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**A review of the thalassinidean families  
Callianideidae Kossmann, Micheleidae Sakai,  
and Thomassiniidae de Saint Laurent  
(Crustacea, Decapoda) with descriptions  
of fifteen new species**

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**ABSTRACT**

Three thalassinidean families with setalrows and with a seta on the scaphognathite of maxilla 2 are defined and reviewed: Callianideidae (with pleopodal filaments, without posterolateral lobes on the carapace, without anterolateral lobes on abdominal somite 1, with short or no linea thalassinica); Micheleidae (without pleopodal filaments but with pleopodal lamellae in one genus, with posterolateral lobes on the carapace, with anterolateral lobes on abdominal somite 1, without linea thalassinica); and Thomassiniidae (without pleopodal filaments, without posterolateral lobes on the carapace, without anterolateral lobes on abdominal somite 1, with well developed linea thalassinica). All the genera are diagnosed and keys are presented. Of the thirty-five species described and listed, fifteen are new: *Marcusiarius wamsoi*, *Meticonaxius noumea*, *M. spicatus*, *Michelea abranchiata*, *M. devaneyi*, *M. hortus*, *M. microphylla*, *M. novaecaledoniae*, *M. paraleura* and *Tethisea mindoro* (Micheleidae); *Crosniera corindon*, *C. panie*, *Mictaxius arno*, *T. moorea* (Thomassiniidae). All others are redescribed when necessary, one in a new combination: *Marcusiarius minutus* (Coelho).

**KEY WORDS**

Crustacea,  
Thalassinidea,  
Callianideidae,  
Micheleidae,  
Thomassiniidae,  
systematics,  
new species.

**RÉSUMÉ**

Trois familles de Thalassinides munis de rangées de soies, et dont le scaphognathite de la deuxième maxille est muni d'une soie, sont définies et revues : Callianideidae (pléopodes avec filaments, carapace sans lobes postérolatéraux ; premier somite abdominal sans lobes antérolatéraux, linea thalassinica courte ou absente) ; Micheleidae (sans filaments aux pléopodes mais lamelles pléopodales présentes dans un genre, carapace avec lobes postérolatéraux, premier somite abdominal avec lobes antérolatéraux ; linea thalassinica absente) ; et Thomassiniidae (sans filaments aux pléopodes, sans lobes postérolatéraux à la carapace, sans lobes antérolatéraux au premier somite abdominal, linea thalassinica bien développée). Les diagnoses des genres et des clés sont présentées.

**MOTS CLÉS**

crustacés,  
Thalassinidea,  
Callianideidae,  
Micheleidae,  
Thomassiniidae,  
système,  
nouvelles espèces.

## INTRODUCTION

The Infraorder Thalassinidea is a group of families of reptant decapods, long recognised, but for which a satisfactory diagnosis has only recently been given (Poore 1994). All have a long abdomen, the basis and ischium of pereopods 1-5 fused, pereopod 1 chelate (rarely subchelate) and with articulation between the carpus and propodus slight, pereopod 2 chelate or simple, pereopod 3 simple, and pereopods 4 and 5 chelate or subchelate. The only character state which all species share and which may be the synapomorphy of the infraorder is the possession of a dense row of evenly-spaced long setae along the lower margin of pereopod 2. The seventy-three genera were placed in eleven families and three superfamilies by Poore (1994) and a phylogeny relating them was proposed. The most commonly seen and most easily recognised families are Callianassidae (ghost shrimps), Upogebiidae (sponge shrimps) and Axiidae.

Seven genera, which are not readily placed in these families and which share characters with Axiidae or Callianassidae, are of special interest here. All have setal-rows (rows of short plumose setae in pits on the cephalothorax, abdomen and pereopods) and a long seta on the end of the posterior lobe of the scaphognathite of maxilla 2. They have complex taxonomic histories, recently thought to be closely related (*e.g.* Kensley & Heard 1991), until Poore's (1994) hypothesis showed that this is not so and that they belong to three families in two superfamilies.

*Callianidea* H. Milne Edwards, 1837 has long been placed in its own group. Milne Edwards (1837) created the Tribe Cryptobranchiata for the only species then known, *C. typa*, on the basis of the unique possession of gill-like structures on the pleopods. Instead, for the same species, Dana (1852a, b) used the name Anomobranchiata. Kossmann (1880) was the first to give the species its own family, Callianideidae, but this was not followed by Borradaile (1903) in his indispensable review of the Thalassinidea: he placed the species in the large subfamily Callianassininae (equivalent to the modern Callianassidae and Ctenochelidae). Some apparently similar species, of which the first discove-

red was *C. leura* Poore *et* Griffin, 1979, differ substantially from *C. typa*. These species also possess fringes of lamellae around the pleopods but of a shape and number very different from those seen in the original species. The homology of these structures with those in *C. typa* was not questioned when these species were described as species of *Callianidea*. Kensley & Heard (1991) placed these species in their new callianideid genus *Michelea* and erected another new genus *Mictaxius* for a very different shrimp, also in Callianideidae. Poore (1994) confined Callianideidae to its type genus, confirmed Sakai's (1992) family Micheleidae for *Michelea*, and placed *Mictaxius* in Thomassiniidae.

*Meticonaxius* de Man, 1905 was erected for *Meticonaxius monodon* and placed in the Axiidae where it was thought to belong by several authors (de Man 1925; Barnard 1950; Balss 1957). Alternatively, the genus has been aligned with the Callianassidae (see Bouvier 1925). De Man (1928) followed Bouvier without further explanation and included both *Meticonaxius* and *Callianidea* in Callianassidae. Both genera were placed in Callianideidae by Coelho & Ramos-Porto (1987). *Metaxius* Bouvier, 1905 is an undisputed junior synonym of *Meticonaxius* (see de Man 1925).

*Marcusiaxius* Rodrigues *et* Carvalho, 1972, also originally described as an axiid, has been placed in synonymy with *Meticonaxius* by Coelho & Ramos-Porto (1987) but its differences were confirmed by Kensley & Heard (1991). The two genera are quite different from axiids, their cephalothorax being much more laterally compressed and being more soft-bodied. They belong to Micheleidae (see Poore 1994).

*Thomassinia* de Saint Laurent, 1979 was provisionally described in the Callianassidae because of its general habitus and the possession of a linea thalassinica and distinct cervical groove. It was separated into its own subfamily within the Callianassidae, largely because of the possession of epipods on pereopods 1-4 and a long seta on the maxilla 2 scaphognathite. *Callianassa minima* Rathbun was included in the Thomassiniinae, without being placed in an alternative genus, by de Saint Laurent & Le Loeuff (1979) and a new genus, *Crosniera*, was erected for it by

Kensley & Heard (1991). The family Thomasiniidae was recognised by Manning & Felder (1991) and Poore (1994).

While describing new species and investigating these taxa, work started before the publication of Kensley & Heard's (1991) and Sakai's (1992) papers, it became clear that it was improbable that the seven genera belonged to a monophyletic taxon. An hypothesis relating the three families, Callianideidae, Micheleidae and Thomasiniidae to each other and other thalassinidean taxa has been published (Poore 1994). Here all their species are listed, fifteen new species are described, some others are redescribed, and some enigmatic but poorly preserved specimens are noted.

Many of the most interesting specimens are small, less than 20 mm long, unique, and in poor condition. Limbs are frequently detached and the articulation between pleon and carapace is often tenuous. Few can be figured as whole animals and such illustrations appearing in this paper must be assumed to be typical of their genera. Many specimens have been stained with Chlorazol Black E or Benzoin Blue to show the distribution of setae and sculpture; limbs and mouthparts of type specimens have been cleared in a lactic acid/glycerol mixture and stained. This technique has proved very successful in revealing morphological features otherwise impossible to see. Most drawings have been done using a stereomicroscope but a compound microscope was used for some of the smaller species.

Thalassinideans, like many other decapods, are setose animals; the distribution of the major setal groups is similar across wide taxonomic groupings. I have attempted to show the patterns of setation for typical species from most of the genera. In other species only the general shape of limbs has been illustrated as an identificatory aid. On some limbs typical setae are figured and the extent of the patches of setae is shown by dotting. "Setal-rows" are always shown even if other setae are not. Scale bars on figures refer to habitus or cephalothorax drawings only and are 1 mm.

It has been necessary to define terms to describe novel features of this group and to clearly diffe-

rentiate others.

"Setal-rows" (a term introduced and figured by Kensley & Heard 1991, figs 1, 2) are characteristic of numerous thalassinidean genera. They are plumose setae, evenly and well spaced, set in a single line of between two and thirty, and seemingly in obvious pits (which are apparent even if the setae have been knocked off). Sometimes each seta of a setal-row is accompanied by a finer minute basal seta. Setal-rows are found only anterolaterally on the cephalothorax, laterally on each abdominal somite, and on the lateral surface of propodi of pereopods 2-4. They are not to be confused with rows or patches of setae found along the margins of limbs or dorsally on the cephalothorax and abdomen. Such setae are usually simple and, even if arranged in linear patches, are usually closely placed and never in a single row. The number and distribution of setal-rows are usually consistent within genera.

I distinguish between a "spine", a sharp cuticular projection found on the merus of pereopod 1 and maxilliped 3 of some of the species described in this paper, and a "spiniform seta". A spiniform seta is a thick seta homologous to other fine articulating tapering crustacean setae. Setae vary throughout the thalassinideans and grade from very fine and tapering to structures about as broad as long. The term "spiniform setae" is used only for thick setae on the pereopods and uropods. Their distribution is taxonomically significant.

Description of the orientation of the limbs has not been consistent in the past. I follow de Man (1925) and use "upper" to describe the extensor (or anatomically anterior) margin and "lower" for the flexor (or posterior) margin. These terms reflect the position of the limbs in life rather than their attitude in the ventrally directed position. "Mesial" and "lateral" are derived as a consequence of this and in most cases truly describe the position of the faces of the limb relative to the body of the animal.

Lengths of specimens are given as carapace length (cl.) and total length (tl.).

Material for this study has been accumulated over several years from museum collections and French expeditions. Most is from the Indo-West Pacific region but some from the Caribbean Sea

is included where it adds information about variation within genera.

It has been deposited in the Muséum national d'Histoire naturelle, Paris (MNHN); Zoological Museum, Amsterdam (ZMA); Zoological Museum, Leiden (ZML); Zoological Museum, Berlin (ZMB); Museum of Victoria, Melbourne (NMV); Australian Museum, Sydney (AM); National Museum of Natural History, Washington (USNM); Museum of Comparative Zoology, Harvard (MCZ); American Museum of Natural History, New York (AMNH); Los Angeles County Museum, Los Angeles (LACM) incorporating collections of the Allan Hancock Foundation (AHF); Museu de Zoologia, Universidade de São Paulo (MZUSP), and South African Museum, Cape Town (SAM).

#### Family CALLIANIDEIDAE Kossmann, 1880

Callianideidae Kossmann, 1880: 80. – Gurney 1938: 343. – de Saint Laurent 1979: 1395. – Kensley & Heard 1991: 497, 498. – Sakai 1992: 9, 10. – Poore 1994: 103.

Callianideinae de Man, 1928: 30 (synonym and homonym). – de Saint Laurent 1973: 515. – Sakai 1992: 10, 11.

Callianideinae Melin, 1939: 4 (synonym and homonym).

TYPE GENUS. — *Callianidea* Milne Edwards, 1837.

#### DIAGNOSIS

Soft-bodied burrowing thalassinidean shrimps. Rostrum very short and broad. Linea thalassinica very short, lateral to eyestalk, or absent. Cephalothorax laterally compressed, ending posteriorly as an obsolete median convexity, not separate from posterolateral margins of carapace; no thickening of posterolateral carapace margins. Without anterolateral lobes on abdominal somite 1 but mid-dorsal region articulating with midposterior margin of carapace. Thoracomere 7 sternite visible between coxae only as a narrow ridge; coxa of pereopod 4 flattened, immobile and without condyle on sternite 7. Abdominal somite 1 two-thirds length of somite 2 and with pleuron triangular but not produced. Abdominal somite 2 pleuron not overlapping pleuron 1.

Cephalothorax, rostrum, pleon, telson and all limbs without armature. Anterior cephalothorax and abdominal somites 1 and 6 with weak lateral setal-rows; lateral surfaces of propodi of pereopods 2-4 with similar setal-rows. Antenna 1 peduncle articles subequal. Antenna 2 with scaphocerite minute, articulating. Mandibular incisor toothed posteriorly only, symmetrical. Maxilla 2 scaphognathite with one long seta extending into branchial chamber. Maxilliped 3 pediform, carpus longer than propodus, merus without distal spine, propodus never flattened. Pereopods 1 unequal, larger cheliped merus ovate, with convex lower margin, propodus proximal part longer than wide, fingers complexly toothed, much shorter than proximal part of propodus. Pereopod 2 chelate, pereopods 2-4 with flattened propodi (of 3 as long as wide). Pereopods 3 and 4 propodi bearing single distal spiniform seta on lower margin. Epipods on thoracomeres 2-7; podobranchs rudimentary or absent; two arthrobranchs on each of thoracomeres 3-7; pleurobranchs absent. Male pleopod 1 without appendix interna. Male pleopod 2 without appendix masculina. Pleopod 2 not modified, similar to pleopods 3-5; all with foliaceous rami fringed with simple or bifurcating filaments; rudimentary appendix interna. Uropodal exopod without suture, endopod ovate.

#### COMPOSITION

*Callianidea* Milne Edwards, 1837.

#### REMARKS

The family is only confined in this paper to only the type genus, all others included by Kensley & Heard (1991) and Sakai (1992) removed to the other two families treated herein or, in the case of *Paracallianidea*, treated as a synonym. Its members are similar in general habitus (elongate shape, flattened eyestalks) to members of the Callianassidae but are best distinguished by the presence of simple or bifurcating marginal filaments on pleopods 2-5 (not to be confused with the lamellae on some species of the micheleid *Michelea*). There is a short, anteriorly situated linea thalassinica in only one species.

Sakai (1992) recognised four callianideid subfamilies: Callianideinae (used in the sense of the family

here); Micheleinae and Thomassiniinae (treated as separate families here); and Meticonaxiinae (treated as a junior synonym of Micheleinae here). His taxonomic arrangement assumes the monophyly of the Callianideidae *s.l.*, and he presented a tree illustrating the relationships of the subfamilies, almost identical to that of Kensley & Heard (1991). The three families are not sister taxa and are independently derived from different clades of the Thalassinidea (Poore 1994).

#### Genus *Callianidea* Milne Edwards, 1837

*Isea* Guérin-Méneville, 1832: 295 (type species by monotypy *Isea elongata* Guérin-Méneville, 1832) (name suppressed by ICZN 1989: 61).

*Callianidea* Milne Edwards, 1837: 319. – Boas 1880: 108, 110. – Bate 1888: 10. – Rathbun 1901: 94. – Borradaile 1903: 548. – Gurney 1938: 301, 342. – Melin 1939: 4. – Balss 1957: 1582. – de Saint Laurent 1973: 515. – Le Loeuff & Intès 1974: 23. – Sakai & Holthuis 1987: 93. – ICZN 1989: 61. – Kensley & Heard 1991: 498.

*Callianisea* Milne Edwards, 1837: 321 (replacement name for *Isea* Guérin).

*Callisea* Dana, 1852a: 11; 1852b: 510 (replacement name for *Isea* Guérin).

*Calliacites* Borradaile, 1903: 545 (type species by original designation *Callianassa securo* Lanchester, 1902).

*Paracallianidea* Sakai, 1992: 17 (type species by original designation and monotypy *Callianidea laevicauda* Gill, 1859).

TYPE SPECIES. — By monotypy: *Callianidea typa* Milne Edwards, 1837 (confirmed by ICZN 1989: 61, 62).

#### DIAGNOSIS

With the characters of the family.

#### OTHER DISTINGUISHING FEATURES

Abdominal somite 1 with separate anterior median boss articulating with posterior margin of carapace. Smaller pereopod 1 narrow.

#### COMPOSITION

*C. laevicauda* Gill, 1859; *C. typa* Milne Edwards, 1837. Other available names are currently considered junior synonyms of *C. typa*: *C. mucronata* Kossman, 1880; *C. planocula* Melin, 1939; *C. securo* (Lanchester, 1901).

#### REMARKS

Generally, only two species, *C. typa*, widespread throughout the Indo-West Pacific, and *C. laevicauda*, confined to the Caribbean region and Galapagos Islands, have been recognised and the other specific names are considered as junior synonyms of *C. typa*. This last species is very variable and, in the absence of an examination of type specimens of other nominal species and a thorough review of material from a wide geographic range, the status of the available names is uncertain. A single individual of what could probably be another species is briefly diagnosed here as *Callianidea* sp.

Sakai (1992) erected a separate genus, *Paracallianidea*, for *C. laevicauda*. The general habitus of this species is very similar to that of the other species and the differences of the pleopods 1 and 2, the male appendix interna on pleopod 2, and the pleopodal filaments are not adequate to justify a second genus for a single species.

#### *Callianidea typa* Milne Edwards, 1837 (Figs 1-3, 4A, B)

*Callianidea typa* Milne Edwards, 1837: 320, pl. 20 figs 8-14. – Borradaile 1898: 1015. – De Man 1902: 751; 1928: 21, 31. – Borradaile 1904: 752. – Nobili 1906: 113. – Pesta 1913: 678. – Balss 1914: 90. – Edmondson 1944: 38. – Miyake 1956: 90. – Sakai & Holthuis 1987: 93. – ICZN 1989: 61 (decision to place *typa* on the Official list of Specific Names in Zoology with the endorsement that it would be given precedence over *elongata* Guérin-Méneville). – Sakai 1992: 12-17, figs 3-5. – Dworschak 1992: 218, fig. 17. – Poupin 1994: 7, fig. 3, colour pl. 1b.

TYPE MATERIAL. — **New Ireland.** Eastern Papua New Guinea, coll. Quoy and Gaimard, holotype, MNHN Th-495 (♀, cl. 14 mm, tl. 55 mm).

OTHER MATERIAL. — **Indian Ocean.** Djibouti, MNHN Th-1303, ♂, cl. 11.8 mm, tl. 42 mm (figured specimen); 1891, MNHN Th-498 (♀ and ♂). — Obock, Dr. Jousseume, 1897, MNHN Th-137 (1 specimen); 11.III.1933, MNHN Th-741 (7 specimens from tl. 23 mm). — Iles Mutha, à l'intérieur des cavités des polypiers, Mis[sion] Ch. Gravier, 24.I.1904, MNHN Th-138 (2 specimens). — Iles Muscha (probably Muskah Island, Red Sea, Saudi Arabia), 22.III.1933, MNHN Th-742 (1 specimen).

— Nosy Bé, Madagascar, sand-stone, intertidal, A. Crosnier, MNHN Th-186 (1 specimen); MNHN Th-187 (4 specimens). — Ile Juan de Nova, W Madagascar, MNHN Th-444 (1 specimen). — Pointe Lokobe, under rock, A. G. Humes, 3.VIII.1960, MNHN Th-188 (1 specimen). — Tanzania (Zanzibar), February 1971, MNHN Th-695 (♀, tl. 50 mm). — Moroni, Grand Comoro Island, R. V. Anton Bruun cruise 9, MNHN Th-696

(1 specimen). — Aldabra, MNHN Th-442 (1 specimen).

**Philippines.** Padada Beach, Gulf of Davao, 14-19.III.1936, G. R. Desch, AMNH 46705 (♀, tl. 19 mm). — Philippines, 14.XI.1937, AMNH 9381 (3 specimens); 7.XI.1937, AMNH 9382 (1 che-  
liped); 5.IV.1936, AMNH 9384 (1 specimen).

**French Polynesia.** Tuamotu, Taiaro, J. Poupin, February 1994, MNHN (2 ♂♂).

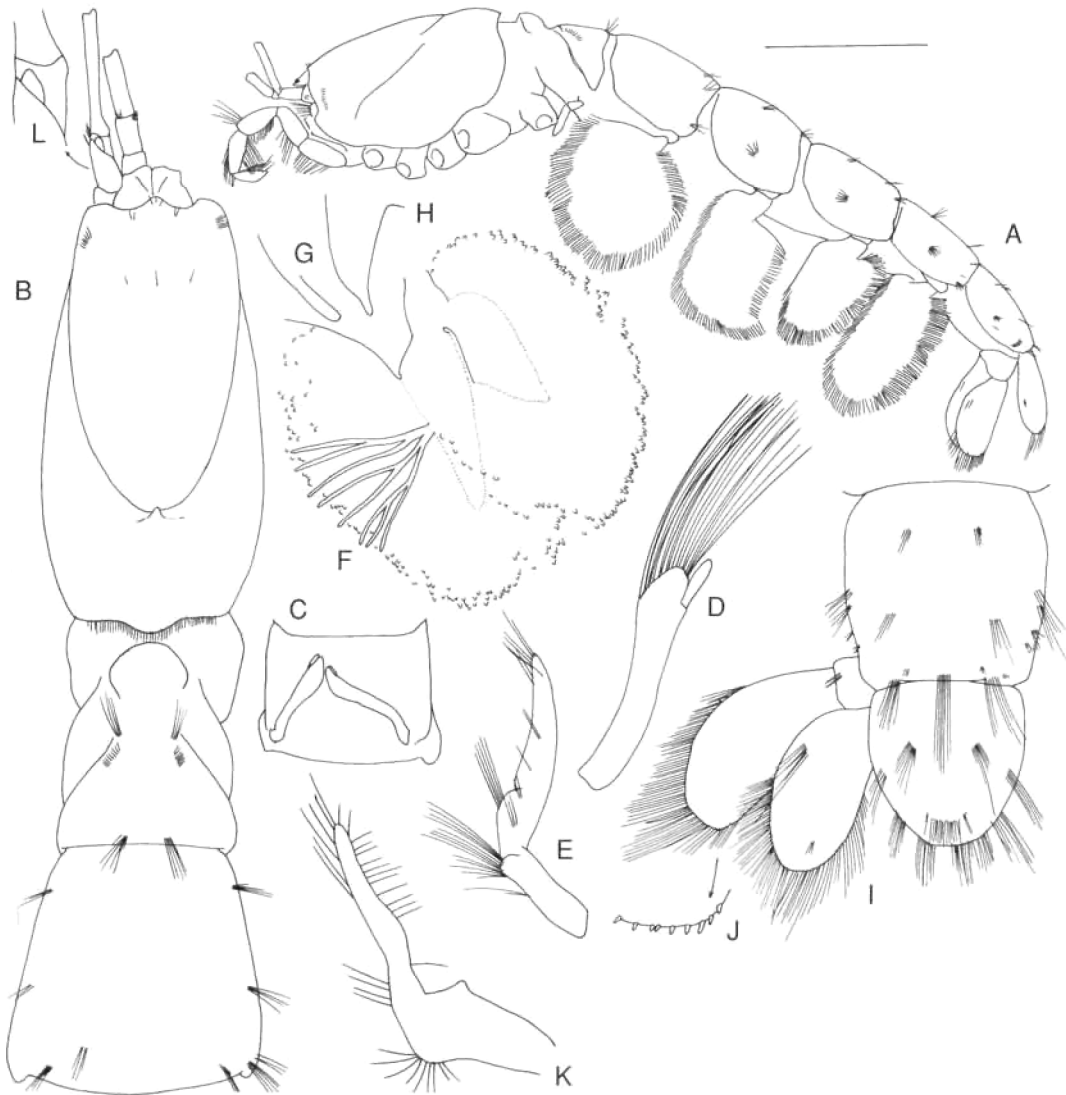


FIG. 1. — *Callianidea typa* Milne Edwards. A, habitus; B, cephalothorax, abdominal somites 1 and 2; C, ♂ ventral view of abdominal somite 1 with pleopods 1; D, ♂ pleopod 1; E, ♀ pleopod 1; F, pleopod 2; G, appendix interna; H, ♀ appendix interna; I, abdominal somite 6, telson and uropod; J, spiniform setae on margin of exopod; K, epipod of pereopod 1; L, antenna 2 with scaphocerite. Figures E, H, from MNHN Th-498; others from MNHN Th-1303.

DISTRIBUTION. — Indo-West Pacific: Japan, Taiwan, Philippines, Mariana Islands, Wake Island, Tahiti, Tuamotu, Samoa, Papua New Guinea, Indonesia, Maldive Islands, Comoro Islands, Gulf of Aden, Red Sea, Aldabra, Madagascar, Tanzania; most records intertidal or from shallow water.

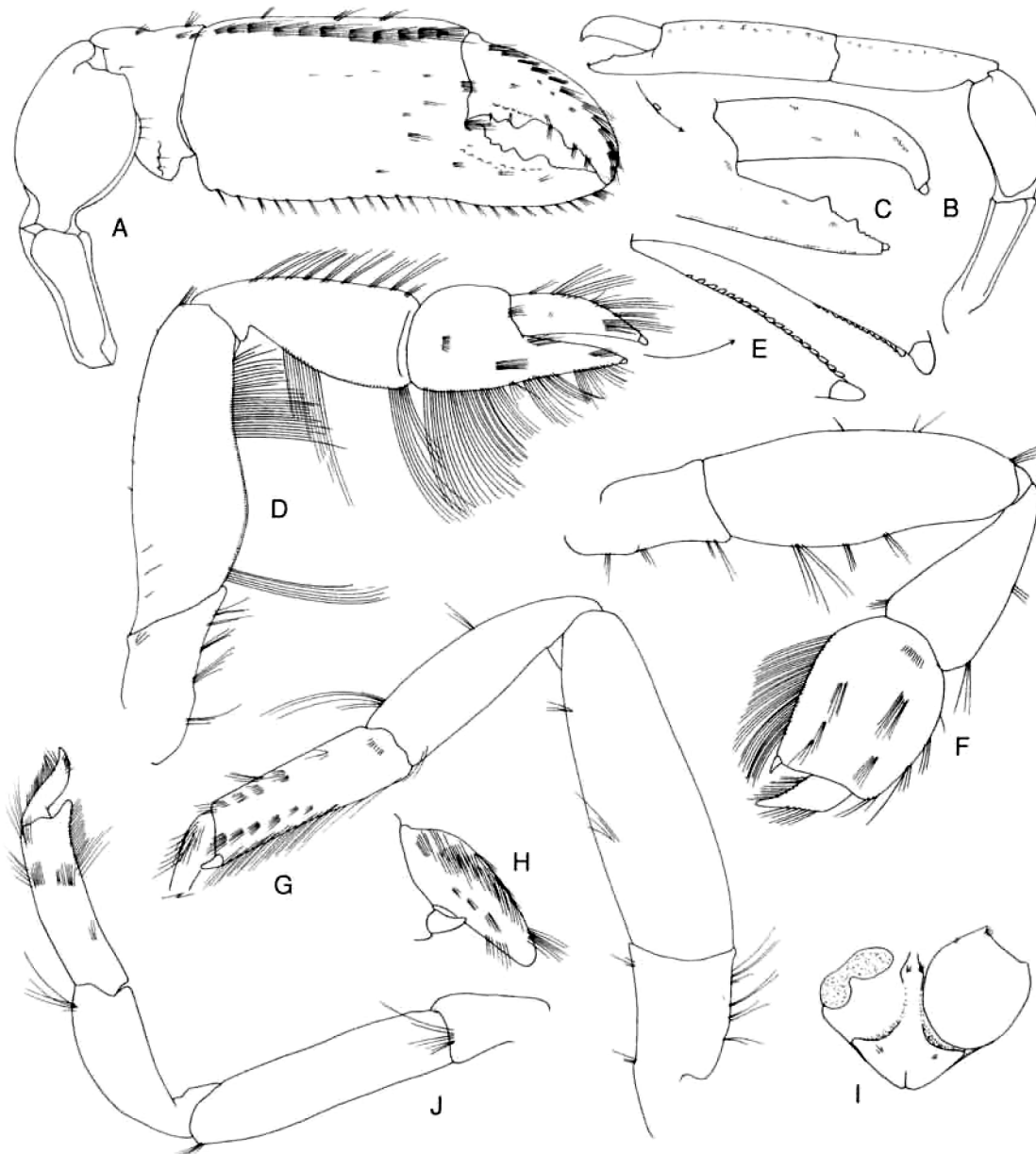


FIG. 2. — *Callianidea typa* Milne Edwards. **A**, left larger cheliped; **B**, right smaller cheliped and **C**, details of fingers; **D**, right pereopod 2 and **E**, details of cutting edges; **F**, right pereopod 3; **G**, left pereopod 4; **H**, dactylus of right pereopod 4; **I**, coxa and sternum of pereopod 4; **J**, right pereopod 5. All figures from MNHN Th-1303.

## DESCRIPTION

Cephalothorax 0.22 total length, about as deep as wide; rostrum flat, very short and broad, less than third as long as eyestalks; cervical groove weakly defined, reaching 0.7 length of cephalothorax; dorsoposterior margin produced to rounded lobe, continuous with posterolateral margins which are setose; submarginal vertical setal-row of seven setae at base of antennae.

Abdominal somite 1 little narrower than greatest width of second, with mid-dorsal boss, without anterolateral lobes; pleuron weakly rounded; dorsolateral setal-rows of nine setae. Abdominal somite 2 as long as first, pleuron not overlapping first somite; without transverse setal-row. Abdominal somite 6 with transverse setal-row of about six setae each side. All abdominal somites with weak groups of long setae dorsally.

Eyestalks flattened, anterolateral corners rectangular; cornea distolateral.

Antenna 1 with short article 1, just longer than eyestalks; article 2 shorter than 3; flagella of about thirty and forty articles, longer than peduncle. Antenna 2 with small articulating article, about third length of article 2; article 4 reaching well beyond article 1 of antenna 1; article 5 short; flagellum almost twice as long as peduncle.

Mandible incisor process with unevenly toothed cutting edge. Maxilla 2 endopod tapering; scaphognathite with one long posteriorly-directed seta. Maxilliped 1 with endopod 0.8 length of basal endite, exopod longer than endite, distal epipod lobe tapering, proximal lobe of similar length, apically rounded. Maxilliped 2 exopod as long as merus; epipod well-developed. Maxilliped 3 ischium with crista dentata of about twenty-six blunt teeth; merus without mesial tooth; ischium-merus with dense mesial rows of long setae; carpus-dactylus longer than ischium-merus, widest point of carpus 0.4 carpal length; exopod with flagellum reaching to middle of ischium; epipod narrow.

Chelipeds unequal. Larger cheliped basis-ischium unarmed; merus with convex lower and upper margins; carpus with transverse row of blunt teeth mesiodistally; propodus tapering, with obsolete teeth on lower margin; fixed finger 0.3 length of propodus, its cutting edge irregu-

larly toothed on proximal half, with submarginal row of denticles on mesial face; dactylus cutting edge irregularly toothed, curved distally, equal to fixed finger. Smaller cheliped ischium and carpus unarmed, each article narrow, carpus much longer than in larger cheliped; propodus elongate; fixed finger 0.3 total length, with two distal teeth; dactylus longer than fixed finger.

Pereopod 2 merus to propodus with lower marginal rows of long setae; carpus 0.6 length of merus; propodus as long as carpus, with setal-row of nine short setae; fixed finger cutting edge with eighteen evenly-spaced spiniform setae, one apical; dactylus slightly longer than fixed finger, with fifteen spiniform setae on distal half of cutting edge, one apical.

Pereopod 3 propodus about three-quarters as long as wide, with spiniform seta on distal corner of lower margin, with a transverse setal-row of nine setae; dactylus subchelate.

Pereopod 4 coxa disc-like, gliding under sternite 7, attached to broad sternite only by dorsomedial muscles, without condyles; propodus 3 times as long as wide, one spiniform seta on distal corner of lower margin; with a proximal transverse setal-row of seven setae.

Pereopod 5 weakly chelate, dactylus twice as long as fixed finger.

Pleopod 1 of male: first article with dense long mesiodistal setae, and small distolateral digitiform second article without hooks. Pleopod 1 of female 2-articled, geniculate. Pleopod 2 rami with numerous marginal bifurcating filaments; appendix interna a minute triangular angle in female, a simple minute process in male; appendix masculina lacking. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod ovate, twice as long as wide; exopod ovate, inner margin straighter, twice as long as wide, with marginal short spiniform setae distally. Telson just longer than wide, proximally parallel-sided, distally rounded.

## Branchial formula:

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	1	1	1	-
Podobranch	-	-	-	-	-	-	-	-
Pleurobranch	-	-	-	-	-	-	-	-
Arthrobranch	-	2	2	2	2	2	2	-



## REMARKS

*Callianidea typa* is the better known of the two callianideids. Although some characters varied between populations, e.g. proportions of some

limbs, dentition, none was consistent enough to warrant recognition of separate species. This was especially the case for an individual from Tanzania which is notable for the more elongate



FIG. 3. — *Callianidea typa* Milne Edwards. A, antenna 1 and B, details of tip of flagellum; C, D, right and left mandibular incisors; E, maxilla 1; F, maxilla 2; G, maxilliped 1; H, maxilliped 2; I, maxilliped 3. All figures from MNHN Th-1303.

chelipedal fingers and the narrower telson and uropods (Fig. 4A). A new species cannot be justified for it on the basis of one individual.

Markham (1995) described the new bopyrid isopod parasite *Ione taiwanensis* from *C. typha* in Taiwan.

***Callianidea laevicauda* Gill, 1859**  
(Fig. 4C)

*Callianidea laevicauda* Gill, 1859: 167. — Rathbun 1901: 94. — De Man 1928: 21. — Schmitt 1924: 79; 1935: 193, fig. 54; 1936: 375. — Rodrigues 1983: 93. — Kensley & Heard 1991: 496, 499, 500, figs 3, 4. — Dworschak 1992: 218, fig. 16. — Lemaitre & Ramos 1992: 352.

*Callianidea typha*. — Lockington 1878: 302.

*Callianidea Steenstrupii* Boas, 1880: 108.

*Callianidea laevicauda occidentalis* Schmitt, 1939: 10, 11.

*Paracallianidea laevicauda*. — Sakai 1992: 17, 18.

**MATERIAL EXAMINED.** — **Galapagos Islands.** 27.IX.1968, USNM 243554 (♀). — Barrington Island, bay head and rocks to N side, intertidal, (R. V. *Velero III*, stn 48-33), 28.II.1933, USNM 123368 (3 specimens).

**British Virgin Islands.** Norman Island, Treasure Point, shore (Smithsonian Bredin Expedition, stn 35-38), USNM 122445 (♂).

**DISTRIBUTION.** — Caribbean Sea and Galapagos Islands, intertidal.

**REMARKS**

This species has often been figured and described, most recently by Kensley & Heard (1991). Although it is very similar to *C. typha*, it differs in the following details which indicate a more plesiomorphic species. A short linea thalassinica is present at the base of the eyestalks, similar in position to that in the thomassiniids. The eyestalks are more cylindrical than in *C. typha*. The pleopodal filaments are cylindrical with a constriction near the midpoint, not bifurcating. The male pleopod 1 has a weakly setose first article and large subtriangular twisted second article. The appendix interna and appendix masculina are well developed, not minute, and the merus of maxilliped 3 has a mesial tooth. Sakai (1992) recognised some of these differences

and considered them of generic importance, a stance with which I cannot agree.

***Callianidea* sp.**  
(Figs 4D-I)

**MATERIAL EXAMINED.** — **Madagascar.** Maromandia (14°10'S - 48°06'E), R. Decary, MNHN Th-139 (♀, cl. 5.3 mm).

**DISTRIBUTION.** — Madagascar (unique specimen).

**DIAGNOSIS**

Maxilliped 3 merus with mesial spine. Larger cheliped fixed finger 0.4 length of propodus. Pereopod 3 propodus 1.5 times as long as wide. Pleopodal 3-5 rami with few (about thirty) simple cylindrical marginal filaments; appendix interna minute. Uropodal rami 1.5 times as long as wide. Telson wider than long, tapering from base.

**REMARKS**

The only specimen of this species is mostly complete but fragmented. It is diagnosed only briefly and in all other respects it is extremely similar to *Callianidea typha*. The specimen was compared with similarly-sized specimens of *C. typha*, also from Madagascar and the differences, notably the pleopodal structure and telson, were confirmed as not being juvenile characters. The specimen resembles *C. laevicauda* in that the pleopodal filaments are simple, but differs in that they lack any constrictions. The specimen suggests strongly a separate species but should not be described until more material is available and the validity of the other available names resolved.

Family MICHELEIDAE Sakai, 1992

Micheleinae Sakai, 1992: 18.

Meticonaxiinae Sakai, 1992: 19.

Micheleidae. — Poore 1994: 99.

**TYPE GENUS.** — *Michelea* Kensley *et* Heard, 1991.

**DIAGNOSIS**

Soft-bodied or firm thalassinidean shrimps. Rostrum present with lateral carinae (rarely

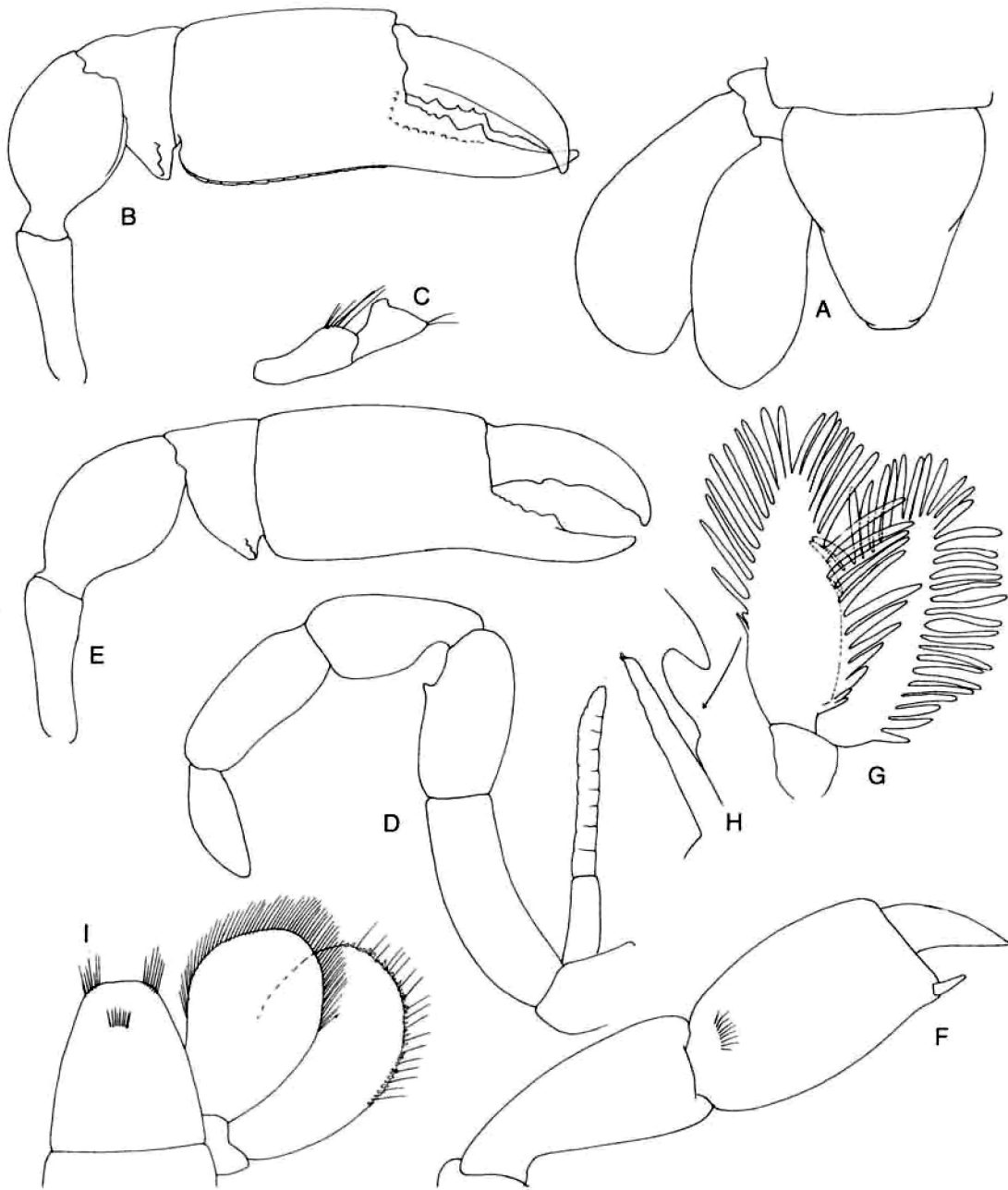


FIG. 4. — *Callianidea tupa* Milne Edwards. A, telson and uropod; B, left larger cheliped. Both figures from MNHN Th-695. *Callianidea laevicauda* Gill, 1859. C, ♂ pleopod 1, USNM 122445. *Callianidea* sp. D, maxilliped 3; E, left larger cheliped; F, pereopod 3 (distal articles); G, pleopod 2; H, appendix interna; I, telson and uropod. All figures from MNHN Th-139.

absent). No linea thalassinica. Cephalothorax laterally compressed, ending midposteriorly as a median lobe separate from produced posterolateral margins of carapace. Anterolateral lobes on abdominal somite 1 articulate with posterolateral margins of carapace which are thickened to form a marginal ridge. Thoracic sternite 7 visible between coxae of pereopods 4 only as a narrow ridge. Coxae 4 flattened, mobile, condyle with thoracic sternite 7 functional. Abdominal somite 1 less than half length of abdominal somite 2 and with pleuron obscure. Abdominal somite 2 pleuron overlaps abdominal somite 1.

Cephalothorax, rostrum, abdomen, telson and all limbs without armature (obsolete rostral dentition and low medial and lateral rostral carinae may be present). Anterior cephalothorax and at least abdominal somites 1 and 6 (usually all) with lateral setal-rows; lateral surfaces of propodi of pereopods 2-4 with similar setal-rows. Antenna 1 peduncle article 1 elongate and waisted, article 3 longer than article 2. Antenna 2 with scaphocerite articulating and prominent, rarely small. Mandibular incisor toothed only posteriorly, asymmetrical. Maxilla 2 scaphognathite with one or two long setae extending into branchial chamber. Maxilliped 3 pediform, carpus longer than propodus, propodus never flattened. Pereopods 1 equal; merus with straight lower margin, sometimes with few spines; proximal part of propodus elongate (about twice as long as wide); fingers as long as proximal part. Pereopod 2 chelate. Pereopods 2-4 with flattened propodi, longer than wide, without single marginal spiniform seta (rows of spiniform setae laterally in *Michelea*). Epipods broadly lamellate; podobranchs 3-6 usually present; two arthrobranchs on each of thoracomeres 3-7; pleurobranchs 5-7 present or absent. Male pleopod 1 with triangular second article, appendix interna only represented by hooks. Appendix masculina free. Pleopod 2 not modified, similar to pleopods 3-5; all with foliaceous rami, well developed appendix interna. Uropodal exopod without transverse suture; endopod more or less triangular.

#### COMPOSITION

*Marcusiaxius* Rodrigues *et de* Carvalho, 1972; *Meticonaxius* de Man, 1905; *Michelea* Kensley *et* Heard, 1991; *Tethisea* Poore, 1994.

#### REMARKS

Sakai (1992) erected the callianideid subfamily Micheleinae for *Michelea* which is without a linea thalassinica, with anterolateral lobes on abdominal somite 1, with a long scaphocerite, subequal first pereopods, with a small rostrum, and with normal propodus on pereopod 4. The subfamily is separated from his other subfamily, Meticonaxiinae, on only two characters (absence of a rostrum and presence of pleopodal lamellae), but there are so many synapomorphies linking the genera that this division cannot be sustained. Further, the cladistic analysis (Poore 1994) hypothesised that *Michelea* is a terminal taxon and not sister to other genera in the family. The two are considered synonymous here. Micheleinae has page precedence.

None of the genera possesses pleopodal filaments as seen in *Callianidea*; the foliaceous rami in *Michelea* are quite different from those in callianideids and are not homologous (Poore 1994). There are several other differences between the micheleids, callianideids and thomassiniids. The possession of anterolateral lobes on abdominal somite 1, which interact with the tripartite posterior margin of the carapace, is a more complex mechanism than the more loose interaction in callianideids and thomassiniids. A rostrum is usual in the family; its loss in *Michelea* is derived independently from similar states in some callianassids, for example. The eyestalks are cylindrical, never flattened. The chelipeds are equal (unequal in callianideids and thomassiniids) and are more elongate than in the other two families. Pereopods 3 and 4 never have a single distal spiniform seta on the lower margin of the propodus. The affinities between the Micheleidae and the Axiidae, noted by Sakai, are much greater than those with the Callianideidae and all warrant separate family status (Poore 1994).

New species, mostly from the Indo-West Pacific, are described in all four genera.

## KEY TO GENERA OF MICHELEIDAE

1. Rostrum minute, triangular; usually without pleurobranches; pereopods 3 and 4 with lateral spiniform setae ..... *Michelea*
- Rostrum prominent, flat; with pleurobranches; pereopods 3 and 4 without lateral spiniform setae ..... 2
2. Cheliped with thickened setae in gape; abdominal somites 3-5 without setal-rows; uropodal endopod with anterior margin convex, ending by curving to rounded posterior margin ..... *Tethisea*
- Cheliped without thickened setae in gape; abdominal somites 3-5 with setal-rows; uropodal endopod with straight anterior margin ending sharply ..... 3
3. Eyes visible in dorsal view, rostrum narrow; cheliped fixed finger with major tooth two-thirds way along; maxilliped  $\neq$  exopod-reduced ..... *Meticonaxius* } 3
- Eyes not visible in dorsal view, rostrum wide; cheliped fixed finger with major tooth one-third way along; maxilliped  $\neq$  exopod long ..... *Marcusiarius* } 3

Genus *Marcusiarius*  
Rodrigues *et de* Carvalho, 1972

*Marcusiarius* Rodrigues *et de* Carvalho, 1972: 357. — De Carvalho & Rodrigues 1973: 553-566 (redesignated as new). — Kensley & Heard 1991: 506, 507, table 2. — Sakai 1992: 25, 26.

TYPE SPECIES. — By monotypy: *Marcusiarius lemoscastroi* Rodrigues *et de* Carvalho, 1972.

## DIAGNOSIS

Rostrum flat and exceeding eyes, medially and laterally carinate and setose. Eyes not visible in dorsal view. Anterolateral cephalothorax with two or three vertical setal-rows, the second shorter than others if present. Abdominal somite 1 with two setal-rows, abdominal somites 2-5 each with one lateral setal-row, and abdominal somite 6 with three converging setal-rows; abdominal somites 3-5 with dense dorsal patches of plumose setae. Antenna 1 peduncle article 1 moderately elongate. Scaphocerite less than half length of antenna 2 peduncle article 4. Maxilliped 1 exopod a single article. Maxilliped 3 without crista dentata; merus with weak mesial row of setae; exopod absent or at most half as long as merus. Pereopod 1 fixed finger

with sharp curved tooth one-third way along. Pereopod 2 fixed finger with even contiguous spiniform setae; dactylus as long as fixed finger. Pereopods 3 and 4 without lateral spiniform setae on propodus and dactylus. Pereopod 4 carpus usually with distal ridge on upper margin; propodus with setal-row along upper margin. Pleopods 2-5 without marginal lamellae. Uropodal endopod with anterolateral margin straight, ending sharply, longer than broad. Uropodal exopod anterolateral margin ending sharply, broader than endopod. Telson broader than long, not clearly constricted, distally rounded. Epipods with lamellate podobranchs well developed, except on last. Arthrobranchs well developed. Pleuro-branchs 5-7 present.

## Branchial formula:

Thoracomere	1	2	3	4	5	6	7	8
Epipod	-	1	1	1	1	1	1	-
Podobranch	-	-	1	1	1	1	-	-
Arthrobranch	-	-	2	2	2	2	2	-
Pleurobranch	-	-	-	-	1	1	1	-

## COMPOSITION

*M. colpos* Kensley *et* Heard, 1991; *M. lemoscastroi* Rodrigues *et* Carvalho, 1972; *M. minutus*

(Coelho, 1973); *M. torbeni* Sakai, 1992; *M. wamsoi* n.sp.

REMARKS

*Marcusiarius* is most similar to *Meticonaxius* but differs in having the rostrum completely covering the eyes and bearing a dense lateral pile of plumose setae, different placement of the major tooth on the fixed finger of pereopod 1, absence of crista dentata on maxilliped 3, possession of two setal-rows on abdominal somite 2, and in

the shorter telson. These two genera together differ from *Tethisea* in lacking thickened setae in the gape at the base of the fixed finger of pereopod 1 and in a sharper apex to the uropodal endopod. All three differ from *Michelea* in possession of a rostrum but see this genus for more differences and Poore (1994) for analysis of phylogenetic relationships.

The diagnosis of Kensley & Heard (1991) is not significantly different from this one.

KEY TO SPECIES OF *Marcusiarius*

- 1. Telson three-quarters as long as abdominal somite 6 ..... *Marcusiarius minutus* (Brazil)
- Telson half as long as abdominal somite 6 ..... 2
- 2. Maxilliped 3 exopod as long or longer than ischium; maxilliped 2 exopod longer than merus ..... 3
- Maxilliped 3 exopod shorter than ischium or absent; maxilliped 2 exopod shorter than merus ..... 4
- 3. Rostrum sharply tapering to rounded apex; pereopod 4 without crest on upper margin of carpus ..... *Marcusiarius colpos* (Gulf of Mexico)
- Rostrum evenly tapering to acute apex; pereopod 4 with crest on upper margin of carpus ..... *Marcusiarius wamsoi* (Indonesia)
- 4. Maxilliped 3 exopod absent; uropodal endopod 3 times as long as wide ..... *Marcusiarius lemoscastroi* (Caribbean, N Brazil)
- Maxilliped 3 exopod present; uropodal endopod twice as long as wide ..... *Marcusiarius torbeni* (Indonesia)

***Marcusiarius colpos* Kensley et Heard, 1991**

*Marcusiarius colpos* Kensley et Heard, 1991: 496, 506, 507, figs 1, 7, 8.

DISTRIBUTION. — Gulf of Mexico, 43-175 m depth.

REMARKS

This species is known only from the original material and is typical of the genus. Its rostrum is relatively broader than in other species and there are only two cephalothorax setal-rows.

***Marcusiarius lemoscastroi***

Rodrigues et de Carvalho, 1972 (Fig. 5)

*Marcusiarius lemoscastroi* Rodrigues et de Carvalho, 1972: 357. — De Carvalho & Rodrigues 1973: 553-566, figs 1-21 (redescribed as new). — Kensley & Heard 1991: 496, 507-510, figs 9, 10.

*Meticonaxius lemoscastroi*. — Coelho et al. 1980: 39. — Coelho & Ramos-Porto 1987: 33. — Coelho 1987: 63, 68.

MATERIAL EXAMINED. — **Caribbean Sea.** Honduras,

off Limón (16°07'N - 85°38'W), 55-57 m (R. V. *Pillsbury* stn P1369), USNM 243550 (♂ and ♀). — Panama, Scout Island Beach, Culebra Island, shallow water, M. Jones and H. Kaufman, 10.III.1974, (NMNH-STRI Panama survey stn 183-1/P), USNM 243549 (3 specimens). — Colombia, near Santa Marta (11°06'N - 74°29'W), 64-73 m, 17.V.1964, Gulf and South Atlantic Fisheries Exploration, Bureau of Commercial Fisheries (R. V. *Oregon* stn 4847), USNM 243548 (1 ♀). — Venezuela, N of Margarita Island, 32-40 m, sand and shell bottom, Hancock Pacific Expeditions (R. V. *Velero*, stn A-42-3), USNM 243555 (1 ♀).

**Brazil.** *Almirante Saldanha*, stn 1705, MZUSP-8942 (1 specimen).

**Location uncertain.** Stn NMHN 248-34, February 1922, Schmitt, USNM 243551 (1 ♂).

**DISTRIBUTION.** — Caribbean Sea, northern Brazil; littoral to 73 m depth.

#### REMARKS

This species was figured by the original authors and redescribed by Kensley & Heard (1991). A habitus figure, view of the thoracic sternites and coxae, and male pleopod 2 are presented here because it is type species of the genus. The coxa of pereopod 4 and its interaction with thoracic sternite 7 are relatively undifferentiated and illustrate the difference between this family and Callianideidae and Thomassiniidae.

Brasil Lima (1980) described a new genus and

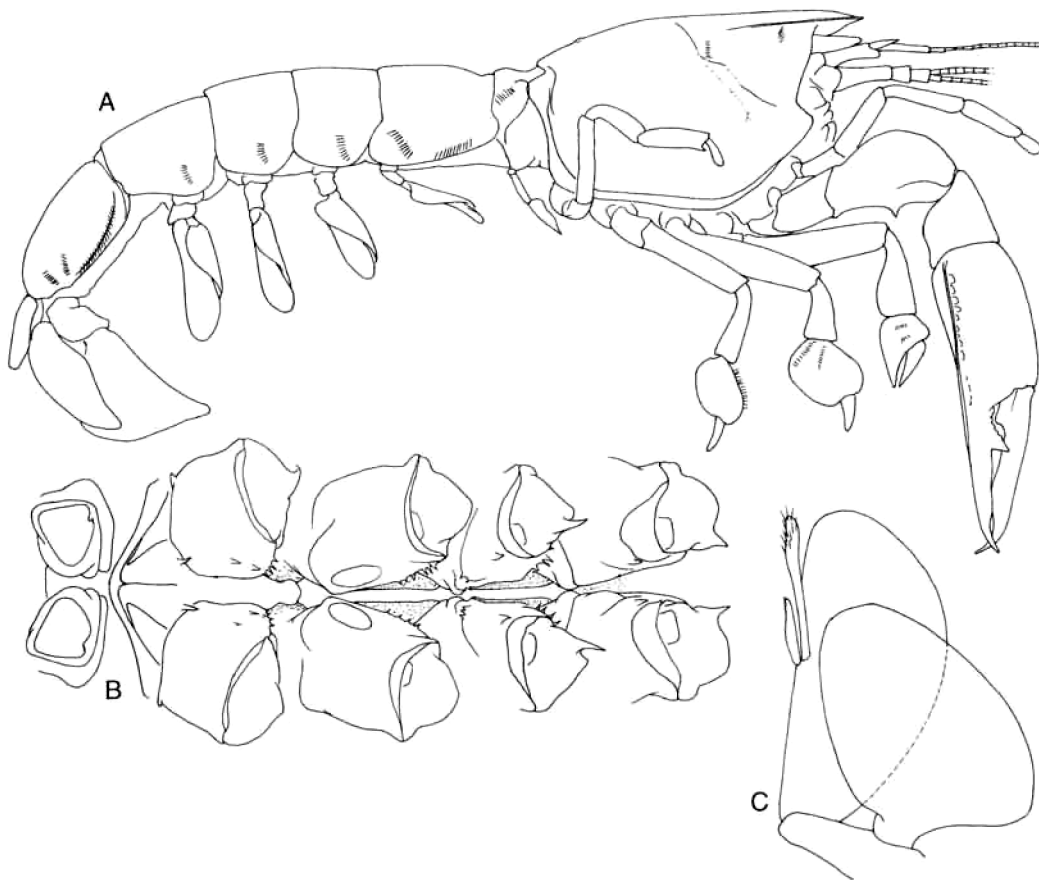


FIG. 5. — *Marcusiarius lemoscastrai* Rodrigues *et de* Carvalho. **A**, ♂ habitus; **B**, sternum and coxae of pereopods 1-5 of ♀; **C**, pleopod 2. Both specimens from USNM 243550.

species of bopyrid isopod, *Castrione longicaudata*, parasitic on the gills of this species.

***Marcusiaxius minutus* (Coelho, 1973)**  
comb. nov.

*Meticonaxius minutus* Coelho, 1973: 345; 1987: 63, 68. — Coelho *et al.* 1980: 58. — Coelho & Ramos-Porto 1987: 32, 33. — Kensley & Heard 1991: 516.

MATERIAL EXAMINED. — **Brazil.** Amapá (04°18'S - 50°17'W), 89-90 m (*Almirante Saldanha*, stn 2413), MZUSP-holotype, not registered (dry).

DISTRIBUTION. — Northern Brazil; 90 m depth.

REMARKS

Examination of the holotype confirmed the new generic placement of this species.

***Marcusiaxius torbeni* Sakai, 1992**  
(Fig. 6)

*Marcusiaxius torbeni* Sakai 1992: 26-30, figs 9-11.

MATERIAL EXAMINED. — **Indonesia.** Makassar Strait (0°40.1'N - 117°51.4'E), 96 m, 1.XI.1980, dredge

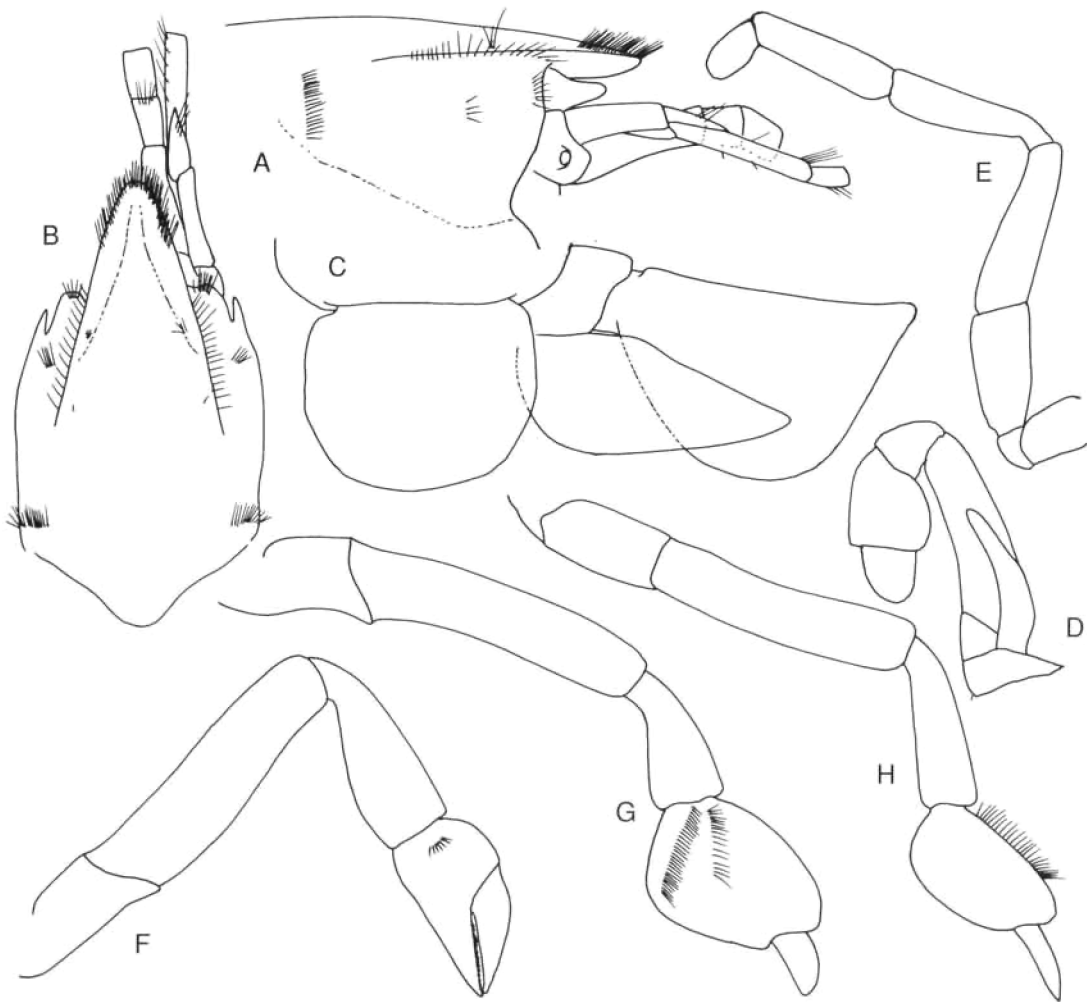


FIG. 6. — *Marcusiaxius torbeni* Sakai, 1992. A, B, anterior cephalothorax; C, telson and uropod; D, maxilliped 2; E, maxilliped 3; F, right pereopod 2; G, right pereopod 3; H, right pereopod 4. All figures from MNHN Th-850.



(CORINDON 2 stn 216), MNHN Th-850 (♂ without pereopods 1, cl. 12 mm, tl. 43 mm).

DISTRIBUTION. — West coast of Malay Peninsula, 70 m (type locality); Makassar Strait, Indonesia, 96 m depth.

#### DIAGNOSIS

Rostrum acutely rounded and with dense patch of marginal setae apically and along lateral margins, 1.7 times as long as eyestalks. Cephalothorax with setal-rows of eight setae near anterior margin, of four setae more posterior, and of nineteen near cervical groove. Antenna 2 with distinct acute articulating scaphocerite, about one-third length of article 4. Maxilliped 2 exopod reaching to middle of merus of endopod. Maxilliped 3 with small or without exopod.

Pereopod 3 propodus with two transverse setal-rows of about fifteen and thirty setae. Pereopod 4 carpus with smoothly curved upper margin; propodus 1.5 times as long as wide; with single setal-row of about twenty setae along upper margin.

Uropodal endopod anterior margin slightly bent, lateral apex acute, 2.3 times as long as wide; exopod with slightly concave anterior margin ending sharply, deeply curved posteriorly, 1.5 times as long as wide. Telson length 0.8 of width, laterally and distally convex.

#### REMARKS

*Marcusiarius torbeni* is figured only in sufficient detail to separate it from the other species of the Indo-West Pacific, *M. wamsoi*. The holotype was figured in detail by Sakai (1992). He noted a small exopod on maxilliped 3, not present on the new specimen but this difference would not seem to warrant a separate species. The species differs from *M. wamsoi* in shorter exopod on maxilliped 2, reduction of exopod on maxilliped 3, the greater extent of marginal setation on the rostrum, longer telson, and shorter uropodal rami. Pereopod 3 has two oblique setal-rows as in *M. lemoscastroi*, not one row as in *M. wamsoi*. The species is also similar to *M. lemoscastroi* in the arrangement of maxillipedal exopods and setation of the rostrum but differs in longer rostrum and third setal-row on the cephalothorax.

#### *Marcusiarius wamsoi* n.sp.

(Figs 7, 8)

*Marcusiarius wamsoi*. — Markham, 1995: 86 (*nomen nudum*).

MATERIAL EXAMINED. — **Indonesia**. Irian Jaya (as Dutch New Guinea), 1 mile E of Dauwi, Wamsoi lagoon (1°17'S - 136°46'E), Padaido Islands, 54-90 m, 4.II.1956, ZML (holotype, ♀, cl. 6.4 mm).

ETYMOLOGY. — For the type locality (noun in apposition).

DISTRIBUTION. — Irian Jaya, Indonesia; 54-90 m depth.

#### DESCRIPTION OF HOLOTYPE

Cephalothorax 0.28 total length, rostrum flat, obscuring eyes from dorsal view, acutely rounded and with dense patch of marginal setae apically, twice as long as eyestalks; dorsolateral carina prominent and reaching about one-third of cephalothorax, a weak groove parallel to carina; cervical groove weakly defined, not visible dorsally; dorso-posterior margin a square medial lobe, separated from posterolateral margins; marginal setal-row of eight setae at base of eyestalk; second setal-row of six setae; and posterior setal-row of eleven setae.

Abdominal somite 1 little narrower than second, with anterolateral lobes overlying posterolateral margins of cephalothorax; pleuron weakly rounded; dorsolateral setal-rows of seven setae. Abdominal somite 2 twice as long as first, pleuron overlapping first somite; longitudinal setal-row of eleven setae; transverse setal-row of seven setae. Abdominal somites 3-5 with long transverse setal-rows. Abdominal somite 6 with marginal setal-row of twenty-three setae diverging anteriorly from edge of pleuron, oblique setal-row of about fourteen setae, and transverse setal-row of about eleven setae.

Eyestalks cylindrical, cornea distolateral.

Antenna 1 with waisted article 1, about 0.3 length of cephalothorax; articles 2 and 3 subequal, each about half length of article 1; flagella each of about fifteen articles, longer than peduncle. Antenna 2 with distinct articulating acicle, about third length of article 2; article 4 reaching to end of antenna 1; article 5 short.

Mandible, maxillae and maxilliped 1 typical of

family. Maxilliped 2 endopodal propodus broader than carpus and dactylus; exopod narrow, reaching beyond merus of endopod. Maxilliped 3 ischium without crista dentata; merus without mesial tooth; ischium-merus with mesial row of long setae; carpus-dactylus longer than ischium-merus, widest point of carpus 0.24 carpal length; exopod with flagellum reaching to middle of merus; epipod narrow-foliaceous, with podobranch.

Chelipeds equal; merus with weak tooth on lower margin, upper margin strongly convex, especially proximally; carpus unarmed; propodus

swollen proximally and tapering; fixed finger 0.4 length of propodus, its cutting edge with strong tooth at proximal third; dactylus cutting edge curved distally, equal to fixed finger.

Pereopod 2 merus-propodus with lower marginal rows of long setae; carpus 0.8 length of merus; propodus little shorter than carpus with setal-row of six short setae; fixed finger cutting edge with thirteen well-spaced spiniform setae; dactylus as long as fixed finger, with five spiniform setae in middle of cutting edge.

Pereopod 3 propodus 1.5 times as long as wide, strongly lobed on upper and lower margins; one

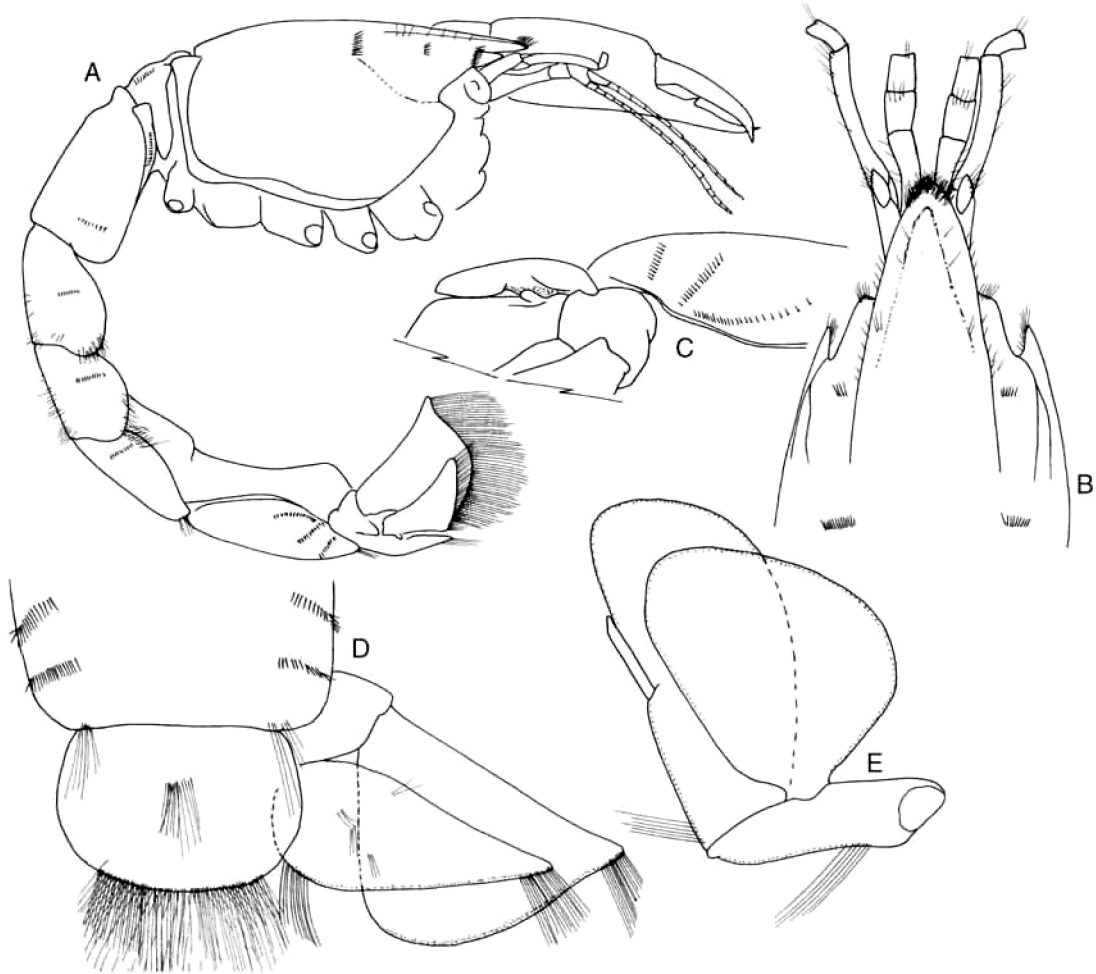


FIG. 7. — *Marcusiaxius wamsoi* n.sp. **A**, habitus; **B**, dorsal view of anterior cephalothorax; **C**, abdominal somite 6, telson and base of right uropod; **D**, abdominal somite 6, telson and uropod; **E**, pleopod 2. All figures from holotype.

transverse setal-row of about thirty setae; dactylus setose.  
Pereopod 4 carpus with distal lobe on upper

margin; propodus little narrower than long; with single setal-row of about forty setae along upper margin; dactylus setose, narrow.



FIG. 8. — *Marcusiaxius wamsoi* n.sp. A, maxilliped 2; B, maxilliped 3; C, larger left cheliped; D, pereopod 2; E, detail of propodus and dactylus; F, pereopod 3; G, pereopod 4 and H, setal-row on upper margin of propodus. All figures from holotype.

Pleopod 1 of male unknown. Pleopod 1 of female nearly midventral, 2-articled. Pleopod 2 endopod rounded distally and along lateral margin; appendix interna about 8 times as long as wide; exopod little longer than wide, inner margin straight, lateral margin convex. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod tear-shaped, lateral apex acute, 2.3 times as long as wide; exopod with straight anterior margin ending sharply, deeply curved posteriorly, 1.5 times as long as wide. Telson length two-thirds width, laterally and distally convex.

REMARKS

*Marcusiaxius wamsoi* is distinguished by the relatively small patch of setae on the tip of the rostrum, the long maxillipedal exopods, and the unusual crest on the upper margin of the carpus of pereopod 4. The uropodal endopod is especially narrow and acute.

Markham (1995) described the new bopyrid isopod parasite *Castrione digiticaudata* from the holotype of this species citing its manuscript name in the "Material examined".

*Marcusiaxius* sp.

MATERIAL EXAMINED. — **England.** Gault, Folkestone, BMNH In.61812 (fossil partly in matrix, rostrum-cervical groove 9 mm).

REMARKS

The anterior cephalothorax is clean dorsally and on the right side some limbs are visible in the matrix. The rostrum is broad with an elevated triangular post-rostral area with sharp median carina leading to the base of the rostrum. This is typical of the genus. Anteriorly there is an oblique row of twelve setal-pits, a row of three transversely near the cervical groove, but the intermediate area where other pits may occur is damaged. The geological age of the specimen is not known.

Genus *Meticonaxius* de Man, 1905

*Meticonaxius* de Man, August 1905: 592; 1925: 53, 54; 1928: 18, 21, 30, 53. — Barnard 1950: 499. — Balss 1957: 1579. — Le Locuff & Intès 1974: 23. — De

Saint Laurent 1973: 515; 1979: 1397. — Sakai & de Saint Laurent 1989: 9. — Kensley & Heard 1991: 507, 510-512, table 2. — Sakai 1992: 20-21.

*Metaxius* Bouvier, November 1905: 804. — De Man 1925: 8; 1928: 18, 20. — Bouvier 1925: 469, 470. — Balss 1957: 1582 (type species by monotypy *Metaxius microps* Bouvier, 1905).

TYPE SPECIES. — By monotypy: *Meticonaxius monodon* de Man, 1905.

DIAGNOSIS

Rostrum acute, usually medially and laterally carinate. Eyes visible in dorsal view. Anterolateral cephalothorax with at least one vertical setal-row close to lateral carina. Abdominal somites 1-5 each with one lateral setal-row, abdominal somite 6 with two-three converging lateral setal-rows; abdominal somites 3-5 with dense dorsal patches of plumose setae. Antenna 1 peduncle article 1 moderately elongate. Scaphocerite less than half length of antenna 2 peduncle article 4. Maxilliped 1 exopod a single article. Maxilliped 3 crista dentata sometimes reduced; merus with strong mesial row of setae; exopod very short or absent. Pereopod 1 fixed finger with at least a sharp curved tooth two-thirds way along. Pereopod 2 fixed finger with even contiguous spiniform setae; dactylus as long as fixed finger. Pereopods 3 and 4 without lateral spiniform setae on propodus and dactylus (rarely one or two on dactylus 4). Pereopod 4 carpus without distal ridge on upper margin; propodus with one or two transverse setal-rows. Uropodal endopod with anterolateral margin bending, ending squarely, shorter than broad. Pleopods 2-5 without marginal lamellae. Uropodal exopod anterolateral margin ending squarely, as broad as endopod. Telson longer than broad, clearly constricted, distally rounded. Epipods well developed and with podobranchs well developed, except on last. Arthrobranchs well developed. Pleurobranchs 5-7 present.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	1	1	1	-
Podobranch	-	r	1	1	1	1	-	-
Arthrobranch	-	-	2	2	2	2	2	-
Pleurobranch	-	-	-	-	1	1	1	-

## COMPOSITION

*M. bouvieri* Kensley *et* Heard, 1991; *M. capricorni* Coelho, 1987; *M. longispina* (Stebbing, 1920); *M. microps* (Bouvier, 1905); *M. monodon* de Man, 1905; *M. noumea* n.sp.; *M. soelae* Sakai, 1992; *M. spicatus* n.sp.

## REMARKS

The genus was most recently diagnosed by Kensley & Heard (1991) and Sakai (1992). The new diagnosis differs only because the number of

setal-rows on the cephalothorax varies from one to three, according to species, not only two or two-three as stated by these authors. Most species have the branchial arrangement given above but one, *M. microps*, is without pleurobranches (Kensley & Heard 1991).

Kensley & Heard (1991) gave a key to five species, excluding *M. minutus* because of lack of information. This species is a member of *Marcusiarius*. The number of described species is now eight plus one not yet described.

KEY TO SPECIES OF *Meticonaxius*

1. Rostrum apex round ..... 2
  - Rostrum apex acute ..... 3
2. Maxilliped 3 with spine on merus, with minute exopod .....
  - ..... *Meticonaxius longispina* (South Africa)
  - Maxilliped 3 without spine on merus, without exopod .....
    - ..... *Meticonaxius microps* (Caribbean Sea)
3. Rostrum shorter than eyestalk; pereopod 1 fingers as long as palm and carpus .....
  - ..... *Meticonaxius spicatus* (Caribbean Sea)
  - Rostrum as long or longer than eyestalk ..... 4
4. Telson shorter than wide ..... *Meticonaxius capricorni* (Brazil)
  - Telson much longer than wide ..... 5
5. Uropodal endopod acute; rostrum as long as eyestalk .....
  - ..... *Meticonaxius noumea* (New Caledonia)
  - Uropodal endopod round; rostrum longer than eyestalk ..... 6
6. Telson much longer than wide; pereopod 1 merus without spine .....
  - ..... *Meticonaxius soela* (Coral Sea)
  - Telson as long or little longer than wide; pereopod 1 merus with 1-2 spines ..... 7
7. Pereopod 1 fingers as long as palm ..... *Meticonaxius bouvieri* (Caribbean Sea)
  - Pereopod 1 fingers shorter than palm .....
    - ..... *Meticonaxius monodon* (Tanzania, Indonesia)

***Meticonaxius bouvieri* Kensley et Heard, 1991**  
(Figs 9, 10)

*Meticonaxius bouvieri* Kensley et Heard, 1991: 496, 512, 513, figs 11, 12.

MATERIAL EXAMINED. — **Caribbean Sea**, 432 m, (*Atlantis*, stn 3427), 1.V.1939, MCZ (♀, cl. 10.5 mm). — 423 m (*Atlantis*, stn 3721), 30.IV.1939, MCZ (2 ♀♀, cl. 10.3 and 21.6 mm, both very damaged and incomplete).

DISTRIBUTION. — Caribbean Sea; 180-768 m depth.

DESCRIPTION

*Female* (stn 3427)

Cephalothorax 0.27 total length, about 1.4 times as deep as wide; rostrum acute, slightly upturned distally, without dorsal setae, longer than broad at base, lateral margins concave such that eyes are visible from dorsal view, 1.8 times as long as eyestalks; lateral carinae extending weakly on to

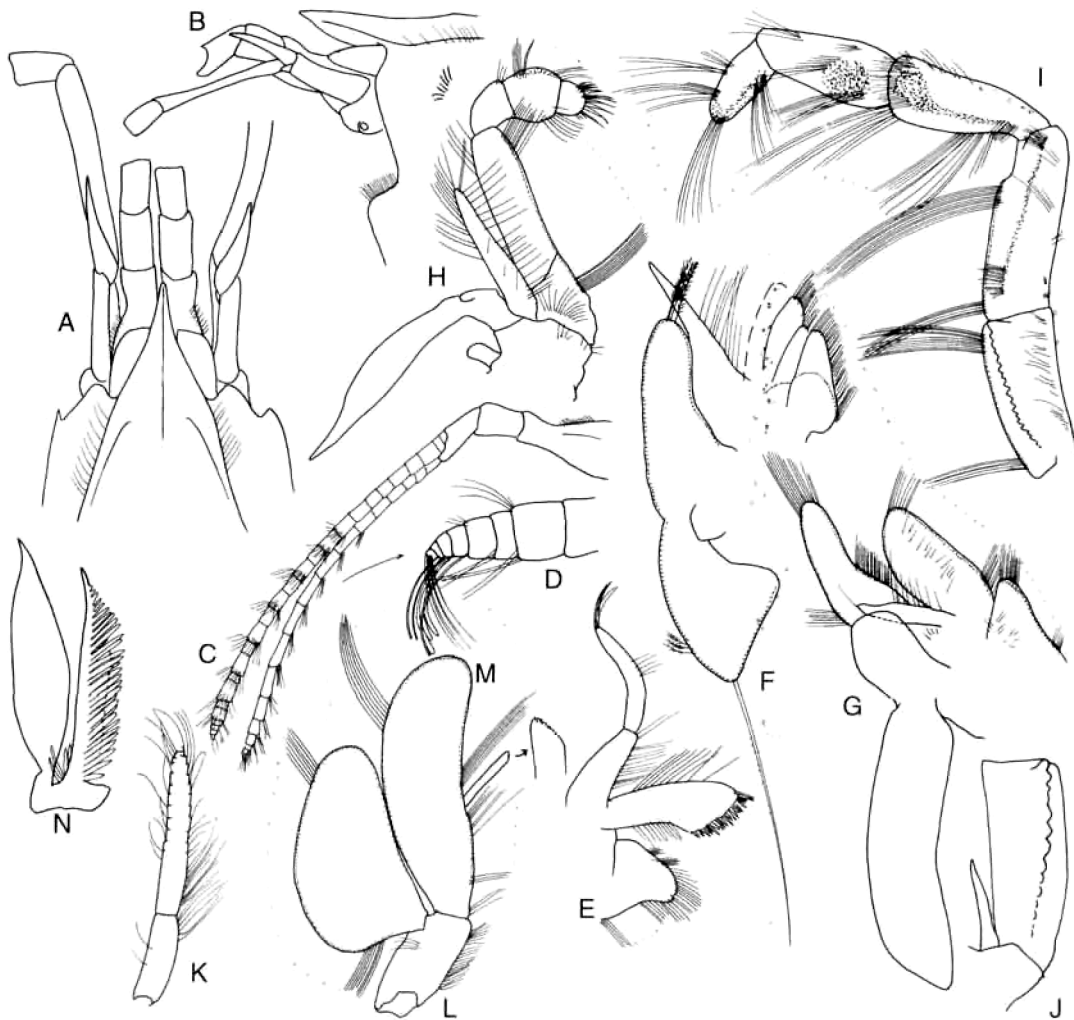


FIG. 9. — *Meticonaxius bouvieri* Kensley et Heard. A, B, anterior of cephalothorax; C, antenna 1 and D, detail of tip of flagellum; E, maxilla 1; F, maxilla 2; G, maxilliped 1; H, maxilliped 2; I, maxilliped 3; J, ischium and exopod of maxilliped 3; K, ♀ pleopod 1; L, pleopod 3; M, apex of appendix interna of pleopod 3; N, podobranch of pereopod 1. Figure J from *Atlantis* stn 3721; others from *Atlantis*, stn 3427.



FIG. 10. — *Meticonaxius bouvieri* Kensley et Heard. **A**, right cheliped; **B**, right pereopod 2; **C**, setal-row from right pereopod 2; **D**, left pereopod 3; **E**, propodus and dactylus of left pereopod 4; **F**, right pereopod 5; **G**, details of finger and dactylus; **H**, right view of abdominal somite 1; **I**, dorsum of abdominal somite 1; **J**, abdominal somite 6, telson and uropod; **K**, left setal-rows of abdominal somite 6; **L**, setae on margin of uropodal endopod. Figure E from *Atlantis*, stn 3721; others from *Atlantis*, stn 3427.

cephalothorax, medial carina reaching to apex of rostrum; cervical groove weakly defined, reaching 0.6 length of cephalothorax; dorsoposterior margin a square medial lobe, separated from posterolateral margins; marginal setal-row absent; longitudinal setal-row of ten setae under lateral carina; setal-row of six setae set well back from anterolateral margin.

Abdominal somite 1 little narrower than second, with anterolateral lobes overlying posterolateral margins of cephalothorax; pleuron rounded; dorsolateral setal-row of nine setae. Abdominal somite 2 twice as long as first, pleuron overlapping first somite; transverse setal-row of about twenty setae. Abdominal somites 3-5 with long transverse setal-rows. Abdominal somite 6 with marginal setal-row of thirty-five setae diverging anteriorly from edge of pleuron, oblique setal-row of about twenty setae, and transverse setal-row of about seventeen setae.

Eyestalks angular mesiodistally, cornea distolateral. Antenna 1 with short-waisted article 1, slightly exceeding rostrum; articles 2 and 3 subequal, each about half length of article 1; flagella of about eighteen and twenty-five articles, longer than peduncle. Antenna 2 with long distinct articulating acicle, about length of article 2; article 4 exceeding article 3 of antenna 1 by half its length; article 5 short; flagellum almost twice as long as peduncle.

Mandible incisor process with smooth cutting edge, excavate on right, broadly acute on left [see Fig. 11D (*M. noumea*)]. Maxilla 2 endopod tapering; scaphognathite with one long posteriorly-directed seta. Maxilliped 1 with endopod 0.6 length of basal endite, exopod longer than basal endite, epipod lobes narrow, proximal lobe much longer. Maxilliped 2 exopod almost as long as endopodal merus; epipod well-developed, with vestigial podobranch. Maxilliped 3 ischium with crista dentata of eighteen blunt teeth; merus without mesial tooth but inner margin distally constricted; ischium to merus with dense mesial rows of long setae; carpus to dactylus as long as ischium to merus, widest point of carpus 0.3 carpal length; exopod almost half length of ischium; epipod foliaceous, with podobranch.

Chelipeds with merus having two-three teeth on lower margin, upper margin strongly convex;

carpus unarmed; propodus swollen; fixed finger 0.4 length of propodus, its cutting edge with obsolete proximal blade and strong tooth two-thirds along; dactylus cutting edge curved distally, just longer than fixed finger.

Pereopod 2 merus to propodus with lower marginal rows of long setae; carpus 0.8 length of merus; propodus 0.4 length of carpus with setal-row of six short setae; fixed finger cutting edge with numerous contiguous spiniform setae; dactylus longer than fixed finger, straight.

Pereopod 3 propodus about as long as wide, upper margin lobed distally, lower margin convex, without spiniform setae; two oblique setal-rows of twenty-twenty-five setae; dactylus short, slender and tapering.

Pereopod 4 propodus twice as long as wide, without spiniform setae; one oblique setal-row of nine setae, another submarginal setal-row of seven setae on upper margin; dactylus finely tapering.

Pereopod 5 weakly subchelate; dactylus closing on three spiniform setae at apex of a short fixed finger.

Pleopods 1 (female) 2-articled. Pleopod 2 endopod 3.5 times as long as wide; appendix interna 6 times as long as wide; exopod almost twice as long as wide, inner margin straight, lateral margin convex. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod with anterior margin convex, ending abruptly, posterior margin strongly lobed, 1.3 times as long as wide, with marginal short spiniform setae distally; exopod subtriangular, width distally equal to length. Telson a little longer than wide, with constriction one-third way along, distally rounded.

#### ADDITIONAL NOTES

Maxilliped 3 exopod minute; pleopod 1 of male 2-articled, second article elongate, triangular, with minute hooks on medial lobe; appendix masculina more robust and twice as long as appendix interna (*vide* Kensley & Heard 1991).

#### REMARKS

Kensley & Heard (1991) provided a diagnosis of this species and some figures. It is illustrated here in detail as a species typical of the genus. The specimens do not possess the anterior marginal



setal-row on the carapace figured by Kensley & Heard but, instead, have a short row set a little more posteriorly. There are subtle differences between this material and the figures of the holotype, notably in a narrower more upturned rostrum, a longer exopod on maxilliped 3, three rather than two spines on the merus of pereopod 1, and more acute uropodal endopod but because all the material comes from much the same region I hesitate to erect a new species for these specimens.

Two specimens are very damaged but differ slightly from the one figured. They possess a meral spine on maxilliped 3 but this may be broken in the figured specimen and the holotype. There is a second, more posterior setal-row as in the holotype but the figured specimen is damaged in this region.

*Meticonaxius capricorni* Coelho, 1987  
(Fig. 11A)

*Meticonaxius* sp. — Coelho & Ramos-Porto 1987: 33.

*Meticonaxius capricorni* Coelho, 1987: 63-69, figs 1-3. — Kensley & Heard 1991: 513.

MATERIAL EXAMINED. — **Brazil.** (23°52'S - 43°11'W), 156 m, (*Almirante Saldanha*, stn 10), 27.III.1972, MZUSP-7113 (holotype, ♀, cl. 22 mm). — Cabo Sao Tomé, 214 m, (*Almirante Saldanha*, stn 9), 11.II.1969, MZUSP-7114 (paratype, ♂, cl. 13 mm).

DISTRIBUTION. — Brazil, 156-214 m depth.

REMARKS

The generic placement of this species was confirmed by examination of the type material. I figure the thoracic sternite 7 and the coxae of pereopod 4 which show a small episternite spine and a condylar surface. The male pleopod 1 is elongate and its second article has a small mesial lobe with minute hooks.

*Meticonaxius longispina* (Stebbing, 1920)

*Axius longispina* Stebbing, 1920: 265, 266, 26B, 27 (Crustacea pls 106B, 107).

*Meticonaxius* ?*longispina*. — De Man 1925: 5.

*Meticonaxius longispina*. — Barnard 1950: 500,

fig. 93a-c. — Kensley 1981: 30. — Coelho 1987: 63. — Kensley & Heard 1991: 496-514, 516, fig. 13.

MATERIAL EXAMINED. — **South Africa.** 7 miles NNW off Cape Morgan, 126 m, SAM A957 (holotype, sex indeterminate, cl. 10 mm).

DISTRIBUTION. — South Africa; 91-126 m depth.

REMARKS

The generic placement of this species was confirmed by examination of the holotype. Kensley & Heard (1991) figured new material from the same region. The broadly rounded rostrum and moderately truncate telson are diagnostic.

*Meticonaxius microps* (Bouvier, 1905)

*Metaxius microps* Bouvier, 1905: 804; 1925: 470-472, fig. 28. — De Man 1925: 1, 2, 8; 1928: 18, 20, 21, 30. — Balss 1925: 210. — Schmitt 1935: 192, fig. 53. — Balss 1957: 1582. — Coelho 1987: 63.

*Meticonaxius microps*. — Kensley & Heard 1991: 496, 516, fig. 14.

MATERIAL EXAMINED. — **Lesser Antilles.** St Croix, 210 m (*Blake*, stn 123), MCZ (holotype, ♂, cl. 3.6 mm).

DISTRIBUTION. — Caribbean Sea, 186 m depth.

REMARKS

The synonymy of *Metaxius* with *Meticonaxius* was first suggested by de Man (1928) and examination of the type specimen confirmed this. The species is the only one of the genus without pleurobranchs but this is insufficient to warrant resurrection of *Metaxius*. The holotype was refigured by Kensley & Heard (1991). The short rounded rostrum barely exceeding the eyestalks distinguishes this species.

*Meticonaxius monodon* de Man, 1905

*Meticonaxius monodon* de Man, 1905: 593; 1925: 54-60, pls 4, 5, figs 10-10r; 1928: 20, 21, 30. — Balss 1925: 210. — Coelho 1987: 63. — Kensley & Heard 1991: 516-519, fig. 15.

*Callianassa* (*Calliactites*) *coeca* Balss, 1921: 175, 176.

*Callianassa* (?*Scallasis*) *coeca*. — Balss 1925: 212, 213 (28, 29), fig. 16. — De Man 1928: 30.

MATERIAL EXAMINED. — **Indonesia.** Off NE point of

Java (7°46'S - 114°30.5'E), 330 m (*Siboga*, stn 5), ZMA (holotype of *Meticonaxius monodon* de Man, ♂, not ♀ as stated by de Man, cl. 8 mm, tl. 23 mm).

**Tanzania.** Dar es Salaam (06°34'S - 39°35'E), 404 m (*Valdivia*, stn 242), 20.III.1899, trawl, ZMB (holotype of *Callianassa (Calliactites) coeca* Balss, ♂, cl. 9 mm).

**DISTRIBUTION.** — Tanzania and Indonesia, 330-404 m depth.

**REMARKS**

The junior synonymy of *Callianassa coeca* and the generic characters of this, the type species, were confirmed. The holotype was reillustrated and the species diagnosed by Kensley & Heard (1991). The species is best recognised by the combination of acute rostrum and moderately truncate, rather than rounded, telson.

***Meticonaxius noumea* n.sp.**  
(Fig. 11B-K)

**MATERIAL EXAMINED.** — **New Caledonia.** SSE of Yaté (22°13'S - 167°08'E), 275-320 m (BIOCAL, stn CP110), 9.IX.1985, beam trawl, MNHN Th-1224 (holotype, ♀, cl. 13 mm, in fragments).

**DISTRIBUTION.** — Off south-eastern corner of main island of New Caledonia, 275-320 m depth.

**ETYMOLOGY.** — For Nouméa, capital city of New Caledonia (noun in apposition).

**DIAGNOSIS**

Rostrum acute, as long as eyestalks; longitudinal setal-row indistinct; setal-row of four setae close to anterolateral margin. Eyestalks rounded mesiodistally. Antenna 1 with article 1 longer than rostrum. Antenna 2 with long distinct articulating scaphocerite, about two-thirds length of article 4; article 4 reaching as far as article 3 of antenna 1. Maxilliped 3 exopod minute.

Chelipeds equal; merus with one tooth on lower margin. Pereopod 3 propodus about 1.4 times as long as wide, two oblique setal-rows of fifteen-eighteen setae. Pereopod 4 propodus 1.7 times as long as wide, one oblique setal-row of eleven setae, another submarginal setal-row of five setae on upper margin.

Uropodal endopod 1.2 times as long as wide;

exopod subtriangular, 1.7 times as long as wide. Telson a little longer than wide, with clear constriction one-third way along, distally tapering to rounded apex.

**REMARKS**

Although this specimen is not in good condition it could not be reconciled with any other species. *Meticonaxius noumea* is notable for the short acute rostrum, no longer than the eyestalks, shorter only in *M. spicatus*. The mandibular incisors are figured *in situ* to show their asymmetry. The species is most similar to *M. soelae* Sakai which occurs in the same region but differs in shorter rostrum, spine on merus of pereopod 1, narrower pereopod 1, more oval pereopod 3 propodus, more acute uropodal exopod and shorter telson.

***Meticonaxius soelae* Sakai, 1992**

*Meticonaxius soelae* Sakai, 1992: 21-25, figs 6-8.

**DISTRIBUTION.** — Coral Sea, 300 m depth.

**REMARKS**

The species is very similar to *M. noumea* n.sp., from which it is distinguished above, and to *M. monodon*.

***Meticonaxius spicatus* n.sp.**  
(Fig. 12)

**MATERIAL EXAMINED.** — **Caribbean Sea.** 351 m (*Atlantis*, stn 3418), 30.IV.1939, MCZ (holotype, immature ♂, cl. 7.2 mm).

**ETYMOLOGY.** — From *spica* (L.), a spike, alluding to the nature of the fingers of the cheliped.

**DISTRIBUTION.** — Caribbean Sea (exact location unknown), 351 m depth.

**DIAGNOSIS**

Rostrum acute, with broad median carina, shorter than eyestalks; longitudinal setal-row indistinct; setal-row of four setae set back from anterolateral margin; oblique setal-row of eight setae short distance posterior; plus setal-row of three near cervical groove. Eyestalks rounded mesiodistally. Antenna 1 with article 1 longer

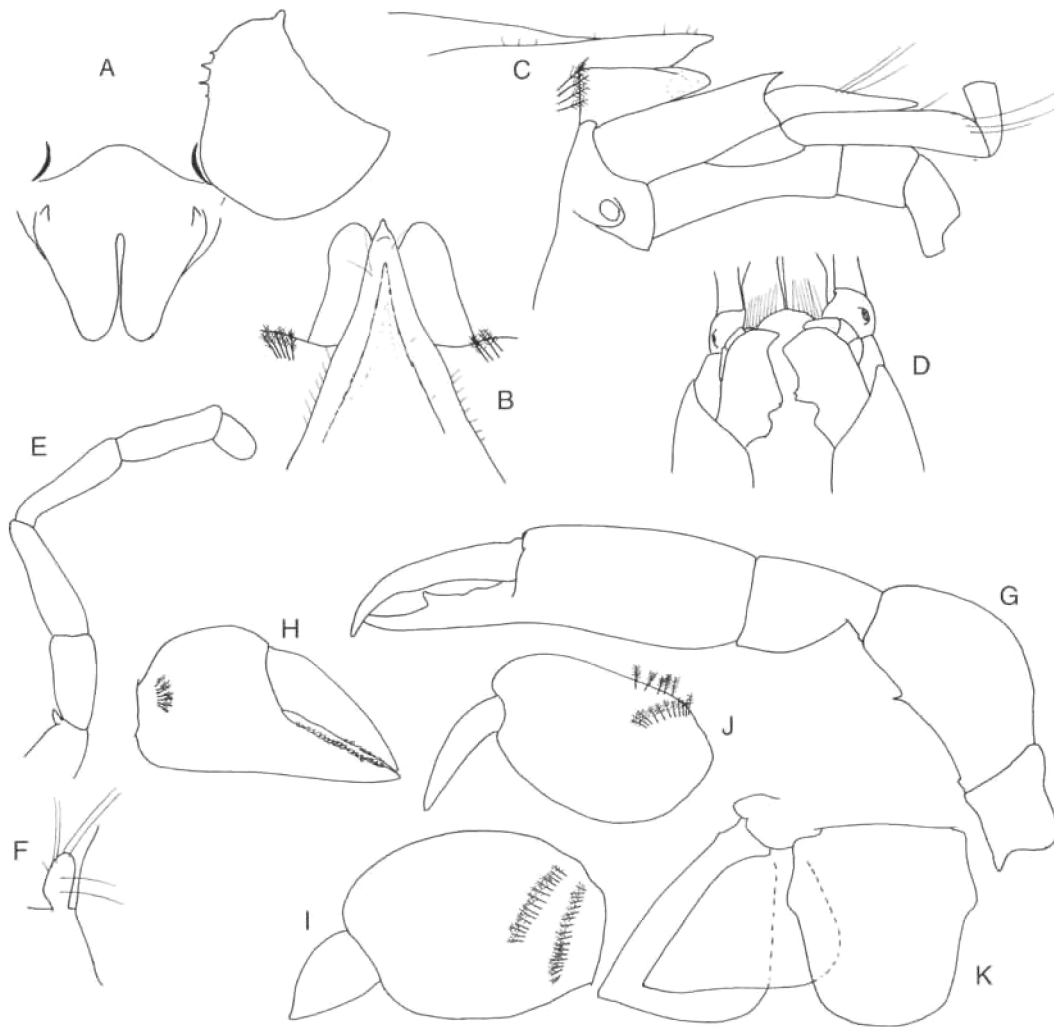


FIG. 11. — *Meticonaxius capricorni* Coelho. **A**, sternum and coxa of pereopod 4, from MZUSP-7114. *Meticonaxius noumea* n.sp. **B**, **C**, dorsal and right view of anterior cephalothorax; **D**, ventral view of mandibular incisors *in situ*; **E**, maxilliped 3; **F**, exopod of maxilliped 3; **G**, right cheliped; **H**, propodus and dactylus of right pereopod 2; **I**, propodus and dactylus of left pereopod 3; **J**, propodus and dactylus of left pereopod 4; **K**, telson and uropod. All figures from holotype.

than eyestalks. Antenna 2 with long distinct articulating scaphocerite, about one-third length of article 4; article 4 reaching beyond article 3 of antenna 1. Maxilliped 3 exopod half length of ischium.

Chelipeds equal; merus unarmed; fixed finger longer than body of propodus, with eight irregular teeth on cutting edge. Pereopod 3 propodus about 1.8 times as long as wide, two oblique setal-rows

of five and ten setae. Pereopod 4 propodus twice as long as wide, without oblique setal-row, submarginal setal-row of three setae on upper margin; dactylus with two small spiniform setae.

Uropodal endopod 1.4 times as long as wide; exopod subtriangular, distal width equal to length. Telson a little longer than wide, with clear constriction one-third way along, tapering to distally truncate-convex apex.

REMARKS

*Meticonaxius spicatus* is distinguished from others in the extreme elongation and dentition of the cheliped fingers, and the very short rostrum.

*Meticonaxius* sp.

MATERIAL EXAMINED. — **Philippines.** Exact position and depth unknown (*Albatross* stn), USNM not regis-

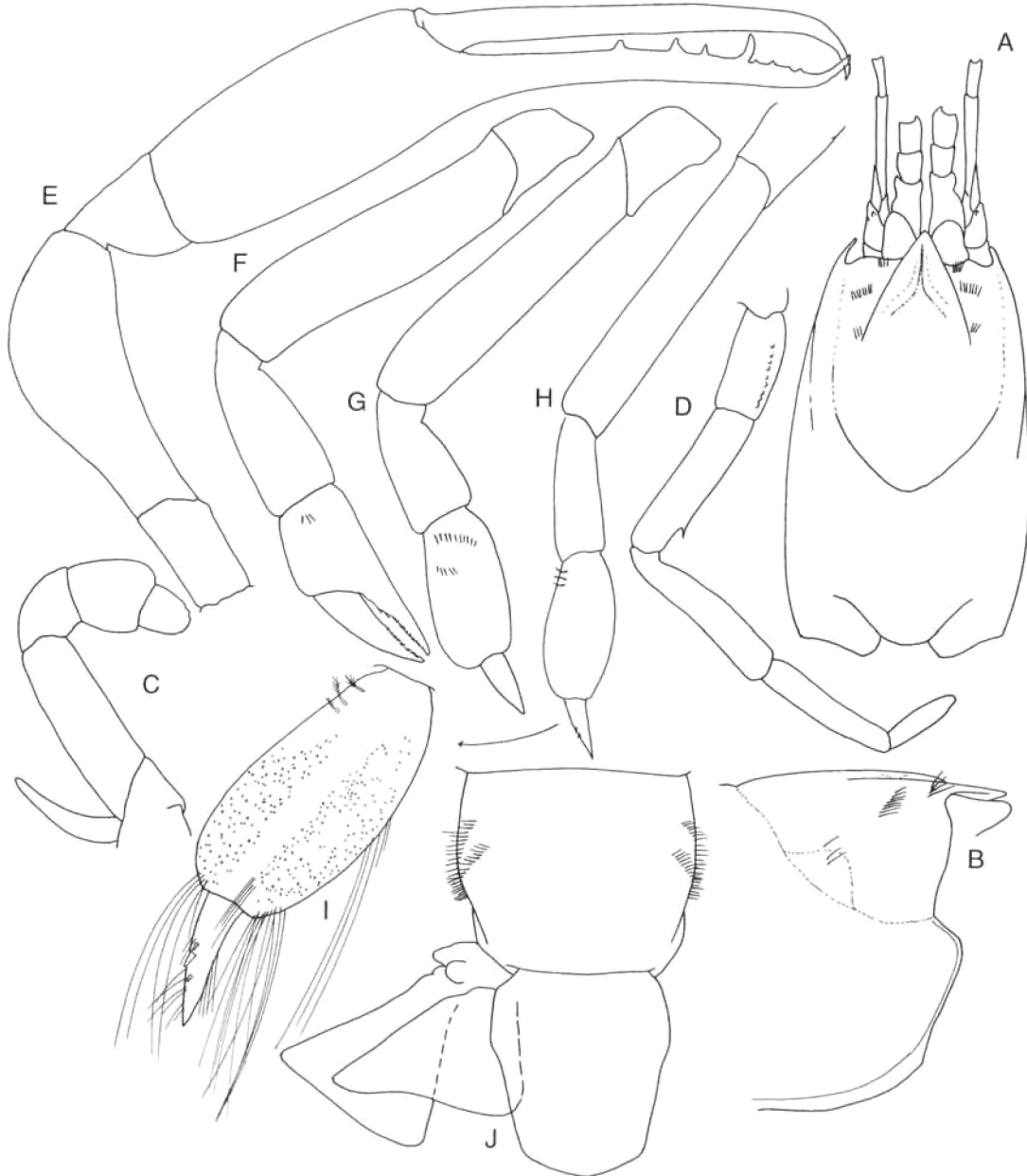


FIG. 12. — *Meticonaxius spicatus* n.sp. **A**, dorsal cephalothorax; **B**, anterior cephalothorax; **C**, maxilliped 2; **D**, maxilliped 3; **E**, left cheliped; **F**, left pereopod 2; **G**, left pereopod 3; **H**, left pereopod 4; **I**, detail of propodus and dactylus; **J**, abdominal somite 6, telson and uropod. All figures from holotype.

tered (damaged specimen without carapace, length of abdomen 62 mm).

#### REMARKS

A single large specimen from the collections of the *Albatross* in the Philippines could be assigned to *Meticonaxius* but was too damaged to be described in sufficient detail to be worthwhile. It does not appear to belong to a known species. Its exact provenance is also uncertain. The specimen is by far the largest individual of the genus so far captured.

#### Genus *Michelea* Kensley et Heard, 1991

*Michelea* Kensley et Heard, 1991: 519.

TYPE SPECIES. — By original designation: *Callianidea vandoverae* Gore, 1987.

#### DIAGNOSIS

Rostrum obsolete or obscurely dentate, not carinate. Eyes visible in dorsal view. Anterolateral cephalothorax with one longitudinal, one marginal and one vertical setal-row. Abdominal somites 1-5 each with one lateral setal-row, abdominal somite 6 with three pairs of setal-rows of which two are in line along posterior margin; abdominal somites 3-5 with sparse paired dorsal patches of long simple setae. Antenna 1 peduncle article 1 extremely elongate. Antenna 2 scaphocerite small. Maxilliped 1 exopod without second article. Maxilliped 3 with teeth of crista dentata reduced; merus with strong mesial row of setae; exopod exceeding end of ischium. Pereopod 1 fixed finger with bicuspidate blade (sometimes obsolete) about one-third way along. Pereopod 2 fixed finger with few separate spiniform setae; dactylus longer than fixed finger. Pereopods 3 and 4 with lateral spiniform setae on propodus and dactylus. Pereopod 4 propodus with two transverse setal-rows. Pleopods 2-5 with marginal lamellae at least on endopod and frequently on both rami. Uropodal endopod with anterolateral margin not defined, ovate, longer than broad. Uropodal exopod anterolateral margin continuous to apex, ovate, broader than endopod. Telson broader than long, obscurely constricted, distally rounded. Epipods on maxilliped 2 to pereopod 4 weakly developed or absent, pod-

branches a single filament, reduced or lost. Branchiae well developed, reduced or absent.

Branchial formula (maximum numbers given, reduced in many species):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	1	1	1	-
Podobranch	-	-	1	1	1	1	-	-
Arthrobranch	-	-	2	2	2	2	2	-
Pleurobranch	-	-	-	-	-	-	1	-

#### COMPOSITION

*M. abbranchiata* n.sp.; *M. devaneyi* n.sp.; *M. hortus* n.sp.; *M. lamellosa* Kensley et Heard, 1991; *M. lepta* (Sakai, 1987); *M. leura* (Poore et Griffin, 1979); *M. microphylla* n.sp.; *M. novaecaledoniae* n.sp.; *M. paraleura* n.sp.; *M. pillsburyi* Kensley et Heard, 1991; *M. vandoverae* (Gore, 1987).

#### REMARKS

*Michelea* is the most distinctive of all micheleid genera. The rostrum is absent but obsolete dentition in *M. vandoverae* suggests derivation from a rostrate ancestor. The uropodal rami are more ovate than in the other genera and the scaphocerite is slightly reduced. The lateral surfaces of the propodus and dactylus of pereopods 3 and 4 bear rows of spiniform setae similar to those seen in many axiid genera; these are not found (with rare exception) in other micheleids.

Most importantly, the pleopods of *Michelea* bear marginal lamellae, at least on the lateral edge of the endopod but usually on margins of both rami. The lamellae are simply ovate in most species but in *M. vandoverae* each lamella has a second distal segment.

Branchiae are frequently lost in this genus and the formula given above is for the maximum number of gills. Several grades from partial to total loss of branchiae are seen; in fact a pleurobranch on thoracic somite 7, usual in other members of the family, is seen in only *M. vandoverae*. Branchial formulae are given for each species. The mouthparts figured for *M. leura* are typical for all members of the genus.

Kensley & Heard (1991) gave a key to the five species then known. The number of described

species is now eleven and another undescribed species is known from an incomplete specimen from Montgomery Reef, northern Western Australia (Queensland Museum, Brisbane, W20365). Identification is probably best made first on geographic likelihood and then compari-

son with published figures. The species are very similar but some can be easily recognised by the number of branchiae or pleopodal lamellae. However, each species is known from so few specimens that nothing is known of variability in these or other characters.

KEY TO SPECIES OF *Michelea*

- 1. Gills reduced or absent ..... 2
- Gills well developed or rudimentary only posteriorly ..... 4
- 2. Pleopods 2-5 with almost 100 lamellae on both rami ..... *Michelea lamellosa* (Jamaica)
- Pleopods 2-5 with 20 or fewer lamellae on both rami ..... 3
- 3. Gills absent; telson as long as wide ..... *Michelea abbranchiata* (Caribbean Sea)
- Gills minute; telson longer than wide ..... *Michelea microphylla* (S Australia)
- 4. Pleopods 2-5 with 7 or fewer lamellae on endopod only ..... 5
- Pleopods 2-5 with lamellae on both rami ..... 7
- 5. Telson tapering to truncate apex ..... *Michelea lepta* (Japan)
- Telson tapering to sharply rounded apex ..... 6
- 6. Pleopod 2 endopod without lamellae; antenna 1 articles 2 and 3 third length of article 1 ..... *Michelea hortus* (W Australia)
- Pleopod 2 endopod with four lamellae; antenna 1 articles 2 and 3 sixth length of article 1 ..... *Michelea novaecaledoniae* (New Caledonia)
- 7. Pleopods 2-5 with numerous 2-segmented lamellae on both rami ..... *Michelea vandoverae* (Caribbean Sea)
- Pleopods 2-5 with 20 or fewer 1-segmented lamellae on both rami ..... 8
- 8. Pleopod 2 endopod with lamellae on lateral and distal half of medial margin; telson semicircular ..... *Michelea leura* (Great Barrier Reef, Australia)
- Pleopod 2 endopod with lamellae on lateral and apical margins only; telson triangular or with truncate apex ..... 9
- 9. Telson longer than wide; maxilliped 3 merus with strong spine ..... *Michelea pillsburyi* (Caribbean coast of Panama)

- Telson as long as wide; maxilliped 3 merus with weak spine ..... 10
- 10. Telson tapering to rounded apex .....  
 ..... *Michelea paraleura* (Great Barrier Reef, Australia)
- Telson tapering to truncate-angled apex ..... *Michelea devaneyi* (Marshall Islands)

***Michelea abranchiata* n.sp.**  
 (Figs 13, 14)

DISTRIBUTION. — Caribbean Sea; intertidal.

MATERIAL EXAMINED. — **Caribbean Sea.** British West Indies, Barbuda, Spanish Point (17°41'N - 61°48'W), shore (Smithsonian Bredin Expedition, stn 122a.58), 28.IV.1958, USNM 122447 (holotype, ♂, cl. 3.3 mm, tl. 16 mm, with 1 slide). — Puerto Rico, 23.VI.1915, USNM 3664 (paratype, ♂, cl. 4.3 mm, tl. 19 mm).

DESCRIPTION

Cephalothorax 0.21 total length; rostrum flat, narrowly produced, about half as long as eyestalks; cervical groove weakly defined, dorsally reaching 0.6 length of cephalothorax; longitudinal setal-row level with lateral margin of eyestalk, of seven setae; marginal setal-row of five setae at base of eyestalk; lateral setal-row of six setae. Abdominal somite 1 with dorsolateral setal-rows

ETYMOLOGY. — The specific name alludes to the absence of gills.

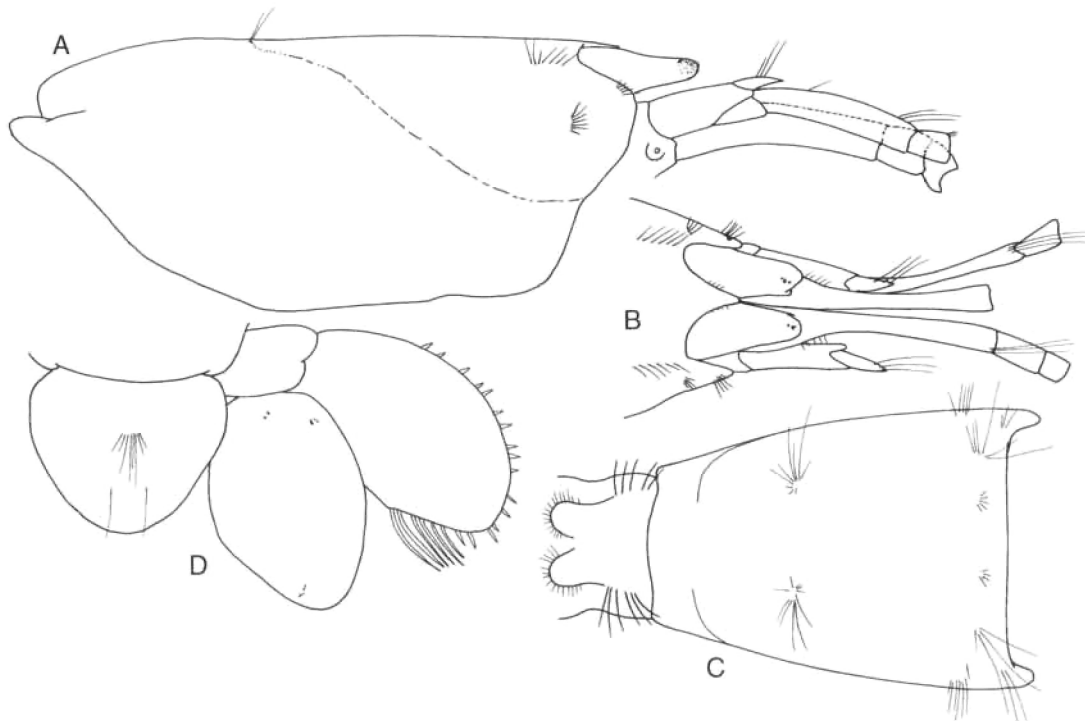


FIG. 13. — *Michelea abranchiata* n.sp. A, cephalothorax; B, anterior cephalothorax; C, abdominal somites 1 and 2; D, telson and uropod. All figures from holotype.

of six setae. Abdominal somites 2-5 with transverse setal-rows of nine, six, six, six setae respectively. Abdominal somite 6 without marginal setal-row along edge of pleuron, oblique setal-row of about six setae, and transverse setal-row of about five+four setae in two groups. All abdominal somites with groups of long setae dorsally.

Eyestalks slightly flattened, with small distomesial lobe; cornea distal.

Antenna 1 with elongate waisted article 1, about 0.4 length of cephalothorax; article 2 longer than 3, together about 0.3 length of article 1.

Antenna 2 with distinct articulating acicle, about half length of article 2; article 4 reaching almost to end of peduncle of antenna 1; article 5 short.

Maxilliped 1 epipod lobes reduced, equal. Maxilliped 2 exopod minute; epipod minute. Maxilliped 3 ischium with obsolete crista dentata of eight blunt teeth; merus without mesial tooth; exopod with flagellum reaching to base of merus; epipod absent.

Chelipeds with ischium with weak lower tooth; merus with weak tooth on slightly convex lower margin, upper margin convex; carpus unarmed; propodus swollen proximally and tapering; fixed finger 0.4 length of propodus, its cutting edge obsoletely toothed; dactylus curved evenly, with sinuous cutting edge, equal to fixed finger.

Pereopod 2 essentially as in *M. leura*.

Pereopod 3 propodus 2.2 times as long as wide, with four spiniform setae on lower margin, clusters of two and three spiniform setae distally on mesial face; dactylus with two spiniform setae on upper-mesial margin.

Pereopod 4 propodus 3.0 times as long as wide, weakly aligned transverse rows of spiniform setae on mesial face, concentrated near margins and strongest on lower margin and distally, and two transverse setal-rows of four and two setae; dactylus with five spiniform setae on upper-mesial margin.

Pleopod 1 of male, second article a rounded-triangular distal blade. Pleopod 2 of male endopod with twelve marginal lamellae distally and laterally; appendix interna club-shaped, 2.5 times as long as wide; appendix masculina 3 times as long as appendix interna; exopod with about ten lamellae distolaterally. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod ovate, 1.6 times as long as wide, without blade-like setae; exopod ovate, 1.7 times as long as wide, with lateral row of spiniform setae becoming longer and blade-like mesially. Telson 0.75 times as long as wide, distally tapering to rounded apex.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	r	r	-	-	-	-	-	-

#### REMARKS

*Michelea abranchiata* is notable for the complete absence of gills and takes one step further the reduction seen in *M. microphylla* from Australia and *M. lamellosa* Kensley *et* Heard from Jamaica.

#### *Michelea devaneyi* n.sp.

(Fig. 15)

MATERIAL EXAMINED. — **Marshall Islands.** N of Sand Island (near Eniwetok Island), Eniwetok Atoll (11°30'S - 162°15'E), under rock on sand, 2 m, A. D. Havens, 10.VIII.1968, MNHN Th-1305 (holotype, ovigerous ♀, cl. 7.5 mm, tl. 33 mm). — Rigili, Eniwetok Atoll (11°30'S - 162°15'E), D. M. Devaney, 25.II.1957, MNHN Th-1307 (paratype, ♂, cl. 3.9 mm, tl. 15 mm); same locality (59/16) 21 July, D. M. Devaney, MNHN Th-1306 (paratype, ♀, cl. 6.5 mm, tl. 29 mm).

ETYMOLOGY. — For the late D. M. Devaney who collected and donated the paratypic specimens.

DISTRIBUTION. — Marshall Islands, subtidal.

#### DESCRIPTION

Cephalothorax 0.23 total length; rostrum flat, broad, about third as long as eyestalks; cervical groove very weakly defined, reaching 0.6 length of cephalothorax; longitudinal setal-row level with lateral margin of eyestalk, of nine setae; marginal setal-row of six setae at base of eyestalk; lateral setal-row of six setae.

Abdominal somite 1 with dorsolateral setal-rows of twelve setae. Abdominal somites 2-5 each with transverse setal-row of about seven setae. Abdominal somite 6 without marginal setal-row along edge of pleuron, oblique setal-row of about seven setae, and transverse setal-row of about



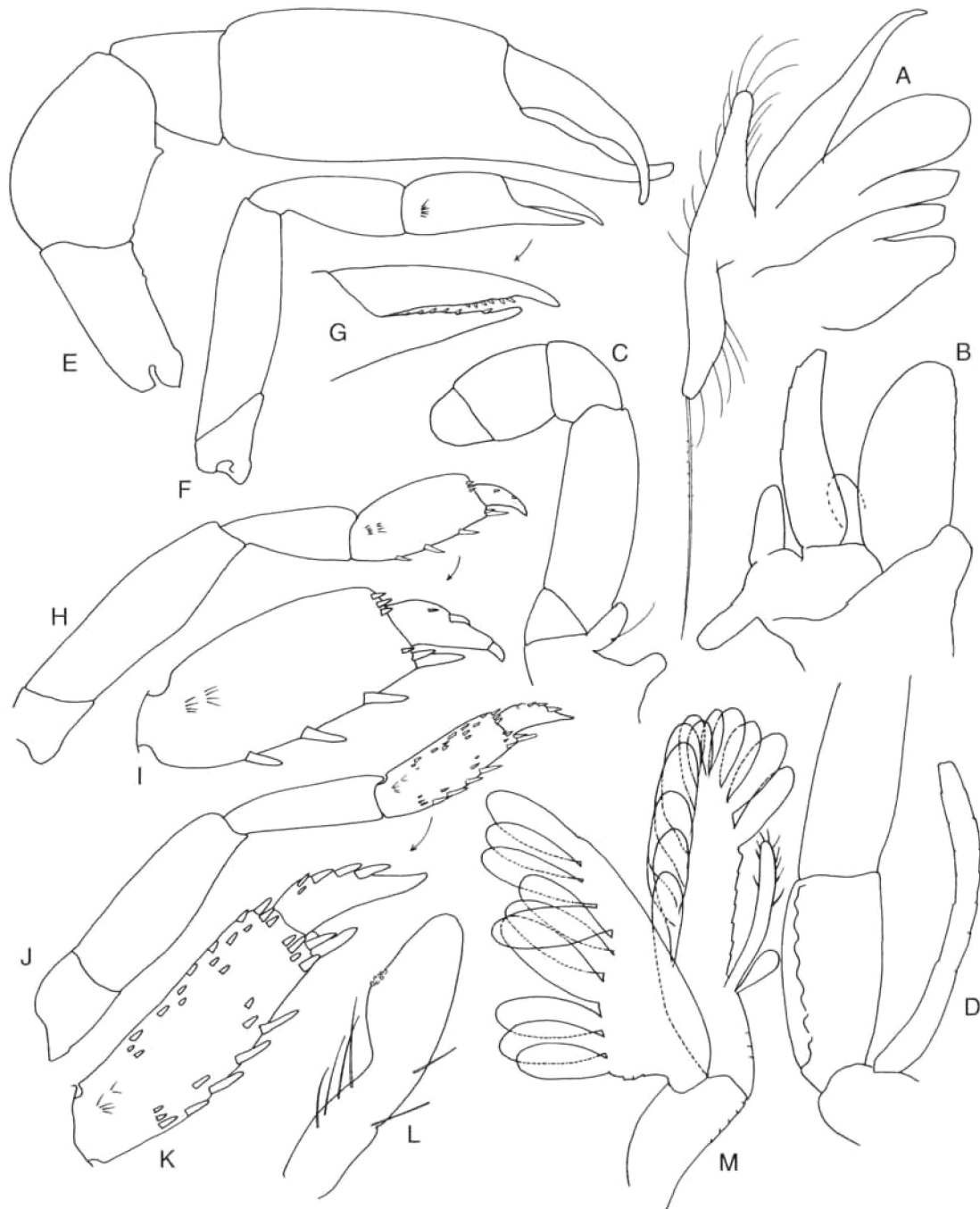


FIG. 14. — *Michelea abranchiata* n.sp. **A**, maxilla 2; **B**, maxilliped 1; **C**, maxilliped 2; **D**, ischium and exopod of maxilliped 3; **E**, left cheliped; **F**, right pereopod 2; **G**, details of fingers; **H**, right pereopod 3; **I**, propodus and dactylus; **J**, right pereopod 4; **K**, propodus and dactylus; **L**, ♂ pleopod 1; **M**, ♂ pleopod 2. Figures A-C, L, M from holotype; others from USNM 3664.

five+six setae in two groups. All abdominal somites with groups of long setae dorsally.

Eyestalks slightly flattened, cornea distolateral.

Antenna 1 with elongate waisted article 1, about 0.6 length of cephalothorax; articles 2 and 3 equal, together about 0.3 length of article 1. Antenna 2 with distinct articulating acicle, almost as long as article 2; article 4 reaching almost to end of article 2 of antenna 1; article 5 short.

Maxilliped 1 epipod lobes narrow, proximal lobe longer. Maxilliped 2 exopod 0.4 length of merus; epipod well-developed. Maxilliped 3 ischium with obsolete crista dentata of ten blunt teeth; merus with mesial tooth; exopod with flagellum reaching to middle of merus; epipod present.

Chelipeds equal; ischium with weak lower tooth; merus with weak tooth on slightly convex lower margin, upper margin convex proximally; carpus unarmed; propodus swollen proximally and tapering; fixed finger 0.4 length of propodus, its cutting edge moderately toothed; dactylus curved apically.

Pereopod 2 essentially as in *M. leura* but with nine spiniform setae on fixed finger, six on dactylus.

Pereopod 3 propodus 2.3 times as long as wide, with five spiniform setae on lower margin, clusters of three and four spiniform setae distally on mesial face; dactylus with four spiniform setae on upper-mesial margin.

Pereopod 4 propodus 3.6 times as long as wide, with about six weakly aligned transverse rows of spiniform setae on mesial face, concentrated near margins and strongest on lower margin and distally, and two transverse setal-rows of four and five setae; dactylus with nine spiniform setae on upper-mesial margin.

Pleopod 1 of male with a triangular distal blade. Pleopod 2 of male endopod with three marginal lamellae distally and five proximolaterally; appendix interna linear, 10 times as long as wide; appendix masculina twice as long as appendix interna; exopod with one distal lamella.

Pleopod 1 of female weakly divided into two articles, second longer and with marginal setae. Pleopod 2 of female endopod with three-four marginal lamellae distally and six-ten proximolaterally, appendix interna broad, 4 times as long as wide, with apical lobe; exopod with five-six lamellae distolaterally. Pleopods 3-5 essentially

similar to pleopod 2 of female.

Uropodal endopod broadly ovate, 1.3 times as long as wide, without blade-like setae, with minute apical spine; exopod ovate, 1.7 times as long as wide, with lateral row of minute spiniform setae. Telson 0.9 times as long as wide, distally with a broadly angled apex.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	r	r	r	-
Podobranch	-	-	f	f	f	f	-	-
Arthrobranch	-	-	1	2	2	2	2	-

Epipods broader anteriorly than posteriorly; podobranchs filamentous (f).

#### REMARKS

This species has unusual pleopods on which the lamella are grouped distally and laterally. There is some size-related differences in the number of lamella between individuals. The characteristic form of the mandibular incisor, typical of the genus, is figured for this species. The exopod of maxilliped 2 is better developed, reaching almost halfway along the merus, in *M. devaneyi* than in other species.

#### *Michelea hortus* n.sp.

(Fig. 16)

MATERIAL EXAMINED. — **Western Australia.** 1.5 miles W of S end of Garden Island (32°12'S - 115°40'E), R. W. George on *Bluefin*, 13.VIII.1962, WAM 57-75 (holotype ♀, cl. 3.6 mm, tl. 14.3 mm, with pereopods 1, left pereopod 2, right pereopod 5).

ETYMOLOGY. — From *hortus* (L.), a garden, alluding to the type locality (noun in apposition).

DISTRIBUTION. — South Western Australia; shelf.

#### DESCRIPTION

Cephalothorax 0.25 total length; rostrum flat, about 0.6 length of eyestalks; cervical groove weakly defined, reaching 0.55 length of cephalothorax; longitudinal setal-row level with middle of eyestalk, of six setae; marginal setal-row of two setae; two lateral setal-rows each of two setae.

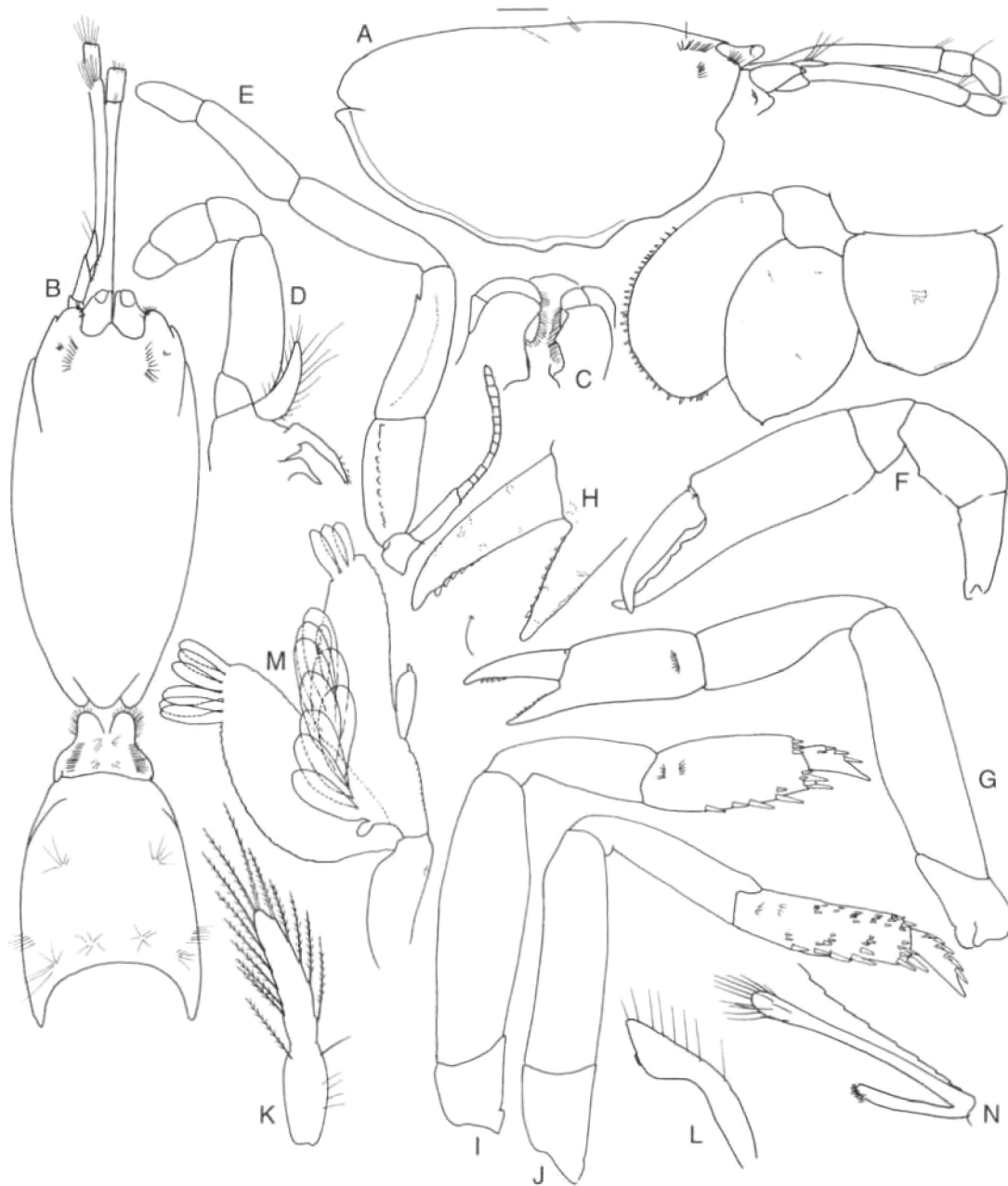


FIG. 15. — *Michelea devaneyi* n.sp. **A**, cephalothorax; **B**, cephalothorax, abdominal somites 1 and 2; **C**, mandibles *in situ*; **D**, maxilliped 2; **E**, maxilliped 3; **F**, right cheliped 1; **G**, left pereopod 2; **H**, details of fixed fingers; **I**, right pereopod 3; **J**, right pereopod 4; **K**, ♀ pleopod 1; **L**, ♂ pleopod 1; **M**, ♀ pleopod 2; **N**, ♂ appendices interna and masculina. Figures L, N, from MNHN Th-1307; all others from holotype.

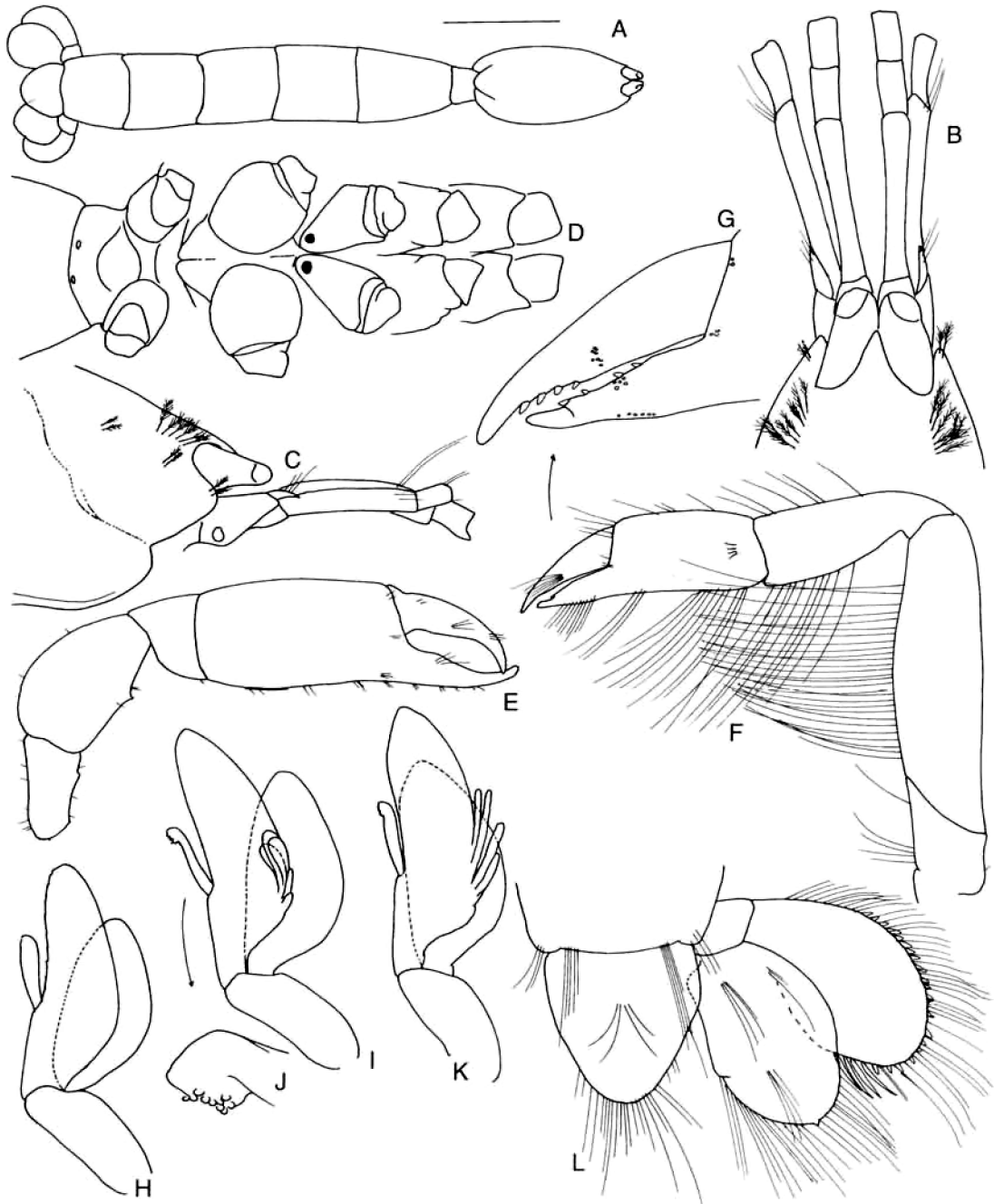


FIG. 16. — *Michelea hortus* n.sp. A, habitus sketch; B, C, anterior of cephalothorax; D, sternum and coxae of pereopods 1-5, abdominal somite 1; E, right cheliped; F, left pereopod 2; G, detail of fingers; H, pleopod 2; I, pleopod 3; J, detail of appendix interna; K, pleopod 4; L, telson and uropod. All figures from holotype.

Abdominal somite 1 with dorsolateral setal-row of four setae. Abdominal somite 2 with transverse setal-row of ten setae. Abdominal somites 3-5 with transverse setal-rows of five-six setae. Abdominal somite 6 without marginal setal-row along edge of pleuron, oblique setal-row of about six setae, and transverse setal-row of about three+three setae in two groups. All abdominal somites with groups of long setae dorsally.

Eyestalks slightly flattened, cornea distolateral.

Antenna 1 with elongate waisted article 1, about half as long as cephalothorax; articles 2 and 3 subequal, each about one-third length of article 1. Antenna 2 with distinct articulating acicle, about 0.3 length of article 2; article 4 reaching beyond article 2 of antenna 1; article 5 short.

Maxilliped 1 epipod as in *M. leura*. Maxilliped 2 exopod minute; epipod reduced. Maxilliped 3 ischium with obsolete crista dentata; merus with mesial tooth; carpus-dactylus longer than ischium-merus, widest point of carpus 0.3 carpal length; exopod with flagellum reaching to middle of merus; epipod narrow, with rudimentary podobranch.

Chelipeds equal; ischium with weak lower tooth; merus with weak tooth on convex lower margin, upper margin strongly convex; carpus unarmed; propodus swollen proximally and tapering; fixed finger 0.3 length of propodus, its cutting edge with obsolete teeth, curved apically; dactylus curved apically, equal to fixed finger.

Pereopod 2 essentially as in *M. leura* but with three spiniform setae on fixed finger, four on dactylus.

Pereopods 3-4 unknown.

Pleopod 1 of female of two short articles. Pleopod 1 of male unknown. Pleopod 2 without marginal lamellae; appendix interna 4 times as long as wide. Pleopods 3-5 with five, four, five lamellae respectively proximolaterally on endopod; appendix interna narrower than on pleopod 2; exopod without lamellae.

Uropodal endopod broadly ovate, 1.4 times as long as wide, with minute apical tooth and small medial lobe; exopod 1.6 times as long as wide, with short spiniform setae laterally and distally. Telson about as long as wide, distally tapering to rounded apex.

Branchial formula (r = rudimentary; f = filamentous):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	1	1	1	-
Podobranch	-	-	f	f	f	f	-	-
Arthrobranch	-	1	1+r	2	2	2	2	-

#### REMARKS

The species is similar to *M. novaecaledoniae* and *M. leptota* in the paucity of lamellae on the pleopods but differs slightly in this regard and in proportions of limbs.

#### *Michelea lamellosa* Kensley et Heard, 1991

*Michelea lamellosa* Kensley et Heard, 1991: 496, 519-522, figs 16, 17.

DISTRIBUTION. — Jamaica; 24 m depth.

#### REMARKS

The species was described in detail by its authors and is notable for the reduction in number and size of branchiae. It is one of few micheleid species with two long setae on the maxilla 2 scaphognathite.

#### *Michelea leptota* (Sakai, 1987)

*Callianidea leptota* Sakai, 1987: 300-302, fig. 3.

*Michelea leptota*. — Kensley & Heard 1991: 519.

DISTRIBUTION. — Okinawa, Japan; intertidal.

#### REMARKS

*M. leptota* is without lamellae on the pleopodal exopods and is therefore similar to *M. hortus* from Western Australia. The latter has even fewer lamellae and differs in the shape of telson and uropods. No material of *M. leptota* has been seen by me.

#### *Michelea leura* (Poore et Griffin, 1979) (Figs 17-19)

*Callianidea leura* Poore et Griffin, 1979: 281-284, figs 40, 41 (in part). — Sakai 1984: 104.

*Michelea leura*. — Kensley & Heard 1991: 519.

MATERIAL EXAMINED. — **Australia**. Queensland,

Masthead Island, Capricorn Group (23°25'S - 151°55'E), AM P25294 (holotype, ovigerous ♀, cl. 6.0 mm, tl. 25.8 mm). — Queensland, low water under dead coral blocks, Junes Reef flat, Heron Island, Capricorn Group (23°25'S - 151°55'E), 23.IX.1976, MNHN Th-642 (juvenile ♀, cl. 4.0 mm, tl. 14.8 mm).

DESCRIPTION OF HOLOTYPE

Cephalothorax 0.25 total length, about 1.4 times as deep as wide; rostrum flat, slightly depressed distally, as long as broad at base, less than half as

long as eyestalks; cervical groove weakly defined, reaching 0.6 length of cephalothorax; dorso-posterior margin narrowly produced to rounded lobe, separated from posterolateral margins which are ridged and setose; longitudinal setal-row level with lateral margin of eyestalk, of seven setae; marginal setal-row of nine setae at base of eyestalk; lateral setal-row of six setae.

Abdominal somite 1 narrower than second, with anterolateral lobes overlying posterolateral margins of cephalothorax; pleuron weakly rounded;

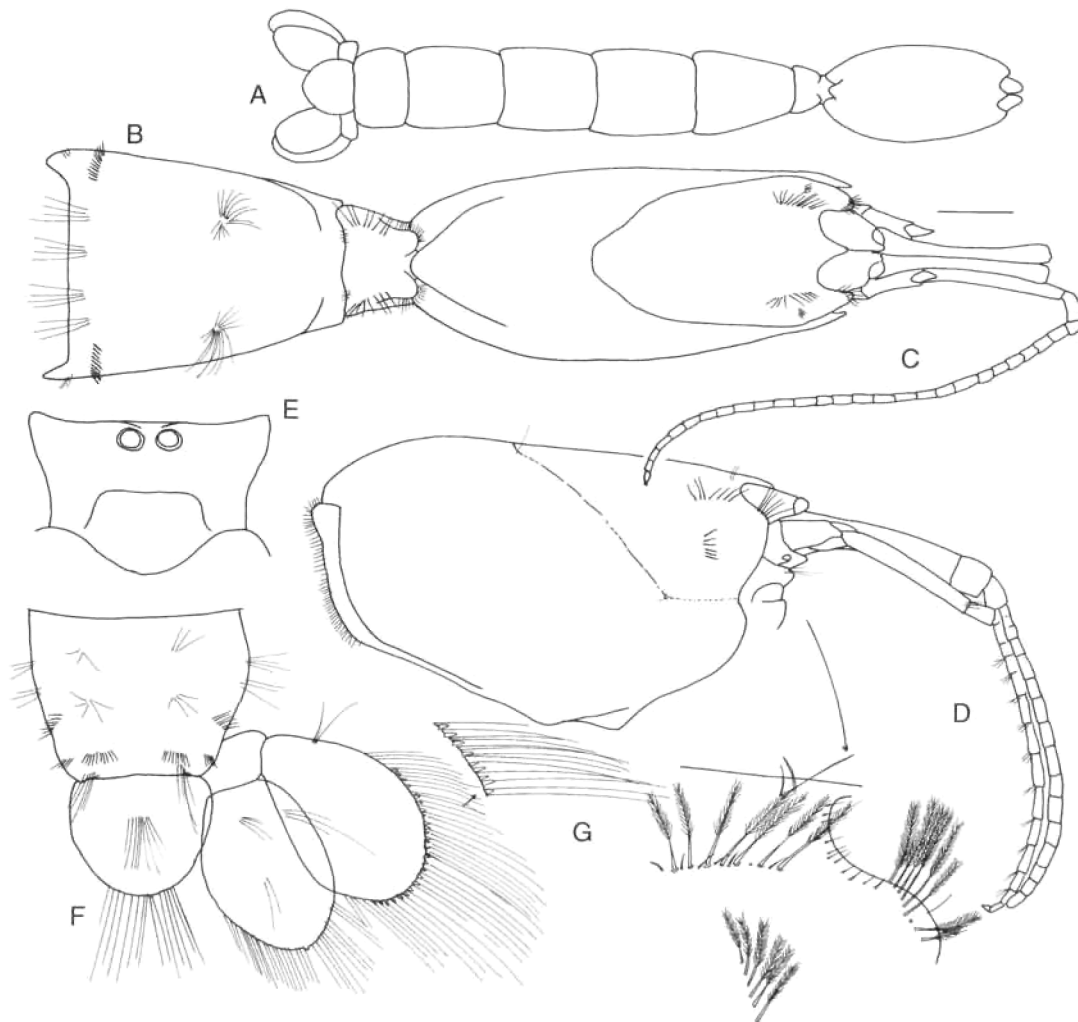


FIG. 17. — *Michelea leura* (Poore et Griffin, 1979). A, habitus sketch; B, cephalothorax and abdominal somites 1 and 2; C, cephalothorax; D, detail of anterolateral setal-rows; E, ventral view of abdominal somite 1; F, abdominal somite 6, telson and uropod; G, setae on margin of uropodal exopod. All figures from holotype.

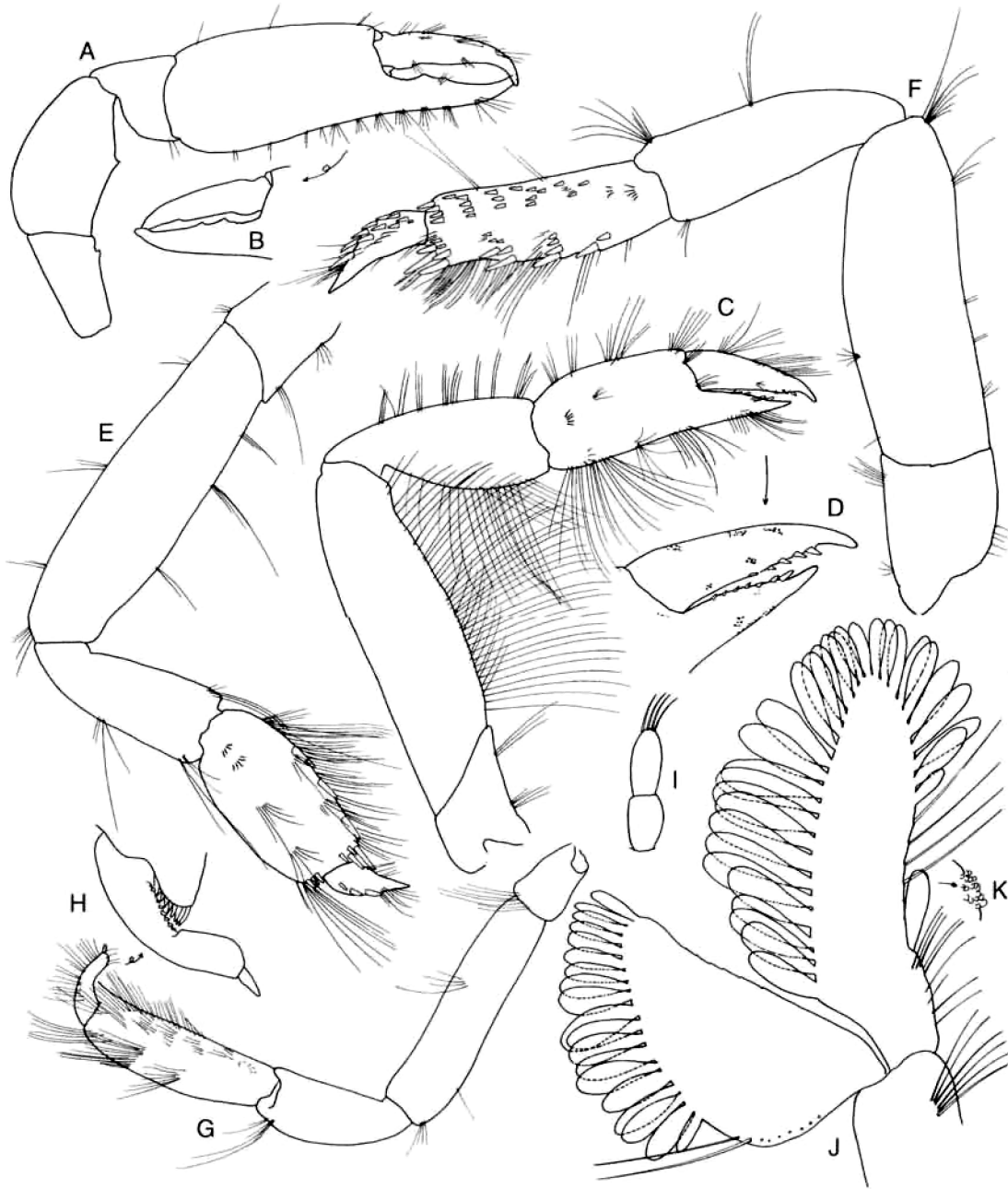


FIG. 18. — *Michelea leura* (Poore et Griffin, 1979). A, left cheliped and B, details of fingers; C, right pereopod 2; D, fingers of left pereopod 2; E, left pereopod 3; F, left pereopod 4; G, right pereopod 5; H, details of fingers; I, ♀ pleopod 1; J, ♀ pleopod 2; K, detail of appendix interna. All figures from holotype.

dorsolateral setal-rows of eight setae. Abdominal somite 2 2.7 times as long as first, pleuron weakly overlapping first somite; transverse setal-row of ten setae. Abdominal somite 6 with marginal setal-row along edge of pleuron, oblique setal-row of about eight setae, and transverse setal-row of about four+ten setae in two groups. All abdominal somites with groups of long setae dorsally.

Eyestalks slightly flattened, cornea distolateral.

Antenna 1 with elongate waisted article 1, almost half as long as cephalothorax; articles 2 and 3 subequal, each about 0.2 length of article 1; flagella each of about fifteen articles, longer than peduncle. Antenna 2 with distinct articulating acicle, about half length of article 2; article 4 reaching just beyond article 1 of antenna 1; article 5 short; flagellum almost twice as long as peduncle. Mandible incisor process with smooth cutting edge, excavate on right, broadly acute on left (see Fig. 19C). Maxilla 2 endopod tapering; scaphognathite with one long posteriorly-directed seta. Maxilliped 1 with endopod 0.3 length of basal endite, exopod longer than endite, epipod lobes narrow, proximal lobe longer. Maxilliped 2 exopod minute; epipod well-developed. Maxilliped 3 ischium with obsolete crista dentata of eleven blunt teeth; merus with mesial tooth; ischium-merus with dense mesial rows of long setae; carpus-dactylus longer than ischium-merus, widest point of carpus 0.3 carpal length; exopod with flagellum reaching to base of merus; epipod narrow, bent, with filamentous podobranch.

Chelipeds equal; ischium with weak lower tooth; merus with weak tooth on slightly convex lower margin, upper margin strongly convex, especially proximally; carpus unarmed; propodus swollen proximally and tapering; fixed finger 0.4 length of propodus, its cutting edge with two obsolete teeth on proximal half; dactylus cutting edge irregular, curved distally, equal to fixed finger.

Pereopod 2 merus-propodus with lower marginal rows of long setae; carpus 0.6 length of merus; propodus little longer than carpus with setal-row of five short setae; fixed finger cutting edge with seven well-spaced spiniform setae; dactylus longer than fixed finger, with five spiniform setae on distal half of cutting edge, tip curved.

Pereopod 3 propodus twice as long as wide, with four spiniform setae on lower margin, two clus-

ters of three spiniform setae distally on mesial face, and two transverse setal-rows of four and five setae; dactylus with three spiniform setae on upper-mesial margin.

Pereopod 4 propodus 2.8 times as long as wide, four-six weakly aligned transverse rows of spiniform setae on mesial face, concentrated near margins and strongest on lower margin and distally, and two transverse setal-rows of five and three setae; dactylus with about eleven spiniform setae in weak rows on upper-mesial margin.

Pereopod 5 weakly chelate; dactylus with nine short spiniform setae closing on eight longer spiniform setae, with a strong apical spiniform seta.

Pleopods 1 of female nearly midventral, 2-articled. Pleopod 2 endopod with thirty-one marginal lamellae along distal third on mesial margin, distally and laterally; appendix interna 3 times as long as wide; exopod twice as long as wide, inner margin straight, lateral margin convex, nineteen lamellae distolaterally. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod ovate, 1.2 times as long as wide, with a minute distal tooth; exopod ovate, 1.6 times as long as wide, with marginal short spiniform setae distally. Telson length 0.8 times width, proximally parallel-sided, distally semi-circular.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	r	r	r	-
Podobranch	-	-	f	f	f	f	-	-
Arthrobranch	-	-	1	2	2	2	2	-

Epipods broader anteriorly than posteriorly; podobranchs filamentous (f).

#### Colour

White. Abdomen, telson and uropodal endopod translucent with red lateral edges. Cornea dark brown. Red spot on distal end of peduncle of antenna 2 and on maxillipedal carpus. Intestine yellow (from notes made by A. J. Bruce on Th.-642).

#### REMARKS

There are several fundamental differences between the holotype and the paratype of this spe-





FIG. 19. — *Michelea leura* (Poore *et* Griffin, 1979). **A**, antenna 1 and **B**, detail of tip of flagellum; **C**, right mandible; **D**, maxilla 1; **E**, maxilla 2; **F**, maxilliped 1; **G**, maxilliped 2; **H**, maxilliped 3; **I**, basis, exopod, epipod and podobranch of maxilliped 3. All figures from holotype.

cies which are now considered to belong to two species. A third specimen from the Capricorn Group, southern Great Barrier Reef, near the type locality, resembles the holotype and is assigned to *M. leura*. Another, from the northern Great Barrier Reef, is more similar to the paratype which also comes from this region and the two are described as a new species, *M. paraleura*. Body proportions of the new species are different, abdominal somite 2 is proportionally longer (about 4 times as long as abdominal somite 1, cf. 2.7 times in the holotype). More importantly, both uropodal rami are rimmed with rows of closely-set spiniform setae of which some are blade-like as, for example, in *M. microphylla*.

This species is illustrated in the greatest detail in this contribution but the male is unknown. It is most easily recognised by the combination of numerous pleopodal lamellae and relatively short telson.

*Michelea microphylla* n.sp.  
(Figs 20, 21)

MATERIAL EXAMINED. — **Australia.** Victoria, Western Port, Crib Point (38°19.92'S - 145°13.95'E), Marine Studies Group, February 1972, sand/gravel, 19 m, grab (stm CPBS 52N), NMV J1263 (holotype, juvenile ♂, cl. 4.0 mm, tl. 12.8 mm).

ETYMOLOGY. — From *micro*, small and *phyllos*, leaf (Gk), alluding to the small gills.

DISTRIBUTION. — Victoria, Australia; 19 m depth.

DESCRIPTION

Cephalothorax 0.3 total length; rostrum flat, narrowly acute distally, about two-thirds as long as eyestalks; cervical groove weakly defined posteriorly only, reaching 0.55 length of cephalothorax; longitudinal setal-row level with lateral margin of eyestalk, of five setae; marginal setal-row of five setae at base of eyestalk; lateral setal-row of five setae.

Abdominal somite 1 with dorsolateral setal-rows of six setae. Abdominal somites 2-5 each with transverse setal-row of about nine setae. Abdominal somite 6 without marginal setal-row along edge of pleuron, oblique setal-row of about six setae, and transverse setal-row of about

five + four setae in two groups. All abdominal somites with groups of long setae dorsally.

Eyestalks slightly flattened, cornea vestigial.

Antenna 1 with long waisted article 1, about one-third as long as cephalothorax; articles 2 and 3 subequal, each about 0.3 length of article 1. Antenna 2 with distinct articulating acicle, about half length of article 2; article 4 reaching to end of peduncle of antenna 1; article 5 short.

Maxilliped 1 epipod lobes narrow, proximal lobe shorter. Maxilliped 2 exopod minute; epipod reduced. Maxilliped 3 ischium with obsolete crista dentata of seven blunt teeth; merus without mesial tooth; ischium-merus with sparse mesial rows of long setae; carpus-dactylus longer than ischium-merus, widest point of carpus 0.3 carpal length; exopod with flagellum reaching to base of merus; epipod narrow, without podobranch.

Chelipeds equal; ischium with weak lower tooth; merus with weak tooth on slightly convex lower margin, upper margin convex; carpus unarmed; propodus swollen proximally and tapering; fixed finger 0.4 length of propodus, its cutting edge almost straight; dactylus curved evenly, equal to fixed finger.

Pereopod 2 essentially as in *M. leura* but dactylus with five spiniform setae on distal half of cutting edge.

Pereopod 3 propodus 1.7 times as long as wide, with three spiniform setae on lower margin, one spiniform seta distally on mesial face, and transverse setal-row of four setae; dactylus with spiniform seta on upper-mesial margin.

Pereopod 4 propodus 2.4 times as long as wide, two spiniform setae on lower margin, one distally on mesial face, setal-row of two setae; dactylus with two spiniform setae on upper-mesial margin.

Pereopod 5 weakly chelate; dactylus with four short spiniform setae closing on four spiniform setae.

Pleopods 1 of female minute. Pleopod 2 endopod with about twenty marginal lamellae distally and laterally; appendix interna 6 times as long as wide; exopod with about twenty lamellae distolaterally. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod ovate, 1.6 times as long as wide, with marginal row of seven long blade-like

setae; exopod ovate, 1.5 times as long as wide, with lateral row of spiniform setae becoming longer and blade-like distally and mesially. Telson about as long as wide, distally tapering to rounded apex.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	r	r	r	r	r	r	-	-
Podobranch	-	-	-	-	-	-	-	-
Arthrobranch	-	-	2r	2r	2r	2r	2r	-

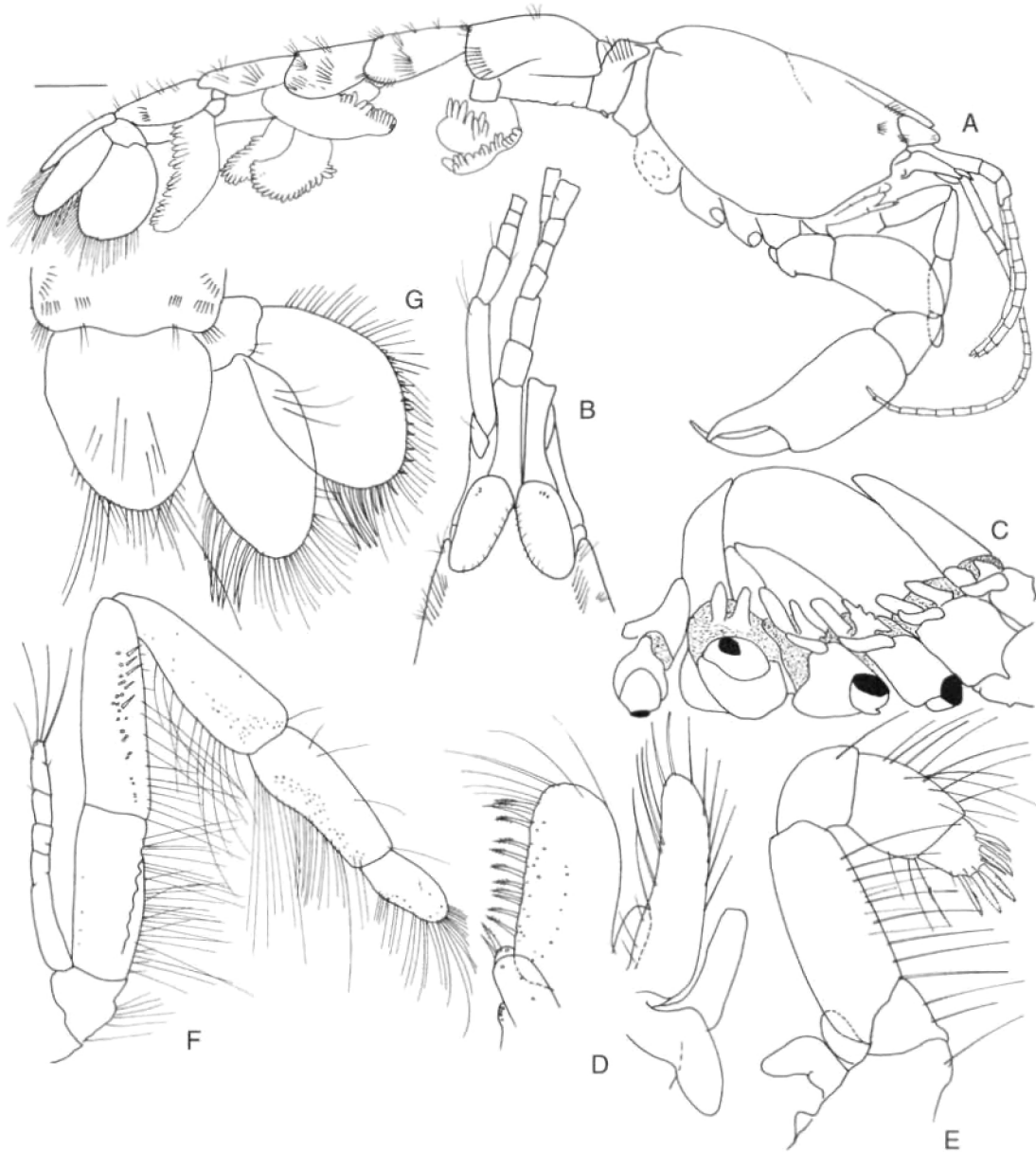


FIG. 20. — *Michelelea microphylla* n.sp. **A**, habitus; **B**, anterior cephalothorax; **C**, right side of thorax (carapace removed) to show coxae of maxilliped 3 and pereopods 1-5, epipods and arthrobranches; **D**, maxilliped 1; **E**, maxilliped 2; **F**, maxilliped 3; **G**, abdominal somite 6, telson and uropod. All figures from holotype.

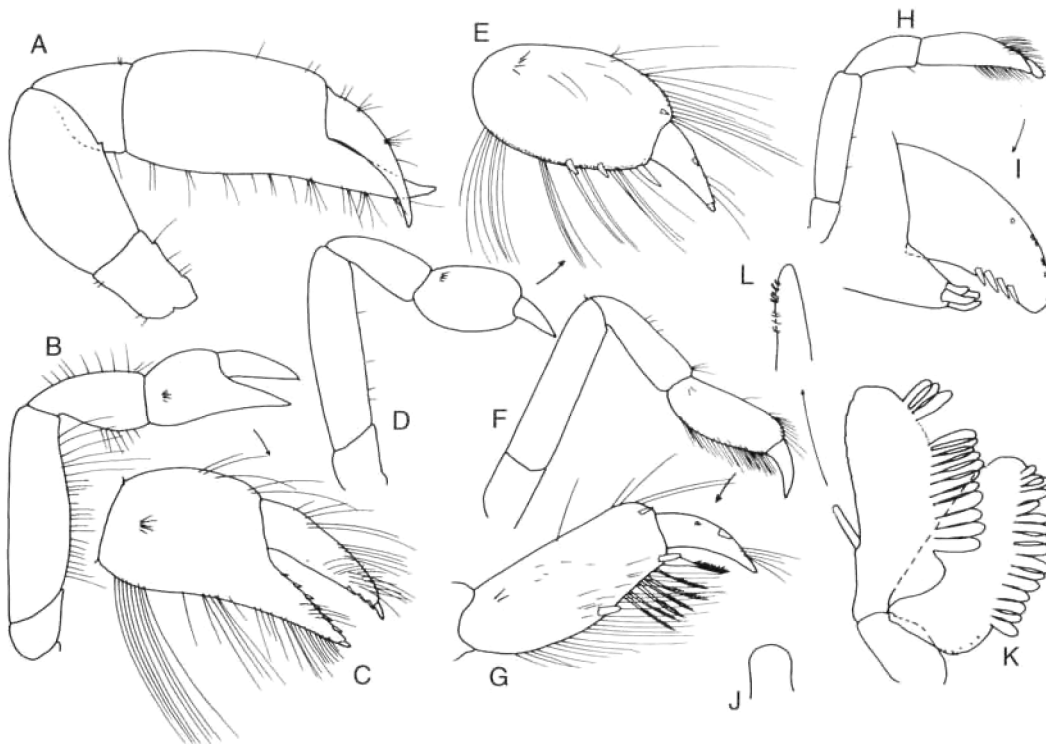


FIG. 21. — *Michelea microphylla* n.sp. A, left cheliped; B, right pereopod 2 and C, propodus and dactylus; D, right pereopod 3; E, propodus and dactylus; F, right pereopod 4; G, propodus and dactylus; H, right pereopod 5; I, fingers; J, juvenile ♂ pleopod 1; K, pleopod 2. All figures from holotype.

REMARKS

This species is known from a single specimen in very poor condition. It is characterised by the rudimentary epipods and arthrobranchs and the absence of podobranchs. Gills are also reduced in *M. lamellosa* Kensley *et* Heard from Jamaica but that species has only three epipods and a single rudimentary arthrobranch on thoracomere 7.

It is the only species in the family from truly temperate waters; *M. hortus* from south-western Australia is from a similar latitude but is from a region with greater influence of tropical fauna.

***Michelea novaecaledoniae* n.sp.**

(Fig. 22)

MATERIAL EXAMINED. — **New Caledonia.** Île Ouen, baie de Prony (22°24'S - 166°50'E), 37 m, B. Richer de Forges (ORSTOM, stn 114), MNHN Th-1215 (holotype, ♀, cl. 5.7 mm, tl. 23.5 mm). — Île Ouen,

baie de Prony (22°30'S - 166°47'E), 52 m, B. Richer de Forges (ORSTOM, stn 128), MNHN Th-1214 (paratype, ♀, cl. 5.4 mm, tl. 24.0 mm).

ETYMOLOGY. — For New Caledonia, type locality.

DISTRIBUTION. — New Caledonia, baie de Prony; 37-52 m depth.

DESCRIPTION

Cephalothorax 0.24 total length; rostrum flat, about 0.4 length of eyestalks; cervical groove weakly defined, reaching 0.55 length of cephalothorax; longitudinal setal-row level with lateral margin of eyestalk, of five setae; marginal setal-row of six setae at base of eyestalk; lateral setal-row of six setae.

Abdominal somite 1 with dorsolateral setal-row of nine setae. Abdominal somite 2 with transverse setal-row of ten setae. Abdominal somites 3-5 with transverse setal-rows of five-six

setae. Abdominal somite 6 without marginal setal-row along edge of pleuron, oblique setal-row of about six setae, and transverse setal-row of about five+four setae in two groups. All abdominal somites with groups of long setae dorsally.

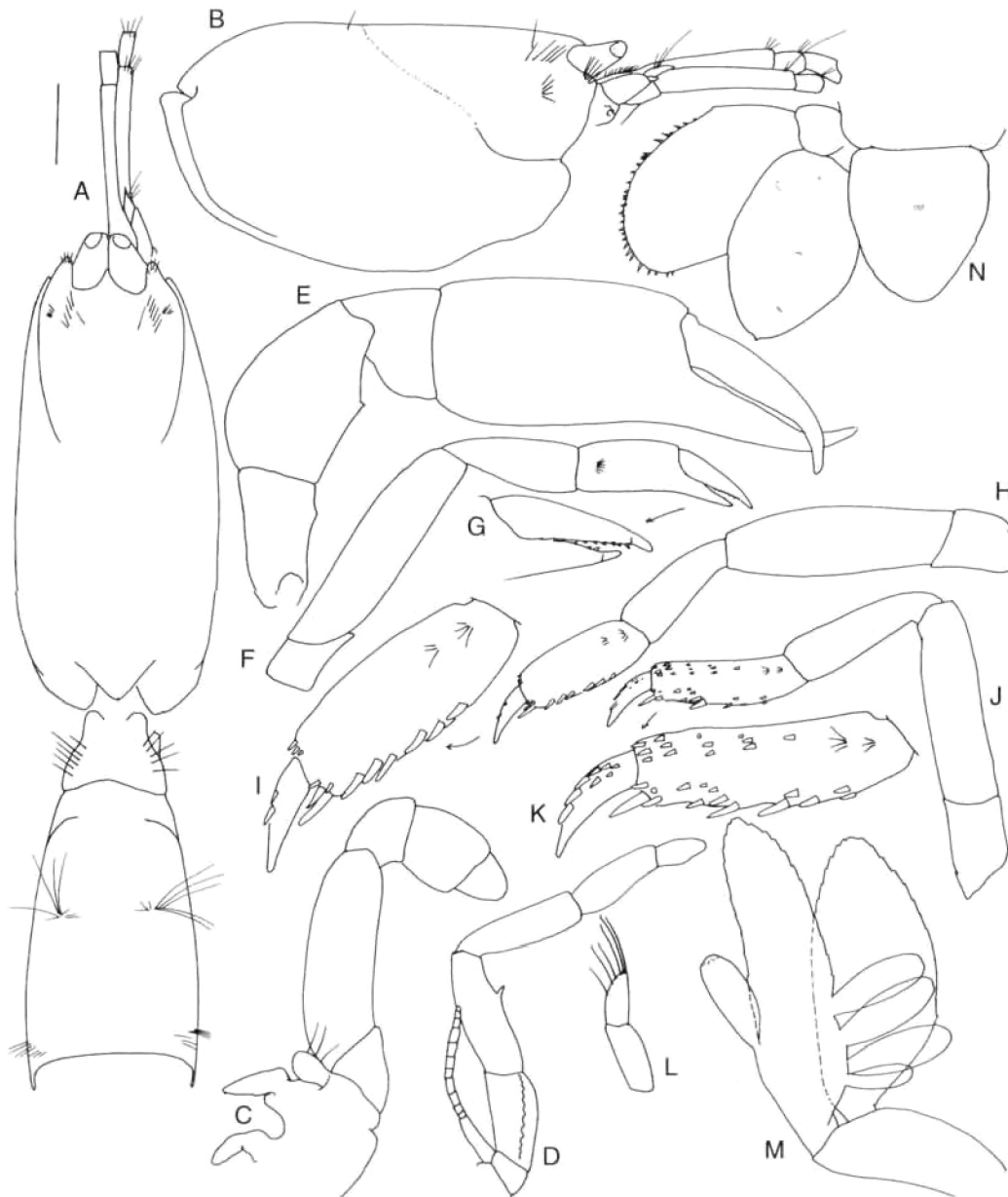


FIG. 22. — *Michelea novaecaledoniae* n.sp. **A**, cephalothorax and abdominal somites 1 and 2; **B**, cephalothorax; **C**, maxilliped 2; **D**, maxilliped 3; **E**, left cheliped; **F**, right pereopod 2; **G**, details of fingers; **H**, left pereopod 3; **I**, propodus and dactylus; **J**, left pereopod 4; **K**, propodus and dactylus; **L**, ♀ pleopod 1; **M**, ♀ pleopod 2; **N**, telson and uropod. All figures from holotype.

Eyestalks slightly flattened, cornea distolateral. Antenna 1 with elongate waisted article 1, about half as long as cephalothorax; articles 2 and 3 subequal, each about one-sixth length of article 1. Antenna 2 with distinct articulating acicle, about 0.7 length of article 2; article 4 reaching to end of article 2 of antenna 1; article 5 short.

Maxilliped 1 epipod as in *M. leura*. Maxilliped 2 exopod minute; epipod reduced. Maxilliped 3 ischium with obsolete crista dentata of ten blunt teeth; merus with mesial tooth; carpus-dactylus longer than ischium-merus, widest point of carpus 0.3 carpal length; exopod with flagellum reaching to middle of merus; epipod narrow, without podobranch.

Chelipeds equal; ischium with weak lower tooth; merus with weak tooth on convex lower margin, upper margin strongly convex; carpus unarmed; propodus swollen proximally and tapering; fixed finger 0.4 length of propodus, its cutting edge with obsolete teeth, curved apically; dactylus curved apically, equal to fixed finger.

Pereopod 2 essentially as in *M. leura*.

Pereopod 3 propodus 2.5 times as long as wide, with seven spiniform setae on lower margin, two clusters of three spiniform setae distally on mesial face, and two transverse setal-rows of four and three setae; dactylus with two spiniform setae on upper-mesial margin.

Pereopod 4 propodus 3.6 times as long as wide, weakly aligned transverse rows of spiniform setae on mesial face, concentrated near margins and strongest on lower margin and distally, and two transverse setal-rows each of three setae; dactylus with eight spiniform setae on upper-mesial margin.

Pleopod 1 of female of two short articles. Pleopod 1 of male unknown. Pleopod 2 endopod with four marginal lamellae proximolaterally; appendix interna 2.5 times as long as wide; exopod without lamellae. Pleopods 3-5 essentially similar to pleopod 2, with four, seven, six lamellae respectively.

Uropodal endopod broadly ovate, 1.4 times as long as wide, with minute apical tooth; exopod 1.3 times as long as wide, with blunt tooth on lateral margin and spiniform setae laterally and distally. Telson about as long as wide, distally tapering to rounded apex.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	r	r	r	-
Podobranch	-	-	f	f	f	f	-	-
Arthrobranch	-	-	1	2	2	2	2	-

Epipods broader anteriorly than posteriorly; podobranchs filamentous (f).

#### REMARKS

The two specimens from New Caledonia are similar to *M. hortus* from south-western Australia in the reduction of pleopodal lamellae. *M. novae-caledoniae* has four lamellae on pleopod 2 and has two lateral setal-rows (*M. hortus* has no lamellae and one lateral setal-row).

#### *Michelea paraleura* n.sp.

(Figs 23, 24)

**MATERIAL EXAMINED.** — **Australia.** Queensland, Holbourne Island (19°42'S - 148°21'E), AM P5574 (holotype, ♀, cl. 6.2 mm, tl. 26.5 mm, paratype of *Callianidea leura* Poore et Griffin, 1979 = *Michelea leura*). — Queensland, Rib Reef (18°28'S - 146°52'E), reef flat, 2 m, M. Riddle, May 1986, corer, NMV J22685 (paratype, ♂, cl. 3.3 mm, tl. 13.8 mm). — Northern Territory, W side of Oxley Island (11°00'S - 132°49'E), intertidal pools, G. C. B. Poore, 18.X.1982, NMV J27643 (1 specimen).

**ETYMOLOGY.** — From *para* and the specific name *leura*, to indicate the species' original confusion with *Michelea leura* (noun in apposition).

**DISTRIBUTION.** — Northern Great Barrier Reef and coral island of Northern Territory, Australia; intertidal to 2 m depth.

#### DESCRIPTION

Cephalothorax 0.24 total length; rostrum flat, about half length of eyestalks; cervical groove weakly defined, reaching 0.6 length of cephalothorax; longitudinal setal-row level with lateral margin of eyestalk, of thirteen setae; marginal setal-row of seven setae at base of eyestalk; lateral setal-rows of seven and four setae.

Abdominal somite 1 with dorsolateral setal-row of five setae. Abdominal somite 2 four times as long as first; with transverse setal-row of twelve setae. Abdominal somites 3-5 with transverse setal-rows of eight-ten setae. Abdominal somite 6

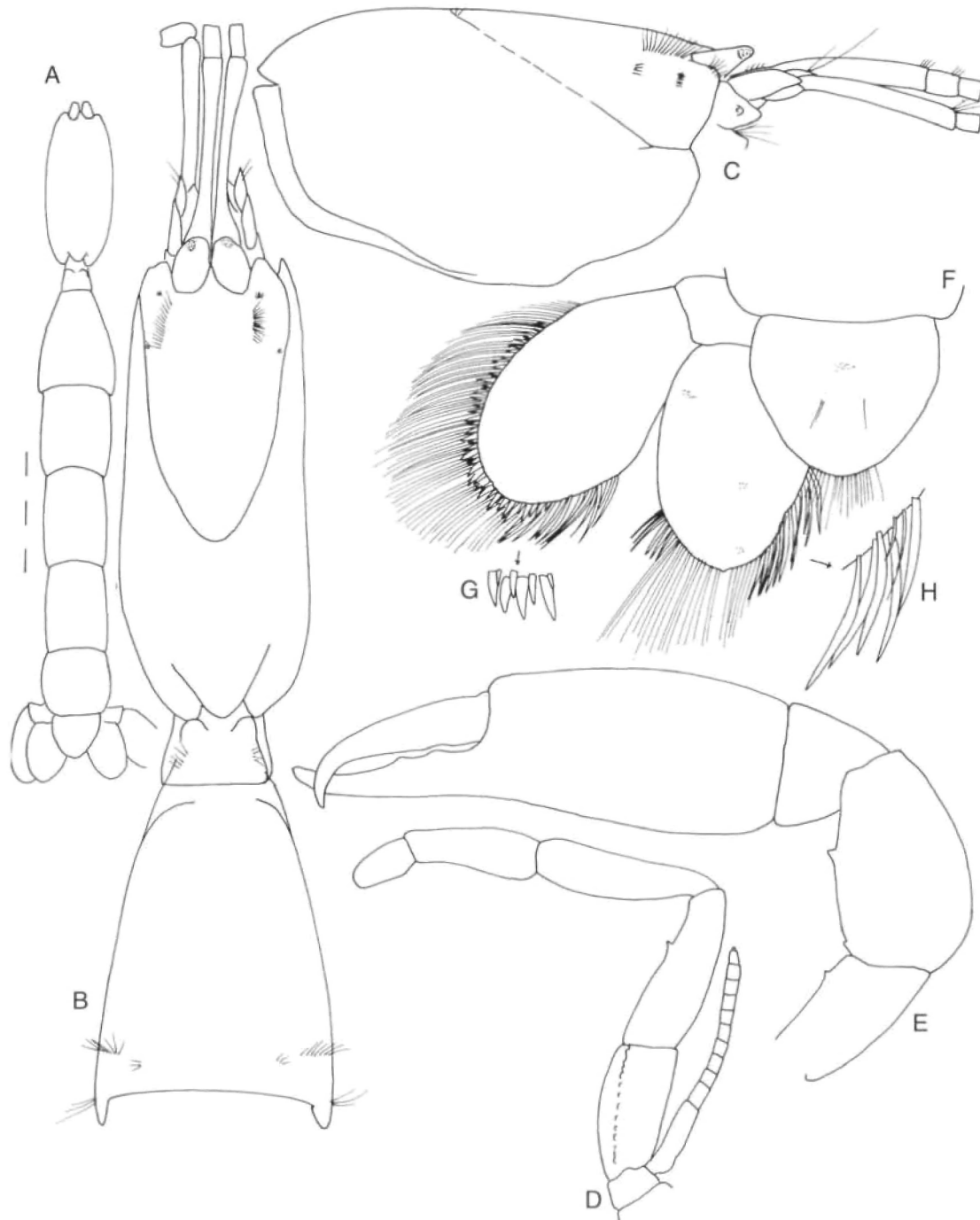


FIG. 23. — *Michelea paraleura* n.sp. **A**, habitus sketch; **B**, cephalothorax and abdominal somites 1 and 2; **C**, cephalothorax; **D**, maxilliped 3; **E**, right cheliped; **F**, telson and uropod; **G**, spiniform setae on margin of uropodal exopod; **H**, spiniform setae on margin of uropodal endopod. All figures from holotype.

without marginal setal-row along edge of pleuron, oblique setal-row of about twelve setae, and transverse setal-row of about ten setae. All abdominal somites with groups of long setae dorsally. Eyestalks slightly flattened, cornea distal.

Antenna 1 with elongate waisted article 1, about half as long as cephalothorax; articles 2 and 3 subequal, each about one-sixth length of article 1. Antenna 2 with distinct articulating acicle, about 0.6 length of article 2; article 4 reaching to end of article 2 of antenna 1; article 5 short.

Maxilliped 1 epipod as in *M. leura*. Maxilliped 2 exopod minute; epipod reduced. Maxilliped 3 ischium with obsolete crista dentata of ten blunt teeth; merus with mesial tooth; carpus-dactylus longer than ischium-merus, widest point of car-

pus quarter carpal length; exopod with flagellum reaching beyond middle of merus; epipod narrow.

Chelipeds equal; ischium with weak lower tooth; merus with weak tooth on convex lower margin, upper margin strongly convex; carpus unarmed; propodus swollen proximally and tapering; fixed finger 0.4 length of propodus, its cutting edge with obsolete teeth, curved apically; dactylus curved apically, equal to fixed finger.

Pereopod 2 essentially as in *M. leura*.

Pereopod 3 propodus twice as long as wide, with four rows of one, two, two and five spiniform setae on lower-mesial margin, and two transverse setal-rows of five setae; dactylus with four spiniform setae on upper-mesial margin.

Pereopod 4 propodus 2.8 times as long as wide,



FIG. 24. — *Michelea paraleura* n.sp. **A**, right pereopod 2; **B**, details of fingers; **C**, right pereopod 3; **D**, right pereopod 4; **E**, ♂ pleopod 1; **F**, ♀ pleopod 2; **G**, ♂ appendices interna and masculina. Figures E, G, from NMV J22685; others from holotype.



five transverse rows of two-six spiniform setae on lower-mesial margin, two setal-rows of four setae; dactylus with six spiniform setae on upper-mesial margin.

Pleopod 1 of female of two short articles. Pleopod 1 of male with medial margin bearing hooks. Pleopod 2 endopod with seventy-seven marginal lamellae distally and laterally; male appendix interna 3 times as long as wide; appendix masculina twice as long as appendix interna; exopod with about twenty lateral lamellae. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod broadly ovate, 1.5 times as long as wide, with minute apical tooth, medial margin with numerous blade-like setae; exopod 1.6 times as long as wide, with numerous spiniform setae laterally and distally. Telson about 0.8 times as long as wide, distally tapering to rounded apex.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	r	r	r	-
Podobranch	-	-	f	f	f	f	-	-
Arthrobranch	-	-	1	2	2	2	2	-

Epipods broader anteriorly than posteriorly; podobranchs filamentous (f).

#### REMARKS

*Michelea paraleura* is distinguished from *M. leura*, with which it was originally confused, in body proportions (longer abdominal somites relative to cephalothorax), longer telson, and spiniform and blade-like setae on the uropodal rami.

#### *Michelea pillsburyi* Kensley et Heard, 1991

*Michelea pillsburyi* Kensley et Heard, 1991: 497, 522-524, figs 18, 19.

DISTRIBUTION. — Caribbean coast of Panama; 28-59 m depth.

#### REMARKS

The species was well illustrated by the original authors and not re-examined.

#### *Michelea vandoverae* (Gore, 1987)

*Callianidea vandoverae* Gore, 1987: 186-194, figs 1-4.

*Michelea vandoverae*. — Kensley & Heard 1991: 496, 523-527, figs 20, 21.

MATERIAL EXAMINED. — **SW Caribbean Sea.** 10°00'N - 76°05'W, 146-162 m, 28.V.1964, Gulf and South Atlantic Fisheries Exploration, Bureau of Commercial Fisheries (RV *Oregon* stn 4904), USNM 273140 (1 specimen).

DISTRIBUTION. — Gulf of Mexico and Caribbean Sea; 37-162 m depth.

#### REMARKS

This species has already been well described and figured. It differs from all others in the genus in the possession of a pleurobranch and the 2-segmented nature of the pleopodal lamellae which attach to all margins of the rami.

#### Genus *Tethisea* Poore, 1994

*Tethisea* Poore, 1994: 99, 100.

TYPE SPECIES. — By original designation: *Tethisea indica* Poore, 1994.

#### DIAGNOSIS

Rostrum flat, well exceeding eyes, medially and laterally carinate and setose. Eyes not visible in dorsal view. Anterolateral cephalothorax with one vertical setal-row near cervical groove. Abdominal somites 1 and 2 with one lateral setal-row, abdominal somites 3-5 with none, abdominal somite 6 with two converging setal-rows; abdominal somites 3-5 with dense dorsal patches of plumose setae. Antenna 1 peduncle article 1 moderately elongate. Scaphocerite more than half length of antenna 2 peduncle article 4. Maxilliped 1 exopod with setose flagellum. Maxilliped 3 with crista dentata; merus with strong mesial row of setae; exopod very short. Pereopod 1 fixed finger with sharp curved tooth one-third way along; with thickened setae in gape. Pereopod 2 fixed finger with even contiguous spiniform setae; dactylus as long as fixed finger. Pereopods 3 and 4 without lateral spiniform setae on propodus and dactylus.

Pereopod 4 carpus without distal ridge on upper margin; propodus with one transverse setal-row. Pleopods 2-5 without marginal lamellae. Uropodal endopod with anterolateral margin convex, ending by curving to rounded posterior margin. Uropodal exopod anterolateral margin ending squarely, broader than endopod. Telson as broad as long, weakly constricted, distally truncate. Epipods with lamellate podobranchs well developed except on last. Arthrobranchs well developed. Pleurobranchs 5-7 present.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	1	1	1	1	1	1	-	-
Podobranch	-	-	r	1	1	1	-	-
Arthrobranch	-	-	2	2	2	2	2	-
Pleurobranch	-	-	-	-	1	1	1	-

#### COMPOSITION

*T. indica* Poore, 1994, *T. mindoro* n.sp.

#### REMARKS

*Tethisea* is most similar to *Marcusiarius* and *Meticonaxius* in the possession of a rostrum and of pleurobranchs. The most obvious differences are the absence of setal-rows on abdominal somites 3-5, the presence of specialised thickened setae in the gape of pereopod 1, and the more ovate shape of the uropodal endopod. The genus is confined to two species in the Indian Ocean and tropical West Pacific.

***Tethisea indica*** Poore, 1994  
(Figs 25, 26)

*Tethisea indica* Poore, 1994: 100.

MATERIAL EXAMINED. — Type material.

DISTRIBUTION. — Mozambique, La Réunion, Indonesia, New Caledonia; 165-460 m depth.

#### DESCRIPTION

Cephalothorax 0.35 total length, about 1.2 times as deep as wide; rostrum triangular, slightly depressed distally, with dorsal setae along lateral carinae, 1.5 times as long as broad at base of eyes, lateral margins convex such that eyes are

invisible from dorsal view, twice as long as eye-stalks; lateral carinae extending on to cephalothorax, without medial carina; cervical groove weakly defined; dorsoposterior margin a convex medial lobe, separated from posterolateral margins; one setal-row of three setae only.

Abdominal somite 1 narrower than second, with anterolateral lobes overlying posterolateral margins of cephalothorax; pleuron with minute marginal spine; dorsolateral setal-row of seven setae. Abdominal somite 2 1.5 times as long as first, pleuron broadly overlapping first somite; transverse setal-row of about seven setae. Abdominal somites 3-5 without setal-rows. Abdominal somite 6 with marginal setal-row of about twenty setae diverging anteriorly from edge of pleuron, and transverse setal-row of about ten setae.

Eyestalks acute distally, cornea distal.

Antenna 1 with article 1 shorter than rostrum; articles 2 and 3 subequal, each about half length of article 1; flagella each of about ten articles, longer than peduncle. Antenna 2 with long acute articulating acicle, longer than article 2; article 4 reaching to middle of article 3 of antenna 1; article 5 short.

Mandible and maxillae as in *Meticonaxius*. Maxilliped 1 with endopod 0.6 length of basal endite, exopod longer than endite, with a linear second article at right-angle to first, epipod lobes narrow, proximal lobe much longer. Maxilliped 2 exopod as long as endopodal ischium; epipod small. Maxilliped 3 ischium with strong cristadentata of eight blunt teeth; merus without mesial tooth; ischium-merus with dense mesial rows of long setae; carpus-dactylus longer than ischium-merus, widest point of carpus quarter carpal length; exopod minute.

Chelipeds equal; ischium with distal spine on lower margin; merus with two spines on lower margin, upper margin strongly convex; carpus unarmed; propodus swollen proximally and tapering; fixed finger 0.3 length of propodus, its cutting edge sinuous; gape wide, with six long spiniform setae laterally; dactylus cutting edge curved distally, opposing fixed finger.

Pereopod 2 merus-propodus with lower marginal rows of long setae; carpus half length of merus; propodus as long as carpus, with setal-row of three short setae; fixed finger cutting edge with

numerous contiguous spiniform setae; dactylus longer than fixed finger, straight.

Pereopod 3 propodus 1.3 times as long as wide, upper margin slightly convex, lower margin convex, one oblique setal-row of six setae; dactylus broad.

Pereopod 4 propodus twice as long as wide, one oblique setal-row of four setae; dactylus broad.

Pleopods 1 of male 2-articled, second article 3 times as long as wide, with medial lobe

bearing about 9 minute hooks. Pleopods 1 of female 2-articled. Pleopod 2 of male with appendix interna one-third length of endopod; appendix masculina twice as long and broad as appendix interna; exopod twice as long as broad. Pleopod 2 of female endopod 3.5 times as long as wide; appendix interna 6 times as long as wide; exopod 2.5 times as long as wide, ovate. Pleopods 3-5 essentially similar to pleopod 2 of female.

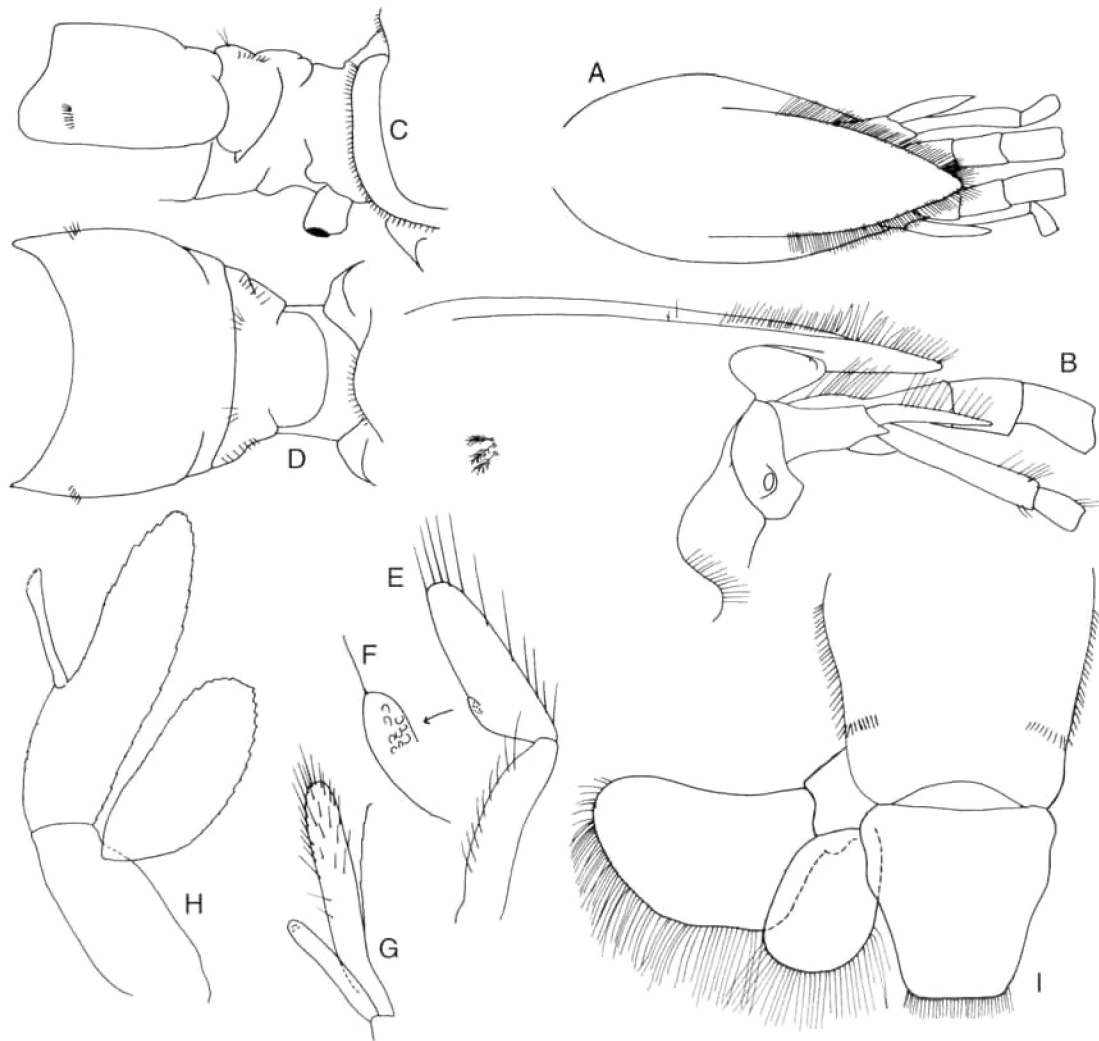


FIG. 25. — *Tethisea indica* Poore. A, B, anterior cephalothorax; C, D, posterior cephalothorax, abdominal somites 1 and 2; E, ♂ pleopod 1; F, detail of appendix interna; G, ♂ pleopod 2; H, ♀ pleopod 2; I, abdominal somite 6, telson and uropod. Figures E-G from MNHN Th-1219; C, D from MNHN Th-1216; others from holotype.

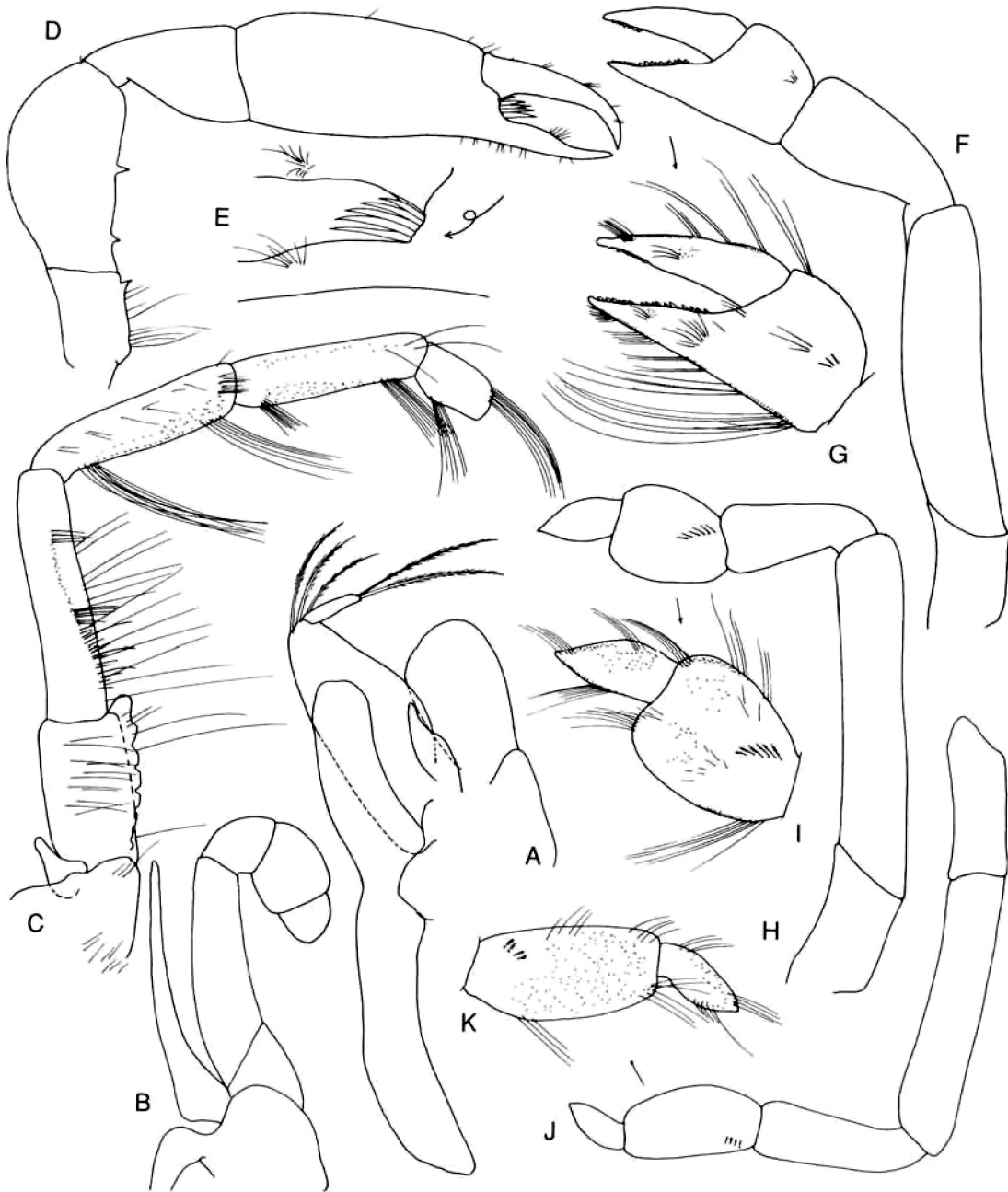


FIG. 26. — *Tethisea indica* Poore. A, maxilla 2; B, maxilliped 2; C, maxilliped 3; D, left cheliped; E, details of setae in gape of fingers; F, left pereopod 2; G, propodus and dactylus; H, left pereopod 3; I, propodus and dactylus; J, right pereopod 4; K, propodus and dactylus. All figures from holotype.

Uropodal endopod with anterior margin convex, ending by curving to rounded posterior margin, 1.3 times as long as wide; exopod with concave anterior margin, apically rounded, posterior margin broadly lobed, 1.7 times as long as wide. Telson as long as wide, tapering to rounded-

truncate apex beyond constriction one-third way along.

## REMARKS

*Tethisea indica* was briefly diagnosed on the basis of thirteen specimens by Poore (1994). The spe-

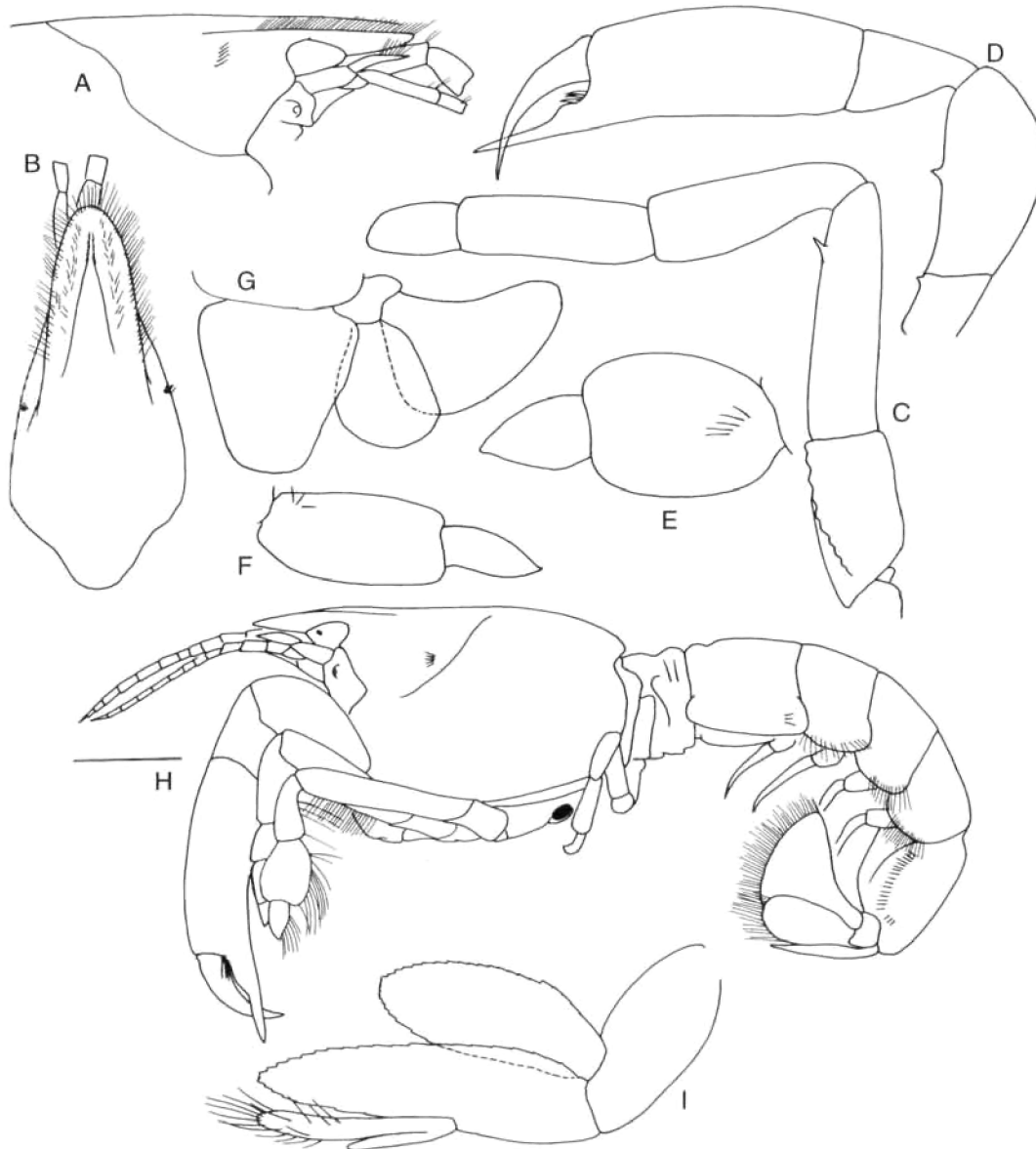


FIG. 27. — *Tethisea mindoro* n.sp. A, B, cephalothorax; C, maxilliped 3; D, right cheliped; E, propodus and dactylus of pereopod 3; F, propodus and dactylus of pereopod 4; G, telson and uropod; H, habitus; I, ♂ pleopod 2. Figures H, I from NMV J17915; others from holotype.

cies is distinguished from the only other in the genus by the acute rostrum and broader uropodal rami. The material comes from a wide geographic range in the Indo-West Pacific region, from eastern Africa to New Caledonia but there is little variation between the specimens.

*Tethisea mindoro* n.sp.  
(Fig. 27)

MATERIAL EXAMINED. — **Philippines.** W of Mindoro (12°31.2'N - 120°39.3'E), 92-97 m, rectangular dredge, 3.VI.1985, (MUSORSTOM stn DR117), MNHN Th-1222 (holotype, ♀, cl. 5.1 mm).

**Western Australia.** North-west Shelf, between Port Hedland and Dampier (18°41'S - 118°39'E), 134 m, muddy sand, WHOI epibenthic sled, G. C. B. Poore and H. M. Lew Ton (R. V. *Soela*, stn NWA 21), 4.VI.1983, NMV J17915 (♂, cl. 5.0 mm), NMV J16607 (♀, cl. 7.1 mm), NMV J3648 (♂, cl. 3.6 mm), NMV J17216 (3 specimens, cl. 2.0-4.8 mm), MNHN Th-1304 (♂, cl. 3.7 mm; ♀, cl. 4.5 mm).

ETYMOLOGY. — For Mindoro, the type locality (noun in apposition).

DISTRIBUTION. — Philippines, north-western Australia; 92-134 m depth.

DIAGNOSIS

Rostrum rounded, 1.3 times as long as broad at base of eyes; posterior setal-row of five setae only. Maxilliped 3 merus with mesial tooth; exopod absent.

Cheliped merus with one spine on lower margin. Uropodal endopod with convex anterior margin, apically rounded, posterior margin broadly lobed, 1.3 times as long as wide; exopod with anterior margin deeply convex, ending by curving to rounded posterior margin, 1.5 times as long as greatest width. Telson as long as wide, tapering to rounded-truncate apex, constriction weak.

REMARKS

*Tethisea mindoro* differs from *T. indica* in the broader less acute rostrum, more tapering uropodal exopod, more evenly curved dactylus of pereopod 1, and very short exopod on maxilliped 2. The male pleopods 1 and 2 are little narrower than in *T. indica* but are of the same form. There seem no significant differences between the holo-

type from the Philippines and the collection of non-type specimens from north-western Australia.

Family THOMASSINIIDAE de Saint Laurent, 1979

Thomassiniinae de Saint Laurent, 1979: 1396. — de Saint Laurent & Le Locuff 1979: 95. — Sakai 1992: 18.

Thomassiniidae. — Manning & Felder 1991: 765. — Poore 1994: 104.

Callianideidae. — Kensley & Heard 1991: 497, 498 (in part).

TYPE GENUS — *Thomassinia* de Saint Laurent, 1979.

DIAGNOSIS

Firm-bodied or soft thalassinidean shrimps. Rostrum absent or present only as sharp spine. Linea thalassinica lateral to eyestalks, complete or incomplete. Cephalothorax usually broad, ending posteriorly as a median convexity not separate from posterolateral margins of carapace. Without anterolateral lobes on abdominal somite 1, anterodorsal tergite weak; no thickening of posterolateral carapace margins. Thoracomere 7 sternite broad and visible between coxae as a flat plate. Coxa 4 flattened, immobile, without condyle with thoracomere 7. Abdominal somite 1 almost as long as abdominal somite 2 and with pleuron broadly rounded (rarely acute). Abdominal somite 2 pleuron not overlapping abdominal somite 1. Cephalothorax, rostrum, abdomen, telson and all limbs without armature. Anterior cephalothorax and at least abdominal somites 1 and 6, sometimes others, with weak lateral setal-rows; lateral surfaces of propodi of pereopods 2-4 sometimes with similar setal-rows. Antenna 1 peduncle article 1 as long as 2 and 3. Antenna 2 with scaphocerite minute, barely articulating. Mandibular incisor toothed anteriorly and posteriorly, symmetrical. Maxilla 2 scaphognathite with one long seta extending into branchial chamber. Maxilliped 3 pediform, sometimes specialised; exopod present or absent. Pereopods 1 unequal; merus ovate, with convex posterior margin; proximal part of propodus broad (about as long as wide); fingers shorter

than proximal part. Pereopod 2 chelate. Pereopods 2-4 with flattened propodi. Pereopods 3 and 4 propodi (or at least 3) bearing single distal spiniform seta on lower margin. Epipods linear, reduced anteriorly; podobranchs rudimentary or absent; arthrobranchs various, present, reduced or lost; pleurobranchs absent. Male pleopod 1 absent. Appendix masculina fused to appendix interna (rarely separate). Pleopod 2 not modified, similar to pleopods 3-5; all foliaceous and with well developed appendix interna. Uropodal exopod without suture; endopod more or less ovate.

## COMPOSITION

*Crosniera* Kensley *et* Heard, 1991; *Mictaxius* Kensley *et* Heard, 1991; *Thomassinia* de Saint Laurent, 1979.

## REMARKS

The Thomassiniinae were originally described on the basis of a single species as a subfamily of the Callianassidae (de Saint Laurent 1979) and

implicitly elevated to family level by Manning & Felder (1991) in a review of American callianassid and ctenochelid genera. The Callianassidae *s.s.* as defined by Manning & Felder (1991) are characterised by pleopods 1 and 2 being sexually modified and pleopods 3-5 being broadened and similar. The Thomassiniidae differ in that pleopod 2 is not different from those that follow, and in having the lineae thalassinicae close together in such a way that there are no ocular lobes as in true callianassids. Further, the maxilla 2 scaphognathite bears a long posterior seta, absent from the callianassids, and there are usually pereopodal epipods present.

The three genera were included in Callianideidae as a single clade by Kensley & Heard (1991) and grouped as a family-level taxon by Sakai (1992). Poore (1994) showed that Thomassiniidae were the sister-taxon of Callianideidae and their similarity to Micheleidae more remote. Thomassiniidae and Callianideidae together were shown to be the sister-taxon of Callianassidae and Ctenochelidae.

## KEY TO GENERA OF THOMASSINIIDAE

1. Maxilliped 3 with brush of stiff setae on ischium and merus; uropodal endopod with oblique transverse row of spiniform setae ..... *Thomassinia*
- Maxilliped 3 without brush of stiff setae on ischium and merus; uropodal endopod without oblique transverse row of spiniform setae ..... 2
2. Rostrum spike-like; maxillipedal 3 exopod as long as merus ..... *Crosniera*
- Rostrum obsolete, maxillipedal 3 exopod vestigial or absent ..... *Mictaxius*

Genus *Crosniera* Kensley *et* Heard, 1991

*Crosniera* Kensley *et* Heard, 1991: 500, 501.

TYPE SPECIES. — By original designation: *Callianassa minima* Rathbun, 1901.

## DIAGNOSIS

Rostrum spike-like. Linea thalassinica incomplete. Eyestalk flattened. Antenna 1 scaphocerite minute and articulating. Maxilliped 1 exopod flagellate. Maxilliped 3: exopod as long as merus;

ischium and merus without brush of stiff setae. Pereopods 1 dissimilar. Pereopod 2 with moderately broad propodus. Pereopods 2-4 without setal-rows; abdominal somite 1 usually with setal-row; somites 2-5 with or without setal-rows; abdominal somite 6 typically with three setal-rows. Uropodal endopod without transverse row of short spiniform setae; exopod simply ovate. Male pleopod 1 present. Appendix masculina and appendix interna separate and elongate or fused; appendix masculina with stiff setae.

## Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	-	1	1	1	1	1	1	-
Podobranch	-	-	r	r	r	r	r-0	-
Arthrobranch	-	-	2	2	2	2	2	-

## COMPOSITION

*C. corindon* n.sp.; *C. minima* (Rathbun, 1901);  
*C. panie* n.sp.

## REMARKS

The diagnosis of Kensley & Heard (1991) does not contradict that given here but it does include characters which are now considered of family status or variable. The spike-like rostrum is the most obvious diagnostic character. The genus is most easily distinguished from rostrate callianasids with which it might superficially be confused by the presence of an incomplete linea thalassinica beginning at the base of the eyestalks, absence of ocular lobes between the linea and the rostrum, similarity of pleopod 2 to pleopods 3-5, and the well developed appendices interna and masculina.

*Crosniera* is assigned to the Thomassiniidae rather than to the Callianideidae or Meticonaxiidae on the basis of the possession of a linea thalassinica commencing anteriorly near the eyestalks, broad asymmetrical chelipeds, and a single spiniform seta on the propodus of pereopod 3 of some species.

Two additional species belonging to this genus are herein described: *C. panie* n.sp. is very similar to the type species and *C. corindon* n.sp. is more remotely related. Two other specimens in poor condition are described as possible members of the genus.

***Crosniera corindon* n.sp.**  
(Figs 28, 29A-H)

MATERIAL EXAMINED. — **Indonesia.** Makassar Strait (0°14.9'S - 117°51.7'E), 150 m, Okean grab (CORINDON 2, stn 207), 31.X.1980, MNHN Th-1217 (holotype, ♀, cl. 4.5 mm, tl. 14.8 mm).

ETYMOLOGY. — For the joint French-Indonesian CORINDON cruises in Indonesia.

DISTRIBUTION. — Indonesia; 150 m depth.

## DESCRIPTION

Rostrum slender, acute, reaching as long as eyes. Cephalothorax without mid-dorsal keel; linea thalassinica reaching posteriorly for half of cephalothorax length; without setal-row near anterior margin; cervical groove absent. Abdominal somite 1 without pleuron; setal-row of two setae; somites 3-5 with setal-rows of ca. five, five and ten setae; somite 6 without setal-rows, unarmed.

Eyestalk flattened, with convex lateral margin, cornea weak. Antenna 1 with peduncle article 3 reaching beyond distal margin of antenna 2 article 4; scaphocerite an acutely-tipped scale. Epistome not setose. Mouthparts essentially as in *C. minima*. Maxilliped 3 ischium with weakly dentate ridge mesially, merus with one small tooth on lower margin, dactylus narrowly ovate, exopod not reaching distal margin of ischium.

Pereopods 1 dissimilar, right larger on holotype. Larger cheliped ischium and merus unarmed; propodus carinate along upper and lower margins; fixed finger one-third length of whole propodus, with lateral tooth at about one-third of cutting edge; dactylus unarmed. Smaller cheliped fixed finger and dactylus more elongate. Pereopods 2 and 3 much broader than in *C. minima*. Pereopod 3 propodus with distal spiniform seta on lower margin. Pereopod 4 unknown. Pereopod 5 subchelate, dactylus much longer than fixed finger.

Thoracic sternite 7 broad, coxae of pereopods 4 flattened and widely separate.

Pleopod 1 of female geniculate, 2-articulate. Pleopod 2 with short appendix interna. Pleopods of male unknown.

Uropodal rami marginally setose; endopod 1.5 times as long as wide, ovate; exopod 1.5 times as long as wide, irregularly ovate. Telson 0.8 times as long as wide, unarmed, tapering over distal two-thirds to rounded apex.

## REMARKS

This specimen is placed in *Crosniera* on the basis of the general habitus, eyes, spine-like rostrum, pleopods, coxae 4, thoracic sternite 7, scaphocerite, telson and the broad larger cheliped. The main differences from the type species are the number of setal-rows on the cephalothorax, dactylus of pereopod 5 and the smaller cheliped.



*Crosniera minima* (Rathbun, 1901)

*Callianassa minima* Rathbun, 1901: 92, fig. 16. – Schmitt 1935: 5. – Biffar 1971: 651. – de Saint Laurent 1979: 1396. – de Saint Laurent & Le Loeuff 1979: 95. – Manning 1987: 397. – Manning & Felder 1991: 765.

*Crosniera minima*. – Kensley & Heard 1991: 496, 503-506, figs 5, 6. – Blanco Rambla & Liñero Arana 1994: 16-18, fig. 1.

MATERIAL EXAMINED. — **Puerto Rico**. Mayaguez Harbour, 45-35 m, U. S. Fisheries Commission (*Fish Hawk*, stn 6062), USNM 24668 (syntype, ♀, cl. 2.5 mm).

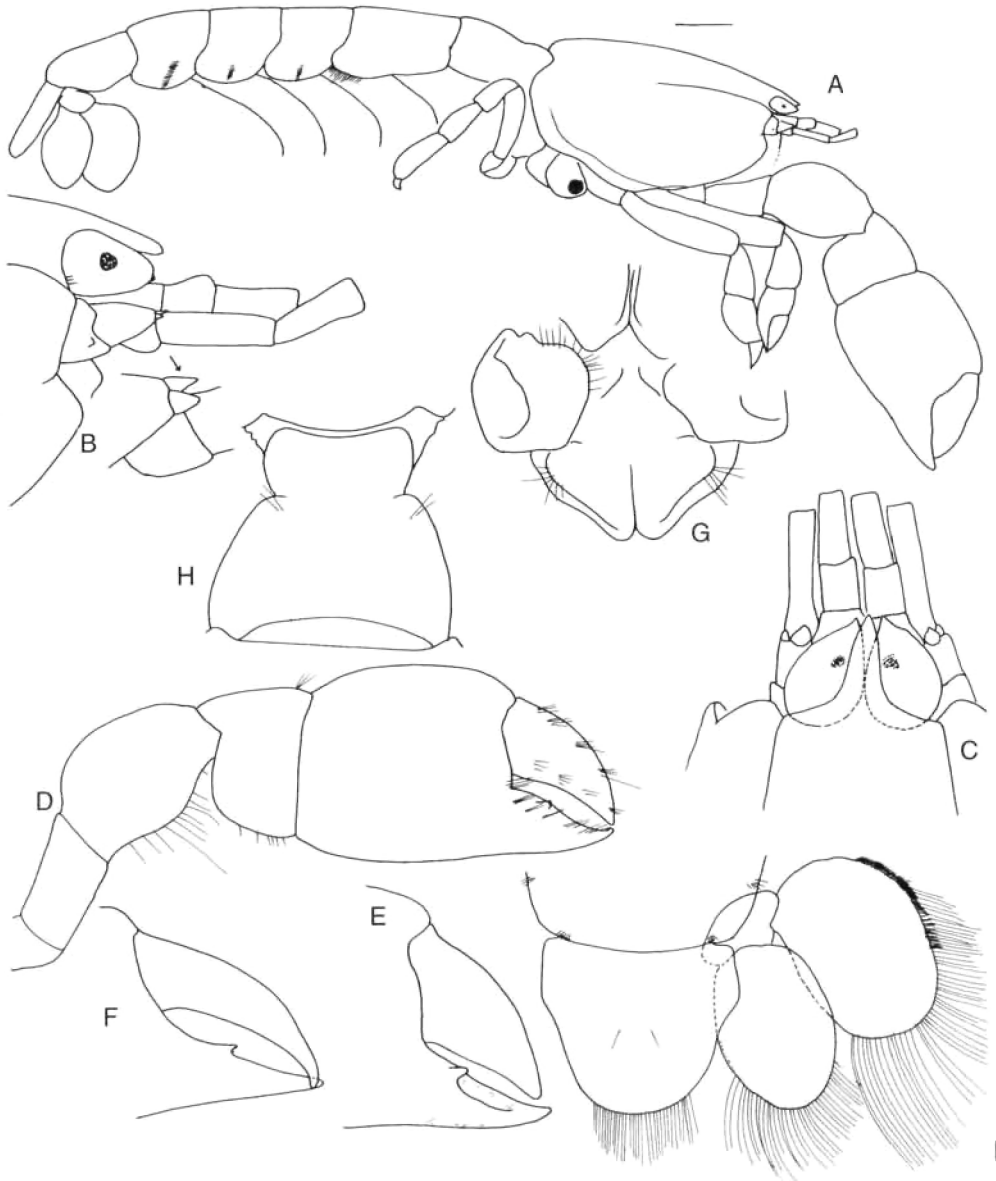


FIG. 28. — *Crosniera corindon* n.sp. A, habitus; B, C, anterior cephalothorax; D, right cheliped and E, fingers; F, fingers of left cheliped; G, sternum and coxa of pereopod 4; H, abdominal somite 1; I, abdominal somite 6, telson and uropod. All figures from holotype.

DISTRIBUTION. — Puerto Rico, Alabama, Venezuela; 35-75 m depth.

REMARKS

The numerous syntypes from Puerto Rico and off Alabama were listed by Kensley & Heard (1991) who described and figured this species in detail. Blanco Rambla & Liñero Arana (1994) recorded the species from Venezuela. The species is distinguished from *C. panie* by the weaker but more numerous spines on the telson, weaker dentition of smaller cheliped, separation of appendices interna and masculina, narrower pereopods, presence of setal-rows on abdominal somites 2-5, 2-articled pleopod 1, and the presence of propodal spines on pereopods 3 and 4.

*Crosniera panie* n.sp.  
(Figs 29I-N, 30)

MATERIAL EXAMINED. — **New Caledonia**. East Lagoon, near Mt Panié (20°33.25'S - 164°49.3'E), 40 m, B. Richer de Forges (ORSTOM, stn 0877), 13.I.1987, MNHN Th-1218 (holotype, ♂, cl. 2.8 mm, tl. 8.5 mm).

ETYMOLOGY. — Mont Panié is the highest mountain in New Caledonia, very near the type locality (noun in apposition).

DISTRIBUTION. — New Caledonia; 40 m depth.

DESCRIPTION

Rostrum slender, acute, reaching just beyond eyes. Cephalothorax with faint mid-dorsal keel on posterior third; linea thalassinica reaching posteriorly for two-thirds of cephalothorax length; vertical setal-row of eleven setae near anterior margin; cervical groove very weak. Abdominal somite 1 with acute pleuron; setal-row of fifteen setae; somites 2-5 without setal-rows; somite 6 with three setal-rows and with small laterally-directed hook on lower margin.

Eyestalk flattened, with convex lateral margin, cornea weak. Antenna 1 with peduncle article 3 reaching distal margin of antenna 2 article 4; scaphocerite reduced to small scale. Epistome setose. Mouthparts essentially as in *C. minima*. Maxilliped 3 ischium with row of spines mesially, merus with two small teeth on lower margin, exopod not reaching distal margin of ischium.

Pereopods 1 dissimilar, left wider and longer than right. Larger cheliped ischium with two spines on lower margin; merus unarmed; propodus carinate along upper and lower margins; fixed finger one-third length of whole propodus, with tooth at about one-third of cutting edge; dactylus with irregular cutting edge. Smaller cheliped ischium with two spines; merus unarmed; propodus carinate; fixed finger with proximal tooth; dactylus widely gaping, narrow, evenly curved, unarmed. Pereopods 2 and 3 similar but slightly broader than in *C. minima*. Pereopod 3 propodus with distal spiniform seta on lower margin. Pereopod 4 propodus without distal spiniform seta on lower margin. Pereopod 5 chelate. Thoracic sternite 7 broad, coxae of pereopods 4 flattened and widely separate.

Pleopods of female unknown. Pleopod 1 of male a simple curved cylindrical article. Pleopod 2 of male with appendix masculina fused to appendix interna, represented only by long stiff setae.

Uropodal rami marginally setose; endopod with anterior margin straight and ending in sharp tooth; exopod subcircular, little longer than wide. Telson as long as wide, with one strong lateral tooth, distal margin narrowly convex.

REMARKS

The very similar species, *C. minima*, was described and figured in detail by Kensley & Heard (1991). Differences were noted above. One difference is more profound than the others, *i.e.*, the pleopod 1 of the male of the new species is simpler, and pleopod 2 has the appendices masculina and interna fused. This might be because the single specimen is a juvenile male rather than full-grown but so little is known of growth stages that this hypothesis cannot be tested.

A rudimentary podobranch on pereopod 4 was noted. This was reported as missing in *C. minima* by Kensley & Heard but may have been overlooked.

*Crosniera* sp. 1  
(Fig. 31)

MATERIAL EXAMINED. — **Indonesia**. Sulu Archipelago (04°38.5'N - 119°49.43'E), 2570 m (ESTASE stn CP6), 5.XII.1984, MNHN Th-1225 (♂, cl. 5.7 mm, without pereopods).

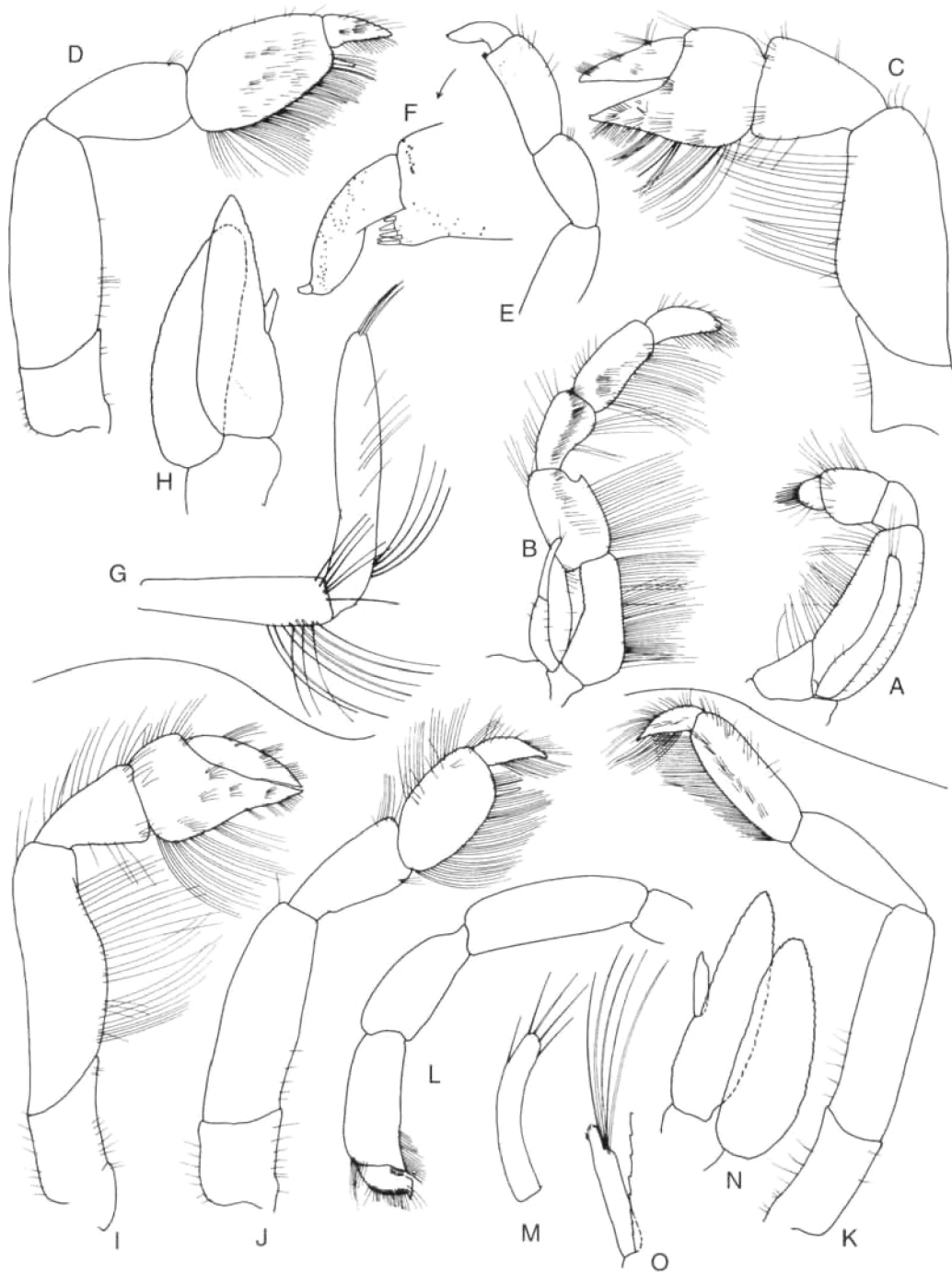


FIG. 29. — *Crosniera corindon* n.sp. A, maxilliped 2; B, maxilliped 3; C, left pereopod 2; D, right pereopod 3; E, right pereopod 5; F, details of fingers; G, ♀ pleopod 1; H, ♀ pleopod 2. All figures from holotype. *Crosniera panie* n.sp. I, right pereopod 2; J, right pereopod 3; K, left pereopod 4; L, left pereopod 5; M, ♂ pleopod 1; N, ♂ pleopod 2; O, fused appendices interna and masculina. All figures from holotype.



FIG. 30. — *Crosniera panie* n.sp. A, habitus; B, anterior cephalothorax; C, cephalothorax and abdominal somite 1; D, abdominal somite 1; E, maxilla 1; F, maxilla 2; G, maxilliped 2; H, maxilliped 3; I, left cheliped; J, right cheliped; K, sternum and coxae of pereopods 4 and 5; L, telson and uropod. All figures from holotype.

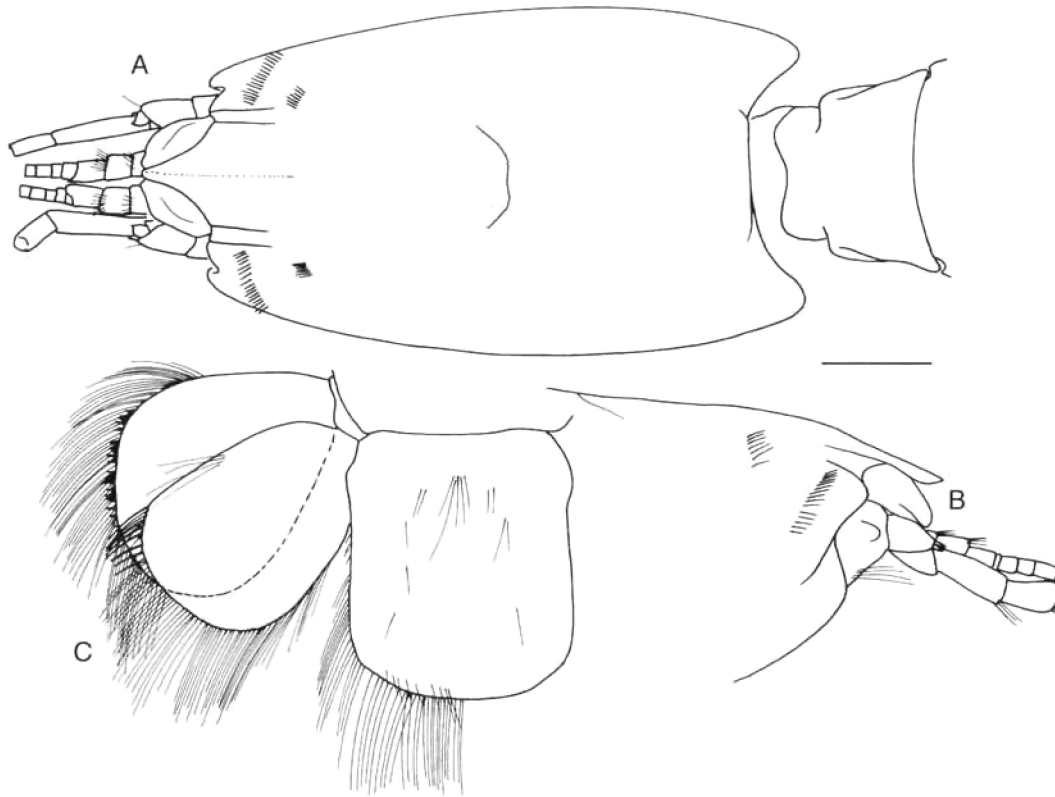


FIG. 31. — *Crosniera* sp. 1. **A**, cephalothorax and abdominal somite 1; **B**, anterior cephalothorax; **C**, telson and uropod. All figures from MNHN Th-1225.

#### DESCRIPTION

Rostrum broadly triangular, faintly carinate, reaching as far as eyes. Cephalothorax without mid-dorsal keel on posterior third; linea thalassinica very short, about one-tenth of cephalothorax length; vertical setal-row of fourteen setae near anterior margin, another of seven more posteriorly; cervical groove very weak. Abdominal somite 1 with pleuron weak, somite 2 with weakly overlapping pleuron and weak condyle; somites 1-5 without setal-rows; somite 6 with longitudinal setal-row.

Eyestalk flattened, tapering to distomesial lobe, cornea unpigmented. Antenna 1 with peduncle article 3 not reaching distal margin of antenna 2 article 4; scaphocerite a minute acutely-tipped scale. Epistome not setose. Mouthparts essentially as in *C. minima*. Maxillipeds 2 and 3 ischium exopods well developed.

Pereopods unknown.

Thoracic sternite 7 broad, with anteriorly directed hooks laterally, coxae of pereopods 4 flattened, with anterior hooks, and widely separate.

Pleopods of female unknown. Pleopod 1 of male a simple article. Pleopod 2 of male with appendix masculina and appendix interna fused at base (as in *C. minima*).

Uropodal rami marginally setose; endopod 1.4 times as long as greatest width; exopod little longer than wide. Telson rectangular, 1.2 times as long as wide, with distal margin convex.

#### Branchial formula:

Thoracomere	1	2	3	4	5	6	7	8
Epipod	-	1	1	1	1	1	1	-
Podobranch	-	-	1	1	1	1	1	-
Arthrobranch	-	1	2	2	2	2	2	-

## REMARKS

The cephalothorax displays the rostrum (a little broader than in the other species), setal-row, eye, scaphocerite, and general shape of typical *Crosniera*. The linea thalassinica is in a similar position but does not extend far beyond the anterior margin. The male appendix interna and appendix masculina are the same as in *C. minima*. The telson is broader than in the named species of *Crosniera* and the epipods and podobranchs are better developed. There appears not to be a setal-row on abdominal somite 1. The generic placement of this specimen is tentative until the pereopods can be described but it seems best placed in *Crosniera* for the time being. The specimen comes from 2570 m depth, much deeper than for any other thomassiniid.

*Crosniera* sp. 2

MATERIAL EXAMINED. — **Mexico.** Angeles Bay, Gulf of California, 4 m (AHF stn 539.36), 3.III.1936, LACM ( $\delta$  in very poor condition, cl. 3.3 mm).

## REMARKS

The general habitus is similar to that of typical species of *Crosniera* in the possession of a spike-like rostrum, linea thalassinica close to eyestalks (short in this case), broad cheliped similar to the smaller one of *C. minima* and maxilliped 3 similar to *C. minima*. The propodi of pereopods 3 and 4 are slightly broadened (not lobate as in callianassids) and with distal spiniform setae. This is the only species with more than one distal spiniform seta on these propodi. The telson is rectangular rather than tapering, as in *Crosniera* sp. 1 and lacks the lateral spines seen in the type species.

The poor condition of the single specimen does not allow it to be described and its placement in *Crosniera* is tentative.

Genus *Mictaxius* Kensley et Heard, 1991

*Mictaxius* Kensley et Heard, 1991: 527.

TYPE SPECIES. — By original designation and monotypy: *Mictaxius thalassicola* Kensley et Heard, 1991.

## DIAGNOSIS

Rostrum obsolete. Linea thalassinica usually complete. Eyestalks moderately flattened, cornea present. Antenna 1 scaphocerite minute and articulating. Maxilliped 1 exopod of one article. Maxilliped 3: exopod reduced or absent; ischium and merus without brush of stiff setae. Pereopods 1 dissimilar. Pereopods 2-4 with setal-rows, pereopod 3 propodus very broad; abdominal somites 1-5 with setal-rows; abdominal somite 6 with three setal-rows. Uropodal endopod without transverse row of short spiniform setae; exopod apically bilobed or twisted. Pleopod 1 of male absent. Appendices interna and masculina fused, appendix masculina with stiff setae.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	-	1	1	1	1	1	r	-
Podobranch	-	-	r	r	r	r	-	-
Arthrobranch	-	-	2	2	2	2	2	-

## COMPOSITION

*M. arno* n.sp.; *M. thalassicola* Kensley et Heard, 1991.

## REMARKS

The new diagnosis differs from that of Kensley & Heard (1991) in the omission of family characters. Its species appear superficially like callianassids but are distinguished by the form of the linea thalassinica, absence of ocular lobes at the front of the cephalothorax, undifferentiated pleopod 2, the well developed appendix interna and fused appendix masculina.

The genus resembles *Crosniera* in the form of pleopods, antennae and thoracic sternite and coxae. Its differences from this genus are slight: the linea thalassinica is usually complete, the cornea is better developed, the uropodal exopod is twisted, the maxillipedal 3 exopod is absent, pereopods 2-4 are very broad and pereopod 5 is non-chelate, and the male pleopod 1 is absent. Kensley & Heard (1991) reported the uropodal exopod of *M. thalassicola* as "bilobed", implying similarity to callianassids. In the very similar species, *M. arno*, seen by me, the exopod is twisted so that the marginal setae are not in a single row, a situation different from that in callianassids.

*Mictaxius arno* n.sp.  
(Figs 32, 33A-G)

MATERIAL EXAMINED. — **Marshall Islands.** Arno Atoll, SE of Arno lagoon, 36 m, J. W. Wells, 22.VII.1950 (USNM acc. No. 19015), USNM 95570 (holotype, ♂, cl. 4.1 mm, tl. 14.5 mm).

ETYMOLOGY. — For Arno Atoll, type locality (noun in apposition).

DISTRIBUTION. — Marshall Islands; 36 m depth.

DESCRIPTION

Cephalothorax with a short triangular rostrum. Linea thalassinica running full length of cephalothorax; antennal angle rounded; anterior setal-row of ten setae; cervical groove weakly marked. Abdominal somite 1 with triangular pleuron, with setal-row of six setae; somite 2

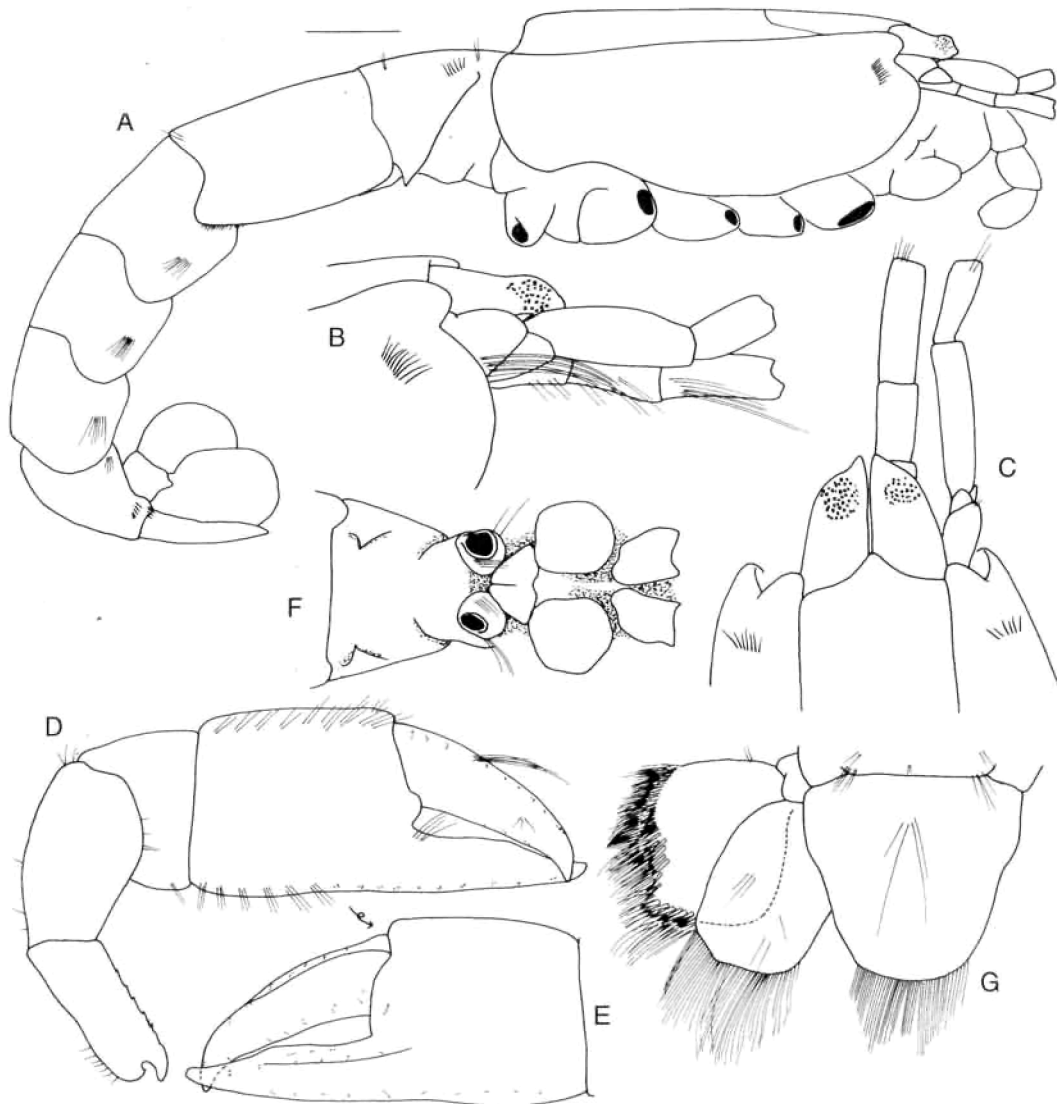


FIG. 32. — *Mictaxius arno* n.sp. A, habitus; B, C, anterior cephalothorax; D, left cheliped; E, propodus and dactylus of left cheliped; F, sternum, coxae of pereopods 3-5, abdominal somite 1; G, telson and uropod. All figures from holotype.

with broad pleuron; somites 2-5 without setal-rows; somite 6 with short setal-row.

Eyestalk tapering to narrowly rounded mediiodistal apex, cornea moderately pigmented, distal to midlength. Antenna 1 with peduncle article 3 longest. Antenna 2 peduncle as long as first; scaphocerite a small mobile semicircular scale. Epistome setose. Mouthparts as in *M. thalassicola*. Maxilliped 2 with well developed exopod. Maxilliped 3 ischium without crista dentata; ischium and merus unarmed; carpus-dactylus broad, as long as ischium-merus; exopod a small digitiform process.

Larger cheliped with ischium lower margin finely serrate; carpus with strongly convex lower margin; propodus flat, fixed finger 0.8 length of palm, with weak distal tooth on cutting edge; dactylus tapering. Smaller cheliped unknown. Pereopod 2 with setal-row of six setae on propodus. Pereopod 3 propodus about as long as wide, with one distal spiniform seta on lower margin, with setal-row of four setae. Pereopod 4 propodus 2.2 times as long as wide, with one distal spiniform seta on lower margin, with setal-row of four setae. Pereopod 5 not chelate, dactylus longer than fixed finger. Thoracic sternite 7 broad, coxae of pereopods 4 rounded and separate.

Pleopod 1 of male absent. Pleopod 2 of male with appendices masculina and interna totally fused, with three terminal stiff setae and apical hooks.

Uropodal endopod with more or less parallel sides, 1.4 times as long as wide, apex obtusely angled, setose; exopod as wide as long, twisted so that rows of marginal spiniform setae overlap. Telson as long as basal width, tapering to narrow rounded apex.

Branchial formula typical except for rudimentary arthropod 2 and poorly developed podobranchs and epipods.

#### REMARKS

The new species differs from *M. thalassicola* in the presence of a rudimentary arthrobranch 2, poorly developed podobranchs and epipods, longer and less rounded telson, uropodal exopod twisted rather than notched, endopod squarer, fewer setal-rows, and broader pereopods.

### *Mictaxius thalassicola*

Kensley *et* Heard, 1991

*Mictaxius thalassicola* Kensley *et* Heard 1991: 497, 527-530, figs 22-24.

DISTRIBUTION. — Atlantic coast of Panama; shallow water.

#### REMARKS

No material of this species was examined but the presence of a linea thalassinica, the form of the chelipeds and numerous other characters require that it and the genus of which it is type species be placed in the Thomassiniidae rather than any other family.

cf. *Mictaxius* sp. 1  
(Figs 33H-J)

MATERIAL EXAMINED. — **Tahiti.** Moorea I., Tiahura (17°30'S - 149°50'E), B. A. Thomassin (stn Tia 23), MNHN Th-1302 (♂ without pereopods, cl. 2.2 mm, tl. 8.0 mm; juvenile ♀ without pereopods, cl. 2.0 mm, dl. 7.2 mm).

#### DESCRIPTION

Cephalothorax 0.28 total length, about as deep as wide; rostrum a broadly based triangle, cervical groove visible only as transverse groove at 0.6 length of cephalothorax; linea thalassinica beginning at lateral margin of eyes, longitudinal and reaching cervical groove; dorsoposterior margin excavate, continuous with posterolateral margins; without setal-rows.

Abdominal somite 1 narrower than second, without anterolateral lobes, pleuron broadly rounded, without dorsolateral setal-rows. Abdominal somite 2 about as long as first, pleuron overlapping first somite. Abdominal somites 2-6 flattened, without setal-rows.

Eyestalks slightly flattened, adpressed, acute distoventrally, cornea distolateral.

Antenna 1 with article 1 shorter than eyestalk; article 2 shorter, 3 subequal to 1; flagella each of about eleven articles, longer than peduncle. Antenna 2 with minute acicle; article 4 reaching just beyond article 2 of antenna 1; article 5 half as long as 4.

Pleopod 1 of male absent. Pleopods 1 of juvenile female minute. Pleopod 2 endopod elongate-



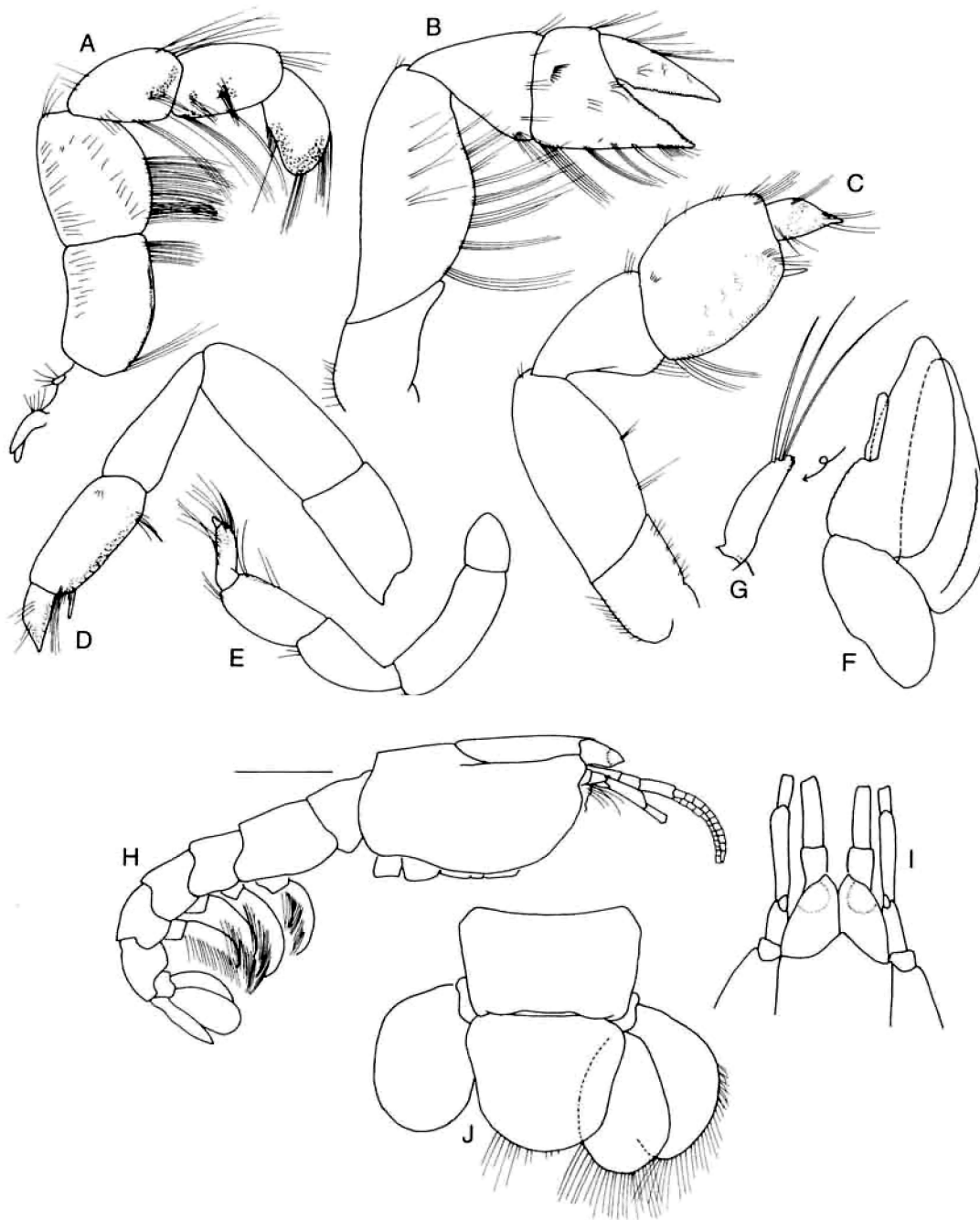


FIG. 33. — *Mictaxius arno* n.sp. **A**, maxilliped 3; **B**, right pereopod 2; **C**, right pereopod 3; **D**, left pereopod 4; **E**, right pereopod 5; **F**, pleopod 2; **G**, appendices interna and masculina. All figures from holotype. cf. *Mictaxius* sp. 1. **H**, habitus; **I**, anterior cephalothorax; **J**, abdominal somite 6, telson and uropod. All figures from MNHN Th-1302.

triangular, appendix interna 5 times as long as wide; appendix masculina represented by a ridge on anterior face of appendix interna; exopod 3 times as long as wide, triangular. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod ovate, 1.5 times as wide as long; exopod ovate, 1.5 times as long as wide, both setose. Telson length 0.8 times width, evenly tapering to rounded apex.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	-	-	1	1	1	1	-	-
Podobranch	-	-	1	r	r	r	-	-
Arthrobranch	-	-	1	2	2	2	2	-

#### REMARKS

These specimens have a similar habitus, rostrum, eyestalk, antennae and telson to the two known species of *Mictaxius* but differ in several features. The linea thalassinica is incomplete, the uropodal exopod is not twisted or bilobed, and there are fewer arthrobranchs. While the species is represented by such incomplete specimens, its generic placement is uncertain.

These specimens were collected with *Thomassinia moorea* n.sp.

Genus *Thomassinia* de Saint Laurent, 1979

*Thomassinia* de Saint Laurent, 1979: 1396. — Kensley & Heard 1991: 528, 529.

TYPE SPECIES. — By original designation: *Thomassinia gebioides* de Saint Laurent, 1979.

#### DIAGNOSIS

Rostrum obsolete. Linea thalassinica almost complete. Eyestalks moderately flattened, contiguous, cornea distal. Antenna 1 scaphocerite absent. Maxilliped 1 exopod of one article. Maxilliped 3: exopod absent; ischium and merus with brush of stiff setae. Pereopods 1 unequal. Pereopod 3 propodus very broad. Pereopods 2-4 without setal-rows; abdominal somite 1 with setal-row; abdominal somites 2-5 without setal-rows; abdominal somite 6 with three setal-rows. Uropodal endopod with transverse

row of short spiniform setae; exopod ovate, not bilobed. Appendices masculina and interna fused, appendix masculina without stiff setae.

#### COMPOSITION

*T. aimsae* n.sp.; *T. gebioides* de Saint Laurent, 1979; *T. moorea* n.sp.

#### REMARKS

This diagnosis of *Thomassinia* is considerably expanded and modified over that of de Saint Laurent (1979). For a general habitus of the genus see figure 34 of *T. aimsae* but the type species is illustrated in greatest detail. The genus is most easily recognised by the unique form of maxilliped 3, which bears a thick brush of straight stiff setae on the merus and ischium. It was originally placed in its own subfamily within the Callianassidae but differs from members of this family in several ways. The form of the linea thalassinica, close to the base of the eyestalks, absence of ocular lobe, homogeneity of pleopods 2-5, and presence of epipods separate this genus (and others in the family) from the Callianassidae.

#### *Thomassinia aimsae* n.sp. (Figs 34, 35)

MATERIAL EXAMINED. — **Australia.** Queensland, Davies Reef (18°50'S - 147°39'E), 5 m, (AIMS site 2), NMV J21766 (holotype, ♀, cl. 4.0 mm, tl. 19 mm).

ETYMOLOGY. — For AIMS, the Australian Institute of Marine Science, Townsville, Queensland, which collected the only specimen.

DISTRIBUTION. — Great Barrier Reef, Australia; 5 m depth.

#### DESCRIPTION

Cephalothorax 0.2 total length, about as deep as wide; rostrum very weak, cervical groove visible only as transverse groove at 0.7 length of cephalothorax; linea thalassinica beginning at lateral margin of eyes, longitudinal and reaching two-thirds along cephalothorax; dorsoposterior margin excavate, continuous with posterolateral margins; submarginal vertical setal-row of about twenty-five setae.

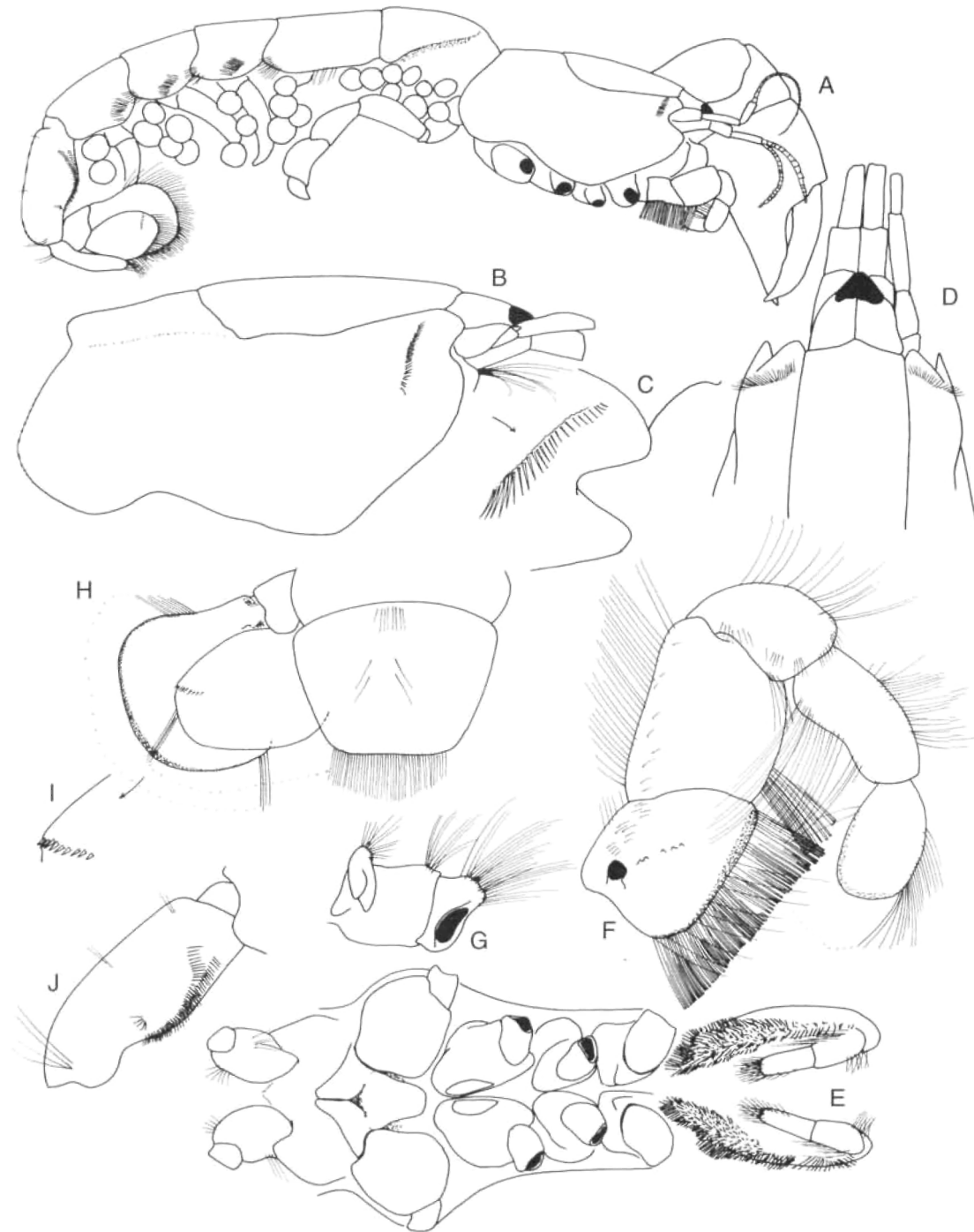


FIG. 34. — *Thomassinia aimsae* n.sp. A, habitus; B, cephalothorax; C, setal-row on anterior of cephalothorax; D, anterior cephalothorax; E, sternum, coxae and bases of peropods 1-5, maxillipeds 3; F, maxilliped 3; G, coxa and basis of maxilliped 3; H, telson and uropod; I, spiniform setae on uropodal endopod; J, right view of abdominal somite 6. All figures from holotype.

Abdominal somite 1 with dorsolateral setal-rows of five setae. Abdominal somites as in *T. gebioides*. Abdominal somite 6 with marginal setal-row of about thirty setae, oblique row of

thirty and transverse row of five setae. Eyestalks flattened, contiguous, acute mediodistally, cornea distal, weak. Antenna 1 with article 1 as long as eyestalk;

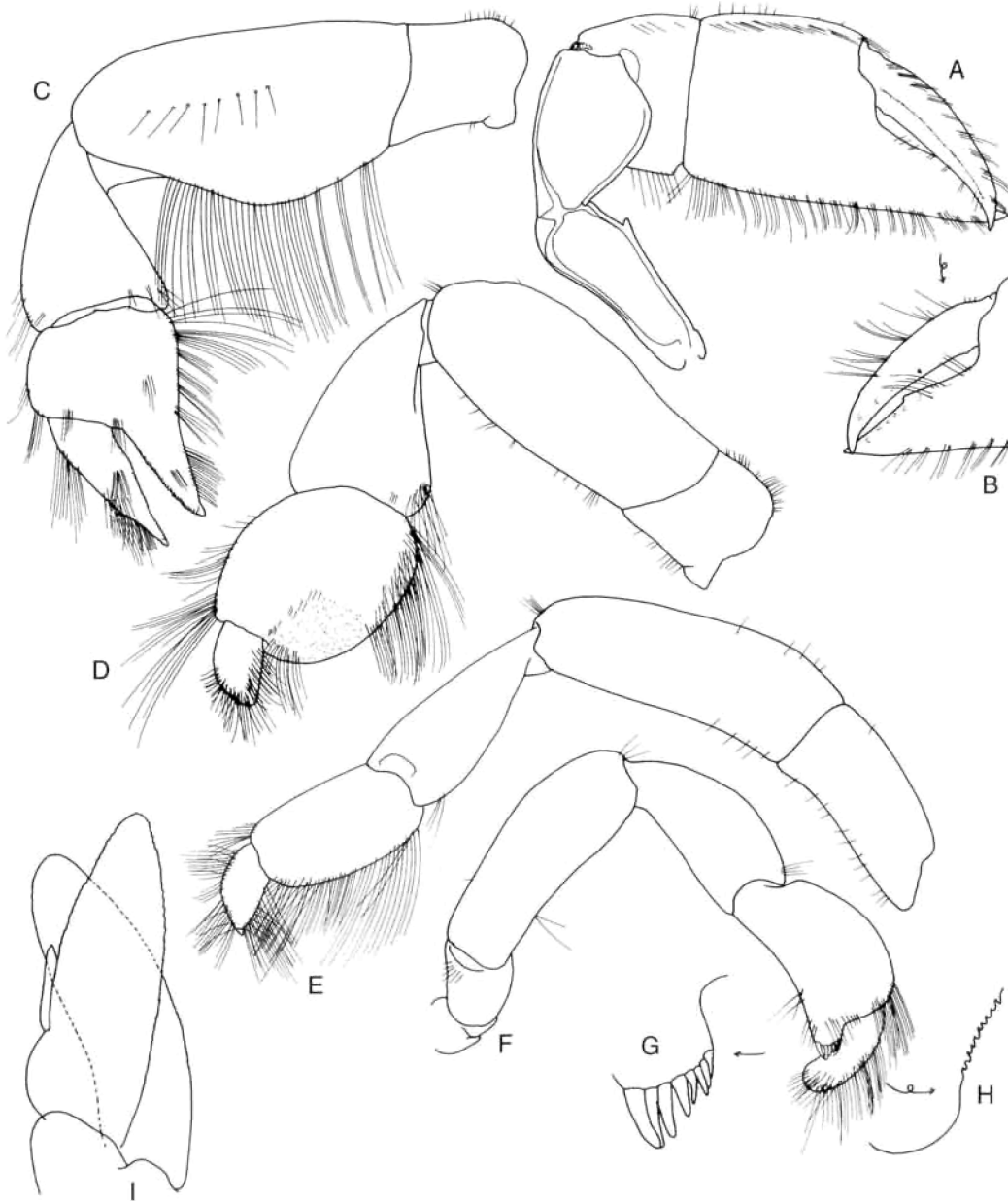


FIG. 35. — *Thomassinia aimsae* n.sp. A, left smaller cheliped; B, fingers; C, left pereopod 2; D, left pereopod 3; E, left pereopod 4; F, left pereopod 5; G, H, detail of fingers of pereopod 5; I, ♀ pleopod 2. All figures from holotype.

article 2 shorter, 3 subequal to 1; flagella each of twelve-fifteen articles, as long as peduncle. Antenna 2 without scaphocerite; article 4 reaching just beyond article 2 of antenna 1; article 5 half as long as 4; flagellum about as long as peduncle. Epistome with long setae.

Mouthparts as in *T. gebioides* except maxilliped 3 ischium with crista dentata of 5 minute teeth.

Only smaller cheliped known: ischium with weak lower tooth; merus 1.5 times as long as wide, with strongly convex lower margin, upper margin weakly convex; carpus unarmed; propodus broad, width half length; fixed finger half length of propodus, its cutting edge with obsolete tooth midway; dactylus cutting edge smooth, curved distally, equal to fixed finger.

Pereopods 2-5 similar to *T. gebioides* but propodus of 3 almost as wide as long and dactylus of 5 closing on eight spiniform setae.

Pleopods of male unknown. Pleopods of female as in *T. gebioides*.

Uropodal endopod triangular with broadly rounded lateral and mesial corners, with a transverse row of nine spiniform setae on anterolateral corner; exopod with anterolateral corner weakly produced, with dense marginal setae distally. Telson length 0.75 times width, evenly tapering to truncate apex.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	-	r	r	r	r	r	-	-
Podobranch	-	r	r	r	r	-	-	-
Arthrobranch	-	1	2	2	2	2	2	-

#### REMARKS

There are only small differences between this, an Australian species, and the type species from Madagascar. This specimen is notable for the possession of minute denticles indicating a very weak crista dentata on maxilliped 3. The single cheliped is assumed to be the smaller on the basis of comparison with other species. Figure 34E shows the ventral arrangement of the limbs, in particular the separation of the coxae of pereopods 4 and the attitude of the brush of maxillipeds 3.

*T. aimsae* is the only species in the genus in

which pereopod 3 lacks a podobranch. The linea thalassinica is very indistinct posterior to the cervical groove.

The specimen was well preserved before dissection and exhibited the solid connection between the cephalothorax and abdomen. Only slight articulation seems possible here and the animal seems designed to walk about the surface of the sediment cleaning detritus with the maxillipedal brush. Pereopod 5 is compact and can be held against a lateral concavity on abdominal somite 1.

#### *Thomassinia gebioides* de Saint Laurent, 1979 (Figs 36, 37)

*Thomassinia gebioides* de Saint Laurent, 1979: 1396.

MATERIAL EXAMINED. — **Madagascar.** Tuléar, B. A. Thomassin, MNHN Th-819 (holotype, ♂, tl. 8 mm); MNHN Th-818, with slide of figured specimen (12 paratypes of which 1 ♀ and a pair of first chelipeds are figured); NMV J34097 (9 topotypes).

#### DESCRIPTION

Cephalothorax 0.2 total length, about as deep as wide; rostrum almost non-existent, cervical groove visible only as transverse groove at 0.6 length of cephalothorax; linea thalassinica beginning at lateral margin of eyes, longitudinal and reaching three-quarters along cephalothorax; dorsoposterior margin excavate, continuous with posterolateral margins; submarginal vertical setal-row of six setae.

Abdominal somite 1 narrow, waisted to accept folded pereopod 5 laterally, depressed anteriorly, without anterolateral lobes; pleuron broadly rounded; dorsolateral setal-rows of five setae. Abdominal somite 2 about as long as first, pleuron not overlapping first somite. Abdominal somites 2-5 flattened, with group of long setae on posterior margin of pleuron, without setal-rows. Abdominal somite 6 with marginal setal-row of about forty setae, oblique row of thirty and transverse row of five setae.

Eyestalks slightly flattened, adpressed, acute distoventrally, cornea distal, ommatidia scattered.

Antenna 1 with article 1 shorter than eyestalk; article 2 shorter, 3 subequal to 1; flagella each of twelve-fifteen articles, longer than peduncle. Antenna 2 without scaphocerite; article 4 rea-

ching just beyond article 2 of antenna 1; article 5 half as long as 4; flagellum about as long as peduncle. Epistome with long setae.

Mandible incisor process with irregularly toothed cutting edge. Maxilla 2 endopod shorter than most distal endite; scaphognathite with one long

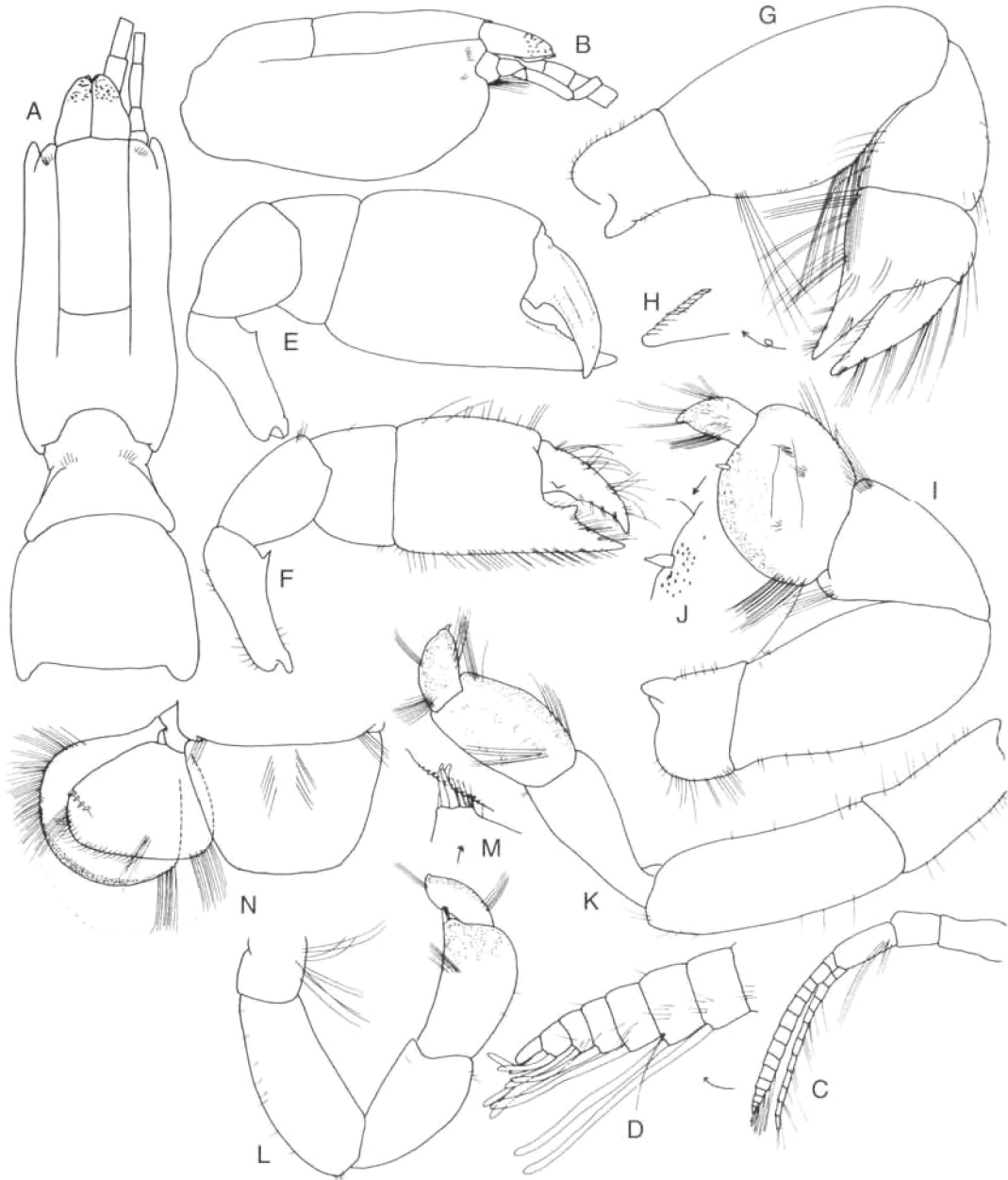


FIG. 36. — *Thomassinia gebioides* de Saint Laurent, 1979. A, cephalothorax and abdominal somites 1 and 2; B, cephalothorax; C, antenna; D, detail of tip of flagellum; E, left larger cheliped; F, left smaller cheliped; G, left pereopod 2; H, tip of dactylus; I, right pereopod 3; J, spiniform seta on propodus; K, left pereopod 4; L, right pereopod 5; M, detail of fingers; N, telson and uropod. Figures A-D, F, N from holotype; others from MNHN Th-818.

posteriorly-directed seta. Maxilliped 1 with endopod 2-articled, as long as basal endite, exopod broad, longer than endite, epipod with small narrow distal lobe and much longer proximal lobe. Maxilliped 2 exopod as long as endopodal merus; epipod broad, with podobranch. Maxilliped 3 ischium without crista dentata; merus about same length as ischium, without

mesial tooth; ischium-merus together broad, with dense brush of stiff setae along ischium and proximally on merus, each apically square rather than tapered; tapering setae elsewhere on all articles; carpus-dactylus about as long as ischium-merus, of similar width throughout; exopod absent; rudimentary epipod with rudimentary podobranch.

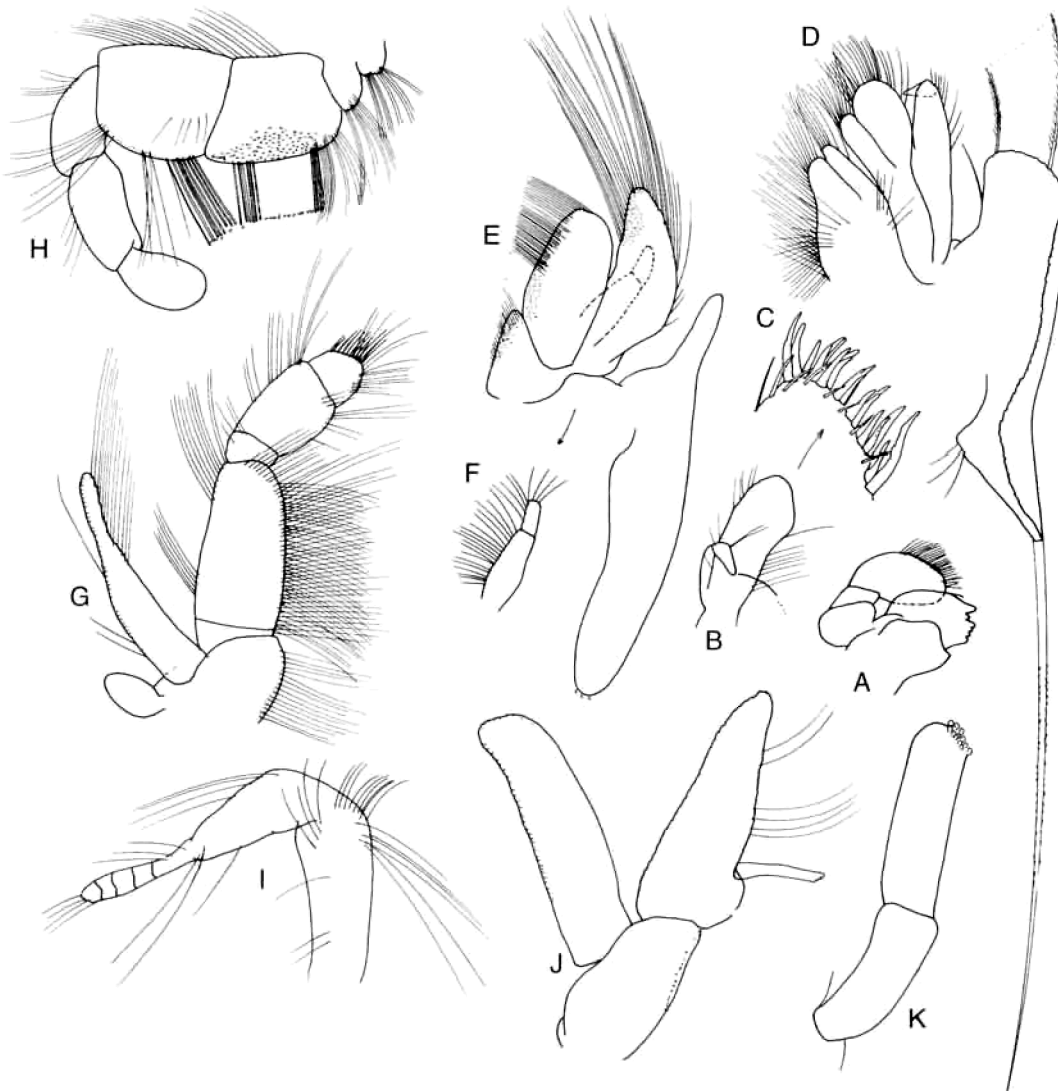


FIG. 37. — *Thomassinia gebioides* de Saint Laurent, 1979. A, mandible; B, maxilla 1; C, detail of tip of endite; D, maxilla 2; E, maxilliped 1; F, its endopod; G, maxilliped 2; H, maxilliped 3; I, ♀ pleopod 1; J, ♀ pleopod 2; K, ♂ appendices interna and masculina of pleopod 2. All figures from MNHN Th-818.

Chelipeds barely unequal. Larger cheliped ischium with weak lower tooth; merus 1.3 times as long as wide, with strongly convex lower margin, upper margin weakly convex; carpus unarmed; propodus broad, width 0.6 length; fixed finger third length of propodus, its cutting edge with obsolete tooth on proximal half; dactylus cutting edge with proximal tooth, curved distally, equal to fixed finger. Smaller cheliped with narrower merus, longer carpus, more elongate propodus, and with long marginal setae.

Pereopod 2 merus broad, twice as long as wide; carpus half as long as merus; propodus longer than carpus; fixed finger cutting edge finely toothed; dactylus as long as fixed finger, tip straight.

Pereopod 3 proximal articles broad; propodus wider than long, with spiniform seta on distal end of setose lower margin; dactylus much narrower than propodus.

Pereopod 4 coxa broad and flat, separated by broad anterior extension of sternal ridge, articles more linear than in pereopods 2 and 3; propodus 1.7 times as long as wide, setose; dactylus with apical spiniform seta.

Pereopod 5 compact, weakly chelate; dactylus finely serrulate, closing on three spiniform setae.

Thoracic sternite 7 especially broad, coxae of pereopods 4 well separated.

Pleopod 1 of male absent. Pleopods 1 of female geniculate. Pleopod 2 endopod triangular, appendix interna 5 times as long as wide; exopod 3.5 times as long as wide, strap-like. Pleopods 3-5 essentially similar to pleopod 2.

Uropodal endopod triangular with broadly rounded lateral and mesial corners, with a transverse row of five spiniform setae near lateral apex; exopod subcircular, anterolateral corner rounded evenly, with dense marginal setae distally. Telson length 0.8 times width, evenly tapering to rounded-truncate apex.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	-	r	r	r	r	r	-	-
Podobranch	-	r	r	r	r	r	-	-
Arthrobranch	-	1	2	2	2	2	2	-

#### REMARKS

This is the first detailed description of this spe-

cies which is only subtly different from the other two species described here.

#### *Thomassinia moorea* n.sp. (Fig. 38)

MATERIAL EXAMINED. — **Tahiti.** Moorea I., Tiahura (17°30'S - 149°50'E), B. A. Thomassin (stn Tia 23), MNHN Th-1220 (holotype, ♂, tl. 11.3 mm).

ETYMOLOGY. — For Moorea I., the type locality (noun in apposition).

DISTRIBUTION. — Tahiti.

#### DIAGNOSIS

Eyestalks closely adpressed and with acute mesial apex, angled distolaterally. Cephalothorax with submarginal setal-row of about fifteen setae. Larger cheliped fixed finger 0.4 length of propodus. Smaller cheliped with very weak tooth on fixed finger which is half length of propodus. Uropodal endopod with transverse row of nine spiniform setae. Telson length 0.6 width, distal margin almost straight. Pereopod 3 with podobranch.

Branchial formula (r = rudimentary):

Thoracomere	1	2	3	4	5	6	7	8
Epipod	-	r	r	r	r	r	-	-
Podobranch	-	r	r	r	r	r	-	-
Arthrobranch	-	1	2	2	2	2	2	-

#### REMARKS

Only a short diagnosis is presented as the species is very similar to *T. gebioides*. The elongate fingers and shape of the merus on the smaller chelipeds are similar to those seen in *T. aimsae* but the shorter telson and presence of podobranch 6 distinguish it from this species.

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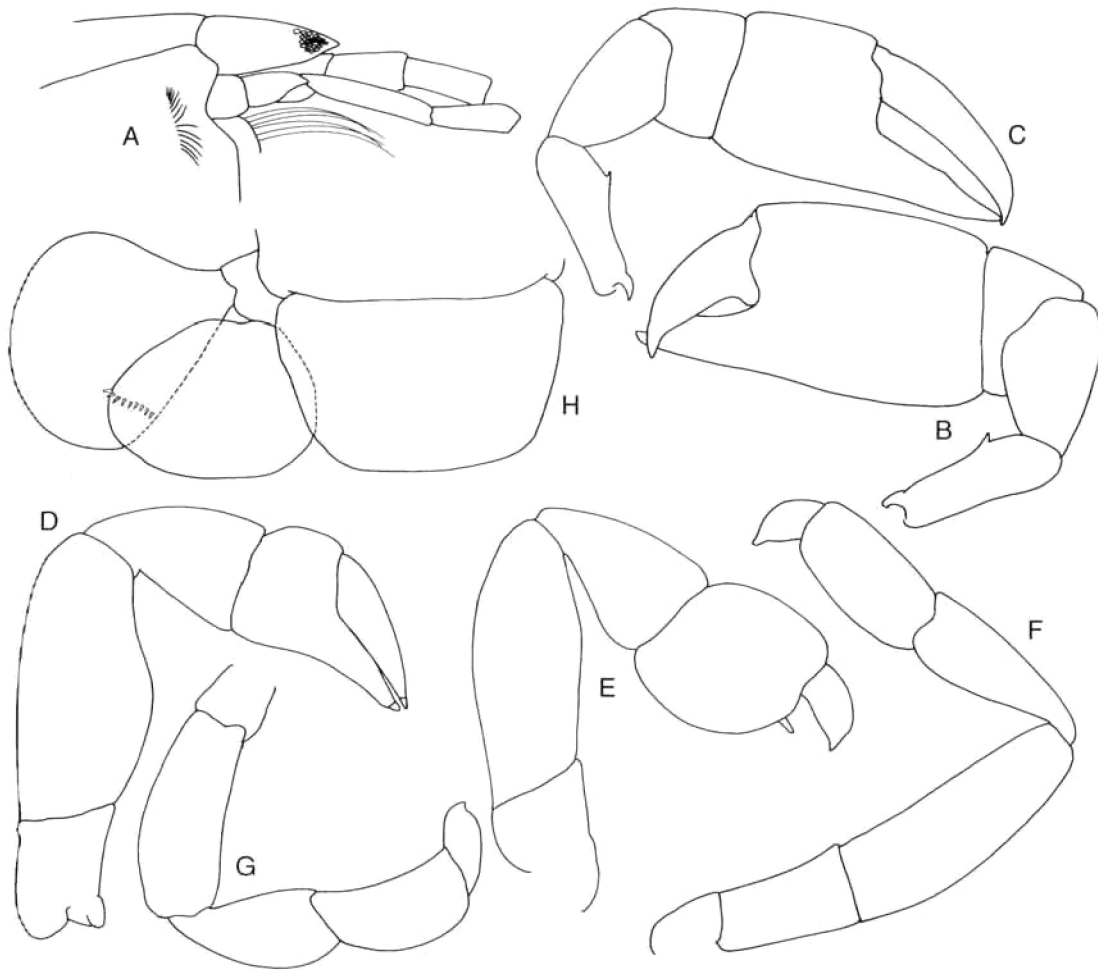


FIG. 38. — *Thomassinia moorea* n.sp. A, anterior cephalothorax; B, right larger cheliped; C, left smaller cheliped; D, left pereopod 2; E, left pereopod 3; F, right pereopod 4; G, left pereopod 5; H, telson and uropod. All figures from holotype.

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#### REFERENCES

- Balss H. 1914. — Beiträge zur Naturgeschichte Ostasiens. Herausgegeben von Dr. F. Dölflin. Ostasiatische Decapoden II. Die Natantia und Reptantia. *Abhandlungen der Mathematisch-Physikalische Klasse der Königlich Academie der Wissenschaften* 2: 1-101.

- 1921. — Diagnosen neuer Decapoden aus den Sammlungen der Deutschen Tiefsee-Expedition und der Japanischen Ausbeute Dofleins und Haberers. *Zoologische Anzeiger* 52: 175-178.
- 1925. — Macrura der Deutschen Tiefsee-Expedition. 1. Palinura, Astacura und Thalassinidea. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899*, 20: 189-216.
- 1957. — Decapoda. Dr. H. G. Bronn's *Klassen und Ordnungen des Tierreichs* 7: 1505-1672.
- Barnard K. H. 1950. — Descriptive catalogue of South African decapod Crustacea (crabs and shrimps). *Annals of the South African Museum* 38: 1-837.
- Bate C. S. 1888. — Report on the Crustacea Macrura collected by H. M. S. *Challenger* during the years 1873-1876. *Report on the Scientific Results of the Voyage of H. M. S. Challenger during the years 1873-1876*. *Zoology* 24: 1-192.
- Biffar T. A. 1971. — The genus *Callianassa* (Crustacea, Decapoda, Thalassinidea) in South Florida, with keys to the Western Atlantic species. *Bulletin of Marine Science* 21: 637-715.
- Blanco Rambla J. P. & Liñero Arana I. 1994. — New records and new species of ghost shrimps (Crustacea: Thalassinidea) from Venezuela. *Bulletin of Marine Science* 55: 16-29.
- Boas J. E. V. 1880. — Studier over Decapodernes Slaegtkskabsforhold. *Dansk Videnskabernes Seksjeab, Copenhagen, Skrifter, Naturvidenskabelig og matematisk Afdeling* 1: 23-210.
- Borradaile L. A. 1898. — On some crustaceans from the South Pacific. Part 3. Macrura. *Proceedings of the Zoological Society of London* 1898: 1000-1015.
- 1903. — On the classification of the Thalassinidea. *Annals and Magazine of Natural History* (series 7) 12: 535-551.
- 1904. — Marine crustaceans. XIII. The Hippidea, Thalassinidea and Scyllaridea: 750-754, in Gardner S. (ed.), *The Fauna and Geography of the Maldive and Laccadive Archipelagoes*. Volume 2. Cambridge University Press, Cambridge.
- Bouvier E. L. 1905. — Sur les Thalassinidés recueillis par le *Blake* dans la mer des Antilles et le golfe du Mexique. *Comptes Rendus Hebdomadaires de Séances de l'Académie des Sciences*, Paris 141: 802-806.
- 1925. — Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1878), in the Caribbean Sea (1878-1879), and along the Atlantic Coast of the United States (1880) by the U.S. Coast Survey Steamer *Blake*. XLVIII. Les Macroures marcheurs. *Memoirs of the Museum of Comparative Zoology at Harvard College*, 47: 401-472, 11 pls.
- Brasil Lima I. M. 1980. — Crustáceos epicarídeos do Brasil. 11. *Castrione longicaudata* g.n., sp.n. do litoral norte do Brasil. *Revista Brasileira de Biologia* 40: 121-123.
- Carvalho H. A. de & Rodrigues S. de A. 1973. — *Marcusiarius lemoscastroí*, g.n., sp.n., nova ocorrência da família Axiidae (Crustacea, Decapoda, Thalassinidea) no Brasil. *Boletim do Zoologia e Biologia Marina*, n.s., Sao Paulo 30: 553-566.
- Coelho P. A. 1973. — Descrição preliminar de *Meticonaxius minutus*, sp. n., do Norte de Brasil (Crust., Decapoda, Axiidae). *Ciência e Cultura*, Suplementa 25: 345.
- 1987. — Uma espécie nova de *Meticonaxius* do Brasil (Crustácea, Decapoda, Callianideidae). *Revista Brasileira de Zoologia* 4: 63-69.
- Coelho P. A. & Ramos-Porto M. 1987. — Sinopsis dos crustáceos decápodos Brasileiros (famílias Callianassidae, Callianideidae, Upogebiidae, Parapaguridae, Paguridae, Diogenidae). *Trabalhos Oceanografico da Universidade Federal de Pernambuco* 19: 27-53.
- Coelho P. A. & Koenig M. L. 1980. — Biogeografia e bionomia dos crustáceos do litoral equatorial brasileiro. *Trabalhos Oceanografico da Universidade Federal de Pernambuco* 15: 7-138.
- Dana J. D. 1852a. — Conspectus crustaceorum quae in orbis terrarum circumnavigatione, Carol Wilkes e classe reipublicae foederatae duce, lexit e descripsit. *Proceedings of the Academy of Natural Science of Philadelphia* 6: 6-28.
- 1852b. — Crustacea. Part I. *United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842 under the command of Charles Wilkes, U.S.N.*, 13: 1-685.
- Dworschak P. C. 1992. — The Thalassinidea in the Museum of Natural History, Vienna; with some remarks on the biology of the species. *Annalen des Naturhistorischen Museums in Wien* 3: 189-238.
- Edmondson C. H. 1944. — Callianassidae of the Central Pacific. *Occasional Papers of the Bernice P. Bishop Museum* 18: 1-11.
- Gill T. 1859. — Descriptions of a new species of *Callianidea*. *Proceedings of the Academy of Natural Science of Philadelphia* 1859: 167-168.
- Gore R. H. 1987. — *Callianidea vandoverae* species nova (Decapoda, Thalassinidea, Callianideidae) from off the central eastern Florida coast, U.S.A. *Crustaceana* 53: 186-194.
- Guérin-Méneville F. E. 1832. — Description d'un nouveau genre de crustacé macroure, formant le passage entre les Paguriens et les Thalassinites. *Annales de la Société Entomologique de France* 1: 295-300.
- Gurney R. 1938. — Larvae of Decapod Crustacea. Part V. Nephropsidae and Thalassinidea. *Discovery Reports* 17: 293-344.
- ICZN 1989. — Opinion 1522 *Callianidea* H. Milne Edwards, 1837 (Crustacea, Decapoda): conserved. *Bulletin of Zoological Nomenclature* 46: 61-62.
- Kensley B. 1981. — On the zoogeography of southern African decapod Crustacea, with distributional checklist of the species. *Smithsonian Contributions to Zoology* 338: 1-64.

- Kensley B. & Heard R. W. 1991. — An examination of the shrimp family Callinideidae (Crustacea: Decapoda: Thalassinidea). *Proceedings of the Biological Society of Washington* 104: 493-537.
- Kossmann R. 1880. — Reise in die Küstengebiete des Rothen Meeres, volume 2, part 1, section III, Malacostraca. *Zoologische Ergebnisse im Auftrage der königlichen Academie der Wissenschaften zu Berlin* 1880: 67-140.
- Lanchester W. F. 1901. — On the Crustacea collected during the *Skeat* Expedition to the Malay Peninsula, together with a note on the genus *Actaeopsis*. Part I. Brachyura, Stomatopoda, and Macrura. *Proceedings of the Zoological Society of London* 1901: 534-574, pls 33, 34.
- Le Locuff P. & Intès A. 1974. — Les Thalassinidea (Crustacea, Decapoda) du Golfe de Guinée. Systématique — Écologie. *Cahiers de l'Office de Recherches Scientifiques et Techniques Outre-Mer, série Océanographique* 12: 17-69.
- Lemaître R. & Ramos G. E. 1992. — A collection of Thalassinidea (Crustacea: Decapoda) from the Pacific coast of Colombia, with description of a new species and a checklist of eastern Pacific species. *Proceedings of the Biological Society of Washington* 105: 343-358.
- Lockington W. N. 1878. — Remarks upon the Thalassinidea and Astacidea of the Pacific coast of North America, with description of a new species. *Annals and Magazine of Natural History* 2: 299-304.
- Man J. G. de 1902. — Die von herrn Professor Kükenthal im Indischen Archipel gesammelten Dekapoden und Stomatopoden. *Abhandlungen der Senckenbergischen Naturforschenden Gesselschaft* 25: 465-929.
- 1905. — Diagnoses of new species of macrurous decapod Crustacea from the "Siboga-Expedition". *Tijdschrift der Nederlansche Dierkundige Vereeniging* 9: 587-614.
- 1925. — The Decapoda of the *Siboga*-Expedition. Part VI. The Axiidae collected by the *Siboga*-Expedition. *Siboga Expéditie* 39: 1-127.
- 1928. — The Decapoda of the *Siboga*-Expedition. Part 7. The Thalassinidae and Callianassidae collected by the *Siboga*-Expedition with some remarks on the Laomediidae. *Siboga Expéditie* 39: 1-187.
- Manning R. B. 1987. — Notes on western Atlantic Callianassidae (Crustacea: Decapoda: Thalassinidea). *Proceedings of the Biological Society of Washington* 100: 386-401.
- Manning R. B. & Felder D. L. 1991. — Revision of the American Callianassidae (Crustacea: Decapoda: Thalassinidea). *Proceedings of the Biological Society of Washington* 104: 764-792.
- Markham J. C. 1995. — Two new species of Isopoda Bopyridae (Crustacea) infesting thalassinideans in the western Pacific. *Raffles Bulletin of Zoology* 43: 83-89.
- Melin G. 1939. — Paguriden und Galatheiden von Prof. Dr. Sixten Bocks Expedition nach den Bonin-Inseln 1914. *Kungliga Svenska Vetenskapsakademiens Handlingar* 18: 1-119.
- Milne Edwards H. 1837. — *Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux*. Librairie encyclopédique de Roret, Paris, 531 p.
- Miyake S. 1956. — Invertebrate fauna of the intertidal zone of the Tokara Islands. *Publications of the Seto Marine Biological Laboratory* 5: 304-337.
- Nobili G. 1906. — Faune carcinologique de la Mer Rouge. Décapodes et stomatopodes. *Annales des Sciences Naturelles* 4: 1-347, pls 1-11.
- Pesta O. 1913. — Botanische und zoologische Ergebnisse einer wissenschaftlichen Forschungsreise nach den Samoainseln von März bis Dezember 1905. Crustacea. II Teil. Decapoda (mit Ausschluß der Brachyura) und Stomatopoda. *Denkschriften der mathematisch-naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften Wien* 89: 673-682.
- Poore G. C. B. 1994. — A phylogeny of the families of Thalassinidea (Crustacea: Decapoda) with keys to the families and genera. *Memoirs of the Museum of Victoria* 54: 79-120.
- Poore G. C. B. & Griffin D. J. G. 1979. — The Thalassinidea (Crustacea: Decapoda) of Australia. *Records of the Australian Museum* 32: 217-321.
- Poupin J. 1994. — *Quelques crustacés décapodes communs de Polynésie Française. Rapport Scientifique du Service Mixte de Surveillance Radiologique et Biologique de l'homme et de l'environnement*, Monthléry, France, 86 p., 8 pls.
- Rathbun M. J. 1901. — The Brachyura and Macrura of Porto Rico. *Bulletin of the United States Fisheries Commission* 2: 1-137.
- Rodrigues S. de A. 1983. — Aspectos da biologia de Thalassinidea do Atlantico tropical Americano. Ph. D. thesis. Universidade Sao Paulo. 174 p.
- Rodrigues S. de A. & Carvalho H. A. de 1972. — *Marcusiarius lemoscastroi*, g.n., sp.n., primeira ocorrência da família Axiidae (Crustacea, Decápoda, Thalassinidea) no Brasil. *Ciência e Cultura*, Suplementa 24: 357.
- Saint Laurent M. de 1973. — Sur la systématique et la phylogénie des Thalassinidea: définition des familles des Callianassidae et des Upogebiidae et diagnose de cinq genres nouveaux. *Comptes Rendus Hebdomadaires de Séance de l'Académie des Sciences, Paris* 277: 513-516.
- 1979. — Sur la classification et la phylogénie des Thalassinides: définitions de la superfamille des Axiioidea, de la sous-famille des Thomassiniinae et de deux genres nouveaux (Crustacea Decapoda). *Comptes Rendus Hebdomadaires de Séance de l'Académie des Sciences, Paris* 288: 1395-1397.
- Saint Laurent M. de & Le Locuff P. 1979. — Campagnes de la *Calypso* au large des côtes

- Atlantiques Africaines (1956 et 1959) (suite) 22. Crustacés Décapodes Thalassinidea. I. Upogebiidae et Callianassidae. *Résultats Scientifiques des Campagnes de la Calypso* 11 : 29-101.
- Sakai K. 1984. — Some thalassinideans (Decapoda: Crustacea) from Heron Is., Queensland, eastern Australia, and a new species of *Gourettia* from East Africa. *The Beagle, Occasional Papers of the Northern Territory Museum of Arts and Sciences* 1: 95-108.
- 1987. — Two new Thalassinidea (Crustacea: Decapoda) from Japan, with the biogeographical distribution of the Japanese Thalassinidea. *Bulletin of Marine Science* 41: 296-308.
- 1992. — The families Callianideidae and Thalassinidae, with the description of two new subfamilies, one new genus and two new species. *Naturalists* 4: 1-33.
- Sakai K. & Holthuis L. B. 1987. — *Callianidea* H. Milne Edwards, 1837 (Crustacea, Decapoda): proposed conservation. *Bulletin of Zoological Nomenclature* 44: 92-94.
- Sakai K. & Saint Laurent M. de 1989. — A check list of Axiidae (Decapoda, Crustacea, Thalassinidea, Anomula), with remarks and, in addition, descriptions of one new subfamily, eleven new genera and two new species. *Naturalists* 3: 1-104.
- Schmitt W. L. 1924. — Bijdragen tot de kennis der fauna van Curaçao. Resultaten eener reis van Dr. C. J. van der Horst in 1920. The macruran, anomuran and stomatopod Crustacea. *Bijdragen tot de Dierkunde* 23: 61-81.
- 1935. — Crustacea Macrura and Anomura of Porto Rico and the Virgin Islands. *Scientific Survey of Porto Rico and the Virgin Islands*, New York Academy of Sciences 15: 125-227.
- 1936. — Zoologische Ergebnisse einer Reise nach Bonaire, Curaçao und Aruba. *Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere* 67: 363-378.
- 1939. — Decapod and other Crustacea collected on the Presidential Cruise of 1938 (with introduction and station data). *Smithsonian Miscellaneous Contributions* 98: 1-29.
- Stebbing T. R. R. 1920. — South African Crustacea (Part X of S. A. Crustacea, for the Marine Investigations in South Africa). *Annals of the South African Museum* 17: 231-272.

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