, distal detail; J, right mandible, distal detail. Scale 1.0 mm.



Figure 6. *Oxinasphaera bisubula* sp. nov. All figs paratype ♂ 4.5 mm (NMV J40490). A, mandible palp; B, maxilla; C, maxillule; D, maxillule exopod apex; E, maxillule endopod apex; F, maxilliped, f, seta from palp article 5; G, maxilliped endite distal margin, g, cuticular setule from endite.

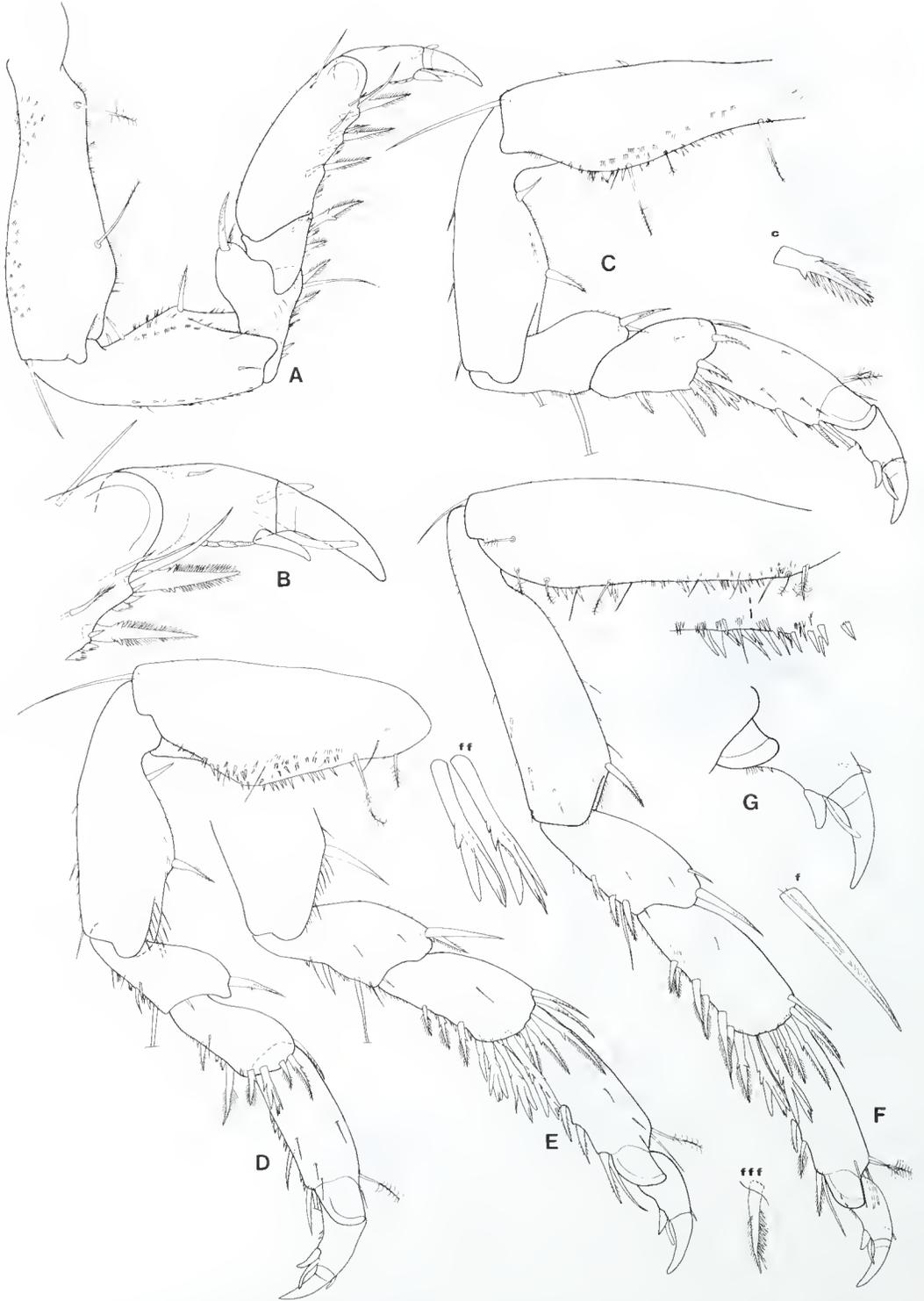


Figure 7. *Oxinasphaera bisubula* sp. nov. All figs paratype ♂ 4.5 mm (NMV J40490). A, pereopod 1; B, pereopod 1, daetylus; C, pereopod 2; D, pereopod 3; E, pereopod 6, distal articles; F, pereopod 7, f, spine from anterodistal angle merus, ff, spines from distal margin carpus, fff, spine from posterior margin of merus; G, pereopod 7, daetylus medial view (a, anterior margin; b, posterior margin).

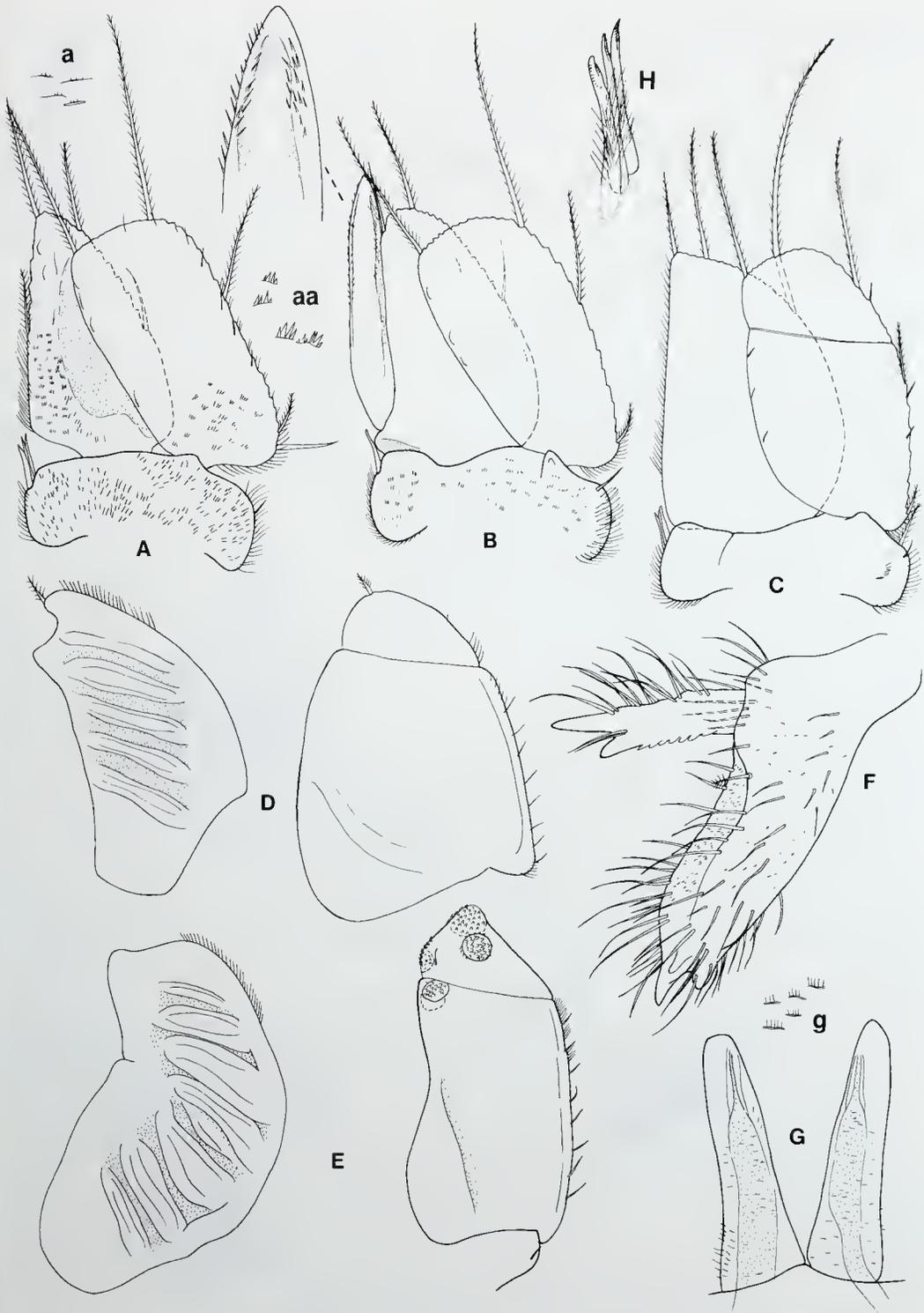


Figure 8. *Oxinasphaera bisubula* sp. nov. All figs paratype ♂ 4.5 mm (NMV J40490). A-E, pleopods 1-5 respectively, a, scales from endopod, aa, scales from exopod; F, uropod; G, penes, g, scales from base of penes; H, coupling hooks, pleopod 1.

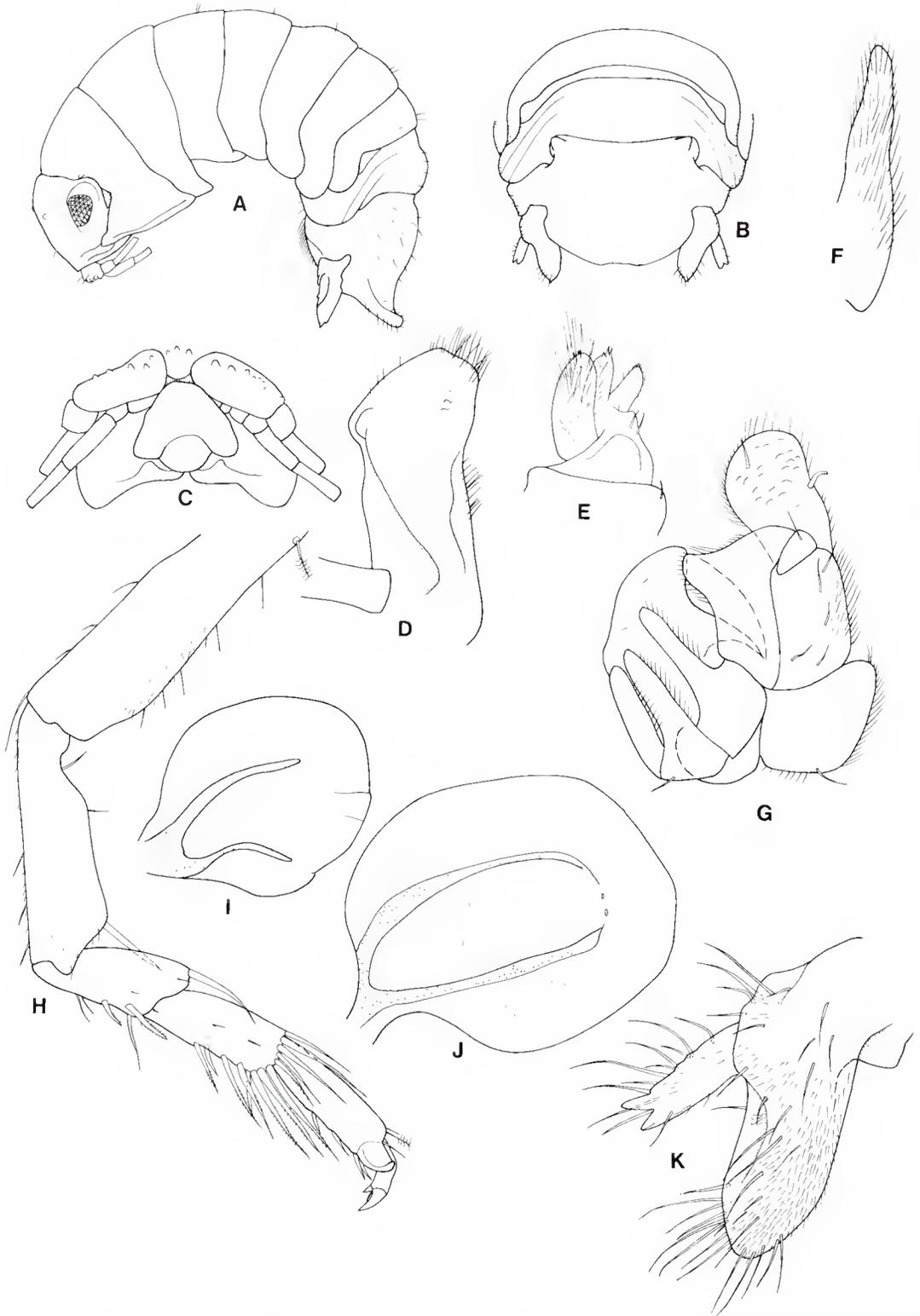


Figure 9. *Oxinasphaera bisubula* sp. nov. Ovigerous ♀ 4.5 mm (NMV J26292). A, lateral view; B, dorsal view of pleon and pleotelson; C, frons; D, mandible; E, maxillule; F, maxilla; G, maxilliped; H, pereopod 7; I, oostegite 1; J, oostegite 4; K, uropod. Scale 1.0 mm.

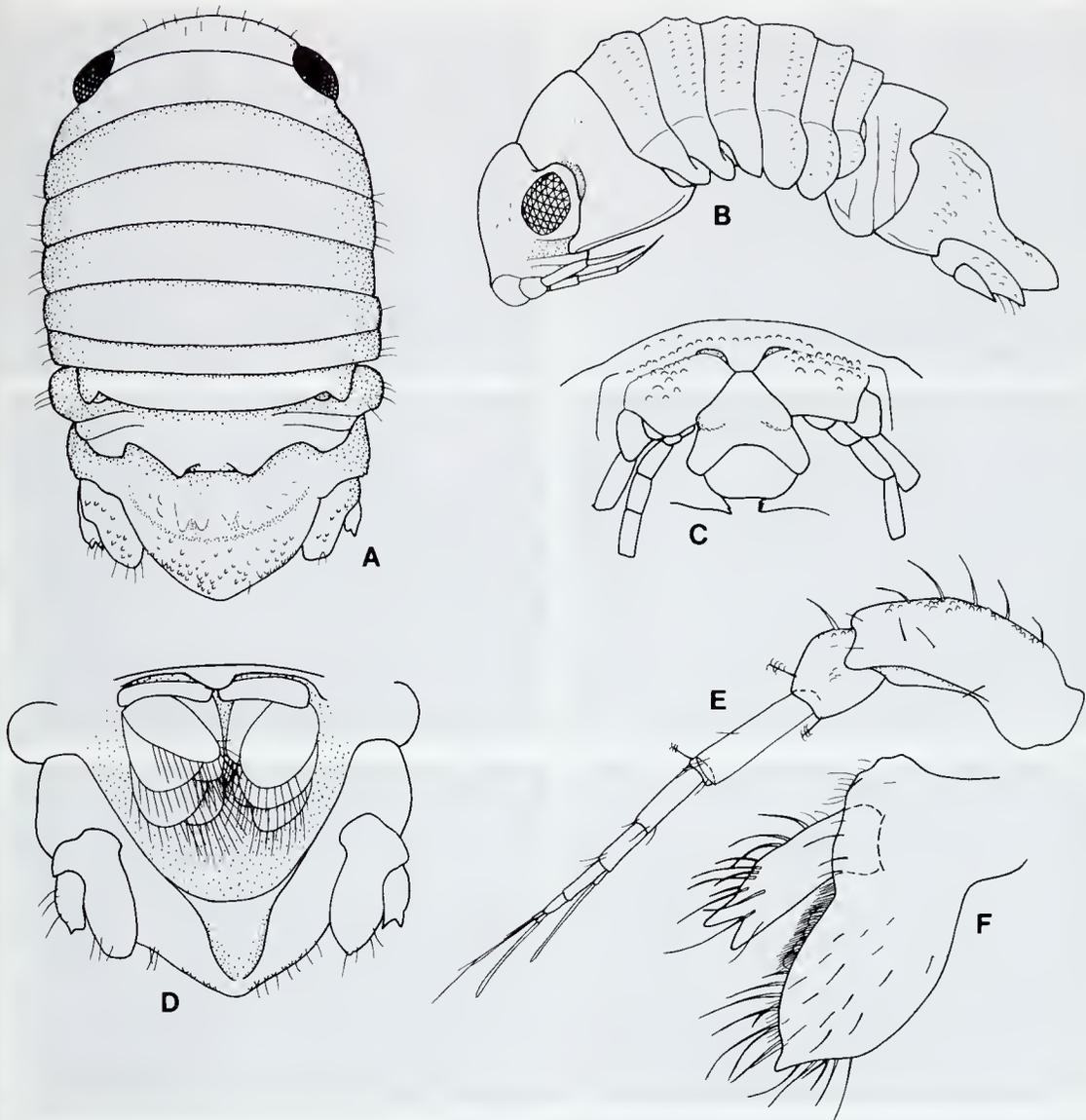


Figure 10. *Oxinasphaera bisubula* sp. nov. Non-ovigerous ♀ 4.3 mm (NMV J40490). A, dorsal view; B, lateral view; C, frons; D, pleon and pleotelson, ventral view; E, antennule; F, uropod. Scale 1.0 mm.

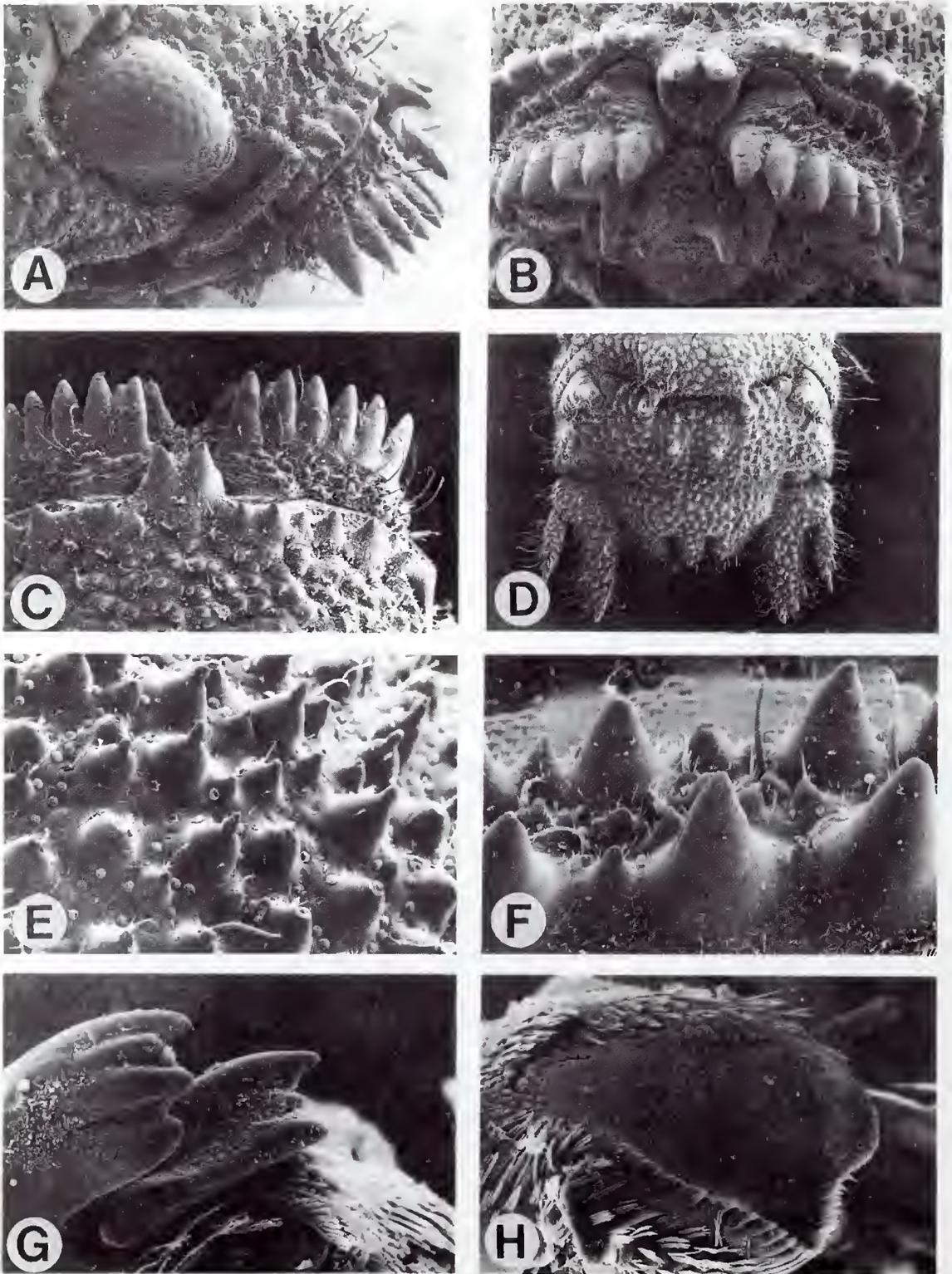


Figure 11. *Oxinasphaera bisubula* sp. nov., SEMs. A–F ♂ 4.8 mm, G, H ♂ 4.5 mm (NMV J40490). A, cephalon, lateral view ($\times 100$); B, cephalon anterior margin and frons ($\times 110$); C, cephalon, anterior margin ($\times 110$); D, pleon and pleotelson ($\times 40$); E, pleotelson tubercles ($\times 270$); F, spike rows, pereonite 5 ($\times 370$); G, left mandible, incisor, lacinia mobilis and spine row ($\times 750$); H, molar process ($\times 700$).

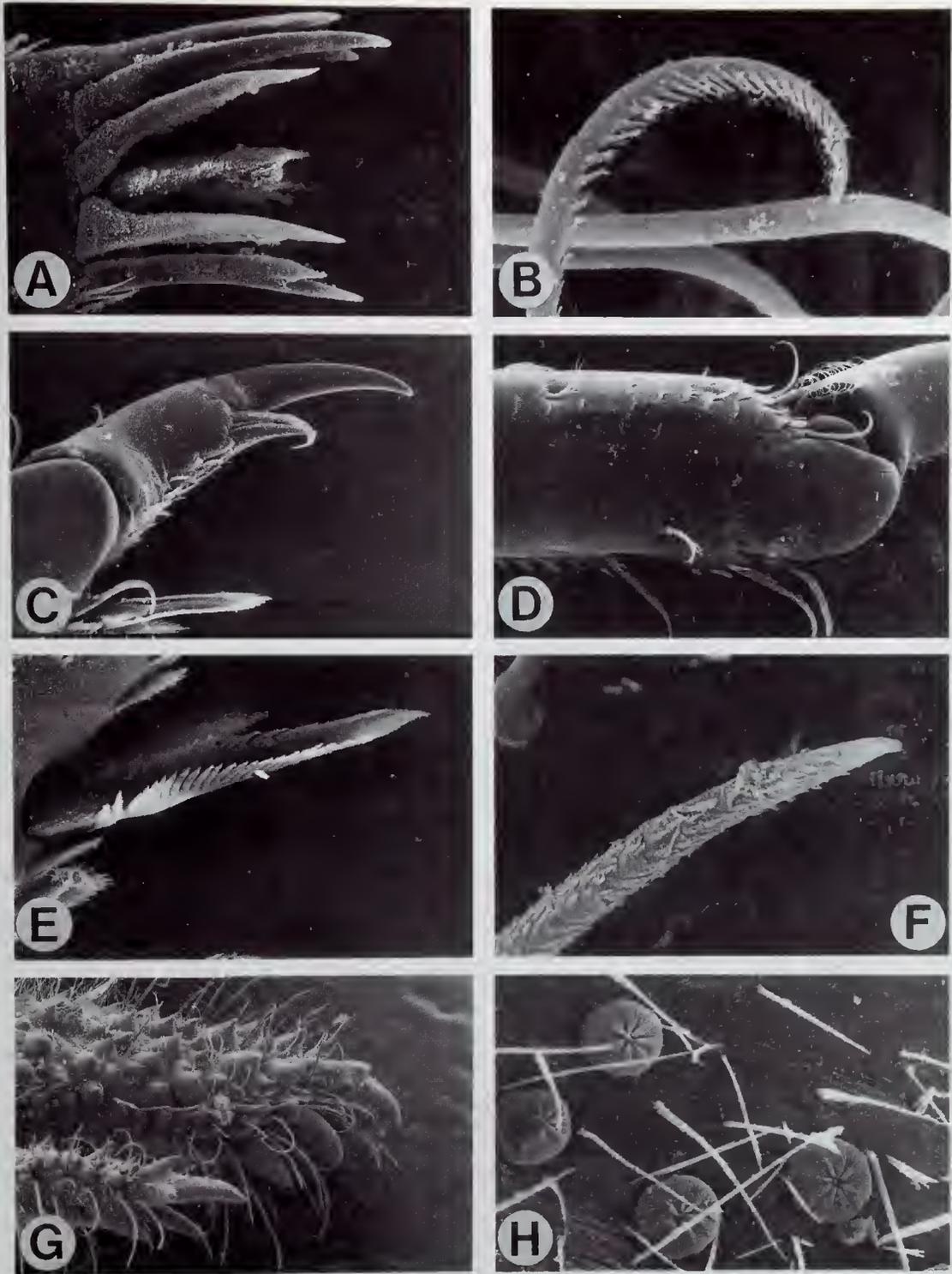


Figure 12. *Oxinasphaera bisubula* sp. nov., SEMs. All figs ♂ 4.5 mm (NMV J26267). A, maxillule, lateral lobe ($\times 950$); B, seta, maxilliped palp article 4 ($\times 4000$); C, pereopod 1, dactylus ($\times 450$); D, pereopod 2, propodus ($\times 450$); E, serrate spine, pereopod 1 propodus ($\times 1200$); F, seta from uropod ($\times 2700$); G, uropod rami, apices ($\times 150$); H, detail, pleotelson cuticle ($\times 2000$).

subtruncate apex; proximolateral margin with scale spikes.

Pleopod 1 exopod with c. 28 PMS, endopod with c. 19 PMS. Pleopod 2 exopod and endopod with c. 16 and 28 PMS respectively; appendix masculina straight, 6.0 times as long as maximum width, narrowing shortly before apex to sub acute point, extending beyond endopod slightly (by about 0.15 of its length). Pleopod 3 exopod and endopod with c. 14 and 26 PMS respectively. Pleopod 4 exopod with single seta at distomedial angle, endopod with 6 thickened fleshy ridges. Pleopod 5 exopod with 2 apical lateral scale lobes 1 medial apical scale lobe and one lateral proximal scale lobe, endopod with 7 thickened fleshy ridges. Uropod dorsally nodular, covered with roughened setae; exopod about 4.7 times as long as proximal width, about half as long as endopod, apex deeply bifid with lateral process prominent; endopod about 3.4 times as long as wide, apex with prominent terminal and 3 downwardly directed prominent spikes.

Ovigerous Female. Body dorsally without tubercles, with sparse setae; posterior margin of pleotelson with thickened rim, with shallow median indentation. Uropod rami thickened, covered with fine setae and longer thickened setae.

Non-ovigerous Female. Body dorsal surfaces with weak transverse tubercles on pereonites 2–7, pleon and pleotelson; pleon with 2 obvious low submedian mounds; pleotelson with 4 indistinct ridges, variable in development between individuals, never prominent.

Colour. Pale yellow ground colour, often with chromatophores which are more evident in females. Cuticle of preserved specimens may be clear or opaque.

Size. Males 3.3–5.1 mm, females 3.5–4.5 mm, ovigerous females 3.8–4.5 mm, manca 0.9–2.8 mm.

Variation. In some localities, notably southern Tasmania, the males have the posterior pair of pleotelsonic tubercles less well developed than those of the type series.

Remarks. This species, restricted in its distribution to south-eastern Australia, is the most frequently collected member of the genus. Males are readily recognized by the prominent pleonal spikes, the presence of a second pair of pleotelsonic tubercles, a bifurcate spike on the rostrum, and the antennule peduncle article 1 with 6 or 7 spikes. Females of *Oxinasphaera bisubula* can be

recognized by the submedian pair of domed mounds on the pleon, a feature shared with few other species either in the group or in the genus.

There are several other species similar to *Oxinasphaera bisubula*, and these are best separated using the key provided.

Distribution. Here recorded from off Moreton Bay, south-eastern Queensland (27°7'S), along the New South Wales coast to the Bass Strait and Tasmania (43°11'S) and westwards to Victoria (143°24'E), at depths from the intertidal to 130 m, with only one record at a depth greater than 77 m; of the samples where depth was recorded, about 71% are from less than 50 m. Twelve samples are recorded from sponges or have sponges mentioned in the habitat data.

Hosts. Sponges, including some identified as *Echinoclathria* sp., *Teichonella labrinthica* and *Polymastea craticia*.

Etymology. The epithet is derived from the Latin *subula* (= awl-shaped or pointed), and alludes to the prominent spikes on the epis-tome.

Oxinasphaera parodia sp. nov.

Figures 13, 14

Material examined. Holotype, ♂ (5.0 mm), S of point Hicks, Vic, 38°17.7'S, 149°11.3'E, 24 Jul 1986, 400 m, coarse sand, gravel, mud, many sponges, M.F. Gomon (NMV J40486).

Paratypes. 12♂ (3.5–4.8 mm, mean = 4.1 mm), 13♀ (ovig 4.0, 4.5 mm; 11 non-ovig 2.8–4.0 mm, mean = 3.5 mm), 31 manca (1.6–2.3 mm), same data as holotype (NMV J19159 [♂], J19160 [♀ and manca]).

Description of male. Body about twice as long as greatest width; dorsal surfaces not polished, generally granular, with scattered setae. Cephalon dorsal surface laterally finely nodulose; anterior margin with 3–4 small lateral tubercles on either side of rostrum; with prominent bifurcate spike on rostrum. Pereonite 1 without ornamentation. Pereonite 2 with 2 fine transverse rows of low spikes, pereonites 3–7 each with 2 transverse rows of prominent acute spikes, anterior row larger than posterior row; coxae 5 and 7 with posterior margins evenly rounded, coxa 6 posteriorly subtruncate. Pleon with posterior boss, with posterolateral angles of boss each with prominent posteriorly directed spikes. Pleotelson with 2 prominent spikes opposing those of pleon, dorsal surface heavily granular, without distinct tubercles; posterolateral flange with 1 submarginal and 2 marginal tubercles; posterior

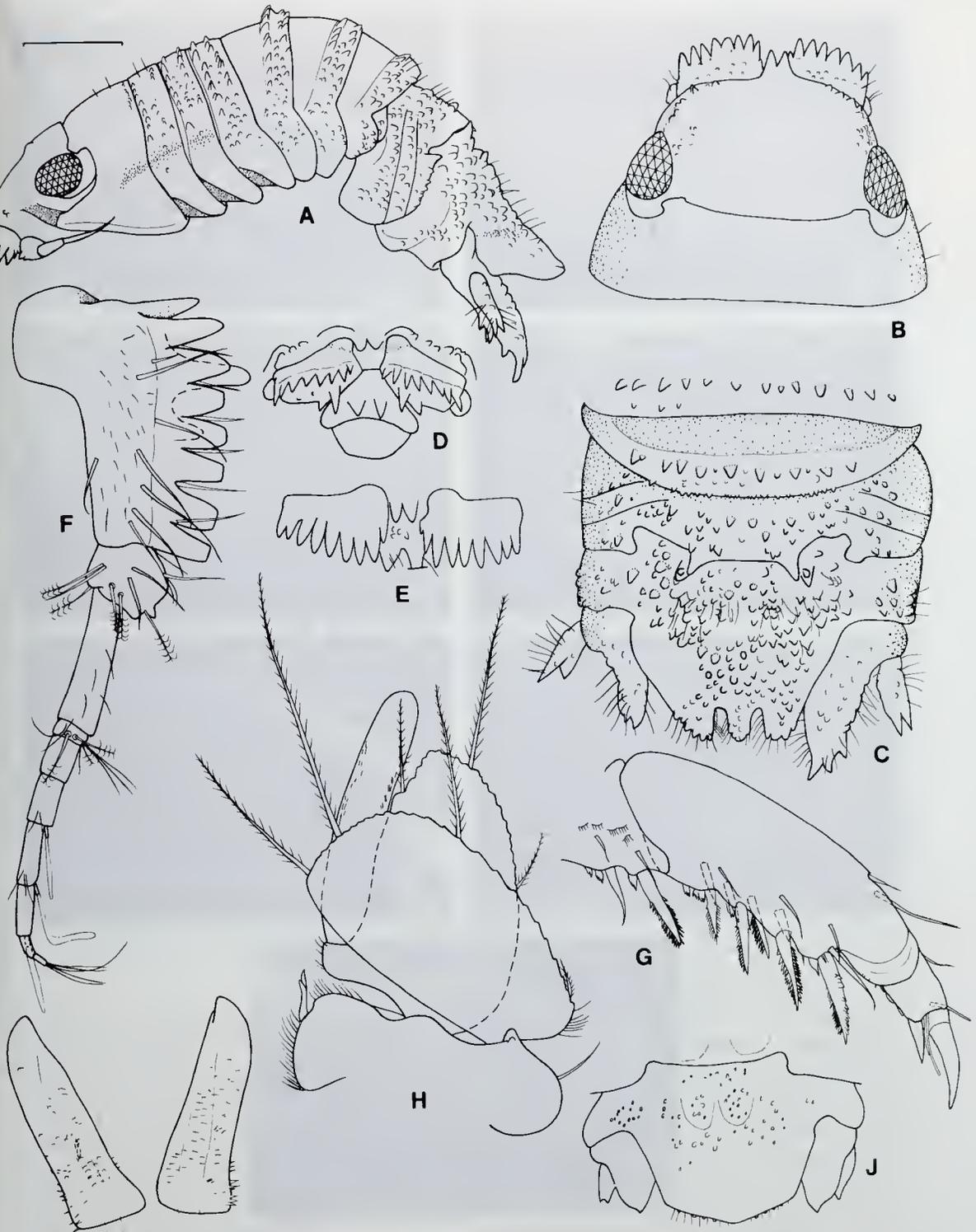


Figure 13. *Oxinasphaera parodia* sp. nov. A-E holotype, F-I paratype ♂ 4.8 mm (NMV JJ19159). A, lateral view; B, cephalon, dorsal view; C, pleon and pleotelson, dorsal view; D, frons; E, antennules, anterior view; F, antennule; G, pereopod 1 propodus; H, pleopod 2; I, penes; J, non-ovigerous ♀ 3.5 mm, pleon and pleotelson. Scale 1.0 mm.

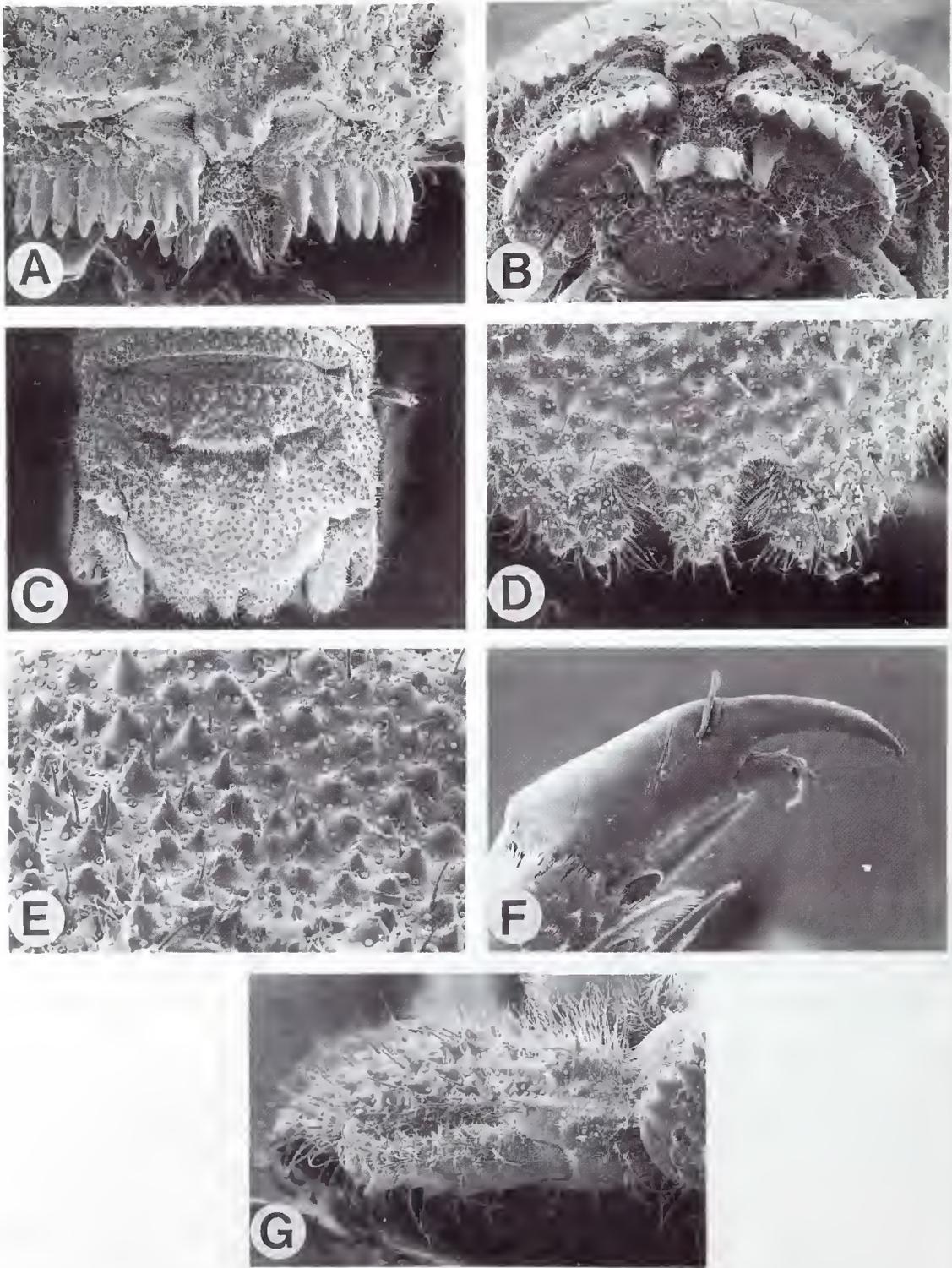


Figure 14. *Oxinasphaera parodia* sp. nov. SEMs. ♂ 4.2 mm (NMV J19159). A, cephalon, anterior view ($\times 95$); B, frons ($\times 90$); C, pleon and pleotelson ($\times 77$); D, pleotelson apex ($\times 120$); E, detail, pleotelson cuticle ($\times 160$); F, pereopod 1 dactylus, medial aspect ($\times 400$); G, uropod ($\times 110$).

margin with 2 submedian indentations on either side of median lobe.

Antennule peduncle article 1 with 8 anterior spikes; with 1 long proximo-posterior spike and 1 short posterior spike; article 2 with small spike at anterodistal margin; dorsal surface of peduncular articles 1 and 2 provided with numerous roughened setae; flagellum with 6 articles.

Epistome with 2 prominent widely separated conical spikes set on transverse ridge.

Pereopod 1 propodus about equal in length to ischium, widest proximally, about 2.7 times as long as wide, posterior margin with distinct scale spikes and 4 large biserrate spines, row of 4 smaller biserrate spines on medial margin; dactylus 0.5 length of propodus, unguis about 80% length of entire dactylus.

Penial processes each process about 3.0 times as long as basal width, tapering slightly, distolateral margin curving smoothly to meet medial margin; proximolateral margin with scale spikes.

Pleopod 2 appendix masculina straight, about as long as endopod, 5.2 times as long as maximum width, extending slightly beyond endopod (by about 0.18 of its length). Uropod exopod about 4.0 times as long as proximal width, about 0.4 times as long as endopod, apex deeply bifid with lateral process prominent; endopod about 4.0 times as long as wide, apex 3 prominent ventrally directed spikes.

Female. Ovigerous and non-ovigerous females could not reliably be distinguished from females of *O. bisubula* other than by lack of chromatophores, and lack of pleonal mounds.

Colour. White, chromatophores not apparent.

Size. Males 3.5–5.0 mm, females 2.8–4.4 mm, ovigerous females 3.8–4.5 mm, manca 1.6–2.3 mm.

Remarks. This species is very similar to *Oxinasphaera bisubula*, but differs consistently in several male characters: antennule with 8–9 anterior spikes (versus 6–7); anterior cephalic margin only laterally nodulose, weakly so (versus entire anterior margin); pleotelson without posterior pair of prominent tubercles (versus with); pleotelson with prominent rough tubercles (versus tubercles not as prominent); appendix masculina blunt (versus with apically narrowed and obliquely truncate).

Females are virtually indistinguishable from *O. bisubula*, and without males probably cannot be identified with certainty. Both males and

females are, in contrast to *O. bisubula*, without chromatophores.

Distribution. Known only from the type locality, off the eastern Victoria coast at a depth of 400 metres.

Hosts. Host identity not known.

Oxinasphaera lobivia sp. nov.

Figures 15, 16

Material examined. Holotype. ♂ (3.7 mm), S of Saint Helena Is., Moreton Bay, south-eastern Qld, 2 Sep 1979, 6 m, from trawled sponge, N.L. Bruce (QM W20034).

Paratypes. 12♂ (2.6–3.4 mm, 3.3 [dissected], mean = 3.1 mm), 13♀ (4 ovig 2.9–3.8 mm, mean = 3.3 mm; 7 non-ovig 2.1–2.9 mm, mean = 2.5 mm), same data as holotype (QM W20035, W20036, W20037, W20045, 2♂, 2♀ ZMUC CRU1387). 4♂ (2.8, 2.8, 2.9, 2.9, mm), 17♀ (4 ovig 3.0–3.3 mm, mean = 3.1 mm; 13 non-ovig 2.1–3.1 mm, mean = 2.6 mm), manca (1.8 mm), Shag Rock, Stradbroke Is., south-eastern Qld, 22 Aug 1979, in sponge, M. Ready and Niels Sverdrup (QM W20041).

Non-paratypic material. NSW. 4♂ (3 damaged or poor), 15♀, W of Spit Bridge, Middle Harbour Port Jackson, 33°8.2'S, 151°14.6'E, 19 Jun 1981, 8 m, telestacean bed with mussels, J.K. Lowry (AM P41177); 2♂, non-ovig ♀, 2 manca, Gibbon Point, Port Hacking, 34°05'S, 151°10'E, 13 Aug 1981, 15 m, sponge, J.K. Lowry and R.T. Springthorpe (AM P44208).

Description of male. Body about 2.2 times as long as greatest width; dorsal surfaces polished, finely pitted on cephalon and pereonite 1, otherwise generally granular, with scattered setae. Cephalon dorsal surface not nodulose; anterior margin with 7 small close set nodules on either side of rostrum; with prominent broad based bifurcate spike on rostrum. Pereonite 1 without tubercles or ornamentation. Pereonite 2 with 2 fine transverse rows of low spikes, pereonites 3–7 each with 2 transverse rows of prominent acute spikes, anterior row larger than posterior row; coxae 5 and 7 with posterior margins evenly rounded, coxa 6 ventro-posteriorly subtruncate. Pleon with posterior boss, with posterolateral angles of boss each with prominent posteriorly directed spikes, each with 2 tubercles anteriorly. Pleotelson with 2 prominent spikes opposing those of pleon, dorsal surface granular, with 2 tubercles set posterolaterally to each primary spike; posterolateral flange without prominent spikes; posterior margin with 2 submedian indentations on either side of median lobe.

Antennule peduncle article 1 with 7 anterior spikes, distalmost spike being distinctly smaller than remainder; with 1 long proximo-posterior

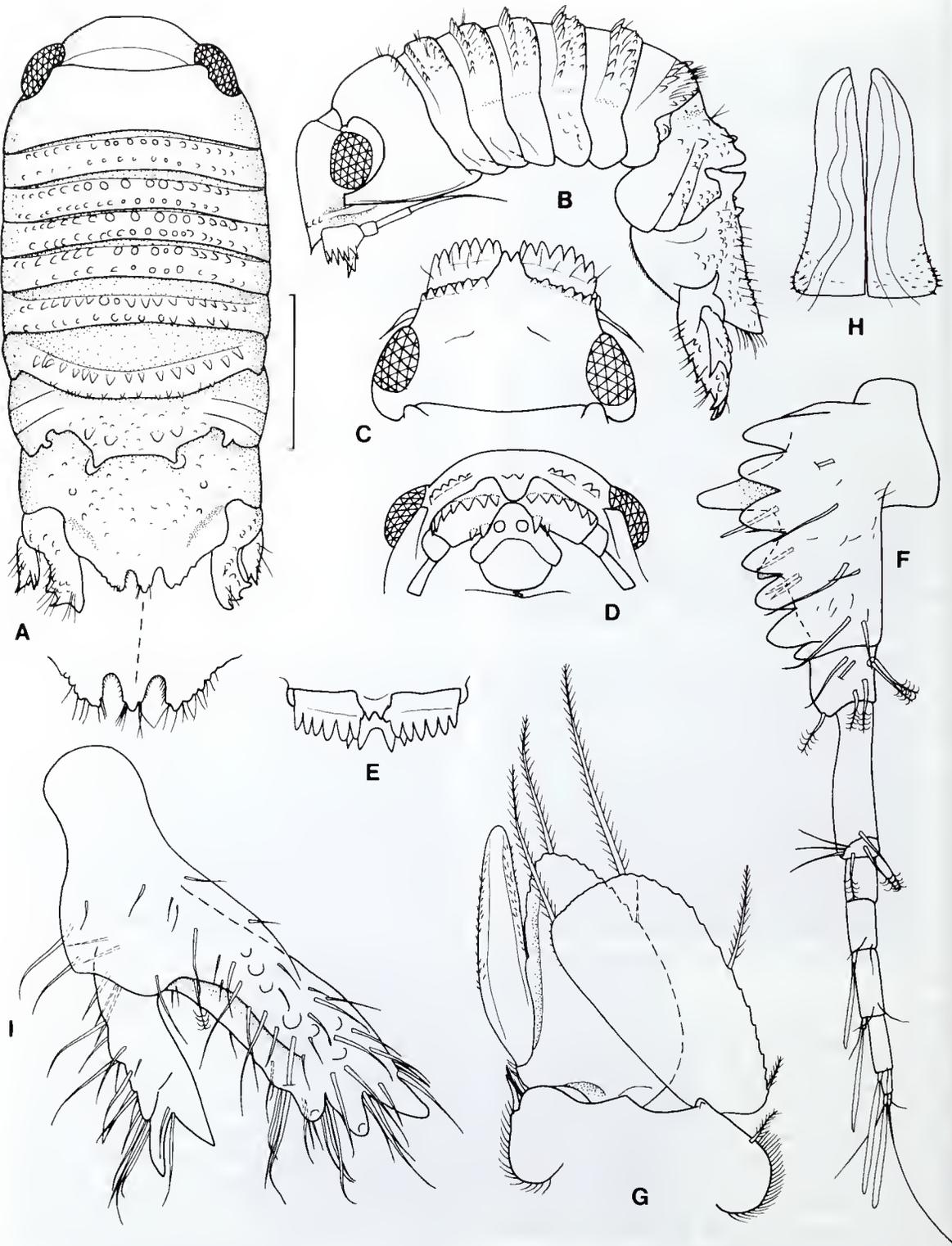


Figure 15. *Oxinasphaera lobivia* sp. nov. A-E holotype, F-I paratype ♂ 3.3 mm (QM W20045). A, dorsal view; B, lateral view; C, cephalon; D, frons; E, antennules, anterior view; F, antennule; G, pleopod 2; H, penes; I, uropod. Scale 1.0 mm.

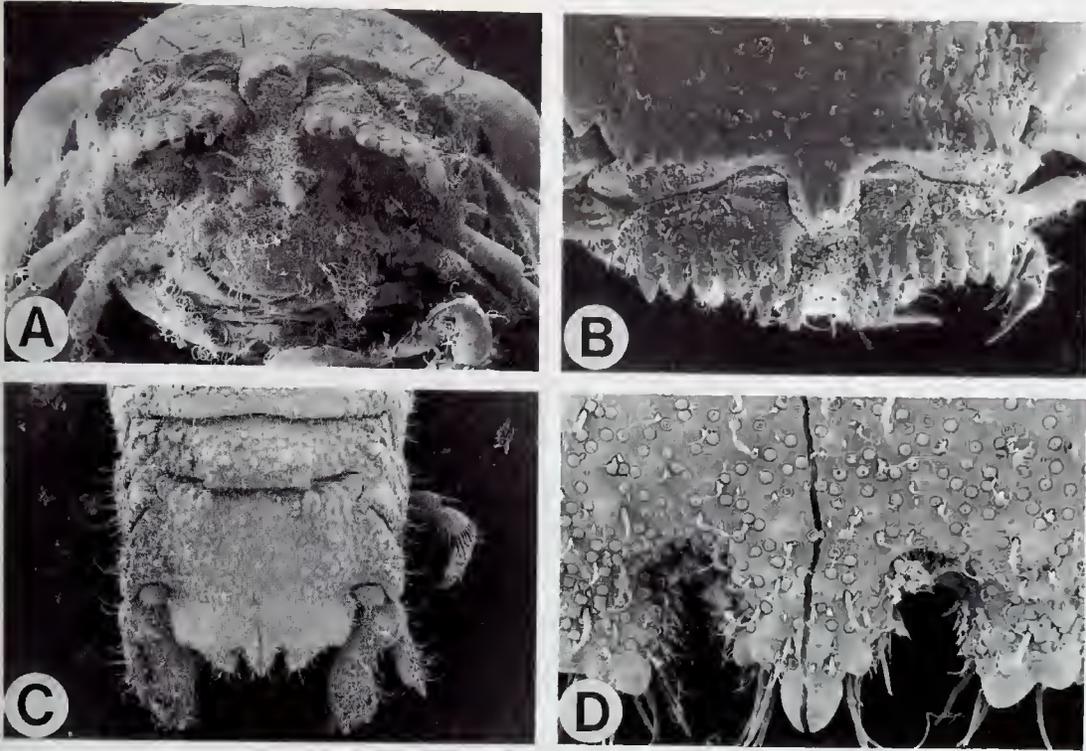


Figure 16. *Oxinasphaera lobivia* sp. nov. SEMs. ♂ 3.5 mm (QM W20037). A, cephalon, anterior view ($\times 100$); B, cephalon, anterior margin ($\times 110$); C, pleon and pleotelson ($\times 45$); D, pleotelson apex ($\times 270$).

spike and 1 short posterior spike; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae; flagellum with 6 articles.

Epistome with 2 prominent widely separated conical spikes.

Pereopods essentially the same as *O. bisubula*.

Penial processes each process about 3.2 times as long as basal width, tapering slightly, distolateral margin curving smoothly to meet medial margin; proximolateral margin with scale spikes.

Pleopod 2 appendix masculina straight, 4.8 times as long as maximum width, about as long (0.94) as endopod, extending slightly beyond endopod (by about 0.12 its length), apex narrowly rounded. Uropod exopod about 2.8 times as long as proximal width, about 0.4 times as long as endopod, apex deeply bifid with lateral process prominent; endopod about 3.5 times as long as wide, apex with 3 prominent ventrally directed spikes.

Female. Females are not distinguishable from those of *O. bisubula*.

Colour. Abundant dark brown and black chromatophores giving an overall dark brown appearance.

Size. Males 2.6–3.7 mm, females 2.1–3.1 mm, ovigerous females 2.9–3.8 mm, manca 1.8 mm.

Remarks. *Oxinasphaera lobivia* is distinguished from others of the *O. bisubula* group of species by the cephalic ornamentation, additional pair of pleonal tubercles and the two pairs of secondary pleotelsonic tubercles. The characters which distinguish this species are: cephalon anterior margin with 7+7 low spikes; antennule peduncle article 1 with 7 anterior spikes; pleon with 2 prominent nodules anterior to the posterior spikes; pleotelson with 2 pairs of tubercles set posterolaterally to the pleotelson spikes; rostrum with short bifurcate spike, basally wide; uropod wide distally with 3 prominent terminal spikes.

The presence of the posterior pairs of tubercles is not always easy to observe, but this and the additional pleonal spikes reliably separates this species from the type species.

Distribution. South-eastern Queensland (Moreton Bay and Stradbroke Is.), Sydney and Port Hacking, central NSW, all locations shallow inshore habitats.

Hosts. Collected from unidentified sponges.

Oxinasphaera frailea sp. nov

Figures 17–19

Material examined. Holotype. ♂ (3.9 mm), Table Head, Port Essington, Cobourg Peninsula, NT, 11°14.4'S, 132°10.8'E, 13 May 1983, 3 m, rock washings, N.L. Bruce (NTM Cr0011333).

Paratypes. NT. ♂ (3.8 mm), 2♀ (non-ovig 3.3, 3.5 mm), 3 manca (2.7, 2.8, 3.0 mm), same data as holotype (NTM Cr0011334). ♂ (3.1 mm), same data as holotype but 14 May 1983, 3 m, algal covered rocks, N.L. Bruce and D. Staples (ZMUC CRU1384). 3♂ (3.2, 3.3 broken, 3.4 mm), ♀ (non-ovig 3.3 mm), Walford Point, Coral Bay, Port Essington, Cobourg Pen-

insula, 11°12.0'S, 132°03.0'E, 18 May 1983, 3–4 m, coral reef, N.L. Bruce (NTM Cr01335). ♂ (2.9 mm), Table Head, Port Essington, Cobourg Peninsula, 11°14.4'S, 132°10.8'E, 13 May 1983, 4 m, *Jaspis* sp., AJB stn CP/51/8–10, N.L. Bruce (QM W20038).

Non-paratypic material. NT. 3♂ (3.2, 3.2 broken, 3.4 mm), ♀ (non/ovig 2.9 mm), Fannie Bay, Darwin, 11°24.0'S, 130°48.0'E, 26 Oct 1982, 8 m, hydroids, J.K. Lowry (NMV J42643). ♂ (3.0 mm), Arafura Sea, NE of Cobourg Peninsula, NT, 11°09'S, 134°27'E, 21 Oct 1989, 30.2 m, BRR (QM W20043).

WA. ♂ (3.9 mm), North West Shelf, 19°29.9'S, 118°52.0'E, 24 Oct 1983, 37 m, bottom 85% sand, T. Ward (ZMUC CRU1385). ♂ (3.6 mm), near Point Murat, Bundegi Reef, Exmouth Gulf, 21°49'S, 113°11'E, 4 Jan 1984, 9 m, pink sponge on dead coral, J.K. Lowry (AM P44198).

Description of male. Body about 2.1 times as long as greatest width; dorsal surfaces not polished, generally granular, with scattered setae.

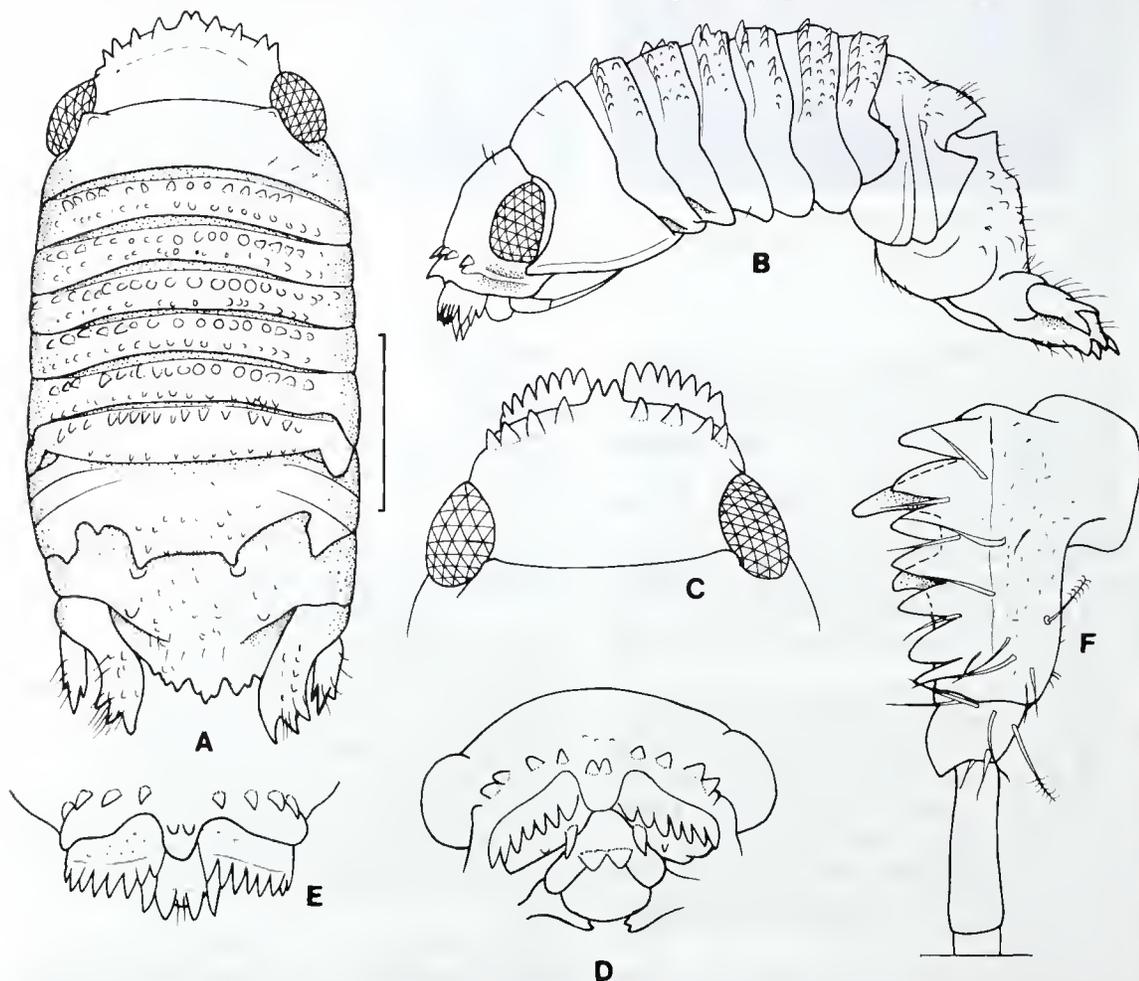


Figure 17. *Oxinasphaera frailea* sp. nov. F paratype ♂ 3.8 mm (NTM Cr0011334), remainder holotype. A, dorsal view; B, lateral view; C, cephalon; D, frons; E, antennules, anterior view; F, antennule. Scale 1.0 mm.

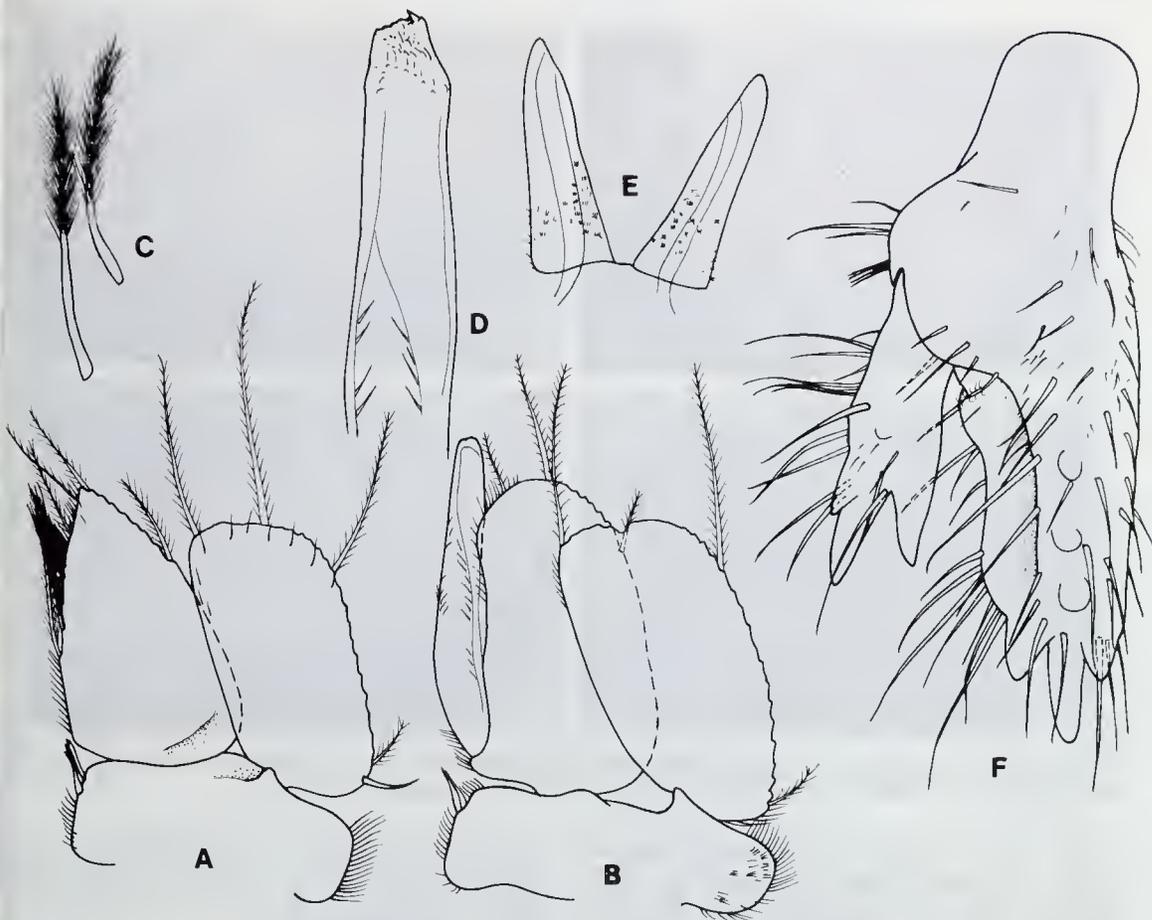


Figure 18. *Oxinasphaera frailea* sp. nov. F paratype ♂ 3.8 mm (NTM Cr0011334), remainder holotype. A, pleopod 1; B, pleopod 2; C, setae from distomedial margin of pleopod 1 endopod; D, apex, appendix masculina; E, penes; F, uropod.

Cephalon dorsal surface not nodulose; anterior margin with 4 prominent widely separated nodules on either side of rostrum; with prominent broad based bifurcate spike on rostrum. Pereonite 1 without tubercles or ornamentation. Pereonites 2 and 3 with 2 rows of distinct low rounded spikes, pereonites 4–7 each with 2 transverse rows of prominent acute spikes, anterior row larger than posterior row; coxae 5 and 7 with posterior margins evenly rounded, coxa 6 ventro-posteriorly weakly concave. Pleon with posterior boss, with posterolateral angles of boss each with prominent posteriorly directed spikes. Pleotelson with 2 prominent spikes opposing those of pleon, dorsal surface granular, with 1 tubercle set posterolaterally to each primary spike; posterolateral flange with 1 prominent tubercle; posterior margin with 2 submedian indentations on either side of median lobe.

Antennule peduncle article 1 with 7 anterior spikes; with 1 long proximo-posterior spike and 1 short posterior spike; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae.

Epistome with 2 prominent narrowly separated conical spikes, basally somewhat flattened.

Pereopods essentially the same as *O. bisubula*.

Penial processes each process about 2.7 times as long as basal width, tapering slightly, distolateral margin curving smoothly to meet medial margin, mediodistally margin weakly oblique; proximolateral margin with scale spikes.

Pleopod 1 endopod distally acute, distal half of lateral margin with conspicuously stout circumplumose setae, subapically without MS, with setulose patch. Pleopod 2 appendix masculina straight, 6.5 times as long as maximum

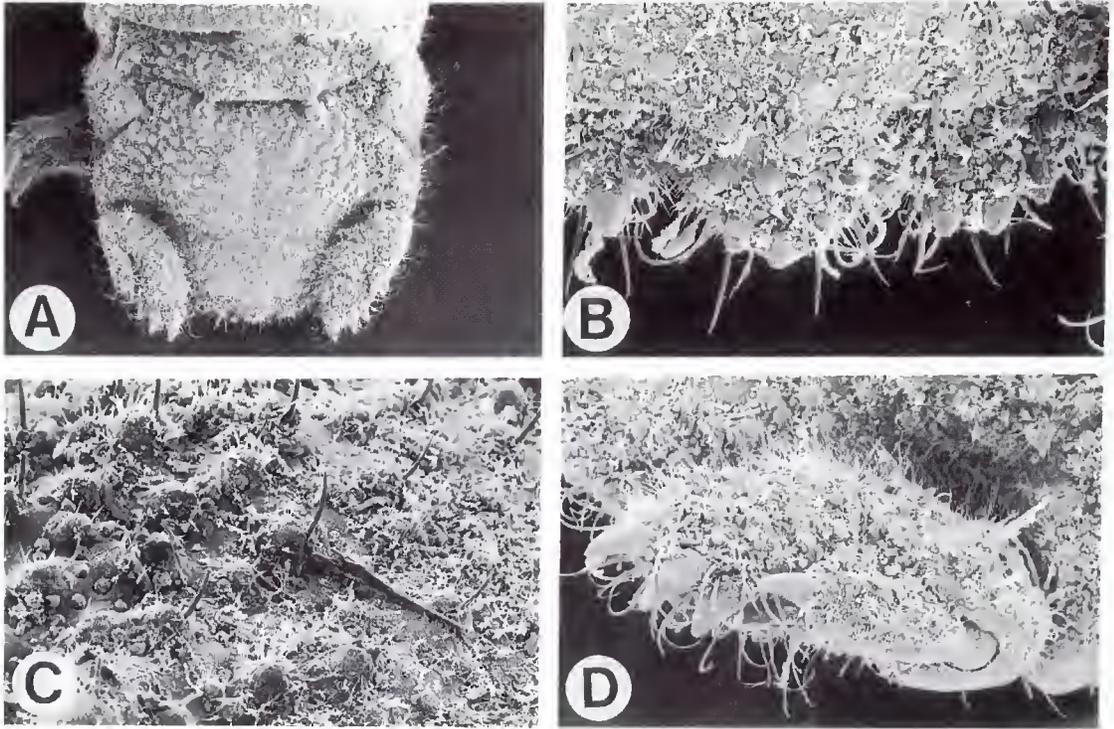


Figure 19. *Oxinasphaera frailea* sp. nov. SEMs. ♂ 3.3 mm (NTM Cr0011334). A, pleon and pleotelson ($\times 55$); B, pleotelson apex ($\times 300$); C, dorsal cuticle, pleotelson ($\times 330$); D, uropod ($\times 180$).

width, about as long as endopod, extending slightly beyond endopod (by about 0.13 of its length); apex subtruncate, distally irregular; endopod margins subparallel, distal margin broadly rounded. Uropod exopod about 3.1 times as long as proximal width, about 0.4 times as long as endopod, apex deeply bifid with lateral process prominent and additional lateral spike; endopod about 2.9 times as long as wide, apex 3 prominent spikes.

Female. Females are not distinguishable from others of this group.

Colour. Abundant dark brown and black chromatophores giving an overall dark brown appearance.

Size. Males 3.0–3.9 mm, females 2.9–3.5 mm, ovigerous females not observed, manca 2.7–3.0 mm.

Remarks. While the overall appearance of *Oxinasphaera frailea* is similar to that of others of the *O. bisubula* group, particularly the details of the pleon and pleotelson, there are several characters by which the species can be immediately recognized. The most obvious of these being the prominent acute tubercles on the

anterior margin of the cephalon. The setation of pleopod 1, shape of the endopods of pleopods 1 and 2, and shape of the appendix masculina are unique within the genus.

The characters by which the species can be separated from others of the group are: cephalon anterior margin with 4+4 prominent widely spaced acute tubercles; antennule peduncle article 1 with 7 anterior spikes; pleon without tubercles anterior setae; pleopod 2 appendix masculina apically truncate, endopod broadly rounded.

Distribution. Tropical western and northern Australia from Exmouth Gulf, WA to Darwin and Cobourg Peninsula, NT, at depths between 3 and 37 m. All records are from inshore waters except that from the North West Shelf; apparently absent from coral reefs.

Hosts. *Jaspis* sp., one other record directly from an unidentified sponge.

Oxinasphaera denmoza sp. nov.

Figures 20, 21

Material examined. Holotype. ♂ (4.2 mm), Blue Lagoon, Lizard Is., Great Barrier Reef, Qld, 7 Jun 1987, c. 10 m, in red sponge, isolated patch reef near

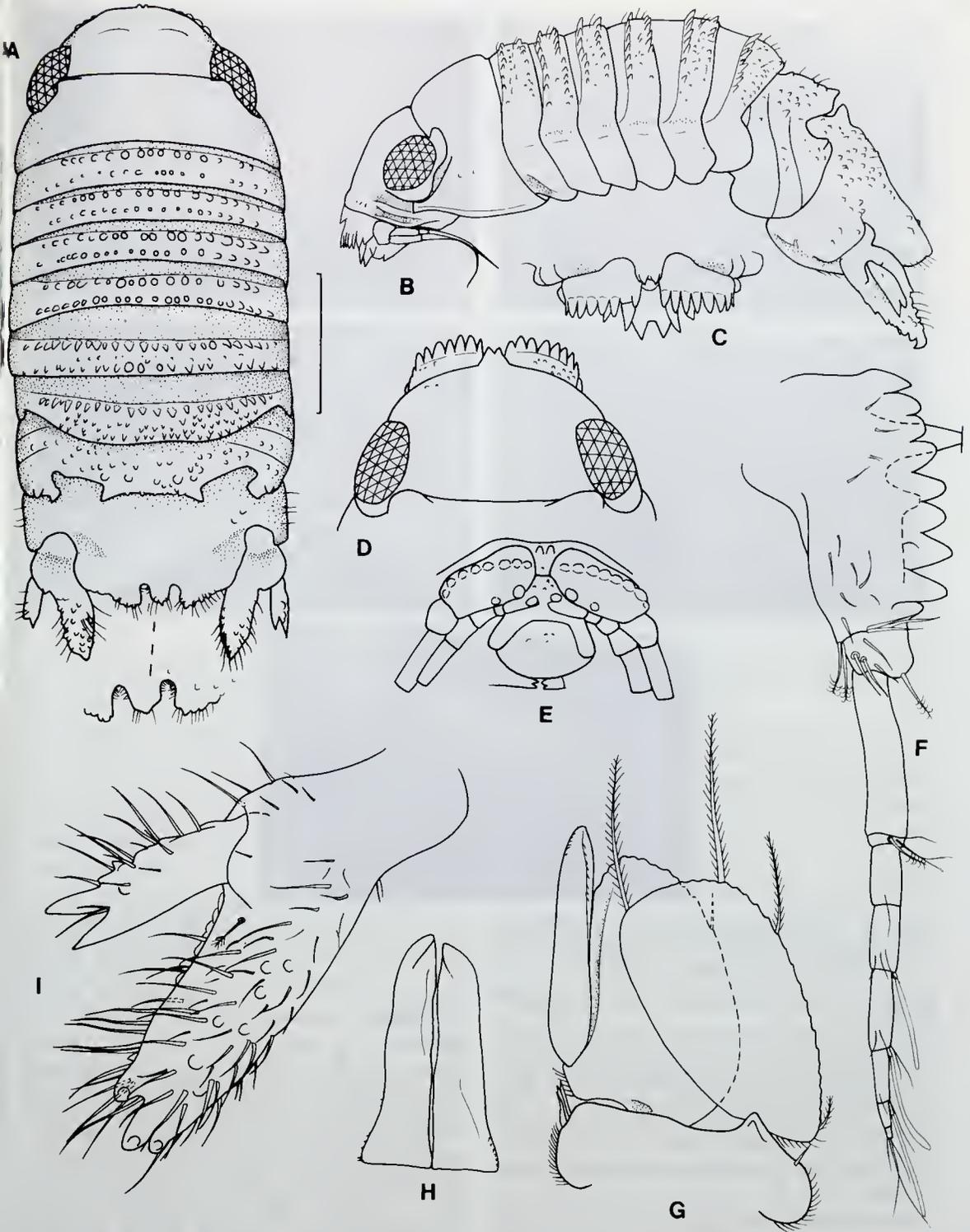


Figure 20. *Oxinasphaera denmoza* sp. nov. A-E holotype, F-H paratype ♂ 3.8 mm (QM W14949). A, dorsal view; B, lateral view; C, antennules, anterior view; D, cephalon; E, frons; F, antennule; G, pleopod 2; H, penes; I, uropod. Scale 1.0 mm.

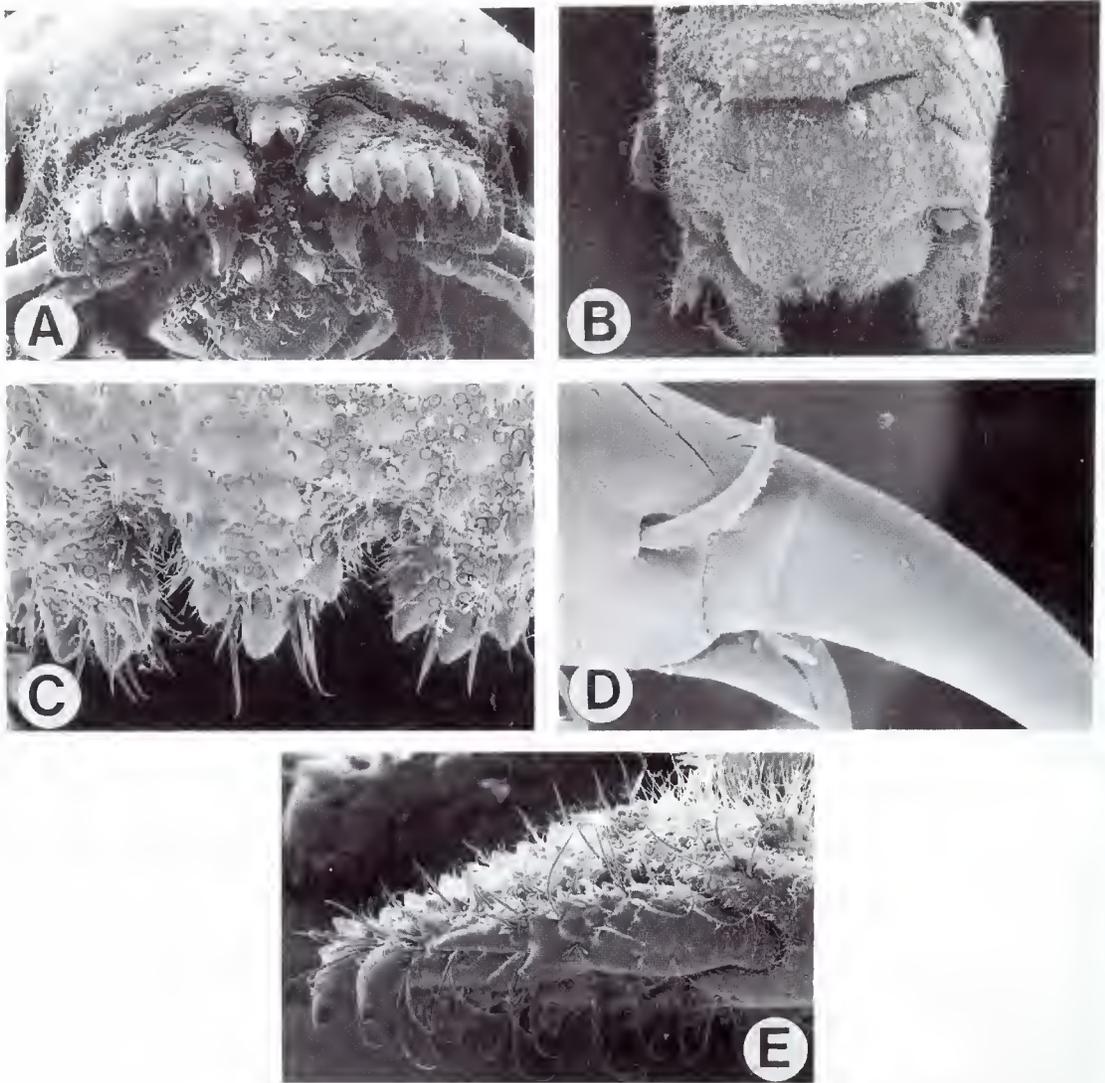


Figure 21. *Oxinaspheera denmoza* sp. nov. SEMs. ♂ 3.8 mm (QM W14949). A, cephalon, frontal view ($\times 110$); B, pleon and pleotelson ($\times 50$); C, pleotelson apex ($\times 300$); D, pereopod dactylus unguis, showing single distal seta ($\times 180$); E, uropod, lateral view ($\times 180$).

lagoon entrance, P.J.F. Davie and J. Short (QM W20039).

Paratypes. **Qld.** 4♂ (3.7, 3.8, 3.8, 4.0 mm), same data as holotype (QM W14949). ♂ (3.3 mm), ♀ (ovig 3.2 mm), Watsons Bay, Lizards Is., 5 Jun 1987, 10–13 m, in sponge on sand/mud, P.J.F. Davie and J. Short (QM W14953). 6♂ (3.2, 3.3, 3.4, 3.5, 3.6, 3.6 mm), Watsons Bay, Lizard Is., 14°40'S, 145°28'E, 5 Dec 1975, 12 m, sandy bottom, W. Ponder, P. Colman and I. Loeh (AM P41134).

Non-paratype material. **Qld.** 4♂, 2♀, 70–80 immature, in poor condition, Mrs Watsons Beach, Lizard Is., 14°40'S, 145°28'E, 24 Nov 1978, 18.3 m, in sponge on sand, D.F. Hoese and H. Larson (AM P28849). 6♂, Wistari Reef, Capricorn Group, southern Great

Barrier Reef, 16 Dec 1978, in sponge, 24 m, D. Fisk (QM W8060, 1♂ ZMUC CRU1381).

Description of male. Body about 2.3 times as long as greatest width; dorsal surfaces not polished, generally granular, with scattered setae. Cephalon dorsal surface not nodulose; anterior margin without nodules; with prominent broad based short bifurcate spike on rostrum. Pereonite 1 without tubercles or ornamentation. Pereonite 2 with 2 fine transverse rows of low spikes, pereonites 3–6 each with 2 transverse rows of prominent acute spikes, anterior row larger than posterior row; pereonite 7 without posterior row of spikes, covered with small pos-

teriorly directed acute tubercles; coxae 5 and 7 with posterior margins evenly rounded, coxa 6 ventro-posteriorly concave. Pleon with posterior boss, with posterolateral angles of boss each with prominent posteriorly directed spikes. Pleotelson with 2 prominent spikes opposing those of pleon, dorsal surface granular, without additional; posterolateral flange without 1 acute tubercle; posterior margin with 2 submedian indentations on either side of median lobe.

Antennule peduncle article 1 with 9 anterior spikes, distalmost spike being distinctly smaller than remainder; with 1 long proximo-posterior spike and 1 very short posterior spike; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae; flagellum with 6 articles.

Epistome with 2 prominent conical spikes, basally somewhat flattened, on basal transverse ridge.

Pereopods essentially the same as *O. bisubula*.

Penial processes each process about 3.5 times as long as basal width, tapering slightly, distolateral margin curving smoothly apex, medial margin straight; proximolateral margin with scale spikes.

Pleopod 2 appendix masculina straight, 6.2 times as long as maximum width, about as long (0.92) as endopod, extending slightly beyond endopod (by about 0.14 of its length), apex narrowly rounded. Uropod exopod about 3.4 times as long as proximal width, about 0.4 times as long as endopod, apex deeply bifid with lateral process prominent; endopod about 3.0 times as long as wide, apex with 3 prominent ventrally directed spikes.

Female. Females are not distinguishable from those of *O. lobivia* or *O. frailea*.

Colour. Dark brown and black chromatophores giving an overall brown appearance.

Size. Males 3.2–4.2 mm, ovigerous female 3.2 mm.

Remarks. The lack of any tubercles on the anterior margin of the cephalon and the number of antennular spikes (9) distinguishes *O. denmoza* from others of the *O. bisubula* group.

The characters by which this species can be identified are: cephalon anterior margin without tubercles; antennule peduncle article 1 with 9 anterior spikes; pleon without anterior tubercles; pleotelson without tubercles; rostrum with bifurcate basally flattened spike; uropod exopod distally narrow.

Distribution. Great Barrier Reef, Queensland, Wistari Reef, Capricorn Group, in the south and Lizard Island in the north; from the coral reef itself, at depths from 10 to 24 m.

Hosts. From unidentified sponges; only one sample was not recorded as having been collected directly from a sponge.

Oxinasphaera copiapoa sp. nov.

Figures 22, 23

Material examined. Holotype. ♂ (4.4 mm), off Moona Moona Creek, Jervis Bay, NSW, 35°03'S, 150°41'E, 19 Jun 1982, 3 m, from sponges, J.K. Lowry (AM P44207).

Paratypes. NSW. 11♂ (3.2–4.5 [dissected] mm, mean = 3.6 mm), 2♀ (non-ovig 4.1, 5.2 mm), 2 immature (3.2, 3.5 mm), same data as holotype (AM P41165, slide P44213; 2♂ and ♀ ZMUC CRU1380). ♂ (3.4, squashed 4.6 mm), ♀ (non-ovig 6.2 mm), off Moona Moona Creek, Jervis Bay, 35°03'S, 150°41'E, 15 Aug 1981, 5 m, from kelp holdfasts, P.B. Berents (AM P41182).

Non-paratype material. NSW. ♂ (5.2 mm), ♀ (non-ovig 4.2 mm), inside Box Head, Broken Bay, 33°33'S, 151°21'E, 22 Nov 1982, sponge *Echinocladia*, J.K. Lowry and R. T. Springthorpe (AM P44195). ♂ (3.5, squashed), 2 imm/♀ (1.9, 2.0 mm), off Moona Moona Creek, Jervis Bay, 35°03.5'S, 150°41.0'E, 15 Aug 1981, 4.5 m, on test of solitary ascidian *Herdmania momus*, P.B. Berents (AM P41200).

Description of male. Body about 2.4 times as long as greatest width; lateral margins subparallel. Cephalon anterior margin without tubercles; rostrum with weak trifurcate spike. Pereonite 1 unornamented. Pereonites 2–7 each with 2 transverse rows of spikes, anterior row distinctly larger than posterior row; coxae 5 posteriorly subtruncate, coxae 6 indented, coxae 7 rounded. Pleon with weak posterior boss, with 2 rounded tubercles at lateral angles of boss with 2 prominent tubercles set anterior to these, posterolateral margin of pleon with 3–4 with tubercles. Pleotelson granular, with spikes opposing pleonal spikes, 2 prominent tubercles set laterally and posteriorly on each side; posterolateral flange with 3 marginal rounded tubercles; posterior margin flattened, somewhat produced, with two submedian triangular excisions.

Antennule peduncle article 1 with 7 anterior spikes; with 1 long posteroproximal and 1 posteromedial spike; dorsal surface of peduncular articles 1 and 2 with few setae; flagellum with 5 articles.

Epistome with 2 basally separated distinct spikes; posterolateral lobes each with 2 distinct spikes.



Figure 22. *Oxinasphaera copiapoa* sp. nov. A-F holotype, F-I paratype ♂ 4.5 mm (AM P41165). A, dorsal view; B, lateral view; C, cephalon, anterior margin; D, antennules, anterior view and frons; E, pleotelson posterior margin; F, pleotelson posterior margin, ventral view; G, antennule; H, pereopod 1; I, pereopod 2; J, pereopod 7; K, penes. Scale 1.0 mm.

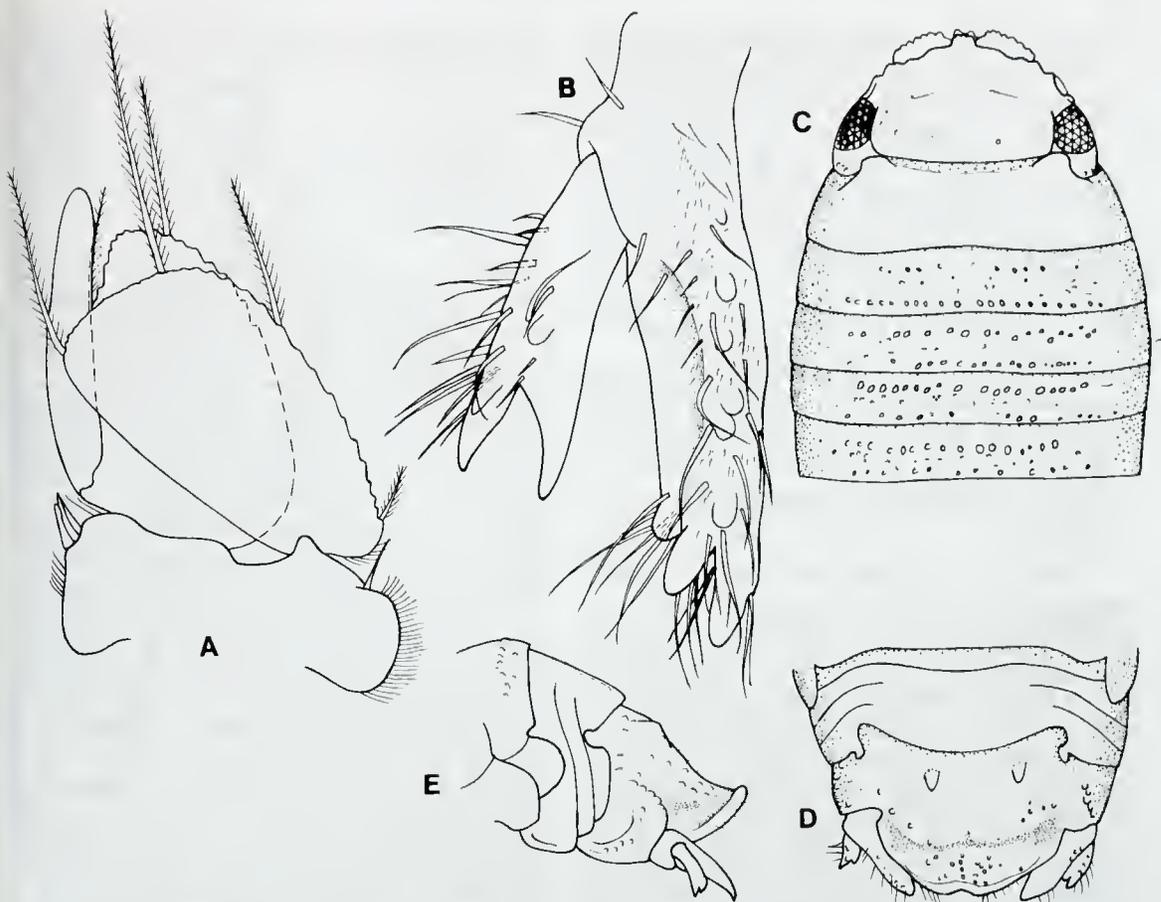


Figure 23. *Oxinasphaera copiapoa* sp. nov. A, B paratype ♂ 4.5 mm, C-E non-ovigerous ♀ 5.2 mm (AM P41165). A, pleopod 2; B, uropod; C, female, dorsal view; D, female, pleon and pleotelson, dorsal view; E, female, pleon and pleotelson, lateral view. Scale 1.0 mm.

Pereopod 1 basis about 2.4 times as long as wide, anterior margin with 2 sensory setae, distally scaled; ischium 0.7 times as long as basis, twice times as long as wide, anterior margin with 1 proximal spine and 1 distal longer feebly biserrate spine; merus 0.4 as long as ischium, 0.8 times as long as wide, anterolateral angle with 1 long and 1 short gently curving weakly pectinate spines, posterior margin with 1 biserrate spine and single long simple seta; carpus 1.2 times as long as long as merus, 1.3 times as long as wide, posterior margin with 2 biserrate spines third submarginal small biserrate spine and 2 simple setae; propodus slightly shorter (0.89) than ischium, widest proximally, about twice as long as wide, posterior margin with distinct scale spikes and 3 large biserrate spines, row of 4 smaller biserrate spines on medial margin; dactylus 0.6 length of propodus, unguis about 55% length of entire dactylus. Pereopod 2 similar others of genus. Pereopod 7 basis 2.7 times as

long as wide, anterior margin with 7 sensory setae, and elongate scale setules; ischium slightly shorter (0.88) than basis, 3.0 times as long as wide; merus 0.4 times as long as ischium, 1.4 times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 1 large and 1 small spine; carpus about as long as merus, 1.8 times as long as wide, posterior margin with 3 biserrate, 2 simple and 1 trifold spines, distal margin with 2 large trifold spines and 5 biserrate spines; anterodistal angle with 2 slender weakly biserrate spines; propodus 1.2 times as long as carpus and 0.6 time as long as ischium, about three times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 2 sensory setae.

Penial processes about 3 times as long as basal width, apcx narrowly rounded; proximolateral margin with scale spikes.

Pleopod 2 appendix masculina slightly shorter (0.96) than endopod, 6.9 times as long as

maximum width, extending beyond endopod by 0.14 of its length, very slightly curved laterally, apex bluntly rounded. Uropod dorsally nodular, covered with roughened setae; exopod about 4 times as long as proximal width, about half as long as endopod, apex deeply bifid with processes about equally prominent, ventral margin with 2 prominent acute serrations; endopod about 4 times as long as wide, apex with 3 prominent bluntly rounded spikes, ventral margin with 4–5 prominent bluntly rounded spikes.

Female. Pereonites 2–7 granular, with small tubercles. Rostrum trifid. Pleotelson with 2 indistinct low submedian bumps anteriorly; posterior margin with weak median indentation.

Colour. Pale tan in alcohol; chromatophores not observed.

Size. Males 3.2–4.5 mm, females 4.1–6.2 mm.

Remarks. *Oxinasphaera copiapoa* can be recognized by the posterior margin of the pleotelson being somewhat flattened and produced, the pleon having a weakly produced medial portion, the epistome with 2 discrete spikes, prominently bifid uropod apices and the anterior margin of the cephalon without submedian tubercles. *O. australis* can be separated by the three prominent tubercles on the anterior margin of the cephalon and the acute apex to the appendix masculina. *O. matucana* has two prominent tubercles on the anterior margin of pereonite 1, and the posterior antennule spikes are set wide apart with one at the distal extremity of peduncle article 1.

The male specimen from Broken Bay, possibly senescent, differs from the type material in lacking distinct tubercles on the median pleonal process. The specimens, other than being larger, agrees well with the type material.

Distribution. Sydney region to Jervis Bay, New South Wales, depths between 3 and 5 m.

Hosts. *Ecinocladia* sp., and the ascidian *Herdmania momus*, possibly an accidental association

Oxinasphaera multidentis

(Richardson, 1910) comb. nov.

Figure 24

Cymodoce multidentis Richardson, 1910: 27, fig. 26.

Non *Cymodoce multidentis*. — Kensley, 1984: 216 (= *O. kensleyi* sp. nov.)

Material examined. Lectotype, ♂ (5.6 mm), off Jolo Light, Philippine Islands, 15 Feb 1908, c. 53 m, on surface of brown sponge, *Albatross* stn. 5141 (USNM 273516).

Paralectotypes, ♂ (5.2 mm), 35♀ and immature specimens, same data as holotype (USNM 40918).

Description of male. Body about 2.1 times as long as greatest width; dorsal surfaces not polished, generally granular, with scattered setae. Cephalon dorsal surface not nodulose; anterior margin without nodules; without spike on rostrum. Pereonite 1 without tubercles or ornamentation. Pereonites 2–3 with 2 transverse rows of low spikes, pereonites 4–6 each with 2 transverse rows of prominent acute spikes, anterior and posterior rows about subequal in size; pereonite 7 posterior margin weakly produced, with weak median indentation, without posterior row of spikes, covered with small posteriorly directed acute tubercles; coxae 5 and 7 with posterior margins evenly rounded, coxa 6 ventro-posteriorly subtruncate. Pleon with posterior boss, with posterolateral angles of boss each with prominent posteriorly directed spikes and 2 additional tubercles; pleonite 3 with sublateral tubercle. Pleotelson with 2 prominent spikes opposing those of pleon, dorsal surface moderately granular, with lateral row of 5 prominent sublateral tubercles running longitudinally, 3 prominent median tubercles placed longitudinally anterior to pleotelson apex; posterolateral flange with 2 acute tubercles; posterior margin with 2 submedian indentations on either side of median lobe, each point with prominent dorsal tubercle.

Antennule peduncle article 1 with 8 anterior spikes, with 1 long proximo-posterior spike, 1 very short posterior spike, and 1 posterodistal spike; peduncle article 2 with prominent antero-proximal tubercle and small medial tubercle; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae; flagellum with 7 articles.

Epistome with 2 prominent conical spikes, basally somewhat flattened, on basal transverse ridge, lateral lobes each with small tubercle.

Pereopods essentially the same as *O. obregonia*.

Penial processes not examined in detail, similar to those of *O. obregonia*.

Pleopod 1 endopod medial margin with PMS along proximal two-thirds. Pleopod 2 appendix masculina straight, 5.3 times as long as maximum width, shorter than (0.74) as endopod, not

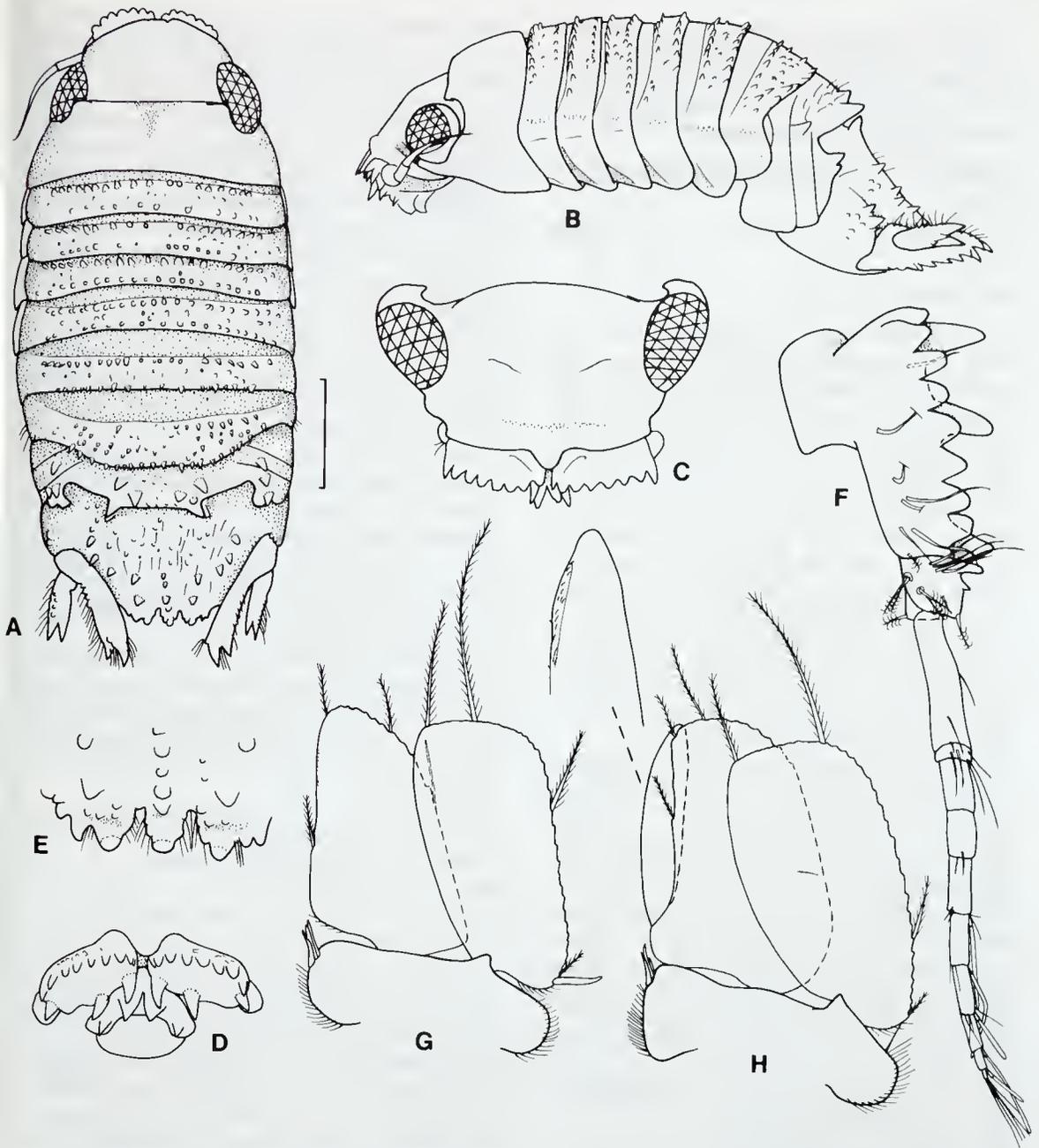


Figure 24. *Oxinasphaera multidens* (Richardson). A-E lectotype, F-G paralectotype ♂. A, dorsal view; B, lateral view; C, cephalon; D, frons; E, pleotelson apex; F, antennule; G, pleopod 1; H, pleopod 2; Scale 1.0 mm.

extending beyond endopod, apex narrowly rounded. Uropod not examined in detail, generally similar to *O. obregonia*; exopod about half as long as endopod, apex with 3 prominent and 1 smaller ventrally directed spikes.

Female. Not differing from others of the group.

Colour. Faded in alcohol to a pale yellow colour.

Size. Males 5.2–5.6 mm.

Remarks. Richardson's (1910) description was based on specimens from two stations, both from near Jolo Light, Philippines. Implicit in her remarks is that material from station 514, the type locality, contained numerous males. Similarly implicit is that the material from station 4145 contained only a single male. In her description Richardson (1910: 27) stated that there was "one small median point instead of two." In this she was not quite accurate as *O. multidentis* does, as do all species of the genus, have a single rostrum, but lacks any trace of a rostral spike. Given that there is some ambiguity over the status of all the material that Richardson reported on, and also as a formal redescription is given here, the larger male from the type locality is designated as the lectotype.

The species is readily identified by the unique pattern of pleonal tubercles, and the antennular morphology of peduncle article 1 having 8 anterior and 3 posterior spikes and peduncular article 2 having a prominent tubercle on the anterior margin.

This species is one of a group of central Indo-Pacific species, generally similar to *O. bisubula*, but is principally characterized by having elongate penial processes and a single rostral spike when present. The other species are *Oxinasphaera obregonia* sp. nov. and *Oxinasphaera tual* sp. nov.

Distribution. Known only from the type locality, at a depth of about 53 m.

Hosts. Unidentified sponge.

Oxinasphaera corypantha sp. nov.

Figure 25

Material examined. Holotype, ♂ (4.3 mm), Ilot Maitre, Nouméa, New Caledonia, Oct 1978, 20 m, from *Siphonochalina*, Yves Magnier (QM W20040).

Paratypes, 6♀ (non-ovig 3.0, 3.1, 3.3, 3.5, 3.6, 3.8 mm), 4 imm (2.5, 2.5, 2.7, 2.7 mm), 2 broken, 4 manca (1.8–2.0 mm), same data as holotype (QM W8083).

Description of male. Body about 2.2 times as long as greatest width; dorsal surfaces polished, generally granular, with scattered setae. Cephalon dorsal surface not nodulose; anterior margin without nodules on either side of rostrum; rostrum without spike. Pereonite 1 with indistinct posterior ridge, surface of which is weakly tuberculate. Pereonite 2 weakly tuberculate; pereonites 3–6 each with 2 transverse rows of prominent acute spikes, anterior row slightly larger than posterior row; pereonite 7 with only anterior spike row distinct, posterior margin bisinuate; coxae 4 and 5 posterior margins weakly concave, coxa 7 posteriorly rounded. Pleon with posterior boss, with posterolateral angles strongly produced, produced portions each with prominent posterior spike and 1 small anterior spike; pleonite 3 with 1 lateral tubercle. Pleotelson with 2 spikes opposing those of pleon, dorsal surface weakly granular and setose, with 2 additional lateral tubercles on each side; posterolateral flange with 2 acute tubercles; posterior margin with 2 submedian indentations on either side of median lobe; median lobe slender, distinctly shorter than sinus.

Antennule peduncle article 1 with 9 anterior spikes; with 1 long proximo-posterior spike and 1 shorter posterior spike; peduncle article 2 with 1 indistinct anterior spike; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae.

Epistome with 2 prominent conical spikes, basally somewhat flattened.

Pereopods essentially the same as *O. bisubula*.

Penial processes essentially the same as *O. bisubula* (examined in situ).

Pleopod 1 medial margin with subproximal ventral groove. Pleopod 2 appendix masculina straight, 7.6 times as long as maximum width, distolateral margin curving at apex, longer (1.1) than endopod, extending slightly beyond endopod by about 0.16 of its length, apex bluntly rounded. Uropod not examined in detail, similar to that of *O. bisubula* or *O. multidentis*.

Female. No ovigerous females observed, and the maturity of the "non-ovigerous" females in the sample is unclear. Generally indistinguishable from others of the group.

Colour. In alcohol, pale cream yellow colour, females with scattered brown chromatophores over dorsal surfaces.

Size. Males 4.3 mm, non-ovigerous females 3.0–3.8 mm.

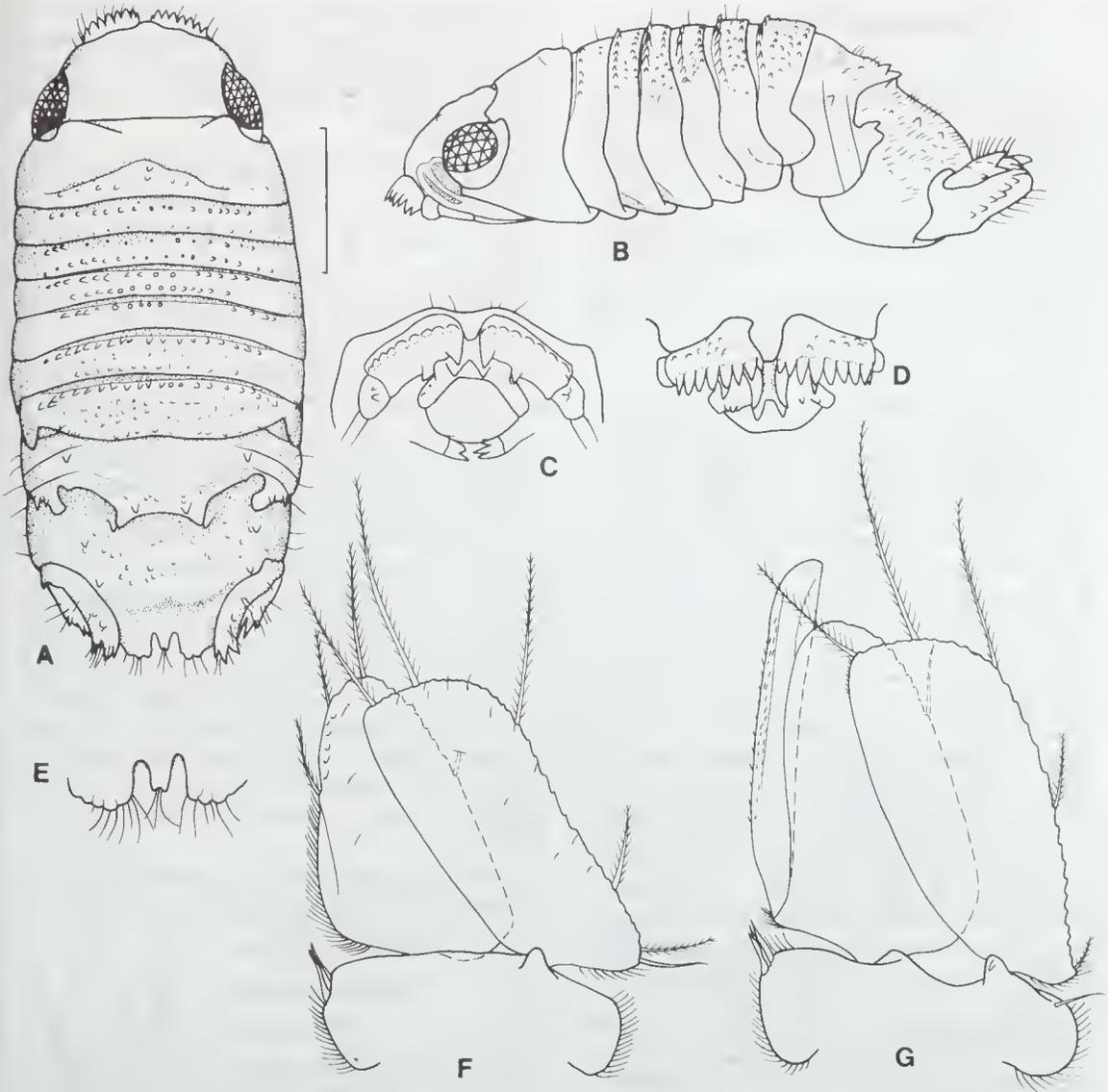


Figure 25. *Oxinasphaera corypantha* sp. nov. All figs of holotype. A, dorsal view; B, lateral view; C, frons; D, antennules, anterior view; E, pleotelson apex; F, pleopod 1; G, pleopod 2. Scale 1.0 mm.

Remarks. The details given here for the antennule and uropod are brief as these appendages were not dissected off on order to preserve the integrity of the single male (holotype) specimen.

The prominence of the pleonal posterior lobe almost approaches the form of processes, and that character along with the posterior ridge on pereonite 1, the generally weakly developed pereonal spike rows and the short and slender median telsonic process all serve to identify this species. *Oxinasphaera multidens* is the only

other species that lacks a rostral spike, and that species has a far more prominent pereonal spikes, numerous secondary tubercles on the pleon, a robust telsonic median lobe and the appendix masculina not longer than the endopod of pleopod 2.

Distribution. Known only from the type locality, Ilot Maitre, Nouméa, New Caledonia.

Hosts. Recorded from the sponge *Siphonochalina* sp.

Oxinasphaera obregonia sp. nov.

Figure 26

Material examined. Holotype, ♂ (3.6 mm), N of Straits of Sunda, Java, Indonesia, 05°40'S, 106°08'E, 28 Aug 1922, 54 m, numerous sponges [Sigsbee trawl], stn. 71, Th. Mortensen's Kei Is. Expedition 1922 (ZMUC CRU1391).

Paratypes. 6♂ (3.5, 3.5, 3.6, 3.6, 3.7, 3.8 mm), imm (2.5 mm), same data as holotype (ZMUC CRU1390).

Non-paratypic material. ♂ (3.7 mm), ♀ (3.0, 3.2, 3.3 mm), imm (2.7 mm), same data as holotype, but station number 11 (ZMUC CRU1389).

Description of male. Body about 2.3 times as long as greatest width; dorsal surfaces not polished, generally granular, with scattered setae. Cephalon dorsal surface not nodulose; anterior margin with 3–4 small lateral nodules on either side of rostrum; with prominent single acute spike on rostrum. Pereonite 1 without tubercles or ornamentation. Pereonites 2 and 3 with 2 transverse rows of spikes, pereonites 4–6 each with 2 transverse rows of prominent acute spikes, anterior row slightly larger than posterior row; pereonite 7 with posterior row of low spikes; coxae 5 and 7 with posterior margins evenly rounded, coxa 6 ventro-posteriorly concave. Pleon with weakly developed posterior boss, with posterolateral angles of boss each with small spikes. Pleotelson with 2 spikes opposing those of pleon, dorsal surface weakly granular, without additional tubercles; posterolateral flange with 1 acute tubercle; posterior margin with 2 submedian indentations on either side of median lobe, each point with distinct dorsal tubercle.

Antennule peduncle article 1 with 7 anterior spikes; with 1 long proximo-posterior spike and 1 shorter posteromedial spike; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae; flagellum with 6 articles.

Epistome with 2 prominent conical spikes, basally somewhat flattened.

Pereopods essentially the same as *O. bisubula*, but propodus of pereopod 7 with very prominent spines, the longest of which are as long as the propodus.

Penial processes each about 4.1 times as long as basal width, both margins tapering towards slender apex.

Pleopod 2 appendix masculina straight, 5.6 times as long as maximum width, about as long (0.97) as endopod, extending slightly beyond endopod (by about 0.10 of its length), apex narrowly rounded. Uropod exopod about 4.7 times

as long as proximal width, about 0.5 times as long as endopod, apex deeply bifid with lateral process prominent; endopod about 3.0 times as long as wide, apex with 3 prominent ventrally directed spikes.

Female. Similar to other species of the *O. bisubula* group.

Colour. Faded in alcohol to a pale yellow colour.

Size. Males 3.5–3.8 mm, ovigerous female 3.0–3.3 mm.

Remarks. The sample from station number 11 is excluded from the type series as the label data is incompatible with the station number, and therefore the locality cannot be regarded as certain. All females from this sample are in poor condition, and are therefore not described.

The single rostral spike immediately separates *O. obregonia* from all other species of the genus except *O. tual*. Both of these species are further characterized by having slender elongate penial processes. *O. obregonia* is distinguished from *O. tual* by having close set epistome spikes without an additional pair of smaller spikes between, very weakly developed pleonal boss, antennule peduncle article 1 with 7 spikes and article 2 without a spike, pleopod 1 medial margin simple and the appendix masculina being of even width.

Distribution. Known only from the type locality, at a depth of about 54 m.

Hosts. Unidentified sponges.

Oxinasphaera tual sp. nov.

Figure 27

Material examined. Holotype, ♂ (4.5 mm), off Tual, Kei Is., (now Pulau Kai, Dulah), Indonesia, c. 05°37'S, 132°43'E, 21 Mar 1922, 2 m, from sponges, Th. Mortensen's Kei Is. Expedition 1922 (ZMUC CRU1394).

Paratypes. 4♂ (3.7, 3.9, 4.0, 4.2 mm), 5♀ (ovig 3.5, non-ovig 3.0, 3.0, 3.2, 3.3 mm), same data as holotype (ZMUC CRU1395). Note: No station number is associated with this sample, presumably hand collected.

Description of male. Body about 2.1 times as long as greatest width; dorsal surfaces not polished, generally granular, with scattered setae. Cephalon dorsal surface not nodulose; anterior margin with 4–5 small nodules on either side of rostrum; with single acute spike on rostrum. Pereonite 1 without tubercles or ornamentation. Pereonites 2–7 with 2 transverse rows of small

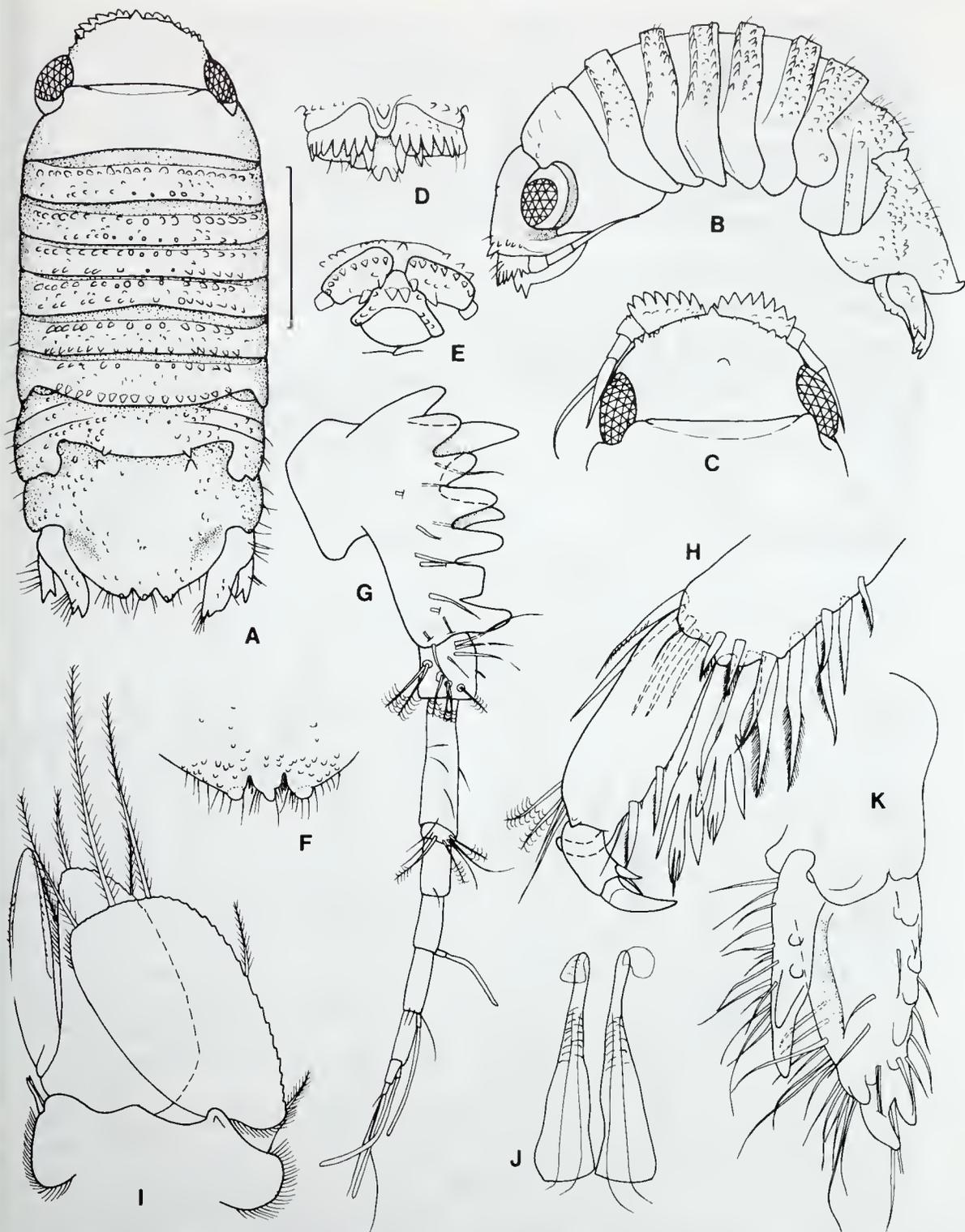


Figure 26. *Oxinasphaera obregonia* sp. nov. A-F holotype, G-J paratype ♂ 3.6 mm. A, dorsal view; B, lateral view; C, cephalon; D, antennules, anterior view; E, frons; F, pleotelson apex; G, antennule; H, pereopod 7, distal articles; I, pleopod 2; J, penes; K, uropod. Scale 1.0 mm.

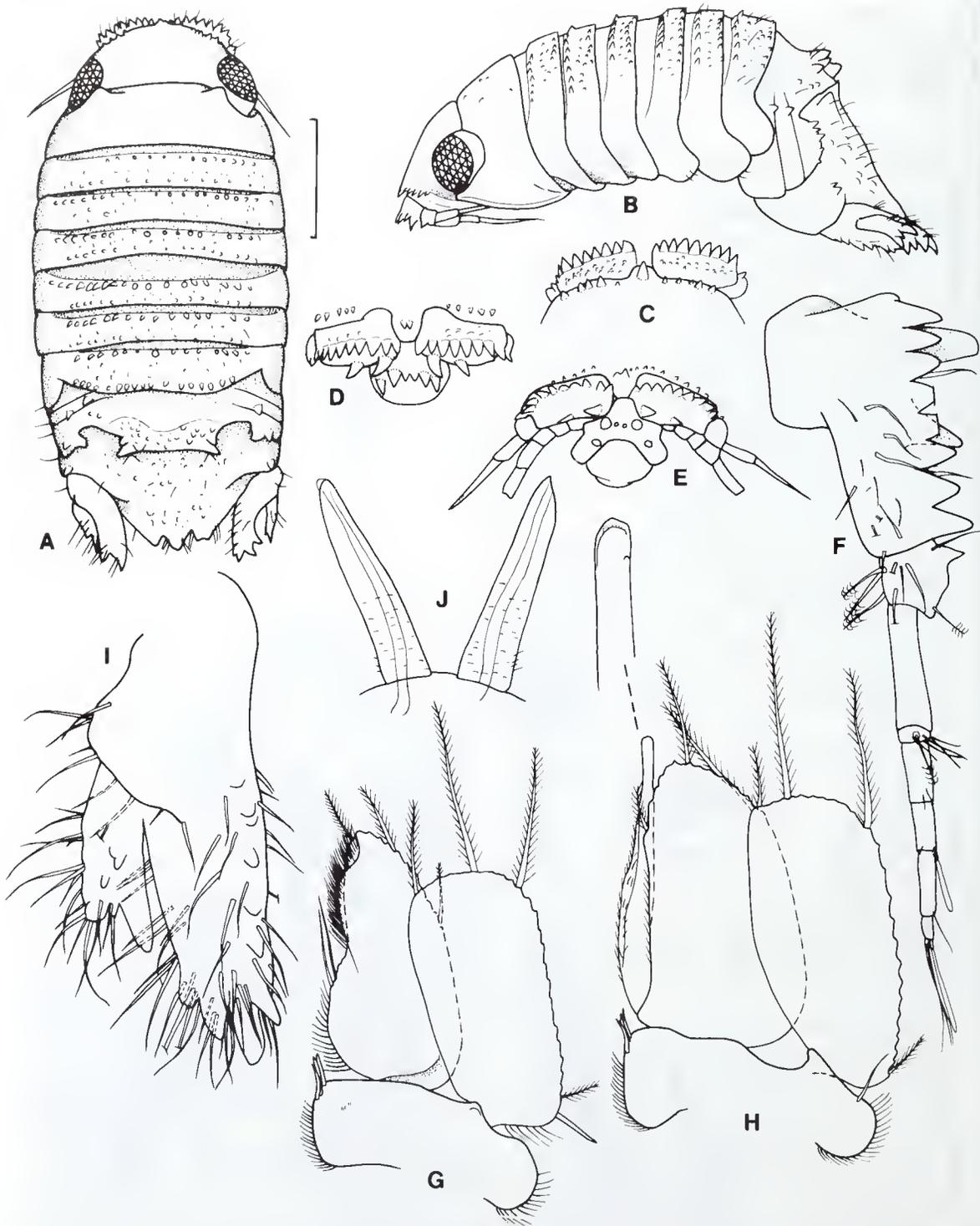


Figure 27. *Oxinasphaera tual* sp. nov. A-E holotype, F-J paratype ♂ 4.0 mm. A, dorsal view; B, lateral view; C, cephalon, anterior margin; D, antennules, anterior view; E, frons; F, antennule; G, pleopod 1; H, pleopod 2; I, uropod; J, penes. Scale 1.0 mm.

spikes, pereonites 3–7 each with anterior spike row more prominent acute; pereonite 7 with posterior row of low spikes; coxae 5 and 6 with posterior margins subtruncate, coxa 7 ventro-posteriorly rounded. Pleon with prominent posterior boss, each posterolateral angle with 2 distinct spikes positioned anteriorly to posterior spike; pleonites 2 and 3 each with lateral acute tubercle. Pleotelson with 2 spikes opposing those of pleon, dorsal surface weakly granular, without additional tubercles; posterolateral flange with 2–3 acute tubercles; posterior margin with 2 submedian indentations on either side of median lobe.

Antennule peduncle article 1 with 9 anterior spikes; with 1 long proximo-posterior spike and 1 shorter posterior spike; peduncle article 2 with 1 anteroproximal spike; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae; flagellum with 4 articles.

Epistome with 2 prominent conical widely separated spikes, between which lie 2 small spikes; lateral lobes each with 1 low tubercle.

Pereopods essentially the same as *O. bisubula*.

Penial processes basally distinctly separate, each process about 4.5 times as long as basal width, both margins tapering towards slender apex.

Pleopod 1 medial margin with stiff setae set proximally to prominent ventral lobe, medial margin of which is densely setulose. Pleopod 2 appendix masculina straight, 9.0 times as long as maximum width, about as long (0.99) as endopod, extending slightly beyond endopod (by about 0.08 of its length), distal 0.4 abruptly narrowed, apex subtruncate. Uropod exopod about 3.7 times as long as proximal width, about 0.5 times as long as endopod, apex deeply bifid with lateral process prominent; endopod about 4.0 times as long as wide, apex with 4 prominent ventrally directed spikes.

Female. Similar to other females of the group; ovigerous females not observed

Colour. Faded in alcohol to a pale yellow colour.

Size. Males 3.7–4.5 mm, ovigerous females 3.0–3.5 mm.

Remarks. This species belongs the group which the pleon has a posterior boss and a distinct spike at the posterolateral angles of the boss. Of that group there are several Indo-Pacific species that either lack the rostral spike or have a single spike. These species are *Oxinasphaera multidentis*

and *Oxinasphaera corypantha* sp. nov. (without a rostral spike), *Oxinasphaera obregonia* sp. nov. and the present species (with a rostral spike). *Oxinasphaera obregonia* and *O. tual* are readily separated by differences in pleonal morphology, the posterior pleonal process in *O. tual* being both prominent and prominently armed, and by *O. tual* having a medial lobe on pleopod 1 endopod and the appendix masculina being flask shaped.

Distribution. Known only from the type locality.

Hosts. Unidentified sponge.

Etymology. The epithet is taken from the type locality (noun in apposition).

Oxinasphaera rebutia sp. nov.

Figure 28

Material examined. Holotype. ♂ (4.4 mm), E of Malabar, 33°58'S, 151°17'E, NSW, 3 Dec 1973, 66 m, AMSBS (AM P22196).

Paratypes. 3♂ (5.2, 5.0, 4.6 mm), ♀ (3.8 mm), 9 km E of Coogee, NSW, 33°57'S, 151°21'E, 89 m, no date, about 1898 to 1914?, fine sand, E.R. Waite on HMCS *Thetis* (AM P44206).

Non-paratypic material. 3♂ (3.5, 3.7, 3.7 mm), E of North Head, Port Jackson, NSW, 33°49'S, 151°18'E, 2 Feb 1973, 25.9 m, from unidentified sponge, AMSBS (AM P22983).

Description of male. Body about 2.2 times as long as greatest width; lateral margins subparallel. Cephalon granular, anterior margin without tubercles; rostrum without spike. Pereonite 1 granular, with posteromedian cluster of 5 prominent rounded tubercles, median tubercle being twice as large as others. Pereonites 2–7 each with 2 transverse rows of rounded spikes, posterior row weak; pereonites 2 and 3 with median 3 spikes conspicuously more prominent than remainder; coxae 5 and 7 rounded, 6 subtruncate. Pleon without posterior boss, with numerous large rounded tubercles. Pleotelson granular, without spikes, posteriorly with distinct low rounded tubercles; posterolateral flange without prominent tubercles; posterior margin deep, laterally depressed, posterior margin deeply excavate, with short rounded median process dorsally with single distinct low rounded tubercle, and longitudinal row of low rounded tubercles.

Antennule peduncle article 1 with 9 elongate subacute anterior spikes, medial spike being smaller than remainder; with 1 posteroproximal

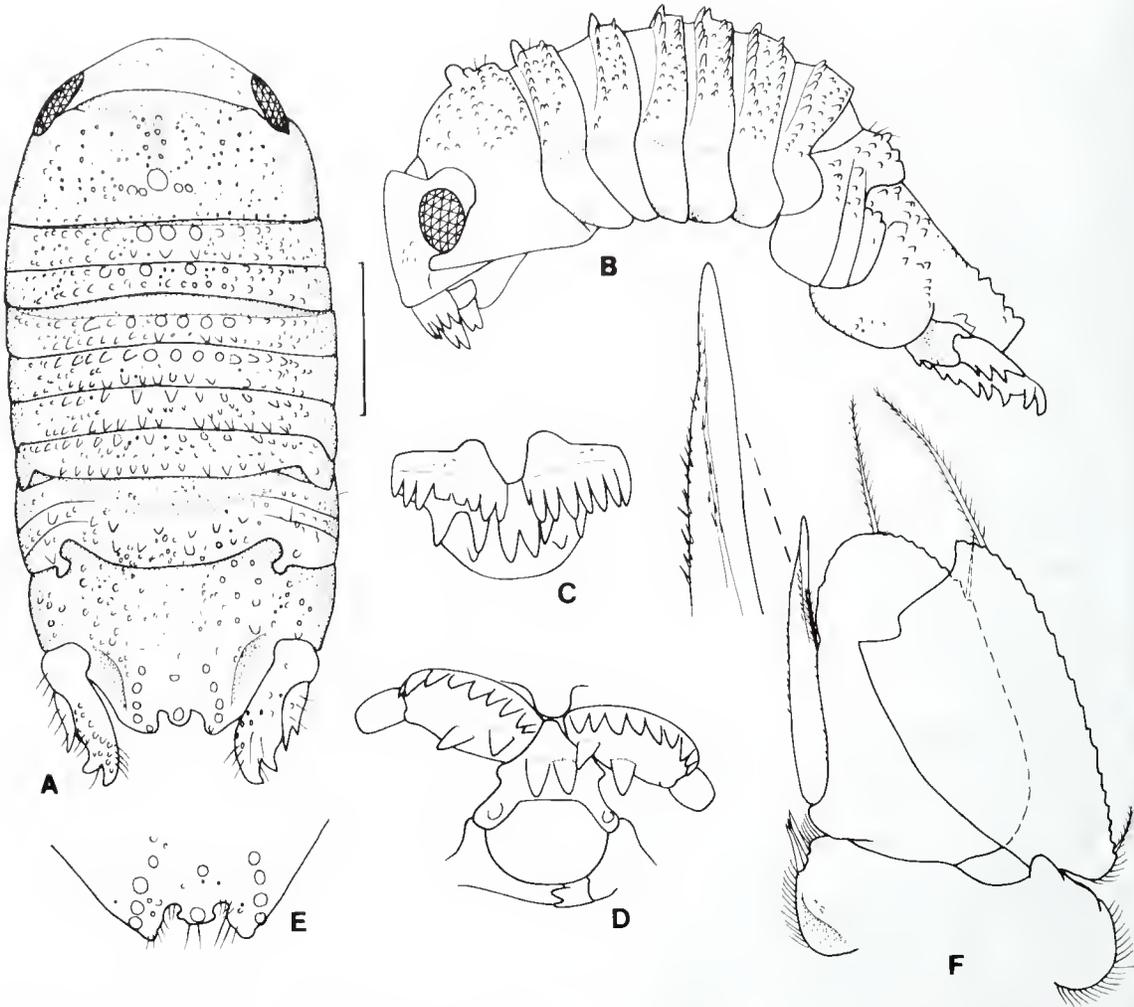


Figure 28. *Oxinasphaera rebutia* sp. nov. All figs of holotype. A, dorsal view; B, lateral view; C, antennules, anterior view; D, frons; E, pleotelson apex; F, pleopod 2. Scale 1.0 mm.

and 1 posteromedial spike subequal in size; dorsal surface of peduncular ariteles 1 and 2 with few setae; flagellum with 7 articles.

Epistome with 2 long basally united distinct spikes; lateral posterolobes with weak tubercle.

Pereopods not examined in detail.

Penial processes examined in situ, about three times as long as basal width, apex subacute.

Pleopod 2 appendix masculina shorter (0.85) than endopod, 7.7 times as long as maximum width, extending slightly (0.07) beyond endopod, apex slender and acute. Uropod exopod about 4 times as long as proximal width, about half as long as endopod, apex deeply bifid with processes about equally prominent, ventral margin with prominent acute serrations; exopod about 4 times as long as wide, apex with 2

prominent downwardly projecting spikes, ventral margin with 4–5 prominent serrations.

Female. Unknown.

Colour. Pale tan in alcohol; chromatophores not observed.

Size. Males 3.5–5.2 mm.

Remarks. The characteristic tubercles on pereonite 1, granular surface of the cephalon and pereonite 1, lack of a rostral spike and telson morphology readily identifies this species. Only *O. aylostera* has a similar telson morphology and these two species can easily distinguished by *O. rebutia* lacking a rostral spike, and having a prominent cluster of tubercles on the posterior of pereonite 1.

The three specimens AM P22983 differ slightly from the others in that the pereon and antennular spines are poorly developed, and are excluded from the type series. Two of the specimens have a poorly developed median spine on the posterior of pereonite 1, and all agree with *O. rebutia* in lacking rostral spines, and in the morphology of the antennule, uropods, pleon and pleotelson.

The old specimens were too fragile to dissect, and therefore the description given here is brief and taken only from the holotype.

Distribution. All specimens taken in the vicinity of Sydney, New South Wales, at depths from 26 to 89 m.

Hosts. One sample from an unidentified sponge.

Oxinasphaera aylostera sp. nov.

Figures 29, 30

Material examined. Holotype, ♂ (4.2 mm), N of Fly Point, Port Stephens, NSW, 32°43'S, 152°09'E, 8 Nov 1981, 20 m, orange sponge on dead mussel, R.T. Springthorpe and D. Stracey (AM P44204).

Paratypes. NSW. 3♀ (ovig 3.8, non-ovig 3.8, 3.6 mm), same data as holotype (AM P41153). ♂ (4.3 mm), Nelson Head, Port Stephens, 32°43'S, 152°09'E, 27 Oct 1980, 24 m, rubble on stones in channel, J. Hall (AM P44193). ♂ (4.2 mm), Barrenjoey Head, Broken Bay, 33°35'S, 151°20'E, 22 Apr 1983, 5 m, sponge, J.K. Lowry (AM P41157).

Vie. 2♂ (4.0, 4.0 mm), 4♀ (ovig 3.6, non-ovig 3.0, 3.4, parasitized 3.8 mm), SW shore, Gabo Is, 34°58'S, 149°55.7'E, 19 Feb 1973, 28 m, sponge community between lighthouse and jetty, J.E. Watson and S.A. Shepherd (NMV J40480).

Non-paratype material. NSW. About 300 non-ovigerous females and manca, same data as holotype (AM P44203). ♂ (4.5 mm), Barrenjoey Head, Broken Bay, 33°35'S, 151°20'E, 22 Apr 1983, 2 m, yellow sponge, J.K. Lowry (AM P41158).

Description of male. Body about 2.1 times as long as greatest width; lateral margins subparallel. Cephalon anterior margin without tubercles; rostrum with prominent bifurcate acute spine. Pereonite 1 unornamented. Pereonites 2–7 each with 2 transverse rows of spines, anterior row distinctly larger than posterior on pereonites 2, 3 and 7, pereonite 2 with prominent median spine; coxae 5–7 rounded. Pleon without posterior boss, with 2 rounded tubercles at the usual position of boss, posterolateral margin of pleonite 3 with prominent tubercles. Pleotelson granular, without spines, posteriorly with distinct low rounded tubercles; posterolateral flange with 1 marginal rounded tubercle; posterior margin

deep, laterally depressed, posterior margin deeply excavate, with short rounded median process dorsally with single distinct low rounded tubercle.

Antennule peduncle article 1 with 8 elongate subacute anterior spines; with 1 long postero-proximal and 1 posteromedial spine; dorsal surface of peduncular articles 1 and 2 with few setae; flagellum with 7 articles.

Epistome with 2 long basally united distinct spines; lateral lobes unornamented.

Pereopod 7 carpus 1.4 times as long as merus, about twice as long as wide, posterior margin with 3 biserrate, 2 simple spines, distal margin with 3 large trifold spines, largest nearly as long as carpus, and 4 biserrate spines, anterodistal angle with 2 slender weakly biserrate spines; propodus 1.1 times as long as carpus, 3.2 times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 2 sensory setae.

Penial processes 3.3 times as long as basal width; medial margin straight, lateral margin curving to subacute apex; proximolateral margin with scale spines.

Pleopod 2 appendix masculina shorter (0.8) than endopod, 6.7 times as long as maximum width, not extending beyond endopod, apex bluntly rounded. Uropod dorsally nodular; exopod about 4 times as long as proximal width, about half as long as endopod, apex deeply bifid with processes about equally prominent, ventral margin with prominent acute serrations; exopod about 4 times as long as wide, apex with 2 prominent downwardly projecting spines, ventral margin with 4–5 prominent serrations.

Female. Pleotelson smoothly rounded; posterior margin with weak indistinct median indentation.

Colour. Pale tan in alcohol; chromatophores not observed.

Size. Males 3.6–4.5 mm, females (ovigerous and non-ovigerous) 3.6–3.8 mm.

Remarks. This species and *Oxinasphaera rebutia* can be separated from all others of the genus by the posterior margin of the pleon not being produced and pleotelson posterior margin having a deep profile with a wide and deep median excavation which houses a short median process. This process is ornamented by a distinct rounded tubercle, and the lateral lobes on either side have a longitudinal row of similar tubercles. The two species also have prominent and acute antennule spines and an elongate bifurcate

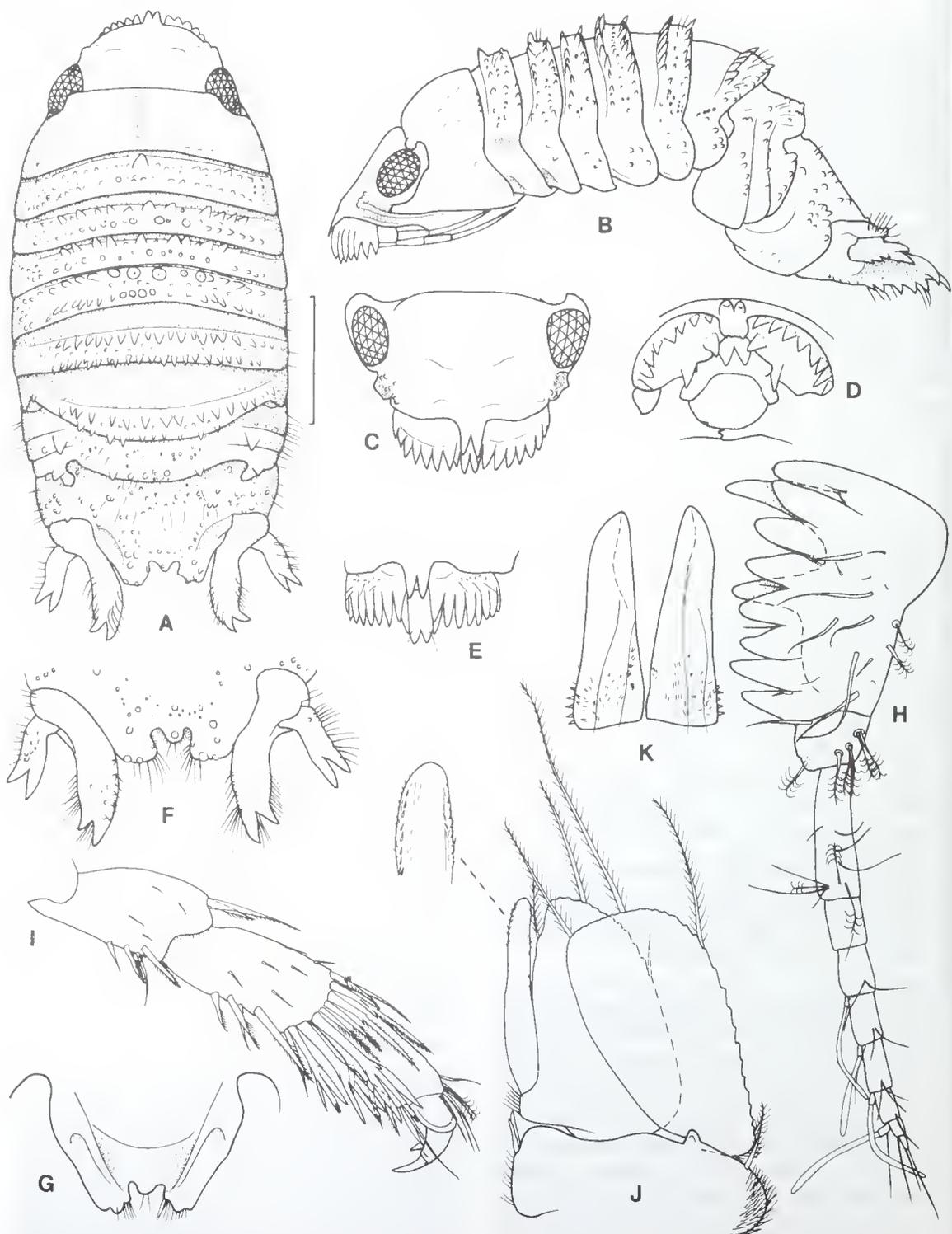


Figure 29. *Oxinasphaera aylosteria* sp. nov. A-G, J holotype, remainder paratype ♂ 4.8 mm NMV J26423. A, dorsal view; B, lateral view; C, cephalon; D, frons; E, antennules, anterior view; F, pleotelson posterior margin; G, pleotelson posterior margin, ventral view; H, antennule; I, pereopod 7, distal articles; J, pleopod 2; K, penes. Scale 1.0 mm.

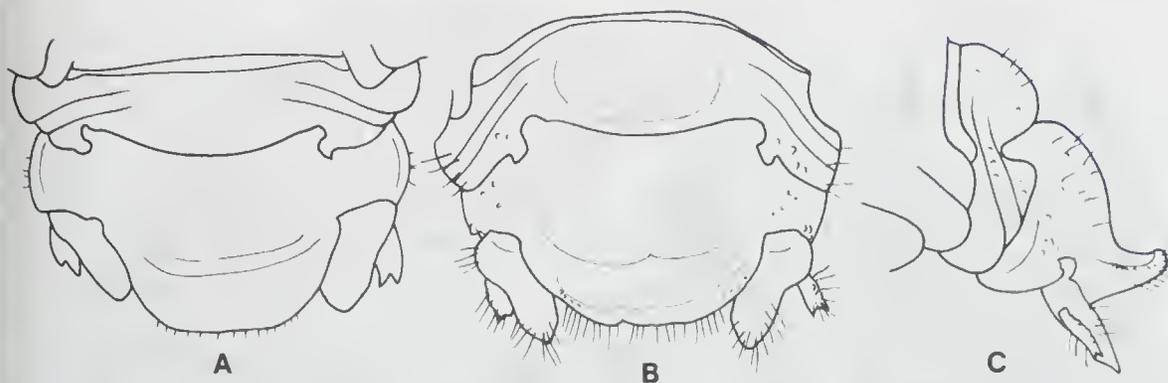


Figure 30. *Oxinasphaera aylosteria* sp. nov., AM P41153. A, non-ovigerous ♀, pleon and pleotelson; B, ovigerous ♀, pleon and pleotelson; C, ovigerous female, pleon and pleotelson, lateral view.

epistome spike. *Oxinasphaera aylosteria* is recognized by pereonite 2 having a prominent median spike, and the anterior spike rows on pereonites 3 and 4 being larger than is usual in the genus. It is readily distinguished from *O. rebutia* by having a rostral spike, and by lacking prominent tubercles on pereonite 1.

Distribution. Port Stephens, NSW to Gabo Is., eastern Victoria, at depths from 2 to 28 m.

Hosts. Unidentified sponges.

Oxinasphaera tuberculosa
(Stebbing, 1873) comb. nov.

Figures 31–33

Cymodocea tuberculosa Stebbing, 1873: 96, pl. 3 figs 1–1b.

Cymodocea tuberculosa. — Baker, 1910: 76, pl. 21 figs 1–20. Nierstrasz, 1931: 200.

Cymodocea tuberculosa tuberculosa. — Harrison and Holdich, 1984: 392 (remarks).

Non *Cymodocea tuberculosa*. — Whitelegge, 1902: 258, fig. 28 (= *Oxinasphaera thetisae* sp. nov.).

Non *Cymodocea tuberculosa*. — Baker, 1908: 140, pl. 3 figs 12–15 [= *O. bispinosa* (Baker, 1910)].

Non *Cymodocea tuberculosa bispinosa* Baker, 1910: 78, pl. 21 figs 21–23, pl. 22 figs 1–7 [= *O. bispinosa* (Baker, 1910)].

Non *Cymodocea tuberculosa tripartita*. — Barnard, 1920: 363, pl. 15 fig. 28. — Barnard, 1940: 493 (key). — Kensley, 1978: 100, Fig. 42C (= *O. kensleyi* sp. nov.).

Material examined. WA. ♂ (6.0 mm), 7♀ (4.8, 4.8, 4.9, 5.0, 5.5, 5.5, 5.6 mm), Bundegi Reef, near Point Murat, Exmouth Gulf, 21°49'S, 113°11'E. 4 Jan 1984, 9 m, large grey cup sponge, R.T. Springthorpe (AM P41351). ♂ (6.2 mm), Arthur Head, Fremantle, 32°03'S, 115°44'E, 25 Dec 1983, 6 m, from *Caulerpa*. J.K. Lowry (AM P41116). 40♂ and ♀ (previously partly desiccated), western end, Lucky Bay, 33°59.0'S,

118°02.5'E, 12 Apr 1984, 20 m, gorgonians and soft corals. G.C.B. Poore and H.M. Lew Ton (NMV J26181). 2♂ (5.4, 5.8 mm), ♀ (ovig 4.8 mm), N end of Little Beach, Two Peoples Bay, 34°58.2'S, 118°10.8'E. 18 Apr 1986, 5 m, yellow sponge, anemones. G.C.B. Poore and H.M. Lew Ton (NMV J26166). 3♂ (5.5, 5.6, 5.8 mm), ♀ (damaged, 5.0 mm), off Possession Point, King George Sound, 35°02.5'S, 117°55.0'E. 14 Dec 1983, 7 m, from purple finger sponges. R.T. Springthorpe (AM P41099). ♂ (5.8 mm), ♀ (4.8 mm), 17 m, mancas and juveniles (in poor condition), off SE corner of Michaelmas Is., King George Sound, 35°03'S, 118°00'E, 17 Dec 1983, 24 m, branching sponge. R.T. Springthorpe (AM P41108, slides P44218). ♂ (4.8 mm, senescent), NE end, Vancouver Peninsula, 35°03.4'S, 117°56.2'E. 8 Apr 1986, 6 m, dictyotaleans. G.C.B. Poore and H.M. Lew Ton (NMV J26163).

SA. 4♂ (4.5, 5.0, 5.3, 5.5 mm), ♀ (4.5 mm), Coal Reef, Tiparra Reef, Tiparra Bay, 34°04.0'S, 137°23.0'E, 15 Mar 1985, 5 m, sponges with hydroids and algae. G.C.B. Poore and H.M. Lew Ton (NMV J40481). ♂, Penneshaw jetty, 31 Jan 1989, sand and weed on pylons, 5–8 m, K.L. Gowlett-Holmes (SAM C5605). 3♂, Cape D'Estaing, 27 Jan 1989, 10–13 m, rubble, reef crevice, W. Zeidler and K.L. Gowlett-Holmes (SAM C5606). ♂, Pearson Is., Investigator Group, 10 Jan 1969, 33 m, algae on slope, S.A. Shepherd (SAM C5607). 10 specimens (in poor condition), Wedge Is., Gambier Group, 29 Dec 1963, 26 m, from sponge, SAORI (SAM C5608). ♀, West Is., Encounter Bay, 12 Feb 1966, ex sponge, S.A. Shepherd (SAM C5609). ♂, Whyalla, Upper Spencer Gulf, 33°02.4'S, 137°37.6'E, Sept 1987, 10 m, SA Fisheries Survey (C5610). ♂, Upper Spencer Gulf, Commissariat Point, 35°35.00'S, 137°46.08'E, Feb 1987, 6 m, beacon 20, S.A. Fisheries (C5611). 4♂, 'South Australian Coast', no other data, probably Baker's 1910 specimens (SAM C368).

Victoria. ♂ (5.6 mm), SW shore midway between lighthouse and jetty, Gabo Is., 37°34'S, 149°55'E, 19 Feb 1973, 28 m, sponge community, J.E. Watson and S.A. Sheperd (NMV J40493).

Tas. ♂, 35 km N of Cape Wickham, King Is., 39°13.6'S, 143°55.6'E. 23 Nov 1981, 85 m, fine sand. R. Wilson (NMV J40495).

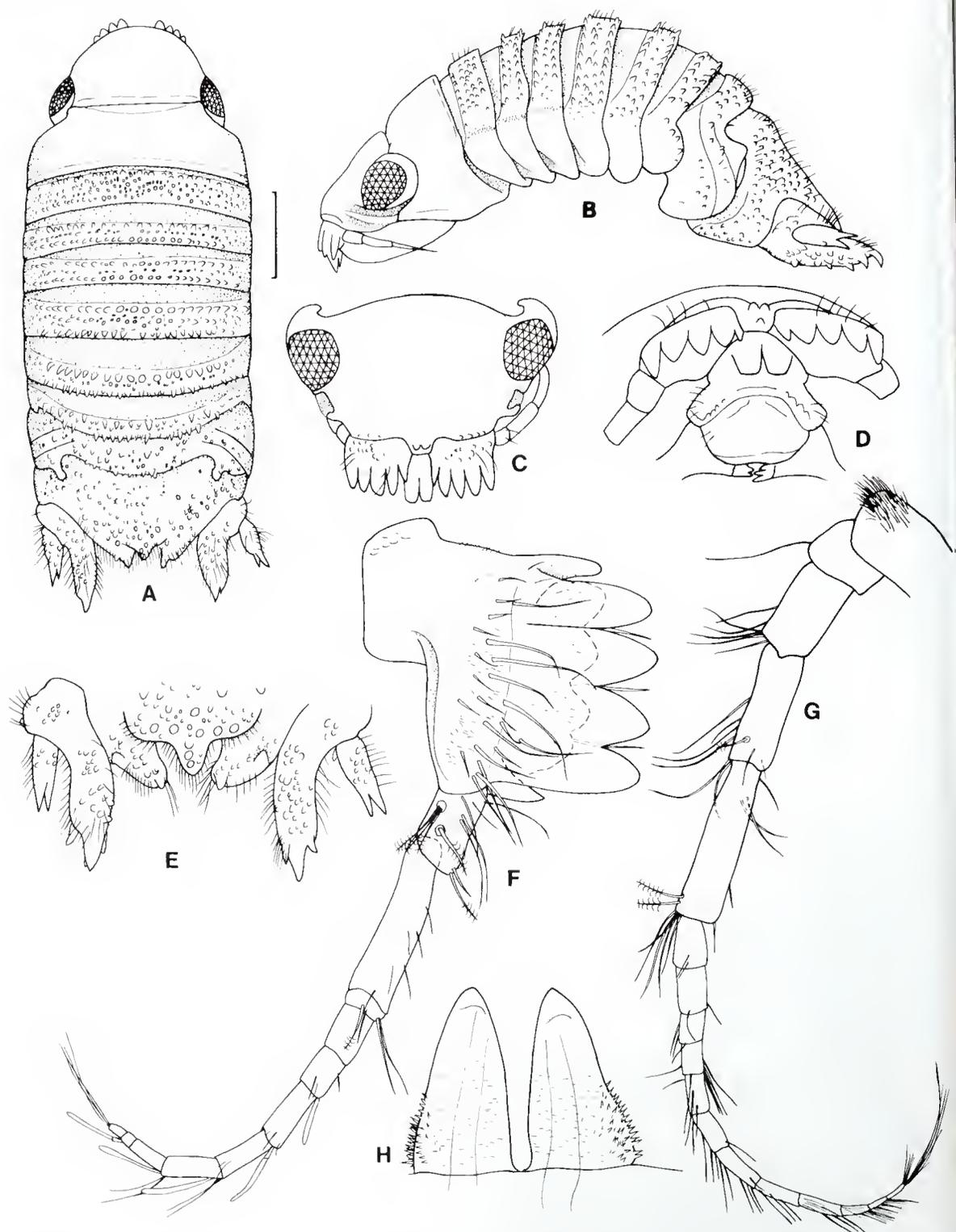


Figure 31. *Oxinasphaera tuberculosa* (Stebbing). A-E ♂ 6.2 mm, Fremantle (AM P41116), remainder ♂ 5.8 mm, King George Sound (AM P41108). A, dorsal view; B, lateral view; C, cephalon; D, frons; E, pleotelson posterior margin; F, antennule; G, antenna; H, penes. Scale 1.0 mm.

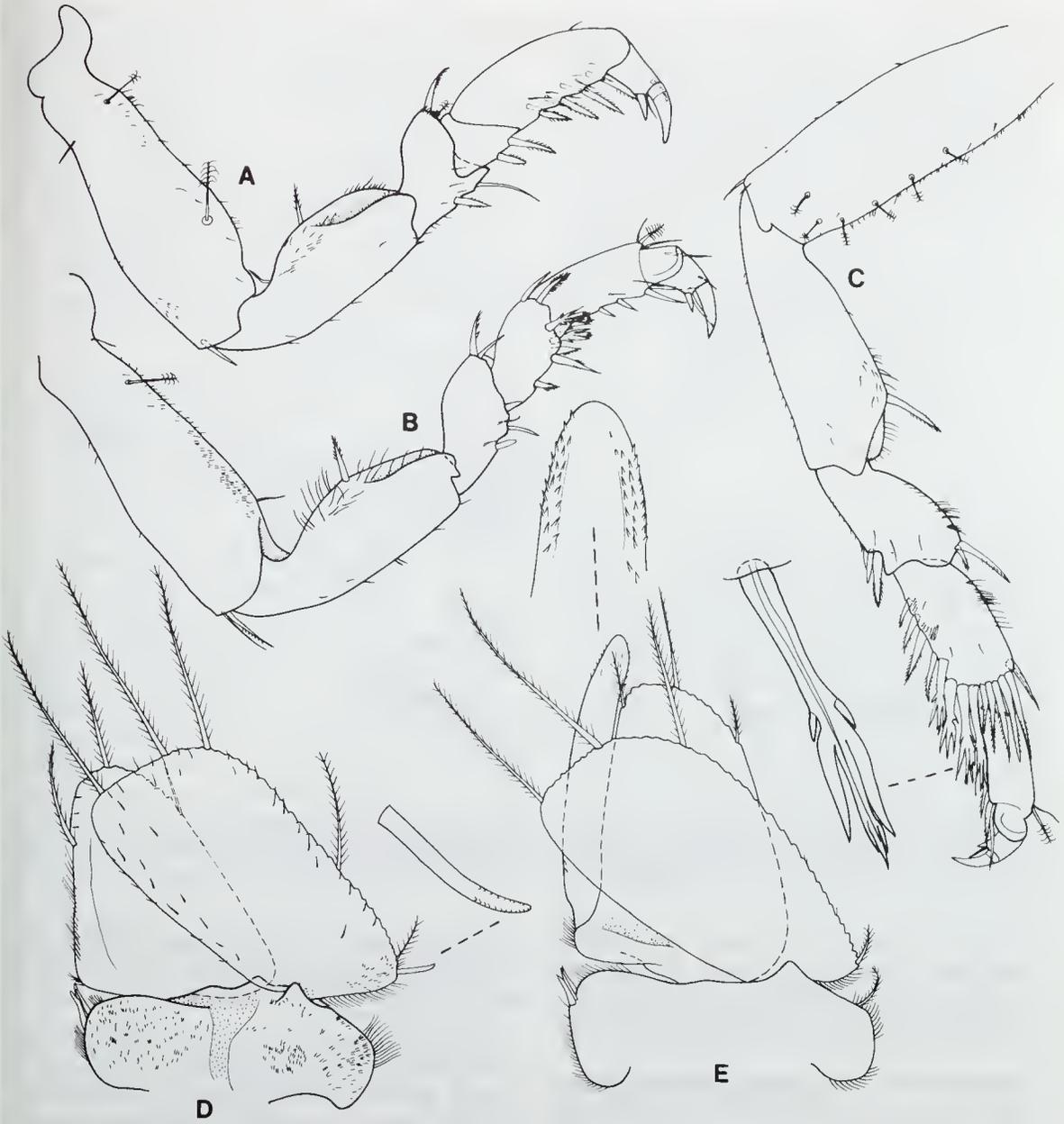


Figure 32. *Oxinasphaera tuberculosa* (Stebbing). All figs ♂ 5.8 mm, King George Sound (AM P41108). A, pereopod 1; B, pereopod 2; C, pereopod 7; D, pleopod 1; E, pleopod 2.

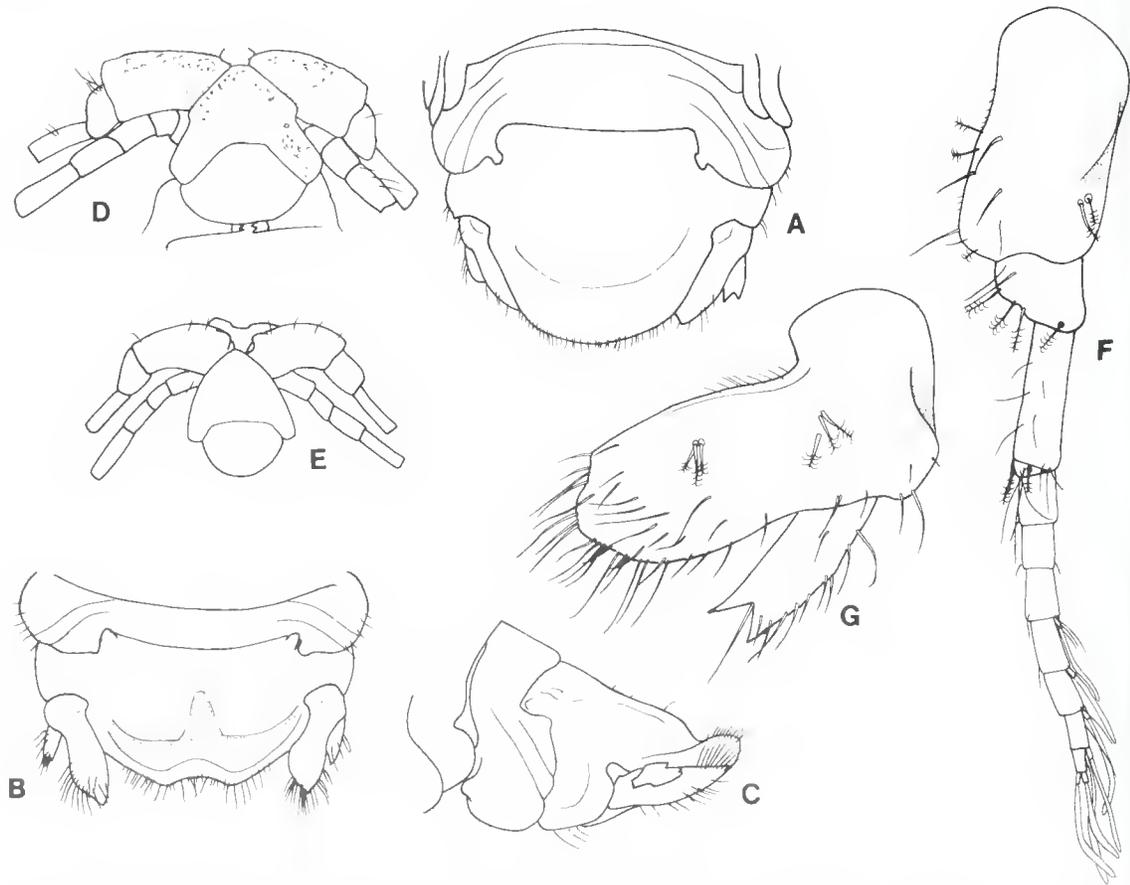


Figure 33. *Oxinasphaera tuberculosa* (Stebbing). A, D, F, G non-ovigerous ♀ 4.8 mm, King George Sound (AM P41108); B, C, E ovigerous ♀ 4.8 mm, Two Peoples Bay (NMV J26166). A, pleon and pleotelson, dorsal view; B, pleon pleotelson, dorsal view; C, pleon pleotelson, lateral view; D, frons; E, frons; F, antennule; G, uropod.

Types. I have been unable to locate the material from the Swan River, WA on which Stebbing based his description. It is not held at The Natural History Museum, London, nor any other institution that I have contacted.

Description of male. Body about 2.5 times as long as greatest width; dorsal surfaces not polished, generally granular, with scattered setae. Cephalon dorsal surface not nodulose; anterior margin unornamented; rostrum without spike, with pair of very weak nodules. Pereonite 1 posterior margin finely granular. Pereonite 2 finely granular, and 3–7 each with 2 transverse rows of prominent spikes, anterior and posterior rows subequal in size; coxae 5–7 with posterior margins evenly rounded. Pleon without posterior boss, without prominent spikes. Pleotelson without prominent spikes or acute tubercles, prominent rounded tubercles on posterior lobe; posterolateral flange without acute tubercles;

posterior margin with deep groove on either side of distinctly dorsal median lobe, telson on either side of apical notch forming distinct lobe, each with prominent spike.

Antennule peduncle article 1 with 4 large and 1 small medial flat anterior spikes; without posterior spikes; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae; flagellum with 8 articles.

Epistome with 2 prominent elongate flat truncate spikes, without subsidiary spikes.

Pereopod 1 basis about 2.8 times as long as wide, anterior margin with 2 sensory setae; ischium about 0.7 times as long as basis, about 2.4 times as long as wide, anterior margin with 1 short proximal spines and 1 distal longer and biserrate spine; merus about half as long as ischium, about 1.2 times as long as wide, anterolateral angle with 1 gently curving pectinate spine, posterior margin with 1 spine and single

long simple seta; carpus short, about 0.7 times as long as merus, about 1.1 times as long as wide, posterior margin with 2 biserrate spines; propodus about 0.8 times as long as ischium, widest proximally, about 2.5 times as long as wide, posterior margin with distinct scale spikes and 4 large biserrate spines, row of 4 smaller biserrate spines on medial margin; dactylus about 0.6 length of propodus, unguis about 55% length of entire dactylus. Pereopods 2 and 3 similar to 1, differing principally in carpus being more elongate and propodus more slender. Pereopod 2 basis about 3.0 times as long as wide; ischium about 2.5 times as long as wide; carpus about equal in length to merus, about 1.6 times as long as wide, with 3 biserrate and 3 trifid spines on posterior of distal margin; propodus about 0.7 times as long as ischium, about 3 times as long as wide, margins subparallel, posterior margin with 3 weakly biserrate spines. Pereopod 7 basis about 3.3 times as long as wide, posterior margin with prominent scale spikes, with several sensory setae; ischium slightly shorter than basis, about 2.7 times as long as wide; merus about 0.5 times as long as ischium, about 1.6 times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 1 large and 1 small spines; carpus about as long as merus, about 2.0 times as long as wide, posterior margin with 4 biserrate spines, distal margin with 4 large trifid spines and 5 biserrate spines, anterodistal margin with 1 weakly serrate spine; propodus about as long as carpus and 0.6 time as long as ischium, about 3.4 times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 1 sensory seta.

Penial processes each about 1.8 times as long as basal width, both margins converging evenly to an acute point; proximolateral margins densely scaled.

Pleopod 1 endopod without lobed or grooved medial margin. Pleopod 2 appendix masculina curving weakly laterally, 7.6 times as long as maximum width, about as long (0.97) as endopod, extending slightly beyond endopod (by about 0.16 of its length), apex bluntly rounded. Uropod exopod about 3.4 times as long as proximal width, about 0.45 times as long as endopod, apex deeply bifid with lateral process prominent; endopod about 3.4 times as long as wide, apex with prominent terminal spike and 2 smaller ventrally directed spikes.

Female. Ovigerous females with unornamented somites. Posterior margin of pleotelson upturned, with wide shallow indentation; with

conspicuous marginal setae. Antennule peduncle article 2 0.4 as long as article 1, article 3 1.7 times as long as article 2; flagellum 0.8 times as long as peduncle, with 7 articles. Uropod endopod flat, distally with medial margin evenly rounded; exopod flat, about half as long as endopod, apex bifid. Non-ovigerous female with posterior margin of pleotelson not upturned, smoothly rounded, without wide shallow indentation. Antennule peduncle article 2 proportionally shorter than in ovigerous female, 0.24 as long as article 1; flagellum about three-quarters as long as peduncle. Uropod as for ovigerous female but endopod with rounded apical point.

Colour. Pale brown to cream in preserved specimens.

Size. Males 4.5–6.2 mm, females 4.5–5.6 mm.

Remarks. *Oxinasphaera tuberculosa* was one of the first described of the Australian marine isopods, but has since remained poorly known. The species is immediately characterized by the deep grooves extending anterolaterally from the posterior margin of the telson, and the very large flat truncate antennule and epistome spikes, characters that it shares with *Oxinasphaera epostoa* and *Oxinasphaera lowryi*. The latter is easily separated by having a single epistome spike, and the pleon with a posterior boss with opposing spikes on the pleotelson. *Oxinasphaera epostoa* is very similar but males of that species have a far more setose pleon and pleotelson, pereonite 2 and 3 are only weakly nodulose and the appendix masculina is straight and distally narrowed.

Distribution. From North West Cape, WA, southwards and eastward along the coast of southern Australia to Gabo Is., Victoria and Tasmania.

Hosts. From sponges, none of which have been identified.

Oxinasphaera epostoa sp. nov.

Figures 34, 35

Material examined. Holotype, ♂ (5.5 mm), Table Point, Cobourg Peninsula, Port Essington, NT, 11°14.8'S, 132°10.5'E, 12 May 1983, 6 m, rock washings, N.L. Bruce (NTM Cr0011329).

Paratypes. NT, 2♀ (4.0, 4.8 mm), same data as holotype (NTM Cr0011330). ♂ (4.3 mm), 13♀ (non-ovig mm), 17 manca (mm), same data as holotype, but 11 May 1983, from *Callyspongia ?diffusa* (NTM Cr0011331), 3♂ (5.3, 6.0 dissected, 6.0 [SEM] mm), 6♀

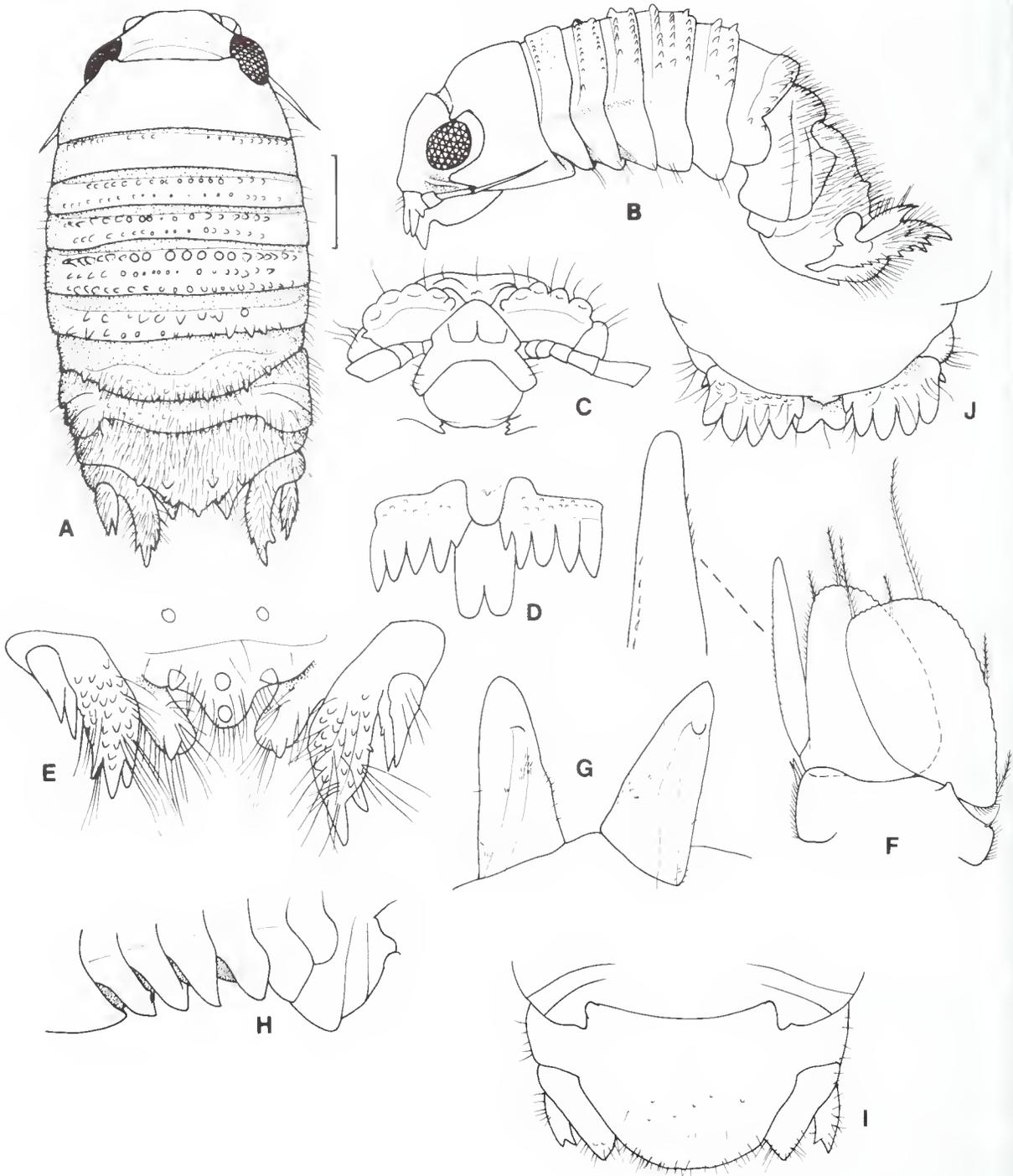


Figure 34. *Oxinasphaera epostoa* sp. nov. A-E, J holotype. G, F♂ 6.0 mm, H, I non-ovigerous ♀ 5.3 mm (both ZMUC CRU1383). A, dorsal view; B, lateral view; C, frons; D, antennules, anterior view; E, pleotelson, posterior margin; F, pleopod 2; G, penes; H, coxae 2-7; I, pleotelson, dorsal view. Scale 1.0 mm.

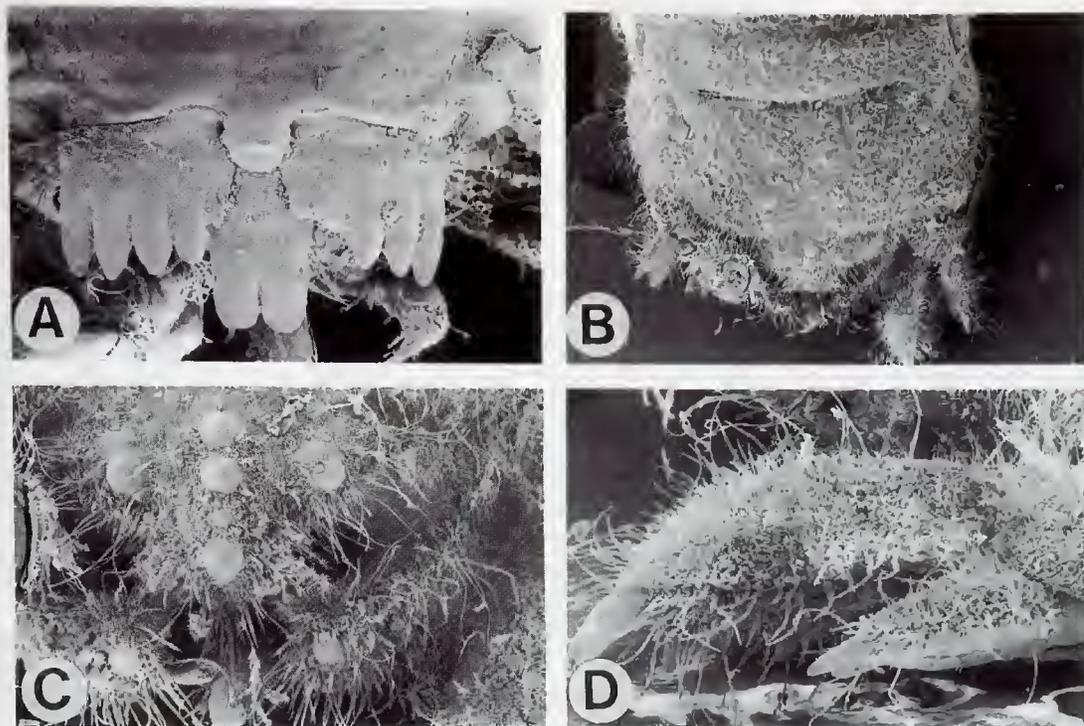


Figure 35. *Oxinasphaera epostoa* sp. nov., SEMs. ♂ 5.3 mm (ZMUC CRU1383). A, cephalon, anterior margin (x75); B, pleon and pleotelson (x30); C, pleotelson apex (x100); D, uropod (x100).

(non-ovig 4.5, 4.7, 4.8, 5.0, 5.3 [drawn] mm), 2 mancas (3.5, 4.3 mm), same data as holotype except, from mixed sponges (ZMUC CRU1383). 21♂ (3.8–6.4 mm, mean = 5.5 mm), 12♀ (9 ovig 3.7–5.3 mm, mean = 4.5 mm, 3 non-ovig), manca (2.5 mm), same data as holotype, except: 7 Aug 1986, 5–7 m, burrowing into sponge, P.J.F. Davie (QM W20033, ZMUC CRU1382).

Non-paratypic material. NT. ♂ (6.0 mm), Arafura Sea, NE of Cobourg Peninsula, 11°09'S, 134°27'E, 21 Oct 1989, 30.2 m, BRR (QM W20044). 17♂ (4.4–6.4 mm, mean = 5.5 mm), 4♀ (ovig, all broken, non-ovig 4.8 mm), Arafura Sea, NE of Cobourg Peninsula, 11°27'S, 133°34'E, 18 Oct 1989, 20.1 m, BRR (QM W20042). ♂, 5♀, Table Head, Port Essington, Cobourg Peninsula, 11°14.4'S, 132°10.8'E, 13 May 1983, 4 m, *Jaspis* sp., N.L. Bruce (NTM Cr0011332).

Description of male. Body about twice as long as greatest width; dorsal surfaces not polished, generally granular, with scattered setae, particularly dense on pleon and pleotelson. Cephalon dorsal surface not nodulose; anterior margin unornamented; rostrum without spike. Pereonite 1 anterior margin with row of fine nodules. Pereonite 2–6 each with 2 transverse rows of prominent spikes, pereonite with additional middle row of low nodules; anterior row largest on pereonite 4, both rows subequal in size on pereon-

ites 3, 4 and 6; pereonite 7 with posterior spikes only; coxae 5 and 6 with posterior margins straight, coxae 7 rounded. Pleon without posterior boss, without prominent spikes. Pleotelson without prominent spikes or acute tubercles; posterolateral flange without acute tubercles; posterior margin with deep groove on either side of distinctly dorsal median lobe; median lobe with prominent rounded median tubercles and adjacent rounded tubercles; telson on either side of apical notch forming distinct lobe, each with prominent spike.

Antennule peduncle article 1 with 4 large and 1 small medial flat anterior spikes; without posterior spikes; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae; flagellum with 8 articles.

Epistome with 2 prominent elongate flat truncate spikes, without subsidiary spikes.

Percopods as for *O. tuberculosa*.

Penial processes each twice (2.0) as long as basal width, both margins converging evenly to an acute point; proximolateral margins weakly scaled.

Pleopod 1 endopod without lobed or grooved medial margin. Pleopod 2 appendix masculina straight, 7.6 times as long as maximum width,

tapering from about mid-length, longer (1.2) than endopod, extending beyond endopod by about 0.15 of its length, apex bluntly rounded. Uropods as for *O. tuberculosa*.

Female. Not distinguishable from *O. tuberculosa*.

Colour. Pale tan to white in alcohol, with scattered chromatophores.

Size. Males 4.5–6.2 mm, females 4.5–5.6 mm.

Remarks. In most characters *Oxinasphaera epostoa* differs little from *O. tuberculosa*. The characters that do distinguish the two species are, in *Oxinasphaera epostoa* the pleon having fewer tubercles and being densely setose, a shorter and rounder median process on the pleotelson, the lateral grooves on posterior of pleon are less clearly defined, coxae 5 and 6 are posteriorly straight (rounded in *O. tuberculosa*), the anterior pereonites are less nodulose, pereonite 7 with only a single row of spikes, the appendix masculina being longer and apically more slender and the penes slightly longer (1.95–2.0 vs 1.87 in *O. tuberculosa*) and less densely set with scale spikes.

Distribution. Cobourg Peninsula, Northern Territory and adjacent Arafura Sea; shallow subtidal to 30 m.

Hosts. *Callyspongia*? *diffusa*.

Etymology. *Epostoa* is a genus of woolly cactus.

Oxinasphaera lowryi sp. nov.

Figures 36, 37

Material examined. Holotype, ♂ (8.0 mm), W side Bowen Is., Jervis Bay, NSW, 35°07'S, 150°46'E, 28 Jun 1981, 6 m, from large grey sponge, J.K. Lowry and R.T. Springthorpe (AM P44212).

Paratypes. NSW, ♂ (7.9 mm), Wommin reef, S of Cook Is., 28°12.0'S, 153°34.8'E, 4 Feb 1993, 21 m, symbiotic with sponge, J.N.A. Hooper and S. Cook (QM W18423). ♀ (9.5 mm), same data as previous (QM W18427). ♂ (8.5 mm), Julian Rocks, Byron Bay, 28°36.8'S, 153°37.7'E, 2 Feb 1993, 18 m, 'black coral garden', symbiotic with sponge, J.N.A. Hooper and S. Cook (QM W18352). ♂ (8.5 mm, dissected), inside Box Head, Broken Bay, 33°33'S, 151°21'E, 22 Nov 1982, from sponge, J.K. Lowry and R.T. Springthorpe (AM P41154, slides P44217). ♂ (9.2 mm, intermoult), ♀ (non-ovig 6.3 mm), same data as holotype (AM P41159). ♂ (10.0 mm, damaged), Nielsen Park, Sydney, 3 Oct 1979, in *Galeolaria*, N. Sverrnivig (ZMUC CRU1388).

Description of male. Body about twice as long as greatest width; dorsal surfaces not polished, generally granular, with abundant scattered setae, particularly dense on pleon and pleotelson. Cephalon dorsal surface not nodulose; anterior margin unornamented; rostrum without spike. Pereonite 1 granular, posterior margin with transverse row of fine nodules; pereonite 2 densely granular, with indistinct anterior and posterior nodule rows; pereonites 5 with 3 transverse rows of prominent spikes, pereonite 6 and 7 with single transverse row of widely spaced prominent spikes; coxae 5–7 with posterior margins evenly rounded. Pleon with prominent posterior boss, with prominent posterolateral spikes and 2 spikes set anteriorly to these. Pleotelson densely granular; posterolateral flange with 1 tubercle; posterior margin with deep groove on either side of distinctly dorsal median lobe; telson on either side of apical notch forming distinct lobe; lobes without prominent rounded median tubercles or spikes.

Antennule peduncle article 1 with 4 large flat anterior spikes; without posterior spikes; dorsal surface of peduncular articles 1 and 2 provided with few roughened setae; flagellum with 10 articles.

Epistome with single prominent elongate flat truncate spike.

Pereopod 1 basis about 3 times as long as wide, anterior margin with 2 sensory setae; ischium about 0.7 times as long as basis, about 2.3 times as long as wide, anterior margin with 1 short proximal spines and 1 distal longer and biserrate spine; merus about one-third as long as ischium, about as long as wide, anterolateral angle with 1 long and 1 short spine, posterior margin with 1 spine and single long simple seta; carpus short, about 0.9 times as long as merus, about 0.8 times as long as wide, posterior margin with 2 biserrate spines; propodus about 0.7 times as long as ischium, widest proximally, about 2.7 times as long as wide, posterior margin with 4 large biserrate spines, row of 3 smaller biserrate spines on medial margin; dactylus about half length of propodus. Pereopods 2 similar to 1, differing principally in having the carpus more elongate and propodus more slender and the ischium anterior margin with abundant setules. Pereopod 7 basis about 2.8 times as long as wide, posterior margin with prominent scale spikes, with several sensory setae, anterior margin with abundant long setules; ischium slightly shorter than basis, about 2.7 times as long as wide; merus about half as long as ischium, about 1.8 times as long as wide, posterior margin with

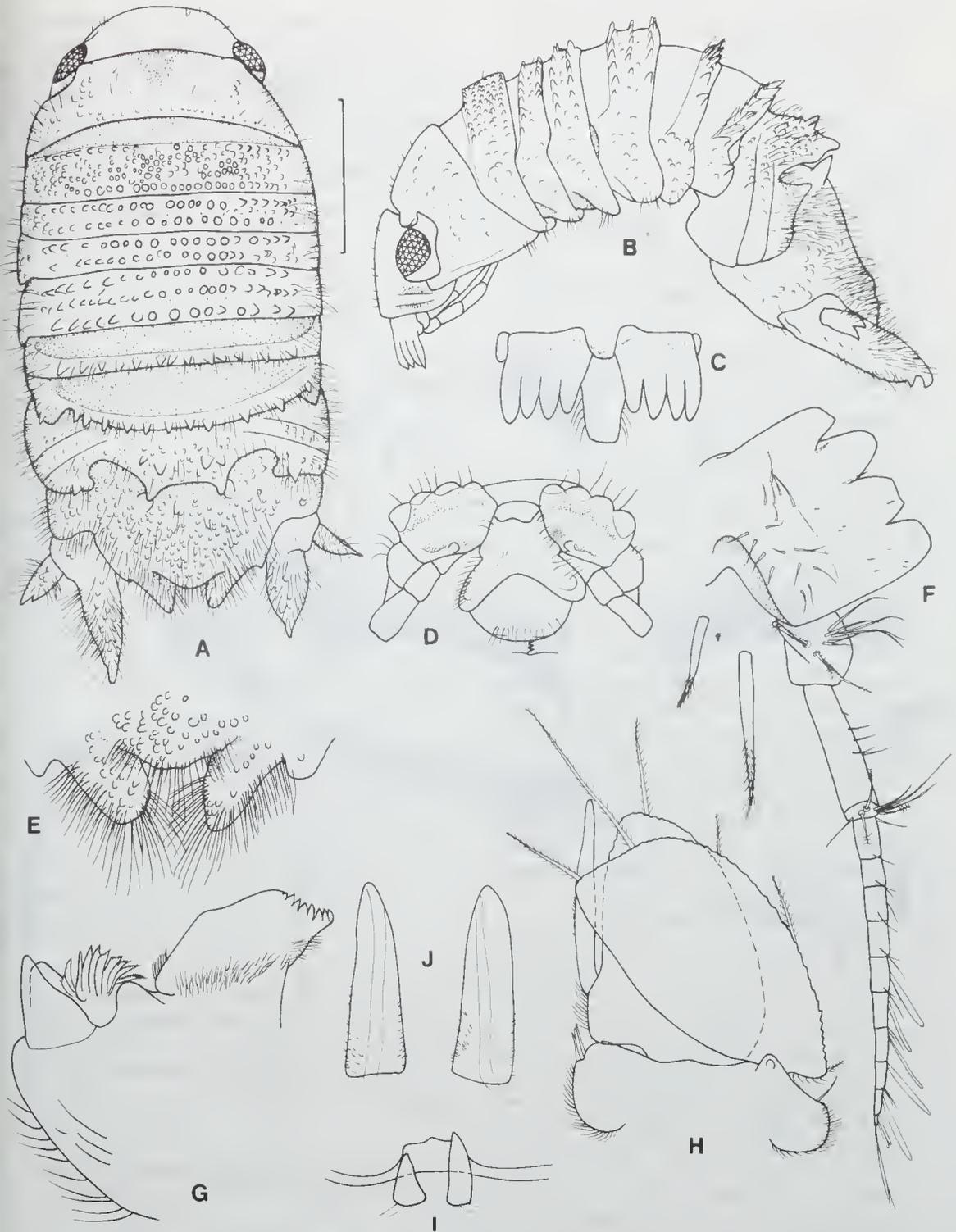


Figure 36. *Oxinasphaera lowryi* sp. nov. A-E holotype, remainder ♂ 8.5 mm (AM P41154). A, dorsal view; B, lateral view; C, antennules, anterior view; D, frons; E, pleotelson posterior margin; F, antennule, f — setae from dorsal surface of peduncular article 1; G, right mandible; H, pleopod 2; I, penes, in situ; J, penes. Scale 2.0 mm.

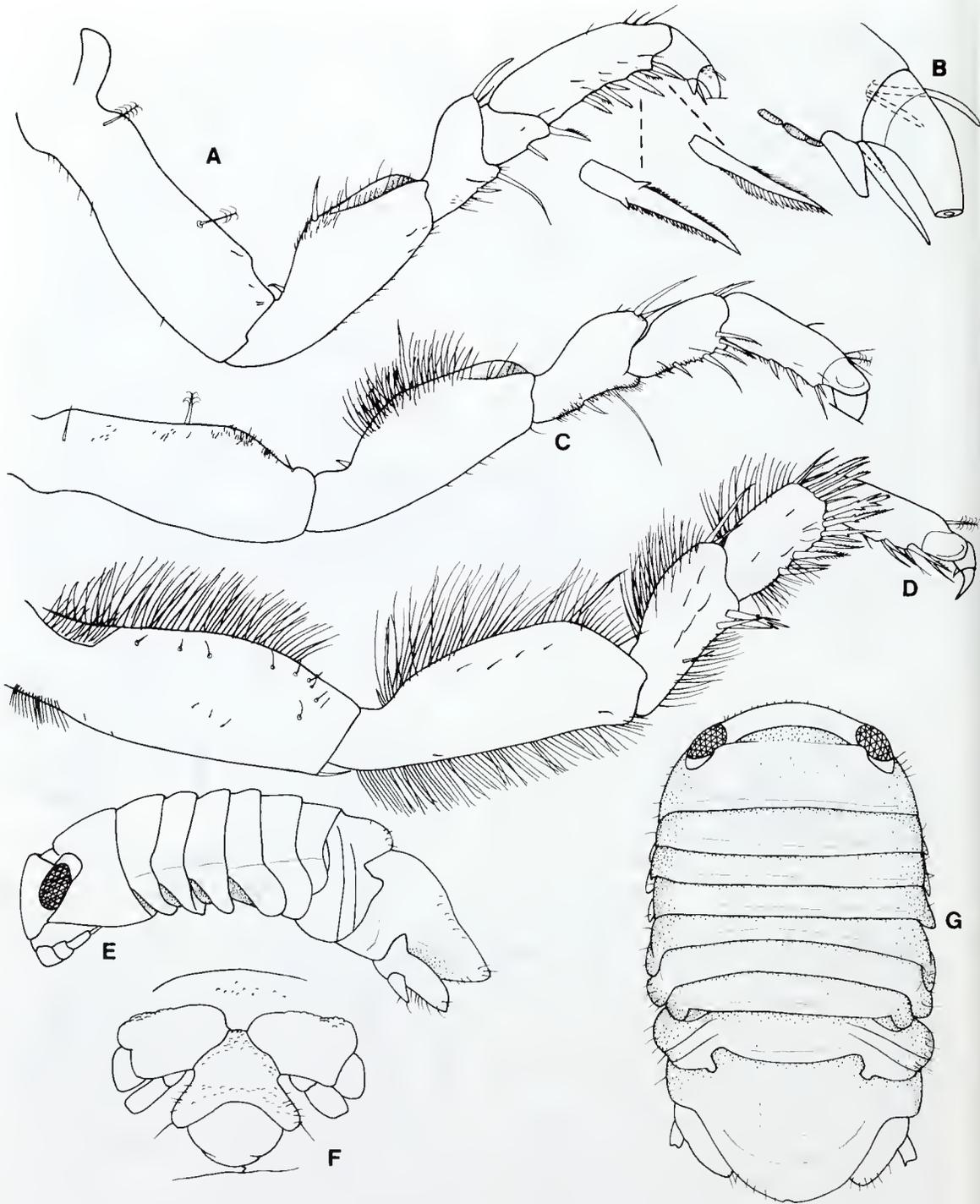


Figure 37. *Oxinasphaera lowryi* sp. nov. A–D, ♂ 8.5 mm (AM P41154), E–G non-ovigerous ♀ 6.3 mm (AM P41159). A, pereopod 1; B, dactylus apex, pereopod 1; C, pereopod 2; D, pereopod 7; E, lateral view; F, frons; G, dorsal view.

3 biserrate and 1 trifold spines, anterodistal angle with 1 large and 1 small spines; carpus about 0.8 times as long as merus, about 1.8 times as long as wide, posterior margin with 5 biserrate spines, distal margin with 2 large trifold spines and 6 biserrate spines, anterodistal margin with 2 weakly serrate spine; ischium to carpus with both anterior and posterior margins with abundant long setules; propodus about 1.3 times as long as carpus and half as long as ischium, about 3 times as long as wide, posterior margin with 6 spines, 2 of which are obviously biserrate, anterodistal angle with 1 sensory seta and 3 simple setae.

Penial processes each about 3 times as long as basal width, medial margin straight, distal lateral margin converging evenly to narrowly rounded point; proximal margins weakly scaled.

Pleopods as for *O. tuberculosa*. Pleopod 2 appendix masculina straight, articulating subbasally, tapering slightly from about mid-length, 9.2 times as long as maximum width, shorter (0.8) than endopod, just extending beyond endopod (by about 0.05 of its length), apex bluntly rounded. Uropod exopod about half as long as endopod, apex deeply bifid with lateral process prominent; endopod about 2.6 times as long as wide, apex with 2 prominent ventrally directed spikes.

Female. Ovigerous females not observed. Non-ovigerous females with distinct pleonal dome, and strongly domed pleotelson; posterior margin of pleotelson with minute median notch.

Colour. In freshly collected preserved, dorsal surfaces densely covered by chromatophores giving an overall dark grey appearance.

Size. Males 7.9–9.5 mm, one non-ovigerous female 6.3 mm.

Remarks. The species, one of the largest of the genus, is immediately recognized by having a single flat epistomal spike, the dorsal surfaces are densely hirsute, on the pereonites the posterior spike rows are prominent and on pereonites 6 and 7 are in a single transverse row. This species is the only species with heavily setulose posterior pereopods.

Distribution. Byron Bay, northern NSW to Jervis Bay, southern NSW (35°S), intertidal to 20 m.

Hosts. Unidentified sponges; also from the massed worm tubes of the polychaete *Galeolaria*, although these could have been from sponges in the tube masses.

Etymology. Named in recognition of Dr Jim K. Lowry's contribution to knowledge of the Australian amphipod fauna.

Oxinasphaera thetisae sp. nov.

Figures 38, 39

Cymodoce tuberculosa. — Whitelegge, 1902: 260, fig. 28, part [non *O. tuberculosa* (Stebbing)].

Material examined. Holotype, ♂ (11.5 mm), 9 km E of Coogee, NSW, 33°57'S, 151°21'E, 15 Mar 1898, 89 m, fine sand. E.R. Waite on HMCS *Thetis* (AM G2270).

Paratypes. NSW, ♂ (1 no head, 9.0, 9.5, 9.7, 10.5 previously dissected, 10.6 mm), ♀ (non-ovig 8.5 mm), 1 km S of Cape Bailey, 34°02.5'S, 151°12.0'E, 11 Mar 1898, 39 m, sand to rock. E.R. Waite on HMCS *Thetis* (AM G2194).

Whitelegge listed the stations from which his specimens were taken as: "8 off Cape Hawke, 10 off Coogee Bay in 25 and 50 fathoms: stns 31 and 44." Material examined here is G2270 from stn 44 and G2194 from stn 36. Other samples identified as *C. tuberculata* in the AM collections are: G2274 (= *O. rebullia* sp. nov. now AM P44206 and *O. bisubula* sp. nov.) from stn 48; G2273 (= *O. bisubula* sp. nov.) from stn 55; G3902 (= *O. bisubula* sp. nov.) from stn 48. Material from stn 31 has not been located.

Description of male. Body about twice as long as greatest width; dorsal surfaces not polished, generally strongly granular, with scattered setae, particularly dense on pleon and pleotelson. Cephalon dorsal surface granular, with anteromedial nodule; anterior margin unornamented; rostrum without spike. Pereonite 1 strongly granular; pereonites 2–7 each with 2 rows of transverse spikes, anterior row prominent, spikes becoming robust on pereonites 5–7; coxae 5–7 with posterior margins evenly rounded. Pleon without posterior boss, with 2 prominent submedian spikes on posterior margin, further 5–6 spikes set laterally to these, forming irregular row. Pleotelson densely granular; with 4 submedian clusters of 4 and 3 large spikes; posterolateral flange with 1 acute tubercle; posterior margin with deep groove on either side of distinctly dorsal median lobe; telson on either side of apical notch forming distinct lobe; median lobe with prominent acute or spikes.

Antennule peduncle article 1 with 4–5 irregular flat anterior spikes, lateralmost being prominent; without posterior spikes; dorsal surface of peduncular articles 1 and 2 granular, provided with few roughened setae; flagellum with 14 articles.

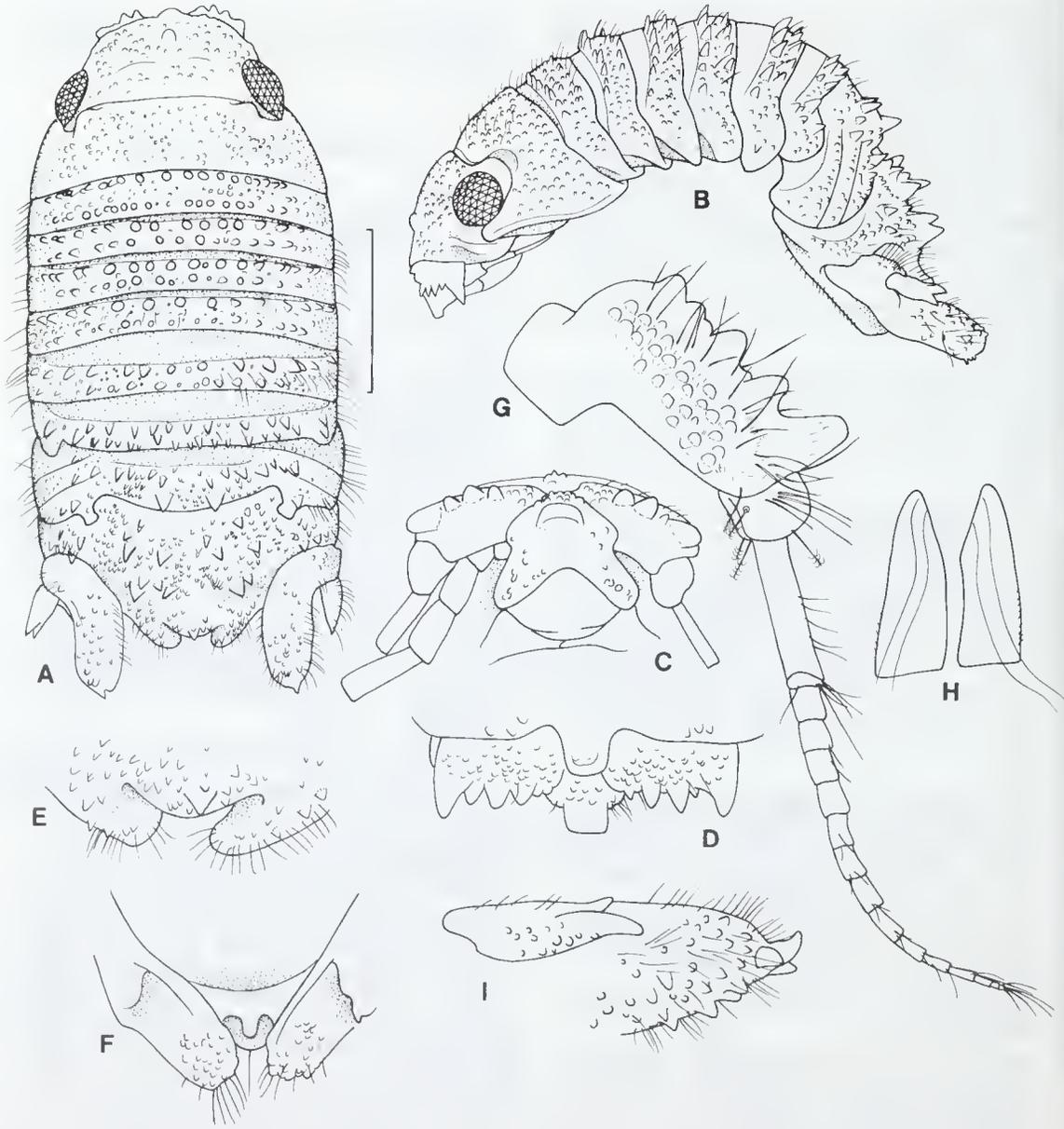


Figure 38. *Oxinasphaera thetisae* sp. nov. A-I holotype, remainder ♂ 9.5 mm (AM G2194). A, dorsal view; B, lateral view; C, frons; D, antennules, anterior view; E, pleotelson posterior margin; F, pleotelson, ventral view of apex; G, antennule; H, penes; I, uropod, in situ. Scale 3.0 mm.

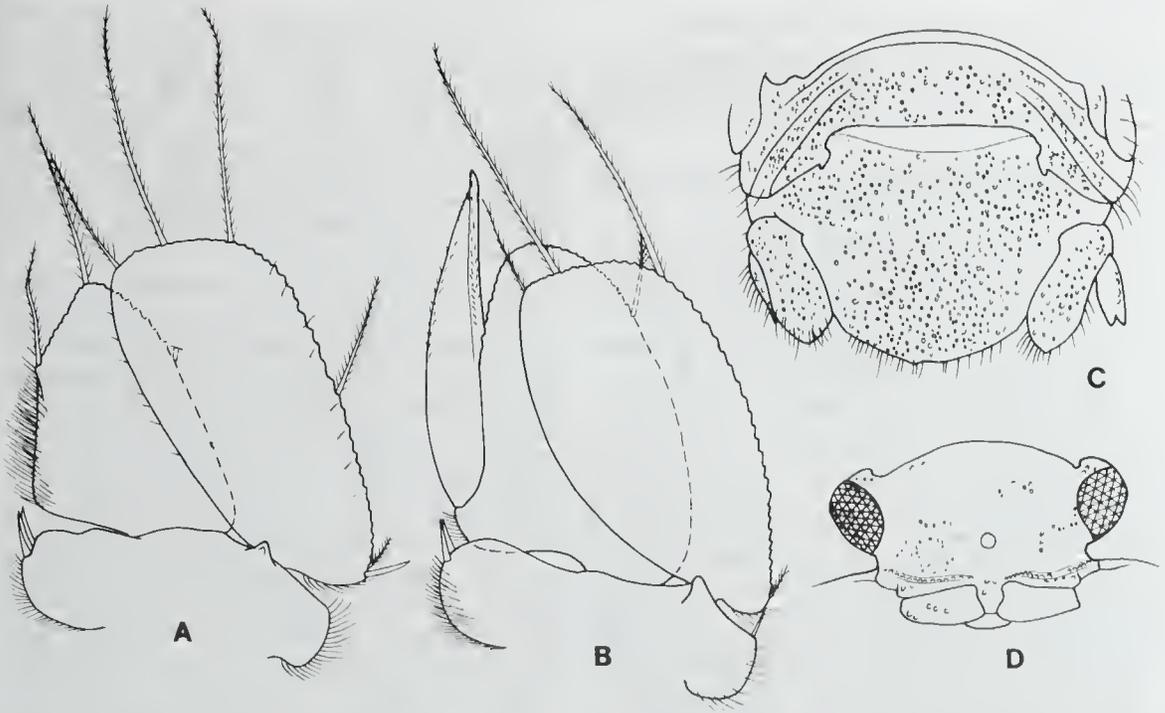


Figure 39. *Oxinasphaera thetisae* sp. nov. A, B, ♂ 9.5 mm, C, D, non-ovigerous ♀ 8.5 (AM G2194). A, pleopod 1; B, Pleopod 2; C, female, pleon and pleotelson; D, female, cephalon, anterior view.

Epistome with single prominent short flat truncate spike.

Pereopods similar to those of others of the group (heavily encrusted, not observed in detail).

Penial processes each about 2.5–3 times as long as basal width, medial margin angling laterally a little beyond midpoint, lateral margin straight, curving medially just before apex; proximalateral margins weakly sealed.

Pleopod 1 endopod two-thirds as long as exopod, proximal margin densely setulose, distal part angle abruptly to medial. Pleopod 2 appendix masculina lateral margin smoothly curved, medial margin straight, articulating subbasally, 5.5 times as long as maximum width, tapering from about mid-length, longer (1.06) than endopod, extending beyond endopod by 0.2 of its length, apex narrow, truncate. Uropod exopod about half as long as endopod, apex deeply bifid with lateral process prominent; endopod about 2.6 times as long as wide, densely granular, apex with 1 prominent and 2 smaller spikes.

Female. The single non-ovigerous female is distinctive in having the dorsal surfaces granular. The posterior margin of the pleotelson is entire.

Colour. Colour has faded from these nearly 100 year old specimens.

Size. Males 9.0–11.5 mm.

Remarks. The identity of Whitelegge's (1902) specimens has always been uncertain, and the material examined here is not identified in the Australian Museum collection as having been identified by Whitelegge, but by Baker as *Cymodoce tuberculata* Stebbing, 1873, presumably a lapsus. Nonetheless, the description given by Whitelegge, particularly of the first antennules and of the size of his specimens, suggests that the present material and Whitelegge's are the one species.

The species is distinctive within the genus in its large size, strongly developed granularity of the cephalon and pereonite 1, single flat truncate epistomal spike, the robustness of the large pleonal and pleotelson spikes and the irregular antennular spikes. Only *Oxinasphaera lowryi* has a single epistomal spike, but the two species are otherwise dissimilar in appearance, the antennular, pleonal and pleotelson characteristics being widely different.

Distribution. Two stations to the south of Sydney, NSW, circa 34°S, at depths between 39 and 89 m.

Hosts. No host recorded for this species.

Etymology. Named after the research vessel from which the specimens were collected, the HMCS *Thetis*.

Oxinasphaera bispinosa (Baker, 1910) comb. nov.

Figures 40–44

Cymodoce tuberculosa. — Baker, 1908: 140, pl. 3 figs 12–15 (non *Cymodoce tuberculosa* Stebbing, 1873).

Cymodoce tuberculosa n. var. *bispinosa* Baker, 1910: 78, pl. 21 figs 21–23, pl. 22 figs 1–7 (part, see comments under 'types') [= *O. bispinosa* (Baker, 1910)].

Material examined. Syntypes (presumed), 3♂ (7.5, 7.0 [head off], 7.0 [in 2 pieces] mm), ♀ (ovig 7.5 mm). "South Australia" (SAM C372).

Non-type material. Tas. 400+ ♂ and ♀, subsampled 16♂ (7.0–9.5 mm, mean = 8.2 mm [8.0 SEM, 7.8 SEM dissected]), 3♂ (imm 6.0, 6.5, 7.5 mm), 14 ♀ (ovig 6.8, 7.5, 7.7, 8.5 mm, 10 non-ovig 6.0–8.0 mm, mean = 6.9 mm), 28 km E of Cape Farewell, King Is., 39°32.8'S, 144°16.0'E, 1 Nov 1980, 18 m, fine sand, M.F. Gomon and G.C.B. Poore on FV *Sarda* (NMV J26414, 10♂, 10♀ ZMUC CRU1392), 3♂ (6.5, 8.0, 8.5 mm), 47 km E of Cape Rochon. Three Hummock Is., 40°23.8'S, 145°32.0'E, 3 Nov 1980, 66 m, muddy sand, M.F. Gomon and G.C.B. Poore (NMV J26300), 2♂ (7.0, 7.5 mm), 32 km NW of Devonport, 40°56.04'S, 146°39.00'E, 4 Feb 1980, 66 m, muddy sand, M. Gomon and G.C.B. Poore (NMV J26298), 4♂ (6.9, 6.6, 6.3, 5.4 mm), 7♀ (ovig 6.6, 6.3, 6.0, non-ovig 6.6, 6.3, 6.1, 5.7 mm), Isthmus Bay, Bruny Is., 13 Aug 1984, from sponge, J.R. Penprase (TM G2815), 2♂ (7.8, 6.6 mm), ♀ (non-ovig 5.4 mm), near Partridge Is., D'Entrecasteaux Channel, 22 Jul 1957, off sponge on *Mimachlamys asperriximus*, vessel *Te Rapunga* (TM 16682/8445).

Vic. 3♂ (7.0, 7.8, imm 6.2 mm), 82 km SW of Cape Liptrap, 39°06.83'S, 144°49.64'E, 11 Feb 1981, 65 m, medium sand, M.F. Gomon and G.C.B. Poore (NMV J26286).

Additional material. Tas. 200+ ♂ and ♀, 35 km E of Cape Farewell, King Is., 39°39.2'S, 144°21.0'E, 1 Nov 1980, 27 m, fine sand, M. Gomon and G.C.B. Poore on FV *Sarda* (NMV J26415), 2♂, 22♀ and manca (possibly mixed species), 35 km N of Cape Wickham, King Is., 39°13.6'S, 143°55.6'E, 23 Nov 1981, 85 m, fine sand, R. Wilson (NMV J26305), 3♂, 2 ovig♀, 59 non ovig ♀ and imm ♂, 5 km N of North Point, 40°40.3'S, 145°15.0'E, 4 Nov 1980, 33 m, medium shell, M.F. Gomon and G.C.B. Poore (NMV J26255), 3♂ (1 imm), 39 km NNE of Devonport, 40°49.75'S, 146°31.33'E, 4 Feb 1980, 68 m, mud with bryozoa and sponges, M. Gomon, G.C.B. Poore and C.C. Lu (NMV J40492), 6♂ (3 imm), 11♀ (2 ovig), 2.5 km SE of Birches Bay, D'Entrecasteaux Channel, 43°11.00'S, 147°16.00'E, 16 Apr 1985, 10 m, R.S. Wilson (NMV J40479).

Australian Museum Old Collections. 3♂, NSW, from a sponge [det. as *C. tuberculosa* by Baker, 1926] (AM P9554), 7♂, 8♀, between Merimbula and Tathra, NSW,

18 Jul 1925, 73 m, taken from sponge, W. Boardman on trawler *Bar-Ea-Mul* [det. as *C. tuberculosa* by Baker, 1926] (AM P9564), ♂, Oyster Bay, Tasmania, 42°40'S, 148°03'E, sorted from a bottle of weed washings, FIS *Endeavour* Expedition 1909–14 (AM E6610), ♂, eastern slope Bass Strait, 6 Sep 1930, *Endeavour* (AM E6753), ♂, 16 km N of Circular Head, Tasmania, FIS *Endeavour* Expedition 1909–14 (AM E6739), ♂, Spencer Gulf, South Australia, 29 m, FIS *Endeavour* Expedition 1909–14 (AM E6770).

Types. The locality was given by Baker (1910) only as "South Australian coast", and I have not been able to identify with absolute certainty the specimens mentioned by Baker, which would be the syntypes of this species. The South Australian Museum has two samples determined by Baker as *Cymodoce tuberculosa* var. *bispinosa*. One of these (SAM C372, labelled "syntypes") contains three males and an ovigerous female of *O. bispinosa*. The other (SAM C371, also labelled "syntypes") contains two specimens of *Cymodoce tuberculosa* Stebbing, 1873 and two specimens of a large species of uncertain generic disposition. Another sample exists (SAM C369) which is identified as *Cymodoce tuberculosa*, but these five females do not appear to be *Cymodoce tuberculosa*, and furthermore are not a species of *Oxinasphaera*, and appear most similar to the genus *Neosphaeroma* Baker, 1926. Baker (1910) unfortunately failed to make clear on which specimens he was basing his description, and the sample SAM C372 is here taken to be the presumed syntypes. Owing to the uncertain type status of SAM C372, a lectotype has not been selected.

Description of male (based on material from Cape Farewell, Tasmania, NMV J26414). Cephalon with dorsal median nodule; anterior margin without nodules; with prominent bifurcate rostral point. Pereonite 1 with obscure longitudinal grooves on lateral surfaces, otherwise without tubercles or ornamentation. Pereonites 2 and 3 each with 2 transverse rows of distinct low spikes, pereonites 4–7 each with 2 transverse rows of prominent acute spikes, anterior row larger than posterior row on 4 and 7, subequal on 5 and 6; coxae 5 and 7 with posterior margins evenly rounded, coxae of pereonite 6 posteriorly straight. Pleon posterior boss with 2 submedian prominent processes extending posteriorly over pleotelson, proximally well separated, pleon otherwise without prominent spikes. Pleotelson with 2 prominent spikes opposing those of pleon, posterior margin with two prominent submedian indentations either side of median lobe.

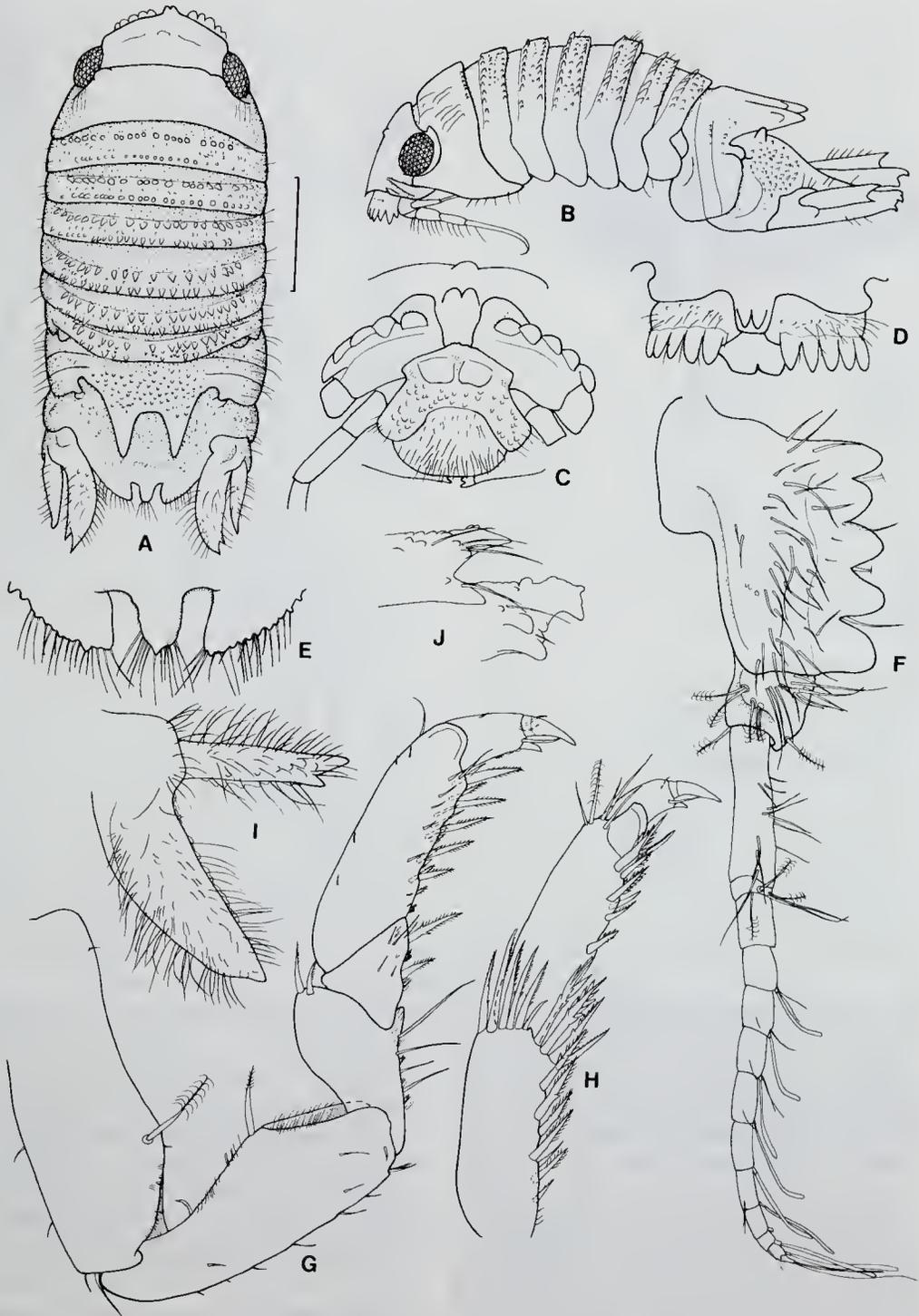


Figure 40. *Oxinasphaera bispinosa* (Baker), ♂ 8.5 mm (NMV J26414). A, dorsal view; B, lateral view; C, frons; D, antennules, anterior view; E, pleotelson apex; F, antennule; G, pereopod 1; H, pereopod 7, distal articles; I, uropod; J, uropod apices, lateral view. Scale 2.0 mm.

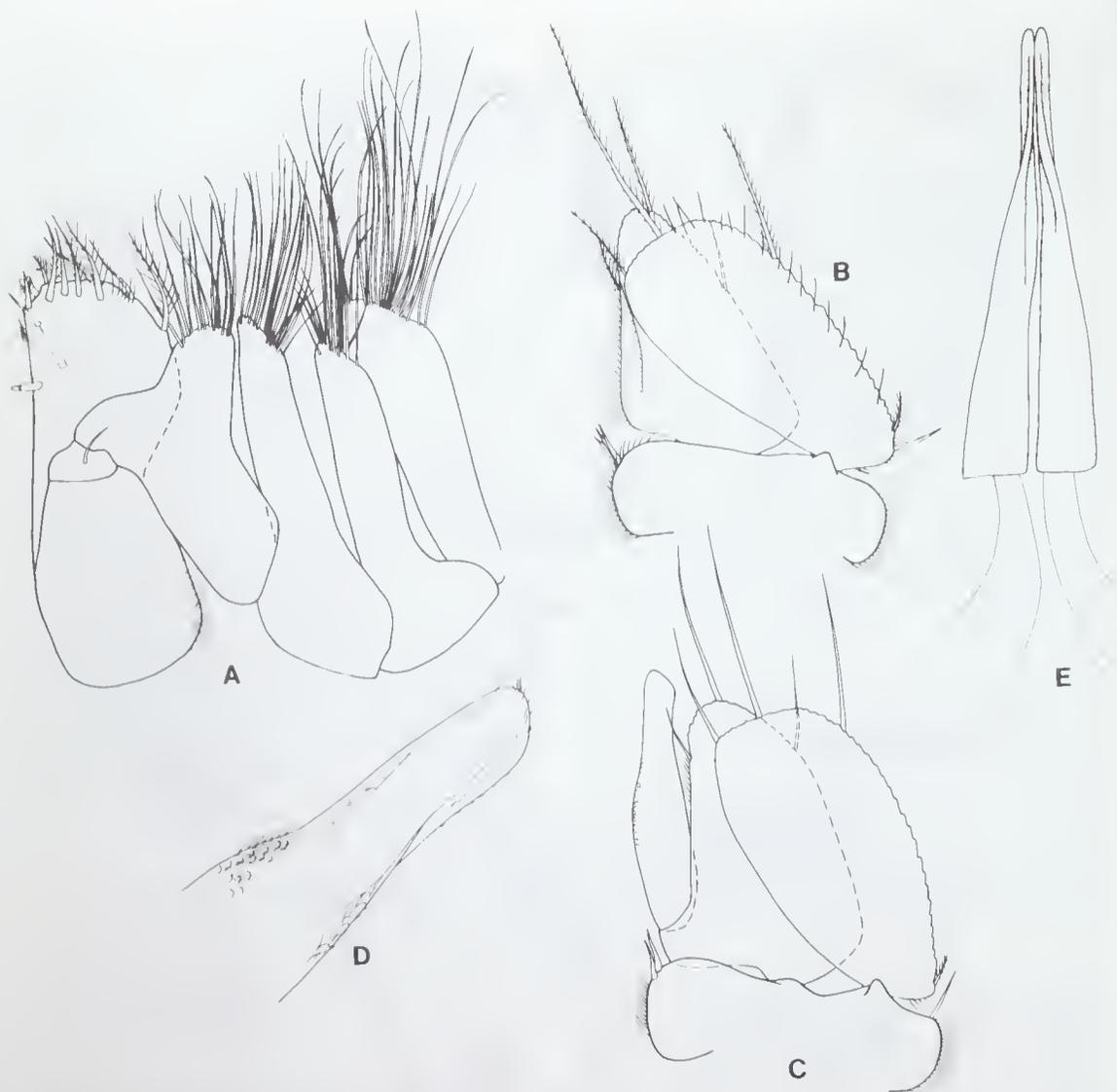


Figure 41. *Oxinasphacra bispinosa* (Baker). ♂ 8.5 mm (NMV J26414). A, maxilliped; B, pleopod 1; C, pleopod 2; D, appendix masculina apex; E, penes.

Antennule peduncle article 1 with 5 broadly rounded anterior spikes; without posterior spikes; flagellum with 12 articles.

Epistome with 2 prominent narrowly separated flat distally truncate spikes. Mandible molar process distal margin deeply indented.

Pereopod 1 basis about 2.6 times as long as wide, anterior margin with 1 sensory setae; ischium about 0.9 times as long as basis, about 2.7 times as long as wide, anterior margin with 1 short proximal spines and 1 distal longer and biserrate spine; merus about 0.4 times as long as ischium, about 1.2 times as long as wide, ante-

rolateral angle with 2 gently curving pectinate spines, posterior margin with 4 long setae; carpus short, about 0.4 times as long as merus, about 1.3 times as long as wide, posterior margin with 2 biserrate spines; propodus about 0.8 times as long as ischium, widest proximally, about 3.2 times as long as wide, posterior margin with distinct scale spikes and 5 large biserrate spines, row of 9 smaller biserrate spines on medial margin; dactylus about 0.4 length of propodus, unguis about 47% length of entire dactylus. Pereopod 7 carpus about 2.3 times as long as wide, posterior margin with 6 biserrate spines, 3

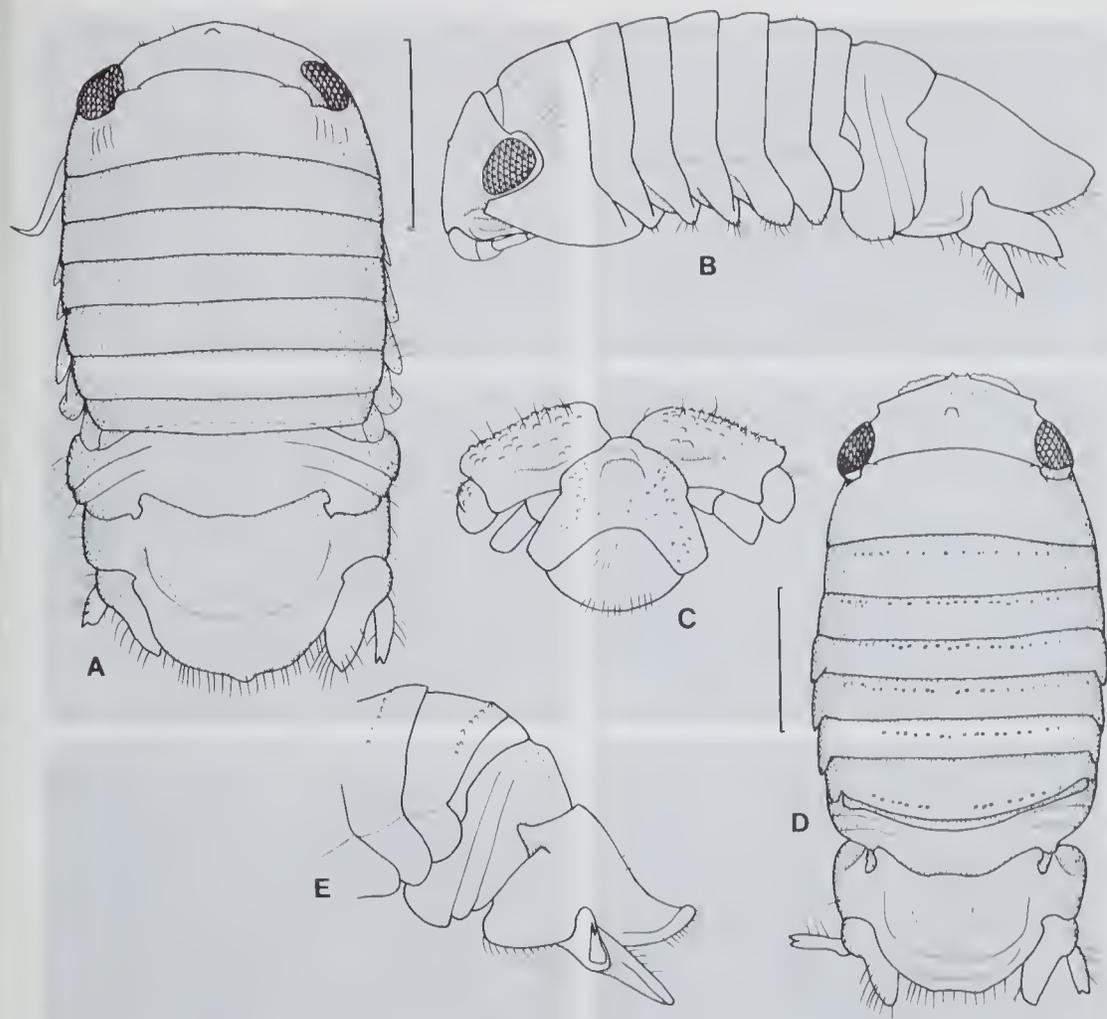


Figure 42. *Oxinasphaera hispinosa* (Baker), A-C, non-ovigerous ♀, 7.0 mm, D, E ovigerous ♀, 8.5 mm. A, dorsal view; B, lateral view; C, frons; D, dorsal view; E, pleon and pleotelson, lateral view. Scale 2.0 mm.

biserrate spines on posteromedial margin, distal margin with 2 large trifold spines and 6 biserrate spines; propodus about 1.2 times as long as carpus and about 2.6 times as long as wide, posterior margin with 7 biserrate spines, anterodistal angle with 4 simple and 1 sensory setae.

Penial processes each about 6.7 times as long as basal width, tapering to an elongate narrowly rounded apex, extending to pleopod rami; distal one third of penial process with plane twisted 90° to proximal part; proximolateral margin with scale spikes.

Pleopod 1 exopod with ventral lateral submarginal groove. Pleopod 2 appendix masculina basal two thirds swollen, distal third narrow, 4.3 times as long as maximum width, apex bluntly

truncated. Uropod dorsally nodular, covered with roughened setae; exopod about 4.6 times as long as proximal width, about 0.6 times as long as endopod, apex deeply bifid with lateral process prominent; endopod about 3.7 times as long as wide, apex with prominent point and, in lateral view, 2 prominent downwardly projecting spikes.

Ovigerous Female. Cephalon with median dorsal tubercle; pereonites 2-7 each with single row of indistinct low tubercles; pleon smooth, without nodules or domes; pleotelson posterior margin with wide median excavation.

Non-ovigerous Female. Cephalon with median dorsal tubercle. Body smooth, finely granular,

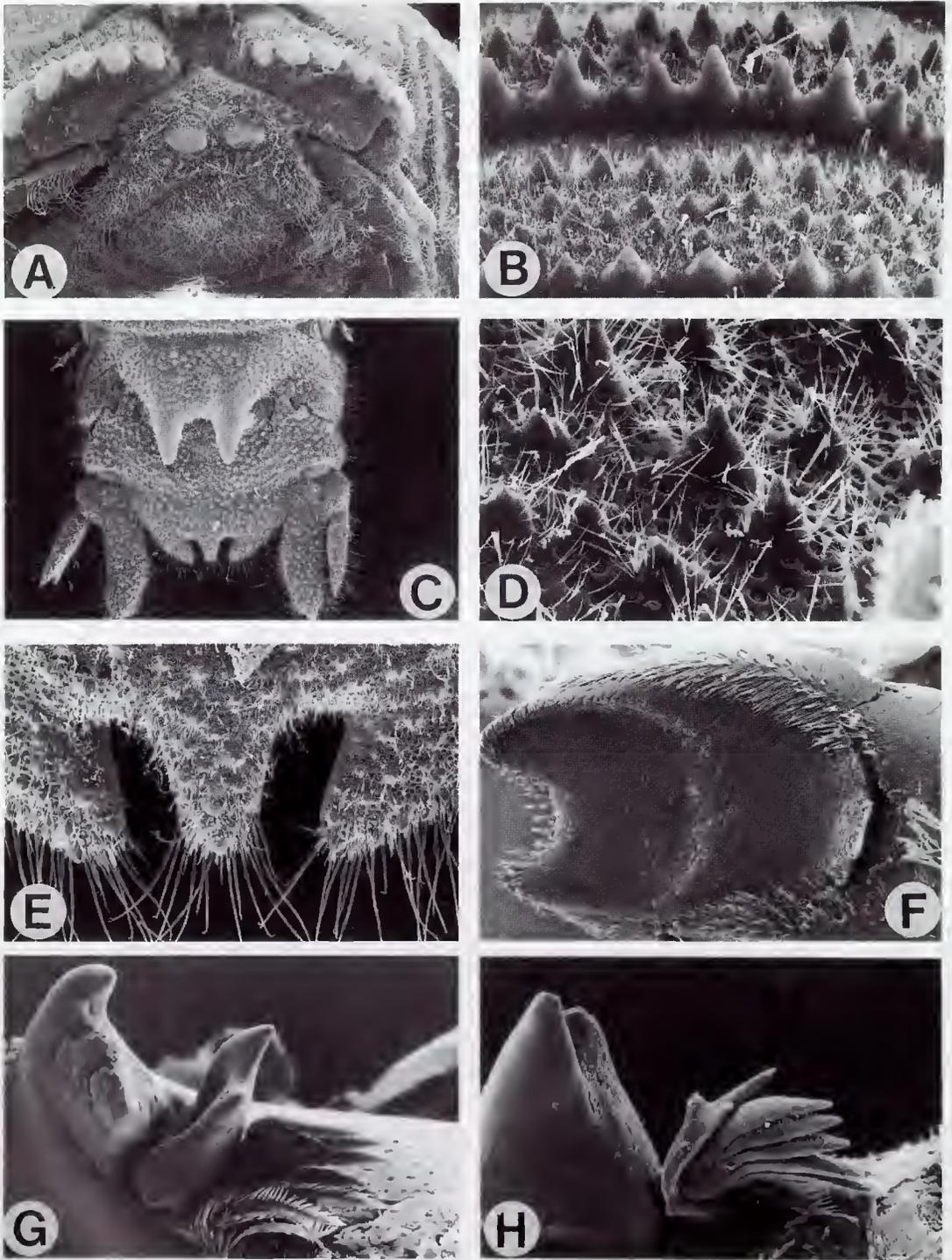


Figure 43. *Oxinasphaera bispinosa* (Baker), SEMs. A-E ♂ 7.8 mm, G, H, ♂ 7.5 mm (NMV J26414). A, frons ($\times 65$); B, spike rows, pereonites 5 and 6 ($\times 110$); C, pleon and pleotelson ($\times 22$); D, pleotelson, tubercles and pits ($\times 400$); E, pleotelson apex ($\times 130$); F, molar process ($\times 300$); G, left mandible, incisor, laeina mobilis and spine ($\times 430$); H, right mandible, incisor and spine row ($\times 500$).

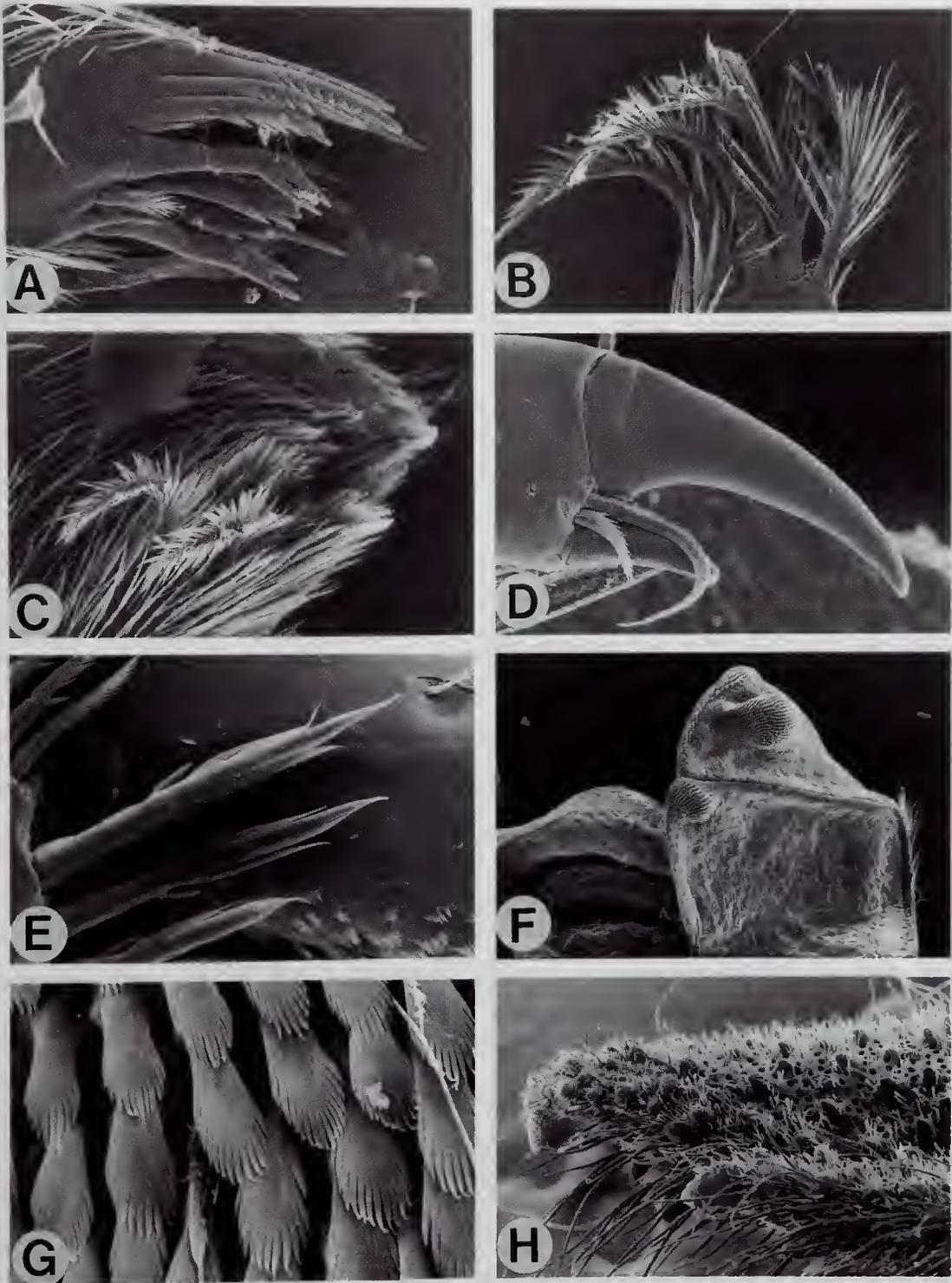


Figure 44. *Oxinasphaera bispinosa* (Baker), SEMs. ♂ 7.5 mm (NMV J26414). A, maxillule, lateral lobe ($\times 500$); B, maxillule, medial lobe ($\times 430$); C, maxilliped endite, dorsal surface showing serrate spines ($\times 430$); D, pereopod 1, unguis, distal spine and setae ($\times 650$); E, pereopod 7, trifold spines on carpus ($\times 450$); F, pleopod 5 ($\times 150$); G, scale from scale lobe, pleopod 5 ($\times 3000$); H, uropod, distal ends of rami ($\times 170$).

unornamented. Epistome with rudimentary undivided flat spike,

Colour. Pale yellow ground colour, usually without chromatophores. Cuticle usually opaque.

Size. Males 5.4–9.5 mm, immature males 6.0–7.5 mm, females 5.7–8.0 mm, ovigerous females 6.0–8.5 mm.

Remarks. The lack of material from further west than the east Victorian coast, and the evident south-eastern distribution of the recent records, suggests that Baker's data may be incorrect. As there is no fresh or recent material from the South Australia coast, the redescription is here based on the large sample of specimens from off Tasmania's northern coast (NMV J26414).

Oxinasphaera bispinosa is one of the most easily recognised species of the genus, and is the only Australian species with prominent pleonal processes. It is further distinguished by the elongate penial processes and bottle-shaped appendix masculina. It shares all of these characters with *Oxinasphaera tripartita* from Papua New Guinea and the Philippines and *Oxinasphaera kensleyi* sp. nov., from South Africa. It can be separated from those two species by the different shape of the processes, the regular antennular spikes and by lacking a large prominent pleotelsonic lobe overriding the pleotelsonic apex.

Distribution. All recent material is from around Tasmania and the Bass Strait, from about 39° to 43°S and westwards to 147°E, at depths between 18 and 85 metres. Substrata recorded are fine sand, and medium shell. Old material includes one lot from Spencer Gulf, S.A., collected by F.I.S. *Endavour* in 1909–1914, and one sample taken off the coast between Tathra and Merimbula, NSW, in 1925.

Hosts. Some records are from sponges, none identified.

Etymology. The epithet given by Baker presumably alludes to the prominent pleonal processes.

Oxinasphaera tripartita
(Richardson, 1910) comb. nov.

Figures 45–47

Cymodoce tripartita Richardson, 1910: 29, fig. 27.

Non *Cymodoce tuberculosa tripartita*. — Barnard, 1920: 363 pl. 15 fig. 28. — Barnard, 1940: 504. — Nierstrasz, 1931: 200. — Kensley, 1978: 100, fig. 42C (= *Oxinasphaera kensleyi* sp. nov.).

Material examined. Syntype. ♂ (3.4), Jolo Jolo, Philippines, 11 Feb 1908, from interior of a pearl oyster (USNM 40919) [See 'Remarks'].

Non-type material. 4♂ (3.4, 3.3, 3.3, 3.2 mm), 5♀ (2.3, 2.6, 2.6, 2.7, 2.8, 2.8 mm), between Kranket Is and Paenwai Is, Madang, Papua New Guinea, 5°11.2'S, 145°50.9'E, 22 May 1989, 20 m, from sponge, N.L. Bruce and M. Jebb (ZMUC CRU1393).

Description of male (based on Madang specimens). Body about twice as long as wide, cuticle clear. Cephalon anterior half irregularly and finely nodulose; anterior margin without nodules; with very weak obscure bifurcate rostral spike. Pereonite 1 unornamented. Pereonites 2 and 3 each with 2 transverse rows of distinct low spikes, pereonites 4–7 each with 2 transverse rows of prominent acute spikes, anterior row larger than posterior row on 4 and 5, posterior row largest on pereonite 7; coxae 5 and 6 posterior margins straight, those of pereonite 7 posteriorly rounded. Pleon posterior boss, with 2 submedian prominent processes extending posteriorly over pleotelson, medial separating margin concave. Pleotelson dorsal surfaces conspicuously granular; with 2 prominent spikes opposing those of pleon; lateral flange with 1 prominent spike; posterior margin with prominent posteriorly rounded lobe overlying telsonic excision and extending posterior to submedian indentations.

Antennule peduncle article 1 with 7–8 irregular anterior spikes and posteromedial blade; flagellum with 4 articles.

Epistome without distinct spikes, with indistinct transverse blade armed with irregular small tubercles.

Pereopod 1 basis about 3 times as long as wide, anterior margin with 2 sensory setae; ischium 0.7 times as long as basis, 2.6 times as long as wide, anterior margin with 1 short proximal spine and 1 distal longer and biserrate spine; merus about 0.4 times as long as ischium, about 1.3 times as long as wide, anterolateral angle with 1 gently curving pectinate spine, posterior margin with 1 long seta; carpus short, about 0.8 times as long as merus, about 1.3 times as long as wide, posterior margin with 2 biserrate spines; propodus about 0.8 times as long as ischium, widest proximally, about 2.8 times as long as wide, posterior margin with distinct scale spikes and 4 large biserrate spines, row of 3 smaller biserrate spines on medial margin; dactylus about 0.5 length of propodus, unguis about

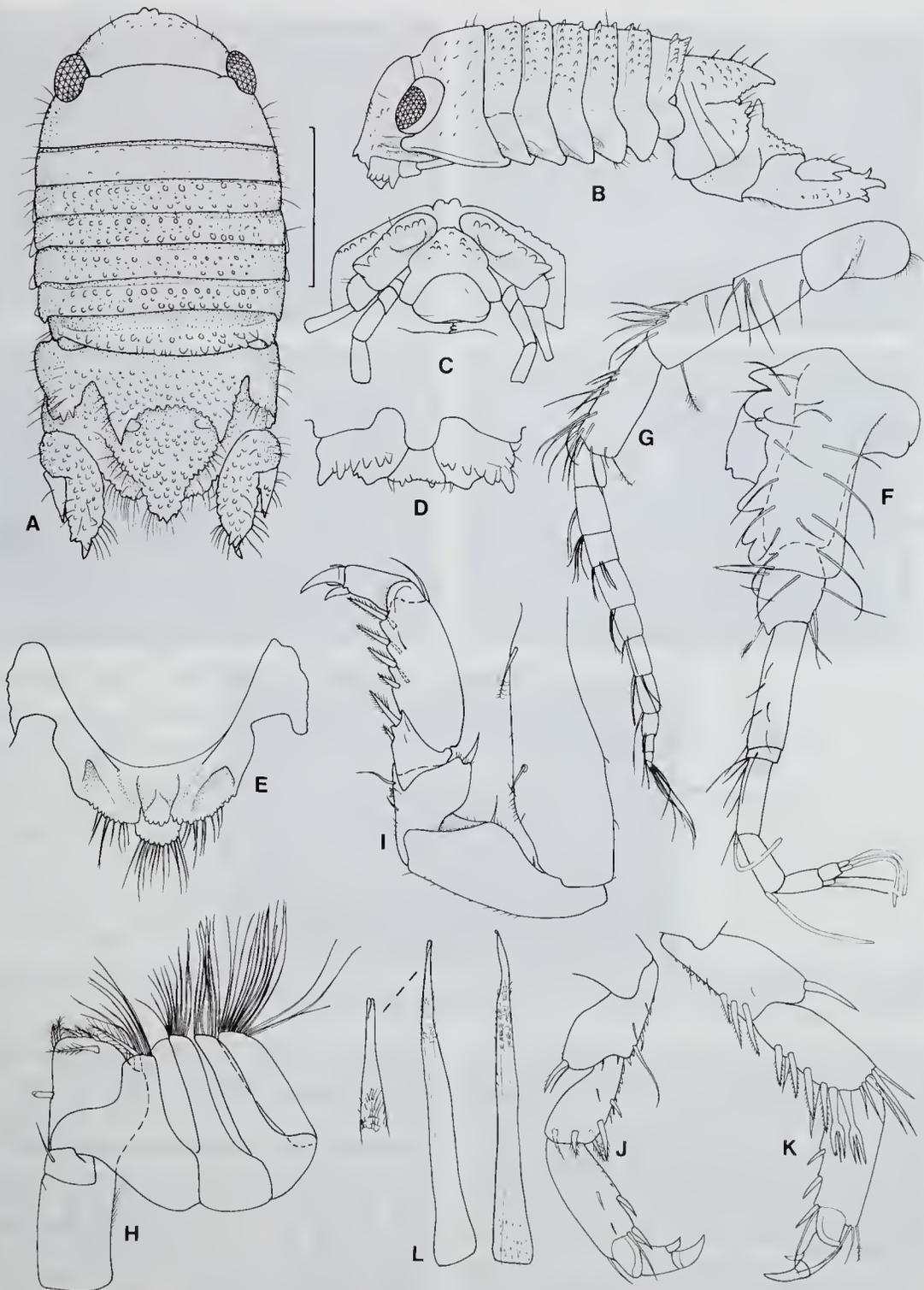


Figure 45. *Oxinasphaera tripartita* (Richardson). A-E ♂ 3.3 mm, remainder ♂ 3.2 mm (ZMUC CRU1393). A, dorsal view; B, lateral view; C, frons; D, antennules, anterior view, in situ; E, pleon, ventral view; F, antennule; G, antenna; H, maxilliped; I, pereopod 1; J, pereopod 2, distal articles; K, pereopod 7, distal articles; L, penes. Scale 1.0 mm.

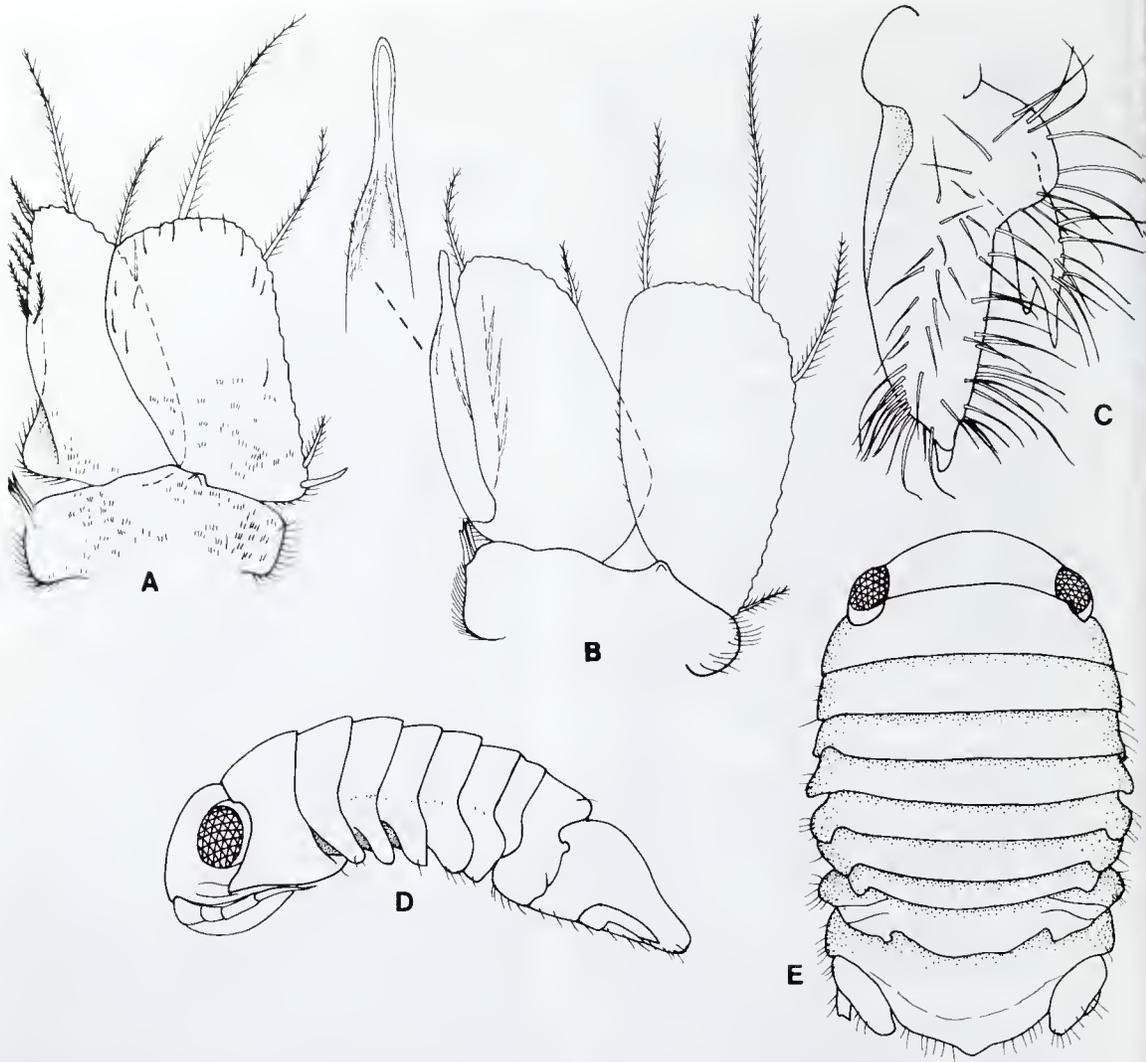


Figure 46. *Oxinasphaera tripartita* (Richardson). A-C ♂ 3.2 mm, D, E non-ovigerous ♀ 2.8 mm (ZMUC CRU1393). A, pleopod 1; B, pleopod 2; C, uropod; D, lateral view; E, dorsal view.

52% length of entire dactylus. Pereopod 7 carpus about 2.3 times as long as wide, posterior margin with 4 biserrate spines and 2 weakly biserrate spines, distal margin with 2 large trifid spines and 5 simple or very weakly biserrate spines; propodus 1.3 times as long as carpus and 3.1 times as long as wide, posterior margin with 3 spines, anterodistal angle with 2 simple and 1 sensory setae.

Penial processes each about 7.5 times as long as basal width, tapering to an elongate slender apex, extending to pleopod rami; proximolateral margin with scale spikes, distal margin with scale setules.

Pleopod 1 exopod with ventral lateral submarginal groove. Pleopod 2 appendix masculina basal four-fifths swollen, distal fifth narrow, apex obliquely truncated, 7.3 times as long as maximum width. Uropod not distinctly nodular, setae smooth; exopod 4.2 times as long as proximal width, about half as long as endopod, apex deeply bifid with lateral process prominent; endopod 3.2 times as long as wide, apex with prominent point and 1 prominent downwardly projecting spike.

Female. Pleon and pleotelson without distinct domes; posterior margin of pleotelson with apical triangular protrusion.

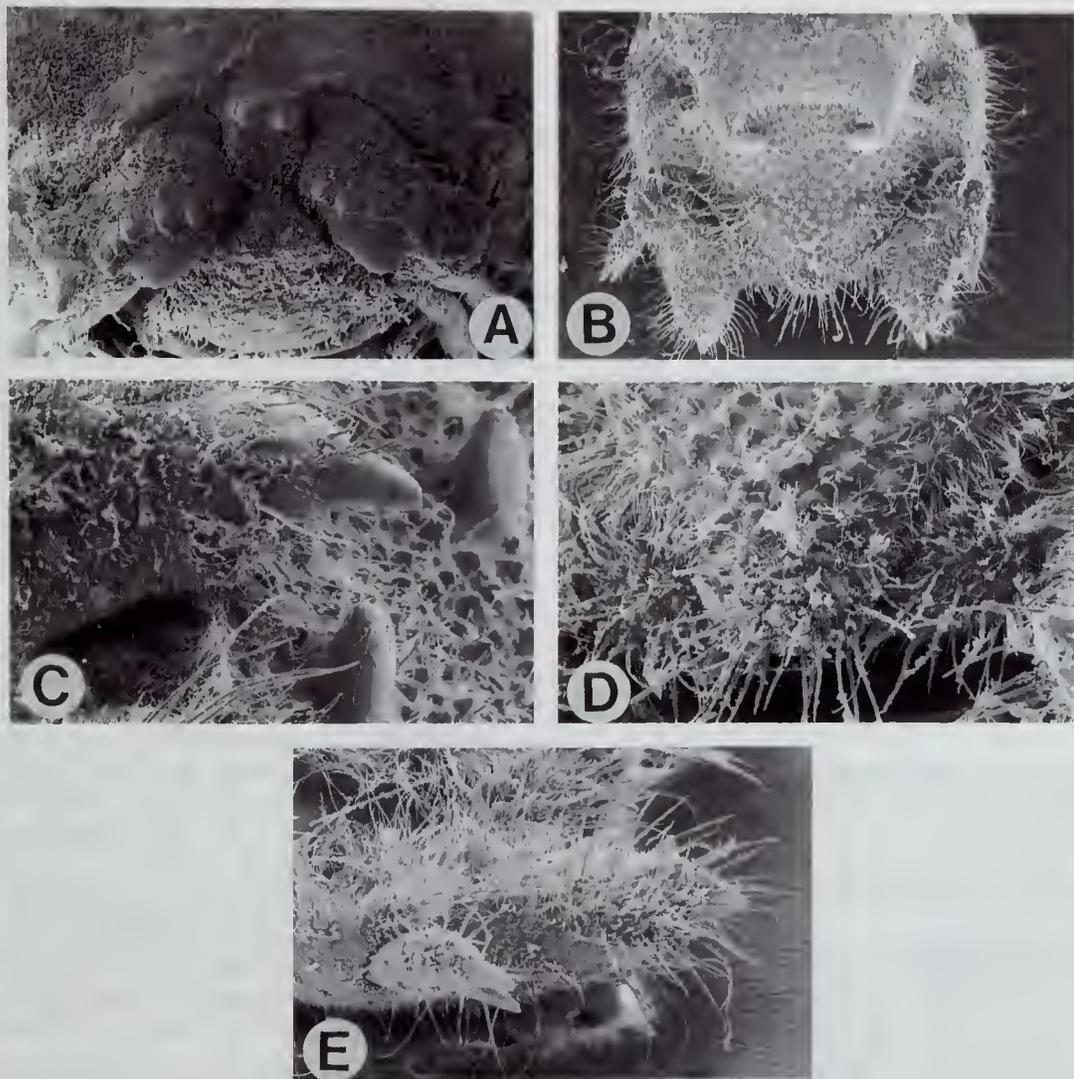


Figure 47. *Oxinasphaera tripartita* (Richardson). SEMs. ♂ 3.3 mm (ZMUC CRU1393). A, frons ($\times 130$); B, pleon and pleotelson ($\times 55$); C, pleonal and pleotelson spikes, lateral view ($\times 190$); D, pleotelson apex ($\times 100$); E, uropod rami ($\times 130$).

Colour. Pale yellow ground colour, with abundant dark brown chromatophores. Cuticle usually clear.

Size. Males 3.2–3.4 mm, females 2.3–2.8 mm.

Remarks. Richardson (1910) recorded two male and two female syntypes. The present type material consists only of one male. This male is labelled lectotype, but I am unaware of any publication of a lectotype designation, and the specimen is here regarded as a syntype. Richardson recorded this specimen as having been collected from the interior of a pearl oyster, but the vial in which the specimen is contained was found, on

examination, to be full of sponge spicules, suggesting that the actual habitat is in sponges.

Two species of *Oxinasphaera*, *O. tripartita* and *O. kensleyi* have a posterodorsal lobe on the posterior margin of the pleotelson in conjunction with antennular peduncle article 1 having an irregular row of anterior spikes and a posteromedial blade. Both species have in addition prominent posteriorly directed processes on the pleon, a character shared with the otherwise dissimilar *O. hispinosa*. *O. tripartita* can be distinguished from *O. kensleyi* by having pereonites 2 and 3 weakly ornamented, the pereonal

spikes of all pereonites being less strongly developed than those of *O. kensleyi*, by having weaker antennular spikes, a wider posterior antennular blade, and the penes and appendix masculina being straight rather than sinuate.

Distribution. Jolo, Philippines and Madang, Papua New Guinea.

Hosts. The specimens from Madang, were collected directly from a sponge, probably a species of *Cribrochalia*.

Etymology. The epithet given by Richardson presumably alludes to the prominent pleonal processes.

Oxinasphaera kensleyi sp. nov.

Figures 48, 49

Cymodoce tuberculosa tripartita. — Barnard, 1920: 363, pl. 15 fig. 28. — Barnard, 1940: 504. — Nierszasz, 1931: 200. — Kensley, 1978: 100, fig. 42C.

Cymodoce tuberculosa-Kensley, 1984: 216.

Non *Cymodoce tuberculosa* Stebbing, 1873: 96, pl. 3 figs 1, 1b.

Non *Cymodoce tripartita* Richardson, 1910: 29, fig. 27.

Material examined. Holotype, ♂ (4.3 mm), off East London, South Africa, 33°04.6'S, 28°06.6'E, 26 May 1978, 90 m, stn 163, R.V. *Meiring Naude* (SAFM A41309).

Paratypes, 5♂ (3.9, 4.0 [dissected], 4.1, 4.2, 4.5 mm), same data as holotype (SAFM A19308).

Description of male. Cephalon anterior half irregularly and finely nodulose, with low median tubercle; anterior margin with row of small close-set nodules; with weak obscure bifurcate rostral spike. Pereonite 1 with anterior submarginal transverse row of small tubercles. Pereonites 2-7 each with 2 transverse rows of acute spikes, those of pereonites 2-4 being somewhat rounded, anterior row larger than posterior row; coxae 5-7 posterior margins rounded. Pleon posterior boss with 2 submedian prominent processes extending posteriorly over pleotelson, each process with prominent proximal ventral spike, medial separating margin straight. Pleotelson dorsal surfaces conspicuously granular; with 2 prominent bluntly rounded spikes opposing those of pleon; lateral flange weakly developed, with 1 prominent spike; posterior margin with prominent posteriorly acute lobe overlying telsonic excision and extending posterior to submedian indentations.

Antennule peduncle article 1 with 5 irregular anterior spikes, distal most being most promi-

nent, with distally truncate posteromedial blade; flagellum with 6 articles.

Epistome without distinct spikes, with indistinct transverse blade armed with irregular small tubercles.

Pereopod generally similar to those of *O. tripartita*.

Penial processes 7.2 times as long as basal width, tapering to an elongate slender acute apex, extending to pleopod rami; proximolateral margin with scale spikes, distal medial margin with scale setules.

Pleopod 1 exopod with ventral lateral submarginal groove. Pleopod 2 appendix masculina sinuate, tapering to narrow bluntly rounded apex, 6.8 times as long as maximum width. Uropod nodular, with abundant setae; exopod 4.2 times as long as proximal width, about half as long as endopod, apex deeply bifid with lateral process prominent; endopod 3.5 times as long as wide, apex with prominent terminal spike.

Female. No females examined.

Colour. Pale yellow ground colour, chromatophores not apparent in preserved specimens.

Size. Males 3.2-3.4 mm, females 2.3-2.8 mm.

Remarks. This is currently the only species of the genus known from the Western Indian Ocean, and cannot be confused with any other sphaeromatids in the region (but see undescribed species). The only similar species is *Oxinasphaera tripartita*, a species known from Papua New Guinea and the Philippines, and *O. kensleyi* can be separated from that species by the far more prominent pereonal spikes and the sinuate penes and appendix masculina. Other differences are given in the 'Remarks' for *Oxinasphaera tripartita*.

The material examined here is that of Kensley (1984) which was incorrectly attributed to Richardson's species.

Distribution. Indian Ocean, off Durban [c. 30°S] (Barnard 1920) and East London, South Africa; from c. 65 to 90 m.

Hosts. Barnard (1920) reported on the specimens that he examined: "in each case from siliceous sponges."

Etymology. The name is in recognition of Dr Brian Kensley's contributions to knowledge of the isopods and Crustacea of South Africa.

Oxinasphaera australis Baker, comb. nov.

Figures 50, 51

Cymodoce multidens var. *australis* Baker, 1929: 52, pl. 1 figs 4-6 [Non *Oxinasphaera multidens* (Richardson, 1910)].

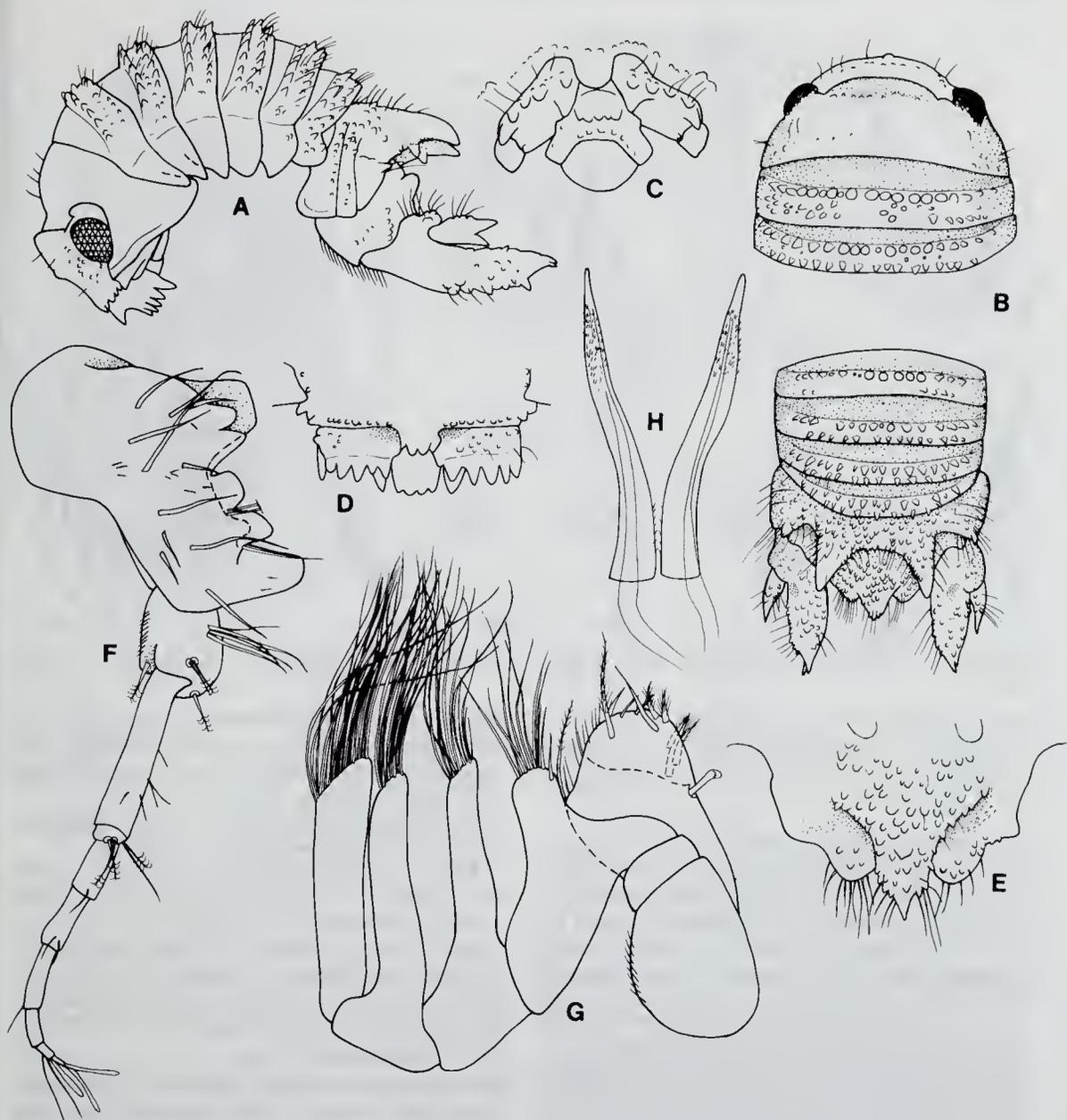


Figure 48. *Oxinasphaera kensleyi* sp. nov. A-D, holotype, E, ♂ 4.2 mm, F-G, ♂ 4.0 mm (SAFM A19308). A, lateral view; B, dorsal view (in two parts); C, frons; D, antennules, anterior view; E, pleotelson apex; F, antennule; G, maxilliped; H, penes. Scale 1.0 mm.

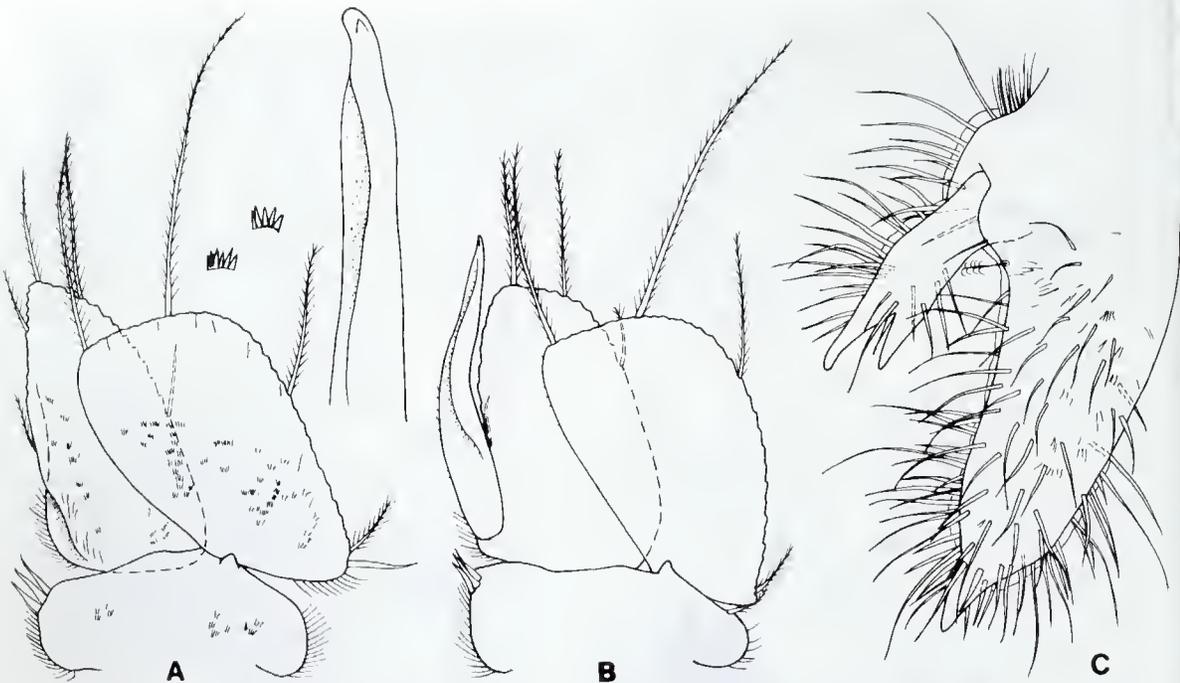


Figure 49. *Oxinasphaera kensleyi* sp. nov. ♂ 4.0 mm (SAfM A19308). A, pleopod 1; B, pleopod 2; C, uropod.

Material examined. Syntypes. 6♂ (5.7–6.6 mm, mean = 6.1 mm), 15♀ (ovig 8.4 [in 2 pieces], 10.2, non-ovig 7.5–9.3 mm, mean = 8.4 mm), Cottesloe, Perth, WA, no other data, L.G. Glauert (WAM 10385, 10484).

Description of male. Body about 2.2 times as long as wide. Cephalon anterior margin with 8–9 nodules, anterior median and 2 submedian nodules being prominent and elongate giving a tricornate appearance; with very weak obscure simple rostral spike. Pereonite 1 unornamented. Pereonites 2–7 granular, each with 2 transverse rows of small low spikes, pereonite 1 with distinct anteromedial tubercle; coxae 5 and 6 posterior margins convex, with distinct posterior join to ventral margin, those of pereonite 7 entirely rounded posteriorly. Plcon without posterior boss, with 2 submedian clusters of tubercles; lateral flange with row of 3–5 spikes. Pleotelson dorsal surfaces granular; without prominent spikes; posterior margin somewhat flattened and produced, with 2 submedian triangular excisions.

Antennule peduncle article 1 with 8–9 irregular anterior spikes and 2 posteromedial spikes.

Epistome with 3 small distinct spikes, surface with numerous small granular tubercles.

Pereopod 1 propodus about 2.6 times as long as wide, posterior margin with distinct scale

spikes and 6 large biserrate spines, row of 5 smaller biserrate spines on medial margin; dactylus about 0.4 length of propodus, unguis about 50% length of entire dactylus.

Penial processes examined *in situ*, generally similar to *O. bisubula* and *O. copiapoa*.

Pleopod 2 appendix masculina about as long as endopod, 6.4 times as long as maximum width, extending beyond endopod by 0.2 of its length, distally acuminate, recurved apex acute. Uropod not distinctly nodular, ventral margins of both rami with acute prominent downwardly projecting spikes; uropod exopod apex with two spikes, appearing bifid.

Female. Retains male pattern of ornamentation in reduced form; epistome spike more distinctly bifid. Pereonite 1 with low rounded submedian subanterior tubercles. Pleotelson posterior margin with shallow submedian excisions.

Colour. Pale yellow in the faded preserved specimens.

Size. Males 5.7–6.6 mm, ovigerous females 8.4–10.2 mm, non-ovigerous females 7.5–9.3 mm.

Remarks. There is no new material available for *O. australis*. The male syntypic specimens appear to have dried out at some time, and are in a fragile and brittle condition, with the pleopods

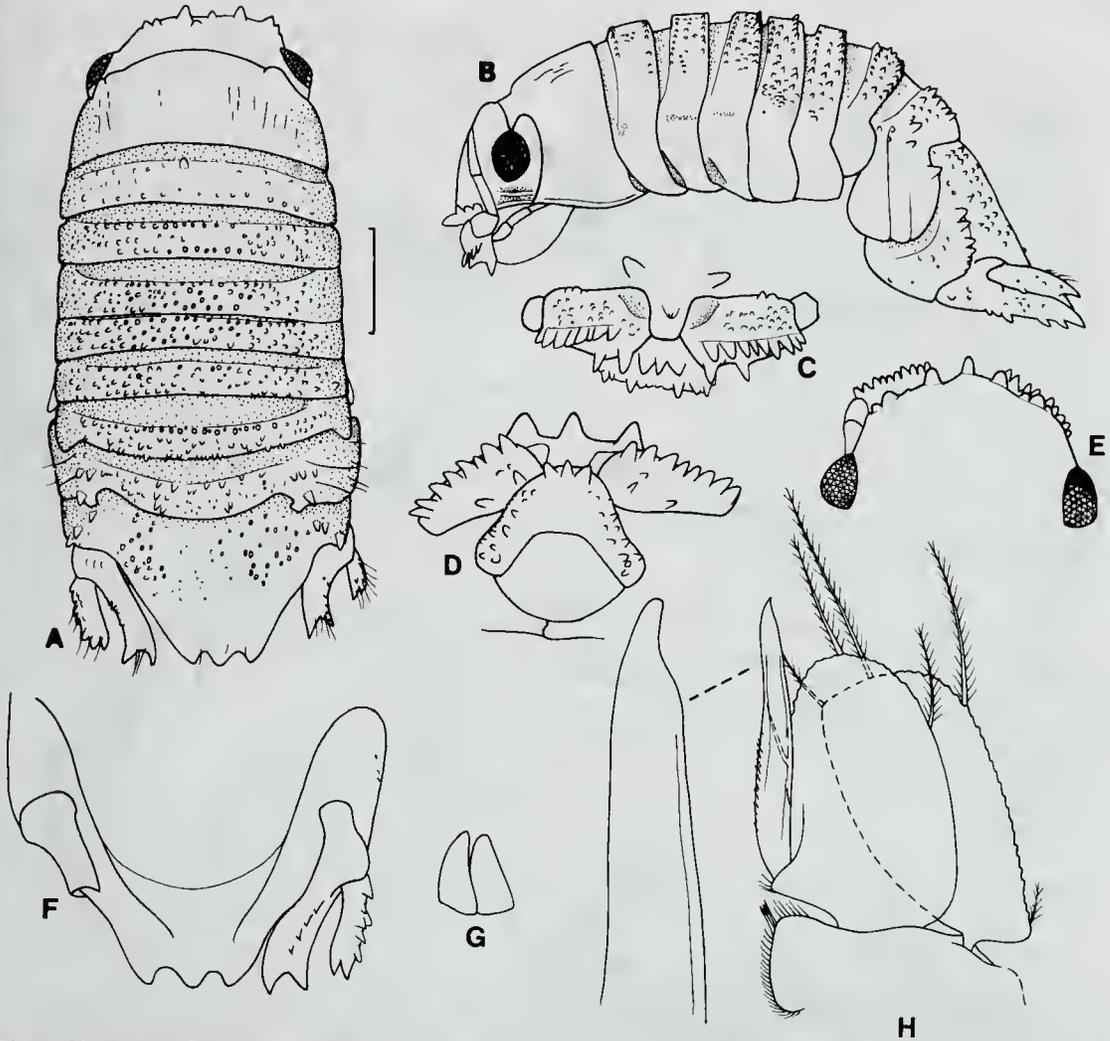


Figure 50. *Oxinasphaera australis* (Baker). A–E syntype ♂ 6.3 mm (WAM 10385/10484), remainder as indicated. A, dorsal view; B, lateral view; C, antennules, anterior view, in situ; D, frons; E, cephalon, dorsal view; F, pleon, ventral view; G, penes, in situ, ♂ 6.3 mm; H, pleopod 2, drawn from Baker's slide. Scale 1.0 mm.

and pereopods immovable. In none of the males were the penes clearly visible, and all specimens were too fragile to dissect. *Oxinasphaera australis* belongs to a group of species characterised by having the posterior margin of the pleotelson somewhat produced and flattened, and distinctly trilobate. The somatic morphology allows males and females of the species to easily distinguished from others of the genus. In particular the male of *O. australis* has prominent single rostral point flanked by two prominent tubercles on either side of the anterior margin of the cephalon, giving it a tricornate appearance; additionally there is a prominent median tubercle on the anterior of pereonite 2; the epistome anterior process is trilobate; antennule

peduncle article 1 has 8–10 teeth on the anterior margin and 2 teeth on the posteromedial margin. All syntypic males showed this character, non-ovigerous females have smaller and more numerous (13) teeth on the antennule peduncle article 1 anterior margin and 3 on the posteromedial margin.

This species (and the other related species) also differ from the remainder of the genus in the females being manifestly larger than the males.

Distribution. Known only from the type locality, Cottesloe, Perth, WA.

Hosts. Not known

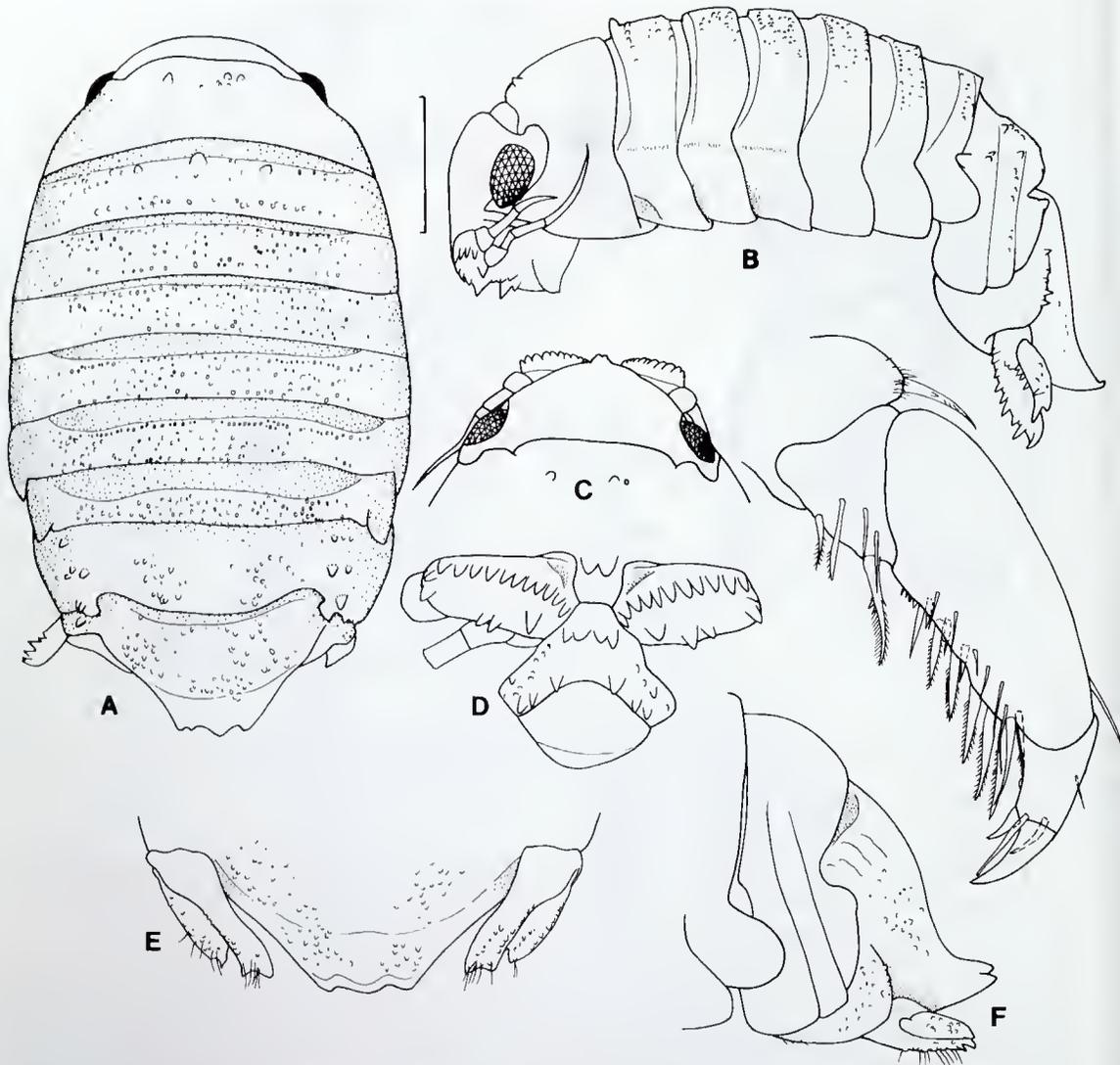


Figure 51. *Oxinasphaera australis* (Baker). A, E, F syntype, ovigerous ♀ 10.2 mm; B-D syntype, non-ovigerous ♀ 9.0 mm. A, dorsal view; B, lateral view; C, cephalon, dorsal view; D, frons; E, pleotelson posterior margin; F, pleon and pleotelson, lateral view; G, pereopod I, non-ovigerous ♀ drawn from Baker's slide. Scale 1.0 mm.

Oxinasphaera matucana sp. nov.

Figures 52, 53

Material examined. Holotype, ♂ (5.6 mm), Pearson Is., Investigator Group, SA, 9 Jan 1969, 50 m, coarse gravel, S.A. Shepherd (SAM C5604).

Paratypes. ♂ (4.6 mm), NE side of Topgallant Is., Investigator Group, SA, 33°43.0'S, 134°36.6'E, 21 Apr 1965, 12 m, algae, bryozoa, sponges, S.A. Shepherd and G.C.B. Poore (NMV J40487). ♂ (5.0 mm), manca (2.8 mm), Bastion Point, Mallacoota, Vic., 37°34.3'S, 149°46.2'E, 6 Apr 1989, reef 300 m offshore, 5 m,

sponges, G.C.B. Poore and R. Wilson (NMV J40483).

Description of male. Body about 2.2 times as long as greatest width; lateral margins subparallel. Cephalon dorsal surface finely pitted; anterior margin without tubercles; rostrum with bifurcate spike. Pereonite 1 with 2 distinct submedian rounded spikes posterior to anterior margin. Pereonites 2-7 each with 2 transverse rows of spikes, anterior row on pereonite 2 prominent with medial 5 being distinctly larger

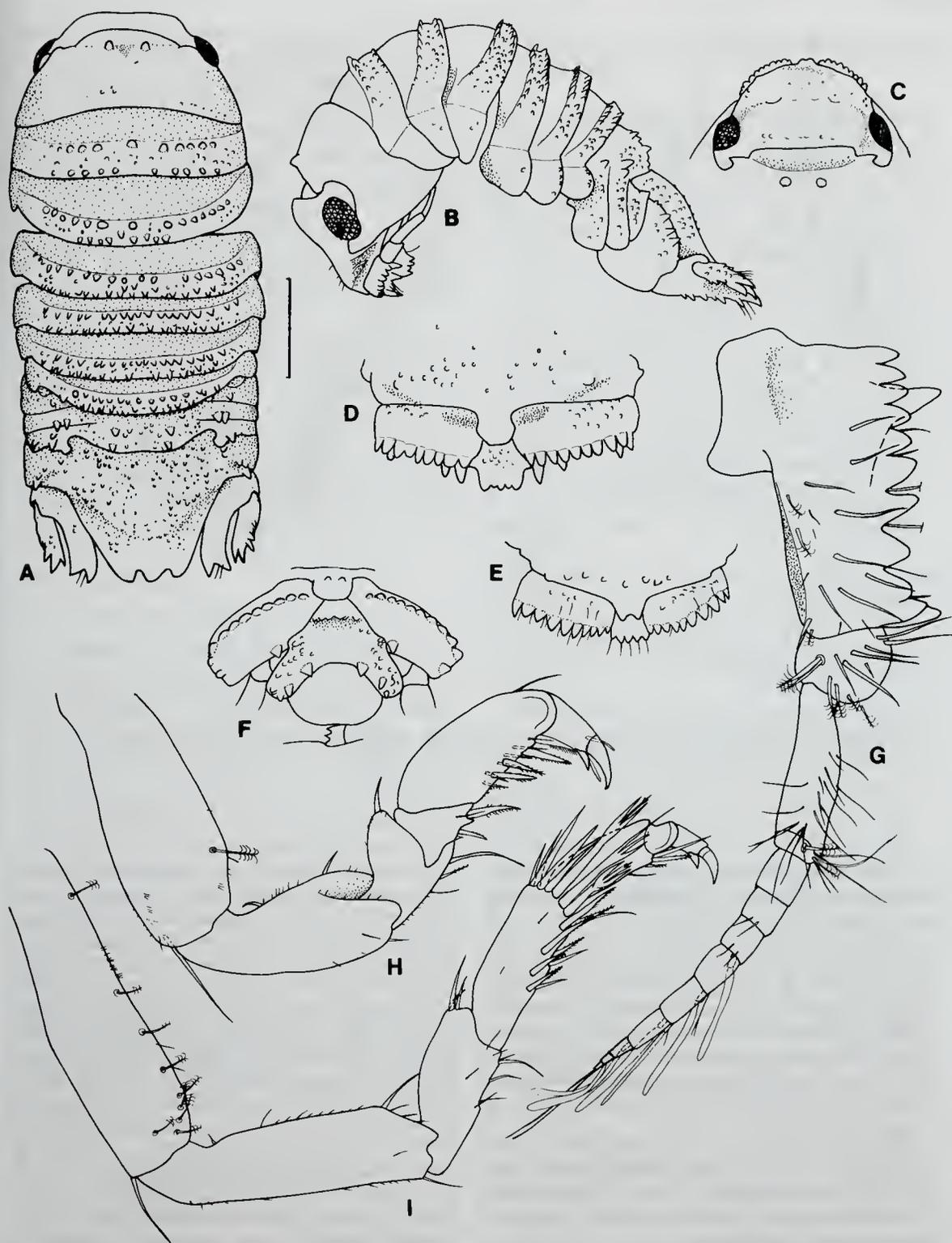


Figure 52. *Oxinasphaera matucana* sp. nov. A–D, F holotype, remainder ♂ 4.6 mm (NMV J40487). A, dorsal view; B, lateral view; C, cephalon, dorsal view; D, antennules, anterior view; E, antennules, anterior view; F, frons; G, antennule; H, pereopod 1; I, pereopod 7. Scale 1.0 mm.

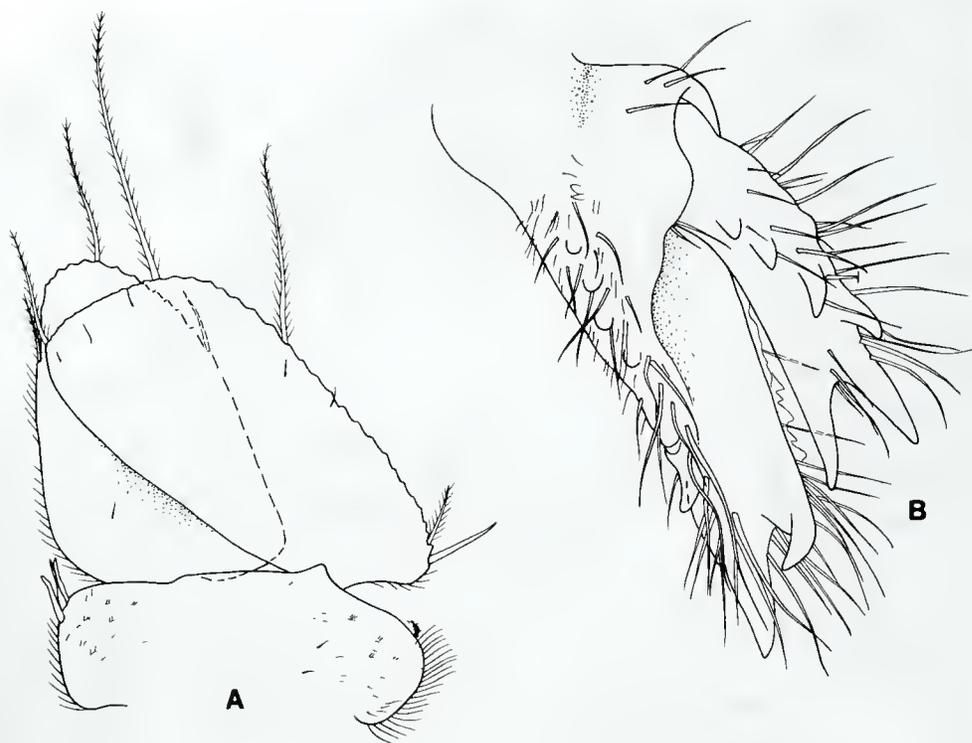


Figure 53. *Oxinasphaera matucana* sp. nov. ♂ 4.6 mm (NMV J40487). A, pleopod 1; B, uropod.

than all other pereonid spikes; pereonite 3 with anterior row larger than posterior but not as prominent as that of pereonite 2; pereonites 4–7 rows of about equal prominence; coxae 5–7 with posterior margins rounded. Pleon without posterior boss, with 2 longitudinally oriented submedian tubercles, pleonite 3 with 2 sublateral tubercles. Pleotelson without spikes or prominent tubercles; posterolateral flange with 3 marginal acute tubercles; posterior margin flattened, somewhat produced, with two submedian triangular excisions.

Antennule peduncle article 1 with 10 anterior spikes; with 1 long posteroproximal and 1 posterodistal spine; dorsal surface of peduncular articles 1 and 2 provided with roughened setae; flagellum with 9 articles.

Epistome without distinct spikes, with 4–5 teeth set on transverse ridge; lateral lobes each with 2 distinct spikes.

Pereopod 1 basis about 2.5 times as long as wide, anterior margin with 1 sensory seta; ischium 0.7 times as long as basis, 2.1 times as long as wide, anterior margin with 1 short proximal spine and 1 distal longer feebly biserrate spine; merus about one third as long as ischium, 0.7 times as long as wide, anterolateral angle with 1 gently curving weakly pectinate spine, posterior margin with 1 spine and single long simple seta; carpus about as long as merus, about as long as wide, posterior margin with 2 biserrate spines; propodus about equal in length (0.92) to ischium, widest proximally, about 2.4 times as long as wide, posterior margin with distinct scale spikes and 4 large biserrate spines, row of 5 smaller biserrate spines on medial margin; dactylus 0.5 length of propodus, unguis about 53% length of entire dactylus. Pereopod 7 basis 3.9 times as long as wide, anterior margin with 7 sensory setae; ischium slightly shorter (0.8) than

basis, 3.6 times as long as wide; merus about half as long as ischium, 1.8 times as long as wide, posterior margin with 3 simple spines, anterodistal angle with 1 large and 2 small spine; carpus 1.3 times as long as merus, 2.6 times as long as wide, posterior margin with 5 biserrate and 3 simple spines, distal margin with 3 large trid spines, longest equal in length to propodus and 5 spines at anterodistal angle; propodus about 0.9 times as long as carpus and 0.5 time as long as ischium, about 3.0 times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 2 sensory setae.

Pleopods conforming to the genus; appendix masculina not observed. Uropod dorsally nodular, covered with roughened setae; exopod about 4 times as long as proximal width, about half as long as endopod, apex deeply bifid with processes about equally prominent, ventral margin with 3–4 prominent acute serrations; endopod about 3 times as long as wide, apex prominently bifid, ventral margin with 4–5 prominent acute serrations.

Female. Unknown.

Colour. Pale tan in alcohol.

Size. Males 4.6–5.6 mm, females 3.5–4.5 mm.

Remarks. Of the males examined here only the holotype had partly developed penial processes and a developing appendix masculina, not detached from the endopod of pleopod 2, and therefore all three specimens are regarded as immature. However, all specimens had clearly developed dorsal sculpting, and the pleotelson and uropods are of the adult male form. The ornamentation of the antennule, pereonite 1 and 2, and pleotelson and uropods clearly separates *Oxinasphaera matucana* from other species of the *O. australis* group and the remaining species of the genus, and a new species is therefore established.

Distribution. Mallacoota, Victoria, westwards to the Investigator Group, South Australia, at depths between 5 and 50 m.

Hosts. One specimen recorded from an unidentified sponge.

Oxinasphaera poorei sp. nov.

Figures 54, 55

Material examined. Holotype, ♂ (2.9 mm), Bastion Point, Mallacoota, Vic., 37°34.3'S, 149°46.2'E, 6 Apr 1989, reef 300 m offshore, 5 m, sponges, G.C.B. Poore and R.S. Wilson (NMV J40488).

Paratypes. 2♂ (2.7, 3.3 mm), same data as holotype (NMV J40498).

Description of male. Cephalon irregularly pitted; with prominent flattened indistinctly bifurcate rostral point; anterior margin without spikes, with single prominent anteriorly projecting flange. Pereonite 1 without tubercles or ornamentation. Pereonites 2–6 each with anterior transverse row of distinctly flattened rounded spikes, pereonite 7 spikes not markedly flattened; posterior rows of pereonal spikes all weakly developed; coxae 5–7 with posterior margins nearly straight, ventral margin subtruncate, that of coxa 6 weakly concave. Pleon without posterior boss, although posterior margin weakly produced; pleonites 3 and 4 each with large sublateral tubercle, otherwise without prominent spikes. Pleotelson generally nodular, with 4 prominent rounded tubercles across anterior, posterior margin with two prominent submedian indentations either side of median lobe.

Antennule peduncle article 1 with 3 wide rounded anterior spikes, and large proximal length set just posterior to front row; without posterior spikes; flagellum with 6 articles.

Epistome with 2 basally united, distally acute, flat spikes.

Pereopod 1 basis about 2.6 times as long as wide, anterior margin with 2 sensory setae, distally with scale spikes; ischium about 0.6 times as long as basis, about 2.3 times as long as wide, anterior margin with 1 short proximal and 1 distal longer and biserrate spines; merus 0.5 times as long as ischium, about as long as wide, anterolateral angle with 1 gently curving pectinate spine, posterior margin 1 biserrate spine and 1 long seta; carpus as long as merus, about 1.5 times as long as wide, posterior margin with 2 biserrate spines; propodus about (1.1) as long as ischium, widest proximally, about 2.5 times as long as wide, posterior margin with 2 large biserrate spines; dactylus about 0.6 length of propodus, unguis about 52% length of entire dactylus. Pereopod 2 similar to others, merus distal margin with 4 biserrate spines. Pereopod 7 basis 3.6 times as long as wide, anterior margin with scale spikes, with prominent seta at anterodistal angle; ischium 0.68 as long as basis, 2.8 times as long as wide; merus about half as long as ischium, 1.6 times as long as wide, posterior margin with 3 feebly biserrate spines, 2 biserrate spines at anterodistal angle; carpus slightly longer (1.1) than merus, 2.2 times as long as wide, posterior margin with 4 large biserrate

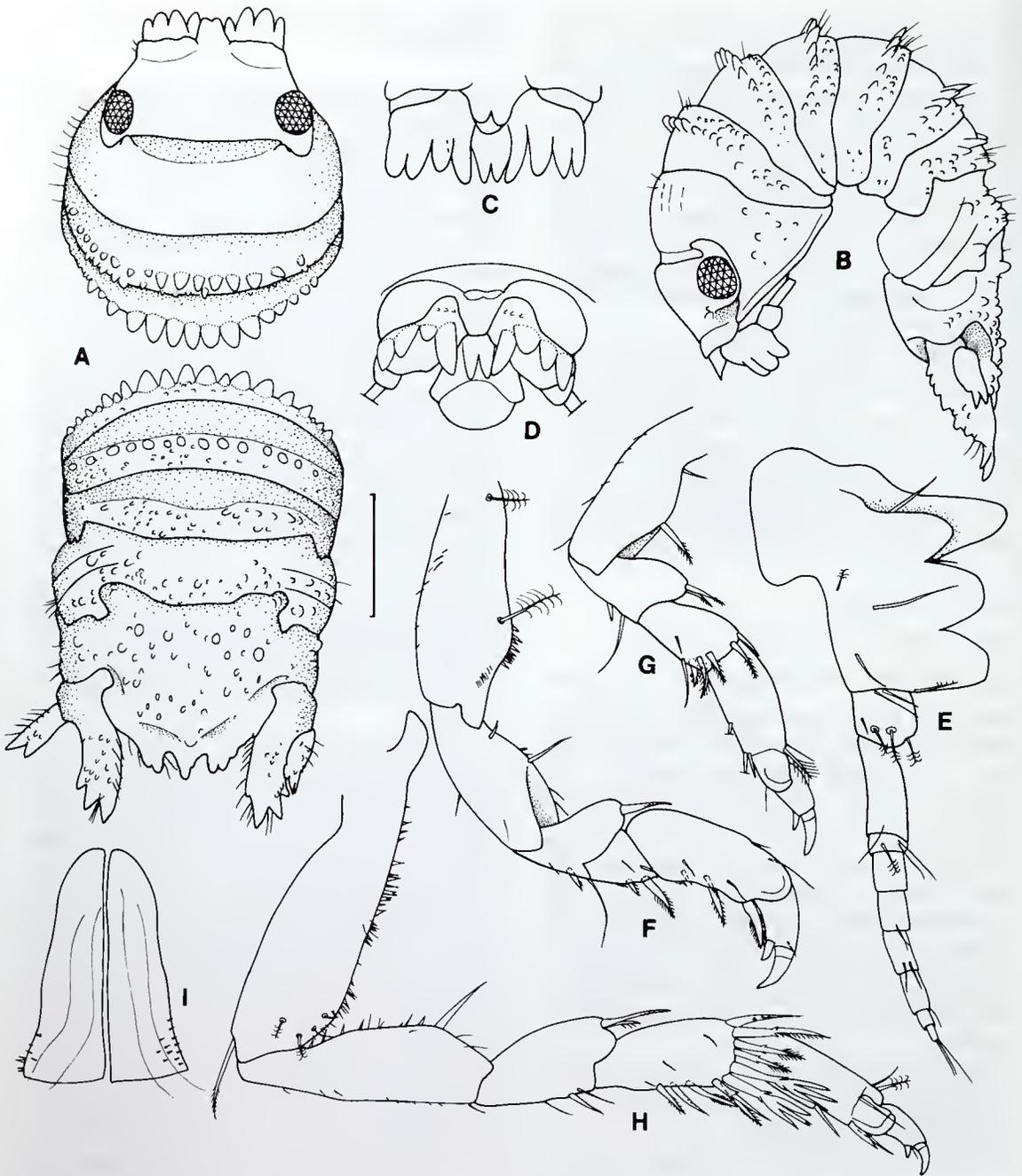


Figure 54. *Oxinasphaera poorei* sp. nov. A–D, holotype, remainder ♂ 2.7 mm (NMV J40487). A, dorsal view (two parts); B, lateral view; C, antennules, anterior view, in situ; D, frons; E, antennule; F, pereopod 1; G, pereopod 2; H, pereopod 7; I, penes. Scale 0.5 mm.

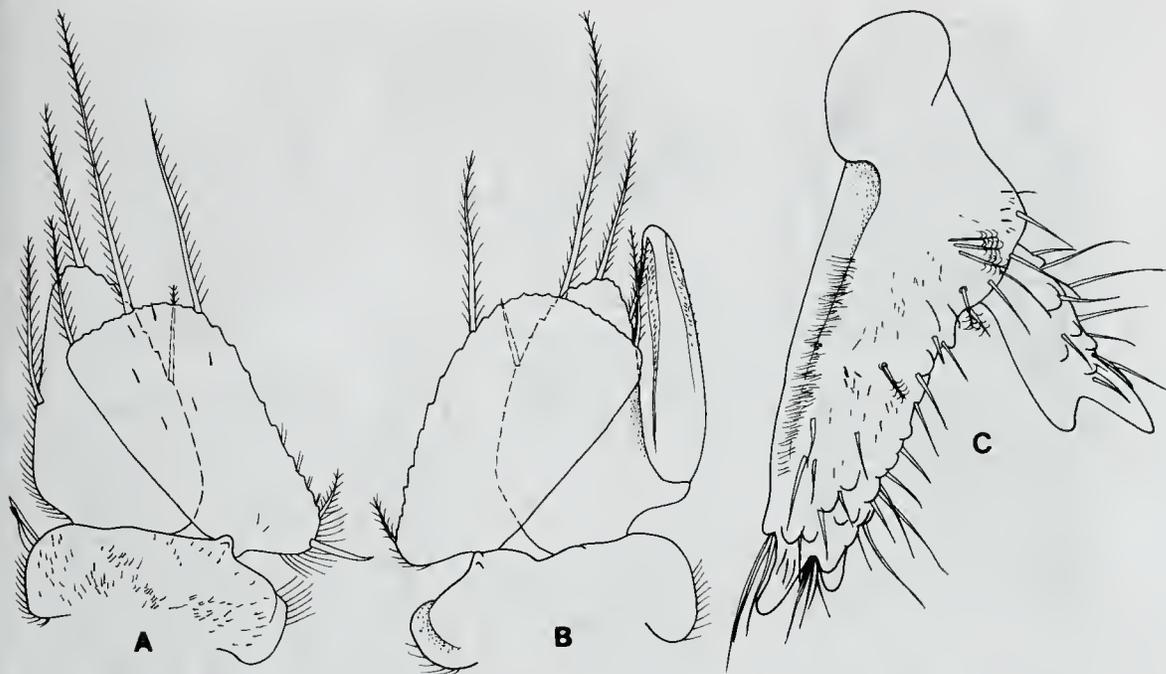


Figure 55. *Oxinasphaera poorei* sp. nov. ♂ 2.7 mm (NMV J40487). A, pleopod 1; B, pleopod 2; C, uropod.

spines, distal margin with 2 trifold and 3 biserrate spines, anterodistal angle with single weakly biserrate spine; propodus about 1.2 times as long as carpus and about 2.6 times as long as wide, posterior margin with 3 biserrate spines, anterodistal angle with 2 simple and 1 sensory setae.

Penial processes each about 2.8 times as long as basal width, medial margin straight, lateral curving to subacute apex; proximolateral margin with scale spikes.

Pleopod 1 endopod medial PMS inserted dorsally. Pleopod 2 appendix masculina stout, 4.0 times as long as maximum width, about as long as endopod, extending beyond endopod by 0.2 of its length, apex bluntly truncated. Uropod dorsally nodular; exopod about 3.3 times as long as proximal width, about 0.4 times as long as endopod, apex deeply bifid with lateral process prominent; endopod about 3.5 times as long as wide, apex with 2 prominent spikes, additional rounded nodules along ventral margin.

Female. Unknown.

Colour. Pale yellow in alcohol.

Size. Males 2.7–3.3 mm.

Remarks. This species is unique within the genus in possessing flattened pereonal spikes, and in having the anterior margin of the cepha-

lon with a distinct hardened ridge. The antennule, with only 4 flattened spikes, the lack of pleonal boss and simple posterior notches to the posterior margin of the pleotelson all further serve to identify the species.

Distribution. Known only from the type locality.

Hosts. Unidentified sponge.

Etymology. Named in recognition of Gary C.B. Poore's contribution to the knowledge of Australian isopod and crustacean fauna.

Oxinasphaera islaya sp. nov.

Figures 56–58

Material examined. Holotype. ♂ (2.8 mm), 2 km S of Cape Peron, WA, 32°16'S, 115°41'E, 26 Dec 1983, 6 m, from sponges, cave in reef, J.K. Lowry (AM P44197).

Paratypes. 16♂ (2.0–2.5 mm, mean= 2.3 mm), 11 manca (2.1, 2.0, 1.9, 1.8, 1.7 mm and 6 1.2–1.8 mm), same data as holotype (AM P41118, slides P44215, P44216; ZMUC CRU1386).

Additional material. 5♂ (2.2 imm, 2.3, 3.0, 3.0, 3.5 mm), "The Hotspot" reef, 5 nm W of N end of Flinders Is., SA, 33°40.5'S, 134°22.0'E, 19 Apr 1985, 12 m, assorted algae, S. Shepherd (NMV J40484).

Description of male. Body about 2.3 times as long as greatest width; lateral margins subparallel; dorsal surfaces polished, anteriorly with



Figure 56. *Oxinasphaera islaya* sp. nov. A–D, F holotype, remainder ♂ 2.1 mm (AM P41118). A, dorsal view; B, lateral view; C, frons; D, antennules, anterior view, in situ; E, posterior margin of pleon; F, pleon, ventral view; G, antennule; H, antenna; I, maxilliped; J, penes. Scale 1.0 mm.

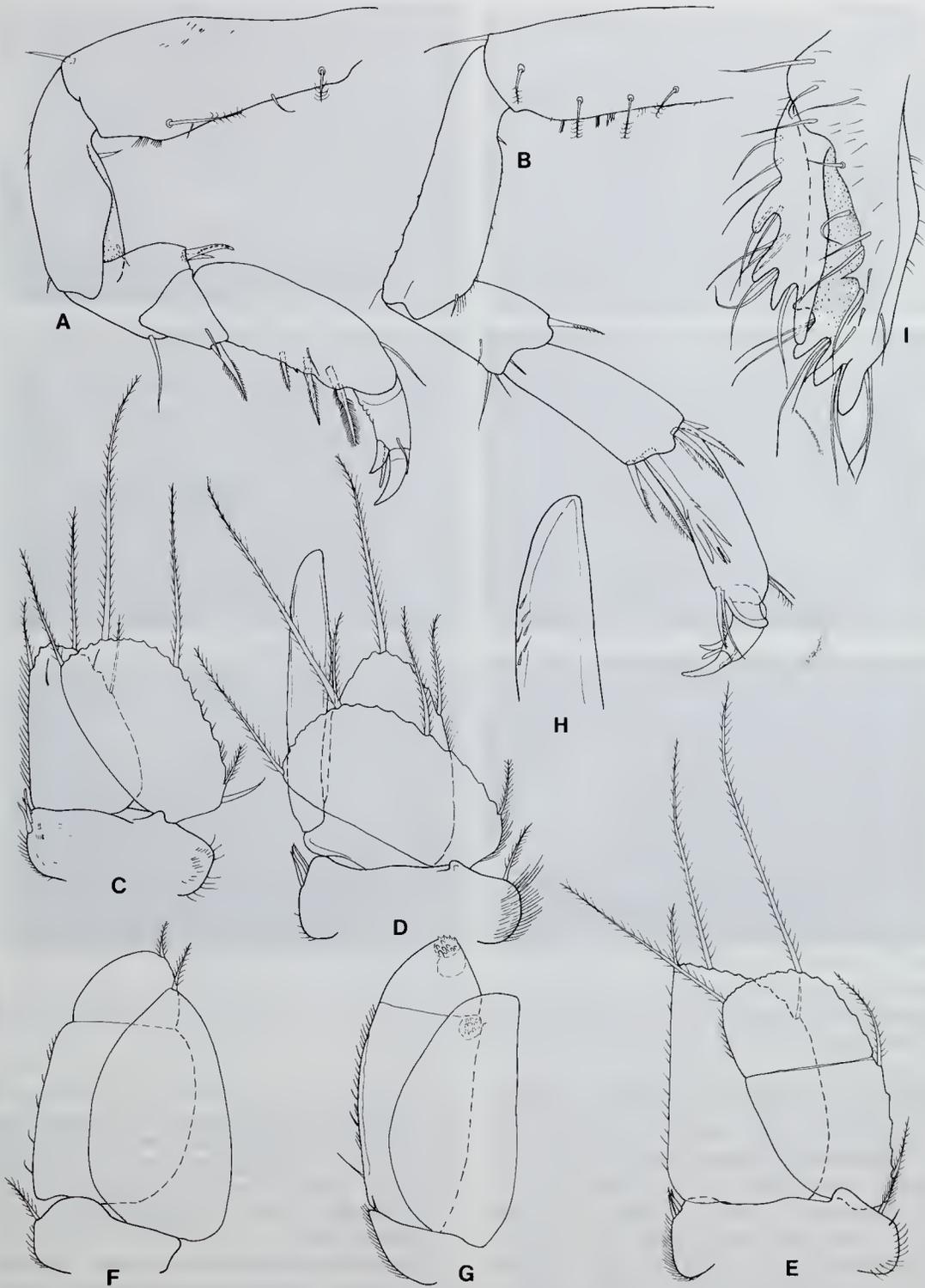


Figure 57. *Oxinasphaera islaya* sp. nov. H, F, ♂ 2.0 mm, remainder ♂ 2.1 mm (AMP41118). A, pereopod 1; B, pereopod 7; C-G, pleopods 1-5 respectively; H, appendix masculina apex; I, uropod.

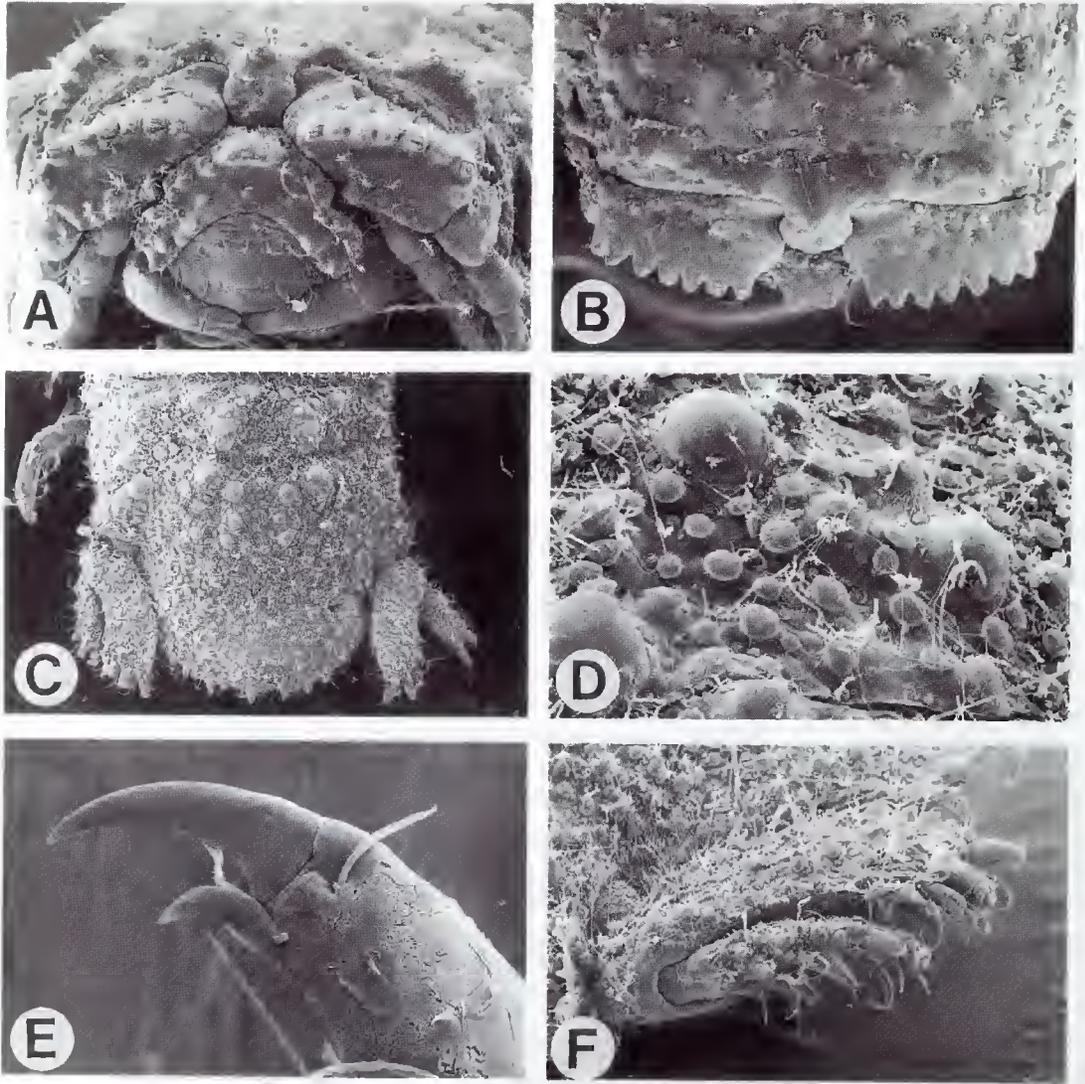


Figure 58. *Oxinasphaera islaya* sp. nov. SEMs. ♂ 2.7 mm (AM P41118). A, cephalon, anterior view ($\times 100$); B, cephalon anterior margin ($\times 150$); C, pleon and pleotelson ($\times 75$); D, detail, pleotelson tubercles ($\times 550$); E, pereopod dactylus ($\times 1100$); F, uropods ($\times 190$).

large pits, otherwise sparsely setose. Cephalon anterior margin with 3–4 small lateral tubercles; rostrum spike simple. Pereonite 1 with smooth low nodules, large shallow pits. Pereonites 2–4 with only anterior spike row distinct, pereonites 5–7 each with 2 transverse rows of spikes, anterior row large, posterior row indistinct: all spikes rounded; coxae 5 with posterior margins evenly rounded, coxae 6 ventrally subaeute, coxae 7 rounded. Pleon with weak posterior boss, posterolateral angles of boss each with 2 rounded spikes; lateral margin of pleonite 4 with

2 prominent rounded tubercles. Pleotelson with 2 rounded spikes opposing those of pleon, otherwise surface irregularly nodulose; posterolateral flange with 1 submarginal and 3–4 rounded tubercles; posterior margin appearing serrate, with 2 weak submedian indentations either side of median lobe.

Antennule peduncle article 1 with 7 anterior spikes; with 1 long proximo-posterior spike and 1 short posterior spike; dorsal surface of peduncular articles 1 and 2 provided with few setae; flagellum with 4 articles. Antenna peduncle

articles 4 and 5 with few long setae; flagellum of about 6 articles.

Epistome with 2 prominent widely separated conical spikes, lateral lobes each with 1 small tubercle.

Pereopod 1 basis 2.9 times as long as wide, anterior margin with 2 sensory setae, few scale spikes, anterodistal angle with prominent single seta; ischium 0.7 times as long as basis, 2.5 times as long as wide, anterior margin with 1 short proximal spine; merus about half as long as ischium, about as long as wide, anterodistal angle with 2 stout curving pectinate spines, posterior margin with single long simple seta; carpus about as long as merus, 1.4 times as long as wide, posterior margin with 1 biserrate spine and short simple seta; propodus about equal in length to ischium, widest proximally, about 2.6 times as long as wide, posterior margin irregularly notched and 3 large biserrate spines, 2 smaller biserrate spines on medial margin; dactylus about half length of propodus, unguis about 51% length of entire dactylus. Pereopods 2 and 3 similar to 1, differing principally in having the carpus more elongate and propodus more slender, and having additional biserrate seta on distal margin of carpus. Pereopod 7 ischium 3.1 times as long as wide; merus 0.5 times as long as ischium, 1.6 times as long as wide, anterodistal angle with 1 large spine, posterodistal angle with 2 simple setae; carpus 1.2 times as long as merus, 2.5 times as long as wide, posterodistal angle with 2 biserrate and 1 large trifold spines, anterodistal angle with 2 biserrate and 2 simple spines; propodus about 1.2 times as long as carpus and 0.8 time as long as ischium, about 3.9 times as long as wide, posterodistal angle with 1 biserrate spine, anterodistal angle with 1 sensory and 1 simple setae.

Penial processes each about 3.7 times as long as basal width, tapering slightly to a subacute apex; proximolateral margin with scale spikes.

Pleopod 2 endopod appendix masculina straight, 5.8 times as long as maximum width, apex rounded and narrowed, longer (1.3) than endopod, extending beyond endopod by 0.35 of its length. Pleopod 4 exopod and exopod with single seta at distomedial angle, endopod without thickened fleshy ridges. Pleopod 5 exopod with 1 apical lateral scale lobe 1 medial apical scale lobe, endopod without thickened fleshy ridges. Uropod dorsally finely nodular; exopod about 3.8 times as long as proximal width, about two-thirds as long as endopod, apex not distinctly bifid, with lateral process being distal part of series of prominent ventral serrations;

endopod about 3.6 times as long as wide, apex with row of 4 terminal prominent spikes.

Female. Unknown.

Colour. Pale brown to dark brown.

Size. Males 2.0–3.5 mm, manca 1.2–2.1 mm.

Variation. The posterior margin of the pleotelson in some specimens shows the typical trilobate or bi-excavate appearance that is common to most species of the genus. In some specimens this character was very unclearly expressed.

Remarks. This species is the smallest of the genus, the nearly entire pleotelson posterior margin enabling easy recognition. The anterior dorsal surfaces are pitted but, with the polished cuticle, this does not give a roughened appearance. Other distinguishing characters are the relatively long appendix masculina, the lack of ridges on pleopods 4 and 5 and the distinctly saw edged appearance of the uropodal exopod.

Distribution. Cape Peron, southern Western Australia and Flinders Is., South Australia, 6 to 12 metres depth.

Hosts. Type series taken from an unidentified sponge.

Undescribed Species

Oxinasphaera sp. 1. (Fig. 59)

Material examined. 3 ♂/♀ (4.4, 4.5, 4.6 mm), 4 ♀ (ovig 6.0, non-ovig 4.6, 4.7, 5.0 mm), 2 km S of Cape Peron, WA, 32°16'S, 115°41'E, 6 m, from sponges, gorgonaceans from cave in reef, J.K. Lowry (AM P44198).

Remarks. Among the specimens from Western Australia is a species of *Oxinasphaera* that could not be assigned to any of the species in the present work. It is most similar to *O. australis*, from which it differs in lacking a prominent median tubercle on pereonite 2, having the posterior margin of the pleotelson entire in intersex and female specimens, and in the deeply serrated uropods. It is included here in order to draw attention to this species and avoid its confusion with *O. australis*, also known only from Western Australia.

There are no male specimens in this series. Those marked as "♂/♀" lack penes, appendix masculina and show a degree of ornamentation that is not normally found in females. Those identified as females are unornamented and, as in *O. australis*, are larger than the males. The cephalic, antennular and epistome ornamentation of the intersex specimens and the ornamentation of the uropods and posterior margin

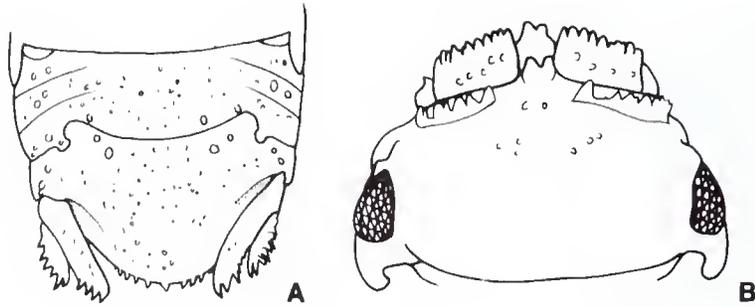


Figure 59. *Oxinasphaera* sp. 1 (AM P41118).

of the pleotelson precludes assignment to any of the species treated here. Specimens that are clearly recognizable as mature are needed before the species can be named and fully described.

Oxinasphaera sp. 2. 1♂, western Bass Strait, 39°16.7'S, 143°06.7'E. 95 m (NMV J40478). Senescent male, without clearly developed antennule spikes; differs from other species in having a transverse row of 4 spikes across the pleon.

Oxinasphaera sp. 3. 1♂, Burrewarra Point, NSW, 35°50'S, 150°14'S, 17 m (NMV J26234). Heavily granular pleon, one of the *O. bisubula* group.

Oxinasphaera sp. 4. 1♂, Spiky Bridge Coastal Reserve, Tasmania, 42°08'S, 148°08'E (NMV J40485). Antennule with 5 spikes, dorsal peroneal tubercles prominent and rounded, cephalon anterior margin with 2–3 flattened teeth; pleotelson similar to the *O. bisubula* group. Although distinctive, more males are needed to confirm that the cephalic spike development is typical.

Oxinasphaera spp. 5–7. Northern Indian Ocean, USNM. These sublittoral species, currently under study by Brian Kensley and Marilyn Schotte, all have prominent pleonal processes, and show a diverse peroneal spike, pleotelson, antennule, epistome and uropod morphology. They are noted here as these specimens clearly demonstrate the presence of the genus in the western and northern Indian Ocean (Fig. 2).

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Appendix 1

Character Matrix. Character state and distribution of the 31 character used in the analysis (? = character not present; — = state unknown).

	0	0	1	1	2	2	3
Characters	12345	67890	12345	67890	12345	67890	1
<i>Cymodoce</i>	00000	00010	00010	00000	00000	01000	0
<i>Sphaeroma</i>	00000	00000	0000?	??000	00000	00000	0
<i>bisubula</i>	12000	11011	11010	00001	00000	00000	1
<i>parodia</i>	02000	11011	11010	00001	00100	00001	1
<i>lobivia</i>	12000	11011	01010	00001	00000	00000	1
<i>frailea</i>	12001	11011	01010	00001	00000	00001	1
<i>denmoza</i>	02000	11111	11010	00001	00000	00000	1
<i>copiapoa</i>	02001	11011	11010	00001	00000	00001	1
<i>multidens</i>	00000	00111	11010	00001	00100	01000	1
<i>corypantha</i>	00000	00111	11010	00001	00100	00100	1
<i>obregonia</i>	11000	11001	01010	00001	00000	01000	1
<i>tual</i>	11000	01111	11010	00001	00100	01111	1
<i>aylosteria</i>	02010	11000	10010	11101	00000	00000	1
<i>rebutia</i>	00111	11000	00010	11101	00000	00000	1
<i>tuberculosa</i>	02000	10000	00020	?1010	00000	10001	1
<i>epostoa</i>	00000	11000	00020	?1010	00000	10001	1
<i>lowryi</i>	00000	10011	11020	?1010	00001	10000	1
<i>thetisae</i>	00001	11000	10020	?0010	10001	10000	0
<i>bispinosa</i>	02000	11020	01010	00010	00000	11111	1
<i>tripartita</i>	02000	10020	110?1	??000	1101?	?1111	0
<i>kensleyi</i>	02001	11020	110?1	??000	1101?	?1100	0
<i>australis</i>	10000	00000	10110	00000	0001?	?0000	1
<i>matucana</i>	00101	10000	10110	00000	0001?	??0??	1
<i>poorei</i>	12001	11000	00010	00010	00000	00000	1
<i>islaya</i>	11101	11000	10010	00001	00000	00000	1