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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 ♂♂).

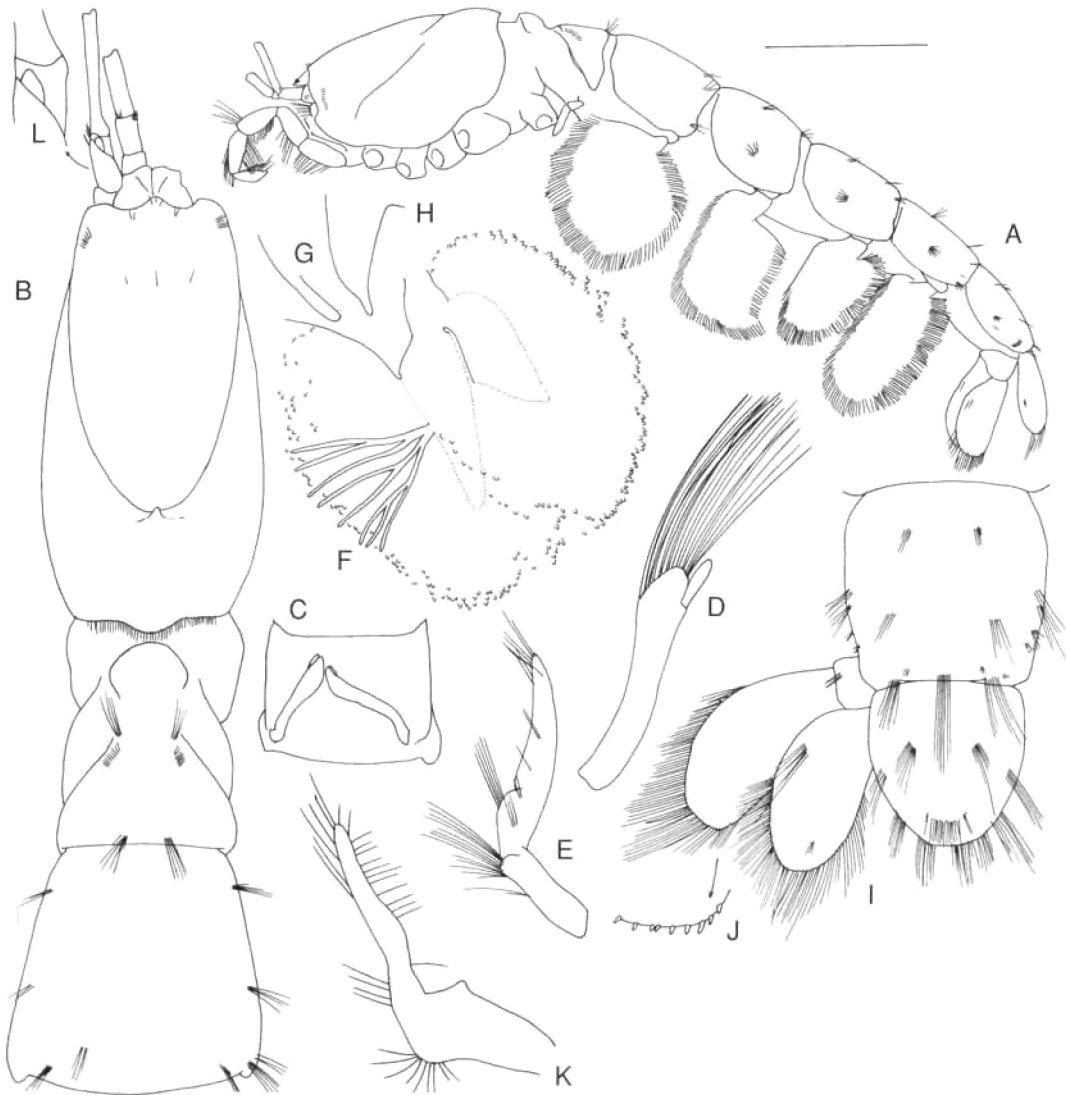


FIG. 1. — *Callianidea typa* Milne Edwards. A, habitus; B, cephalothorax, abdominal somites 1 and 2; C, ♂ ventral view of abdominal somite 1 with pleopods 1; D, ♂ pleopod 1; E, ♀ pleopod 1; F, pleopod 2; G, appendix interna; H, ♀ appendix interna; I, abdominal somite 6, telson and uropod; J, spiniform 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.

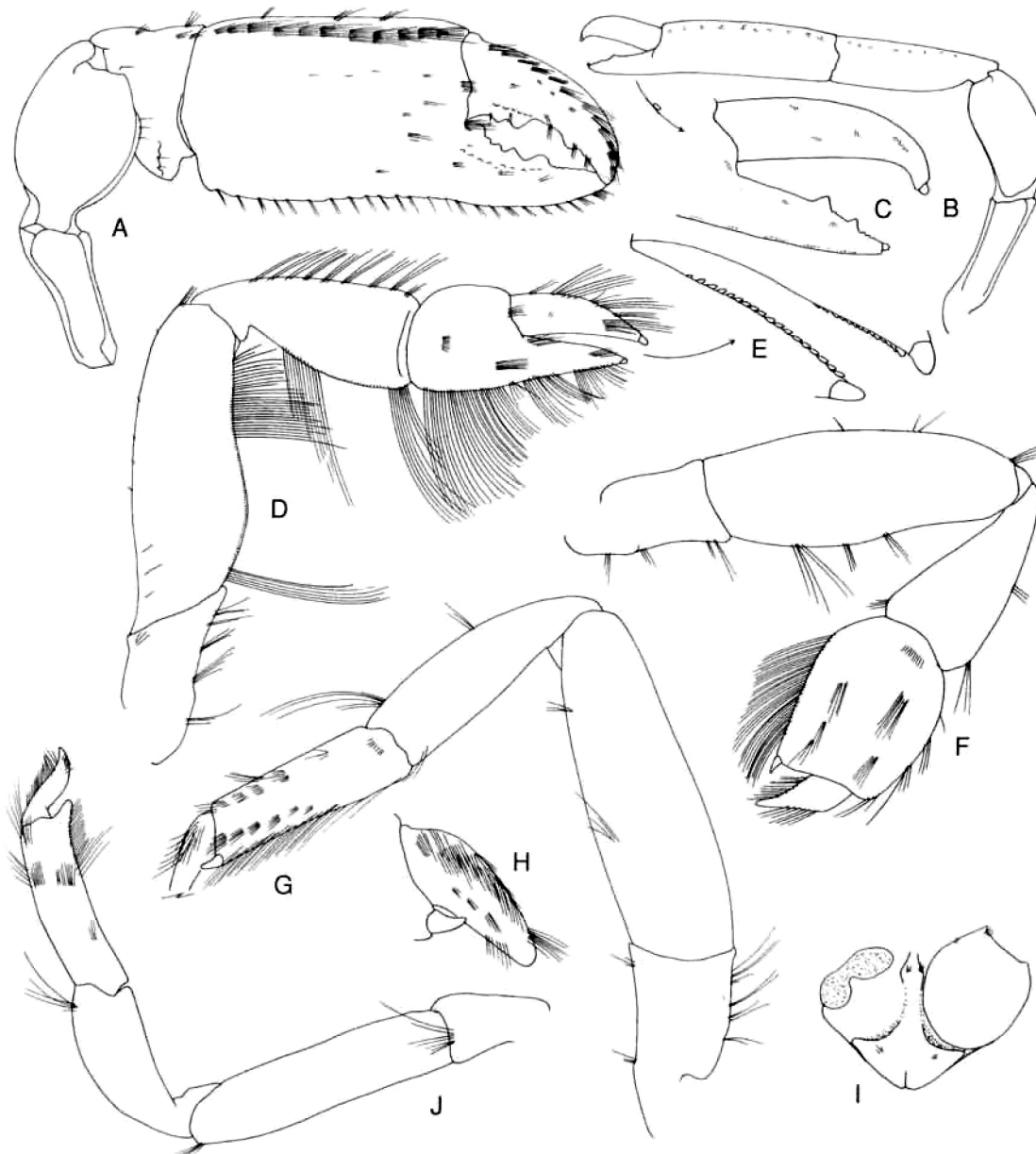


FIG. 2. — *Callianidea tya* Milne Edwards. A, left larger cheliped; B, right smaller cheliped and C, details of fingers; D, right pereopod 2 and E, details of cutting edges; F, right pereopod 3; G, left pereopod 4; H, dactylus of right pereopod 4; I, coxa and sternum of pereopod 4; J, right pereopod 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

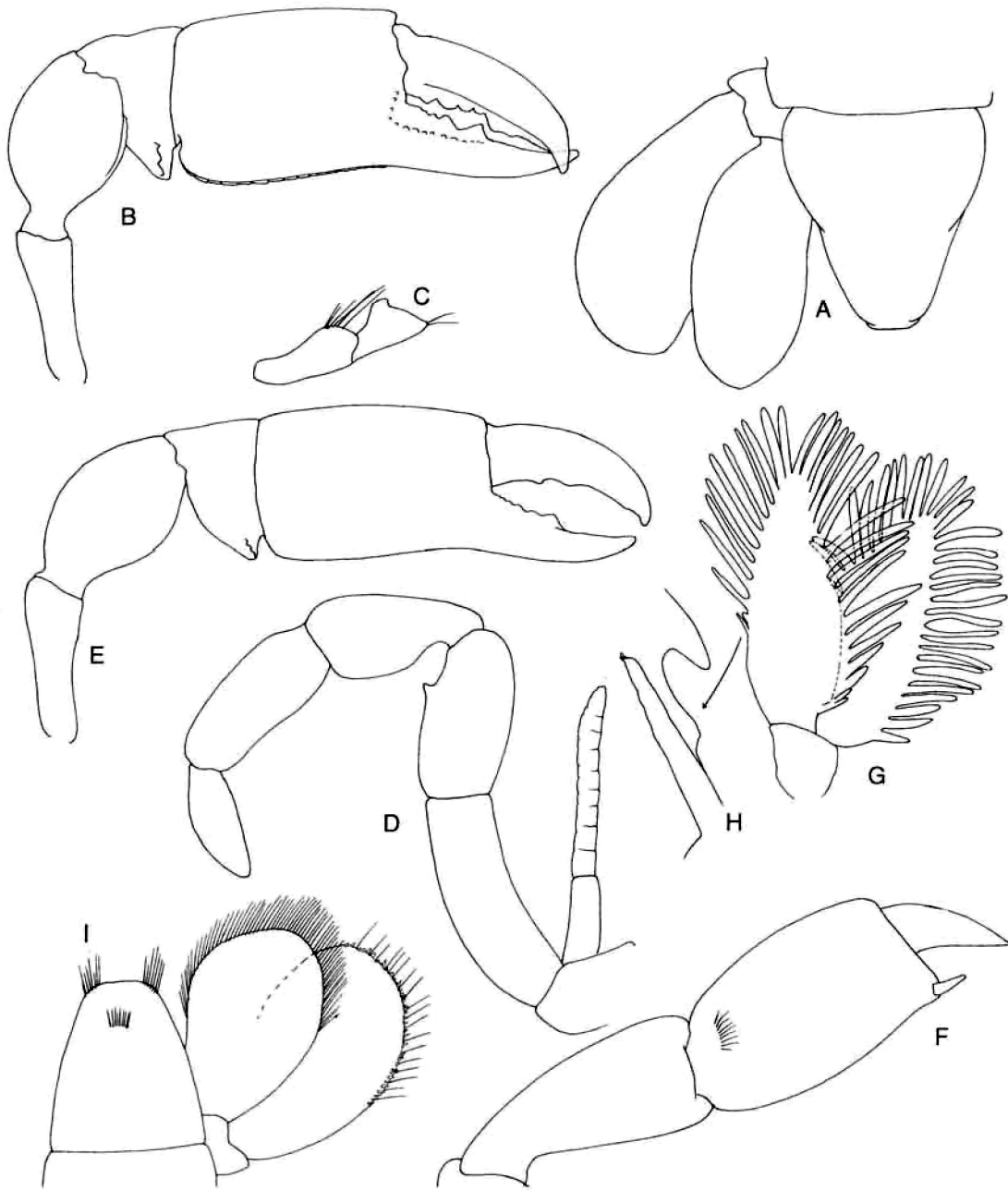


FIG. 4. — *Callianidea tupa* Milne Edwards. A, telson and uropod; B, left larger cheliped. Both figures from MNHN Th-695. *Callianidea laevicauda* Gill, 1859. C, ♂ pleopod 1, USNM 122445. *Callianidea* sp. D, maxilliped 3; E, left larger cheliped; F, pereopod 3 (distal articles); G, pleopod 2; H, appendix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

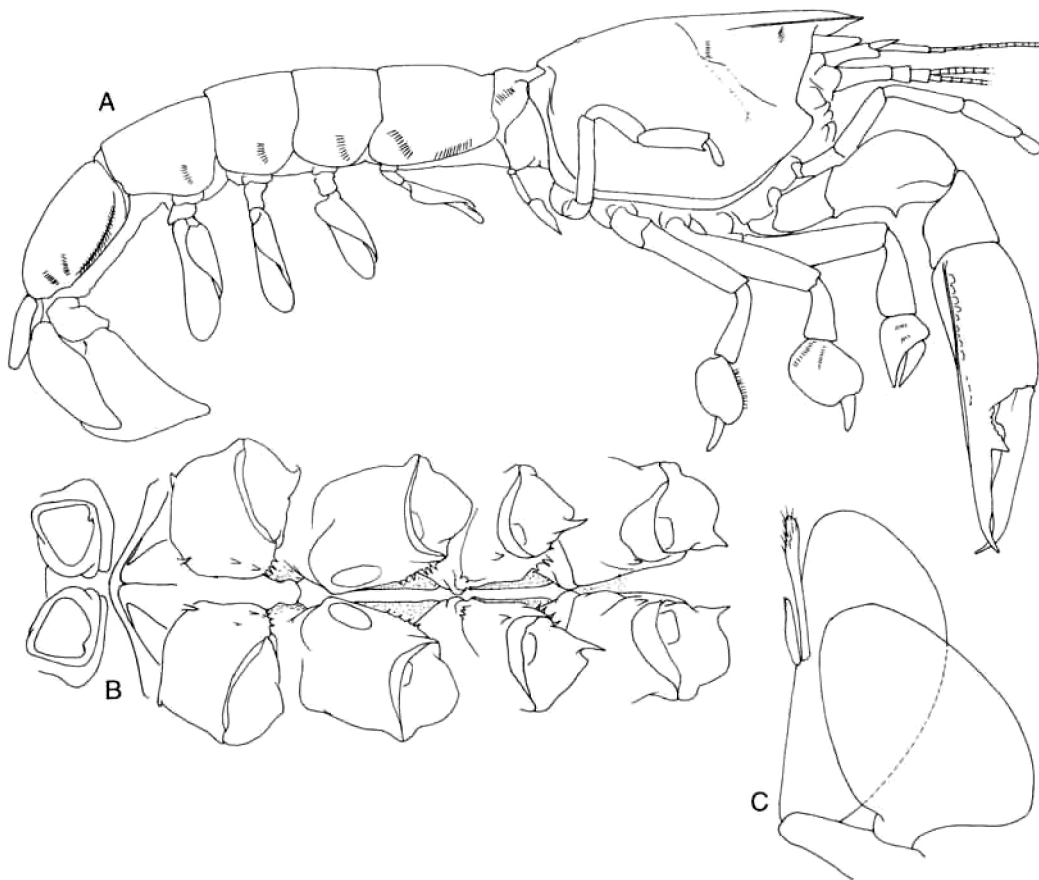


FIG. 5. — *Marcusiarius lemoscastrai* Rodrigues *et de* Carvalho. **A**, ♂ habitus; **B**, sternum and coxae of pereopods 1-5 of ♀; **C**, pleopod 2. Both specimens from USNM 243550.

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

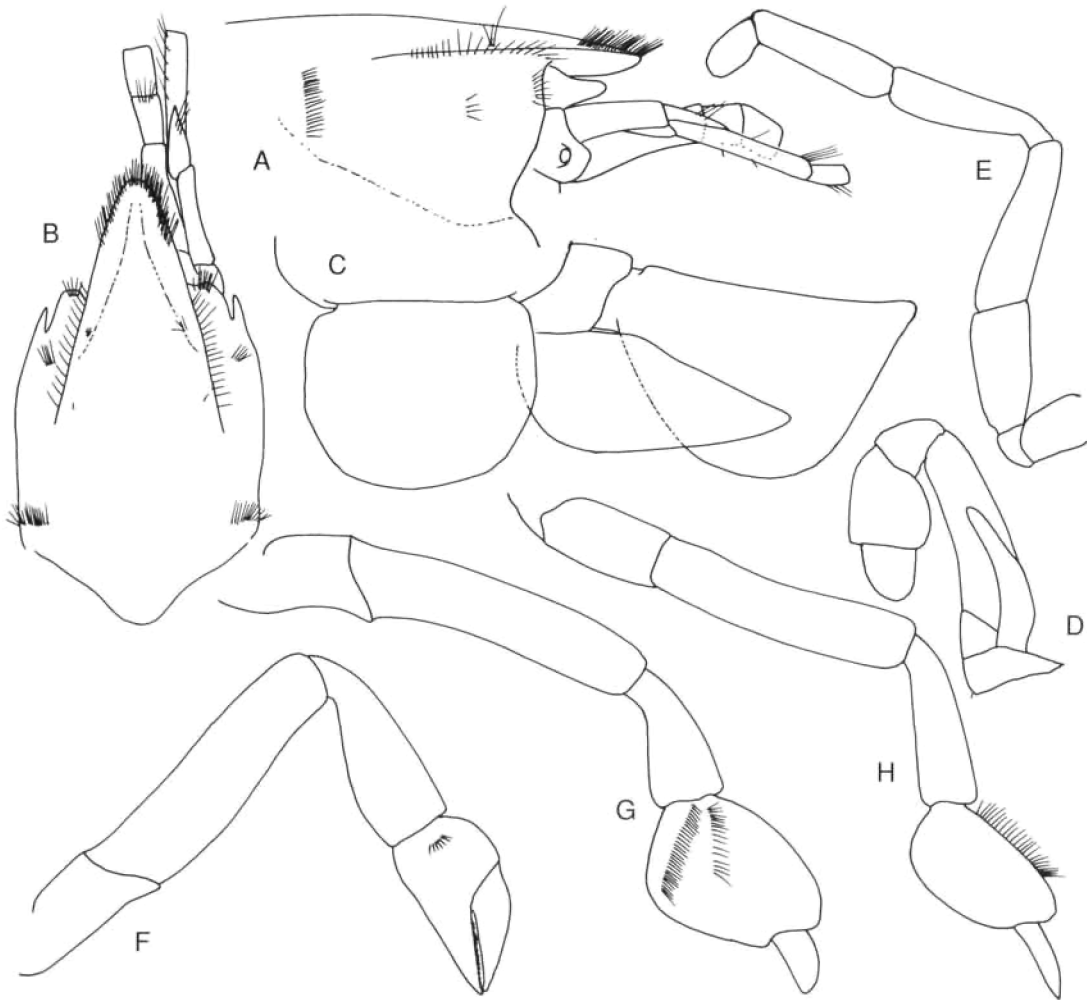


FIG. 6. — *Marcusiaxius torbeni* Sakai, 1992. A, B, anterior cephalothorax; C, telson and uropod; D, maxilliped 2; E, maxilliped 3; F, right pereopod 2; G, right pereopod 3; H, right pereopod 4. All figures from MNHN Th-850.

(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