

## New species and records of Flabellifera from the Indian Ocean (Crustacea: Peracarida: Isopoda)

MARILYN SCHOTTE & BRIAN KENSLEY

Department of Zoology, National Museum of Natural History, Smithsonian Institution, Washington, DC, USA

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### Abstract

In this study of flabelliferan Isopoda from the Indian Ocean, 19 species are described as new, in 11 genera and two families: family Cirolanidae, *Baharilana koloura*, *B. lira*, *Cirolana aldabrensis*, *C. mimulus*, *C. somalia*, *C. undata*, *Eurydice paxilli*, and *Metacirolana chemola*; family Sphaeromatidae, *Cassinidea clarkae*, *Cymodoce fuscina*, *C. lirella*, *Dynamenella alveolata*, *D. remex*, *Heterodina* (new genus), *H. mccaini*, *Oximasphaera brucei*, *O. furcata*, *O. tetradon*, *Paracilicæa stauros*, and *Sphaeromopsis sulcifera*. Diagnoses of the genera and species are provided, and keys to the Indian Ocean species of most of the genera are provided. The material comes primarily from Aldabra Atoll, the granitic Seychelles islands, Zanzibar Island, and Phuket in Thailand. A few miscellaneous samples from the South African Museum collections, and from the International Indian Ocean Expedition carried out in the mid-1960s are included.

**Keywords:** Crustacea, Flabellifera, Indian Ocean, Isopoda, Peracarida

### Introduction

This paper is part of a series that is based on collections of material from various sites around the Indian Ocean (see Kensley and Schotte 2000, 2002). The material comes mainly from Aldabra Atoll, the granitic Seychelles, Zanzibar Island, and Phuket, Thailand, along with a few samples from the South African Museum, and the International Indian Ocean Expedition. About 450 species of flabelliferan isopod species in eight families have been recorded from the Indian Ocean (see Kensley 2001). In the present paper, 19 species from two families, the Cirolanidae and Sphaeromatidae, are recorded. Each of the 11 genera involved is diagnosed, and where appropriate, keys to their constituent Indian Ocean species are provided. Distribution of the species is provided in the keys as a further aid to separation. Revisionary works are referred to in the generic synonymies.

The following abbreviations are used: IIOE, International Indian Ocean Expedition; JR, Jack Rudloe field stations; J-SEY, Janice Clark Walker field stations; K-AL, K-SEY, Brian Kensley field stations; NMNH, National Museum of Natural History, Smithsonian Institution; SAM, South African Museum; USNM, United States National Museum; ZMUC, Zoological Museum, University of Copenhagen.

**Suborder FLABELLIFERA**

**Family CIROLANIDAE** Dana, 1852

**Genus *Baharilana*** Bruce and Svavarsson, 2003

*Restricted synonymy.* Bruce and Svavarsson 2003, p 2.

*Diagnosis*

Head without rostral point. Pereopods 1–3 with ischium superior distal margins moderately produced, setose; merus anterodistal margin moderately produced, setose, not overriding propodus. Paired flattened articulating penial processes present on sternite 7. Pleopod 1 endopod narrow, half as wide as exopod; exopod sub-circular. Pleopod 2 appendix masculina inserted submedially, curving laterally; apex bluntly rounded to sub-acute. Uropod peduncle ventrolateral margin with row of plumose setae.

Key to species of *Baharilana* from the Indian Ocean

1. Pleotelson lacking longitudinal ridges or carinae; lateral margins deeply sinuous, apex narrowly rounded and bearing two robust setae . . . . . *Baharilana koloura*, sp. nov.  
[Off Mozambique]
- Pleotelson not as above . . . . . 2
2. Pleotelson with single mid-dorsal ridge; cephalon and pereonite 1 rugose; pereonites 2–7 with double carinae near lateral margins . . . . . *Baharilana lira*, sp. nov.  
[Off Somalia]
- Pleotelson not as above; cephalon and pereon not rugose, either smooth or with weak transverse furrows only . . . . . 3
3. Pereon smooth; pleotelson with three parallel longitudinal ridges; apex truncate . . . . . *Baharilana bisulcata* (Hobbins and Jones, 1993)  
[Red Sea]
- Pereonites with weak transverse furrows; pleotelson with two weak longitudinal ridges; apex broadly rounded . . . . . *Baharilana richmondi* Bruce and Svavarsson, 2003  
[Zanzibar, Tanzania]

***Baharilana koloura*** sp. nov.  
(Figures 1, 2)

*Material examined*

Holotype: USNM 280268, one male (5.0 mm), IIOE sta 372-B, off Mozambique, 24°48'S, 34°59'E, 42 m, 19 August 1964. Paratype: USNM 280269, one male (dissected) 3.9 mm, one ovigerous female (damaged) 5.0 mm, same data as holotype.

*Description*

*Male.* Body length about 2.7 times width. Cephalon with carina on broadly rounded anterior margin. Frontal lamina somewhat quadrate, rounded anteriorly, narrowing toward base and with carinae on lateral margins. All pereonites with transverse line impressed at mid-length or near posterior margin; pereonites 5 and 6 with two lines. Cephalon and

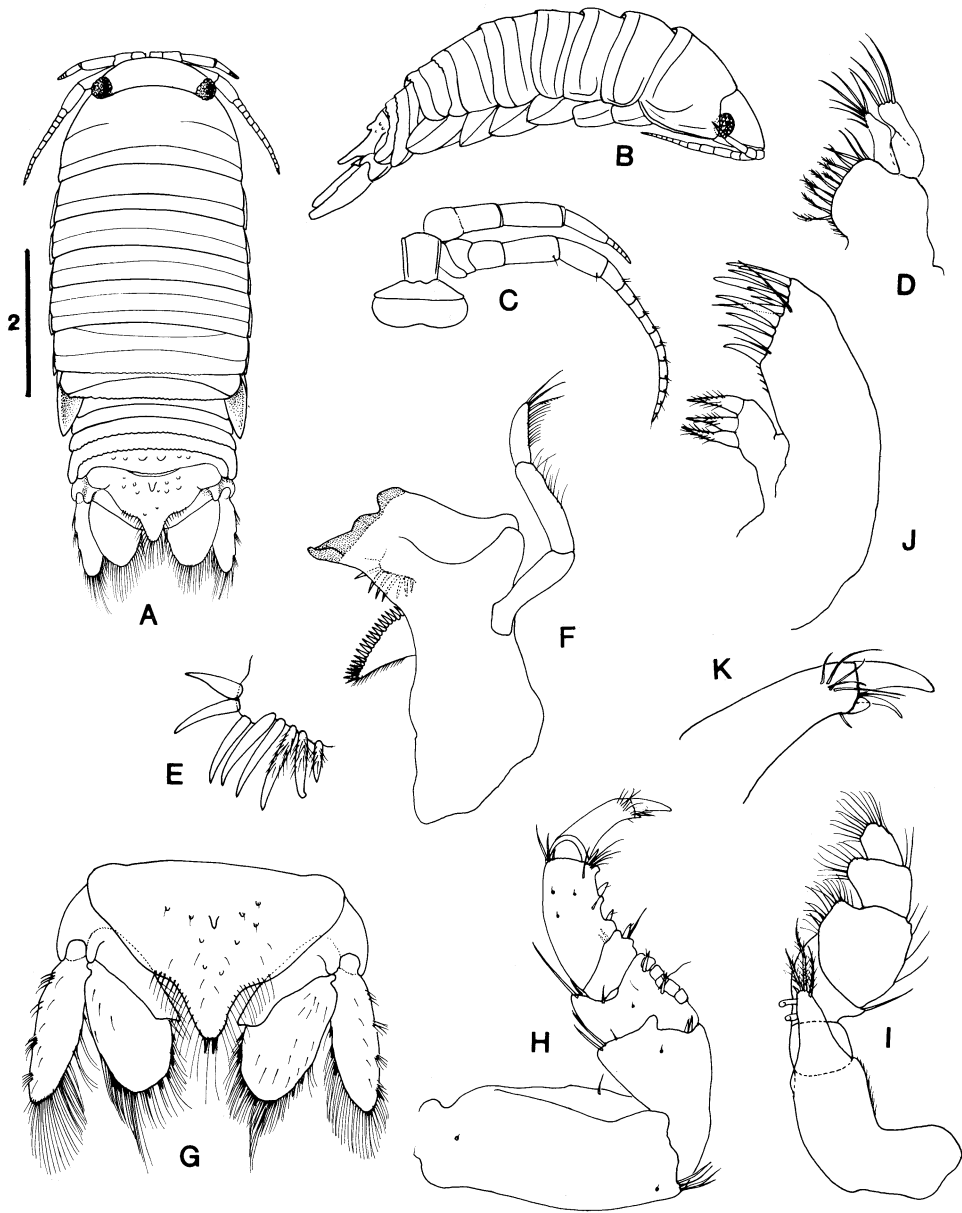


Figure 1. *Baharilana koloura* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) frontal lamina, clypeus, labrum, antenna, and antennule; (D) maxilla 2; (E) setal row of left mandible; (F) left mandible; (G) pleotelson and uropods; (H) pereopod 1; (I) maxilliped; (K) dactyl of pereopod 1; (J) maxilla 1.

pereonites sparsely punctate. Coxae on pereonites 2–3 quadrate; coxae 4–7 progressively more produced and acute posteriorly; all coxae with strong, entire, oblique carina. Posterior margins of pleonites 3–5 finely denticulate. Pleonite 5 with two larger submedial and four smaller lateral tubercles. Pleotelson short, extending to mid-length of uropodal exopod, broad anteriorly and abruptly tapering to narrowly rounded apex, posterior margin bearing about 35 plumose setae with two short, strong setae distally; dorsal surface with

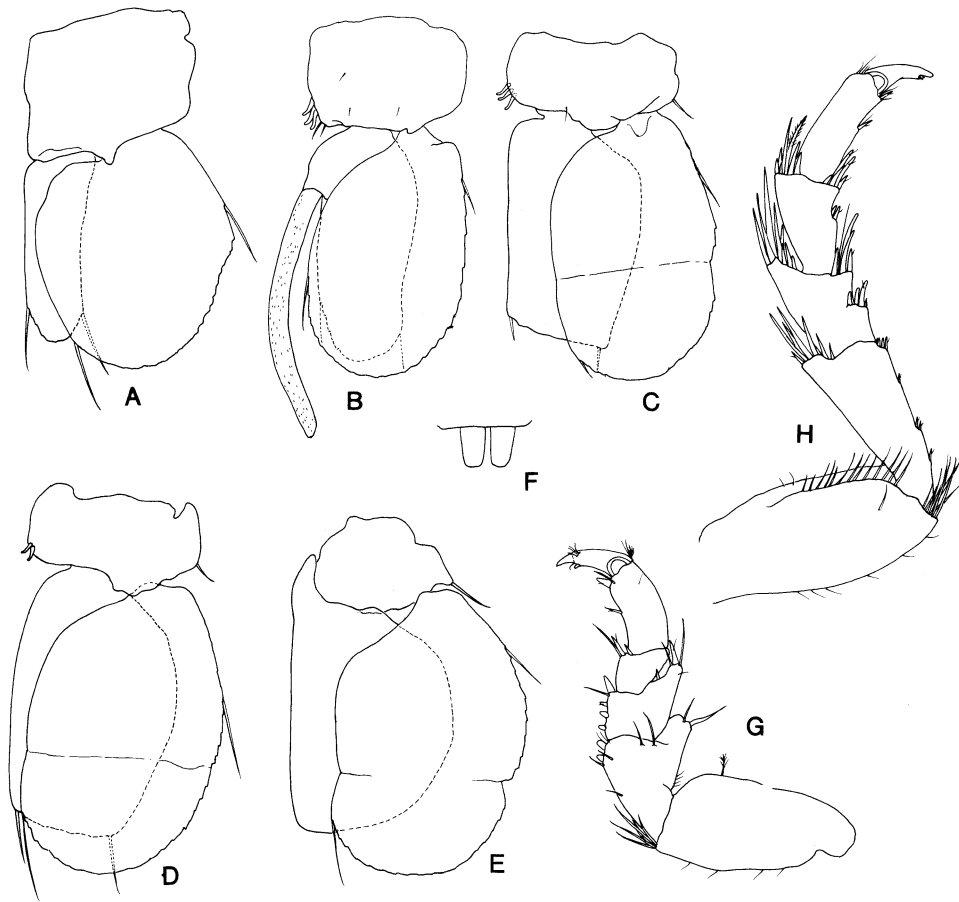


Figure 2. *Baharilana koloura* sp. nov. (A) Pleopod 1; (B) male pleopod 2; (C) pleopod 3; (D) pleopod 4; (E) pleopod 5; (F) penes; (G) pereopod 2; (H) pereopod 7.

acute tubercle near anterior margin, directed posteriorly, with eight to nine small scattered tubercles nearby.

Antennular peduncle articles 1 and 2 not fused, together subequal in length to article 3; flagellum with four to five articles. Antenna extending to posterior margin of pereonite 1, flagellum of 11 articles. Mandible and palp as figured. Maxilla 1 with three stout plumose setae on endopod and about 13 setae (two slender) on exopod. Maxilla 2 with eight plumose and four simple setae on endopod, and six and four simple setae on palp and exopod, respectively. Maxillipedal endite with two coupling hooks and three terminal, plumose setae.

Pereopods as figured. Penes short, broad, separate but adjacent. Pleopod 1 exopod nearly as broad as long, not operculate; endopod one-third width of exopod, setose only on distal margin. Exopods of pleopods 3–5 with indistinct suture, only partial in pleopod 5; both rami of all pleopods with fringe of plumose setae except endopod of pleopod 5. Pleopod 2 appendix masculina large, curved, uniform in width, articulating sub-basally, extending beyond endopod by one-quarter length, covered with tiny setules. Uropodal exopod half width of endopod and subequal in length; lateral margins with four tufts of

setae; medial margins bearing plumose setae and three spine-like setae. Endopod bearing about eight spine-like setae and many plumose setae. Both rami with short, simple setae scattered on surface.

*Female.* As for male except for sexual characters.

#### *Remarks*

Like *Baharilana richmondi*, *B. koloura* shows weak transverse furrows on all pereonites. The new species is readily distinguished from all its congeners by the morphology of the pleotelson, being nearly twice as wide as long, with deeply incurving lateral margins, and having uropods that reach only to mid-length of the uropodal exopod.

#### *Etymology*

The specific name, *koloura*, is from the Greek “bob-tailed”, and refers to the pleotelson.

### ***Baharilana lira* sp. nov.**

(Figures 3, 4)

#### *Material examined*

Holotype: USNM 280271, one male (3.4 mm), IIOE sta 453, off Somalia, 11°11'N, 51°14'E, 47–49 m, 17 December 1964. Paratypes: USNM 280272, one male, four females, same data as holotype. USNM 280273, four males, five females, IIOE sta 446, off Somalia, 9°41'N, 51°03'E, 60–70 m, 16 December 1964. USNM 280274, two males, one female, IIOE sta 437, off Somalia, 9°25'N, 50°54'E, 85–95 m, 16 December 1964.

#### *Description*

*Male.* Body length more than three times greatest width. Integument of pereon covered with flattened, mosaic-like granules. Cephalon rugose with anterior margin smoothly rounded, with thickened anterior ridge, dorsal interocular suture absent; dorsal surface of cephalon and pereonite 1 with several indistinct transverse ridges; anterolateral margins of cephalon produced and bearing carinae in lateral view; posterior margin with two short, lateral sutures. Pereonites 2–7 rugose, each with medial transverse ridge meeting double transverse carinae near lateral margins; posterior margins of all pereonites appearing granular. Coxae all with strong, entire oblique carinae; coxae 3–6 nearly acute apically. Pleon without ornamentation. Pleotelson with strong mid-dorsal carina; triangular in shape, apex narrowly rounded, bearing four short, spine-like setae among plumose setae.

Antennular flagellum with four articles; articles 1 and 2 not fused, combined length twice that of article 3. Antennal flagellum with seven to eight articles. Frontal lamina pentagonal, not flat but with raised hump near acute apex; lateral margins upcurved and converging slightly toward base; greatest width subequal to length. Maxilla 1 and 2 and mandible as figured.

Pereopod 1 with three blunt robust setae, single slender seta and two thicker, flagellated setae on merus. Pereopods 2 and 7 as figured. Penes projecting, close together, separated by about 3% of sternite width.

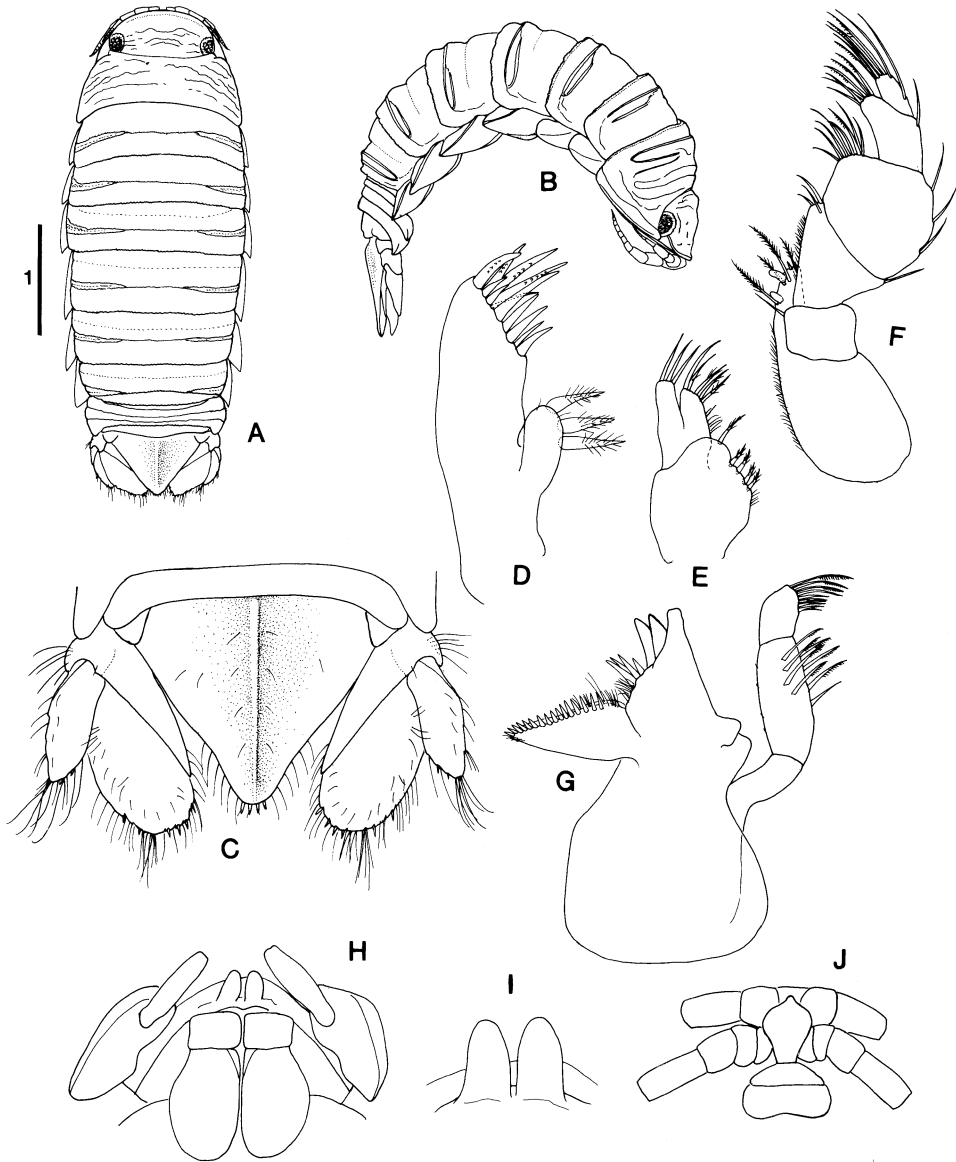


Figure 3. *Baharilana lira* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) pleotelson and uropods; (D) maxilla 1; (E) maxilla 2; (F) maxilliped; (G) mandible; (H) penes, in situ; (I) penes; (J) frons.

Pleopod 1 operculate, endopod small, only three-quarters length and one-quarter width of exopod, setose only distally; exopod width four-fifths of length. Pleopod 2, appendix masculina stout, broadly rounded at apex, covered with minute setules, extending beyond exopod by about one-fifth of length, distally curving laterad. Pleopods 3–5, endopod with complete sutures. Pleopods 3 and 4, endopod markedly shorter than exopod and bearing few plumose setae. Pleopod 5 endopod lacking setae. Uropodal exopod length about three times width, lateral margin without spine-like setules, with simple setae in notches; apex somewhat blunt with long setae; medial margin bearing two stout setules and long, simple

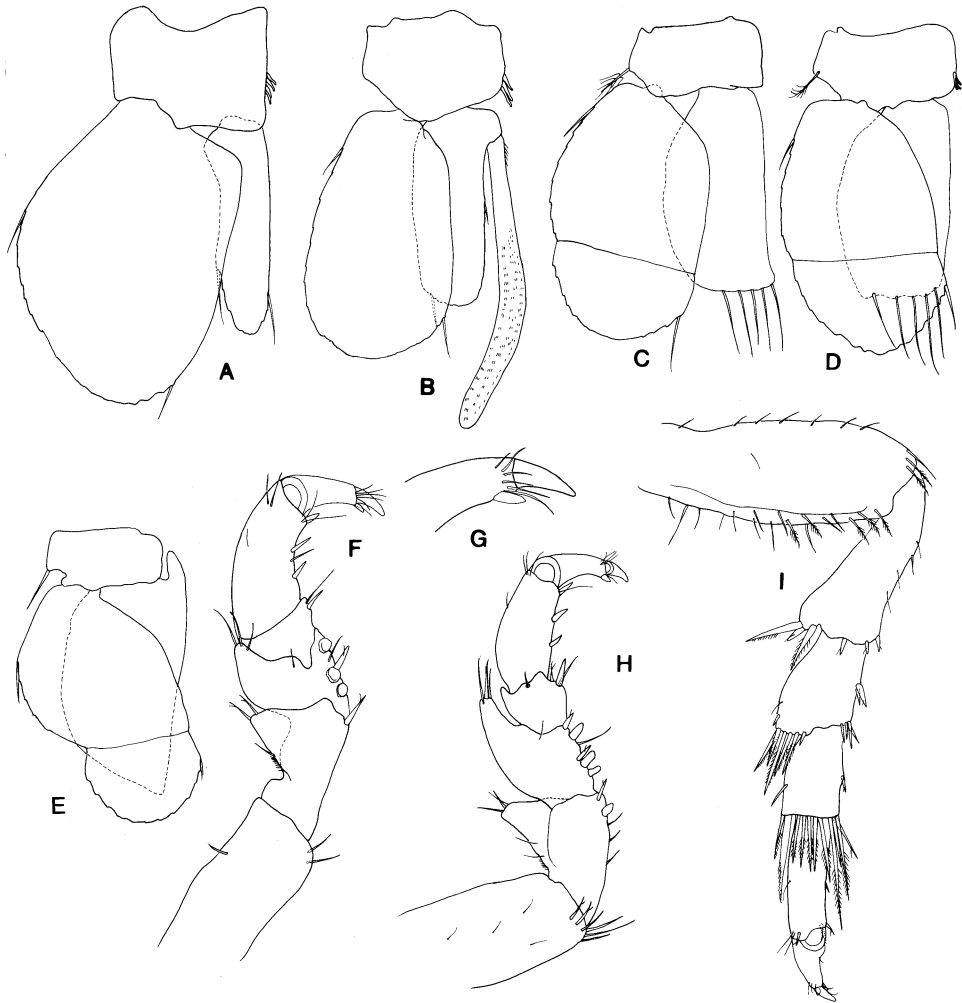


Figure 4. *Baharilana lira* sp. nov. (A) Pleopod 1; (B) male pleopod 2; (C) pleopod 3; (D) pleopod 4; (E) pleopod 5; (F) pereopod 1; (G) dactylus of pereopod 1; (H) pereopod 2; (I) pereopod 7.

setae. Uropodal endopod with two setules on lateral margin and four spine-like setae on medial margin amongst long plumose setae.

*Female.* As in male, excepting sexual characters.

*Remarks*

The new species is quite distinctive due to easily seen characters of the habitus. The cephalon and first pereonite are rugose, not the case in any other congener. The double carinae near the lateral margins of pereonites 2–7, joined dorsally by a transverse ridge, are also unique as are shape of the frontal lamina and presence of a single longitudinal carina on the pleotelson.

*Etymology*

The specific name is from the Latin “lira”, a ridge or furrow, and refers to the transverse dorsal ridges found on the pereon.

**Genus *Cirolana* Leach, 1818**

*Restricted synonymy.* *Cirolana* Leach 1818, p 347; Bruce 1986, p 139; Kensley and Schotte 1989, p 132; Brusca et al. 1995, p 17.

*Diagnosis*

Pleonite 1 often concealed by pereonite 7; pleonite 5 lateral margins covered by those of pleonite 4. Pleotelson posterior margin with setae and spines. Antennular peduncle article 3 longest. Antennal peduncle articles 4–5 longest. Frontal lamina flat, about twice as long as wide; clypeus sessile. Pereopods 1–3 with anterodistal margins of ischium and merus not produced. Pleopod peduncle without lateral lobes; only endopod of pleopod 5 without setae. Appendix masculina inserted basally.

Below is presented a key to 23 known species of *Cirolana* from the western Indian Ocean (Bruce 1994a), without implying phylogenetic relationships among them. It is based on characters of adult males. Kensley (2001) has provided a complete list of *Cirolana* species from the entire Indian Ocean region; to this may be added two species from Phuket, Thailand described by Bruce and Olesen (2002).

Key to species of *Cirolana* from the western Indian Ocean

1. Pleotelson smooth, unornamented except for setules . . . . . 2
  - Pleotelson with shallow depression, ridge(s), groove(s), carina(e) or tubercles . . . . . 8
2. Without eyes . . . . . *Cirolana bougaardti* Kensley, 1984b  
[East coast of South Africa]
  - With fully developed eyes. . . . . 3
3. Apex of pleotelson incised, having forked appearance . . . . .  
. . . . . *C. incisicauda* Barnard, 1940  
[Hermanus to Port Alfred, South Africa]
  - Apex not forked . . . . . 4
4. Pleotelson with two submedian patches of setae . . . . . *C. meinerti* Barnard, 1920  
[Off East London, South Africa; Madagascar]
  - Pleotelson lacking such setae . . . . . 5
5. Frontal lamina narrow, more than twice as long as wide; apex of pleotelson bearing  
10 stiff, spine-like setae . . . . . *C. meseda* Hobbins and Jones, 1993  
[Red Sea]
  - Frontal lamina pentagonal, broad, length less than two times width; apex of  
pleotelson having fewer than 10 spine-like setae . . . . . 6
6. Pleotelsonic apex bearing six stiff, spine-like setae separated by two plumose  
setae . . . . . *C. aldabrensis* sp. nov.  
[Aldabra Atoll]
  - Uropodal endopod with five stout spine-like setules on inner margin . . . . . 7



7. Outer margin of uropodal endopod with two stout setules; male stylet about 30% longer than endopod . . . . . *C. mimulus* sp. nov.  
[Mahe, Seychelles]
- Both margins of uropodal endopod bearing five stout setules; male stylet extends beyond distal margin of endopod by almost 50% of length . . . . .  
. . . . . *C. mascarensis* Müller, 1991  
[Réunion Island; off Mauritius]
8. Pleotelson with finely pubescent surface and broad, very shallow mid-dorsal depression, tubercles lacking . . . . . 9
- Pleotelson bearing ridges, grooves, carina(e) or tubercles . . . . . 10
9. Uropodal rami broadly rounded; apical teeth of pleotelson blunt . . . . .  
. . . . . *C. theleceps* Barnard, 1940  
[Off Natal; Gulf of Suez]
- Uropodal rami apically acute; apical teeth of pleotelson acute . *C. somalia* sp. nov.  
[Somalia]
10. Pleotelson with cone-like tubercles only . . . . . 11
- Pleotelson with faint ridges, grooves, carina(e) or elongate tubercles . . . . . 14
11. Pereonites 1–7 with one or two complete transverse sutures. . . *C. undata* sp. nov.  
[Off Somalia; off Mozambique]
- Not all pereonites, or none, having complete transverse sutures . . . . . 12
12. Frontal lamina pentagonal, lateral margins concave, diverging anteriorly; cephalon, pleotelson, uropods and posterior margins of pereonites 2–6 with pubescence . . . . . *C. brucei* Javed and Yasmeen, 1995  
[Pakistan]
- Frontal lamina with straight sides; cephalon and pereonites without pubescence 13
13. Pereonite 6 with nodules; pleotelson dorsal surface without setules; uropodal endopod evenly rounded apically . . . . . *C. manorae* Bruce and Javed, 1987  
[Pakistan]
- Pereonite 6 without nodules; dorsal surface of pleotelson with abundant stiff setules; uropodal endopod angular apically. . . . . *C. bovina* Barnard, 1940  
[East London, South Africa; India; Kenya]
14. Pleotelson bearing single, mid-dorsal carina or keel . . . . . *C. carina* Jones, 1976  
[Kenya]
- Pleotelson with ridges, grooves, multiple carinae or elongate tubercles. . . . . 15
15. Frontal lamina with prominent transverse ridge across middle . . . . .  
. . . . . *C. littoralis* Barnard, 1920  
[Saldanha Bay to East London, South Africa]
- Frontal lamina smooth, unadorned . . . . . 16
16. Frontal lamina quadrangular with anterior extension meeting rostral point . . . . .  
. . . . . *C. venusticauda* Stebbing, 1902  
[Lambert’s Bay to East London, South Africa; Madagascar]
- Rostral point lacking, anterior margin of cephalon rounded . . . . . 17

17. Frontal lamina pentagonal, apically acute . . . . . *C. imposita* Barnard, 1955  
 [False Bay to Natal, South Africa]  
 – Frontal margin anteriorly rounded . . . . . 18
18. Pleotelson having elliptical mid-dorsal depression flanked by two evenly curved  
 carinae; frontal lamina obovate . . . . . *C. sulcata* Hansen, 1890  
 [Lüderitz to Natal, South Africa; off Mozambique]  
 – Pleotelson with straight, longitudinal ridges, parallel at least in part . . . . . 19
19. Two outer mid-dorsal carinae of pleotelson contiguous along anterior one-fourth  
 of length. . . . . *C. cingulata* Barnard, 1920  
 [Still Bay to East London, South Africa]
19. Pleotelson with two well-separated longitudinal submedian rows of ridges;  
 posterior margin of pleonite 5 with five to seven tubercles . . . . .  
 . . . . . *C. fluviatilis* Stebbing, 1902  
 [India; Thailand; Knysna to Zululand, South Africa]
19. Pleotelson with three straight longitudinal ridges; pleonites 3–5 bearing eight, five  
 and three tubercles, respectively, on posterior margins . . . . .  
 . . . . . *C. corrugis* Jones, 1976  
 [Kenya; Red Sea]  
 – Pleotelson with three longitudinal rows of fused tubercles; posterior margins of  
 pleonites 3–5 each bearing three large tubercles . . . . .  
 . . . . . *C. sulcatauda* Stebbing, 1904  
 [Maldive Islands; Kenya; Sri Lanka; Seychelles; Aldabra Atoll]

The latter part of the key, pertaining to the last eight species, was adapted from a key to closely allied Indian Ocean species presented by Jones (1976), which was in turn based on a key published by Barnard (1935).

*Cirolana aldabrensis* sp. nov.

(Figures 5, 6)

*Material examined*

Holotype: USNM 280265, one male (6.0 mm), Seychelles, sta K-AL-60, encrustations on intertidal boulders, Île Éspirit in Aldabra lagoon, 16 March 1985. Paratypes: USNM 280266, two females, one juvenile, sta K-AL-42, intertidal reef crest, Picard Island, Aldabra, 12 April 1983.

*Other material examined.* USNM 280267, four males, six juveniles, from four stations, coral rubble and low algal turf, Picard Island, Aldabra, intertidal to 10 m.

*Description*

*Male.* Body length about three times greatest width. All somites except telson and uropods dotted with red-brown chromatophores. Cephalon with very faint interocular furrow; rostrum not overlapping frontal lamina. Coxae 4–7 with entire oblique carinae and acute posterolateral angles. Pleonites 1 and 2 in lateral view overlapped by coxa of pereonite 7. Pleonites 4 and 5 with seven to eight tiny denticles on posterior margin. Pleotelson with

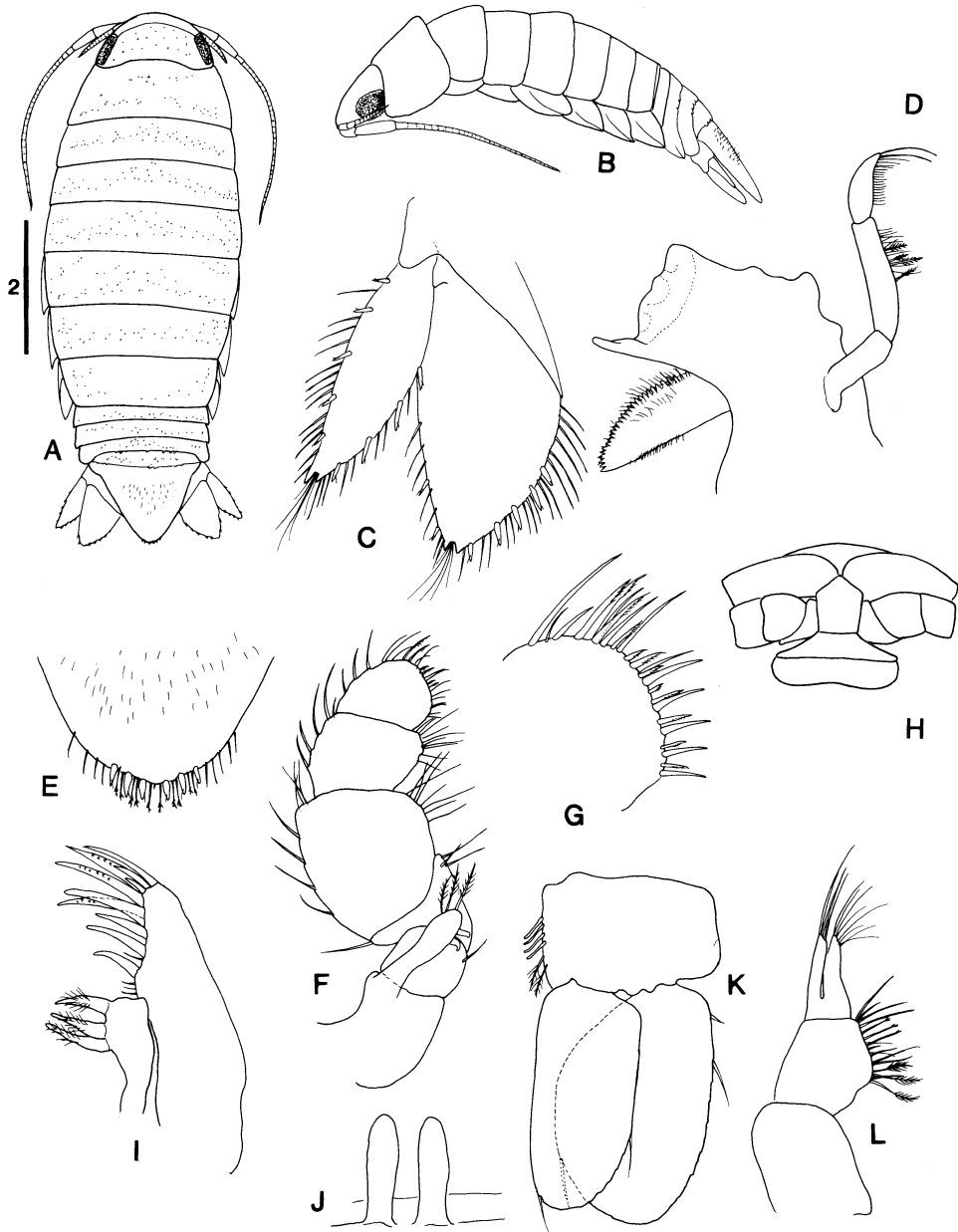


Figure 5. *Cirolana aldabrensis* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) uropod; (D) mandible; (E) apex of pleotelson; (F) maxilliped; (G) terminal palp article of maxilliped, enlarged; (H) frons; (I) maxilla 1; (J) penes; (K) pleopod 1; (L) maxilla 2.

dense mat of setules on dorsal surface in mature males; triangular, tapering to narrowly rounded apex bearing six spine-like setules, each separated by two plumose setae.

Antennular peduncle articles 1 and 2 fused but suture still visible, article 3 subequal in length to 1 and 2 combined; flagellum with 10–11 articles. Antenna extending to pereonite 4, flagellum with 25–27 articles.

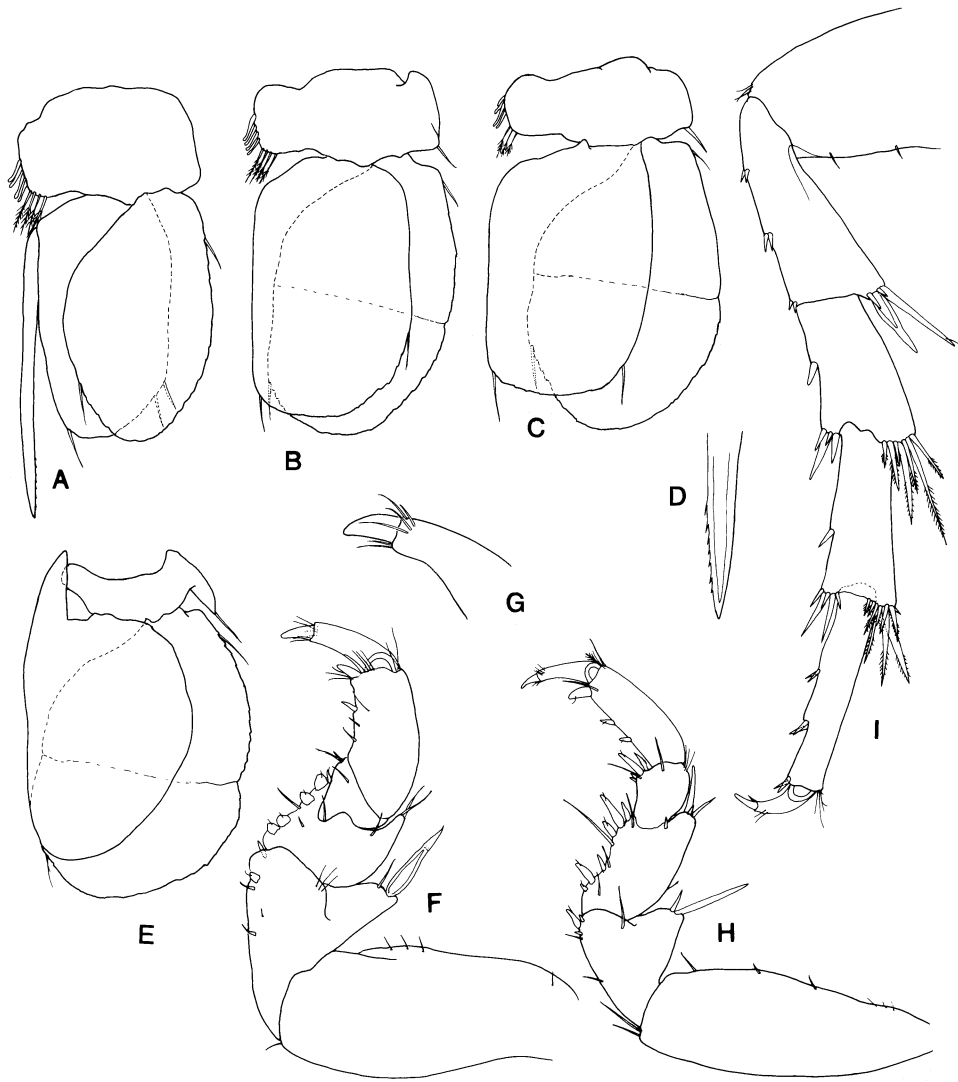


Figure 6. *Cirolana aldabrensis* sp. nov. (A) Male pleopod 2; (B) pleopod 3; (C) pleopod 4; (D) apex of copulatory stylet; (E) pleopod 5; (F) pleopod 1; (G) dactyl of pereopod 1; (H) pereopod 2; (I) pereopod 7.

Frontal lamina pentagonal, maximum width about two-thirds of length, lateral margins straight, converging very slightly toward base. Maxilla 1, maxilla 2 and mandible as figured. Maxillipedal endite with two coupling hooks and three plumose setae; article 5 of palp bearing 12 fringed setae of varying lengths amongst long, simple setae.

Pereopod 1, propodus with two simple, short setules on posterolateral margin; merus bearing four short, squat, wide setae on posterior margin, each bearing a short lash; ischium with very large, stout seemingly hollow seta on anterodistal margin. Pereopod 2, propodus with three flagellated setae on posterior margin; carpus bearing four robust and one slender setae at posterodistal margin; merus with six stout and two slender setae on posterior margin; ischium bearing one large and two smaller stout setae at posterolateral corner, one short and one long stiff setae at anterolateral angle. Pereopod 7, propodus with three pairs

of short, double spine-like setae along anterior margin; carpus with nine serrate setae at posterolateral angle and five simple setae at anterolateral corner; merus having seven serrate setae and four simple setae at same angles; ischium with large, hollow seta, two shorter setae and one long, flagellated seta on posterolateral margin. Penes separate, elongate, about three times as long as wide, separated by about 10% of width of sternite 7.

Pleopod 1 peduncle with four coupling hooks and two plumose setae; endopod two-thirds width of exopod, lateral margins straight. Pleopod 2, four coupling hooks and four plumose setae on peduncle; appendix masculina narrow, parallel-sided, extending beyond endopod by one-quarter of length, several setules set on lateral margin near acute apex. Pleopod 3 peduncle with four coupling hooks and four plumose setae, exopod suture complete. Pleopod 4 peduncle having four coupling hooks and three plumose setae, exopod suture complete. Pleopod 5 endopod lacking marginal setae, exopod with complete suture. Uropodal exopod shorter than pleotelson, lanceolate, bifid apex containing several long setae; lateral margin with five spine-like, flagellated setae and medial margin with four such setae set among numerous plumose marginal setae. Endopod with two short, spine-like lateral setae, five medial setae and bifid apex bearing long, slender setae; subequal in length to pleotelson.

*Female.* Similar to male except for sexual characters. Pleotelson nearly glabrous, denticles on pleonal margins lacking.

#### *Remarks*

The new species differs from its similar congener from Réunion Island, *C. mascarenensis* Müller, 1991, by details of setation of the uropods and pleotelson: e.g. eight short, spine-like, flagellated setae on the pleotelsonic apex versus six in the new species, and seven and three such setae on lateral and inner margins of the exopod versus five and four, respectively, for *C. aldabrensis*. In Müller's species the appendix masculina is relatively longer and penes are lacking; further differences can be seen in the type and number of strong setae on the pereopods, and in the lack of an overlapping rostrum. The prominent and elongate penes of *C. aldabrensis* represent a rare condition in the *Cirolana parva* complex of species.

#### *Etymology*

The species is named for the type locality.

### ***Cirolana mimulus* sp. nov.**

(Figures 7, 8)

#### *Material examined*

Holotype: USNM 280275, one male (5.3 mm), in clumps of coralline alga *Amphiroa* sp. on reef flat, Anse Marie Louise, Mahé, Seychelles, 1 m, 21 February 1989. Paratypes: USNM 280276, 86 specimens, same data as holotype.

*Other material examined.* USNM 280277, 150 specimens from eight stations, algal turf, rubble, coralline algae, on reef flat, Mahé Island, Seychelles, 0.5–1.5 m.

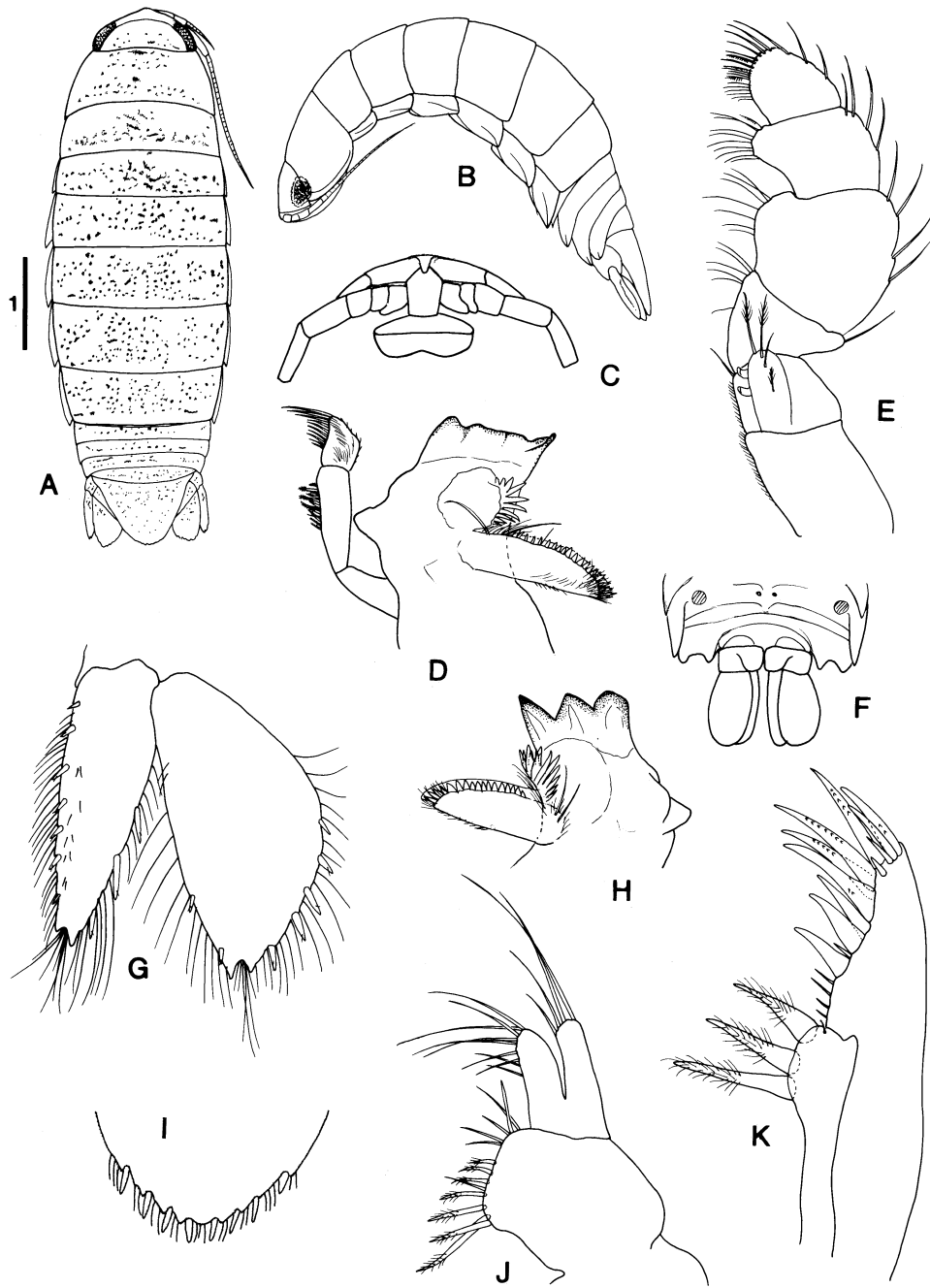


Figure 7. *Cirolana mimulus* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) frons; (D) left mandible; (E) maxilliped; (F) anterior pleon in ventral view; (G) uropod; (H) right mandible; (I) apical margin of pleotelson; (J) maxilla 2; (K) maxilla 1.

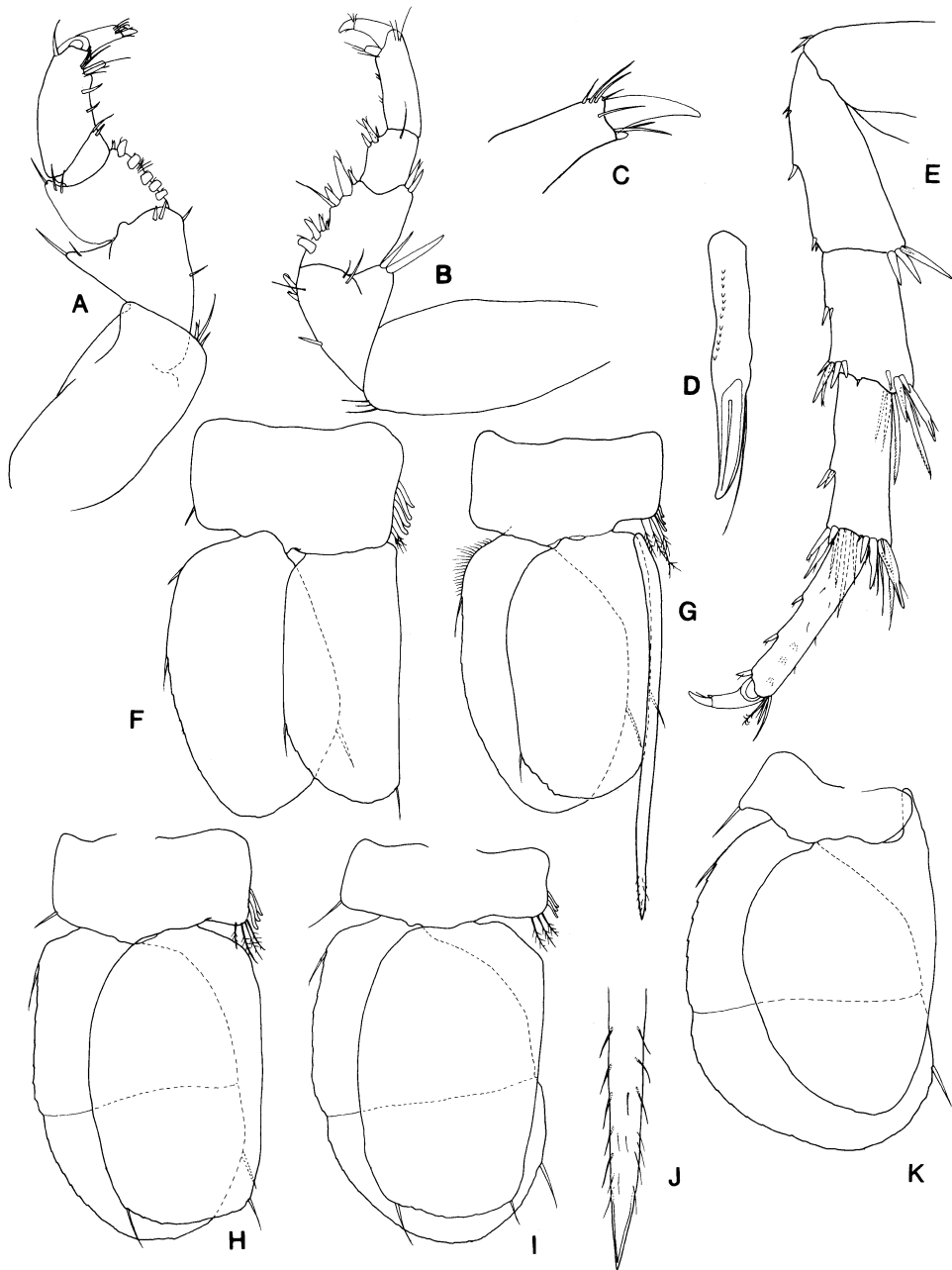


Figure 8. *Cirolana mimulus* sp. nov. (A) Pereopod 1; (B) pereopod 2; (C) dactyl of pereopod 1; (D) seta from merus of pereopod 2; (E) pereopod 7; (F) pleopod 1; (G) male pleopod 2; (H) pleopod 3; (I) pleopod 4; (J) apex of copulatory stylet; (K) pleopod 5.

*Description*

*Male.* Body about three times as long as greatest width. Cephalon with submarginal anterior and faint interocular sutures. Integument smooth. Pereonite 1 with single lateral suture; coxae all with entire carina, posterolateral angles of coxae 5–7 acute. Pleonite 1 visible in lateral view, not completely overlapped by coxa of pereonite 7. Pleotelson broadly rounded, armed with eight apical spine-like setae amongst plumose marginal setae.

Antennular peduncle articles 1 and 2 fused; article 3, slightly shorter than articles 1 and 2 combined; flagellum of 10–11 articles. Antennal flagellum of 24 articles, extending to pereonite 4. Frontal lamina overlapped by rostrum, pentagonal, width two-thirds of length. Mandible as figured, with three long setae at junction of molar process. Maxilla 1 lateral lobe with nine stout and seven shorter, simple setules. Maxilla 2 as figured. Maxillipedal endite with two coupling hooks and four circumplumose setae.

Pereopod 1, propodus bearing large conspicuous seta at posterodistal angle; merus with five very stout, short, blunt spine-like setae on posterior margin. Pereopod 2 as figured. Pereopod 7, carpus with one and merus with two, long, stout complex setae at posterodistal angle (see enlarged view) among cluster of other fringed and simple setae. Penes lacking, vasa differentia openings inconspicuous.

Pleopod 1 with four coupling hooks and two plumose setae; endopod 73% width of exopod. Pleopod 2 with three coupling hooks and four plumose setae; appendix masculina straight, length about 28 times basal width, apex acute bearing several fine setae, extending about one-third beyond endopod. Pleopods 3 and 4 similar, peduncle of pleopod 3 with one more plumose seta; exopod sutures complete. Pleopod 5 peduncle without coupling hooks, endopod without setae. Uropodal exopod length more than three times greatest width, subequal in length to endopod; lateral margin with seven spine-like setae, apex sub-bifid, medial margin bearing three short spine-like setules amongst plumose setae; a few short setae scattered on surface near lateral margin. Uropodal endopod subequal in length to pleotelson; lateral margin with two (very occasionally three) short spine-like setae; apex bifid with several long plumose setae emerging; medial margin with five spine-like setae amongst long plumose setae.

*Female.* Similar to male except for sexual characters.

*Remarks*

*Cirolana mimulus* can be distinguished from *C. aldabrensis* sp. nov. described herein, by the spination of the uropods and pleotelson, e.g. in having eight apical setules on the pleotelson (versus six) and by the lack of penes. The new species is much more similar to *C. mascarenensis* Müller, 1991 but differs in subtle ways: antennal articles 1 and 2 are fused in the Seychelles species, which also has anterior and interocular furrows on the cephalon (not shown in Müller's drawings), a relatively shorter appendix masculina and a complex of robust setae on pereopod 7. The easiest character to use in separation is the number of stout setules on the lateral margin of the uropodal endopod: five in Müller's species versus two in *C. mimulus*.

*Etymology*

The specific name is from the Latin diminutive of "mimus" (imitator), referring to its great similarity to another Indian Ocean species, *C. mascarenensis* Müller, 1991 from Réunion Island.



*Cirolana somalia* sp. nov.

(Figures 9, 10)

*Material examined*

Holotype: USNM 280279, one male (11.0 mm), IIOE sta 444, off Somalia, 9°36'N, 51°01'E, 80 m, 16 December 1964. Paratypes: USNM 280280, two ovigerous females, one female, one juvenile, same data as holotype. USNM 280281, two male, two ovigerous female, one female, IIOE sta 447, off Somalia, 10°00'N, 51°15'E, 59–61 m, 16 December 1964.

*Description*

Body three times longer than wide. Cephalon bearing four tiny tubercles in two pairs on posterior half, posterior pair wider apart. Evenly convex dorsal interocular suture connecting posterior margins of eyes. Pereonite 1 with five to six tiny tubercles in two

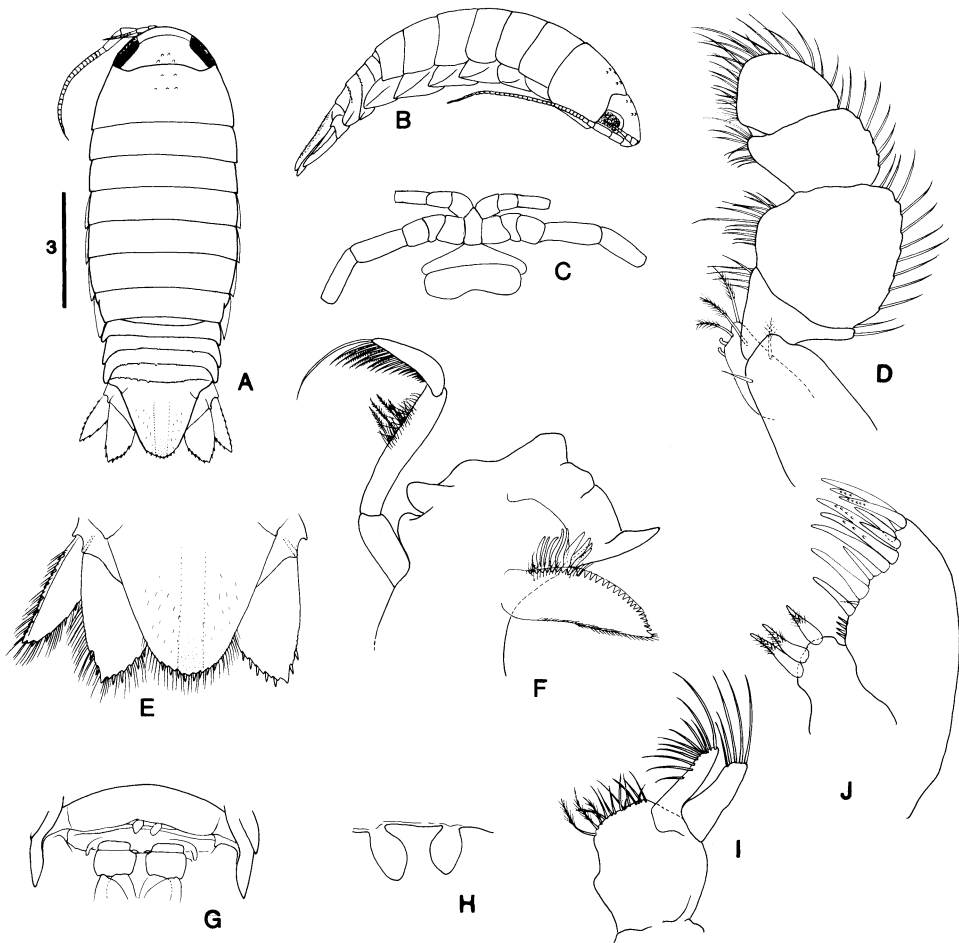


Figure 9. *Cirolana somalia* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) frons; (D) maxilliped; (E) pleotelson and uropods; (F) left mandible; (G) anterior pleon in ventral view; (H) penes; (I) maxilla 2; (J) maxilla 1.

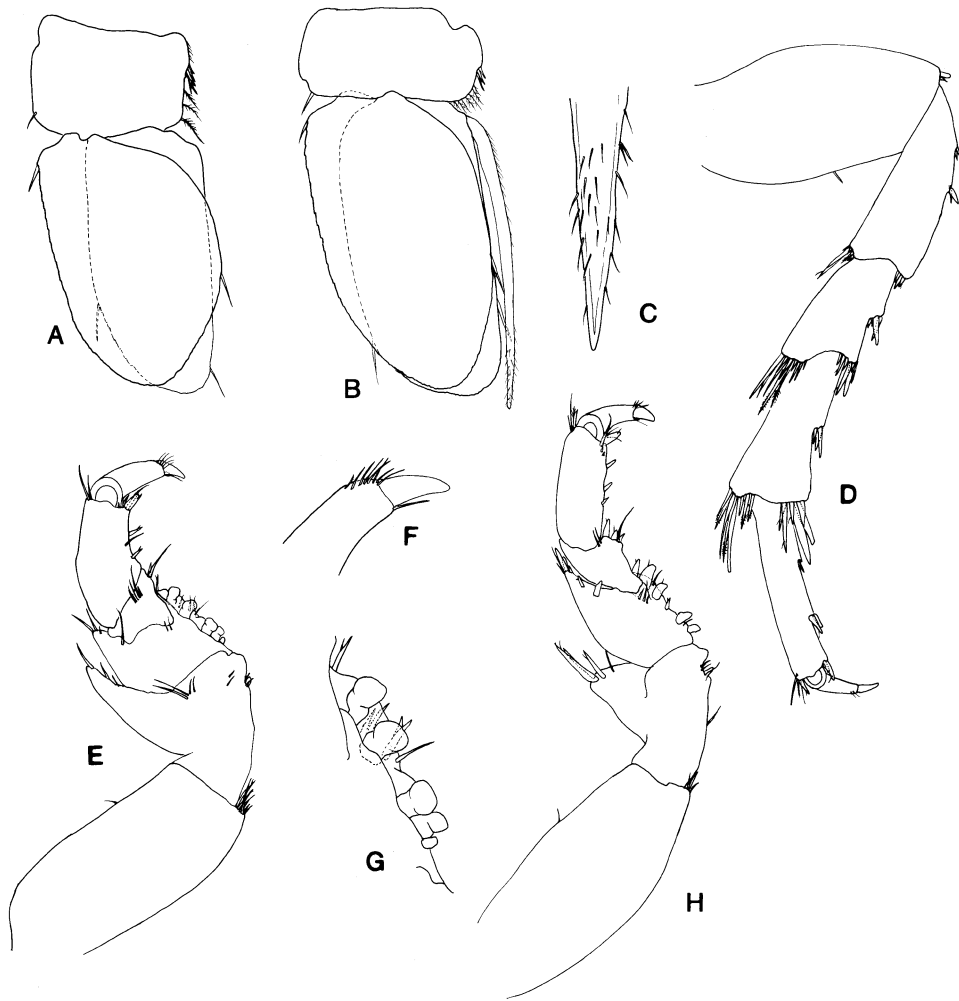


Figure 10. *Cirolana somalia* sp. nov. (A) Pleopod 1; (B) male pleopod 2; (C) apex of copulatory stylet; (D) pereopod 7; (E) pereopod 1; (F) dactylus of pereopod 1; (G) setae on merus of pereopod 1, enlarged; (H) pereopod 2.

rows near anterior margin. Pereonites without furrows. Pleonites 3–5 with irregular number of small, low tubercles on posterior margins. Pleotelson with barely perceptible medial depression, best seen in side view; dorsal surface with scattered, tiny setules. Apex evenly rounded, armed with eight spine-like setae and plumose setae between small teeth.

Antennule, article 3 of peduncle about two-thirds length of articles 1 and 2 combined; 1 and 2 not fused; flagellum of antennule with about 15 articles. Flagellum of antenna with 42 articles, extending posteriorly to pereonite 5. Frontal lamina narrowly pentagonal, sides slightly incurved, length more than twice greatest width, acute apex not overlapped by rostral process. Maxilla 1 and 2 and mandible as figured.

Pereopod 1 with four robust and one tiny blunt setules on posterior margin of merus. Pereopod 2 merus bearing five robust and one tiny spine-like setules on posterior margin. Pereopod 7 with groups of spine-like setae at distal angles of carpus and merus. Penes present, short, separated by distance equal to about 11% of width of sternite.

Pleopod 1 with five coupling hooks and three fringed setae on peduncle. Pleopod 2 with slender appendix masculina arising basally, extending beyond endopod by about 10% of its length with scattered simple setae, apex narrowing to acute point; three coupling hooks and seven plumose setae on peduncle.

Uropods projecting slightly beyond pleotelsonic apex. Exopod slightly shorter than endopod, lateral margin having seven spine-like setules amongst plumose setae, medial margins with four setules, apex acute but not bifid. Endopod with two stiff setules and long plumose setae on lateral margin; medial margin with five setules plus plumose setae, apex not bifid.

*Female.* As for male except in sexual characters and absence of tubercles on cephalon and pereonite 1. Ovigerous females considerably larger than mature males.

#### *Remarks*

The new species appears very similar to another western Indian Ocean species, *Cirolana theleceps* Barnard, 1940, in having a faint mid-dorsal depression on the pleotelson and tubercles on the cephalon and first pereonite of the male. The uropods and pleotelsonic apex of *C. theleceps* differ considerably, both uropodal rami being more rounded apically and, as in the pleotelson, armed with very blunt, almost scallop-like teeth unlike those in *C. somalia*.

#### *Etymology*

The species name is a noun in apposition, taken from its type locality, Somalia.

### *Cirolana undata* sp. nov.

(Figures 11, 12)

#### *Material examined*

Holotype: USNM 280282, one male (6.5 mm), IIOE sta 437, off Somalia, 9°25'N, 50°54'E, 90 m, 16 December 1964. Paratypes: USNM 280283, two males, 14 ovigerous females, one female, same data as holotype.

*Other material examined.* USNM 280284, one ovigerous female, IIOE sta 453, off Somalia, 9°41'N, 51°03'E, 47–49 m, 16 December 1964. USNM 285232, one male, four ovigerous females, two females, IIOE sta 408-D, off Mozambique, 16°42'S, 43°19'E, 150–300 m, 15 October 1964.

#### *Description*

*Male.* Body length three times width. Cephalon slightly produced anteriorly, covering antennal bases, apically upturned in dorsal view; two dorsal, medial tubercles present, anterior of which low, rounded; posterior tubercle low, short, transverse ridge; interocular suture lacking. Pereon punctate. Pereonites 1–3 each with one, and pereonites 4–6 each with two transverse sutures. Pereonite 7, posterior border finely scalloped, largely concealing pleonite 1. Coxae 2–7 each with two prominent carinae. Pleonites 3–4 with

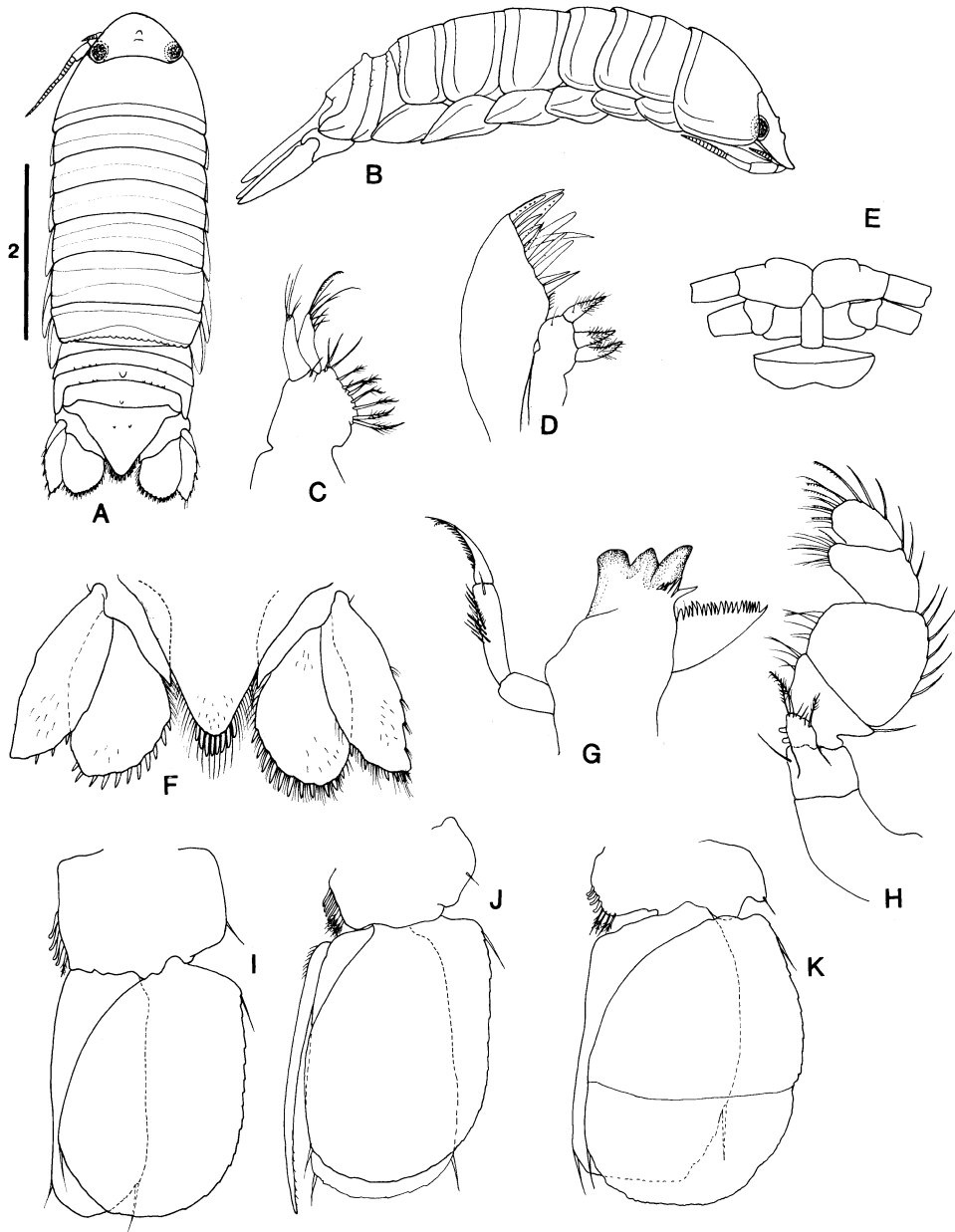


Figure 11. *Cirolana undata* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) maxilla 2; (D) maxilla 1; (E) frons; (F) pleotelson and uropods; (G) mandible; (H) maxilliped; (I) pleopod 1; (J) male pleopod 2; (K) pleopod 3.

several tiny tubercles on posterior border. Pleonite 4 bearing prominent tubercle mid-dorsally. Pleotelson with slightly sinuous lateral margins, narrowly rounded apex bearing eight long, flat spine-like setae separated by long, slender setae.

Antennular peduncle articles 1 and 2 fused but suture slightly visible; article 3 about two-thirds length of articles 1 and 2 combined; flagellum of eight articles; several aesthetascs each on articles 2–7. Antennal flagellum with 16 articles. Frontal lamina narrow,

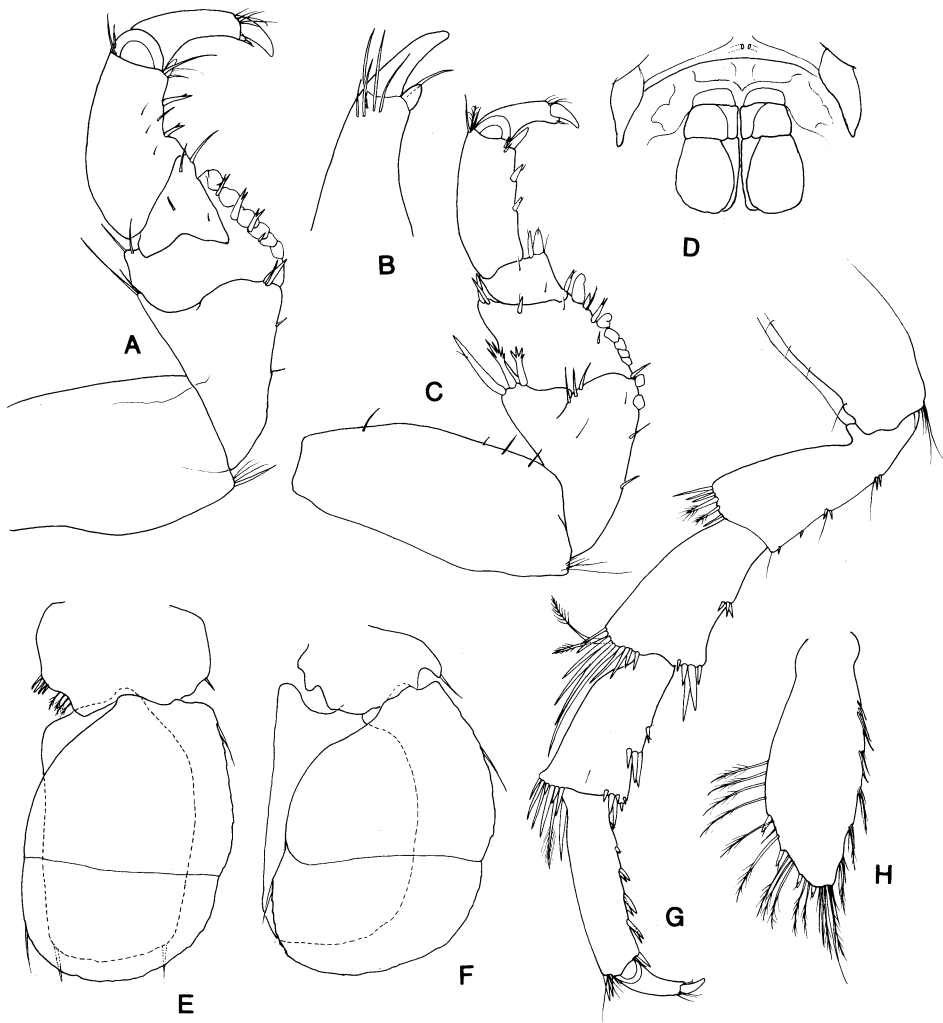


Figure 12. *Cirolana undata* sp. nov. (A) Pereopod 1; (B) dactylus of pereopod 1; (C) pereopod 2; (D) anterior pleon in ventral view; (E) pleopod 4; (F) pleopod 5; (G) pereopod 7; (H) uropodal exopod.

pentagonal, length nearly twice greatest width, lateral margins slightly incurved with submarginal depression. Maxilla 1 and 2 and mandible as figured.

Pereopod 1, merus with six stout, blunt setules and three more slender, bifid setae on posterior margin. Pereopod 2, merus with six stout, one bifid and three simple setules on posterior margin. Pereopod 7, posterodistal angles of merus and ischium each with two plumose setae and several long, simple spine-like setae, carpus bearing single fringed seta and eight stiff, simple setae at same angle. Penes absent; openings on sternite 7 separated by about 3% width of sternite.

Pleopod 1 endopod one-half width of exopod. Pleopod 2, appendix masculina long, slender, extending beyond apex of endopod by about 10% of length; apical one-sixth with sparse scales or setules. Pleopods 3 and 4 similar with four coupling hooks and four plumose setae on peduncles. Pleopod 5, endopod lacking setae. Uropodal peduncle,

posterior margin sinuous. Uropodal endopod broadly rounded apically, bearing 11 spine-like setae interspersed with plumose setae; scattered short setae on dorsal surface. Uropodal exopod with four stiff, simple and several plumose setae on mesial margin; stiff setae lacking on lateral margin, with four to five tufts of slender setae at notches; apex entire, with long, simple setae of various lengths. Uropodal rami subequal in length, both extending beyond pleotelson by 20% of length of exopod.

*Female.* Similar to male, excepting sexual characteristics and having cephalon smooth, lacking tubercles.

#### Remarks

The scalloped border of pereonite 7 and the character and number of cephalic tubercles in the male serve to separate this species from its congeners, as well as the anteriorly produced cephalon.

#### Etymology

The specific name, from the Latin for “wavy”, refers to the distinctive scalloped posterior border of pereonite 7.

### Genus *Eurydice* Leach, 1815

*Restricted synonymy.* *Eurydice* Leach 1815, p 354, 370; Jones 1971, p 201; Bruce and Jones 1978, p 396; Bruce 1986, p 11. Brusca et al. 1995, p 40.

#### Diagnosis

Pereonites 1 and 2 subequal in length. Pleonite 5 lateral margin not overlapped by pleonite 4. Antennular peduncle article 2 at right angles to article 1. Antenna peduncle with four articles. Frontal lamina reduced; clypeus with triangular blade projecting ventrally. Pereopods 5–7 with ischium to propodus flattened, setose. Pleopods rounded; endopod of pleopod 5 without setae. Appendix masculina inserted medially. Uropodal peduncle not produced.

#### Key to species of *Eurydice* from the Indian Ocean

1. Posterior margin of pleotelson with no spine-like setae, at most simple or plumose setae . . . . . 2
- Posterior margin of pleotelson having two or four robust, spine-like setae. . . . . 6
2. Both uropodal rami narrow and tapering to acute, posterolateral apices; pereopods 1–7 chelate . . . . . *Eurydice chelifera* Jones, 1971 [Kenya]
- Not as above . . . . . 3
3. Posterior margin of pleotelson narrowly rounded with five apical teeth . . . . . *Eurydice humilis* Stebbing, 1910a [Chagos Archipelago]
- Posterior margin of pleotelson relatively straight . . . . . 4

4. Uropodal rami both broadly rounded apically; endopod extending slightly beyond apex of pleotelson . . . . . *Eurydice inornata* Jones, 1971 [Kenya]
- Uropodal rami truncate or with acute posterolateral angles; endopod not reaching apex of pleotelson . . . . . 5
5. Uropodal rami broad, truncate; endopod extending close to apex of pleotelson . . . . . *Eurydice orientalis* Hansen, 1890 [Java Sea]
- Uropodal exopod short, narrow; posterolateral angle of endopod acute, not at all close to apex of pleotelson . . . . . *Eurydice inermis* Hansen, 1890 [Red Sea; Atlantic; Mediterranean]
6. Posterior margin of pleotelson convex; pereopods 4–6 with elongate dactyls . . . . . *Eurydice longipes* Jones, 1971 [Kenya]
- Posterior margin of pleotelson relatively straight; pereopod dactyls not elongate . 7
7. Posterior margin of pleotelson bearing two spine-like setae . . . . . *Eurydice paxilli* sp. nov. [Persian Gulf]
- Posterior margin of pleotelson bearing at least four spine-like setae . . . . . 8
8. Posterior margin of pleotelson having 13 plumose setae; uropodal endopod extending beyond apex of pleotelson . . . . . *Eurydice peraticis* Jones, 1974 [Persian Gulf, Saudi Arabia, Goa]
- Not as above . . . . . 9
9. Posterior margin of pleotelson deeply indented with two pairs of widely separated spine-like setae not extending beyond posterior corners of telson and with two medial plumose setae . . . . . *Eurydice cavicaudata* Jones, 1971 [Kenya]
- Not as above . . . . . 10
10. Posterior margin of pleotelson about one-fifth width of same; appendix masculina markedly recurved apically . . . . . *Eurydice indicis* Eleftheriou and Jones, 1976 [India]
- Posterior margin of pleotelson narrow, one-quarter or less width of pleotelson 11
11. Adult reaching 7 mm in length; epimera hind margins acute . . . . . *Eurydice longicornis* (Studer, 1883) [South Africa]
- Adult size ca 2 mm in length; epimera hind margins ending in blunt point . 12
12. Antennular third peduncular article longest, just longer than second peduncular article; flagellum longer than peduncular articles 1–3 combined; appendix masculina tapering to blunt point apically . . . . . *Eurydice arabica* Jones, 1974 [Red Sea]
- Antennular third peduncular article longest, just less than length of flagellum; flagellum shorter than peduncular articles 1–3 combined; appendix masculina tapering to sharp point . . . . . *Eurydice agilis* Jones, 1971 [Kenya]

Note: According to Bruce (1986), the Red Sea record for *E. inermis* is possibly an error; this may be another species.

***Eurydice paxilli* sp. nov.**

(Figures 13, 14)

*Material examined*

Holotype: USNM 280285, one ovigerous female (2.9 mm), sta 2I1A, Persian Gulf, south of Ras Tanajib, Saudi Arabia, intertidal, coll. J. McCain, 31 May 1982. Paratypes: USNM 280286, two males, three females, four juveniles, from six stations, Persian Gulf (five south of Ras Tanajib and one north of Safaniya), intertidal, coll. J. McCain, January and May 1982.

*Description*

*Female.* Body length about 2.5 times greatest width. Pereonites 2–6 progressively longer; pereonite 6 longer than 7. Coxae without acute angles at posterolateral corners. Pleonites of equal length. Pleotelson with dorsal depression faint; posterior margin truncate, bearing two short, blunt peg-like setae each with an accessory flagellum and separated by four long, simple setae, with additional long seta lateral to each peg-like seta. Maximum width of pleotelson 3.5 times width of posterior margin.

Antennule barely reaching mid-point of eye, flagellum composed of four articles, articles 1–2 with at least two aesthetascs each. Antenna extending to mid-length of pereonite 1; flagellum of five articles. Maxilla 1 and 2 and mandible as figured. Frontal lamina broadly rounded at apex, somewhat projecting, not reaching mid-point of antennular basal article.

Pereopod 1 with large, thick serrate seta, nearly as long as dactylus, at posterolateral margin of propodus. Pereopods 2 and 7 as figured.

Pleopod 1 rami subequal in length, endopod less than one-half width of exopod. Uropodal endopod subtruncate, bearing about 10 plumose setae. Exopod much narrower, shorter, rounded apically, bearing about eight long setae and two small spine-like setules. Both rami shorter than pleotelson.

*Male.* As female but body more slender; length of antenna and antennule unknown; pleopod 2 appendix masculina arising proximal to mid-point of endopod, tapering abruptly near toothed apex; sparse, tiny setules on lateral margins. Penes short, unfused, longer than broad.

*Remarks*

The present species is the second of the genus to be described from the Persian Gulf, following *Eurydice peraticis* Jones, 1974. *Eurydice paxilli* differs from all congeners by the configuration of the pleotelsonic apex in having four simple setae between two small blunt spine-like setae, which are each flanked laterally by a simple seta. The five species described from Kenya by Jones, 1971, *E. agilis*, *E. cavicaudata*, *E. chelifer*, *E. inornata*, and *E. longipes*, have either four or no small spine-like setae at the pleotelsonic apex. Likewise, both *E. arabica* Jones, 1974 from the Red Sea and *E. peraticis* bear four such setae there.

*Etymology*

The specific name is the plural of *paxillus* (Latin for a small peg), referring to the two diagnostic small, blunt spine-like pegs on the apex of the pleotelson.



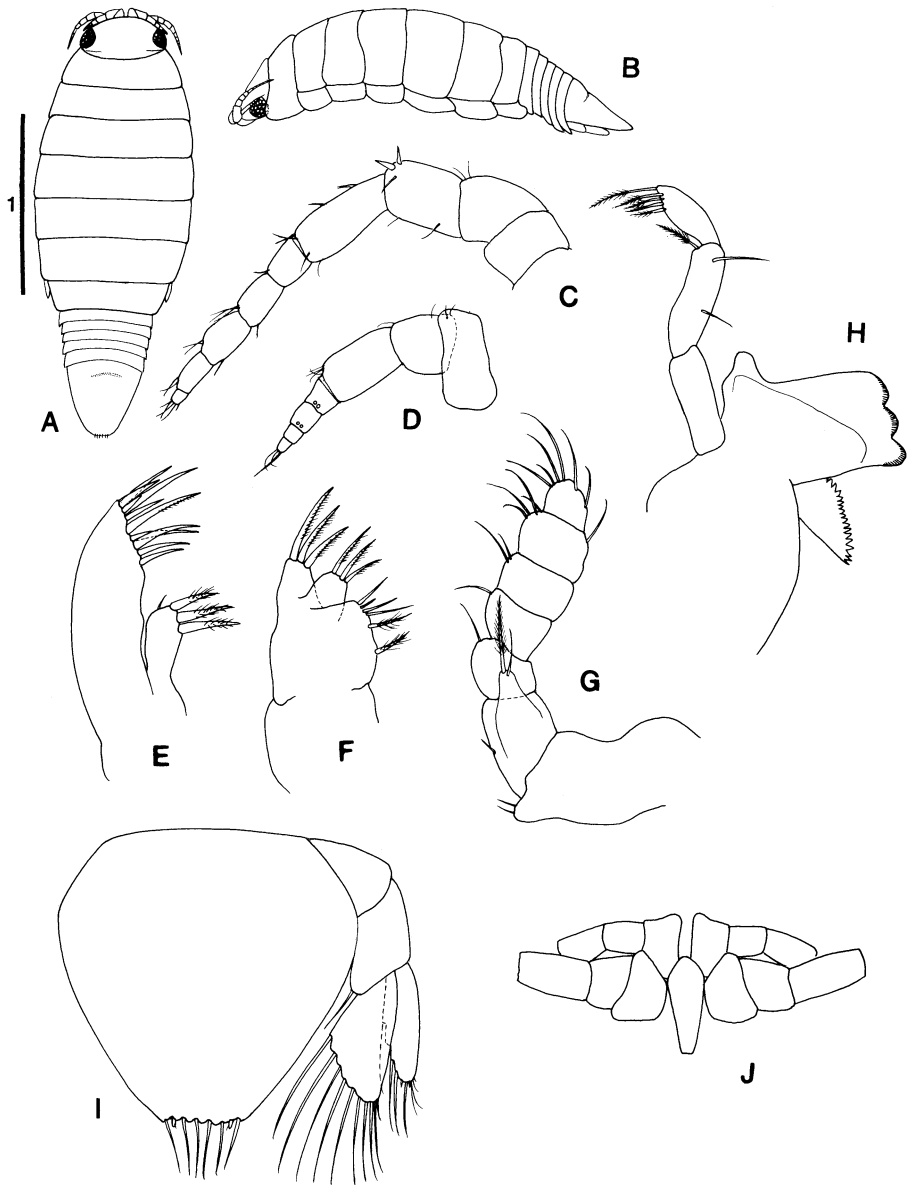


Figure 13. *Eurydice paxilli* sp. nov. (A) Ovigerous female, dorsal view; (B) female, lateral view; (C) antenna; (D) antennule; (E) maxilla 1; (F) maxilla 2; (G) maxilliped; (H) mandible; (I) pleotelson and uropods; (J) frontal lamina and antennal bases.

**Genus *Metacirolana* Nierstrasz, 1931**

*Restricted synonymy.* *Metacirolana* Nierstrasz 1931, p 147, 162; Kussakin 1979, p 212; Bruce 1981, p 950, Figures 1f–i, 2c–f, 3c, d, 4b, 5e–g; Bruce 1986, p 31; Kensley 1984a, p 42 (remarks); Kensley and Schotte 1989, p 153; Bruce 1996, p 157.

*Paracirolana* Nierstrasz 1931, p 147.

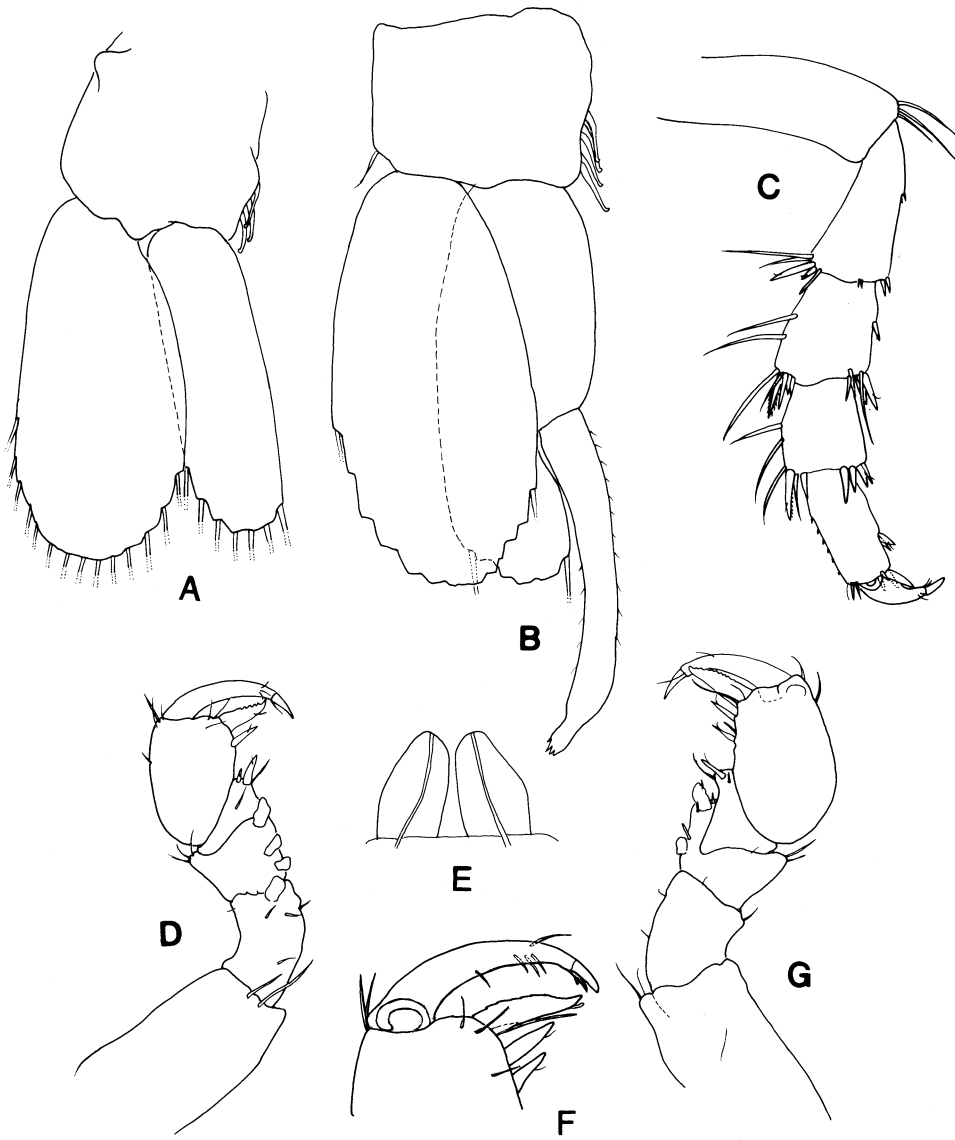


Figure 14. *Eurydice paxilli* sp. nov. (A) Pleopod 1; (B) male pleopod 2; (C) pereopod 7; (D) pereopod 2; (E) penes; (F) dactylus of pereopod 1; (G) pereopod 1.

### Diagnosis

Pereonites 1–2 subequal in length. Pleonite 5 lateral margins not overlapped by those of pleonite 4. Antennular peduncle articles colinear, article 2 longest. Antenna peduncle with five articles. Frontal lamina anterior margin dilated, freely projecting; clypeus with triangular blade projecting ventrally. Pereopods 5–7 slender with few setae or spines. Pleopods rounded; only endopod of pleopod 5 without setae. Appendix masculina inserted basally or sub-basally. Uropod peduncle medial margin produced, rami with setae on all margins.

Key to species of *Metacirolana* from the Indian Ocean

1. Eyes lacking. . . . . *Metacirolana anocula* (Hansen, 1890)  
[South Africa]
- Eyes present . . . . . 2
2. Cephalon with two anteriorly projecting horns . . . . .  
. . . . . *Metacirolana bicornis* (Kensley, 1977)  
[South Africa]
- Cephalon lacking horns . . . . . 3
3. Pereon with distinct sublateral processes on pereonites 4–6; dorsal surface of  
pleonites 2–5 each with three processes. . . . *Metacirolana mbudya* (Bruce, 1981)  
[Tanzania]
- Not as above . . . . . 4
4. Posterior margin of pleotelson truncate or angular . . . . . 5
- Posterior margin of pleotelson broadly or narrowly rounded . . . . . 6
5. Lateral costae near posterior margin of pereonites 6 and 7; median ridge on  
pleotelson . . . . . *Metacirolana rotunda* (Bruce and Jones, 1978)  
[Red Sea; East Africa]
- Pereon and pleotelson smooth, without sculpturing . . . . .  
. . . . . *Metacirolana fishelsoni* (Bruce and Jones, 1978)  
[Red Sea]
6. Pleotelson with low, rounded mid-dorsal ridge and pair of lateral ridges . . . . .  
. . . . . *Metacirolana sphaeromiformis* (Hansen, 1890)  
[Sri Lanka; Seychelles]
- Pleotelson smooth, lacking ridges . . . . . 7
7. Coxa 6 broad, rectangular, overlapping coxa 7; uropodal endopod entire, lacking  
serrations . . . . . *Metacirolana convexissima* (Kensley, 1984b)  
[South Africa]
- Not as above . . . . . 8
8. Posterior margin of pleotelson with two submedian notches each occupied by  
single spine-like setae . . . . . *Metacirolana chemola* sp. nov.  
[Off Somalia]
- Posterior margin of pleotelson lacking spine-like setae . . . . . 9
9. Body oval, length less than twice width; frontal lamina length almost twice width,  
anteriorly rounded . . . . . *Metacirolana monodi* (Jones, 1976)  
[Aldabra Atoll, Seychelles]
- Body length 2.6 times length; frontal lamina widening anteriorly *Metacirolana*  
*arnaudi* Kensley, 1989 [St Paul and Amsterdam Is.]

***Metacirolana chemola* sp. nov.**  
(Figures 15, 16)

*Material examined*

Holotype: USNM 280287, one ovigerous female (3.5 mm), IIOE sta 447, off Somalia, 10°00'N, 51°15'E, 59–61 m, 16 December 1964. Paratypes: USNM 280288, one male

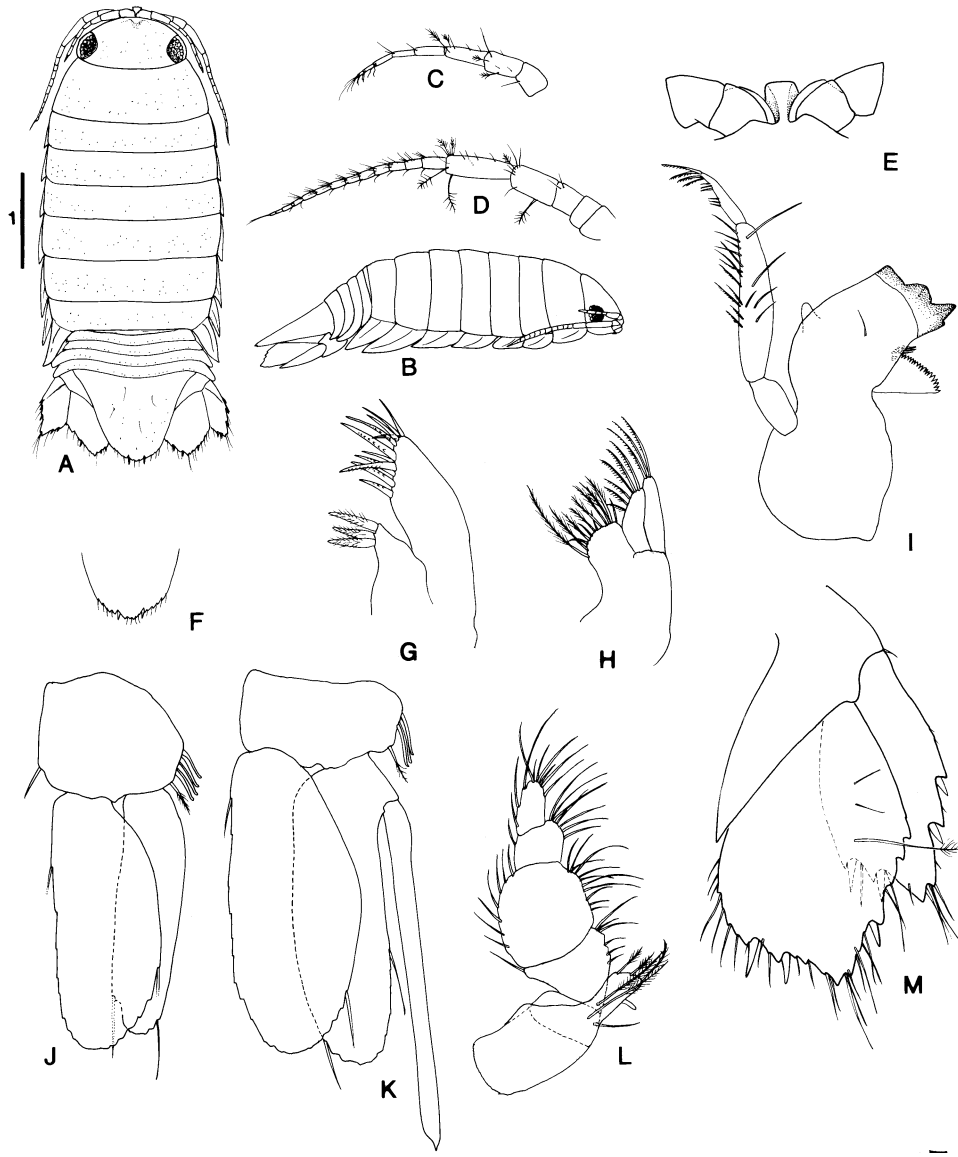


Figure 15. *Metacirolana chemola* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) antennule; (D) antenna; (E) frontal lamina; (F) apex of pleotelson; (G) maxilla 1; (H) maxilla 2; (I) mandible 3; (J) pleopod 1; (K) male pleopod 2; (L) maxilliped; (M) uropod.

4.0 mm, immature male 3.0 mm, four ovigerous females 3.1–4.0 mm, two females 2.9–3.0 mm, same data as holotype.

*Other material examined.* USNM 280289, one immature male, two ovigerous females, IIOE sta 445, off Somalia, 9°41'N, 51°05'E, 60–70 m, 16 December 1964.

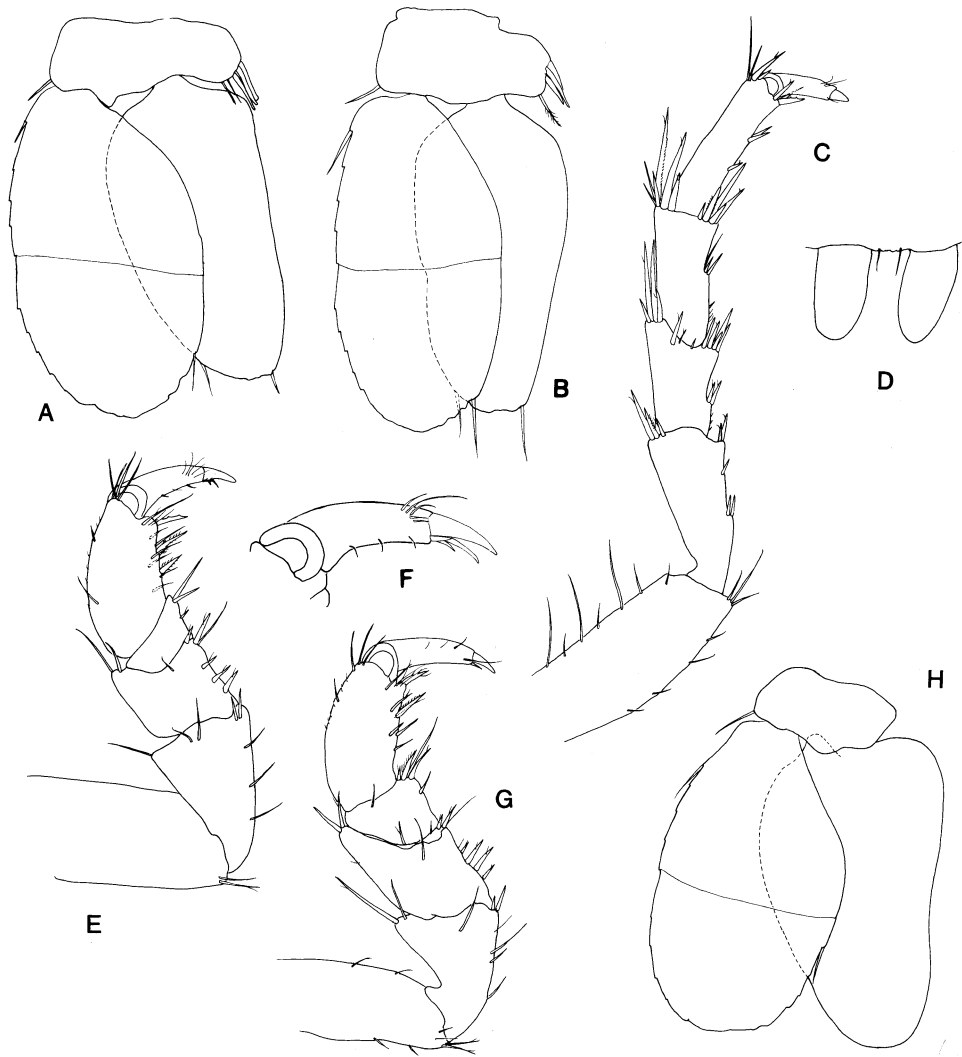


Figure 16. *Metacirolana chemola* sp. nov. (A) Pleopod 4; (B) pleopod 5; (C) pereopod 7; (D) penes; (E) pereopod 1; (F) dactylus of pereopod 1; (G) pereopod 2; (H) pleopod 5.

*Description*

*Ovigerous female.* Body length about 2.5 times width. Cephalon with slight mid-dorsal depression anteriorly, tiny rostral process present. Pigment variable, scattered chromatophores on all somites including pleotelson. Coxae 2–7 with distinct furrows. Pleotelson posterior margin coarsely serrate, apex flanked by two notches each containing a single short, spine-like seta, and bearing 12–13 short plumose setae.

Antennular flagellum with five to six articles and two aesthetascs on each of articles 3–5. Antennal flagellum reaching pereonite 3, bearing 11–12 articles. Frontal lamina columnar, pentagonal in head-on view; in ventral view appearing truncate distally, tapering basally, length 1.5 times greatest width. Mandibular palp, penultimate article bearing about six fringed and 11 simple setae; terminal article with four fringed and six simple setae. Maxilla

1 with 11 spine-like setae on the outer ramus; maxilla 2 as figured. Pereopods and pleopods 1, 3–5 as figured.

Uropods coarsely serrate, endopods subequal in length to pleotelson, exopods shorter. Exopod with two short, stout spine-like setae and simple setae on lateral margin, two such setae on mesial margin; endopod much wider, acute distally with one stout, spine-like seta and long, simple setae on lateral margin, two robust spine-like setae present on mesial margin.

*Male.* Pereon more slender than in female. In mature males, mid-dorsal depression on cephalon is flanked by low bosses. Appendix masculina on pleopod 2 parallel-sided, extending beyond endopod by less than one-quarter length, abruptly tapering to acute apex. Penes separate, flat, length about twice width with two simple setae between rami.

#### *Remarks*

This species closely resembles its congener from the Gulf of Aqaba, *M. fishelsoni* Bruce and Jones, 1978, but differs in the shape of the apex of the pleotelson (being an obtuse median angle in *M. fishelsoni* and lacking the two prominent spine-like setae on the apex), as well as in the numbers of setae on the maxillule and mandibular palp, far fewer in the case of the latter species. The two notches on the pleotelsonic apex and lack of sculpturing thereon immediately separate it from all other congeners in the Red Sea and western Indian Ocean.

#### *Etymology*

The specific name, from the Greek “chemola”, a notch, refers to this feature on the pleotelsonic apex.

### **Family SPHAEROMATIDAE** H. Milne Edwards, 1840

#### **Genus *Cassidinidea*** Hansen, 1905

*Restricted synonymy.* *Cassidinidea* Hansen 1905, p 113; Kensley and Schotte 1989, p 207; Bruce 1994b, p 1082, 1150.

#### *Diagnosis*

*Adult male.* Body about twice as long as greatest width, widest at pereonite 5; without *membrana cingulata*; surface smooth or finely granular, dorsum often with nodules; margins with fringe of fine setae. Cephalon lacking rostral point, lateral margins expanded; eyes dorsal, rounded; pereonite 1 longer than pereonite 2; pereonites 2–4 progressively increasing in length, 4–7 subequal in length. Pleonite 1 indicated by two anterolateral sutures. Pleotelson anterolateral margins not reaching lateral margin of pleon or uropodal peduncle; posterior margin without groove or exit channel.

Antennule peduncle dorsoventrally compressed, articles 1 and 2 not markedly flattened or expanded; article 3 longer than article 2; flagellum slightly more than twice as long as peduncle article 3. Antenna peduncle about one-half length of article 2; articles 3–5 progressively increasing in length; flagellum with four to seven articles, shorter than peduncle. Epistome prominent in dorsal view, widely separating antennal bases; flat in ventral view with mesial constriction.

Mandibles with three- or four-dentate incisor, spine row of four or five serrate spine-like setae; lacinia mobilis on left mandible; molar process with serrate teeth, some indistinct ridges. Maxilla 1 with large, weakly serrate spines plus one serrate and one short spine-like seta on lateral lobe; mesial lobe with four serrate spines. Maxilla 2 lateral and middle lobes with prominent flat nodular spines, medial lobe narrow; endite subtruncate with simple and plumose spine-like setae along distal margin.

Pereopod 1 dactylus short with prominent, conical secondary unguis. Pereopods 2–7 subsimilar; pereopod 7 merus distal margin with trifid spine-like setae, posterior margins of merus, carpus and propodus with scale setules.

Penes fused to form single process, *vasa differentia* fused along entire length. Appendix masculina slender, elongate, apically acute, borne on prominent posteriorly directed proximomedial lobe on endopod. Pleopod 3 exopod with weak suture. Pleopods 4 and 5, both rami lacking transverse folds.

*Ovigerous female.* Mouthparts not metamorphosed. Brood pouch formed by two opposing ventral pockets which overlap at sternite 4.

***Cassidinidea clarkae* sp. nov.**

(Figures 17, 18)

*Material examined*

Holotype: USNM 280290, one male, 2.0 mm, intertidal mudflat with green algae, Harbour View Guesthouse, Mahé, Seychelles, coll. J. Clark, 1 May 1984. Paratypes: USNM 280291, two males, two ovigerous females, one female, same data as holotype.

*Description*

*Male.* Body reticulate brown-red pigment on all segments including base of uropodal endopods. Pereonites smooth. Epistome rectangular, twice as wide as long, fairly straight-sided with incurving extensions posteriorly. Pleonite 7 and pleon with few scattered tubercles especially in male. Pleotelson with four very weak longitudinal carinae, not tuberculate, medial two seeming to converge at base of segment; apex of pleotelson truncate.

Antennal flagellum with seven articles; antennular flagellum with three to four. Maxilla 1 and 2 and mandible as figured. Pereopod 1 having two stout fringed setae at mid-length of propodus; pereopod 2 with scattered simple setules and two robust setae on propodus. Pereopod 7 with nine very robust and two slender setae at articulation of carpus. Pleopod 1 endopod reduced in width, indented distally, margins of both rami with simple and plumose setae. Pleopod 2, appendix masculina long, slender, extending beyond endopod by one-third total length, posterior one-third with tiny setules on margins. Pleopod 3 with complete suture on endopod. Pleopods 4 and 5 as shown, few if any marginal setae present. Fused penial process more than three times longer than wide.

*Ovigerous female.* As for male, except sexual characters, somewhat larger in size. Internal pouches absent.

*Remarks*

This animal is tentatively separated from another Indian Ocean species, *C. quadricarinata* Pillai, 1954, which was not examined. The latter's dorsum is furnished with "four distinct

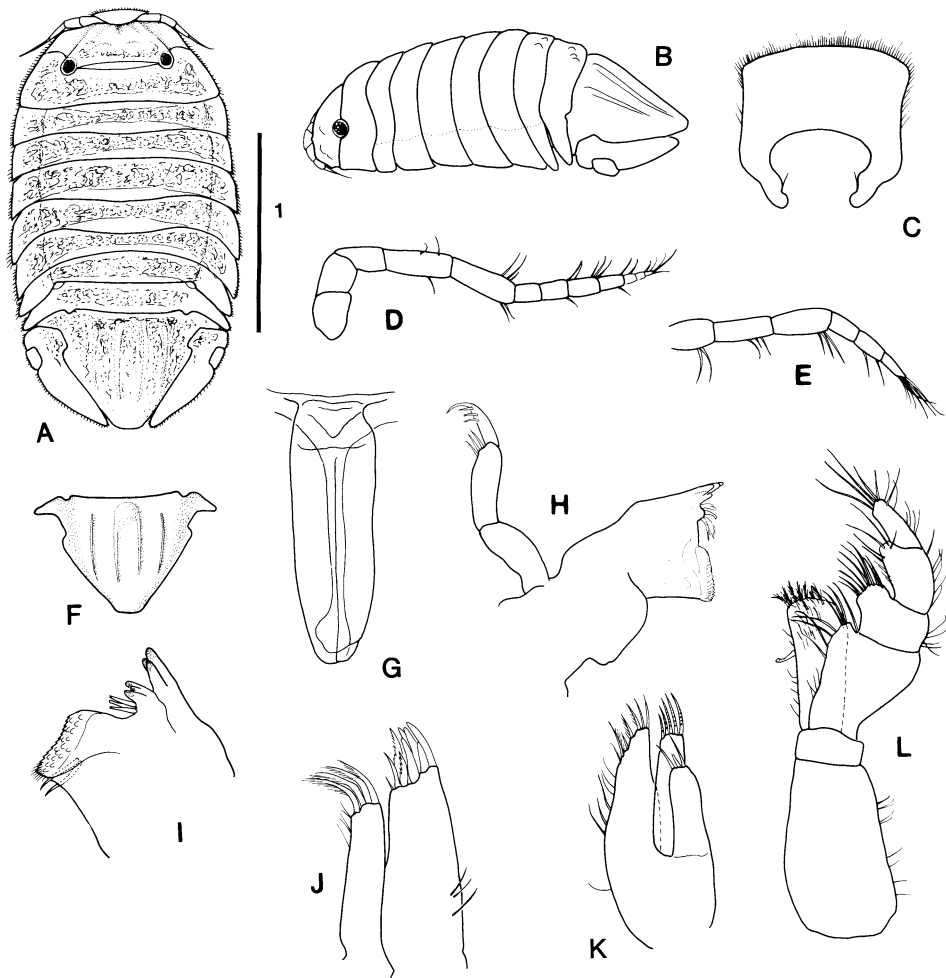


Figure 17. *Cassidimidea clarkae* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) frontal lamina; (D) antenna; (E) antennule; (F) pleotelson; (G) penes; (H) left mandible; (I) right mandible; (J) maxilla 1; (K) maxilla 2; (L) maxilliped.

longitudinal rows of tubercles giving the animal a quadricarinate appearance". The rows on the pleotelson of *C. clarkae*, which are lacking on the dorsum, are not tuberculate but very low and smooth. Based on Pillai's illustrations, *C. quadricarinata* bears one large biserrate seta on the propodus of pereopod 1 whereas the new species has two; pereopod 7 is much more setose marginally than in *C. clarkae*. These two species both possess an apically truncate pleotelson. *Cassinidea monodi* (Barnard, 1951), recently transferred from *Dies* by Bruce (1994b), also shows four low, rounded keels on the pleotelson but is distinguished by its bluntly rounded apex.

#### Etymology

The species is named for its collector, Janice Clark Walker, formerly of the Department of Zoology, NMNH.



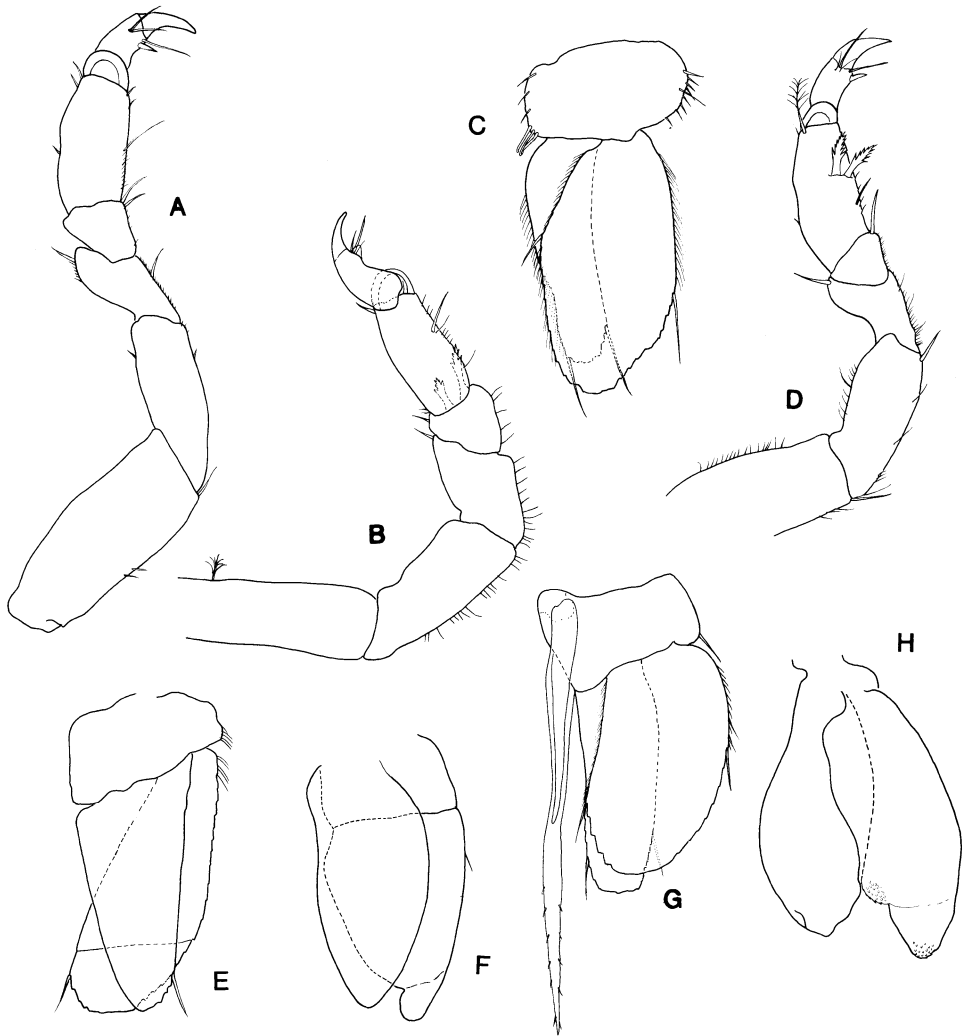


Figure 18. *Cassidinidea clarkae* sp. nov. (A) Pereopod 2; (B) pereopod 7; (C) pleopod 1; (D) pereopod 1; (E) pleopod 3; (F) pleopod 4; (G) male pleopod 2; (H) pleopod 5.

**Genus *Cymodoce* Leach, 1814**

*Restricted synonym.* *Cymodoce* Leach 1814, p 433; Dumay 1972a, 1972b, 1972c, 1972d; Harrison and Holdich 1984, p 302.

*Diagnosis*

Cephalon, pereon and pleon lacking dorsal extensions. Pleon bearing two, long, straight parallel sutures at each side extending to postero-lateral angle. Pleotelsonic apex with marked notch bearing median tooth. Pleopods 4 and 5 with branchial pleats on endopods only. Sexual dimorphism obvious. Uropodal endopod in male thickened, not reduced, often lanceolate; exopod lamellar. Penes long, slender, separate to base. Appendix masculina arising basally and extending well beyond apex of pleopodal endopod. Ovigerous female mouthparts metamorphosed; brood pouch formed by four pairs of oostegites arising

from sternites 1–4 and overlapping at midline; brood held in internal pouches. Uropodal rami in female both lamellar.

A tentative key to recognized species of *Cymodoce* found in the Indian Ocean is presented below, based on morphology of adult males. Since the genus is in need of extensive revision (Harrison and Holdich 1984), those species whose generic standing is in question are not included in the key but listed here: *C. acanthiger* Barnard, 1914; *C. africana* Barnard, 1914; *C. alia* Kensley, 1975; *C. amplifrons* (Stebbing, 1902); *C. cavicola* Barnard, 1920; *C. cryptodoma* Barnard, 1920; *C. daviae* Kensley and Buxton, 1984; *C. excavans* Barnard, 1920; *C. falcata* Barnard, 1920; *C. lis* Barnard, 1955; *C. madrasensis* (Srinivasan, 1959); *C. picta* Brocchi, 1875; *C. radiata* Barnard, 1957; *C. setulosa* (Stebbing, 1902); *C. tetrahele* Barnard, 1920; *C. umbonata* Barnard, 1914; *C. uncinata* Stebbing, 1902; *C. valida* (Stebbing, 1902); *C. velutina* Kensley, 1975.

Key to species of *Cymodoce* from the Indian Ocean

1. Adult male pleotelson with large, obvious, submedian boss, usually setose, anterior to median apical lobe . . . . . 6
  - Adult male pleotelson lacking submedian boss anterior to median lobe . . . . . 2
2. Pleon with two extensions or large tubercles on posterior margin . . . . . 3
  - Pleon lacking two extensions or tubercles on posterior margin . . . . . *C. erythraea* Nobili, 1906 [Red Sea]
3. Pleotelson with median apical lobe bifid . . . . . *C. comans* Barnard, 1914 [False Bay to Natal, South Africa]
  - Pleotelson with median apical lobe not bifid . . . . . 4
4. Uropodal exopod extending beyond apex of pleotelson by 50% of length, much longer than endopod; pleotelson with several conical and bifid tubercles . . . . . *C. alis* Barnard, 1955 [False Bay to Port Elizabeth, South Africa]
  - Uropodal rami subequal in length . . . . . 5
5. Median lobe of pleotelsonic apex tapering to narrowly rounded apex; lateral incisions deep, equal to one-third of pleotelson in length . . . . . *C. fuscina* sp. nov. [Persian Gulf]
  - Median lobe of pleotelson short, very rounded apically; lateral incisions shallow . . . . . *C. natalensis* Barnard, 1920 [Algoa Bay to Natal, South Africa]
6. Median apical lobe of pleotelsonic apex considerably longer than lateral lobes . . . . . 7
  - Median apical lobe of pleotelsonic apex subequal to or slightly longer than lateral lobes . . . . . 8
7. Median lobe coplanar with lateral lobes; notches on either side of median lobe very shallow; uropodal endopod extending beyond apex of pleotelson by more than 25% . . . . . *C. bicarinata* Stebbing, 1904 [Maldiv Islands; Sri Lanka, Zanzibar]
  - Median lobe overlying telsonic incision; uropodal endopod barely extending beyond apex of pleotelson . . . . . *C. lirella* sp. nov. [Mahe, Seychelles]

- 8. Pleotelson with two curving carinae in proximal half . . . . . *C. richardsoniae* Nobili, 1906  
[Red Sea]
- Pleotelson lacking such carinae . . . . . 9
- 9. Uropodal endopod extending beyond pleotelsonic apex by 40–50% of length . . . . . 10
- Uropodal endopod barely surpassing apex of pleotelson . . . . . 11
- 10. Submedian boss bearing antero-median spine; pleotelsonic tubercles discrete, single . . . . . *C. pelsarti* Tattersall, 1922  
[Western Australia and Queensland]
- Antero-median spine on submedian boss lacking; some tubercles on pleotelson fused into ridges . . . . . *C. longistylis* Miers, 1884  
[Torres Strait, Australia; Nicobar Islands; India; Thailand]
- 11. Uropodal exopod extending beyond apex of pleotelson by much less than 50% of length . . . . . *C. zanzibarensis* Stebbing, 1910a  
[Zanzibar; Mozambique]
- Uropodal exopod extending beyond apex of pleotelson by at least 50% of length . . . . . *C. pilosa* (H. Milne Edwards, 1840)  
[Gulf of Suez; Mediterranean]

***Cymodoce fuscina* sp. nov.**  
(Figures 19, 20)

*Material examined*

Holotype: USNM 280292, one male (12.0 mm), sta 2G2, Persian Gulf between Safaniya and Manifa, Saudi Arabia, seagrass beds, coll. J. McCain, 5 March 1982. Paratypes: USNM 280293, 38 males, 19 ovigerous females, two females, 277 juveniles, from 28 stations in Persian Gulf between Bandar Mishar and Manifa, Saudi Arabia, sand and seagrass beds, 1–4 m, coll. J. McCain, January and May 1982.

*Description*

*Male.* Cephalon and pereonites 1–4 smooth, very sparse setae. Pereonites 5–7 each with two sometimes faint rows of small tubercles, setae increasing toward lateral margins. Pleon, anterior fused segments with many long setae near lateral margins, two strong dentate projections on posterior margin of segment, and scattered tubercles mid-region. Pleotelson with tubercles of various sizes; two rows of two elongate tubercles on either side of midline, posterior pair bifid, each of pair flanked by smaller bifid tubercle, all apically setose; anterior pair covered with short, golden-brown setae. Posterior region at midline with small knob bearing tuft of brown setae, additional tufts on either side of knob; domed boss lacking. Apex tridentate, setose, apical notch very deep; three apices toothed, rounded distally, coplanar and of equal length.

Antennule with 16 articles in flagellum, articles 5–15 bearing one aesthetasc each; plumose setae on ventral margins on articles 1 and 2 of peduncle. Antenna with 13 articles in flagellum. Frontal lamina broad, narrowly rounded at apex. Maxilliped

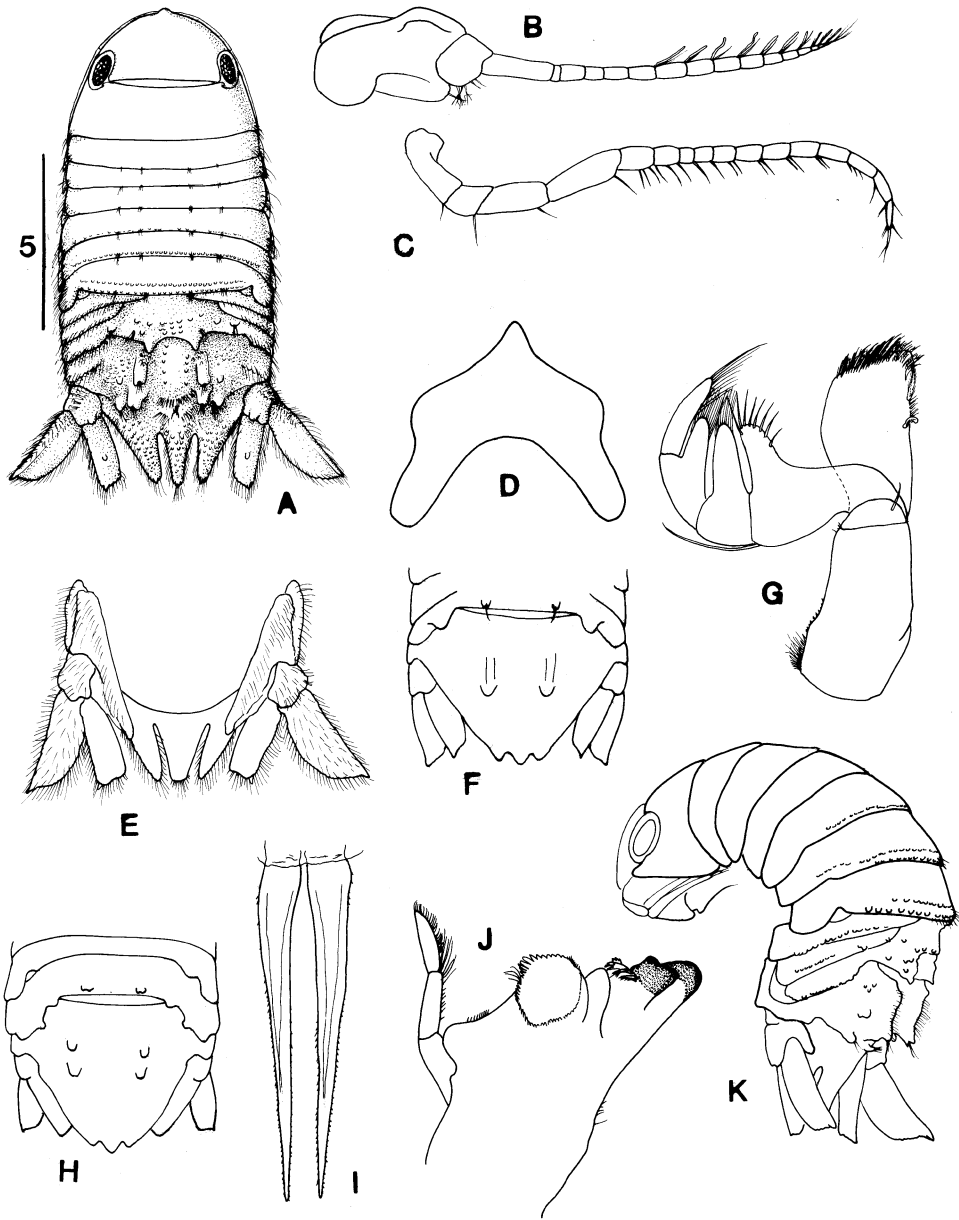


Figure 19. *Cymodoce fuscina* sp. nov. (A) Male, dorsal view; (B) antennule; (C) antenna; (D) frontal lamina; (E) pleotelson and uropods, ventral view; (F) immature pleon, dorsal view; (G) maxilliped; (H) female, pleon; (I) penes; (J) left mandible; (K) male, lateral view.

palp article 2 bearing long distal seta. Pereopod 1 with five very stout, fringed setae and a few smaller setules on inner margin of propodus, four similar large setae on carpus, three to four stout setae on merus. Pereopod 2 with a fringe of small setules interspersed with a few longer setae on propodus, and merus. Pereopod 7 with row of stout, simple setae on propodus; carpus and merus each bearing a "comb" of long, slender fringed setae on anterior margins. Penes tapering evenly to acute tip, length about 9.5 times

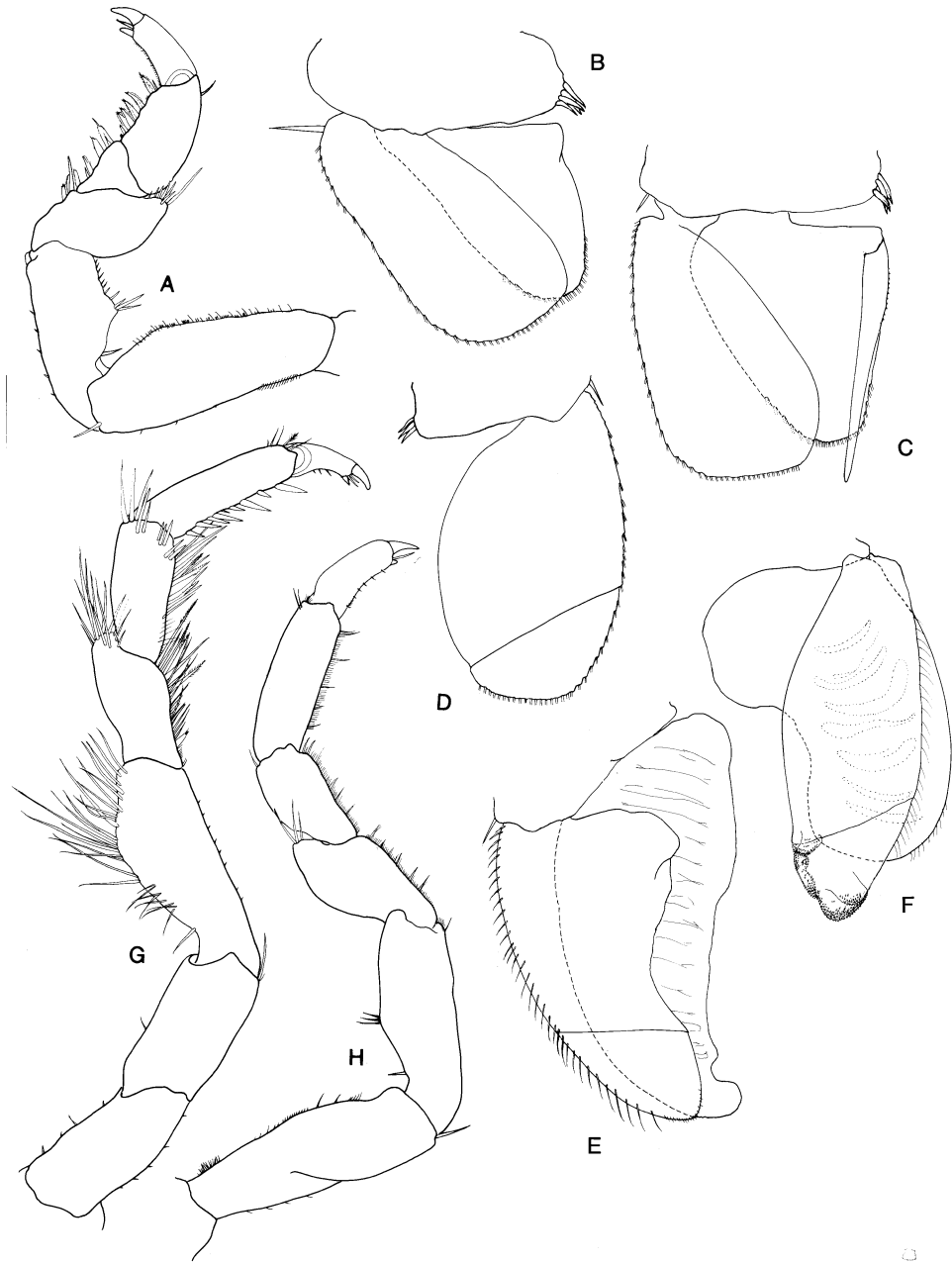


Figure 20. *Cymodoce fuscina* sp. nov. (A) Pereopod 1; (B) pleopod 1; (C) male pleopod 2; (D) pleopod 3; (E) pleopod 4; (F) pleopod 5; (G) pereopod 7; (H) pereopod 2.

width; margins bearing tiny setules, most obvious in posterior half. Pleopod 1, three coupling hooks on basis, plumose marginal setae on outer margins of exopod and apical region of endopod as shown. Pleopod 2 with three hooks on basis; appendix masculina tapering evenly to narrowly rounded tip, extending one-fifth length beyond endopod. Pleopod 3 with three hooks on basis. Pleopod 4 with subterminal

indentation on internal margin of endopod, exopod with simple setae on external margin. Pleopod 5 with short, simple distal setae on external margin, exopod with external setae on most of margin. Uropod with rami subequal, extending very slightly beyond pleotelson apex. Endopod subrectangular, latero-distal angle toothed, with single tubercle at midline, setose laterally and ventrally near base. Exopod setose laterally and ventrally, with short, dark brown setae dorsally near external margin; internal margin arcuate, tapering to acute tip.

*Sub-adult male.* Dorsum smooth. Posterior margin of fused segments of pleon with two submedian tubercles, each bearing a seta. Pleotelson with ridge on either side of midline, culminating in low tubercle. Apex tridentate. Uropodal rami tapering to acute apices and extending slightly beyond pleotelson.

*Ovigerous female.* Dorsum smooth. Pleotelson with two submedian tubercles on posterior margin of fused segments; posteriorly, two pairs of tubercles on either side of midline. Apex of pleotelson shallowly tridentate, extending slightly beyond both rami of uropod; apices of endopod truncate, exopod with small tooth apically.

#### Remarks

This species differs from other species placed in this genus by having three apical lobes of the pleotelson that are coplanar, relatively slender, equal in length, rounded distally but each bearing a tiny spike, and separated by deep incisions, resulting in a marked tridentate appearance. *Cymodoce tribullis* Harrison and Holdich, 1984, *C. longistylis* Miers, 1884 and *C. pelsarti* Tattersall, 1922, Australian species, also possess three apical lobes but those in the present new species are much longer and of identical length. The maxillipedal palp, tuberculate pleon and pleotelson, and shape of the uropodal rami are characteristic of the genus, of which *C. truncata* Leach, 1814 is the type species. These characters are consistent with Harrison and Holdich's (1984) diagnosis of *Cymodoce s. str.* It lacks, however, the hemispherical dome just anterior to the pleotelsonic notch which is listed by Bruce (1997) as a possible apomorphy for *Cymodoce s. str.* The pereopods are also similar to the type species with regards to setation. The shape of the uropods and pleotelson seem somewhat similar to those of the poorly described *C. aculeata* Haswell, 1881 but lack of details in the description and lack of illustrations of appendages prevent further comparison. The structure of the brood pouch is consistent with that characterizing the genus (Harrison 1984).

#### Etymology

The specific name, from the Latin "fuscina", used as a noun in apposition, means "trident" and refers to the shape of the three-pronged pleotelsonic apex.

### *Cymodoce lirella* sp. nov. (Figures 21, 22)

#### Material examined

Holotype: USNM 280294, one male (7.0 mm), sta J-SEY-1, rubble and algal turf, Mahé Island, Seychelles, 0.5 m, 29 April 1984. Paratypes: USNM 280295, 19 male, 29 females, eight juveniles, from four stations, rubble and algal turf, 0.5–1.0 m.

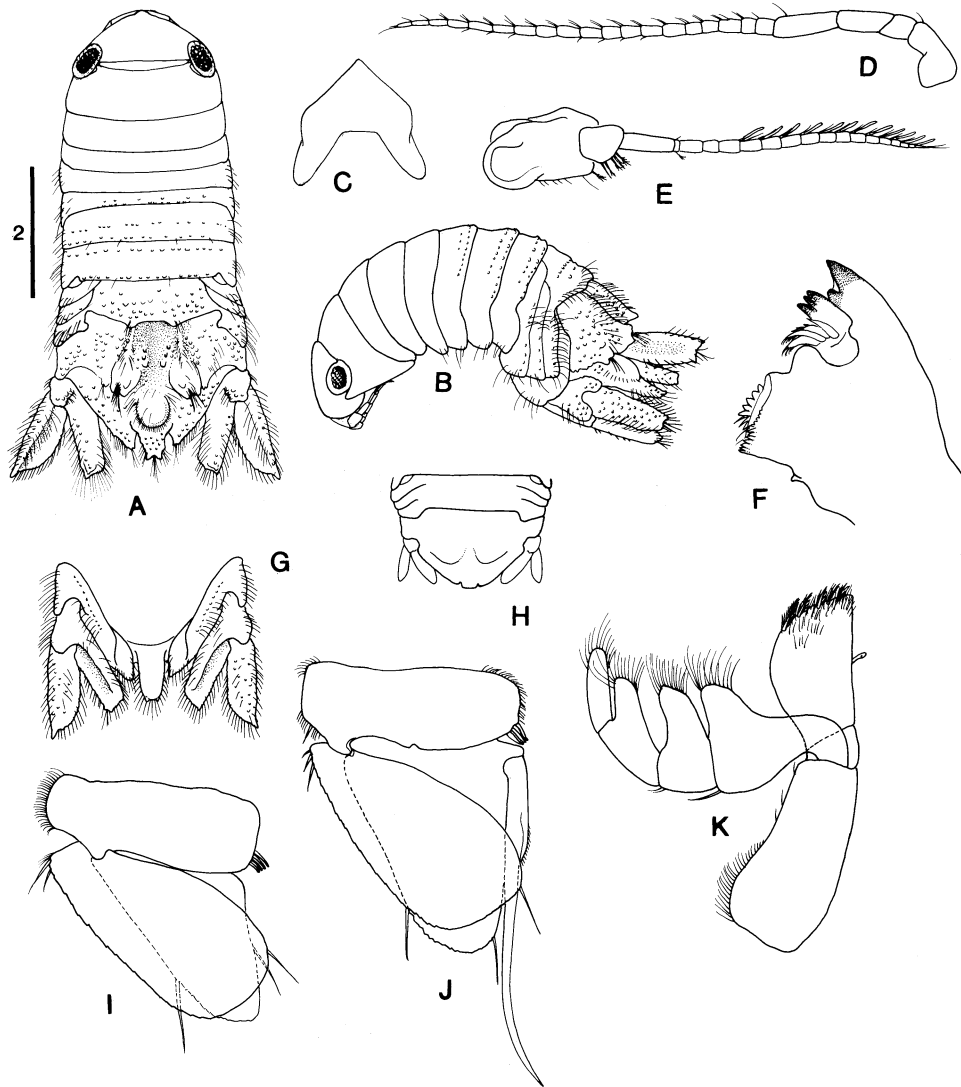


Figure 21. *Cymodoce lirella* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) frontal lamina; (D) antenna; (E) antennule; (F) left mandible; (G) ventral pleon; (H) female, pleon; (I) pleopod 1; (J) male pleopod 2; (K) maxilliped.

*Description*

*Male*. Dorsal surface of cephalon and pereonites 1–4 smooth, bearing few marginal setae. Pereonites 5–7 each with two transverse rows of very small tubercles. Pleon with many small tubercles, some in transverse rows. Pleotelson very granulose with two large bosses, apically bifid and setose, posterior to two ridges of tubercles also bearing setae; two irregular, longitudinal rows of small tubercles between bosses; smaller bifid tubercle posterolateral to each boss. Posterior half of pleotelson with medial, large smooth domed boss; posterior margin tridentate, medial tooth raised and subtruncate, apically bifid, extending beyond lateral teeth.

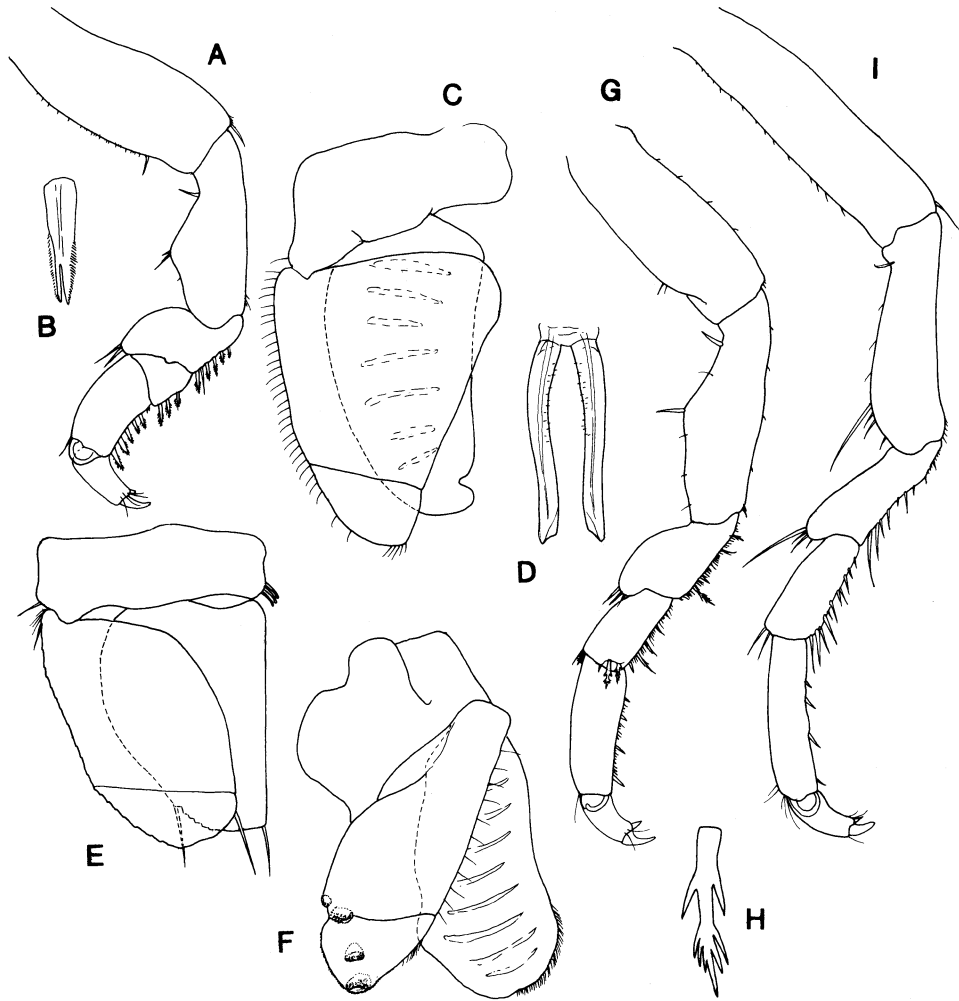


Figure 22. *Cymodoce lirella* sp. nov. (A) Pereopod 1; (B) pereopod 1, fringed seta enlarged; (C) pleopod 4; (D) penes; (E) pleopod 3; (F) pleopod 5; (G) pereopod 2; (H) pereopod 2 carpal seta, enlarged; (I) pereopod 7.

Antennal flagellum with 19 articles. Antennule, article 1 with single lateral plumose seta; article 2 with one simple and four plumose setae; flagellum of about 17 articles, proximal 13 of which each bearing single aesthetasc. Epistome broad with pointed apex. Maxilliped as figured. Pereopod 1, propodus, carpus and merus with fringed, stubby setae on posterior margins. Pereopod 2, short fringe of setules with few interspersed setae on posterior margin of propodus, carpus and merus; two very stout setae, one tridentate, at posterodistal margin of carpus. Pereopod 7, several strong simple setae of varying lengths on posterior margin of propodus, carpus and merus; longer setae at anterodistal margins of carpus, merus and ischium. Penes separate at base, length six times width, parallel-sided, angled at apex, with sparse setules on medial margin in proximal half; apex appearing to twist apically. Pleopod 1, peduncle with four coupling hooks; exopod subelliptical, endopod triangular in shape. Pleopod 2, peduncle with four coupling hooks; appendix masculina slender, tapering to fine tip, 1.6 times length of endopod, curving in distal one-fourth toward midline of animal;



bearing short fringe of short marginal setae in proximal half. Pleopod 4, endopod pleated with notch in medial margin near apex; exopod with subterminal articulation and many simple setae along outer margin and at apex. Pleopod 5, endopod rounded apically with fringe of short setae; exopod with complete articulation distally and four spinulose bosses. Uropodal endopod parallel-sided, concave in ventral view, subtruncate apically, dorsally granular with long marginal setae; exopod tuberculate with long dorsal and marginal setae, inner margin convex with acute tip, outer margin straight. Uropodal rami subequal in length, both extending beyond median tooth of pleotelsonic apex.

*Ovigerous female.* Dorsum smooth; two low bosses on pleotelson, median notch of pleotelsonic apex truncate.

#### *Remarks*

The males of this species seem to be somewhat variable in the degree of setation especially of the posterior body. The present species is very similar to *C. zanzibarensis* Stebbing, 1910a but distinct due to the former's longer appendix masculina and smaller and much more slender body size. The median lobe of the pleotelsonic apex also extends farther relative to the lateral lobes in the new species. It is separated from *C. tribullis* Harrison and Holdich, 1984, which has "hemispheric domes" at the ends of the pleotelsonic ridges instead of notched tubercles and possesses pads of setae on the merus and carpus. It resembles also *C. longistylis* Miers, 1884, which differs in having subequal teeth at the pleotelsonic apex, lacking the prominent, dentate tubercles on either side of the pleotelson midline and having relatively longer uropods, the endopod of which is curved. Similar also to *C. pelsarti* Tattersall, 1922, *C. lirella* has relatively shorter uropodal rami but much larger dentate tubercles on the pleotelson. The presence of a hemispherical dome anterior to the pleotelsonic notch is, according to Bruce, 1997, a possible apomorphy for *Cymodoce s. str.* *Cymodoce lirella* shares this character with all the four above-mentioned species.

#### *Etymology*

The specific name, from the Latin for "small ridge", used as a noun in apposition, refers to the two low ridges of the pleotelson.

#### **Genus *Dynamenella* Hansen, 1905**

*Restricted synonymy.* *Dynamenella* Hansen 1905, p 107; Harrison and Holdich 1982, p 89; Javed and Ahmed 1988, p 234.

#### *Diagnosis*

Eubranchiate with antennular peduncle article 1 not extended anteriorly as plate. Both sexes with pereon and pleon lacking dorsal processes, and with both uropodal rami lamellar, endopod greater than half length of exopod. Pereopod 1 markedly more robust than other pereopods. All pereopods with simple, not bifid secondary unguis. Exopod of pleopod 3 with or without articulation. Sexual dimorphism obvious.

*Adult male.* Penes long, tapering, fused at base. Appendix masculina arising from proximomedial angle of endopod of pleopod 2 and extending to or beyond apex of endopod; usually broad proximally and tapering to acute tip. Apex of pleotelson with

dorsally directed foramen connected to apex by narrow slit. Ventral margins various. Uropods broader than those of female and immatures.

*Ovigerous female.* Mouthparts not metamorphosed. Apex of pleotelson various; bearing slight notch, simple groove, or foramen connected to apex by narrow slit. Uropods narrower than those of male. Brood pouch, lacking oostegites, formed by two opposing ventral pockets and opening in midline at sternite 4.

Key to species of *Dynamenella* from the Indian Ocean region

1. Pleotelson of adult male with dorsal, subapical foramen . . . . . 2
  - Apex of pleotelson in adult male folded to form posteriorly directed groove; pleotelson with four longitudinal carinae . . . . . *D. scaptocephala* Messana, 1990 [Somalia]
2. Subapical foramen elliptical or transverse . . . . . 3
  - Subapical foramen neither elliptical nor transverse . . . . . 4
3. Pleotelson having two identical bosses, each covered with several small tubercles; pleon without surface ornamentation . . . . . *D. quilonensis* Pillai, 1954 [India]
  - Pleotelson granulose with irregular tubercles; pleon with two small, granular, transverse ridges . . . . . *D. alveolata* sp. nov. [Off Sumatra]
4. Pleotelson smooth and unornamented, without obvious tubercles . . . . . *D. mossambicus* Ortiz, Berze-Freire and Wasikete, 1992 [Mozambique]
  - Pleotelson rugose or with tubercles . . . . . 5
5. Subapical foramen on pleotelson of male “key-hole”-shaped, subcircular, extending anteriorly into smaller half circle; appendix masculina more than twice length of endopod . . . . . *D. granulata* Javed and Ahmed, 1988 [Pakistan]
  - Subapical foramen on pleotelson of male circular; appendix masculina less than twice length of endopod . . . . . 6
6. Pleotelson triangular with relatively straight sides; appendix masculina barely longer than endopod . . . . . *D. remex*, sp. nov. [Madagascar]
  - Lateral margins of pleotelson sinuous; appendix masculina extending well beyond endopodite . . . . . 7
7. Subapical foramen open posteriorly; lateral tubercles on pleotelson oblique; appendix masculina widening toward apex . . . . . *D. bullejiensis* Javed and Ahmed, 1988 [Pakistan]
  - Subapical foramen closed posteriorly; all tubercles on pleotelson round; appendix masculina tapering to acute apex . . . . . *D. savignyi* (H. Milne Edwards, 1840) [Egypt; Gulf of Aqaba; South Africa]

Note: *Dynamenella yomsii* Storey, 2002, recorded from Phuket, Thailand, seems nearly identical to *D. savignyi*, known thus far only in the western Indian Ocean. Further investigation is needed to establish the division between these two species.

***Dynamenella alveolata* sp. nov.**

(Figures 23, 24)

*Material examined*

Holotype: USNM 280296, one male (4.0 mm), R/V *Te Vega* cruise 2, sta 9-24, Pulau Nais, off Sumatra, 00°41'N, 97°54'E, coll. J. Colinvaux, 24 November 1963. Paratypes: USNM 280297, two ovigerous females 4.0 mm, 12 juveniles, same data as holotype.

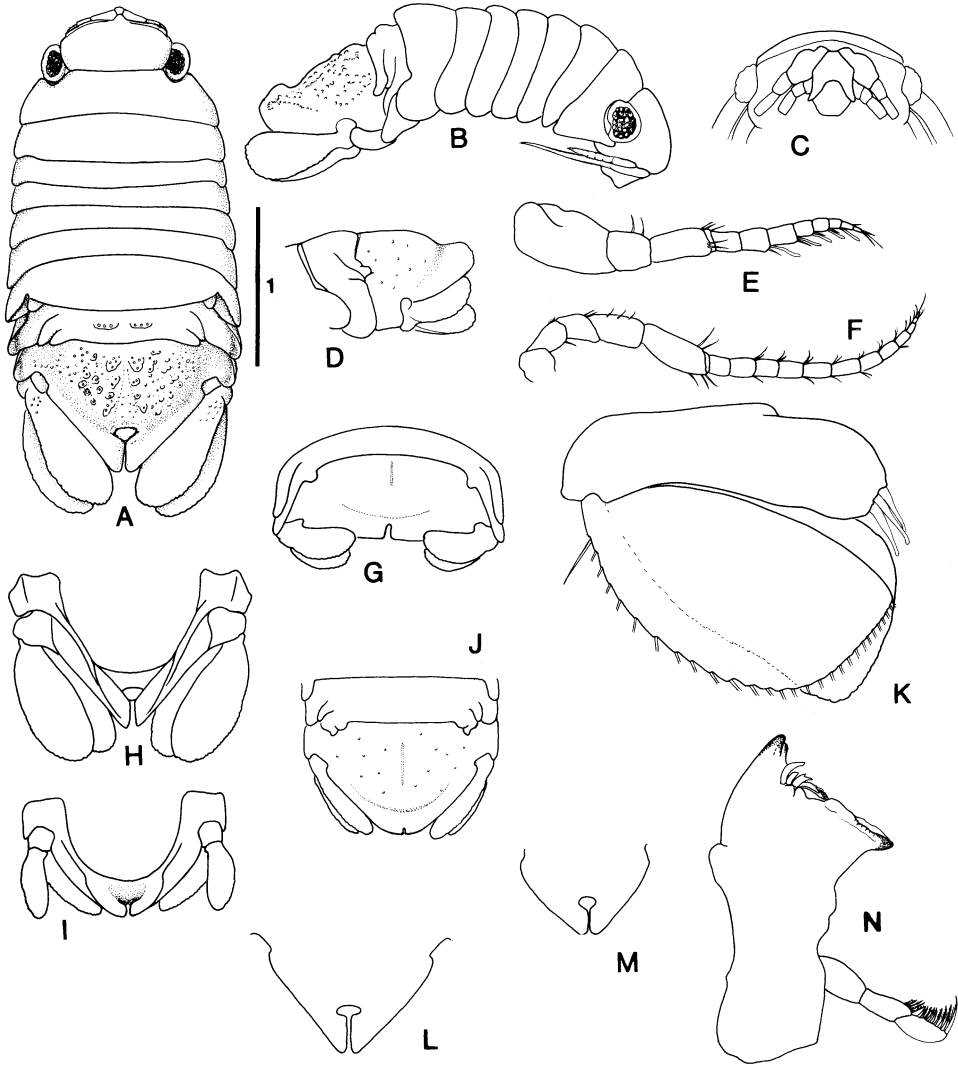


Figure 23. *Dynamenella alveolata* sp. nov. (A) Male in dorsal view; (B) male, lateral view; (C) frons; (D) female, pleon, lateral view; (E) antennule; (F) antenna; (G) female, pleon, posterior view; (H) male, pleon in ventral view; (I) female, pleon in ventral view; (J) female, pleon, dorsal view; (K) pleopod 1; (L) male, pleotelsonic foramen; (M) female, pleotelsonic foramen; (N) right mandible.

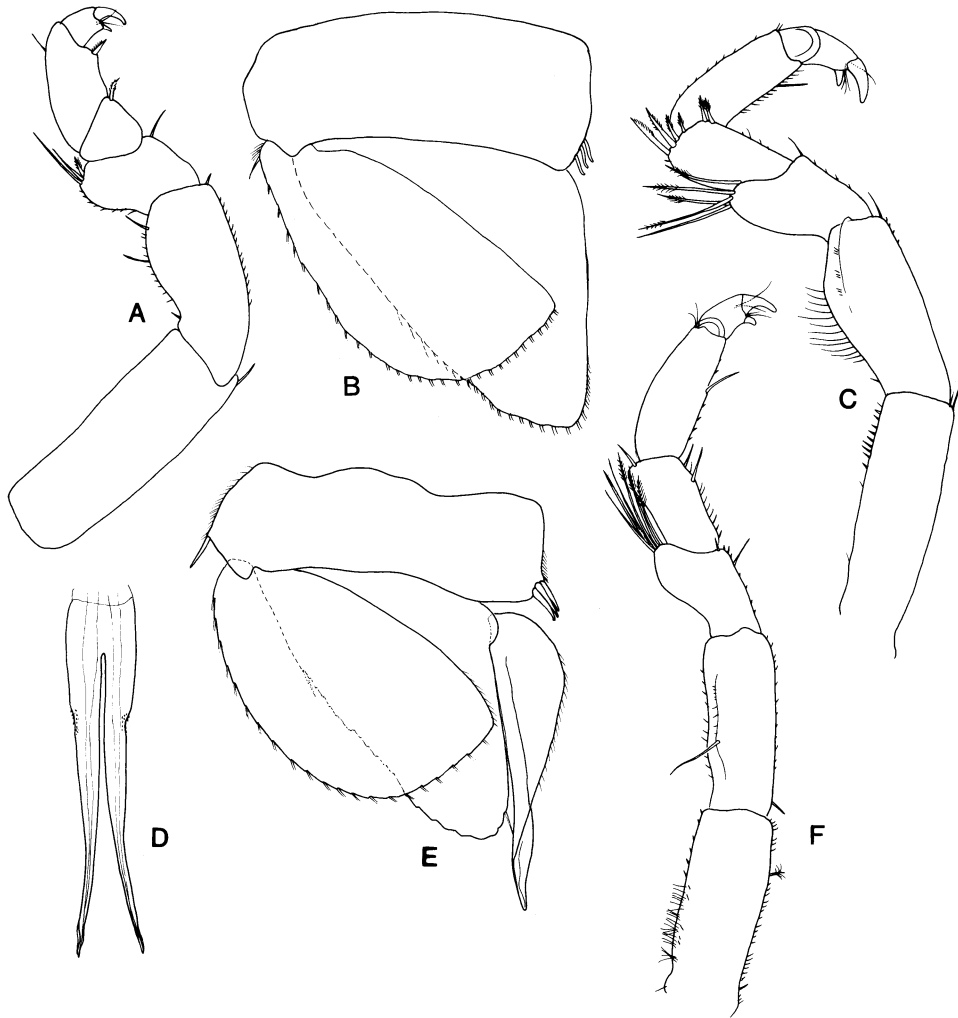


Figure 24. *Dynamenella alveolata* sp. nov. (A) Pereopod 1; (B) pleopod 3; (C) pereopod 7; (D) penes; (E) male pleopod 2; (F) pereopod 2.

*Description*

*Male.* Body length five times width. Integument pitted. Posterior border of pereonite 7 and pleon appearing granular. Pleon bearing two low, pitted transverse tubercles on either side of midline. Pleotelson granulate, rugose with many small, pitted tubercles over dome. Subapical foramen elliptical, directed anterodorsally, separated from apex by slit closed most of its length. Ventral margins of pleotelson outcurved to meet in midline.

Antennular peduncle, articles 1 and 2 combined slightly longer than article 1; flagellum of eight articles, extending to middle of pereonite 1. Antennal peduncle articles increasing in length from 1 to 5, flagellum with 12 articles, reaching to pereonite 3. Mouthparts typical of genus but distal molar of left mandible with broad tooth fitting into indentation in corresponding region of right mandible as in *D. liochroea* and *D. trachydermata*. Pereopod 1, two simple and one fringed setae at posterodistal margin of merus and single fringed seta

each at anterodistal margins of carpus and propodus. Pereopod 2, long, prominent seta at mid-length of ischium; three long, simple and three fringed setae at posterodistal angle of merus. Pereopod 7, fringe of long setae along posterior margin of ischium; single long and four long, fringed setae at posterodistal margin of merus; six fringed, stout setae on distal margin of carpus.

Penes thickened at one-third length with setules present, tapering to acute apices. Pleopod 1, rami subequal in width and length. Pleopod 2, appendix masculina flattened basally with marginal setae, tapering to acute apex slightly more than one-fourth length beyond apex of endopod. Uropodal rami extending beyond pleotelson, broadly rounded apically with margins appearing serrate; exopods with small tubercles proximally on dorsal surface; endopods with lateral margins upcurved.

*Ovigerous female.* Pleon smooth; pleotelson pitted, with faint median depression, otherwise smooth. Uropodal rami small, extending only slightly beyond pleotelson. Internal pouches absent.

#### *Remarks*

*Dynamenella alveolata* is most similar to *D. trachydermata* Harrison and Holdich, 1982 (locality Queensland, Australia). It is considerably larger, holotype males are 4.0 and 2.8 mm, respectively, while the allotype female of the new species is 4.0 mm versus 2.0 mm for the latter. In the males, the pleotelsonic foramina serve to distinguish the two; in *D. alveolata* it is narrowly elliptical, breadth three times depth, while in the other species it is nearly circular. The dome of the pleotelson of the new species (male) is much more rugose with small pitted tubercles scattered over its surface.

#### *Etymology*

The specific name, from the Latin for “small hollow or cavity”, refers to the pleotelsonic foramen.

### ***Dynamenella remex* sp. nov.**

(Figures 25, 26)

#### *Material examined*

Holotype: USNM 280298, one male (3.9 mm), sta JR-38, Port Fievre, Nosy-Bé, Madagascar, intertidal mud and rock, 20 January 1964. Paratypes: USNM 280299, three females, four ovigerous females, four juveniles, same data as holotype.

#### *Description*

*Male.* Dorsum smooth, few lateral setae, pereonites 4 and 5 granular, 3 much less so, posterior edge of pereonite 6 with coarsely irregular, brittle ridge. Scattered chromatophores, densest on pleotelson. Pleotelson: granular, two large submedian tubercles on anterior fused segments; posterior pleonite with two diverging, longitudinal rows of four tubercles each on either side of midline, anterior pair largest; numerous smaller

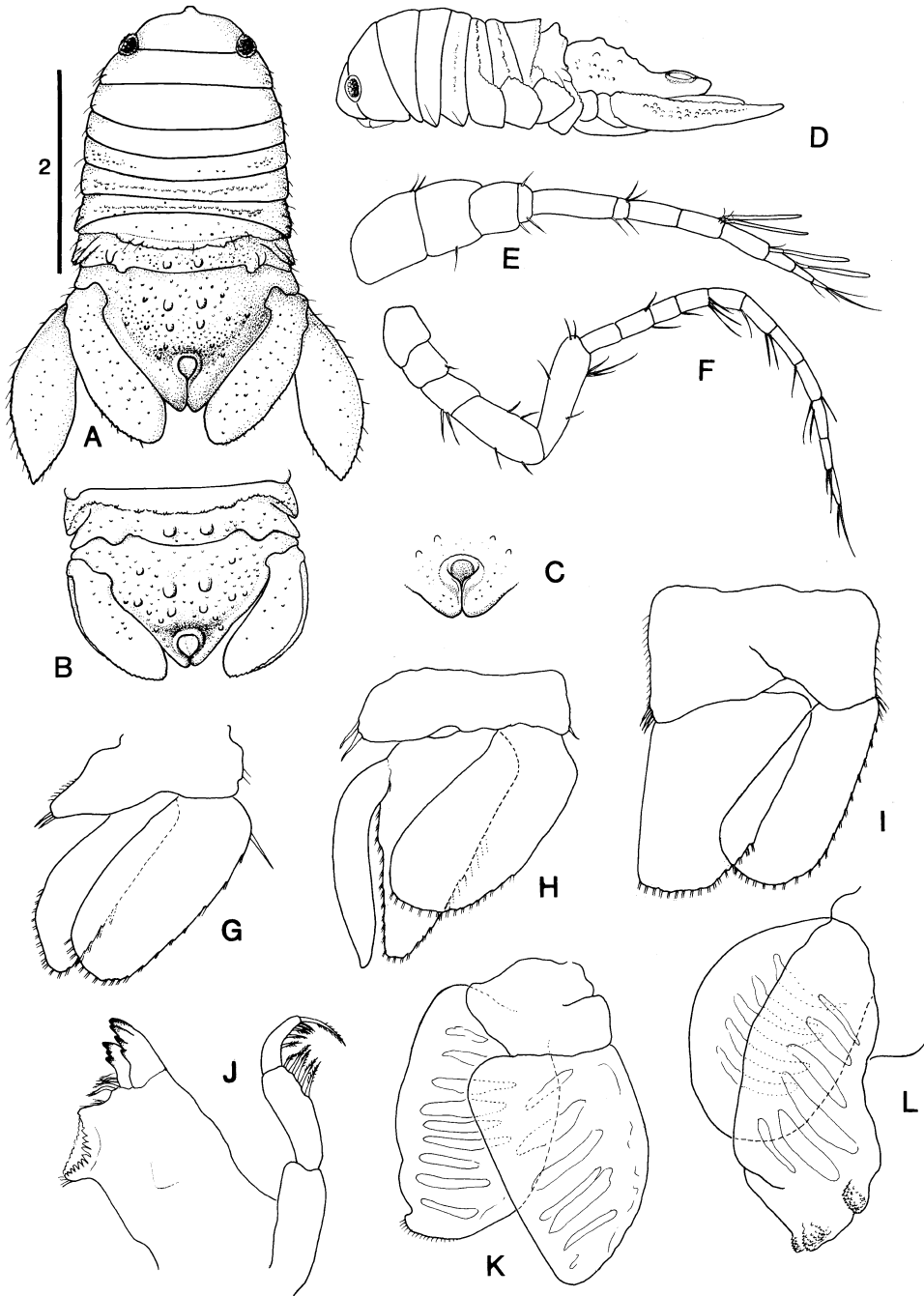


Figure 25. *Dynamenella remex* sp. nov. (A) Male, dorsal view; (B) male pleon, dorsal view; (C) male, pleotelsonic foramen; (D) male, lateral view; (E) antennule; (F) antenna; (G) pleopod 1; (H) male pleopod 2; (I) pleopod 3; (J) left mandible; (K) pleopod 4; (L) pleopod 5.

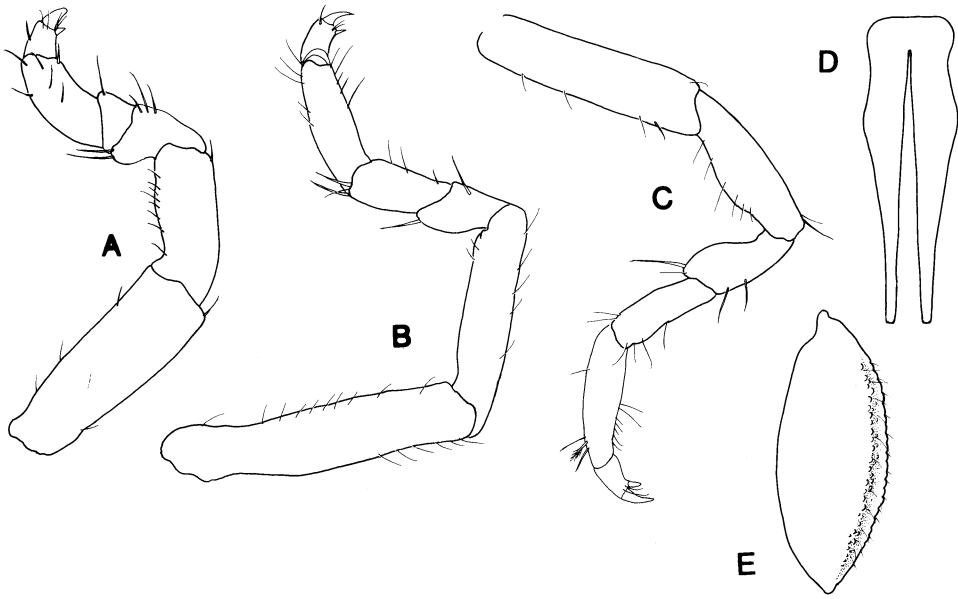


Figure 26. *Dynamenella remex* sp. nov. (A) Pereopod 1; (B) pereopod 2; (C) pereopod 7; (D) penes; (E) uropodal exopod.

tubercles and tiny granulations scattered on surface; margins of pleotelsonic slit meet in midline, opening into circular, rimmed, dorsally directed foramen.

Antenna flagellum of nine articles; antennular flagellum bearing 11. Mandible as figured. Pereopods 1 and 2 with simple setae only; carpus of each with two stiff setae at posterolateral angle. Pereopod 7, single plumose and two simple setae at anterodistal margin. Pleopods typical of genus. Appendix masculina evenly wide, narrowly rounded at apex, extending slightly beyond endopod. Penes fused at base, length about seven times greatest width, expanded at proximal one-third of length and tapering to blunt apices. Uropodal endopod sparsely granular on dorsal surface, extending beyond apex of pleotelson by one-sixth of length, marginally dentate; exopod exceeding length of endopod, dorsally smooth, ventrally thickened submarginally, with three or more rows of teeth.

*Ovigerous female.* Dorsum very similar to male, tubercles and granulation less obvious; uropods much shorter and narrower, extending only slightly beyond pleotelsonic apex. Internal pouches absent.

#### Remarks

The new species resembles most closely its Indian Ocean congener *D. savignyi* (H. Milne Edwards, 1840). It is a larger species with straighter pleotelsonic margins, broader uropodal rami and a relatively shorter appendix masculina which does not taper to an acute apex. It is also closely allied with *D. bullejiensis* Javed and Ahmed, 1988 from the Arabian Sea. The primary differences lie in the shape and length of the appendix masculina, the size of the uropods (longer and broader in *D. remex*), the lack of pubescence and oblique

tubercles on the pleotelson, and straight versus sinuous pleotelsonic margins in the new species.

#### *Etymology*

The specific name, from the Latin meaning “oarsman”, refers to the paddle-like uropods.

#### ***Heterodina*, gen. nov.**

*Type species.* *Heterodina mccaini* sp. nov., by present designation.

*Additional species.* *Cassidinidea mosaica* (Kensley and Schotte, 1987).

#### *Diagnosis*

*Male.* Body dorsoventrally somewhat compressed, length more or less twice maximum width; with membrana cingulata; integument smooth or finely tuberculate; margins with fringe of setae. Cephalon embedded in pereonite 1; eyes dorsal. Epistome visible in dorsal view. Coxal extension on ventrum of pereonite 1 absent; pleonal tergite absent. Exopod of uropod very small, set into margin of endopod. Pleon with free lateral margins. Pleotelson triangular, apex extending slightly beyond uropod.

Pleopod 1 with endopod reduced, about half length and half width of exopod. Pleopod 2, appendix masculina short and broad. Exopod of pleopod 3 without suture; both rami of pleopods 4 and 5 lamellar or with very weak folds. Penes long, tapering and basally fused.

*Female.* Similar to male except in genitalia. Mouthparts not metamorphosed. Marsupium formed by two opposing pockets opening at sternite 4.

#### *Remarks*

This genus exhibits a unique mix of characters which may be found singly in other “subfamily” groups. It differs from *Cassidinidea*, which it most resembles at first glance, by having the cephalon set into the first pereonite instead of having expanded lateral margins; the penes, instead of being entirely fused, are basally fused; and the appendix masculina, instead of being long and acute, is short and broad. These characters were mentioned by Bruce (1994b), who therein stated the need for a new genus to accommodate *C. mosaica* Kensley and Schotte, 1987, which is herein transferred to the new genus. The morphology of the cephalon of the new genus is shared with the *Leptosphaeroma* group of Cassidininae (Bruce, 1994b), which possess in contrast short, unfused penes and expanded antennular peduncles. These latter two traits are also common to those species in the *Cassidina* group as defined by Bruce (1994b), in which however the cephalon is not set into pereonite 1. For the same reason the new genus does not fall within Bruce’s *Cassidinidea* group and thus remains unallied within the “subfamily” Cassidininae. It may indeed signify a fourth such grouping. The structure of the brood pouch, however, is identical to that of *Cassidinidea*, i.e. formed by two opposing pockets and different from those in *Leptosphaeroma* and *Cassidina* as described by Harrison (1984).

#### *Distribution*

Species of the genus are known at present from Belize and the Persian Gulf.



*Etymology*

The generic name is derived from the Greek “hetero-” (different or other), plus the suffix-*dina*, indicating the subfamilial affinity.

***Heterodina mccaini* sp. nov.**  
(Figure 27, 28)

*Material examined*

Holotype: USNM 280350, one male (1.3 mm), sta 1G1, seagrass beds near coral reef off Manifa, Persian Gulf, 3 m, coll. J. McCain, 12 November 1981. Paratypes: USNM 280351, one male, 12 ovigerous females, 54 juveniles, from eight stations, seagrass beds near Manifa and Ras Tanajib, Persian Gulf, 3–3.5 m.

*Description*

*Male.* Body oval in outline; length somewhat less than twice maximum width. Brownish pigment sparse, more visible in mature males, usually as two submedial rows on dorsum and as patch at base of pleotelson or scattered along lateral margins of pereonites. Epistome flat anteriorly with concave lateral margins and wide, tapering extensions posteriorly. Pleotelson triangular, posterolateral margins slightly sinuous, posterior apex tapering to very obtuse point.

Flagella of antennule and antenna with seven articles each. Maxilla 1, maxilla 2 and mandible as pictured. Pereopod 1 with two stout, fringed setae on propodus, one on carpus and two at posterolateral angle of merus; pereopod two with two fringed setae at posterolateral corner of merus; pereopod 7 with four very stout, fringed setae on carpus only. Pleopod 1, endopod reduced, about one-fourth total area of exopod. Appendix masculina of pleopod 2 extending well beyond apex of endopod, broad, about five times as long as wide, broadly rounded at apex; not on a posteriorly directed lobe. Penes separate throughout most of length, four times longer than wide at base, rami diverging abruptly before tapering to broadly rounded apices. Exopod of uropod one-fifth length of endopod, set into margin.

*Ovigerous female.* As for male except in sexual characters.

*Remarks*

The new species differs from its Caribbean congener in the shape of the epistome and of the pleotelson, which is narrowly rounded in *H. mosaica* (Kensley and Schotte, 1987). In the latter, the appendix masculina is swollen basally, tapering to a narrow apex, and the long, more slender penes do not diverge distally as in the new species.

*Etymology*

The species is named for Dr John C. McCain, who collected it while doing fieldwork under the auspices of the University of Petroleum and Minerals in Dhahran, Saudi Arabia.

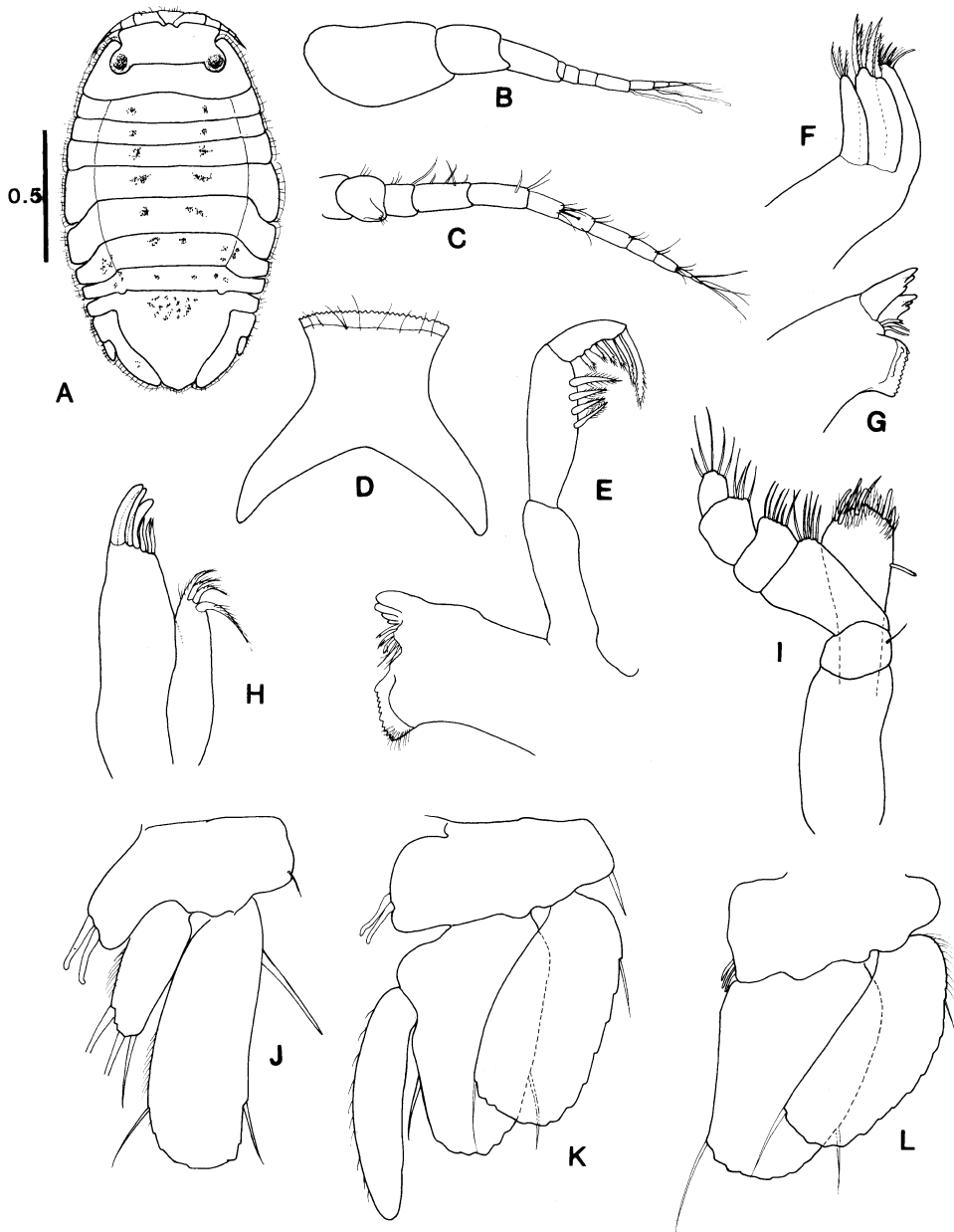


Figure 27. *Heterodina mccaini* sp. nov. (A) Male, dorsal view; (B) antennule; (C) antenna; (D) frontal lamina; (E) right mandible; (F) maxilla 2; (G) left mandible; (H) maxilla 1; (I) maxilliped; (J) pleopod 1; (K) male pleopod 2; (L) pleopod 3.

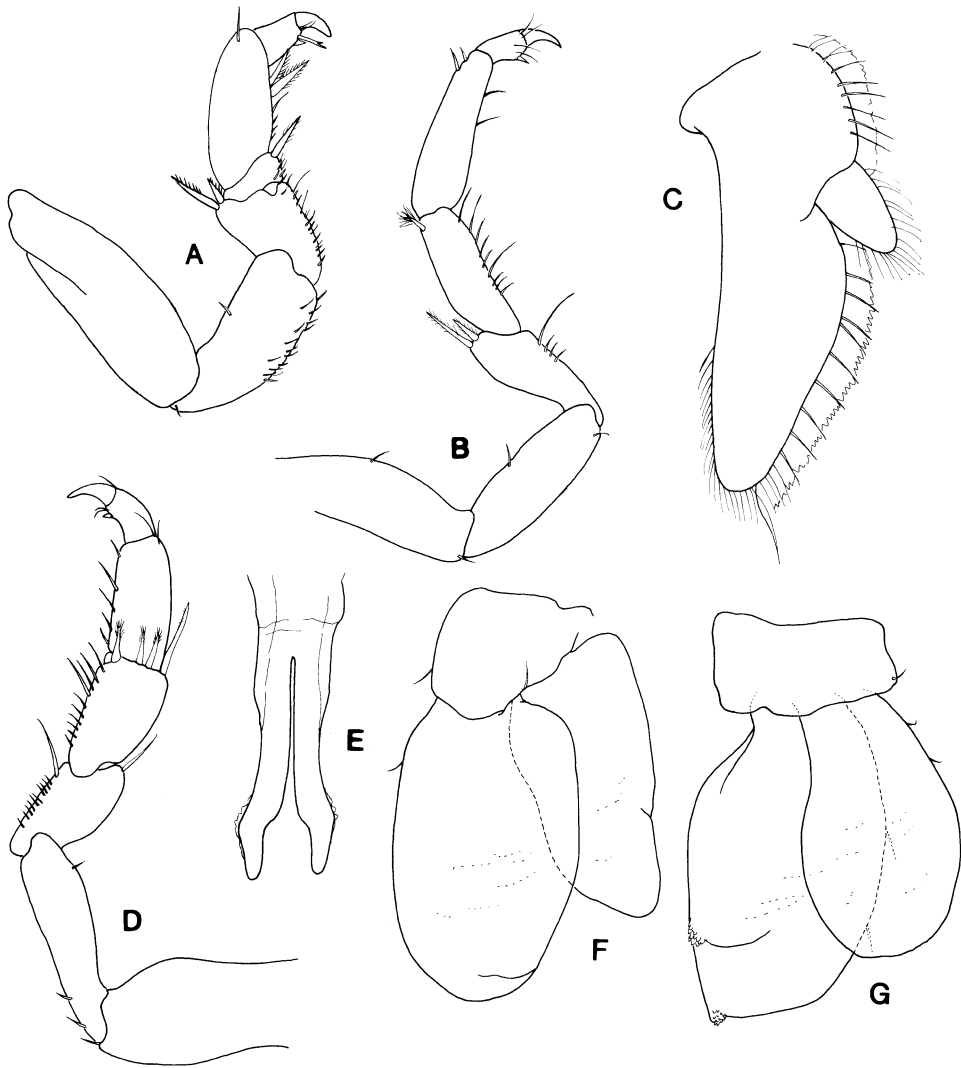


Figure 28. *Heterodina mccaini* sp. nov. (A) Pereopod 1; (B) pereopod 2; (C) uropod; (D) pereopod 7; (E) penes; (F) pleopod 4; (G) pleopod 5.

**Genus *Oxinasphaera* Bruce, 1997**

*Restricted synonymy.* *Oxinasphaera* Bruce 1997, p 151.

*Diagnosis*

Pereonites 2–7 with one or two rows of distinct, usually acute spikes, segments 3–6 usually with two rows. Pleotelson posterior margin medially excavate, with median process set within or above indentation, occasionally entire. Antennule peduncle article 1 anteriorly with row of prominent, ventrally projecting spikes, posteriorly with two spikes or fewer. Epistome anterior margin with one or two ventrally projecting spikes or blades. Mandible incisor multicuspid; molar process medial margin strongly produced. Maxilliped, articles 3–5 with medial margins greatly elongated and finger-like; distolateral margins of articles 2–

5 provided with abundant long setae. Uropodal exopod short, one-half or less length of exopod, apex deeply bifid; endopod projecting beyond apex of pleotelson, round in section, acute at apex and often with additional abundant tubercles. Penes paired, unfused. Ovipigerous female brood pouch composed of four short oostegites arising from sternites 1–4, overlapping slightly at midline; eggs held in internal pouches.

Key to western Indian Ocean species of *Oxinasphaera* (males only)

1. Pleon with two prominent submedian processes extending to mid-length of uropodal endopod . . . . . *O. brucei* sp. nov.  
[Off Mozambique]
- Pleon with submedian processes not reaching mid-length of uropodal endopod . . . . . 2
2. Epistome with transverse blade and without prominent spikes . . . . . 3
- Epistome without transverse blade and with prominent spikes . . . . . 4
3. Epistome with trapezoidal blade having U-shaped notch on distal margin; antennular peduncle article 1 with five equal anterior spikes . . . . .  
. . . . . *O. furcata* sp. nov.  
[Off Somalia]
- Epistome with quadrate blade bearing small, irregular tubercles; antennular peduncle article 1 with five irregular anterior spikes . . . . .  
. . . . . *O. kensleyi* Bruce, 1997  
[Off Durban and East London, South Africa]
4. Epistome with four posteriorly directed spikes; antennular peduncle article 1 with seven irregular anterior spikes; rostral spike absent . . . . .  
. . . . . *O. tetradon* sp. nov.  
[Zanzibar]
- Epistome with three prominent and two smaller spikes; antennular peduncle article 1 with six equal anterior spikes; rostral spike prominent, bifurcate. . . . . *O. penteumbonata* Benvenuti, Messana and Schotte, 2000, [Somalia]

The other 22 known *Oxinasphaera* species, known from Australia and the Indo-West Pacific, are separated in a key to species given by Bruce (1997).

***Oxinasphaera brucei* sp. nov.**  
(Figures 29, 30)

*Material examined*

Holotype: ZMUC, one male (5.1 mm), IIOE sta 371-G, off Mozambique, 24°29'S, 35°13'E, 73 m, 18 August 1964. Paratype: USNM 280352, one male 5.6 mm, IIOE sta 403-E, off Mozambique, 19°09'S, 36°55'E, 88 m, 9 August 1964.

*Description*

*Male.* Body length excluding uropods slightly more than twice maximum width; lateral margins subparallel, widest at pereonite 4. Cephalon pitted, with short, sparse setae;

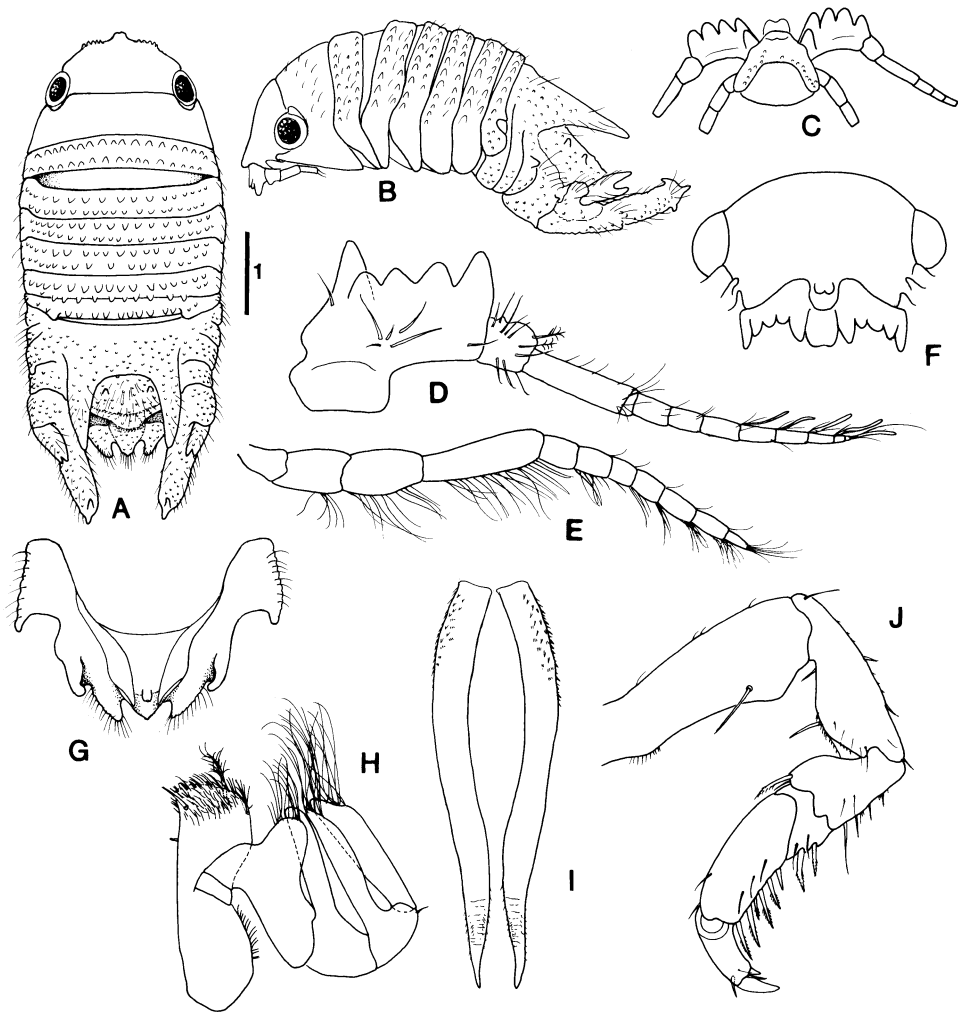


Figure 29. *Oxinasphaera brucei* sp. nov. (A) Male, dorsal view; (B) male in lateral view; (C) antennular bases and frontal lamina; (D) antennule; (E) antenna; (F) cephalon in anterior view; (G) male pleotelson, ventral view; (H) maxilliped; (I) penes; (J) pereopod 1.

anterior margin with five to six tiny tubercles on either side of rostrum; rostral spike broad with slightly crenulate margin. Pereonite 1 smooth. Pereonites 2–4 each with two transverse rows of short rounded spikes, occasional intermediate nodules and granules between rows; pereonites 5–7 each with two rows of somewhat longer, more acute spikes. Pleon very granulose with posterior boss bearing two prominent posteriorly directed projections extending beyond mid-length of pleotelson. Pleotelson very granulose, sparsely setose with two submedian anteriorly directed obtuse spikes beneath pleonal projections; lateral, transverse concavities at two-thirds of pleotelson extending inward to median one-third of width; posterior margin with two submedian indentations on either side of narrowly pointed median lobe. Ventral view as figured; ventral median lobe on posterior margin with short projection anterior to apex.

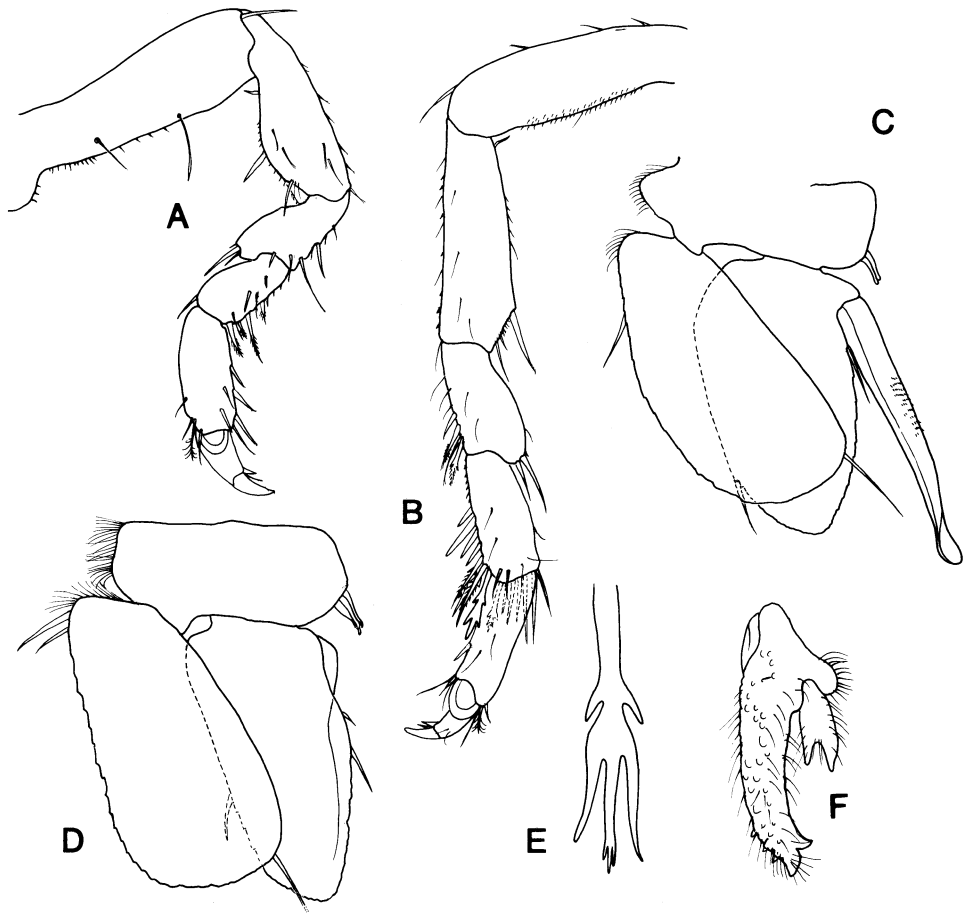


Figure 30. *Oxinasphaera brucei* sp. nov. (A) Pereopod 2; (B) pereopod 7; (C) male pleopod 2; (D) pleopod 1; (E) carpal seta of pereopod 7, enlarged; (F) uropod.

Antennule peduncle article 1 with four large, regular anterior spikes, single large proximoventral spike and posterior blade; several setae on articles 1 and 2; flagellum of nine articles, distal five each with single aesthetasc. Antennae articles 3–5 with long setae; flagellum with seven articles. Epistome with thick, transverse blade anteriorly; lateral lobes very granulose. Mandibles and maxilliped typical of genus.

Pereopod 1, five to six strong, fringed setae on posterior margin of propodus; carpus having two fringed setae on posterior margin; merus with single such seta on anterodistal margin. Pereopod 2, several simple setae on distal margins of propodus; carpus with four fringed spine-like setae on posterior margin of carpus. Pereopod 7 longest, with several very robust, complex tridentate setae on distal margin of carpus; merus with two long, fringed and several simple setae on posterodistal margin. Penes elongate, tapering to narrow apex, length more than 12 times width; very short stiff setules proximally at lateral margins; fewer setules on distal one-sixth of length.

Pleopod 1 peduncle with three coupling hooks, setose on outer margin; exopod with strong stiff seta proximolaterally; endopod having groove on medial margin. Pleopod 2,

appendix masculina extending somewhat beyond apex of endopod, narrowing distally before inflating to bulbous tip; tiny setules medially. Uropods rough, very granulose with several setae; exopod about one-third length of endopod and deeply bifid apically; endopod with two or more medium spikes distoventrally; apex with two prominent spikes, one directed dorsally, one ventrally.

*Female.* Unknown.

#### *Remarks*

As noted by Bruce (1997) in his monograph of the genus *Oxinasphaera*, all the western Indian Ocean species, all of which except *O. kensleyi* are described as new in the present paper, possess elongate pleonal processes. The four new species of *Oxinasphaera* described in this paper, all from the western Indian Ocean, appear to be related to the *O. tripartita*–*O. kensleyi* clade proposed by Bruce, having in common a posterior antennular blade and a pleotelsonic lobe overriding the apical sinus. *O. brucei* is distinguished by the chisel-like blade on the epistome, the formula of spikes on the antennular peduncle, and morphology of the appendix masculina. In the same monograph, Bruce discusses the characters which separate this genus from its probable sister group, *Cymodoce*.

#### *Etymology*

The species is named for Dr Niel L. Bruce, respected friend, colleague and authority on numerous isopod taxa.

### ***Oxinasphaera furcata* sp. nov.** (Figures 31, 32)

#### *Material examined*

Holotype: USNM 280353, one male (5.7 mm), IIOE sta 463, off Somalia, 11°24'N, 51°35'E, 75–175 m, 17 December 1964. Paratypes: USNM 280354, two immature males, one ovigerous female, two females, three juveniles, same data as holotype. USNM 280355, one male, IIOE sta 445, off Somalia, 9°41'N, 51°03'E, 60–70 m, 16 December 1964. USNM 280356, two males, IIOE sta 447, off Somalia, 10°00'N, 51°15'E, 9–61 m, 16 December 1964.

#### *Description*

*Male.* Body length slightly less than twice as long as wide. Cephalon faintly tuberculate on anterior margin with prominent bifurcate spike on rostrum. Pereonite 1 unornamented. Pereonites 2 and 3 each with two rows of very low, indistinct tubercles. Pereonites 4–6 each with two rows of low rounded spikes, spikes in anterior rows larger. Pereonite 7 with anterior row of larger, conical spikes and many fewer, smaller tubercles in posterior row. Pleon very granulose with scattered setae, having two relatively short projections on posterior margin, not reaching mid-length of pleotelson; posterolateral margin of pleon produced into spike. Pleotelson very granulose with scattered setae, having pair of short protuberances ventral to each pleonal projection, posterior protuberance larger; posterior

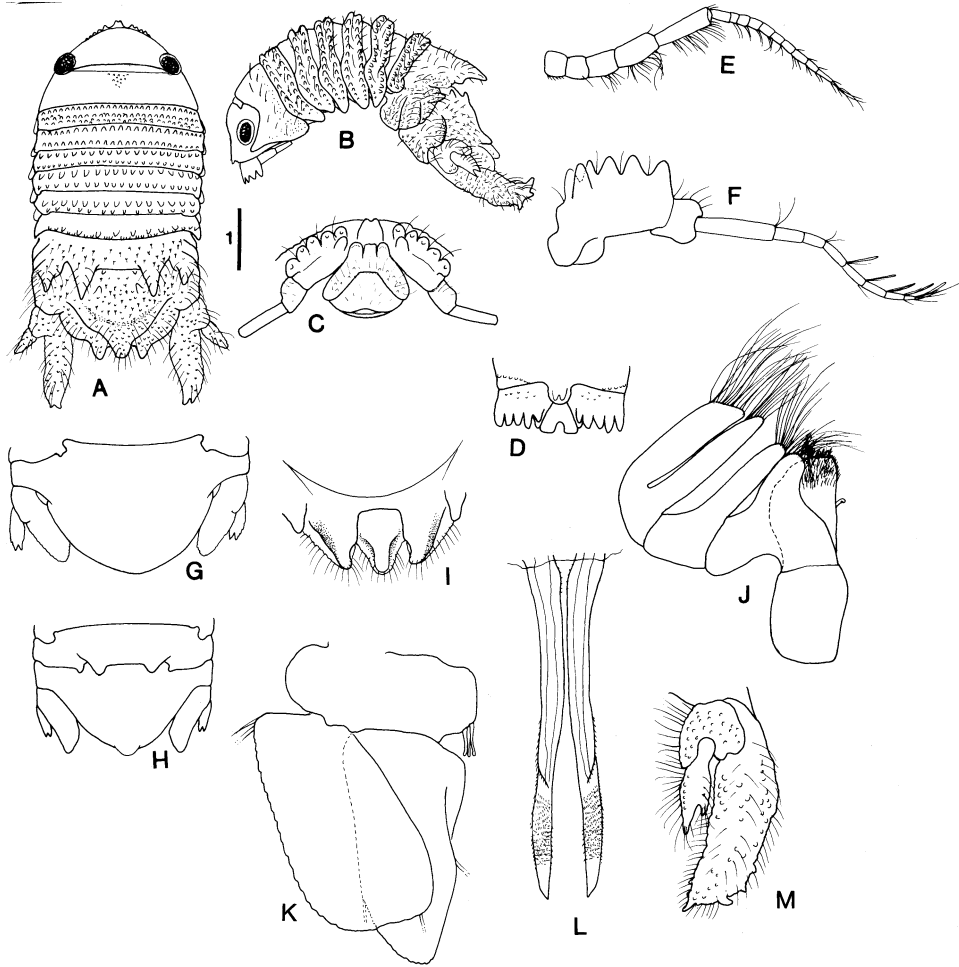


Figure 31. *Oxinasphaera furcata* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) antennular bases, rostrum and frontal lamina in ventral view; (D) antennular bases and frontal lamina, anterior view; (E) antenna; (F) antennule; (G) female pleon; (H) immature male pleon; (I) male pleotelsonic apex, ventral view; (J) maxilliped; (K) pleopod 1; (L) penes; (M) uropod.

margin with produced, rounded medial lobe overlying telsonic excision, equal in length to lobes on either side.

Antennule peduncle article 1 with five regular anterior spikes, single proximoventral spike, and posterior blade; flagellum of seven to eight articles, single aesthetasc each on distal five articles. Antennal peduncle articles 3–5 with long setae; flagellum of about 11 articles. Epistome bearing triangular, chisel-like blade with medial notch on posterior margin. Maxilliped as figured; other mouthparts also typical of genus.

Pereopod 1 with several stiff, fringed setae on posterior margin of propodus and two on carpus. Pereopod 2 with single fringed and three simple setae at distal margin of carpus. Pereopod 7 with long stiff setae on posterior margin of propodus, carpus and merus; several long setae and two complex tridentate setae on distal margin of carpus.

Penes length about 12 times width, tapering to acute apex; spinulose on distal one-fourth.



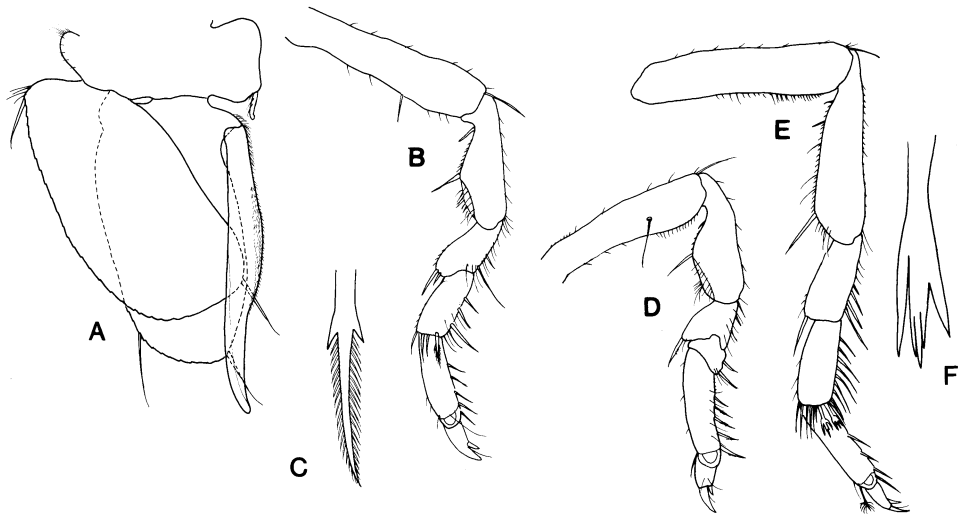


Figure 32. *Oxinasphaera furcata* sp. nov. (A) Male pleopod 2; (B) pereopod 2; (C) fringed seta from carpus, pereopod 2; (D) pereopod 1; (E) pereopod 7; (F) seta from carpus, pereopod 7.

Pleopod 1 with three coupling hooks; medial margin of endopod with groove. Pleopod 2, appendix masculina bulging somewhat at mid-length before tapering to narrowly rounded apex extending by one-sixth of length beyond posterior margin of endopod. Uropodal exopod about one-third length of endopod; endopodal apex with single, strong dorsally curved spine and three ventral tubercles, distalmost largest.

*Ovigerous female.* Dorsum smooth, unornamented, with broadly rounded pleotelsonic apex; not distinguishable from other females in genus. Brood pouch typical of genus.

*Color.* Chromatophores apparently lacking.

#### *Remarks*

The forked epistomal blade and pattern of antennular spikes (five regular anterior and one proximoventral) separate the new species from all other western Indian Ocean species. See comments under “Remarks” for *O. brucei*.

#### *Etymology*

The specific name *furcata*, from the Latin for “forked”, refers to the shape of the epistome, a diagnostic characteristic of the species.

### ***Oxinasphaera tetrodon* sp. nov.**

(Figures 33, 34)

#### *Material examined*

Holotype: ZMUC, one male (4.1 mm), CRU-1887 sta 1, Paje, Zanzibar, 6°06'54"S, 39°09'48"E, coral heads on sand and rubble, coll. N. L. Bruce, 18 September 1995. Paratypes: ZMUC, two males, CRU-1887 sta 1, Paje, Zanzibar, same data as holotype.

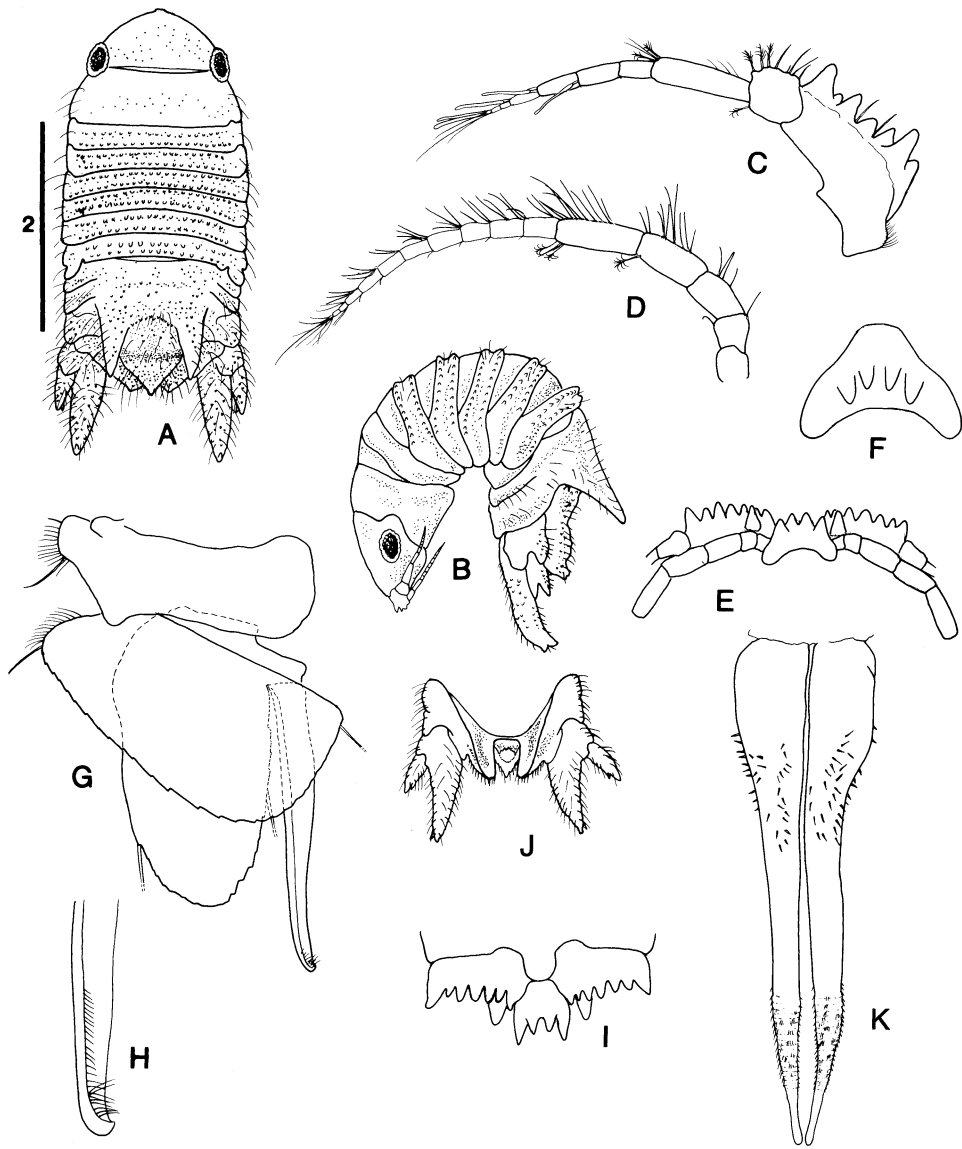


Figure 33. *Oxinasphaera tetodon* sp. nov. (A) Male, dorsal view; (B) male, lateral view; (C) antennule; (D) antenna; (E) ventral view of antennular bases and frontal lamina; (F) frontal lamina; (G) male pleopod 2; (H) apex of copulatory stylet; (I) rostrum, antennular bases and frontal lamina in anterior view; (J) male pleotelson in ventral view; (K) penes.

USNM 280359, three males, sta 2/D1-1, Changuu Island, Zanzibar, 6°6'54"S, 39°09'48"E, coral heads on sand and rubble, 7 m, coll. N. L. Bruce, 19 September 1995.

*Description*

*Male.* Length 2.6 times width, lateral margins subparallel. Cephalon smooth. Rostral spike absent. Pereonite 1 without ornamentation, several simple setae at lateral margins.

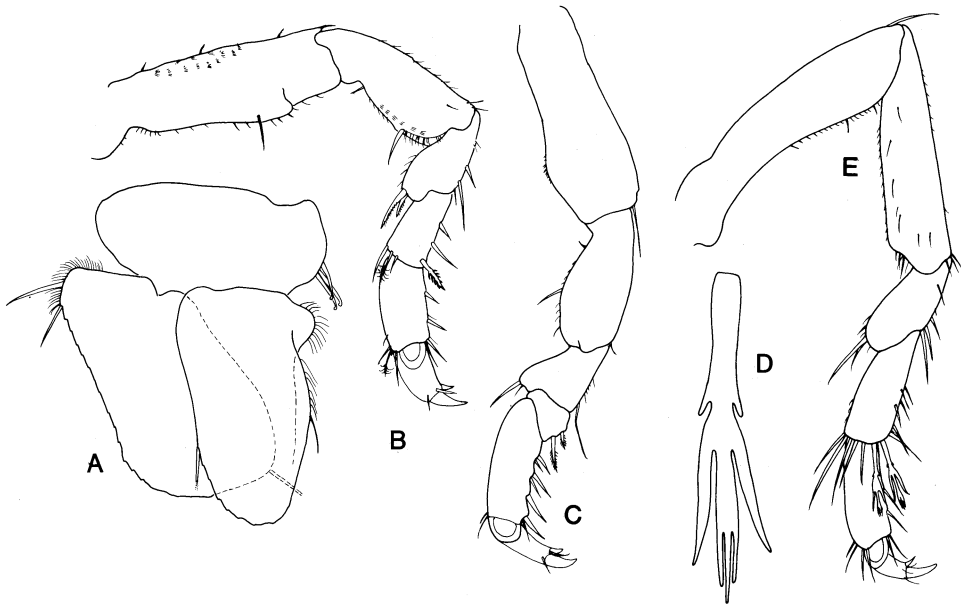


Figure 34. *Oxinasphaera tetradon* sp. nov. (A) Pleopod 1; (B) pereopod 1; (C) pereopod 2; (D) carpal seta on pereopod 7; (E) pereopod 7.

Pereonite 2 with two transverse rows of very low, conical spikes, posterior row barely visible; pereonites 3–7 with scattered setae and two transverse rows of tubercles, largest spikes on pereonite 7. Pleon very granulose with two relatively short projections posteriorly, not extending beyond apex of pleotelson; large dorsally directed spike at posterolateral angle of projection and single smaller one posterior to it; pleotelson very tuberculate with few scattered setae; posterior margin with medial projection overlying telsonic excision and ending in upwardly turned spike, equal in length to lobes on either side. Ventral view of pleotelson as figured.

Antennular peduncle article 1 with seven anterior spikes, one tiny, plus one large proximoventral spike; article 2 with four plumose and several simple setae; flagellum with eight articles, terminal five with one aesthetasc each and basal article bearing two plumose setae anterodistally. Antennal peduncle of five articles, increasing in length distally and all bearing long simple setae; articles 4 and 5 with one and three distal plumose setae, respectively; flagellum of 11 setae-bearing articles. Epistome with four large fang-like spikes, lateral two longer in dorsal view. Mouthparts (not figured) typical of genus.

Pereopod 1, propodus with one plumose and several long, simple setae on distal margin; carpus, single stout serrate seta on posterodistal margin and single plumose seta on anterior margin; merus, two stiff, fringed setae at anterodistal angle; ischium, grooved to accommodate merus, with patches of setules and single strong stiff seta near anterodistal margin. Pereopod 2, propodus with several strong stiff setae on posterior margin; carpus, two fringed setae on posterior margin. Pereopod 7, propodus with several long setae at distal margin; carpus bearing several very long stiff setae and two very strong, complex trident setae at posterodistal margin; ischium with a few long stiff setae on antero- and posterolateral margins.

Penes elongate, length 3.5 times width at base; several scattered setules in proximal one-third; rows of very fine setules in distal one-fourth of rami; rami slender, tapering to narrowly rounded apices.

Pleopod 1, three coupling hooks on basis; exopod quadrate with single strong seta and fringe of fine setae at anterolateral corner; endopod narrower, grooved on medial margin. Pleopod 2, appendix masculina length eight times width, tapering slightly, curved at tip, apparently grooved and bearing many setae near apex; extending beyond margin of endopod by one-fourth length. Uropodal exopod very granulose, bearing many setae, about three times length of endopod; endopod bifid.

*Female.* Unknown.

*Color.* Evenly spaced brown chromatophores scattered on all segments, also on uropodal endopods.

#### *Remarks*

*Oxinasphaera tetradon* can be recognized by the absence of a rostral spike and by having seven irregular spikes on antennular peduncle article 1 and four prominent spikes on the epistome.

#### *Etymology*

The specific name refers to the number of spikes on the epistome and is from the Greek, "tetra" (four) and "odon" (tooth).

#### ***Genus Paracilicaea* Stebbing, 1910a**

*Restricted synonymy.* *Paracilicaea* Stebbing 1910a, p 106; Hale 1929, p 272, 288; Harrison and Holdich 1984, p 324; Javed 1990, p 27 (discussion).

#### *Diagnosis*

Hemibranchiate with endopod of pleopod 3 lacking branchial folds. Both sexes with cephalon, pereon and pleon lacking dorsal extensions. Pleon bearing two long, straight parallel sutures at each side; sutures extending to posterolateral angle. Pleotelsonic apex with a marked notch bearing a median tooth. Pereopods 1–3 with anterior surfaces of ischium and merus bearing, at most, several short superior spine-like setae. Sexual dimorphism obvious, especially in morphology of uropods and dorsal ornamentation of the pleotelson.

*Adult male.* Penes slender, separate to base. Appendix masculina sublinear, arising from proximomedial angle of pleopod 2 and extending beyond apex of ramus. Maxilliped with palp articles 2–4 bearing produced setigerous lobes. Uropodal endopod reduced; exopod elongate, thickened, subcylindrical or subelliptical in tranverse section, extending well beyond apex of pleotelson.

*Ovigerous female.* Mouthparts metamorphosed. Brood pouch formed by four pairs of oostegites arising from sternites 1–4 and overlapping at midline. Brood held in internal

pouches. Uropodal rami lamellar and subequal in length to pleotelsonic apex; exopod with external margin entire or bearing a distal indentation.

Below is a key to *Paracilicæa* species, based on morphology of adult males.

Key to species of *Paracilicæa* from the Indian Ocean

1. Pleotelson without large bosses, lobes or conical tubercles; pleotelson with six longitudinal rows of small tubercles; uropodal exopods long, curved . . . . . *Paracilicæa flexilis* Baker, 1928  
[Western Australia]
- Pleotelson with two or more large lobes, bosses or tubercles; exopods various . . . . . 2
2. Pleotelsonic bosses triangular in shape, each extending anteriorly to form ridge meeting submedian pair of tubercles on posterior margin of pleonite 4, thus forming a square-shaped concavity . . . . . *Paracilicæa keiji* Javed, 1990  
[Pakistan]
- Pleotelson not as above . . . . . 3
3. Each of three pleotelsonic apical processes notched; uropodal rami apically notched . . . . . *Paracilicæa mossambicus* Barnard, 1914  
[Mozambique; Madagascar; Seychelles; Mauritius]
- Pleotelsonic apical processes unnotched, rounded or truncate or acute . . . . . 4
4. Posterior margin of pleon entire, not produced and without tubercles or processes . . . . . 5
- Posterior margin of pleon produced, or with processes and/or tubercles . . . . . 6
5. Uropodal endopods parallel-sided, width of exopod ca one-sixth of length, apically acute. . . . . *Paracilicæa teretron* Barnard, 1955  
[Mozambique; Madagascar]
- Uropodal endopods not parallel-sided, width of exopod ca one-third of length, apically rounded . . . . . *Paracilicæa watamuae* Müller, 1995  
[Kenya]
6. Posterior margin of pleon markedly and broadly produced at midline . . . . . 7
- Posterior margin not produced at midline; bearing tubercles or two processes . . . . . 8
7. Dorsum covered with pile of setae; uropodal exopod with conical tooth on distal external margin. . . . . *Paracilicæa pubescens* H. Milne Edwards, 1840  
[South Australia; Zanzibar; Indonesia]
- Dorsum smooth; exopod long, narrow and without tooth on margin . . . . .  
. . . . . *Paracilicæa dakini* Tattersall, 1922  
[Western Australia]
8. One or two small, median tubercles at base of pleotelsonic notch . . . . . 9
- Lacking small tubercles at base of pleotelsonic notch. . . . . 10
9. Single, small tubercle at base of pleotelsonic notch; two large, setose bosses on pleotelson . . . . . *Paracilicæa eupyga* (Nobili, 1906)  
[Red Sea]
- Pair of small tubercles at base of pleotelsonic notch; four large, setose lobes on pleotelson . . . . . *Paracilicæa setosa* Müller, 1995  
[Kenya]

10. Medial process in pleotelsonic notch cross-shaped . . . . .  
 . . . . . *Paracilicæa stauros* sp. nov.  
 – Not as above . . . . . 11
11. Pair of small tubercles at base of pleotelson anterior to large bosses . . . . .  
 . . . . . *Paracilicæa cordylina* Kensley, 1984  
 [Africa]  
 – Pair of small tubercles absent at base of pleotelson . . . . . 12
12. Pleotelsonic lobes truncate apically; uropodal exopods curved, rounded at  
 apex . . . . . *Paracilicæa hanseni* Stebbing, 1910  
 [Gulf of Kutch, India]  
 – Pleotelsonic lobes narrowly rounded apically; uropodal exopods straight, acute at  
 apex . . . . . *Paracilicæa clavus* Barnard, 1955  
 [Mozambique]

***Paracilicæa stauros* sp. nov.**  
 (Figures 35, 36)

*Material examined*

Holotype: USNM 280360, one male (4.0 mm), sta K-SEY-16, coral reef at Anse á la Mouche, Mahé, Seychelles, 2.5–5 m, 1 May 1984. Paratypes: USNM 280361, one male, one ovigerous female, two females, three juveniles, same data as holotype.

*Description*

*Male.* Pereon smooth with scattered setae, single and in pairs on dorsum, especially abundant at posterolateral margins; four tufts of setae along posterior margin of pereonite 7. Brown chromatophores spread evenly, sparsely over all segments. Pleotelson short, broad; anterior fused pleonites with two submedial projections and four bundles of setae along posterior margin; fifth pleonite bearing two large bosses on either side of midline, each with fringes of long, prominent setae; long setae numerous on lateral margins of segment; deep median notch bearing a cruciform projection, apically truncate, with many setae anteriorly and extending from apex.

Antennule flagellum with 10 articles, single aesthetasc on articles 5–8 and 10, two on penultimate article. Antenna flagellum with 10 articles. Frontal lamina broad with rounded apex, transverse ledge projecting ventrally. Maxilliped as figured. Pereopod 1 with three stout, complex setae each on propodus, carpus and merus; dense setal patches near anterior margins of carpus and merus. Pereopod 2, setal patches on anterior margins of carpus and merus, proximal area of propodus and anterodistal margin of ishium. Pereopod 7 with many long, robust, fringed setae as figured on carpus; merus with three stiff, robust setae at posterolateral angle. Penes, length five times width at base. Pleopod 1 with three coupling hooks on basis, plumose setae where figured. Pleopod 2, four hooks on basis; appendix masculina extending one-fourth length beyond apex of endopod, dilating slightly near tip then constricting to narrowly rounded apex. Pleopod 3 with four hooks on basis, complete transverse suture on exopod, plumose marginal setae indicated in figure. Pleopod 4 with sparse simple setae on external margins of both rami; single strong apical seta on each ramus; subterminal indentation on endopod. Pleopod 5

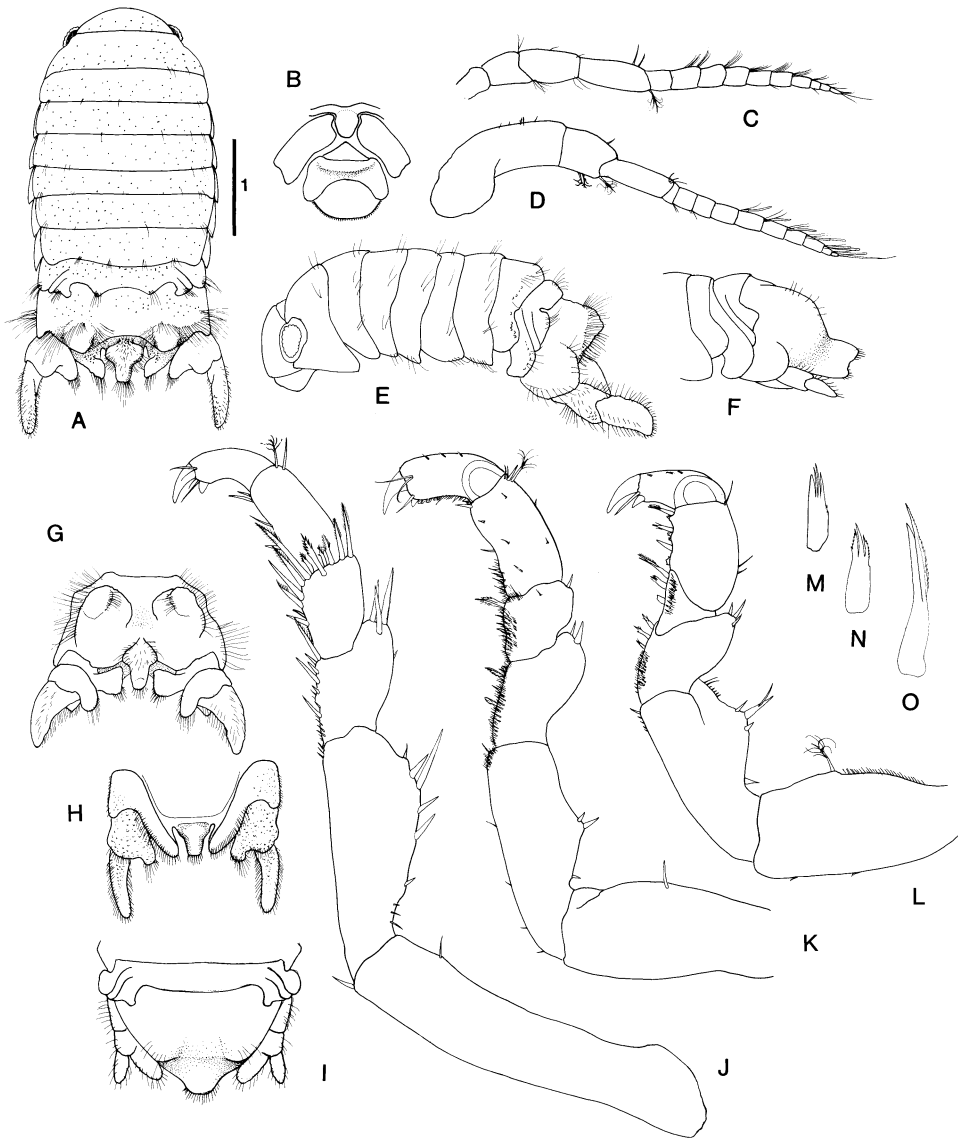


Figure 35. *Paracilicsea stauros* sp. nov. (A) Male, dorsal view; (B) frons; (C) antenna; (D) antennule; (E) male, lateral view; (F) female, pleon in lateral view; (G) male pleotelson, posterior view; (H) male pleotelson in ventral view; (I) female pleon in dorsal view; (J) pereopod 7; (K) pereopod 2; (L) pereopod 1; (M, N, O) carpal setae from pereopod 1, enlarged.

exopod with four distinct patches of dentate spinules, one patch anterior to articulation; sparse setae on internal margin. Uropod with endopod short, extending to length of pleotelsonic apex, with rounded median extension; exopod tuberculate, setose and twice length of endopod, inner margin convex anteriorly; exopod and endopod ventrally tuberculate.

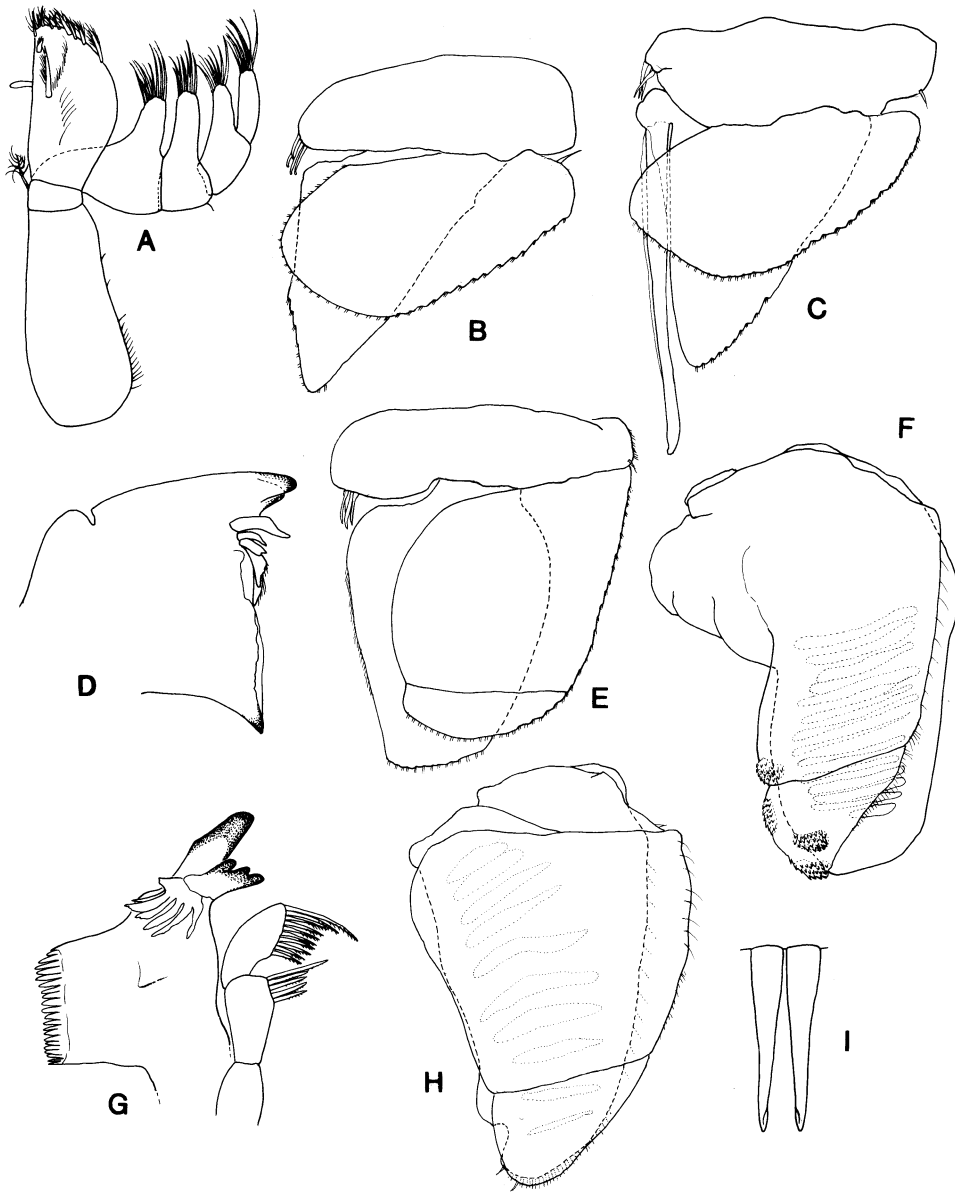


Figure 36. *Paracilicaea stauros* sp. nov. (A) Maxilliped; (B) pleopod 1; (C) male pleopod 2; (D) right mandible; (E) pleopod 3; (F) pleopod 5; (G) left mandible; (H) pleopod 4; (I) penes.

*Ovigerous female.* Pleotelson with boss on either side of midline, few setae, apex truncate with marginal setae. Uropodal rami of equal length, both shorter than pleotelsonic apex; endopod broadly rounded apically and wider than exopod. Brood pouch with anterior pair of oostegites meeting at midline, posterior three pairs overlapping.



*Remarks*

*Paracilicæa stauros* is distinguishable from all other members of this genus by the nature of the tripartate apex of the pleotelson, including the unique cross-shaped median projection. *Paracilicæa setosa* Müller, 1995 from Kenya possesses a robust medial pleotelsonic projection but of differing shape and lacks the lateral projections on either side of this process, which are present in the new species.

*Etymology*

The specific name is from the Greek, meaning “cross”, suggested by the cruciform shape of the medial projection of the pleotelsonic notch.

**Genus *Sphaeromopsis* Holdich and Jones, 1973**

*Restricted synonymy.* *Sphaeromopsis* Holdich and Jones 1973, p 386; Holdich and Harrison 1981, p 287.

Key to species of *Sphaeromopsis* from the Indian Ocean

1. Pleotelson with lateral margins sinuous . . . . . *S. reticulata* Stebbing, 1910b [Red Sea]
  - Lateral margins of pleotelson not sinuous . . . . . 2
2. Apex of pleotelson broadly truncate . . . . . *S. amathitis* Holdich and Jones, 1973 [Kenya, Somalia, Persian Gulf]
  - Apex of pleotelson not broadly truncate . . . . . 3
3. Pleotelson smooth, apex broadly rounded . . . . . *S. minutus* Javed and Yousuf, 1995 [Pakistan]
  - Pleotelson with small, medial sulcus, apex narrowly rounded . . . . . *S. sulcifera*, n. sp. [Seychelles]

*Diagnosis*

Eubranchiate with antennular peduncle article not expanded anteriorly as plate. Both sexes with pereon and pleon lacking dorsal processes. Uropodal rami lamellar; endopod greater than half length of exopod. Pleotelsonic apex entire, lacking notch, but lateral margins folded ventrally. Sexual dimorphism not pronounced. Penes fused at base, broad in proximal half. Inferior margins of pereopods in male typically with dense or long, fine setae. Ovigerous female mouthparts not metamorphosed; brood pouch lacking oostegites and formed by two ventral pockets opening between fourth pereopods.

***Sphaeromopsis sulcifera*, sp. nov.**

(Figures 37, 38)

*Material examined*

Holotype: USNM 280362, one male (2.0 mm), sta K-SEY-6, intertidal mud flat with green algae at Harbour View Guest House, Mahé, Seychelles, 30 April 1984. Paratypes: USNM 280363, 59 ovigerous females 2.1 mm, 33 females, same data as holotype.

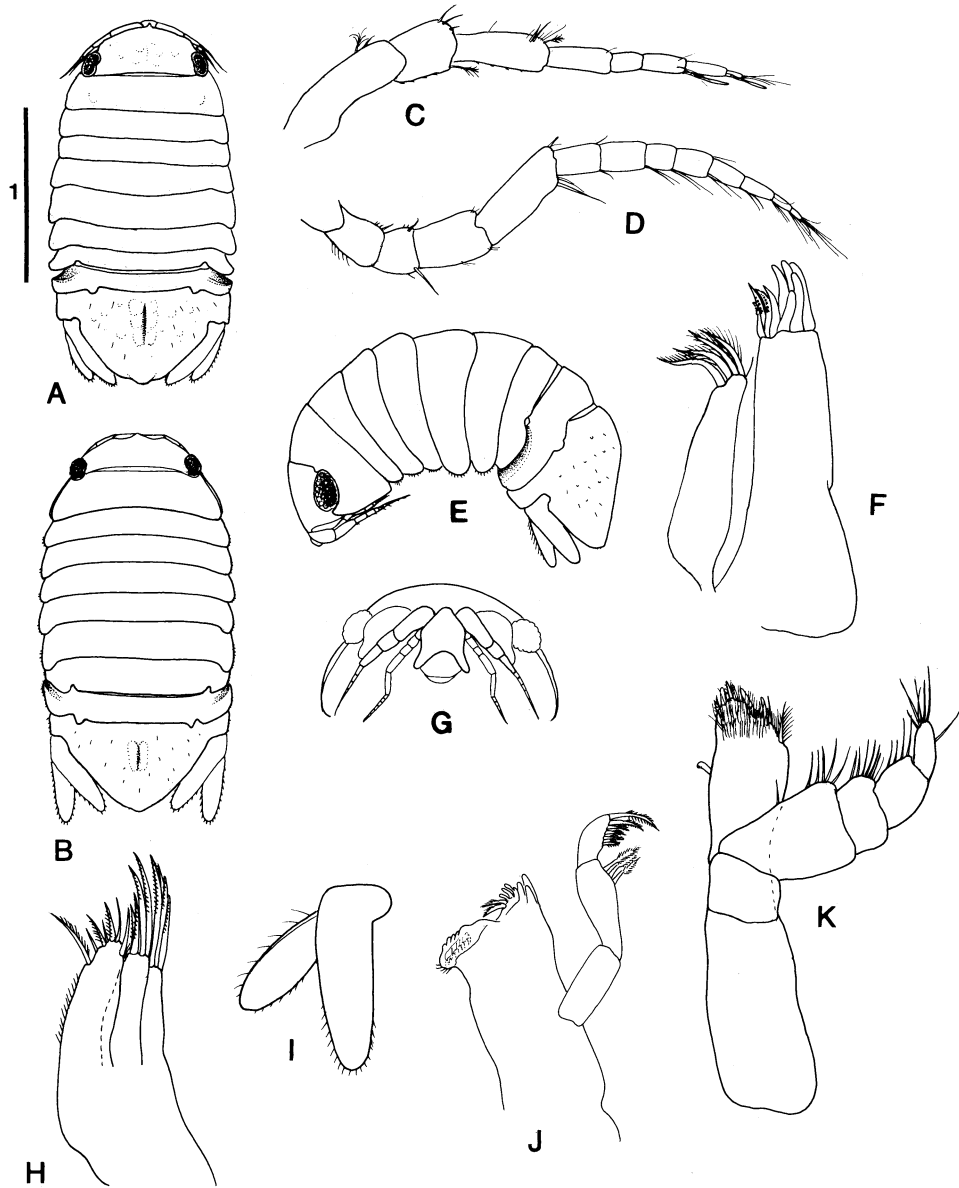


Figure 37. *Sphaeromopsis sulcifera* sp. nov. (A) Male, dorsal view; (B) female, dorsal view; (C) antennule; (D) antenna; (E) male, lateral view; (F) maxilla 1; (G) frons; (H) maxilla 2; (I) uropod; (J) mandible; (K) maxilliped.

*Description*

*Male.* Body length about twice greatest width, strongly conglobate. Cephalon smooth, or very faintly granular, wider than long, moderately convex with pointed rostrum barely visible in dorsal view; epistome narrowly rounded at apex, as broad as long, with “arms” extending to mid-length of labrum. Pereonites 1–6 smooth, without sculpturing or setae except few at margins. Pereonite 7 with submarginal transverse ridge underlapping margin of pereonite 6 in conglobation. Pleotelson wider than long, apex narrowly rounded, bearing

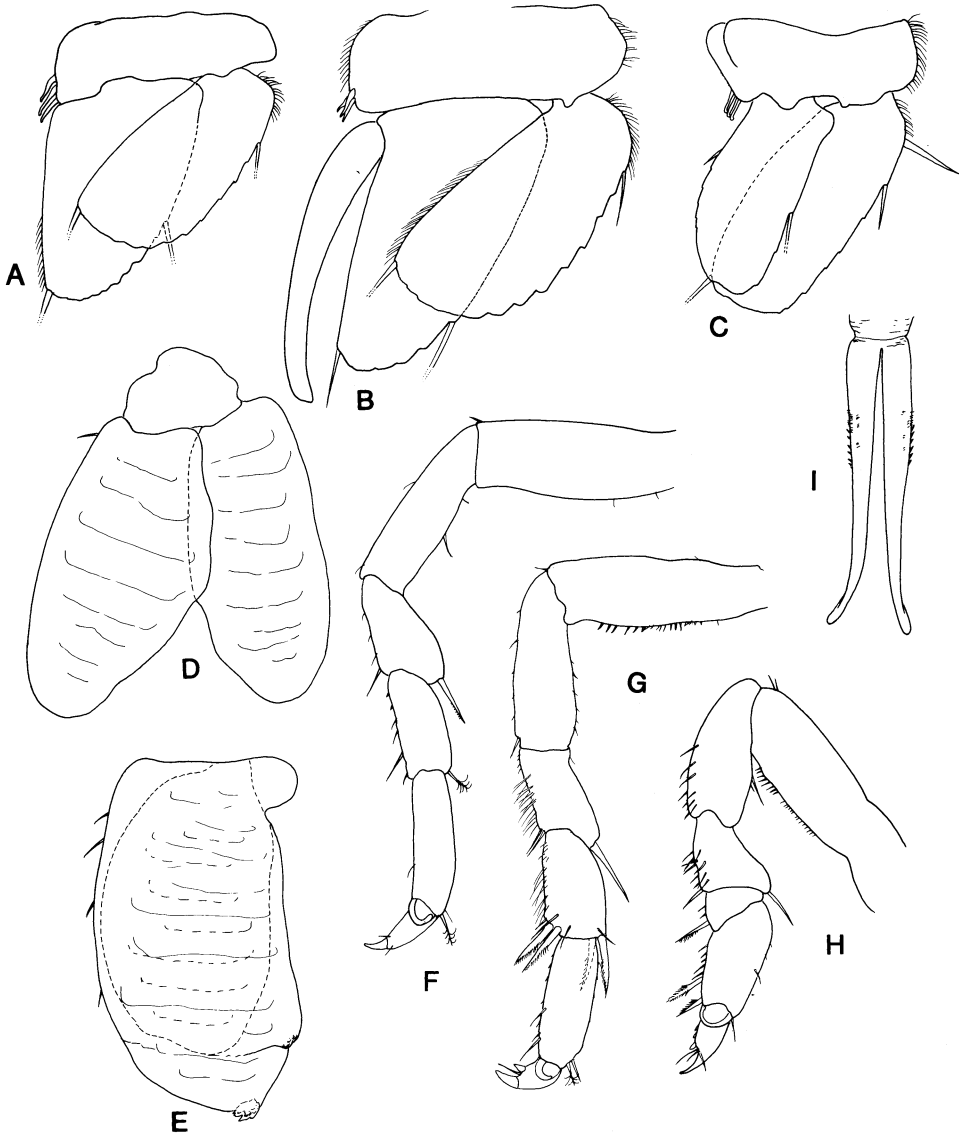


Figure 38. *Sphaeromopsis sulcifera*, sp. nov. (A) Pleopod 1; (B) male pleopod 2; (C) pleopod 3; (D) pleopod 4; (E) pleopod 5; (F) pereopod 2; (G) pereopod 7; (H) pereopod 1; (I) penes.

in anterior half a faint medial furrow flanked by obscure ridges; with few scattered, short setae and faint tubercles over surface clearly detectable only in stained specimens.

Antennule basal article subequal in length to articles 2 and 3 together; flagellum of five articles, articles 4 and 5 each bearing single aesthetasc. Antenna with articles 1–3 short, subequal; article 4 twice length of article 3; article 5 subequal in length to 3 and 4 together; flagellum of eight setose articles. Mandible with incisor of three sclerotized cusps, spine row with five spines, two of which fringed, molar with many teeth. Maxilla 1, inner ramus with four fringed setae; outer ramus with five blunt, robust setae and four more slender stiff setae, two or three fringed. Maxilla 2, inner ramus with seven setae on distal

margin; both lobes of outer ramus with four fringed stiff setae each. Maxillipedal endite broad, with single coupling hook on mesial margin, distal margin bearing three blunt and several fringed setae; palp of five setae-bearing articles, articles 2–4 each with low rounded distomesial lobe. Pereopod 1, propodus with single fringed, single dentate and several simple setae on posterodistal margin; carpus with single stout, fringed seta on posterodistal margin; merus with strong, simple anterodistal and posterodistal setae; merus and ischium with several short setae along posterior margin. Pereopod 2, single plumose seta at anterodistal margin of propodus and carpus; merus with single stiff, fringed seta at anterodistal margin. Pereopod 7, one simple and one plumose seta at anterodistal margin of propodus; four stout fringed setae at distal margin of carpus; carpus and merus with many fine setae along posterior margins, merus with single strong stiff seta at anterodistal margin and several simple setae along posterior margin. Penes long, slender, fused at base, six times longer than basal width, tapering to rounded apices; patch of tiny setules near and on margin in anterior half. Pleopod 1, basis with three distomesial coupling hooks, endopod narrower and slightly shorter than exopod, latter with single stiff seta proximally. Pleopod 2, stout appendix masculina tapering slightly, extending somewhat beyond endopod, apex blunt. Pleopod 3, basis with three coupling hooks, fringe of setae on distomesial margin of endopod. Pleopod 4, both rami with transverse folds, tapering to rounded apices.

Pleopod 5, exopod longer than endopod, with incomplete transverse suture distally, bearing two spinulose bosses. Uropodal rami subequal in length, endopod narrower, both rami extending slightly beyond pleotelsonic apex and bearing simple marginal setae.

*Ovigerous female.* Cephalon and pereon smooth; pleotelson with very faint medial furrow and scattered setae; pereonite 7 as in male. Mouthparts and brood pouch typical of genus.

#### *Remarks*

At present six species of *Sphaeromopsis* are known and can be distinguished from the new species and each other by the characters of the pleotelson. *S. heardi* Kensley and Schotte, 1994 from the Caribbean has obvious sculpturing on the pleotelson whereas the species from Brazil, *S. mourei* Loyola e Silva, 1960, is completely smooth. That of *S. serriguberna* Holdich and Harrison, 1981, from Australia has a mid-dorsal raised area. In the three known Indian Ocean species the pleotelson varies from broadly truncate in *S. amathis* Holdich and Jones, 1973 (Kenya), and reticulate with sinuous margins in *S. reticulata* Stebbing, 1910b (Red Sea) to smooth and broadly rounded in the Pakistan species *S. minutus* Javed and Yousuf, 1995. The faint longitudinal, medial furrow in *S. sulcifera* is unique.

#### *Etymology*

The specific name is derived from the Latin *sulcus*, a furrow, plus *-fera*, bearing, and refers to the faint sulcus on the pleotelson.

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