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## New species and records of anthuridean isopod crustaceans from the Indian Ocean

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Twenty four new species of anthuridean isopods are described from a variety of localities in the Indian Ocean, including the granitic Seychelles, Aldabra Atoll, Phuket Island, the Persian Gulf and Zanzibar Island: Family Antheluridae, *Anthomuda quadrilineata*; Family Anthuridae, *Amakusanthura cosmoledo*, *Apanthuroides aldabrae*, *Apanthuroides calculosa*, *Eisothistos andamanensis*, *Eisothistos corallina*, *Heptanthura phuket*, *Malacanthura arabica*, *Mesanthura quadrata*, *Panathura indica*, *Pendanthura picardi*, *Pendanthura seminigra*, *Pendanthura siamensis*, *Quantanthura andamanensis*; Family Hyssuridae, *Neohyssura gladia*, *Xenanthura victoriae*; Family Paranthuridae, *Accalathura hastata*, *Accalathura phuketensis*, *Accalathura wardae*, *Leptanthura calcis*, *Leptanthura maheensis*, *Paranthura algophila*, *Paranthura seychellensis*, *Paranthura urodentata*. Of the 15 genera represented, all except two were previously known from the Indian Ocean; *Heptanthura* and *Pendanthura* are recorded from the Indian Ocean for the first time. Most of the genera have wide distributions through the Indian, Atlantic and Pacific oceans, while the species tend to be endemic to limited island or coastal regions. The 15 genera are diagnosed and keys or comparative tables to the Indian Ocean species are provided.

KEYWORDS: Crustacea, Isopoda, Anthuridea, Antheluridae, Anthuridae, Hyssuridae, Paranthuridae, Indian Ocean.

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### Introduction

The marine isopod fauna of the Indian Ocean is recorded in a large number of scattered publications. The region has been unevenly sampled, some few areas being relatively well explored (e.g. the east coast of South Africa, Aldabra Atoll, Zanzibar Island). Most of the region, however, both shallow and deep waters, is poorly known or completely uncollected. Few papers provide an overview of the isopod fauna of the entire region (see Bruce, 1997; Kensley, in press). About 133 species of anthurideans have been recorded from the Indian Ocean, including the records from the subantarctic islands (see species list in Kensley, in press). Clearly this number is only a fraction of the true fauna, given the wide extent of shallow reef, seagrass and mangrove areas yet to be sampled.

The present paper, a contribution to the knowledge of crustacean biodiversity

of the region, is based on accumulations of isopod material from around the Indian Ocean: collections especially from the tropical areas of the granitic Seychelles islands, Aldabra Atoll, Zanzibar, the Gulf of Arabia and Phuket Island, Thailand, make up the bulk of this report. In addition to describing and adding 24 species to the anthuridean faunal list of the Indian Ocean, some information on the definition and composition of the relevant genera is provided. Revisionary works are referred to in the generic synonymies and a generic diagnosis provided, as well as keys or comparative tables to distinguish the Indian Ocean species. Distribution of the species is provided in the keys as a further aid to separation.

*Abbreviations.* F—Kristian Fauchald field stations; JR—Jack Rudloe field stations; K—Brian Kensley field stations; MS—Marilyn Schotte field stations; NMNH—National Museum of Natural History, Smithsonian Institution; USNM—United States National Museum; ZMUC—Zoological Museum, University of Copenhagen; sta—station.

## Systematics

### SUBORDER ANTHURIDEA

#### Family ANTHELURIDAE Poore and Lew Ton, 1988a

#### Genus *Anthomuda* Schultz, 1979

*Anthomuda* Schultz, 1979: 907; Poore and Lew Ton, 1988a: 500.

*Diagnosis.* Eyes present in both sexes. Antennular flagellum of four to five shortened articles, with three terminal aesthetascs. Antennal flagellum of two to three short articles. Mandibular palp of three articles. Pereopods 4–7, propodus with one to two robust setae on posterior margin; carpus with anterior margin shorter than posterior, latter with two robust setae. Telson flattened, with single statocyst opening by small pore. Male antennular flagellum of about ten articles bearing aesthetascs. Copulatory stylet of pleopod 2 apically hooked.

*Remarks.* The five species of *Anthomuda* now known from the Indian Ocean can be separated by subtle features such as the proportions of some appendages, the most obvious of which are summarized in table 1.

#### *Anthomuda quadrilineata* sp. nov.

(Figures 1, 2)

*Type material.* HOLOTYPE: USNM 253159, ovigerous ♀ 4.8 mm, sta K-AL-115, coral rubble and coarse sand, Aldabra lagoon at head of Grande Passe, 2–3 m, 6 April 1987. PARATYPES: USNM 253160, one ovigerous ♀ 4.0 mm, two non-ovigerous ♀ 4.6 mm, one damaged, sta K-AL-26, coarse sediment and coral rubble on outer reef slope, Picard Is., Aldabra, 18 m, 7 April 1983. USNM 253161, one pre-♂ 3.8 mm, one non-ovigerous ♀ 5.0 mm, sta K-AL-39, coral rubble from fore-reef slope, Picard Is., Aldabra, 20 m, 11 April 1983.

*Other material examined.* USNM 253162, one ♂ 4.1 mm, four non-ovigerous ♀ 4.4–5.8 mm, 19 juveniles, from 14 separate stations, coral rubble and coarse sediments, Aldabra, intertidal, 25 m.

*Diagnosis.* Ovigerous female: Antennular flagellum of four articles, two aesthetascs on subterminal article, one on terminal article. Antennal flagellum of four setose articles. Mandibular palp, article 2 with single long distal seta, four fringed setae on

Table 1. Features separating the five species of *Anthomuda* known from the Indian Ocean.

|  | Pleopod 1<br>endopod setae | Uropodal endopod<br>length:basal width | Uropodal exopod<br>length:width | Telson<br>length:greatest width |
|--|----------------------------|--|---------------------------------|---------------------------------|
| <i>A. cracens</i> (Kensley, 1980a) Mozambique; Somalia         | 6                          | 2.4                                    | 3.1                             | 2.1                             |
| <i>A. hapla</i> (Kensley, 1980a) Mauritius                     | 3                          | 2.5                                    | 2.2                             | 2.7                             |
| <i>A. hovea</i> Poore and Lew Ton, 1988a Queensland, Australia | 4                          | 1.6                                    | 1.8                             | 2.4                             |
| <i>A. poorei</i> Müller, 1990 Reunion Island                   | 7                          | 2.6                                    | 2.3                             | 2.4                             |
| <i>A. quadrilineata</i> sp. nov. Aldabra Atoll                 | 2                          | 1.8                                    | 1.7                             | 2.8                             |

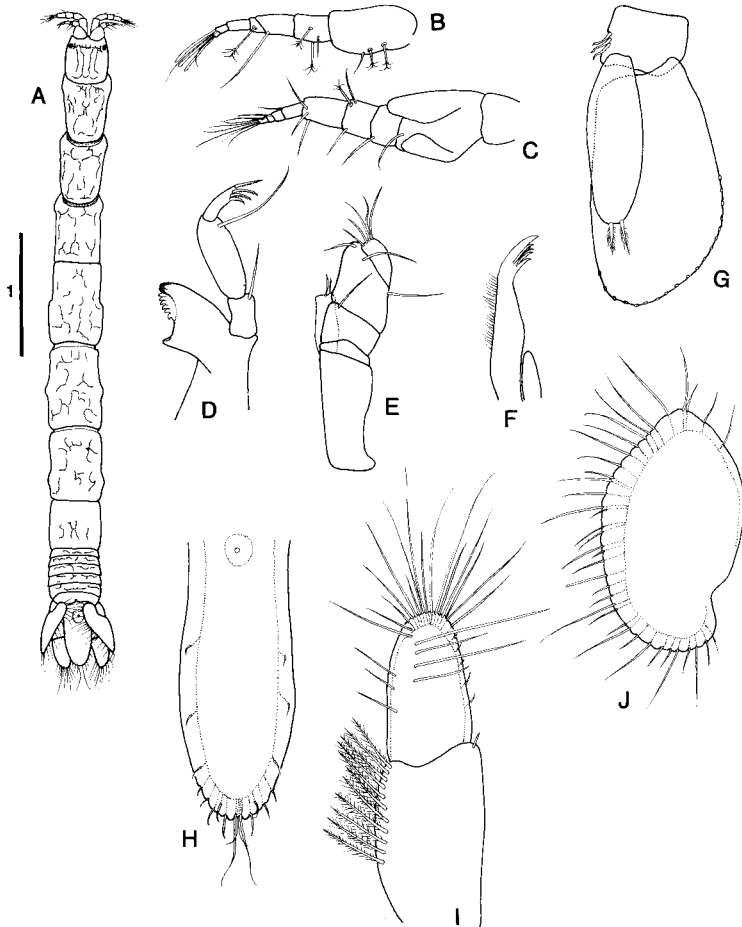


FIG. 1. *Anthomuda quadrilineata* sp. nov.: (A) ♀ dorsal view; (B) antennule; (C) antenna; (D) mandible; (E) maxilliped; (F) maxilla; (G) pleopod 1; (H) telson; (I) uropodal protopod and endopod; (J) uropodal exopod.

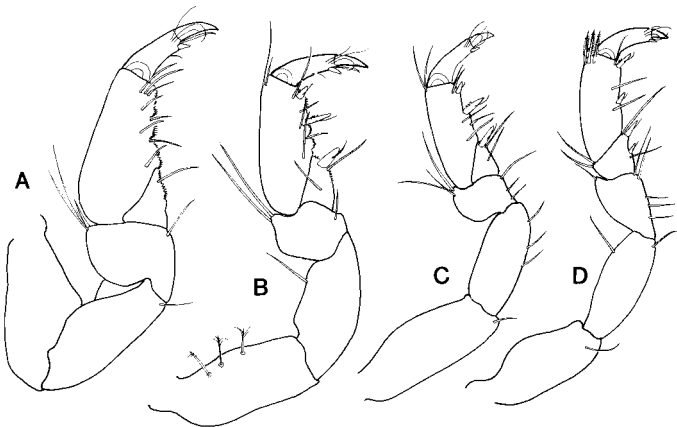


FIG. 2. *Anthomuda quadrilineata* sp. nov.: (A) pereopod 1; (B) pereopod 2; (C) pereopod 3; (D) pereopod 4.

article 3; lamina dentata of six teeth; molar small, conical. Maxillipedal endite distally truncate, with two terminal setae; terminal palp article having five mesial setae, inserted obliquely at distolateral angle of article 3. Pereopod 1, carpus triangular, propodus barely expanded, margin of palm bearing fringed scales. Pereopods 2 and 3, carpus with stout distal seta; propodus with two stout sensory setae on palm. Pereopod 7, carpus with free anterior margin shorter than posterior margin, latter bearing two sensory setae; propodus rectangular, with two sensory setae on posterior margin, three fringed setae anterodistally. Pleopod 1 exopod operculiform, with 19–20 plumose marginal setae; endopod two-thirds of exopod, with two distal plumose setae. Uropodal exopod broadly ovate, apex narrowly rounded; endopod length about 1.8 times basal width, bearing numerous elongate distal setae. Telson length about 2.8 times basal width, posterior margin broadly rounded.

*Colour.* Dorsum of cephalon, pereonites and pleon with thin spidery lines of pigment; cephalon with indistinct line of pigment between eyes and four roughly parallel longitudinal lines almost reaching posterior margin.

*Remarks.* In addition to the characters provided in table 1, the four species of *Anthomuda* from the Indian Ocean can be further distinguished by the following: *A. cracens* (Kensley, 1980a) has a less elongate telson with a proportionally much larger statocyst and a more elongate uropodal exopod and endopod, than *A. quadrilineata*. *A. hapla* (Kensley, 1980a), unlike *A. quadrilineata*, has an apically acute maxillipedal endite, a broader terminal maxillipedal palp article and a more elongate uropodal endopod. *A. poorei* Müller, 1990, from Réunion, has a more elongate and slender uropodal exopod, more marginal plumose setae on the endopod of pleopod 1 and far more elongate posterior pereopods. *A. cf. hovea* Poore and Lew Ton, 1988a, was also recorded from Réunion by Müller (1990); this species has a distinctive colour pattern, quite different from *A. quadrilineata* and more articles in the flagella of both the antennule and the antenna. The present species does not bear a close resemblance to any of the three Pacific species.

*Etymology.* The specific name refers to the four lines of pigment on the dorsum of the cephalon.

### Family ANTHURIDAE Leach, 1814

#### Genus *Amakusanthura* Nunomura, 1977

*Amakusanthura* Nunomura, 1977: 79; Poore and Lew Ton, 1988b: 108.

*Diagnosis.* Eyes usually present. Antennular flagellum of three articles. Antennal flagellum of two to four articles. Mandibular palp of three articles. Maxillipedal palp of three articles; endite small or absent. Pereopod 1 subchelate, propodus inflated, palm often stepped or weakly toothed. Pereopods 2 and 3 with propodus barely inflated. Pereopods 4–7, carpi roughly triangular or pentagonal, anterior margin shorter than posterior. Pleonites 1–4 fused, margins marked by dorsal folds; pleonites 4 and 5 not demarked dorsally, only indicated laterally, or pleonites 1–5 fused, indicated laterally; pleonite 6 demarked from telson.

*Remarks.* Species of *Amakusanthura* tend to be morphologically very similar. Distinguishing the species, as in the key below, is sometimes based on subtle, not easily seen features.

Key to the Indian Ocean species of *Amakusanthura*

- 1 Uropodal exopod distally notched . . . . . 2  
 – Uropodal exopod not notched, usually with lateral margin sinuate . . . . . 3
- 2 Uropodal exopod slightly more than twice longer than basal width . . . . .  
 . . . . . *dubia* Barnard, 1914 South Africa  
 – Uropodal exopod less than twice longer than basal width . . . . .  
 . . . . . *hibbertia* Poore and Lew Ton, 1988b Great Barrier Reef; north-western Australia
- 3 Pereopod 1, propodal palm not stepped or toothed . . . . . 4  
 – Pereopod 1, propodal palm stepped or toothed . . . . . 6
- 4 Uropodal exopod not sinuate distally . . . . . *moragallae* Müller, 1991 Sri Lanka  
 – Uropodal exopod distally sinuate . . . . . 5
- 5 Uropodal endopod about 1.3 times longer than basal width . . . . .  
 . . . . . *agonis* Poore and Lew Ton, 1988b Queensland; north-western Australia  
 – Uropodal endopod length about twice basal width . . . . . *pori* Wägele, 1981b Red Sea
- 6 Uropodal endopod length two or more times basal width . . . . . 7  
 – Uropodal endopod length less than twice basal width . . . . . 8
- 7 Telson moderately domed, tapering to subacute apex . . . . .  
 . . . . . *coppingeri* (Barnard, 1925) North-western Australia  
 – Telson convex, with sloping rhomboid area posteriorly, apex narrowly rounded . . . . .  
 . . . . . *africana* Barnard, 1914 South Africa
- 8 Pereopod 1 ♀, carpus distally acute; Telson posterodorsally with about 12–15 elongate erect setae . . . . . *cosmoledo* sp. nov. Cosmoledo Island  
 – Pereopod 1 ♀, carpus distally rounded; Telson posterodorsally with one or two erect setae . . . . . *stocki* Müller, 1991 Sri Lanka

***Amakusanthura cosmoledo* sp. nov.**

(Figures 3, 4)

*Type material.* HOLOTYPE: USNM 253185, non-ovigerous ♀ 7.5 mm, sta K-AL-110, coarse sand and rubble from reef slope, Cosmoledo Is., 3–5 m, 26 March 1986. PARATYPES: USNM 253186, four non-ovigerous ♀ 4.8–5.5 mm, four juveniles, sta K-AL-110, same data as holotype. USNM 253187, one ♂ 5.5 mm, eight non-ovigerous ♀ 4.8–6.0 mm, sta K-AL-101, coral rubble and algal turf from edge of channel Passe Hoareau, Malabar Is., Aldabra, 1 m, 18 March 1986. USNM 253188, three non-ovigerous ♀ 4.5–4.8 mm, nine juveniles, sta K-AL-124, coral rubble from reef slope off Picard Is., Aldabra, 22 m, 13 April 1987. USNM 253189, one ♀ 5.0 mm, one pre-♂ 5.0 mm, five non-ovigerous ♀ 5.0–5.7 mm, eight juveniles, sta F8-87, intertidal coral rubble from Passe Hoareau, Malabar Is., Aldabra, 11 April 1987.

*Other material examined.* USNM 253190, one non-ovigerous ♀, 3 juveniles, sta K-AL-85, coarse sediment and rubble, Anse Var, Picard Is., Aldabra, 10–12 m, 26 March 1985. One non-ovigerous ♀, K-AL-87, coarse coral rubble, outer reef slope off Picard Is., Aldabra, 15 m, 12 March 1986. One juvenile, sta K-AL-106, coralline algal turf, lagoon near Passe du Bois, Aldabra, 0.2 m, 21 March 1986. One non-ovigerous ♀, two juveniles, sta K-AL-107, coral rubble between patch reefs, Grande Passe, Aldabra, 5–8 m, 21 March 1986. Two juveniles, sta K-AL-108, coarse sand on outer reef slope, Picard Is., Aldabra, 3–5 m, 22 March 1986. One non-ovigerous ♀, nine juveniles, sta K-AL-115, coarse coral rubble in lagoonal patch reefs, Grande Passe, Aldabra, 2–3 m, 6 March 1987. One non-ovigerous ♀, four juveniles, sta K-AL-117, coarse rubble, outer reef slope, Picard Is., Aldabra, 12–18 m,

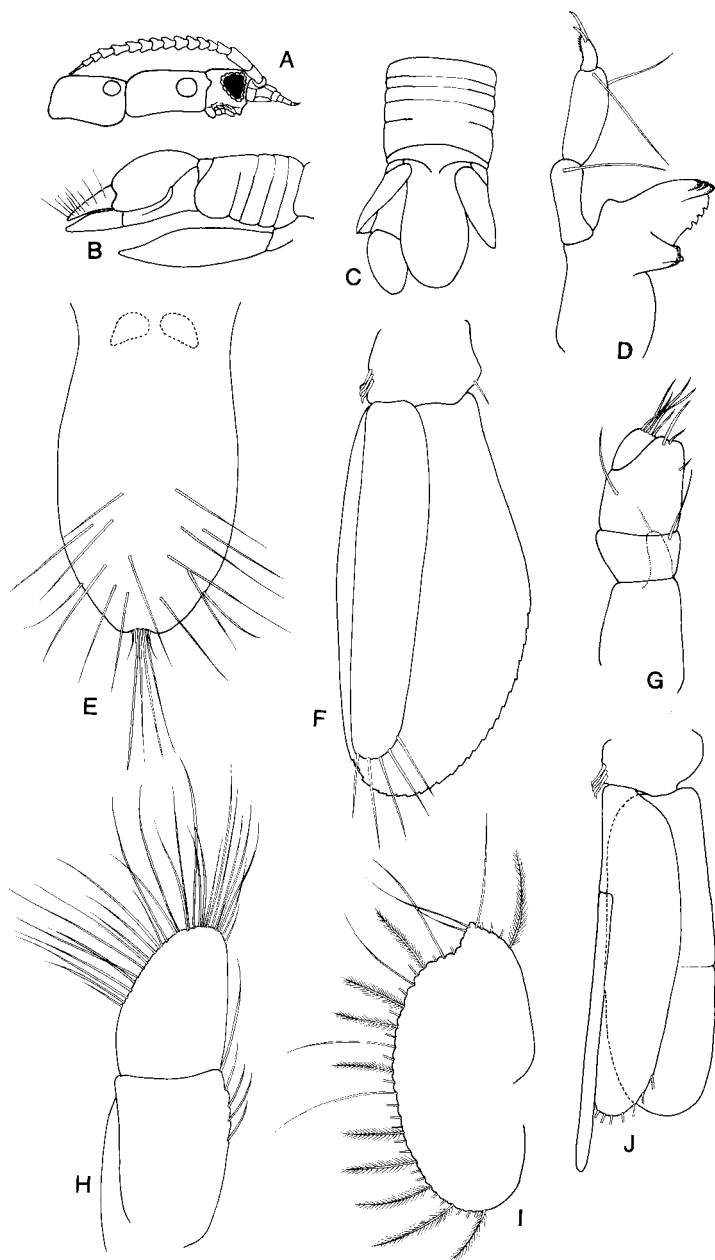


FIG. 3. *Amakusanthura cosmoledo* sp. nov.: (A) ♂ anterior segments in lateral view; (B) pleon lateral view; (C) pleon dorsal view; (D) mandible; (E) pleotelson; (F) pleopod 1; (G) maxilliped; (H) uropodal protopod and endopod; (I) uropodal exopod; (J) ♀ pleopod 2.

7 April 1987. Two non-ovigerous ♀, two juveniles, sta K-AL-118, coral rubble, outer reef slope, Picard Is., 12 m, 7 April 1987. Two non-ovigerous ♀, sta K-AL-119, intertidal coralline algal turf, Passe Hoareau, Aldabra, 12 April 1987. Two non-ovigerous ♀, sta F-7-85, coarse intertidal rubble from reef crest, Picard Is., Aldabra,



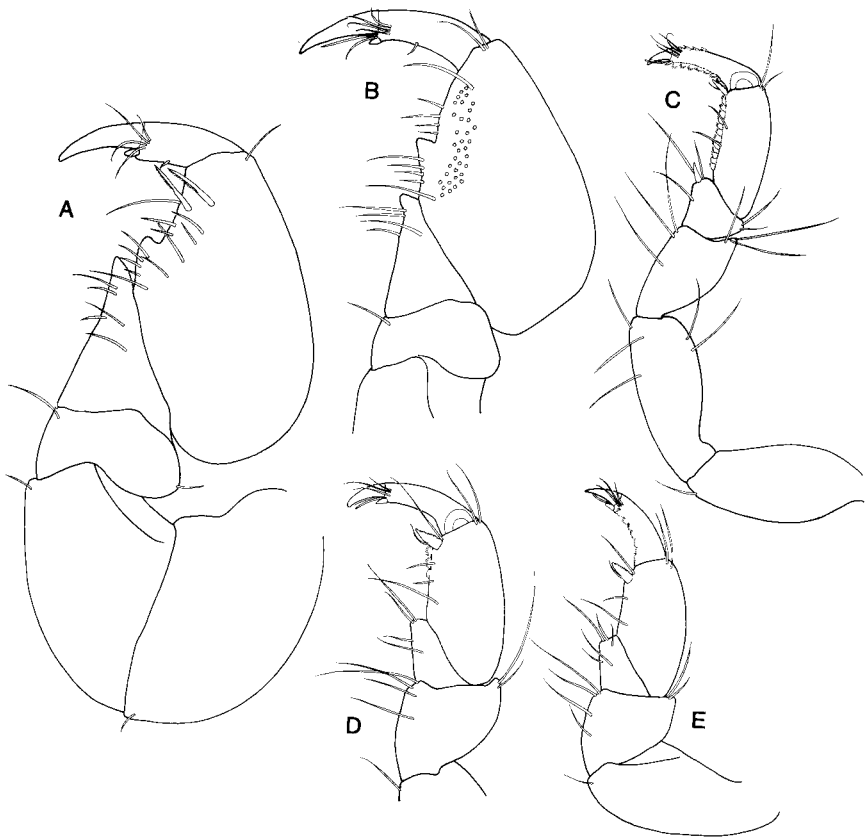


FIG. 4. *Amakusanthura cosmoledo* sp. nov.: (A) ♀ pereopod 1; (B) ♂ pereopod 1; (C) pereopod 7; (D) pereopod 2; (E) pereopod 3.

18 March 1985. One non-ovigerous ♀, sta F-1-87, intertidal reefcrest rubble, Picard Is., Aldabra, 27 March 1987. One pre-♂, two non-ovigerous ♀, sta F-4-87, intertidal rubble, Picard Is., Aldabra, 3 April 1987. Three non-ovigerous ♀, three juveniles, sta F-7-87, coral rubble from patch reefs, Grande Passe, Aldabra, 2 m, 6 April 1987. Two non-ovigerous ♀, four juveniles, sta F-11-87, coral rubble, reef crest, Picard Is., Aldabra, 0.3 m, 13 April 1987.

*Diagnosis.* Non-ovigerous female: Pleotelson ovate, widest at about midlength, posterior margin notched, bearing cluster of three pairs of setae, dorsal surface of posterior half bearing about 12–15 scattered elongate simple setae at right angles to surface. Lamina dentata of mandible having four marginal serrations; palp with article 2 longer than 1, article 3 short, with two distal setae. Maxillipedal endite reaching to suture between articles 2 and 3 of palp, with single terminal seta. Pereopod 1, carpus triangular, posterodistally acute; propodus palm with blunt process, with few scattered setae on mesial face; unguis about as long as remainder of dactylus, with short squat accessory seta at base. Pereopods 2 and 3, carpus posterodistally rounded, lacking free anterior margin; propodus with strong serrate setae at posterodistal angle. Pereopod 7, carpus with short free anterior margin, with short rigid seta posterodistally; propodus roughly rectangular, posterior margin lined with fringed setae. Pleopod 1, endopod slightly shorter than exopod, bearing



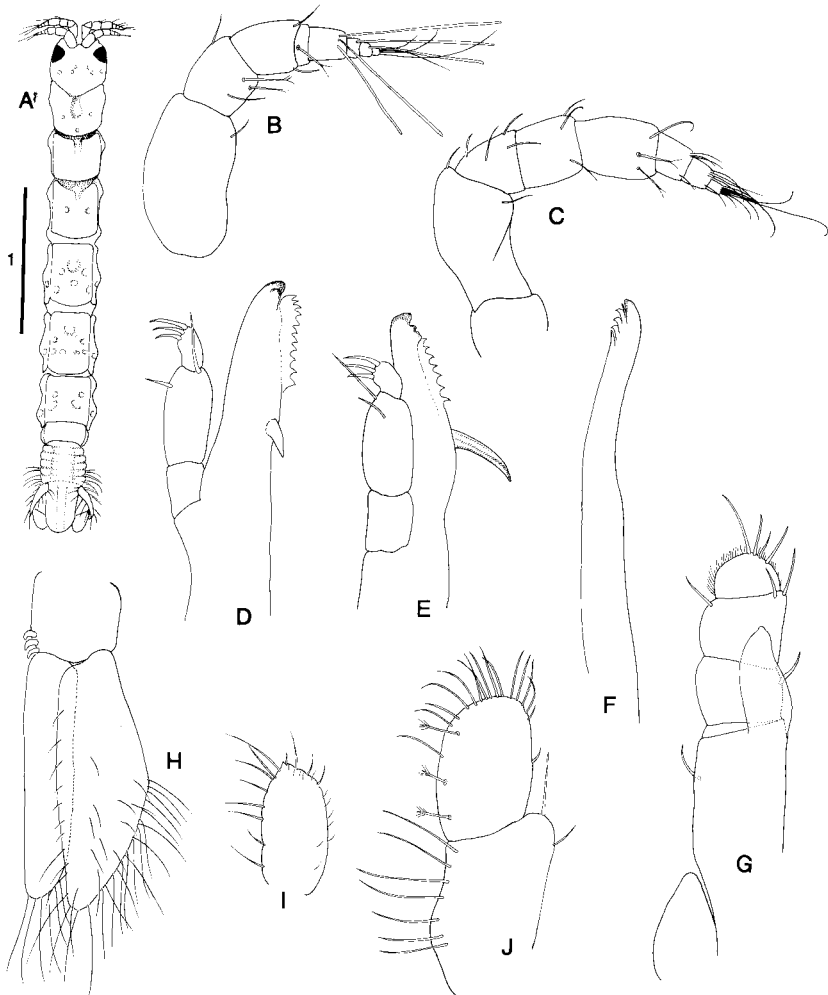


FIG. 5. *Apanthuroides aldabrae* sp. nov.: (A) ♀ dorsal view; (B) antennule; (C) antenna; (D) left mandible; (E) right mandible; (F) maxilla; (G) maxilliped; (H) pleopod 1; (I) uropodal exopod; (J) uropodal endopod.

than two distal peduncle articles together; flagellum of five articles, article 2 with three aesthetascs, articles 3, 4 and 5 each with single aesthetasc. Antennal flagellum of three setose articles. Mandibular palp of three articles, middle article longest, terminal article with three setae; incisor with three cusps; lamina dentata with seven teeth; molar curved, spike-like on one side, much shorter on other. Maxilla with strong distal spine and five more slender subterminal spines. Maxillipedal palp of four articles, basal article very short, terminal article semicircular, with four distal setae. Pereopod 1, carpus triangular; propodus barely inflated, with strong posterodistal robust seta, few setae near posterior margin. Pereopod 2 similar to pereopod 1. Pereopod 6, carpus with free anterior margin shorter than posterior margin; bearing short posterodistal robust seta; propodus with serrate posterodistal seta. Pereopod 7 lacking. Pleopod 1, protopod with three retinaculæ on mesial margin; both rami contributing to opercular function; endopod about half width of exopod; latter with

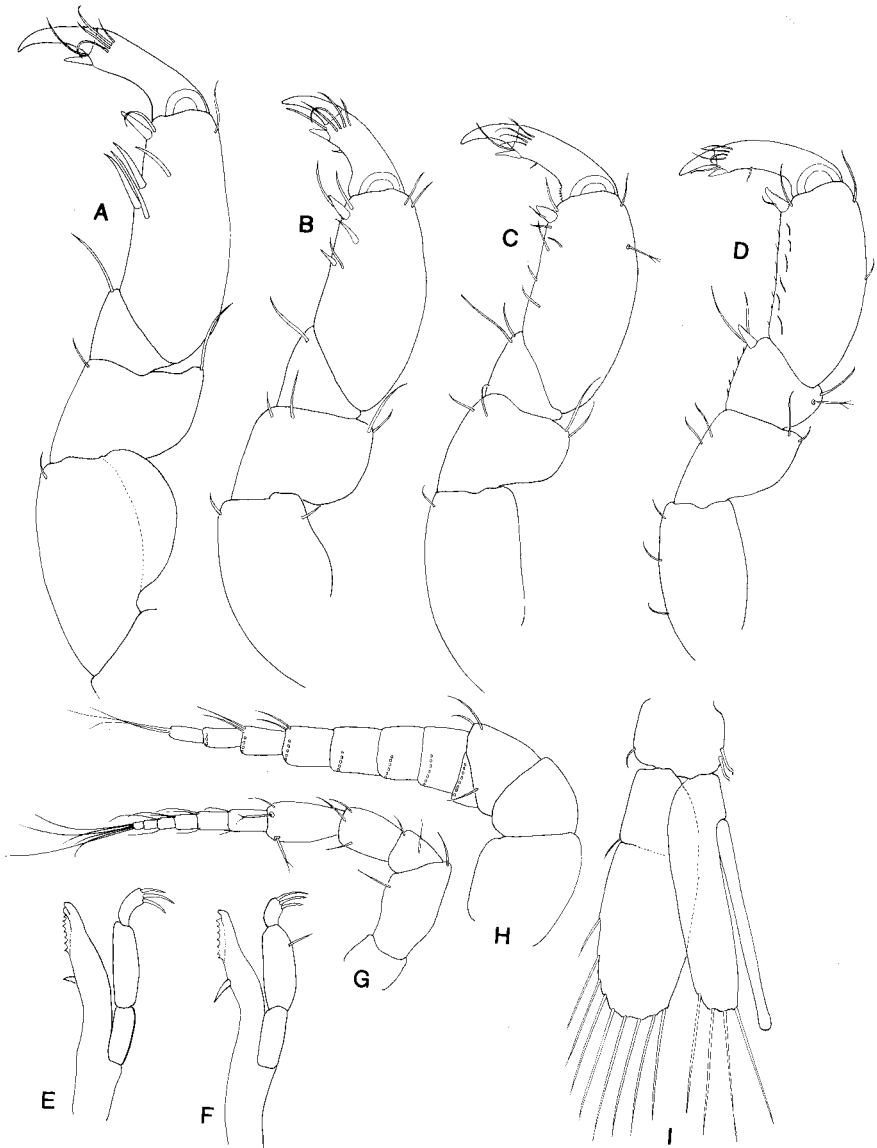


FIG. 6. *Apanthuroides aldabrae* sp. nov.: (A) ♂ pereopod 1; (B) ♀ pereopod 1; (C) ♀ pereopod 2; (D) ♀ pereopod 6; (E) left mandible; (F) right mandible; (G) antenna; (H) ♂ antennule; (I) ♂ pleopod 2.

numerous elongate distal and lateral setae. Uropodal protopod with seven elongate plumose setae on outer margin, single plumose seta on inner distal angle; exopod ovate, about twice as long as wide; endopod roughly ovate, 1.5 times longer than wide.

Male: Antennular flagellum of eight articles each bearing row of aesthetascs. Antennal flagellum of six setose articles. Pereopod 1, propodus with two stout and two slender setae at or near posterior margin, plus posterodistal robust seta.

Pereopod 7 lacking. Pleopod 2, endopod with copulatory stylet articulating in proximal half of mesial margin, bearing four distal plumose setae; endopod with incomplete transverse suture, nine distal plumose setae.

*Remarks.* All the available specimens of this species lack pereopod 7. As there are apparently mature males in the samples, it is possible that this species retains the manca condition into adulthood. In addition to this six-legged condition, *Apanthuroides aldabrae* differs from *A. calculosus* described below in having the rami of pleopod 1 more setose in the female; in having greater molar development of the mandible in the female; while the ischium of pereopod 1 of the male has a broad transparent flange on anterior margin not seen in *A. calculosus*.

*Etymology.* The specific name derives from the type locality, Aldabra Atoll.

***Apanthuroides calculosa* sp. nov.**

(Figures 7, 8)

*Type material.* HOLOTYPE: USNM 253099, ovigerous ♀ 4.7 mm, sta F-8-87, Passe Hoareau channel, Ile Malabar, Aldabra, coral rubble, 0.3 m, 11 April 1987. PARATYPE: USNM 253100, non-ovigerous ♀ 3.3 mm, same data as holotype.

*Other material examined.* USNM 253101, non-ovigerous ♀ 3.0 mm, sta K-AL-13, Cinq Cases, South Is., Aldabra, coral rubble, 6 m, 3 April 1983. USNM 253102, three non-ovigerous ♀ 3.3 mm, sta K-AL-40, reef flat, Ile Picard, Aldabra, intertidal, 12 April 1983. USNM 253103, non-ovigerous ♀ 2.9 mm, sta K-AL-49, coral rubble, Passe Femme, Aldabra, intertidal, 14 April 1983. USNM 253104, non-ovigerous ♀ 2.9 mm, sta K-AL-107, coral rubble, Grande Passe, Aldabra, 6 m, 21 April 1986. USNM 253105, three non-ovigerous ♀ 4.0 mm, sta K-AL-112, coral rubble, Mahe Beach, Mahe Is., Seychelles, 8 m, 2 April 1986. USNM 253106, three manca 2.8–3.0 mm, sta K-SEY-15, Anse à la Mouche, Mahe Is., Seychelles, 3 m, 1 May 1984. USNM 253107, ♂ 3.0 mm, coral rubble, reef crest, Picard Is., Aldabra, 3 April 1983.

*Diagnosis.* Non-ovigerous female: Body about ten times longer than wide. Integument pitted, more so in posterior than in anterior half. Head with weakly pigmented eyes; low triangular rostrum not reaching anteriorly as far as anterolateral lobes. Pereonite 7 about two-thirds length of pereonite 6, with pereopods present. Pleonites 1–5 fused, with dorsal pits faintly indicating original pleonites. Telson basally broad, tapering posteriorly, with posterior margin evenly rounded, setose; strong middorsal ridge running almost entire length. Antennule with basal article slightly longer and wider than two distal peduncle articles; flagellum of five articles, two distal articles together bearing five aesthetascs. Antenna with article 2 longest; flagellum of six setose articles. Mandible typical of genus; distal palp article bearing three setae; molar process styliform on one side, represented by tiny ‘thorn’ on other. Maxilla elongate–slender, distal spine blunt, with four smaller spines present. Maxilliped with well developed endite having two distal spinules; distal article broadly rounded, with three distal marginal setae. Pereopods 1–3 of similar size and proportions. Pereopod 1, propodus not expanded, palm concave, bearing one posterodistal simple seta, three submarginal setae. Pereopod 2 with stout serrate posterodistal seta. Pereopods 4–7 with posterodistal serrate seta on propodi and carpi; latter with anterior margin shorter than posterior margin. Pleopod 1 protopod

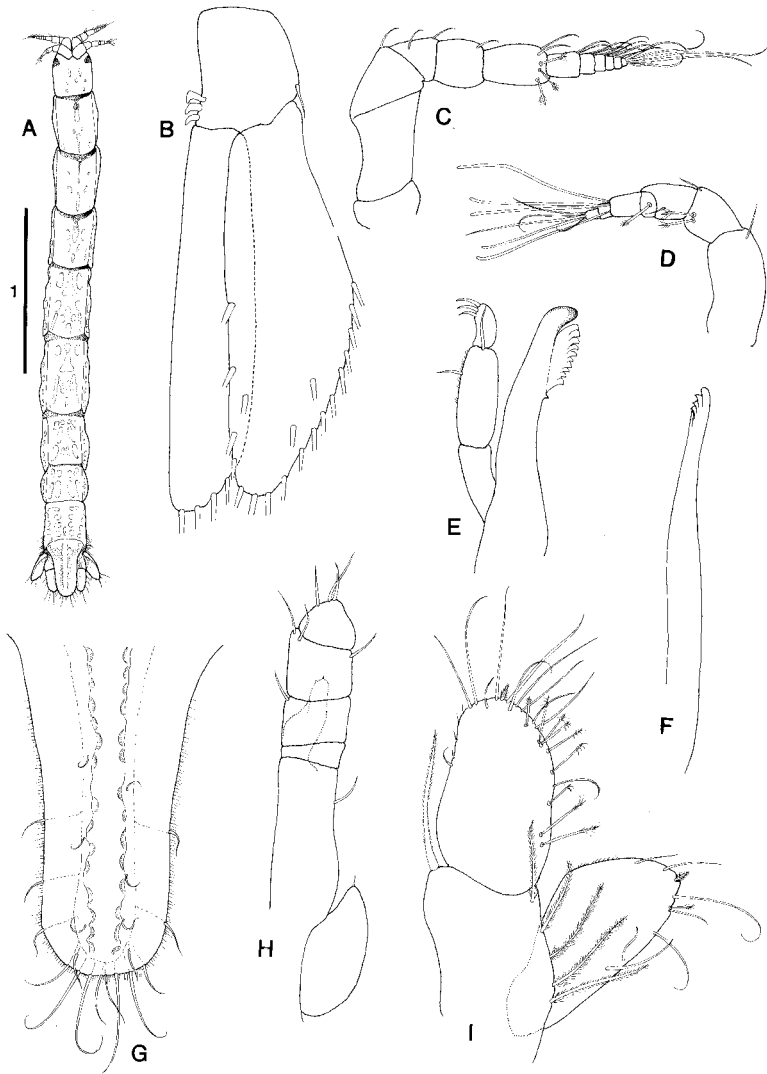


FIG. 7. *Apanthuroides calculosa* sp. nov.: (A) ♀ dorsal view; (B) pleopod 1; (C) antenna; (D) antennule; (E) mandible; (F) maxilla; (G) pleotelson; (H) maxilliped; (I) uropod.

with three retinaculae; endopod about two-thirds width of, and slightly longer than exopod; both rami forming operculum. Uropodal protopod with five elongate plumose setae on outer margin, single plumose seta on inner distal angle; endopod longer than wide, distal margin setose, rounded; exopod not reaching midlength of endopod, basally narrowed, widest at midlength, distally somewhat tapered.

Male: Antennular flagellum of eight articles, each bearing whorl of aesthetascs. Antennal flagellum of seven articles. Eyes enlarged, occupying most of lateral surface of cephalon, not quite meeting middorsally. Pereopod 1, propodus bearing five stout fringed setae in distal half of posterior surface.

*Remarks.* In general proportions, and in the integumental pitting, *A. calculosa*

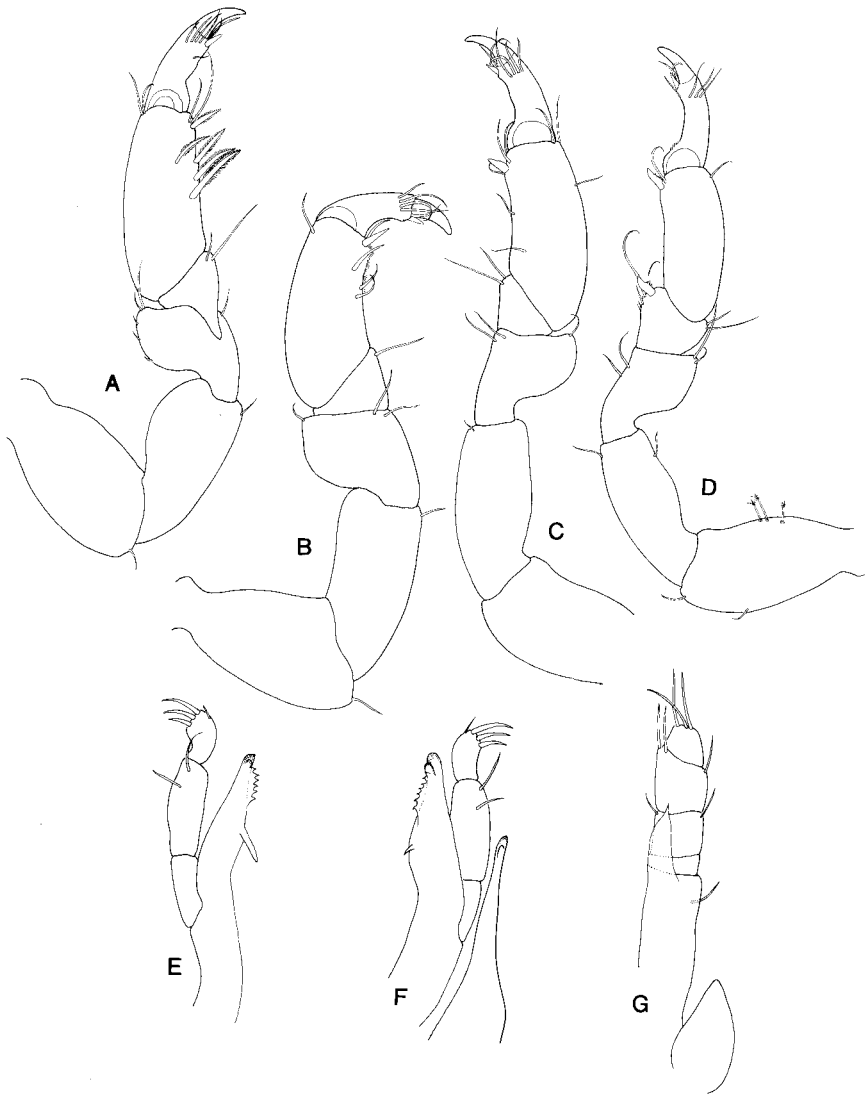


FIG. 8. *Apanthuroides calculosa* sp. nov.: (A) ♂ pereopod 1; (B) ♀ pereopod 1; (C) pereopod 2; (D) pereopod 6; (E) left mandible; (F) right mandible and maxilla; (G) maxilliped.

closely resembles *A. fijiensis* (Kensley, 1979) from Fiji. The latter, however, has a three-articulate flagellum of the antenna (six articles in the present species) and a three-articulate flagellum of the antennule (four in the present species). *Apanthuroides foveolata* (Kensley, 1978b) from deep water off the east coast of South Africa and *A. spathulicauda* Wägele, 1981b from the Mediterranean both possess finely dentate telsonic and uropodal margins. *Apanthuroides millae* Menzies and Glynn, 1968 from the Caribbean (and also the type species of the genus) is a squatter species with smaller pereonite pits.

*Etymology.* The specific name derives from the Latin, *calculosus*, meaning gravelly or pebbly, referring to the rubble habitat of the species.

**Genus *Eisothistos* Haswell, 1884**

*Eisothistos* Haswell, 1884: 677; Wägele, 1979: 2; Kensley and Schotte, 1989: 38.

*Diagnosis.* Eyes present, enlarged in male, or absent. Mouthparts reduced in male; in female anteriorly produced beyond rostrum; mandible lacking palp, molar and lamina dentata. Maxilliped slender, endite obsolete or lacking; palp of one to five narrow articles. Pereonites sometimes elongate, giving body worm-like appearance in post-spawning females. Pleonites 1–5 free; pleonite 6 with free posterior margin, or fused with pleotelson. Pereopods 1–3 not subchelate, propodi slender, elongate. Pleopod 1, rami fused in juvenile and prespawning female, together forming weak operculum, free in male. Tailfan indurate; uropodal exopod with strong apical spike and serrate margin. Telson lacking statocysts; with dentate posterior margin.

**Key to the Indian Ocean species of *Eisothistos***

- |  |  |
|--|--|
| 1 Telson having middorsal row of spines . . . . .                            | 2  |
| – Telson lacking middorsal row of spines . . . . .                           | 5  |
| 2 Telson with six or fewer spines in middorsal row . . . . .                 | 3  |
| – Telson with more than six spines in middorsal row . . . . .                | 4  |
| 3 Telson with three spines in middorsal row . . . . .                        | <i>crateris</i> Kensley, 1976 St. Paul Island  |
| – Telson with six spines in middorsal row . . . . .                          | <i>corallina</i> sp. nov. Aldabra  |
| 4 Telson with about ten large spines in middorsal row . . . . .              |  |
| . . . . .  | <i>andamanensis</i> sp. nov. Andaman Sea   |
| – Telson with 11 large spines plus row of smaller submedian spines . . . . . |  |
| . . . . .  | <i>antarcticus</i> Vanhöffen, 1914 Antarctica  |
| 5 Pereopod 1 propodus, length less than twice width . . . . .                |  |
| . . . . .  | <i>bataviae</i> Kensley and Poore, 1982 Houtman Abrolhos Islands, Western Australia    |
| – Pereopod 1 propodus, length more than twice width. . . . .                 | 6  |
| 6 Posterior margin of telson non-dentate . . . . .                           |  |
| . . . . .  | <i>vermiformis</i> Haswell, 1884 New South Wales, Australia [included as type species] |
| – Posterior margin of telson dentate . . . . .                               | 7  |
| 7 Posterior margin of telson with eight teeth . . . . .                      |  |
| . . . . .  | <i>neoanomalus</i> (Shyamasundari <i>et al.</i> 1991) South India                      |
| – Posterior margin of telson with about 16 teeth . . . . .                   |  |
| . . . . .  | <i>maledivensis</i> Wägele, 1979 Maldive Islands                                       |
| – Posterior margin of telson with about 20 teeth . . . . .                   | <i>anomala</i> (Kensley, 1980a) Madagascar   |

***Eisothistos andamanensis* sp. nov.**

(Figures 9, 10)

*Type material.* HOLOTYPE: USNM 253129, non-ovigerous ♀ 6.0 mm, west coast of Thailand, Fifth Thai-Danish Expedition, January–March 1966. PARATYPES: USNM 253130, six non-ovigerous ♀ 3.9–5.2 mm (one with two manca in same serpulid tube), one immature female, same data as holotype.

*Diagnosis.* Non-ovigerous female: Body slender, integument other than of tailfan thin; pereonites 2–5 elongate, uropods and telson sclerotized; telson with posterolateral margins spinose, slight median ridge bearing longitudinal row of about nine or ten large spines plus several smaller spinules. Antennule with flagellum of seven articles. Antennal peduncle article 5 equal to articles 3 and 4 together; flagellum of six articles. Mandible thin, lamellate. Maxilla thin-walled, spines barely discernible distally. Pereopod 1 bearing several elongate setae on merus, ischium and basis;



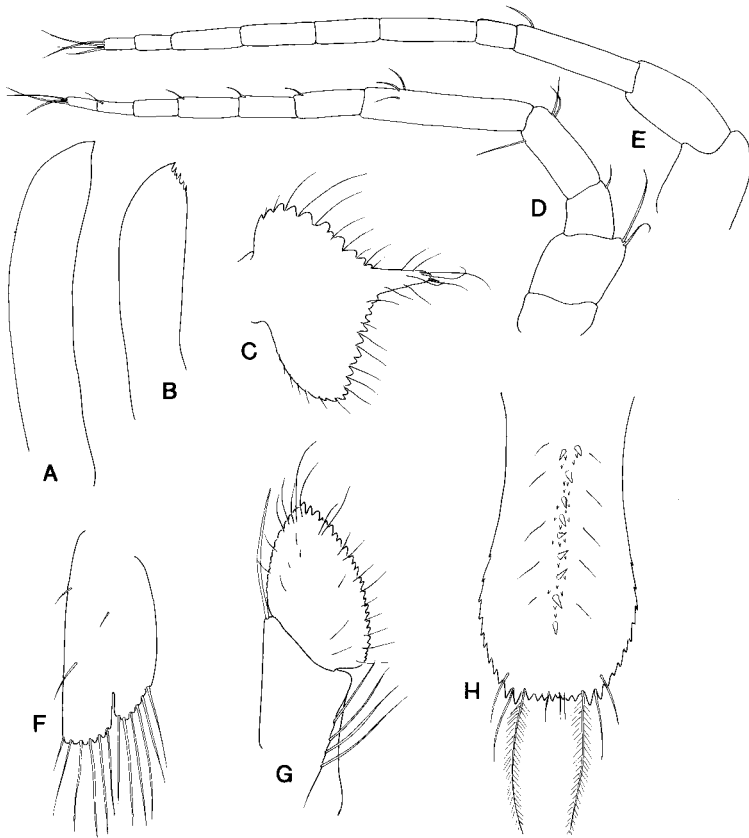


FIG. 9. *Isothistos andamanensis* sp. nov.: (A) mandible; (B) maxilla; (C) uropodal exopod; (D) antenna; (E) antennule; (F) pleopod 1; (G) uropodal protopod and endopod; (H) pleotelson.

unguis of dactylus relatively short. Pereopod 2 with blunt tubercles on posterior surface of ischium and merus; propodus with row of short setae on posterior margin, short blunt posterodistal seta; unguis about one-fifth length of rest of dactylus. Pereopod 7 with elongate setae on merus, ischium and basis; carpus with posterior margin slightly shorter than anterior; propodus about 3.5 times longer than wide, with short setae on posterior margin, short blunt posterodistal seta; unguis about one-fifth length of rest of dactylus. Pereopod 7 with elongate setae on merus, ischium and basis; carpus with posterior margin slightly shorter than anterior; propodus about 3.5 times longer than wide, with short setae on posterior margin, short blunt posterodistal seta. Pleopod 1, rami fused for four-fifths of length of endopod; both rami having six distal plumose setae. Uropodal exopod with elongate spike on lateral margin; latter bluntly spinose; endopod ovate, distally acute, margins bluntly spinose.

*Etymology.* The specific name derives from the Andaman Sea.

***Isothistos corallina* sp. nov.**

(Figures 11, 12)

*Type material.* HOLOTYPE: USNM 253127, non-ovigerous ♀ 2.8 mm, sta K-AL-99, intertidal coralline algal turf, lagoon near Passe Du Bois, Aldabra,

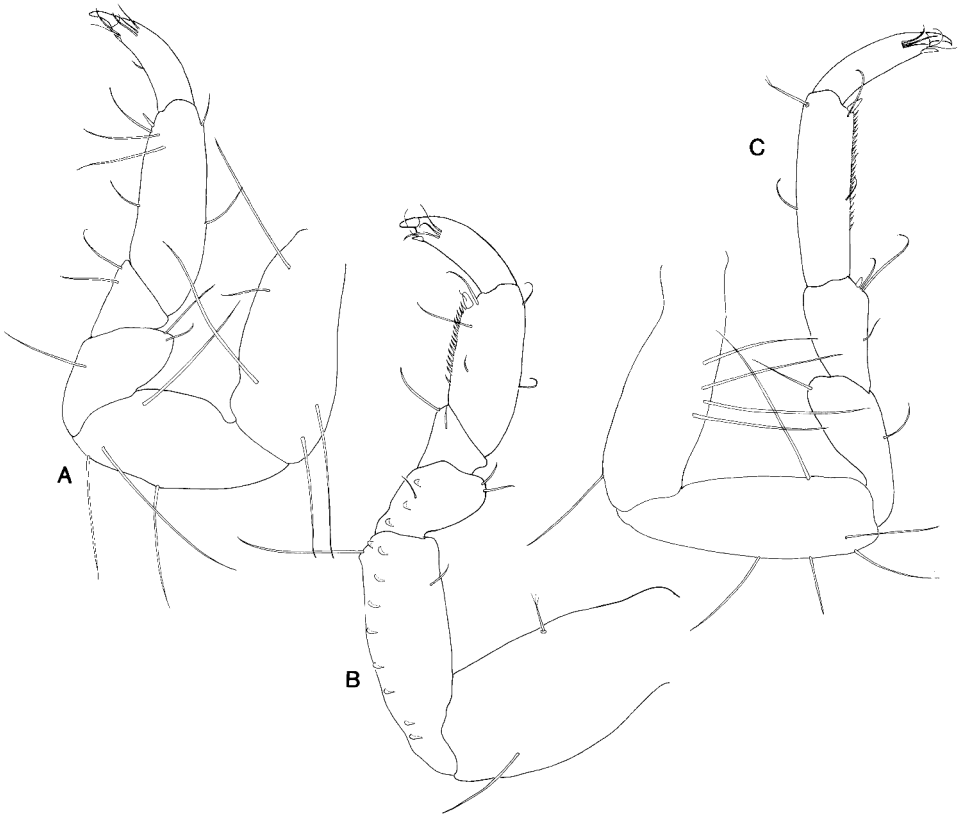


FIG. 10. *Eisothis andamanensis* sp. nov.: (A) ♀ pereopod 1; (B) ♀ pereopod 2; (C) ♀ pereopod 7.

16 March 1986. PARATYPES: USNM 253128, one ♂ 2.3 mm, six non-ovigerous ♀ 2.0–3.0 mm, sta K-AL-99, same data as holotype.

*Diagnosis.* Female: Integument of pereon moderately sclerotized, tailfan strongly so. Telson with median longitudinal row of six to eight spines, widening posteriorly, with dentate posterior margin broadly rounded/truncate. Eyes large, anterolateral. Antennule with three peduncular articles increasing in length distally; flagellum of seven articles, with antepenultimate and penultimate articles each bearing single aesthetasc. Mandible with broadly rounded, sclerotized incisor. Maxilla with two broad and six slender distal spines. Maxilliped slender, shorter than mandible and maxilla, of four articles. Pereopod 1, carpus triangular, with almost no free anterior margin; propodus not expanded, with stout posterodistal serrate seta. Pereopod 2, ischium, merus and carpus bearing short rounded tubercles on posterior margin; propodus with row of distal short setae, stout posterodistal serrate seta. Pereopod 7, carpus with anterior and posterior margins subequal in length, carpus with row of short setae and posterodistal seta; propodus about four times longer than wide, posterior margin bearing low setae, stout posterodistal serrate seta present. Pleopod 1, rami fused except for distal slit, exopod with four distal plumose setae, endopod with six. Uropodal exopod ovate, with spike-like extension on dentate lateral margin; endopod tapering distally, margins dentate; protopod with margins finely serrate.

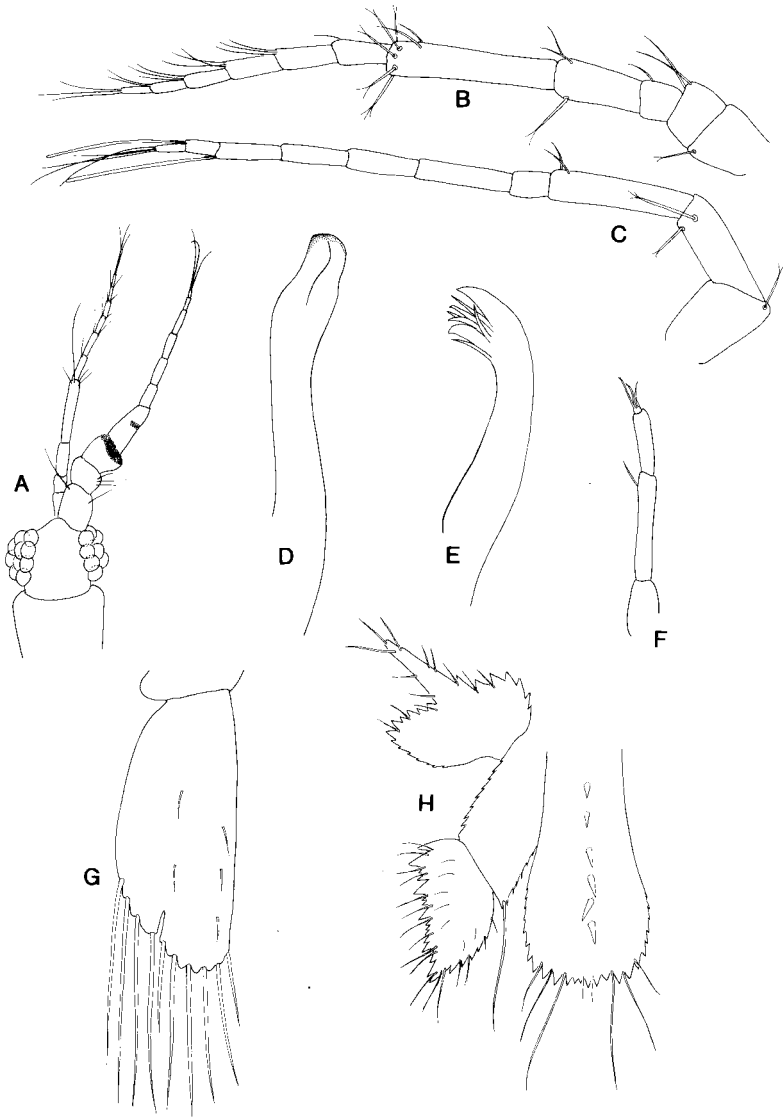


FIG. 11. *Eisothisios corallina* sp. nov. (A) ♂ cephalon and antennae; (B) ♀ antenna; (C) ♀ antenna; (D) mandible; (E) maxilla; (F) mandibular palp; (G) pleopod 1; (H) telson and uropod.

Male: eyes enlarged, occupying most of lateral margins of cephalon. Antennule with articles 1–3 broad, latter with dense whorl of aesthetascs, distal flagellar articles also bearing aesthetascs. Pereopod 1, carpus triangular, with row of four short setae on posterior margin; propodus about five times longer than wide, submarginal posterior row of setae, stout serrate posterodistal seta. Pereopod 2 similar to pereopod 1. Pereopod 7, carpus with anterior margin subequal in length to posterior, with serrate posterodistal seta; propodus slightly more than five times longer than wide, bearing row of short posterior setae, stout serrate posterodistal seta.

*Colour.* Symmetrical thin red pigment lines on antennules, antennae and on dorsum of cephalon, pereonites, pleon, uropods and telson.

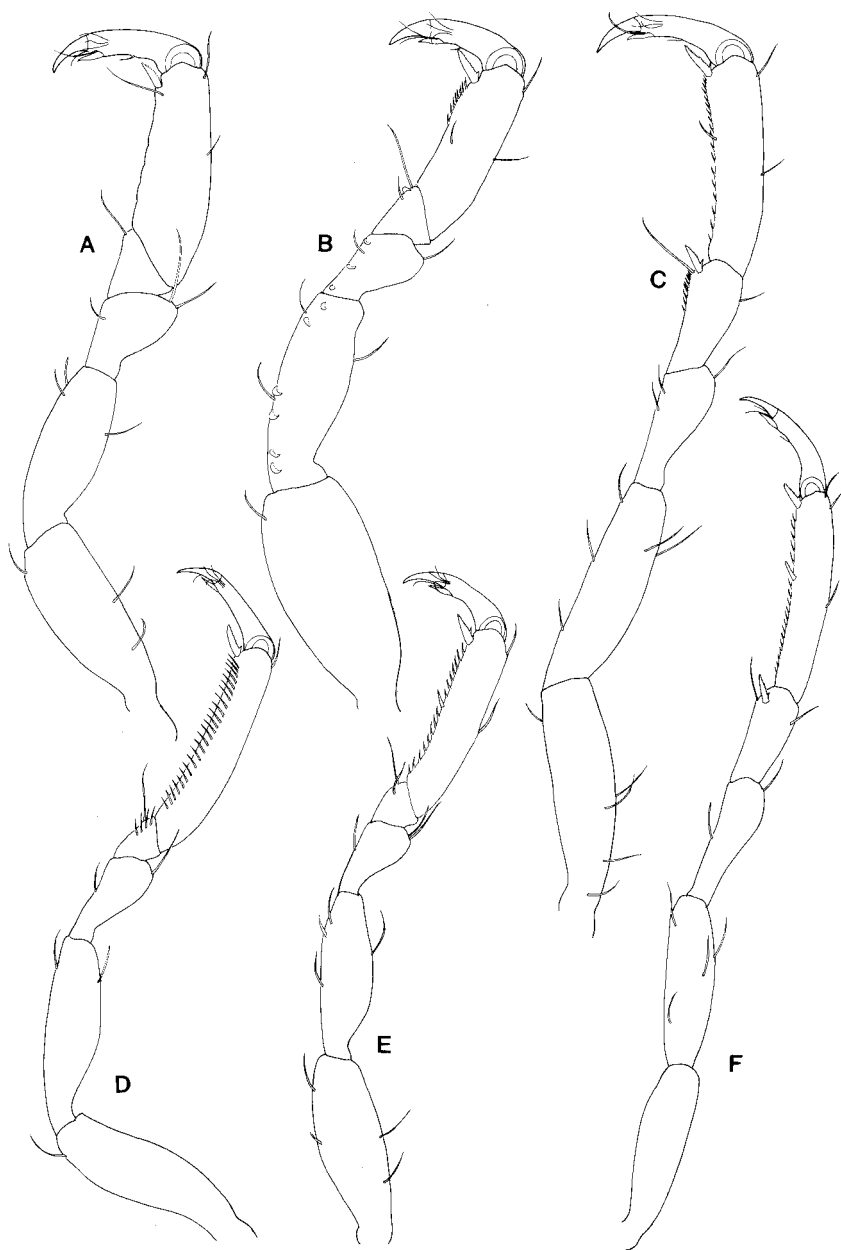


FIG. 12. *Eisothisos corallina* sp. nov.: (A) ♀ pereopod 1; (B) ♀ pereopod 2; (C) ♀ pereopod 7; (D) ♂ pereopod 1; (E) ♂ pereopod 2; (F) ♂ pereopod 7.

*Remarks.* The present species bears little resemblance to any of the nine known Indian Ocean species, but to some degree resembles *E. besar* Müller, 1992a, from Malaysia, in possessing mediadorsal spines on the telson. These spines are fewer in number, however (four against six in *E. corallina*), while a characteristic recurved hook-like spine on the mesial surface of the uropodal exopod of *E. besar*, serves easily to separate these species.

*Etymology.* The specific name refers to the coralline algae from which the specimens were taken.

**Genus *Heptanthura* Kensley, 1978b**

*Heptanthura* Kensley, 1978b: 775.

*Diagnosis.* Eyes present. Mandibular palp of three articles, or absent. Maxillipedal palp of five articles, terminal article small; endite lacking. Pereopod 7, carpus with anterior margin much shorter than posterior; two stiff, fringed, anterodistal setae on propodus. Pleopod 1, both rami forming operculum. Uropodal exopod having strong distodorsal spike-like lobe. Telson lacking statocyst.

*Etymology.* The specific name derives from the Andaman Sea.

***Heptanthura phuket* sp. nov.**

(Figures 13, 14)

*Type material.* HOLOTYPE: ZMUC, non-ovigerous ♀ 4.0 mm, sta CRU-2001, MBC reef flat, Phuket, Thailand, intertidal, coll. N. L. Bruce, 22 November 1995.

*Diagnosis.* Non-ovigerous female: Pleonites 1–4 subequal in length, pleonites 5 and 6 longer. Pleotelson length about twice greatest width, posterior margin broadly rounded, finely serrate. Antennular flagellum of three articles, penultimate article with one aesthetasc, terminal article with two aesthetascs. Antennal flagellum of eight articles. Terminal article of mandibular palp bearing three setae. Maxillipedal palp of five articles, terminal article small, bearing four setae; endite not developed. Pereopod 1 with four distal articles squat in appearance, carpus with three setae on posterior margin, with very short free anterior margin; propodus with palm straight, with few scattered setae, somewhat expanded proximally; dactylus basally broad, bearing fringed scales on posterior surface, short squat seta at base of unguis. Pereopod 2, carpus triangular, with very short anterior margin; propodus not expanded, with short squat dentate seta posterodistally; dactylus with strong accessory seta at base of unguis. Pereopod 7, carpus roughly triangular, with anterior margin much shorter than posterior, short dentate seta at posterodistal angle; propodus rectangular, with short dentate seta and more elongate bifringed seta posterodistally, two elongate bifringed setae anterodistally. Pleopod 1, exopod slightly longer than endopod, both contributing to operculum. Uropodal exopod margin dentate/serrate, with strong spike-like extension on lateral margin; endopod ovate, margin dentate/serrate.

*Colour.* Sparse scattered red–brown squiggles on dorsum of cephalon, pereonites 1–7 and pleotelson.

*Remarks.* Although only a single specimen of this species is available, it is nevertheless described, given that the only other species of the genus, *H. novaezealandiae* Kensley, 1978b, is known from two specimens from New Zealand. *Heptanthura phuket* is surprisingly similar to the type species, especially in the structure of the pereopods, but several differences are apparent: the second article of the mandibular palp is much longer in the New Zealand species; the uropods and pleotelson of the latter are somewhat more slender, while the antennal flagellum has two fewer articles.

Kensley and Poore (1982) recorded and briefly described an unnamed species from Australia, which somewhat resembles the present species.

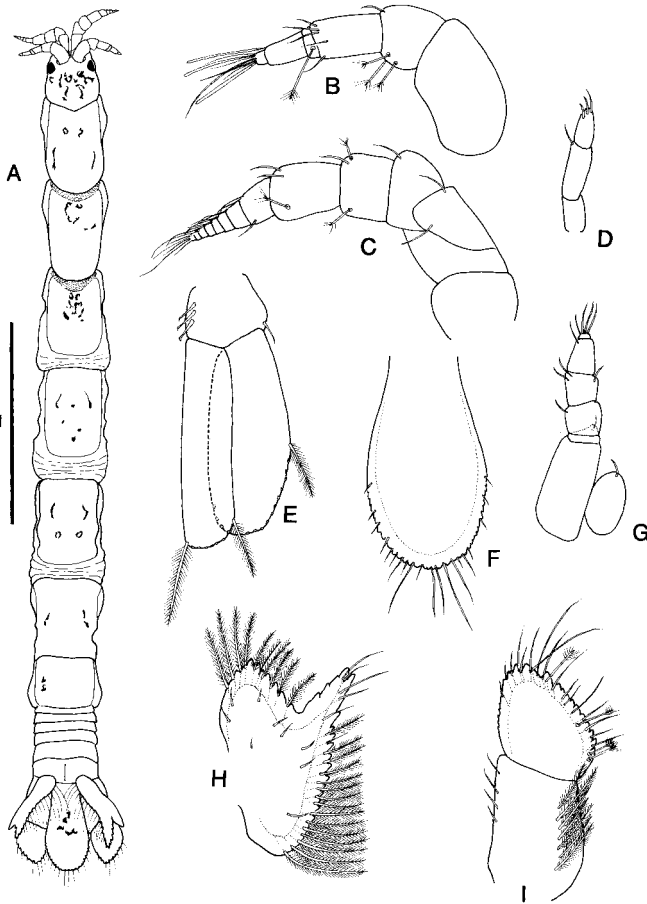


FIG. 13. *Heptanthura phuket* sp. nov.: (A) ♀ dorsal view; (B) antennule; (C) antenna; (D) mandibular palp; (E) pleopod 1; (F) pleotelson; (G) maxilliped; (H) uropodal exopod; (I) uropodal protopod and endopod.

*Etymology.* The specific name, used as a noun in apposition, is taken from Phuket Island, the type locality.

**Genus *Malacanthura* Barnard, 1925**

*Malacanthura* Barnard, 1925: 133; Kensley and Schotte, 1989: 43.

*Diagnosis.* Eyes present. Mandibular palp of three articles. Maxillipedal palp of three articles; endite short or absent. Pereopod 1, propodus subchelate, expanded. Pereopods 4–7, carpus rectangular, with anterior margin subequal to posterior. Pleopod 1, exopod operculiform. Pleonites 1–5 short, fused. Pleotelson with two basal statocysts.

*Remarks.* Of the nine species of *Malacanthura* recorded from the Indian Ocean, seven are from South Africa, where they have fairly restricted distributions centered around the southern Cape coast (see Kensley, 1982 for key). Only *M. mombasa* Kensley, 1980a, has been recorded from the tropical Indian Ocean (see *Remarks* below).

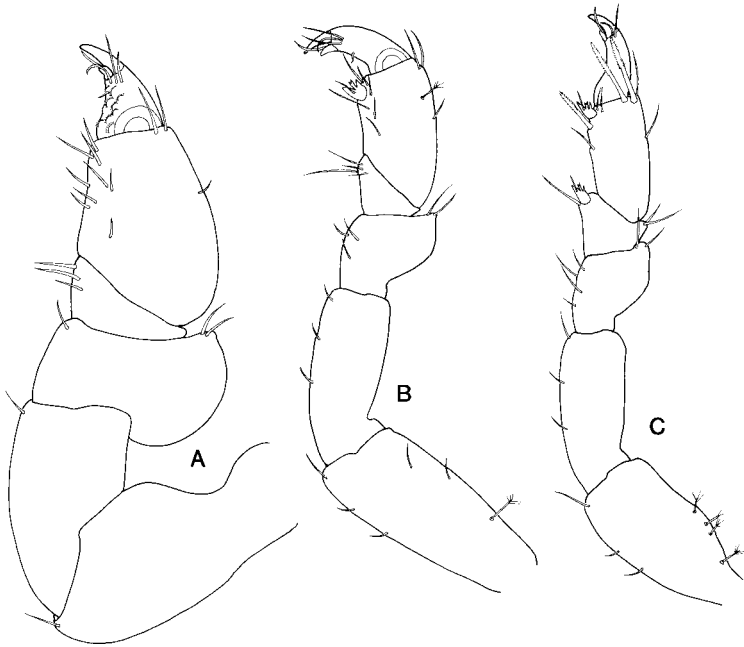


FIG. 14. *Heptanthura phuket* sp. nov.: (A) pereopod 1; (B) pereopod 2; (C) pereopod 3.

***Malacanthura arabica* sp. nov.**  
(Figures 15, 16)

*Type material.* HOLOTYPE. USNM 253268, ♂ 18.7 mm, sta 5S3, 26°30'N, 50°05.30'E, 1.5 m, Tarut Bay, Persian Gulf, Saudi Arabia, May 1982. PARATYPES. USNM 253269, one ♂ 15.2 mm, one non-ovigerous ♀ 15.3 mm, sta 1S2, 25°05.29'N, 50°36.70'E, 7 m, Tarut Bay, Persian Gulf, Saudi Arabia, May 1982.

*Other material examined.* One ♂, ten non-ovigerous ♀, 13 juveniles, from 17 stations, Tarut Bay, 1.5–7.0 m, Persian Gulf, Saudi Arabia, 1981–1982.

*Diagnosis.* Male: Exoskeleton moderately indurate. Telson about 2.5 times longer than basal width, dorsally strongly convex, with strong rounded middorsal longitudinal ridge, latter flanked by short lateral ridges in posterior half, posterior margin evenly rounded, lateral margin with pronounced 'shoulder' just beyond midlength. Antennular flagellum of nine articles, articles 2–8 bearing whorl of aesththascs. Antennal flagellum of seven articles. Mandibular palp with terminal article bearing row of 12 stiff setae; molar short, rounded. Maxillipedal palp of three articles, article 2 longest, with row of ten short setae on mesial margin. Pereopod 1, propodus expanded proximally, palm convex, with band of dense setae on mesial surface. Pereopod 2, carpus triangular, lacking free anterior margin; propodus linear, with several simple setae on posterior margin, short squat dentate seta posterodistally. Pereopod 7, carpus rectangular, almost three times longer than wide, with several setae and stiff robust setae on posterior margin; propodus narrow, rectangular, about four times longer than wide, with three stout posterodistal fringed setae. Pleopod 1, endopod slightly shorter than, and about half width of exopod, with about 11 distal plumose marginal setae. Pleopod 2, slender copulatory stylet articulating at midlength of mesial margin of endopod; latter slightly longer than exopod.

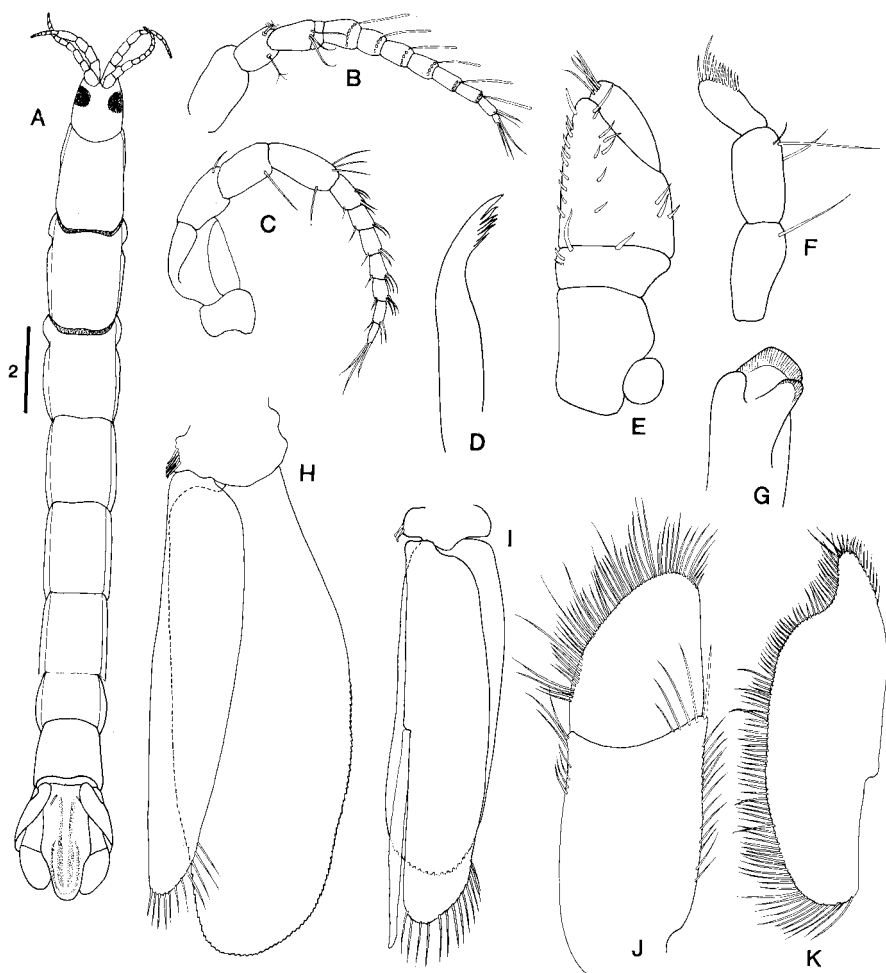


FIG. 15. *Malacanthura arabica* sp. nov. (A) ♂ dorsal view; (B) ♂ antennule; (C) antenna; (D) maxilla; (E) maxilliped; (F) mandibular palp; (G) mandible; (H) pleopod 1; (I) ♂ pleopod 2; (J) uropodal protopod and endopod. K, uropodal exopod.

Uropodal exopod about three times longer than greatest width, distally strongly notched, apex narrowly rounded; endopod roughly triangular, about 1.3 times longer than basal width.

Female: Resembles male in overall proportions. Eye somewhat smaller than in male. Antennular flagellum of nine articles. Antennal flagellum of seven articles. Pereopod 1 as in male, but with fewer setae on mesial surface of propodus.

*Remarks.* *Malacanthura arabica* bears a close resemblance to *M. mombasa* Kensley, 1980a, from Kenya, in general appearance and in the structure of the appendages. The most easily discerned difference lies in the telson: in *M. mombasa* a distinct shoulder is lacking, while the lateral ridges extend further anteriorly than in *A. arabica*. The maxilliped in the Kenyan species is proportionally squatter than in the present species.

*Etymology.* The specific name derives from the general region of the type locality, the Persian (or Arabian) Gulf.



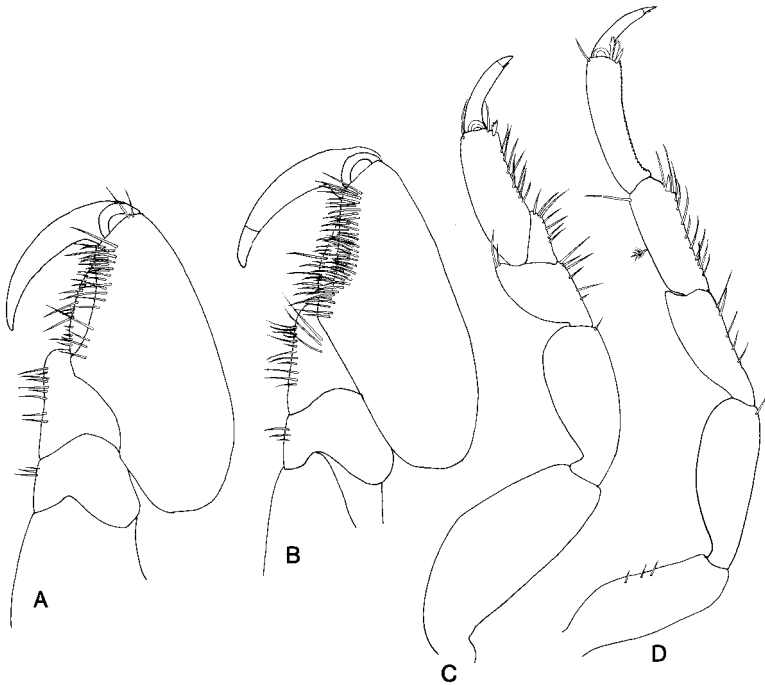


FIG. 16. *Malacanthura arabica* sp. nov.: (A) ♀ pereopod 1; (B) ♂ pereopod 1; (C) pereopod 2; (D) pereopod 7.

### Genus *Mesanthura* Barnard, 1914

*Mesanthura* Barnard, 1914: 343a; Poore and Lew Ton, 1986b: 90; Müller, 1993: 19.

**Diagnosis.** Eyes present. Persistent species-specific dorsal pigment pattern present. Antennular flagellum of three articles. Antennal flagellum short, of few articles. Mandibular palp of three articles. Maxillipedal palp of three articles; endite very short or absent. Pereopod 1, propodus subchelate, expanded. Pereopods 4–7, carpus roughly triangular, with anterior margin shorter than posterior. Pleon short, pleonites fused. Telson with two basal statocysts.

**Remarks.** Nine species of *Mesanthura* have been described from the Indian Ocean, separation of which, using clear key characters, is difficult due to lack of material and poor descriptions. Morphologically, aside from the dorsal colour pattern, species of *Mesanthura* are very similar. Table 2 attempts to provide some basis for distinguishing these species.

### *Mesanthura quadrata* sp. nov.

(Figures 17, 18)

**Type material.** HOLOTYPE: USNM 253163, ovigerous ♀ 8.0 mm, sta J-SEY-2, red coralline algae from reef flat, 1–1.5 m, Mahé Beach, Mahé, Seychelles, 30 April 1984. PARATYPES: USNM 253164, two non-ovigerous ♀ 5.2 mm, 7.0 mm, ten juveniles, sta K-SEY-22, algal turf on granite boulders, 1 m, Anse Marie Louise, Mahé, Seychelles, 25 April 1989. USNM 253165, four non-ovigerous ♀ 4.6–6.3 mm, two juveniles, sta K-SEY-23, algal turf from reef crest, 0.5 m, Anse Marie Louise, Mahé, Seychelles, 25 February 1989. USNM 253166, one non-ovigerous ♀ 7.9 mm, sta

Table 2. Features distinguishing *Mesanthura* species.

|   | Mandibular palp article 3 setae | Uropodal exopod | Colour pattern  |
|---|---------------------------------|-----------------|---|
| <i>M. albinotata</i> Thomson, 1951<br>Rottnest Island, W. Australia   | ?                               | notched         | solid, with open middorsal oval on pereonites 4–6   |
| <i>M. bipunctata</i> Thomson, 1951<br>Rottnest Island, W. Australia   | ?                               | notched         | double linked ovals on head, pereonites and pleon, each with ovate open area                            |
| <i>M. catenula</i> (Stimpson, 1855)<br>South Africa   | 12                              | notched         | subquadrate rings on head and pereonites  |
| <i>M. dimorpha</i> Kensley, 1982<br>South Africa  | 4                               | notched         | narrow rings on pereonites 1–3, posterior band on 4–7   |
| <i>M. gerlachi</i> Wägele, 1981b<br>Maldive Island  | 6                               | sinuate         | irregular open rings on pereonites and pleon  |
| <i>M. maculata</i> ( <i>sensu</i> Kensley, 1980a) Madagascar  | 11                              | notched         | solid blocks on head, pereonites and pleon  |
| <i>M. nigra</i> Müller, 1993 Kenya  | 7                               | sinuate         | solid continuous band from head to telson   |
| <i>M. protei</i> Kensley 1980a<br>Mozambique; Madagascar; Kenya; Malaysia   | 9                               | sinuate         | variable, rings on pereonites and pleon, or linked or unlinked longitudinal bars on head and pereonites |
| [Kensley and Poore (1982) recorded <i>M. protei</i> from Australia; there is some doubt that this is same species.] |                                 |                 |   |
| <i>M. quadrata</i> sp. nov. Seychelles  | 7                               | sinuate         | solid squares on head, pereonites and pleon   |

J-SEY-6, coral rubble between brown algae, 1 m, Anse à la Mouche, Mahé, Seychelles, 1 May 1984.

*Other material examined.* USNM 253167, one non-ovigerous ♀, two juveniles, sta K-SEY-15, coral rubble, 2.5–5 m, Anse à la Mouche, Mahé, Seychelles, 1 May 1984. USNM 253168, two non-ovigerous ♀, one juvenile, sta K-SEY-21, coralline alga on reef flat, 1 m, Anse Marie Louise, Mahé, Seychelles, 25 February 1989. USNM 253169, two juveniles, sta K-SEY-24, coral rubble, 1–1.5 m, Anse à la Mouche, Mahé, Seychelles, 26 February 1989.

*Diagnosis.* Female: Telson fused dorsally with pleonite 6. Telson length about 2.7 times basal width, posterior margin evenly convex, apex with cluster of six pairs of setae of varying lengths. Antennular flagellum of four articles, two distal articles each bearing two aesthetascs. Antennal flagellum of four articles. Mandibular palp, short terminal article bearing seven fringed setae; lamina dentata of five serrations. Distal article of maxillipedal palp subcircular, with four setae mesially. Pereopod 1, carpus triangular, distally truncate, ridged; propodal palm with low rounded tooth at midlength, bearing six setae. Pereopods 2 and 3, propodus rectangular, with single stout dentate seta posterodistally. Pereopod 7, carpus with anterior margin much

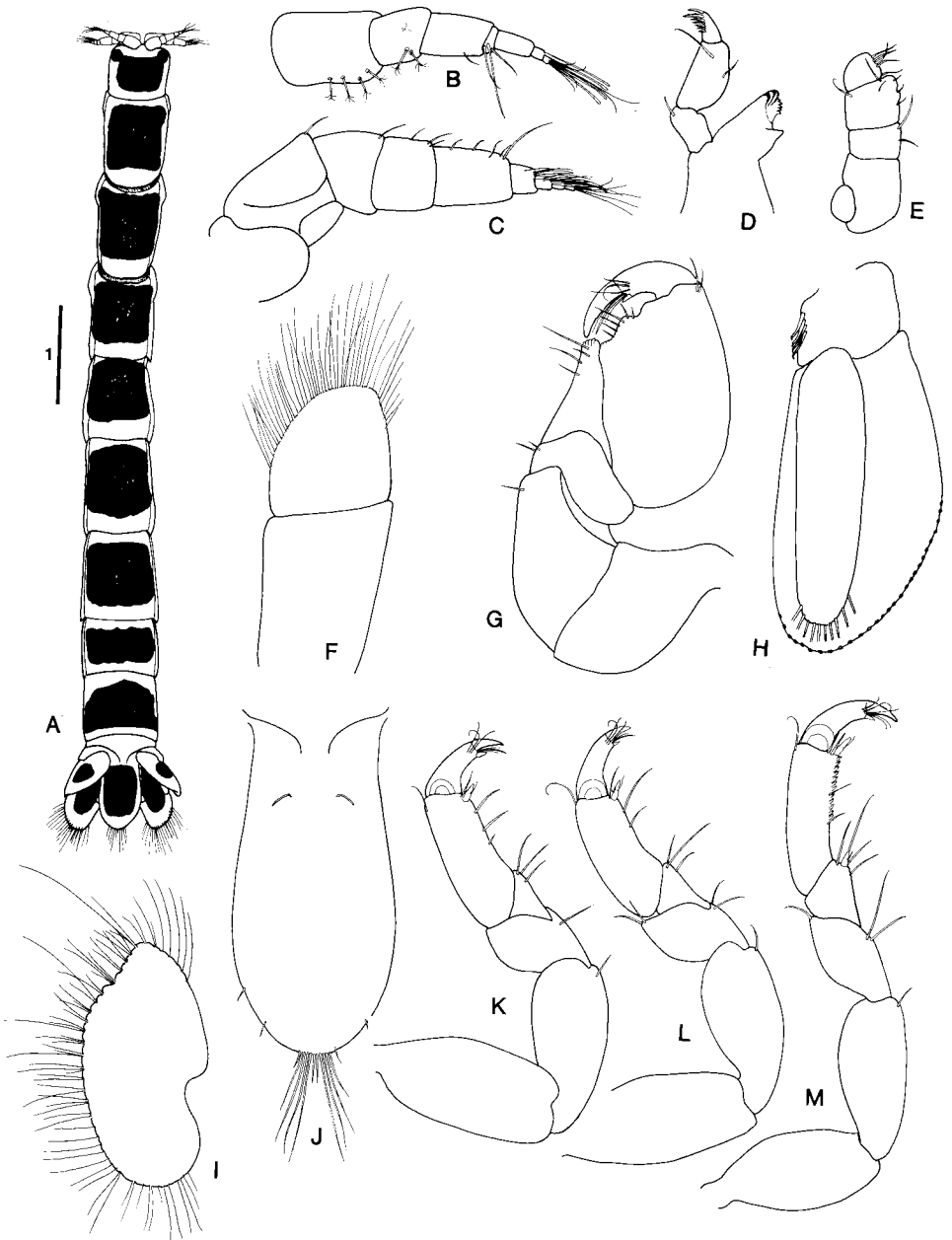


FIG. 17. *Mesanthura quadrata* sp. nov.: (A) ♀ dorsal view; (B) antennule; (C) antenna; (D) mandible; (E) maxilliped; (F) uropodal protopod and endopod; (G) pereopod 1; (H) pleopod 1; (I) uropodal exopod; (J) pleotelson; (K) pereopod 2; (L) pereopod 3; (M) pereopod 7.

shorter than posterior, with short squat seta posterodistally; propodus rectangular, posterior margin bearing numerous fringed scales, stout sensory seta posterodistally. Pleopod 1, endopod slightly shorter than, and about 0.4 times width of exopod, bearing ten distal plumose marginal setae. Uropodal exopod ovate, lateral

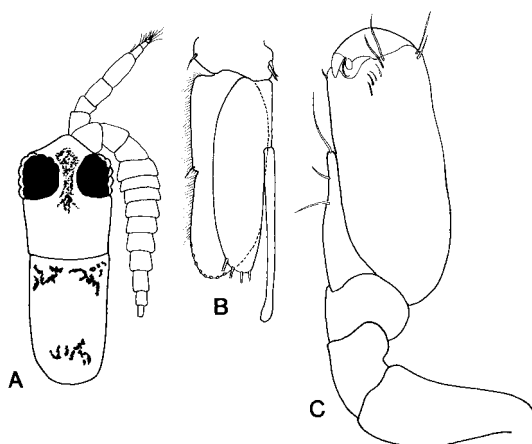


FIG. 18. *Mesanthura quadrata* sp. nov.: (A) ♂ cephalon; (B) ♂ pleopod 2; (C) ♂ pereopod 1.

margin distally very slightly emarginate, apically rounded; endopod distally broadly rounded, slightly longer than basal width.

*Colour.* Fairly solid rectangles of red–brown pigment dorsally on cephalon, all pereonites, pleon and telson; blobs of pigment on uropodal exopod and endopod/protopod.

*Remarks.* The present species, with its solid rectangles of pigment, bears some resemblance to those species referred to as *M. 'maculata'*, described by various authors (see Poore and Lew Ton, 1986b: 88). The latter, however, point out the confusion with both the name '*maculata*' and the fact that several species undoubtedly masquerade under this name. As *Haliopasma maculata* Haswell, 1881, is a species of *Accalathura*, this name is to be avoided, hence the present species is given a new name. *M. quadrata* bears some resemblance to *M. dianella* Poore and Lew Ton, 1986b, from New South Wales, but has a more strongly notched uropodal exopod and pleonite 6 not visibly fused dorsally with the telson.

*Etymology.* The specific name refers to the quadrate pigment patches on the dorsum of the animal.

### ***Panathura* Barnard, 1925**

*Panathura* Barnard, 1925:143; Kensley, 1982:159.

*Diagnosis.* Body pigmented or not. Pleonites 1–5 free, articulating; pleonites 5 and 6 usually longer than preceding pleonites; pleonite 6 with posterior margin dorsally distinct. Eyes present. Mandible with molar blunt; palp of three articles. Maxillipedal endite distally rounded, reaching to palp article 3; palp with five articles, suture between articles 1 and 2. Pereopods 1–3 differentiated from posterior pereopods, propodus somewhat swollen, palm with few mesial setae. Pereopod 2 and 3 with robust distal seta. Pereopod 7, propodus with row of serrate setae anterodistally. Pleopod 1 exopod operculiform, endopod contributing somewhat in proximal region. Uropodal exopod lacking serrate lateral lobe.

Male: Rostrum stronger than in female. Eyes enlarged. Antennular flagellum of seven or more articles. Pereopods more elongate than in female; pereopod 1 propodus with increased number of setae on palm. Pleopod 2 appendix masculina as long or longer than rami.

***Panathura indica* sp. nov.**  
(Figures 19, 20)

*Type material.* HOLOTYPE: USNM 253131, non-ovigerous ♀ 6.7 mm, sta F4-87, Picard Is., Aldabra, intertidal, 20 March 1987. PARATYPES: USNM 253132, one ♂ 3.9 mm, two non-ovigerous ♀ 5.4–6.0 mm, same data as holotype.

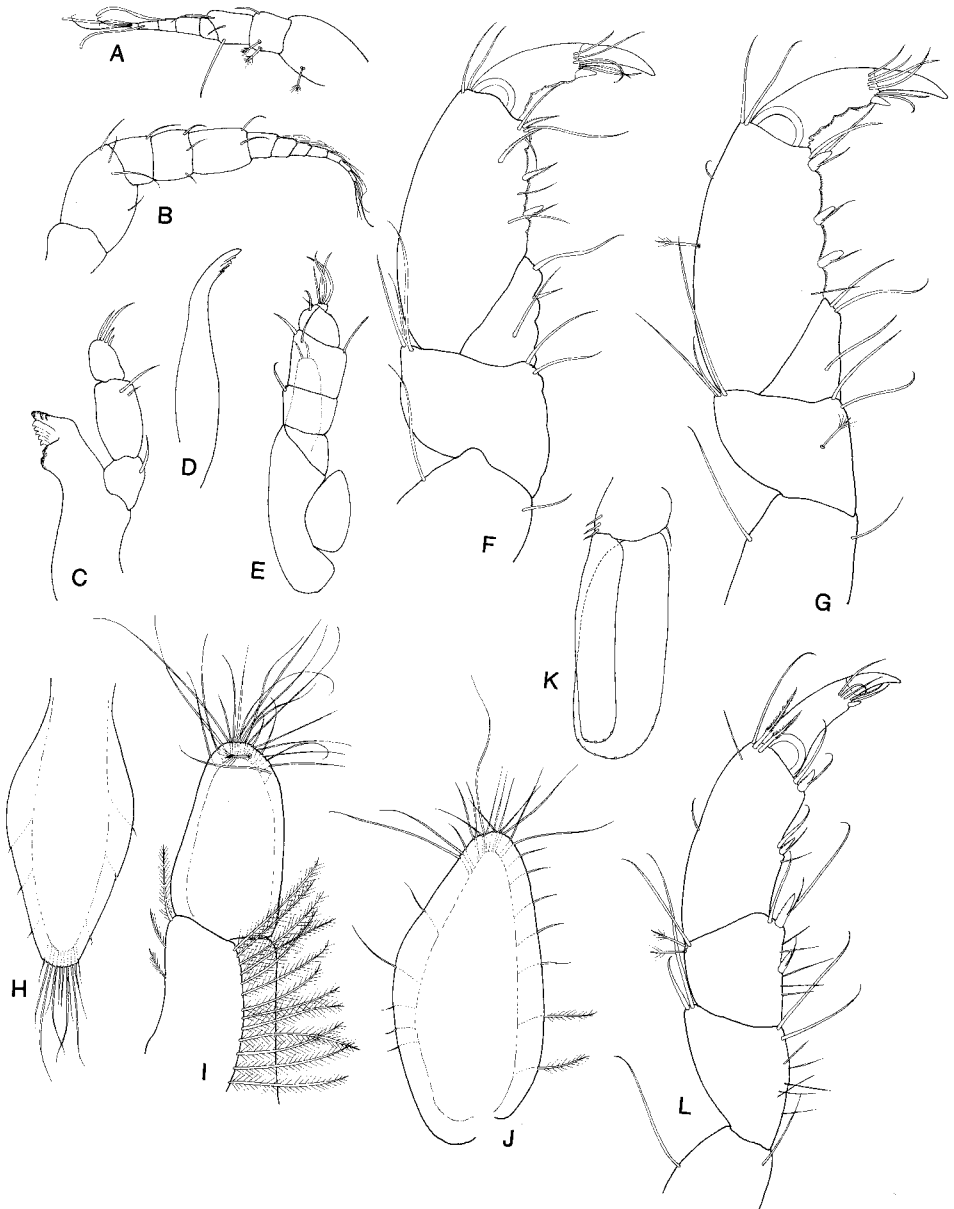


FIG. 19. *Panathura indica* sp. nov.: (A) ♀ antennule; (B) antenna; (C) mandible; (D) maxilla; (E) maxilliped; (F) ♀ pereopod 1; (G) ♀ pereopod 2; (H) pleotelson; (I) uropodal protopod and endopod; (J) uropodal exopod; (K) pleopod 1; (L) pereopod 7.

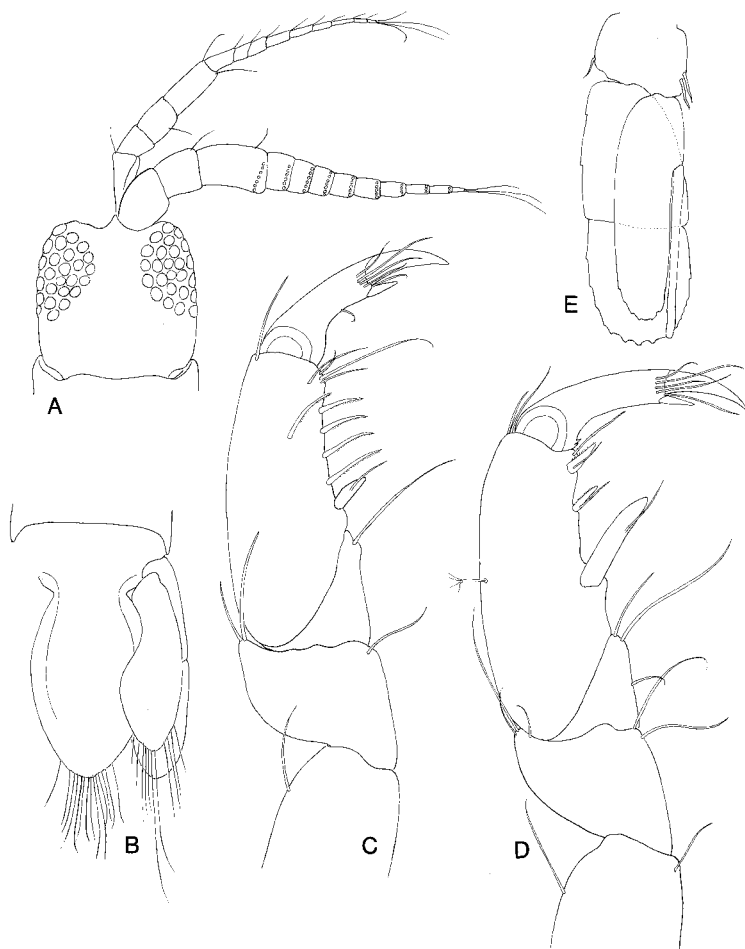


FIG. 20. *Panathura indica* sp. nov.: (A) ♂ cephalon and antennae; (B) pleotelson and uropod; (C) ♂ pereopod 1; (D) pereopod 2; (E) ♂ pleopod 2.

*Other material examined.* USNM 253133, six non-ovigerous ♀, three manca, from nine stations around Aldabra, from reef crest and shallow slope coral rubble, clumps of *Halimeda* and rotten wood, 0.5–26 m.

*Diagnosis.* Female: Body ten to eleven times longer than wide. Cephalon with low triangular rostrum, small well pigmented anterolateral eyes. Pleonites 1–5 free, wider than long, pleonite 6 longer than preceding segments, with free dorsal posterior margin. Telson widest at about midlength, narrowing posteriorly to rounded setose margin. Antennular peduncle of three articles; flagellum of five articles, three distal articles each bearing single aesthetasc. Antennal flagellum of seven articles. Mandibular palp of three articles, article 2 longest; incisor of three cusps; lamina dentata having five serrations; molar low, rounded. Maxillipedal endite reaching midlength of palp article 3; palp of five articles, apical article tiny. Pereopod 1, carpus short, triangular; propodus barely inflated, palm bearing two short setae; unguis three-quarters length of rest of dactylus, with strong accessory seta at base. Pereopod 2, propodal palm with three short setae; unguis slightly more than half length of rest of dactylus. Pereopods 4–7, carpus with anterior margin shorter than

posterior, with two setae on latter; propodus with two setae on posterior margin. Pleopod 1 slightly larger than following pleopods, with exopod somewhat operculiform. Uropodal exopod slightly more than twice longer than wide, with distinct convexity on lateral margin; endopod subequal in length to basis, distally broadly rounded.

Male: Cephalon with acutely triangular rostrum; eyes large, well pigmented. Antennular flagellum of nine articles bearing whorls of aesthetascs. Antennal flagellum of nine articles. Pereopod 1, propodal palm with strong proximal robust seta, plus four evenly-spaced fringed setae. Pereopod 2, propodal palm with enlarged seta at proximal third, two much smaller fringed setae distally. Pleopod 2, endopod with copulatory stylet articulating at proximal third of mesial margin; exopod of two articles. Uropodal exopod with mesial margin proximally distinctly excavate. Telson broader than in female.

*Remarks.* The present species differs from the type and only species in the genus, *P. serricauda* (Barnard, 1920), most conspicuously in the structure of the tailfan. The uropodal exopod in the earlier species is broadly rounded, almost subcircular, while in *P. indica* it is elongate-ovate. The telson of *P. serricauda* is widest posteriorly, broadly rounded, with serrate margins; in *P. indica* it is hastate, widest at midlength, with a narrowly-rounded apex and an entire margin.

*Etymology.* The specific name refers to the Indian Ocean.

**Genus *Pendantthura* Menzies and Glynn, 1968**

*Pendantthura* Menzies and Glynn, 1968: 31; Kensley and Schotte, 1989: 56.

*Diagnosis.* Eyes present. Antennular flagellum of two to three articles. Antennal flagellum of two articles. Mandibular palp of single often reduced article. Maxillipedal palp of single broad article; endite small, triangular. Pereopod 1, propodus subchelate, expanded. Pereopods 4–7, carpus with anterior margin shorter than posterior. Pleopod 1, exopod, or exopod and endopod, operculiform. Pleon short, pleonites fused. Telson with two statocysts.

*Remarks.* The genus *Pendantthura* has not previously been recorded from the Indian Ocean.

**Key to the Indian Ocean species of *Pendantthura***

- 1 Pleopod 1, exopod and endopod forming operculum; Body 5.5 times longer than wide . . . . . *seminigra* sp. nov. Aldabra Atoll
- Pleopod 1, only exopod operculiform; Body length/width ratio greater than six . . . . . 2
- 2 Maxillipedal palp 1.6 times longer than wide; Telson lacking fine marginal setules, tapering somewhat. . . . . *siamensis* sp. nov. Thailand
- Maxillipedal palp 1.3 times longer than wide; Telson having fine marginal setules, parallel-sided, posteriorly subtruncate . . . . . *picardi* sp. nov. Aldabra Atoll

***Pendantthura picardi* sp. nov.**

(Figure 21)

*Type material.* HOLOTYPE: USNM 253125, ovigerous ♀ 4.0 mm, sta K-AL-98, coral rubble off Picard Is., Aldabra, 15–18 m, 17 March 1986. PARATYPES: USNM 253126, one ovigerous ♀ (damaged), two non-ovigerous ♀ 3.5 mm, sta K-AL-116, lagoon near Grande Poche, Aldabra, 0.5 m, 6 April 1987.

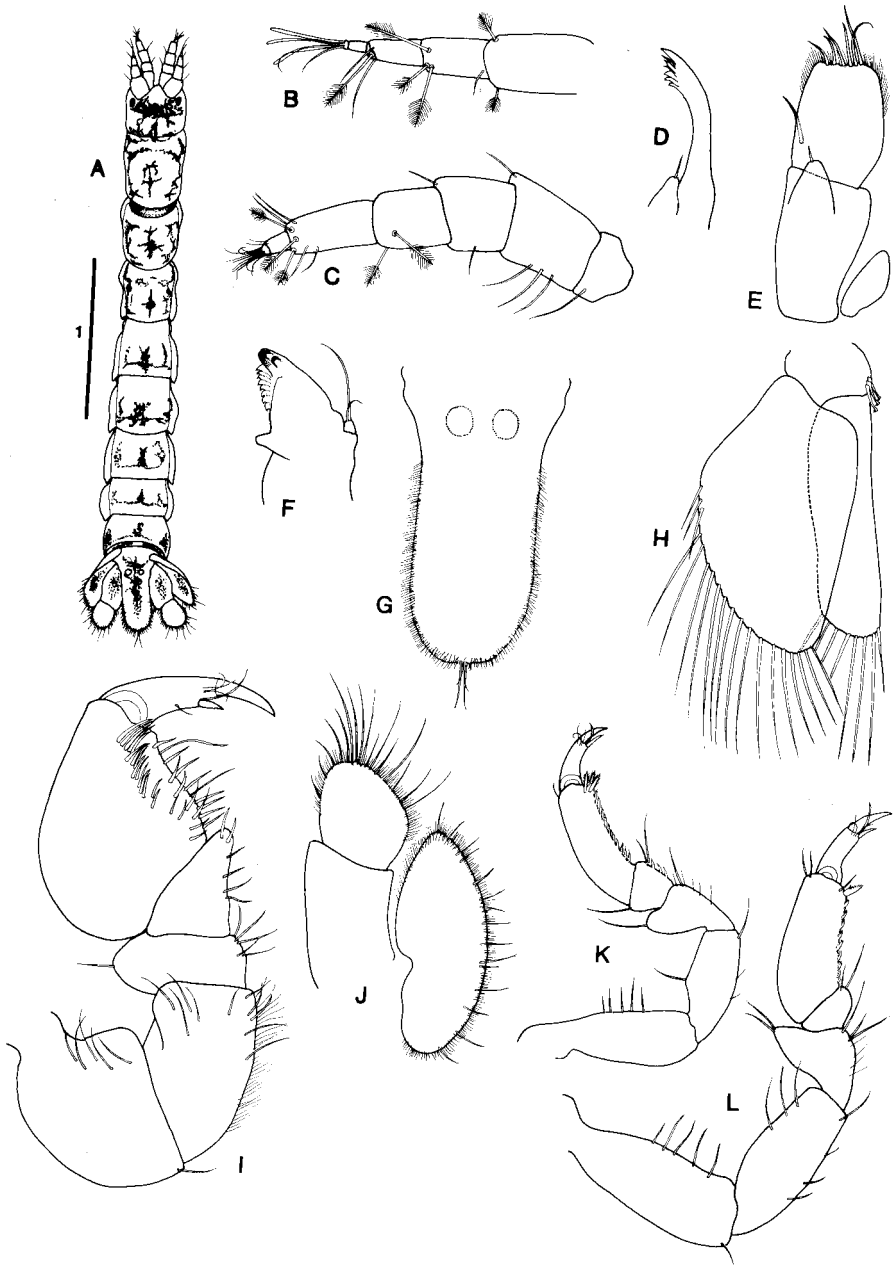


FIG. 21. *Pendantshura picardi* sp. nov.: (A) ♀ dorsal view; (B) antennule; (C) antenna; (D) maxilla; (E) maxilliped; (F) mandible; (G) pleotelson; (H) pleopod 1; (I) pereopod 1; (J) uropod; (K) pereopod 2; (L) pereopod 7.

**Diagnosis.** Oviparous female: body about 7.3 times longer than greatest width. Cephalon with broad triangular rostrum. Telson about 1.7 times longer than basal width, posterior margin broadly rounded, finely setulose. Antennular flagellum of three articles, three aesthetascs on terminal article. Antennal flagellum of two short articles. Mandibular palp consisting of single very short article bearing two setae;



lamina dentata having eight serrations. Maxillipedal palp of single broad article bearing six distal setae; endite broadly triangular, with single terminal seta. Pereopod 1, carpus distally rounded, projecting; propodus strongly inflated, palm sinuous, with irregular band of setae on mesial surface. Pereopod 2, carpus with very short free anterior margin; propodus not inflated, with fringed scales on posterior margin, strong dentate seta posterodistally. Pereopod 7, carpus bearing fringed scales on posterior margin, anterior margin shorter than posterior; propodus relatively slender, with fringed scales on posterior margin, three fringed setae posterodistally. Pleopod 1, endopod as long as, and 0.4 times width of exopod, bearing eight distal plumose marginal setae. Uropodal exopod elongate ovate, about 2.5 times longer than greatest width; endopod broad, subcircular.

*Colour.* Irregular red–brown reticulation on dorsum of cephalon, all pereonites, pleon, telson and uropods.

*Remarks.* *Pendantura picardi* bears some resemblance to *P. siamensis* described below, in its relatively elongate body form. Several easily seen differences can be noted: the telson is narrower, the uropodal exopod is rounder, the maxillipedal endite is broader and the antennae and antennules are more elongate. In pereopod 1, there are more setae on the propodal mesial surface than in the Thai species.

*Etymology.* The specific name, used as a noun in apposition, is taken from the type locality, Picard Island, part of Aldabra Atoll.

***Pendantura seminigra* sp. nov.**

(Figure 22)

*Type material.* HOLOTYPE: USNM 253118, ovigerous ♀ 1.6 mm, sta K-AL-108, coarse sand between coral heads, Ile Picard, Aldabra, 3–5 m, 22 March 1086. PARATYPES: USNM 253119, three ovigerous ♀ 1.5–1.8 mm, same data as holotype. USNM 253120, one ovigerous ♀ 1.3 mm, sta K-AL-109, reef flat, Picard Is., Aldabra, intertidal, 23 March 1986.

*Diagnosis.* Ovigerous female: Integument not indurate. Body 5.5 times longer than greatest width at pereonite 1. Cephalon broader than middorsal length, with rounded rostrum reaching as far anteriorly as anterolateral corners. Eyes well pigmented. Strong anterodorsal articular hollows between pereonites 1 and 2, and 2 and 3. Pleonites 1–5 fused, together equal in length to pereonite 7; pleonite 6 fused with telson, forming raised ‘collar’ at base of telson; latter with sinuous lateral margins tapering to broadly rounded apex, bearing two large statocysts at about midlength; posterior half of telson with hyaline margin. Antennular peduncle of three articles, basal article equal to two distal articles together; flagellum of single short article bearing several setae and two aesthetascs. Antennal peduncle of five articles, article 2 longest and broadest; flagellum of single short article bearing numerous setae. Mandibular palp article about 2.5 times longer than wide, with two distal setae; incisor of three cusps; lamina dentata with four marginal serrations; molar short, bluntly triangular. Maxilla as figured. Maxilliped with low rounded endite; palp of single broad article bearing seven setae distally. Pereopod 1, carpus distally hyaline, acute; propodus inflated, palmar area hyaline, almost straight; unguis equal in length to rest of dactylus, with slender elongate accessory seta. Pereopod 2 less robust than pereopod 1, propodus with strong serrate sensory spine posterodistally. Pereopod 7, carpus with anterior free margin about half length of posterior margin; propodus with several fringed scales on posterior margin plus

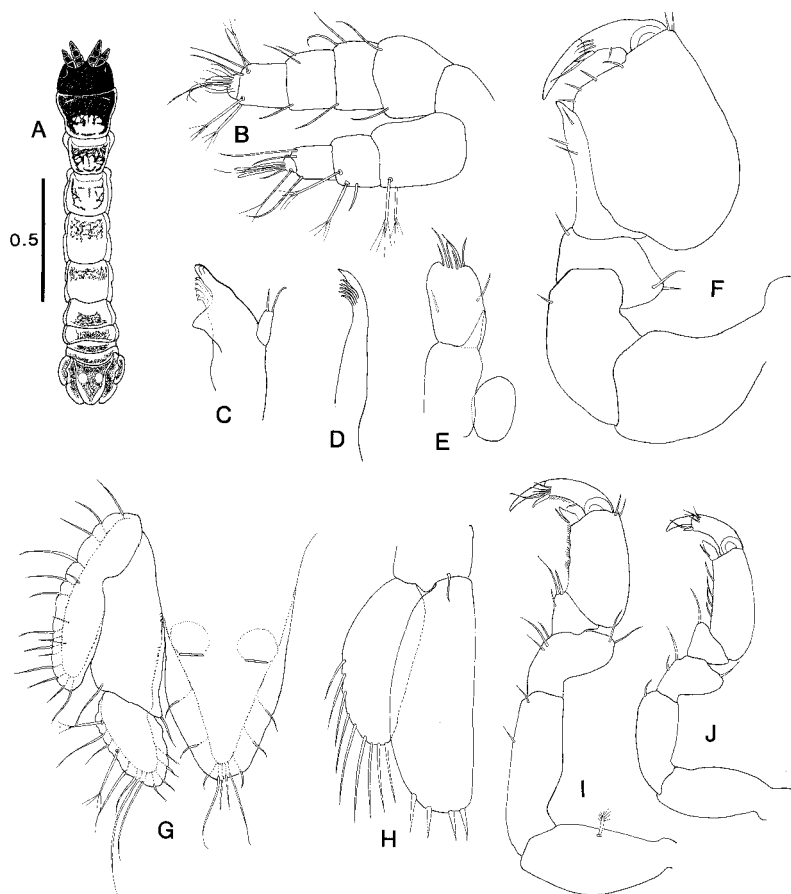


FIG. 22. *Pendanthura seminigra* sp. nov.: (A) ovigerous ♀ dorsal view; (B) antennule and antenna; (C) mandible; (D) maxilla; (E) maxilliped; (F) pereopod 1; (G) pleotelson and left uropod; (H) pleopod 1; (I) pereopod 2; (J) pereopod 7.

strong serrate sensory seta posterodistally; dactylar unguis with short accessory seta. Pleopod 1, both rami forming operculum but endopod larger than exopod; exopod about two-thirds in length, and slightly narrower than endopod, with nine marginal plumose setae; endopod with four relatively short distal setae. Uropodal exopod elongate-ovate, outer margin crenulate with fringed setae, reaching to base of endopod; latter distally rounded, with several marginal setae.

Male: Unknown.

*Colour.* Anterior half of animal more heavily pigmented than posterior. Cephalon and pereonite 1 and propodus of pereopod 1 dark blackish-brown; pereonite 2 anteriorly pigmented; pereonites 3–7, pleon, pleotelson and uropods with paler reticulation of pigment.

*Remarks.* The present species differs from the three previously described species (see Kensley 1984: 18) in several respects: the pigment pattern is distinctive; the unarticulate mandibular palp is longer than in any of the earlier species, the maxillipedal endite is more reduced; the endopod of pleopod 1 is relative broader than in any of the earlier species.

*Etymology.* The species name, from the Latin meaning 'half-black', refers to the black pigmentation of the anterior half of the animal.

***Pendanthura siamensis* sp. nov.**  
(Figures 23, 24)

*Type material.* HOLOTYPE: USNM 253121, ♂ 3.2 mm, fifth Thai–Danish Expedition, 7°55'22"N, 98°49'45"E, 13–18 m, coll. Gallardo, 14 February 1966.

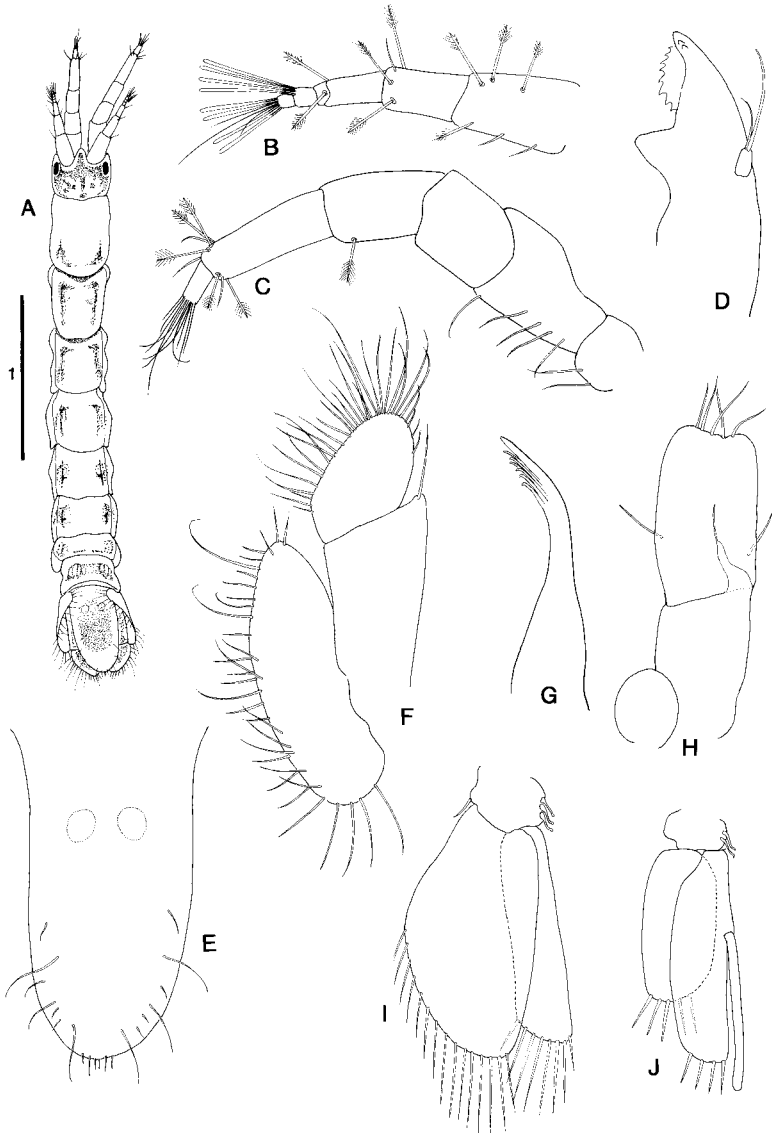


FIG. 23. *Pendanthura siamensis* sp. nov.: (A) ♂ dorsal view; (B) ♂ antennule; (C) ♂ antenna; (D) mandible; (E) pleotelson; (F) uropod; (G) maxilla; (H) maxilliped; (I) pleopod 1; (J) ♂ pleopod 2.

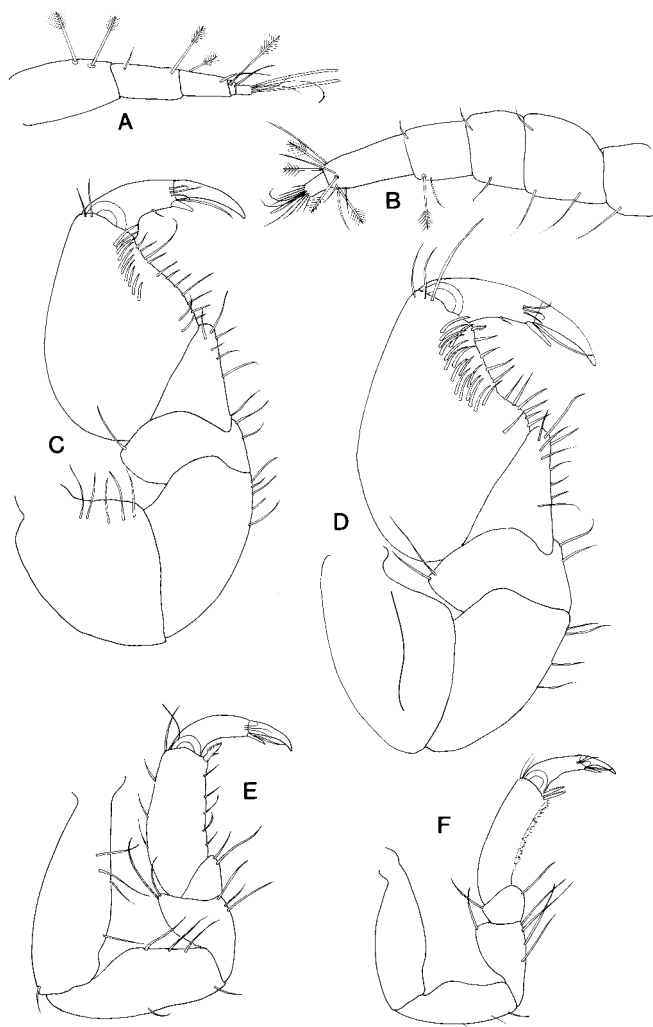


FIG. 24. *Pendanthura siamensis* sp. nov.: (A) ♀ antennule; (B) ♀ antenna; (C) ♀ pereopod 1; (D) ♂ pereopod 1; (E) pereopod 2; (F) pereopod 7.

PARATYPES: USNM 253122, 16 ♂, 22 ovigerous ♀, 20 non-ovigerous ♀, 12 juveniles, same data as holotype.

*Other material examined.* USNM 253123, two ♂, one ovigerous ♀, two non-ovigerous ♀, five juveniles, fifth Thai–Danish Expedition, 6°45'00"N, 99°32'04"E, coll. Gallardo, 3 February 1966. USNM 253124, nine ovigerous ♀, five non-ovigerous ♀, three juveniles, fifth Thai–Dan Program, locality unknown, January–March 1966.

*Diagnosis.* Male: Body about 7.6 times longer than greatest width at pereonite 4. Cephalon slightly wider than midlength, with pronounced rostrum; eyes well pigmented. Telson length slightly more than twice width, posterior margin broadly rounded. Antennular peduncle of three articles, decreasing in length distally; flagellum of three articles, penultimate and terminal articles each bearing four aesthetascs. Antennal peduncle of five articles, article 3 seven-eighths length of article 4, article 5 six-sevenths length of article 4; flagellum of single short setose article. Mandibular

palp of single short article, with two distal setae; incisor of three cusps; lamina dentata of eight teeth; molar bluntly triangular, non-sclerotized. Maxilla with single strong spine and several more slender spines. Maxillipedal palp of single broad article, bearing five distal setae; slender, thin-walled endite on mesial surface bearing single terminal seta. Pereopod 1, propodus inflated, palm faintly sinuous, bearing few well separated setae, mesial surface bearing band of short stiff setae; unguis two-thirds length of rest of dactylus. Pereopod 2, carpus triangular, lacking free anterior margin; propodus 2.5 times longer than wide, with serrate posterodistal seta. Pereopod 7, carpus with anterior margin shorter than posterior; propodus with two posterodistal serrate setae. Pleopod 1, rami subequal in length, exopod operculiform, 2.5 times wider than endopod. Pleopod 2, exopod two-thirds length of endopod, with five distal plumose setae; endopod with four distal plumose setae, copulatory stylet articulating just short of midlength of mesial margin. Uropodal exopod narrowly ovate, distally rounded, reaching base of endopod; latter ovate, distally rounded, setose.

Female: Eye as in male. Antennular flagellum of two articles, terminal article bearing two aesthetascs. Antenna relatively shorter than in male, with peduncle articles 4 and 5 noticeably less elongate. Pereopod 1, propodus with single row of about ten stiff setae on mesial surface near palm.

*Colour.* Cephalon with irregular band of pigment between eyes; pereonites and pleon with small irregular lateral patches of pigment; telson with broad patch falling well short of posterior margin.

*Remarks.* *Pendantthura siamensis* is a much larger species than *P. seminigra* and lacks the latter's distinctive pigment pattern. The arrangement of the stiff setae on the mesial face of the propodus of pereopod 1, in both male and female, is distinctive and differs from the other described species.

*Etymology.* The specific name refers to Siam, the old name for Thailand.

### **Genus *Quantanthura* Menzies and George, 1972**

*Quantanthura* Menzies and George, 1972: 29; Poore and Lew Ton, 1986a: 75.

*Diagnosis.* Eyes present, rarely absent. Antennular flagellum of three to seven articles. Antennal flagellum of three to nine articles. Mandibular palp of three articles. Maxillipedal palp of four or five articles; endite moderately strong. Pereopod 1 subchelate, propodus inflated. Pereopods 2 and 3, propodi ovate. Pereopods 4–7, carpi roughly pentagonal; numerous elongate setae present on posterior margins. Pleopod 1, exopod operculiform. Pleon short, pleonites 1–5 fused, pleonite 6 dorsally free. Telson with two basal statocysts.

### ***Quantanthura andamanensis* sp. nov.**

(Figures 25, 26)

*Type material.* HOLOTYPE: ZMUC, non-ovigerous ♀ 9.1 mm, sta CRU-2039, Patang, Phuket Is., Thailand, coll. Dexter, 26 July 1994. PARATYPES: ZMUC, one non-ovigerous ♀ 9.0 mm, sta CRU-2039, Patang, Phuket Is., Thailand, coll. Dexter, 26 July 1994. ZMUC, four non-ovigerous ♀ 7.0–7.9 mm, sta CRU-2044, Nai Hain, Phuket Is., Thailand, coll. Dexter, 5 October 1994. USNM 253283, four non-ovigerous ♀ 7.0–8.5 mm, sta CRU-2045, Koto, Phuket Is., Thailand, coll. Dexter, 3 December 1994.

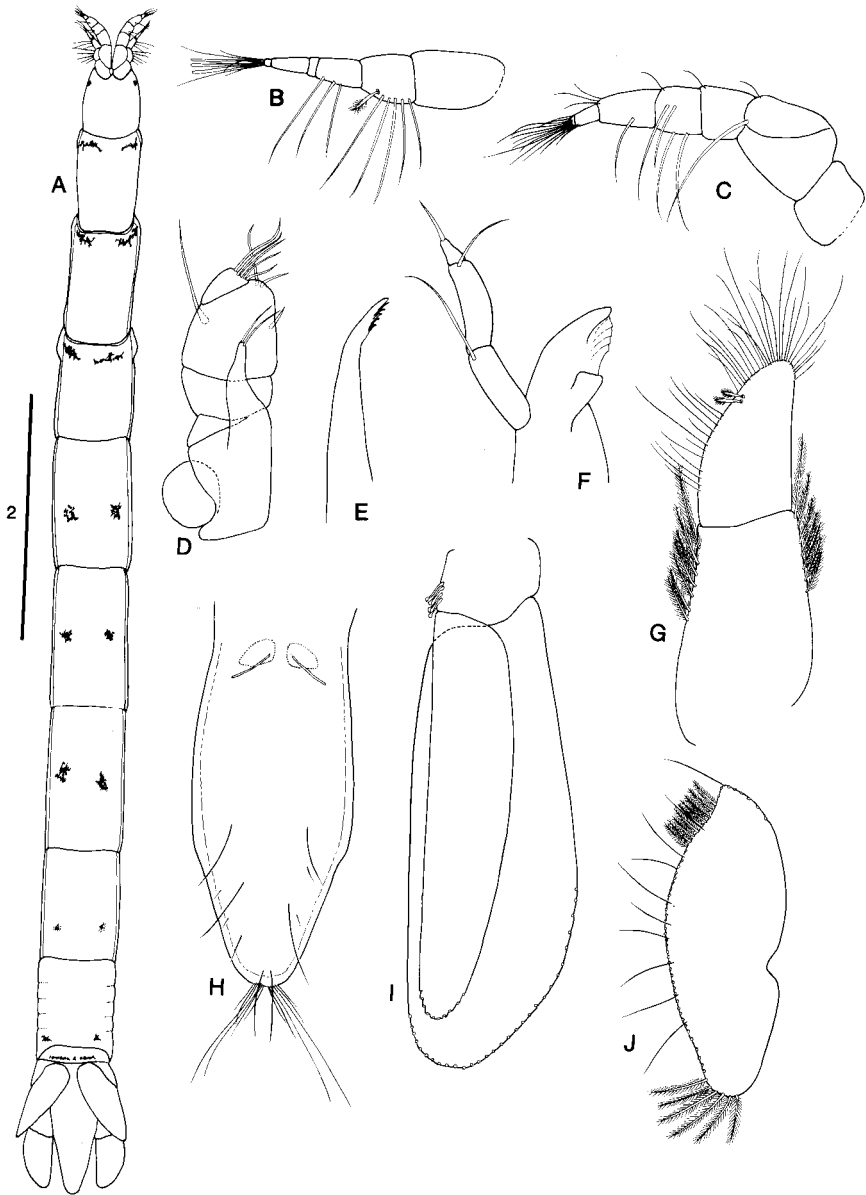


FIG. 25. *Quantanthura andamanensis* sp. nov.: (A) ♀ dorsal view; (B) antennule; (C) antenna; (D) maxilliped; (E) maxilla; (F) mandible; (G) uropodal protopod and endopod; (H) pleotelson; (I) pleopod I; (J) uropodal exopod.

*Other material examined.* ZMUC, three juveniles, sta CRU-2040, Nopoiotoush, Phuket Is., Thailand, coll. Dexter, 19 March 1995. ZMUC, three juveniles, sta CRU-2041, Patang, Phuket Is., Thailand, coll. Dexter, 3 March 1995. ZMUC, one non-ovigerous ♀, sta CRU-2042, Koto, Phuket Is., Thailand, coll. Dexter, 4 March 1995. ZMUC, five juveniles, sta CRU-2043, Nai Yang flat, Phuket Is., Thailand, coll. Dexter, 8 August 1994. ZMUC, four non-ovigerous ♀, nine juveniles, sta CRU-2046, Patang, Phuket Is., Thailand, coll. Dexter, 6 December 1994.

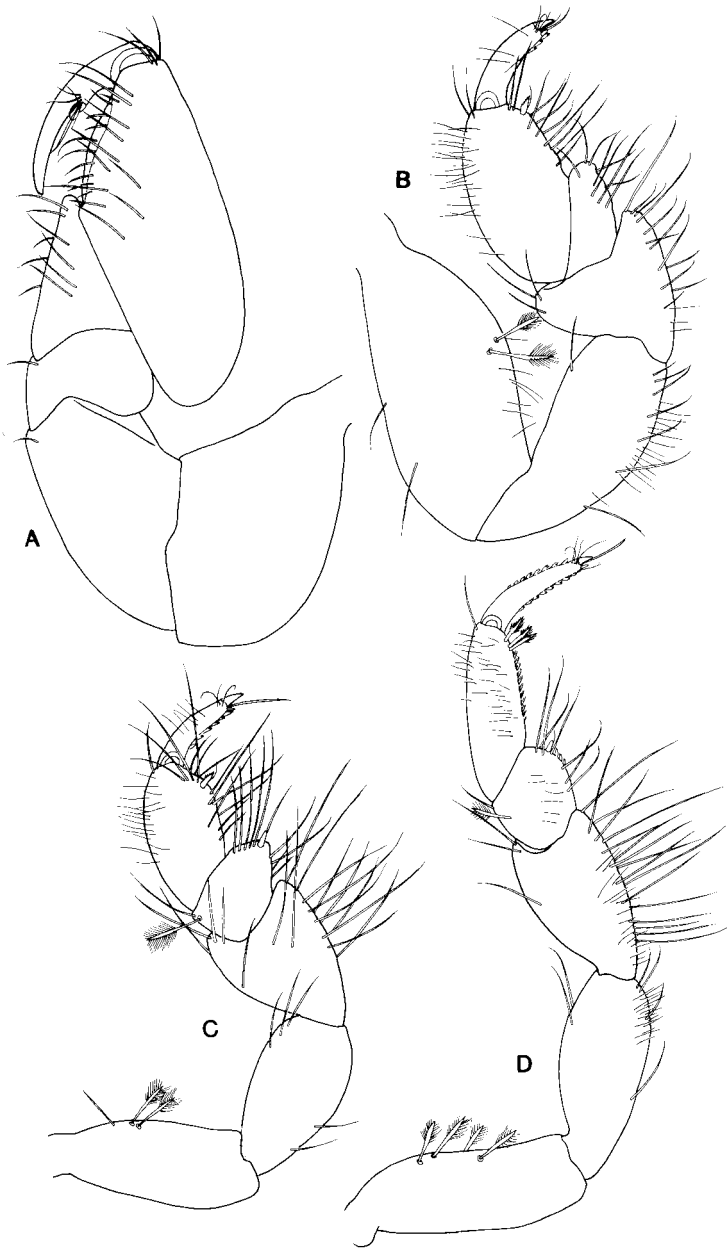


FIG. 26. *Quantanthura andamanensis* sp. nov.: (A) pereopod 1; (B) pereopod 2; (C) pereopod 4; (D) pereopod 7.

*Diagnosis.* Female: body about 14 times longer than greatest width. Pleonite 6 dorsally distinct from telson. Latter about 2.7 times longer than basal width, with slight 'shoulder' in posterior half, apically narrowly rounded, apex bearing two clumps of six setae each. Antennular peduncle article 2 bearing five elongate ventrally-directed setae, article 3 with three setae, flagellum of three articles, tiny terminal article with three aesthetascs. Antennal peduncle article 2 with single distal elongate

seta, article 4 with four elongate setae, article 5 with single seta, flagellum of two (perhaps three) articles. Mandibular palp articles each bearing single distal seta; lamina dentata having five marginal serrations. Maxillipedal endite narrow, with two terminal setae, reaching to middle of palp article 3; terminal palp article attached obliquely at distolateral corner of article 3, bearing five setae. Pereopod 1, carpus triangular, distally rounded, bearing scattered setae on posterior surface; propodus expanded proximally, palm convex, with scattered setae on mesial surface; unguis subequal to rest of dactylus, with tiny accessory seta at base. Pereopods 2 and 3, posterior surfaces of ischium, merus, carpus and propodus bearing relatively elongate setae; merus and carpus each having rounded distal projecting portion; propodus not inflated as in pereopod 1, with numerous fine setules on anterior surface; unguis about one-fifth length of dactylus, with fringed setae on posterior margin. Pereopods 4–7 becoming more elongate posteriorly, having elongate setae on posterior margins of merus, carpus and propodus; carpus having short free anterior margin, with short squat seta posterodistally. Pereopod 7, propodus with fringed scales on posterior margin, three bifringed setae posterodistally. Pleopod 1, endopod slightly shorter than exopod, with about ten distal plumose marginal setae. Uropodal exopod about 2.5 times longer than greatest width, lateral margin distally sinuous, apex subacute; endopod triangular, apically rounded, 1.8 times longer than basal width.

*Remarks.* *Quantanthura andamanensis* is the second species of the genus from the Indian Ocean (*Q. remipes* (Barnard, 1914), was recorded from the Agulhas area of South Africa) and bears some resemblance to *Q. erica* Poore and Lew Ton, 1986a, from the Bass Strait off southern Australia. The Australian species, however, lacks shoulders on the telson, has a less elongate uropodal exopod, a much broader maxillipedal endite, while the propodal palm of pereopod 1 is slightly concave.

Poore and Lew Ton (1986a) divided the species of *Quantanthura* into two groups, based on features of the antennules, mandible, maxilliped and posterior pereopods. *Q. andamanensis*, while not agreeing in all features, does have densely setose pereopods 4–7, has articles 1 and 2 of the mandibular palp subequal and does have long setae on articles 2 and 3 of the antennular peduncle, all features of group 2.

*Etymology.* The specific name is taken from the Andaman Sea, in which Phuket Island lies.

### Family HYSSURIDAE Wägele, 1981a

#### Genus *Neohyssura* Amar, 1953

*Neohyssura* Amar, 1953: 353; Wägele, 1981a: 72; Poore and Lew Ton, 1988c: 184.

*Diagnosis.* Mandibular palp of three articles; molar spiniform. Maxillipedal palp of five articles; endite well developed. Pereopods 1–3 subchelate, similar, propodal palm bearing setae. Pereopods 4–7, carpi with anterior margin shorter than posterior. Pleonites 1–6 free. Uropodal exopod elongate, usually with setae on mesial margin; endopod elongate, longer than protopod. Telson tapering, lateral margin usually armed with spines, lacking statocysts.

#### *Neohyssura gladia* sp. nov.

(Figures 27, 28)

*Type material.* HOLOTYPE: USNM 253134, non-ovigerous ♀ 2.0 mm, sta K-AL-54, coarse sand and rubble, outer reef slope off Picard Is., Aldabra, 25 m,



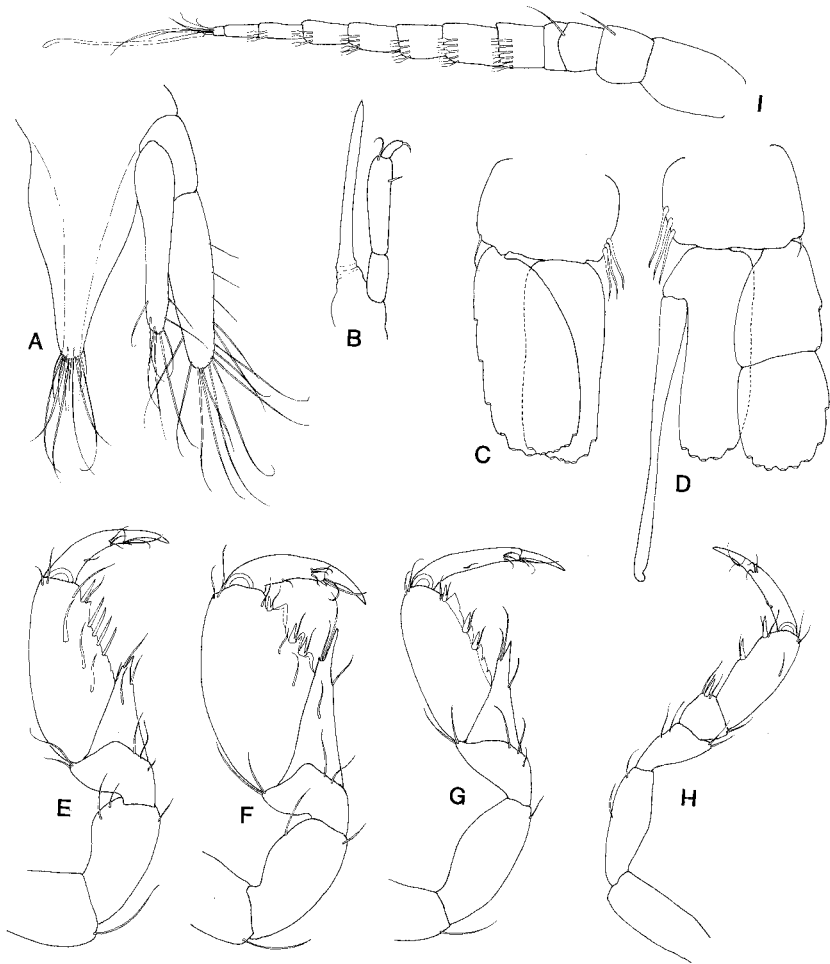


FIG. 27. *Neohyssura gladia* sp. nov.: (A) ♂ pleotelson and uropod; (B) ♂ mandible; (C) ♂ pleopod 1; (D) ♂ pleopod 2; (E) ♂ pereopod 1; (F) ♂ pereopod 2; (G) ♂ pereopod 3; (H) ♂ pereopod 7; (I) ♂ antennule.

15 April 1983. PARATYPES: USNM 253135, two ♂ 2.5 mm, sta K-AL-54, same data as holotype. USNM 253136, one ♂ 2.2 mm, four non-ovigerous ♀ 2.0–3.0 mm, sta K-AL-38, K-AL-39, coral rubble, outer reef slope off Picard Is., Aldabra, 11 April 1983. USNM 253137, two non-ovigerous ♀ 2.2–3.0 mm, sta JR-29, JR-33A, Nosy Be, Madagascar, 1–1.5 m, February 1964.

*Diagnosis.* Non-ovigerous female: Body elongate–slender. Integument non-indurate. Cephalon with tiny weakly pigmented eyes; low rounded rostrum not extending anteriorly beyond anterolateral lobes. Pleonites 1–5 free, as broad as wide, laterally with numerous elongate plumose setae; pleonite 6 with posterodorsal margin convex. Telson basally broad, tapering to narrowly rounded apex bearing numerous setae of varying lengths. Antennular peduncle with two basal articles broad, article 3 two-thirds width of 2; flagellum of three articles, middle article longest, short terminal article bearing single conspicuous aesthetasc. Antennal flagellum of seven articles, together barely longer than fifth peduncular article. Mandibular palp of three articles, middle article longest, bearing two distal setae; terminal article almost

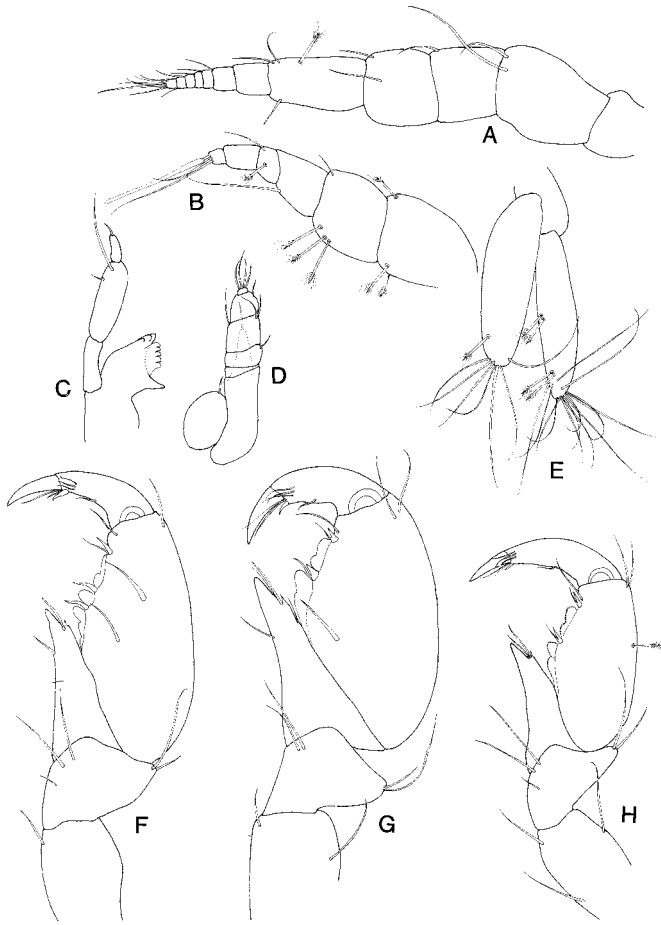


FIG. 28. *Neohyssura gladia* sp. nov.: (A) ♀ antenna; (B) ♀ antennule; (C) ♀ mandible; (D) ♀ maxilliped; (E) ♀ uropod; (F) ♀ pereopod 1; (G) ♀ pereopod 2; (H) ♀ pereopod 3.

one-third length of second, with single short terminal seta; incisor of three cusps; lamina dentata having five marginal serrations; molar strong, spiculiform. Maxilla having six distal spines, terminal spine strongest. Maxilliped having five-articulate palp; basal palp article short, having free lateral, but no free mesial margin; terminal article tiny, bearing four setae; strong endite reaching to third palp article, with single terminal seta. Pereopod 1 subchelate, carpus narrowly triangular, distally acute, extending well beyond proximal palm of propodus; latter somewhat expanded, palm bearing three setae plus transparent flange divided into rounded sections between setae; unguis slightly more than half length of remainder of dactylus, with short seta at base. Pereopod 2 subchelate, carpus narrowly triangular, distally extending well beyond propodal palm; propodus more expanded than in pereopod 1, palm bearing two short sensory setae, with lobed transparent flange between; unguis half length of remainder of dactylus. Pereopod 3 subchelate, carpus narrowly triangular, distally acute, extending well beyond propodal palm; latter bearing two sensory setae, plus lobed and marginally serrate transparent flange; unguis about one-third length of remainder of dactylus. Posterior pereopods with carpi short, anterior margin shorter than posterior margin, serrate sensory seta at posterodistal

angle; propodus with two serrate sensory setae on posterior margin; unguis just less than one-third length of remainder of slender dactylus. Pleopods 1–5 similar; pleopod 1 non-operculate, rami subequal in length and width, exopod with ten marginal plumose setae, endopod with eight distal marginal plumose setae. Uropodal exopod wider than, but subequal in length to endopod, elongate–oval, with seven elongate setae distally; endopod elongate, narrowly rounded distally, with several elongate setae of varying lengths.

Male: Body proportions: Cephalon with large well pigmented eyes extending towards midline dorsally and constricting mouthparts ventrally. Pereopod and pleon essentially as in female. Telson less spiciform than in female, proximally slightly broader. Antennular flagellum of nine articles, all except first and eighth bearing aesthetascs; short terminal article bearing single aesthetasc. Mandibular palp of three articles, middle article twice length of first, four times length of third, with two short distal setae, terminal article with single seta; body of mandible modified to form slender sclerotized sword-like structure reaching anteriorly beyond ramus. Maxilla and maxilliped reduced, both represented by low rounded exopods only. Pereopod 1 subchelate, carpus triangular, distally acute, reaching for short distance beyond proximal propodal palm; propodus with five elongate setae on palm, mesial (inner) surface with three setae some distance from margin; unguis half length of remainder of dactylus. Pereopod 2 subchelate, carpus narrowly triangular, distally acute–spinose, extending well beyond propodal palm; propodus more expanded than in pereopod 1, palm bearing three sensory setae separated by rounded lobes of transparent flange; unguis half length of remainder of dactylus. Pereopod 3 subchelate, carpus narrowly triangular, distally acute–spinose, extending well beyond propodal palm; propodus narrower than in pereopod 2, palm bearing three sensory setae separated by transparent flange divided into distally acute lobes; unguis slightly less than half length of remainder of dactylus. Posterior pereopods as in female. Pleopod 2, exopod biarticulate, with transverse suture at about midlength, bearing ten marginal plumose setae; endopod slightly shorter and narrower than exopod, with five distal plumose setae, copulatory stylet articulating on proximal half of mesial margin, extending well beyond ramus, distally rounded and flexed. Uropodal exopod narrower and slightly shorter than endopod, with eight distal setae; endopod with about 12 distal setae of varying lengths.

*Remarks.* Five species of *Neohyssura* have been described: *N. irpex* (Menzies and Frankenberg, 1966), from the north-western Atlantic, *N. spinicauda* (Walker, 1901) from the Mediterranean, *N. skolops* Kensley, 1978a (from South Africa, the only other Indian Ocean species), *N. atlantica* Wägele, 1987, from off the Cape Verde Islands and *N. bilara* Poore and Lew Ton, 1988c from Queensland, Australia. Poore and Lew Ton (1988c) characterized *Neohyssura* by two apomorphies, a tapering telson and marginal spines on the telson and uropodal exopod. The present species lacks one of these apomorphies in that the uropodal and telsonic margins do not have spines. Apart from this feature, and the structure of the male mandible, *N. gladia* agrees closely with the earlier species. The body of the mandible in the male of the present species shows a remarkable feature not noted for any other anthuridean, namely the modification into a sword-shaped sclerotized structure. Wägele (1981a) in his redescription of *N. spinicauda*, described a male and mentioned that the mouthparts, except for the mandibular palp, are reduced; his figure of the male mandible merely shows a loss of definition of the normal mandibular structures, not a major reorganization as is seen in the present species. The stiletto-like structure

of the maxilla and distal mandible in paranthurids comes to mind when this remarkable mandibular structure is viewed; its function, however, is uncertain and is perhaps more involved with reproduction than with feeding.

*Etymology.* The specific name is from the Latin '*gladius*', a sword and refers to the structure of the mandible in the male.

### Genus *Xenanthura* Barnard, 1925

*Xenanthura* Barnard, 1925: 138; Poore and Lew Ton, 1988c: 186; Kensley and Schotte, 1989: 60.

*Diagnosis.* Eyes present. Antennular flagellum of three articles. Antennal flagellum of five to six articles. Mandibular palp of single article. Maxillipedal endite short, triangular, or absent; palp of single fused article. Pereopod 1 subchelate, propodus inflated. Pereopods 2 and 3 with carpi triangular, distally produced, pereopod 3 with tufts of distal setae on produced distal lobes of carpus and merus. Uropodal endopod fused to peduncle, having emargination on mesial margin bearing four robust bottlebrush setae; exopod subcircular, obscuring telson in dorsal view. Telson rhomboid, considerably shorter than uropods.

*Remarks.* As the two Indian species of *Xenanthura* have been very superficially described (*X. linearis* was not illustrated), a key to the four Indian Ocean species is not practical. Table 3 provides some characters that help to distinguish the species.

### *Xenanthura victoriae* sp. nov.

(Figure 29)

*Type material.* HOLOTYPE: USNM 253183, non-ovigerous ♀ 3.2 mm, sta K-SEY-6, Victoria, Mahe Is., Seychelles, in *Enteromorpha* growing on surface of intertidal mudflat, 30 April 1984. PARATYPES: USNM 253184, two non-ovigerous ♀, 2.5 mm, same data as holotype.

*Diagnosis.* Non-ovigerous female: Body about 14 times longer than greatest width. Three or four ommatidia per eye. Pleonite 6 slightly longer than preceding segment. Telson basally wider than midlength, lateral margins tapering, posterior margin truncate, bearing two pairs of setae. Antennular flagellum of three articles, single aesthetasc on terminal article. Antennal peduncle article 5 having two stout bottle-brush setae distally; flagellum of six short articles. Pereopod 1, carpus posterodistally with tooth-like lobe plus rounded fringed lobe; propodal palm bearing low fringed lobes. Pereopod 2, carpus triangular, posterior margin crenulate, distally rounded; propodus expanded, but shorter than in pereopod 1, palm with proximal rounded lobe flanked by setae. Pereopod 3, merus with strong posterodistal lobe

Table 3. Some characters that help to distinguish the species of *Xenanthura*.

|   | Antennular<br>flagellum | Antennal<br>flagellum | Telson<br>length:width ratio |
|---|-------------------------|-----------------------|------------------------------|
| <i>X. linearis</i> Pillai, 1954. India        | ?                       | ?                     | ?                            |
| <i>X. orientalis</i> Barnard, 1935. India     | 4 articles              | 4–5 articles          | 2                            |
| <i>X. sinaica</i> Wägele, 1981a. Gulf of Elat | 3 articles              | 3 articles            | ~ 1                          |
| <i>X. victoriae</i> sp. nov. Seychelles       | 3 articles              | 6 articles            | 0.7                          |

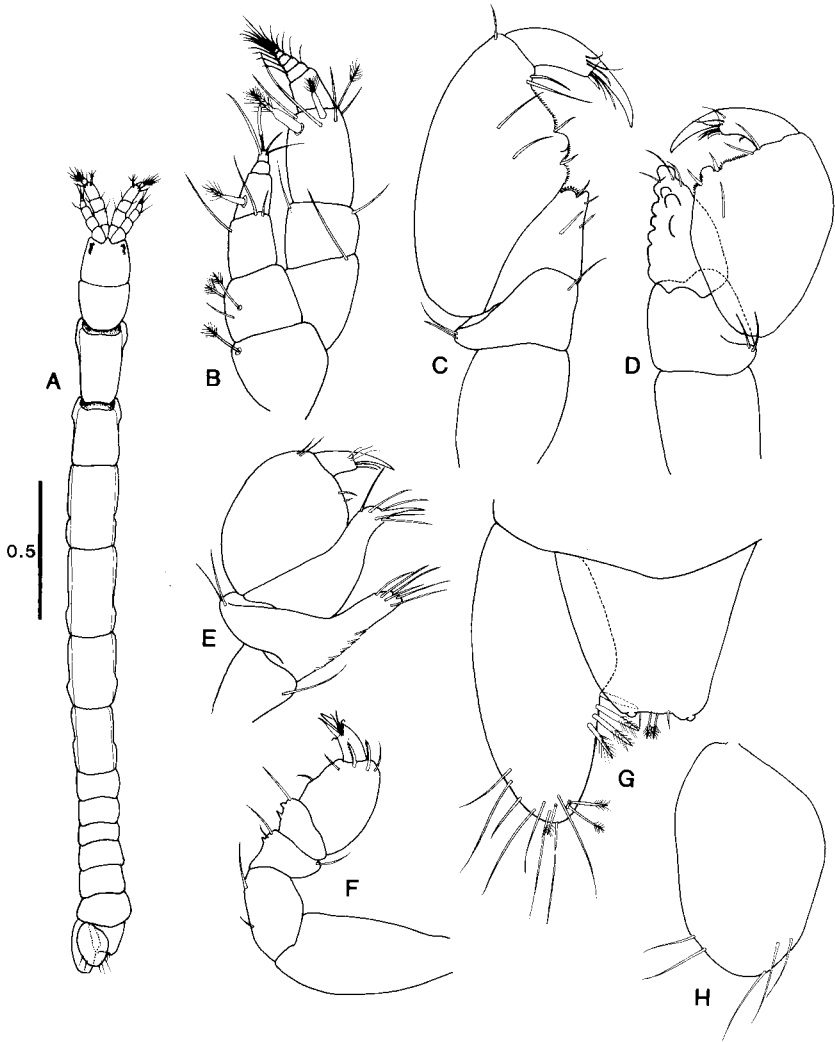


FIG. 29. *Xenanthura victoriae* sp. nov.: (A) ♀ dorsal view; (B) antennule and antenna; (C) pereopod 1; (D) pereopod 2; (E) pereopod 3; (F) pereopod 7; (G) pleotelson and uropodal endopod; (H) uropodal exopod.

bearing distal setae; carpus with very short free anterior margin, posterodistally produced into strong lobe bearing distal seta and several setae; propodus semicircular, palm unarmed. Pereopod 7, merus and carpus shorter than wide, with low teeth on posterior margin; propodus bearing two fringed setae distally. Uropodal exopod ovate, with five simple setae distally; endopod about twice length of telson, with notch at midlength of mesial margin bearing four stout circumplumose setae, several simple setae near rounded distal margin.

*Remarks.* *Xenanthura victoriae* was found living in shallow runnels on an exposed mudflat, the water of which reached a temperature of 40°C and where freshwater seepage was marked by the growth of the green alga *Enteromorpha*.

*Etymology.* The mud-flat type locality of this species lies on the edge of the town of Victoria, hence the specific name.

## Family PARANTHURIDAE Menzies and Glynn, 1968

Genus *Accalathura* Barnard, 1925

*Accalathura* Barnard, 1925: 147; Poore, 1980: 58; Poore, 1981: 57; Poore and Lew Ton, 1990: 381.

*Diagnosis.* Eyes present. Antennular and antennal flagella multiarticulate (more than ten articles). Mandibular palp of three articles, terminal article bearing comb of seven or more setae. Maxillipedal endite reaching at least article 3; palp almost as long as basis. Pereopod 1 subchelate, propodus inflated, having proximal 'thumb', palm with even row of simple robust setae; carpus with posterior margin lacking short robust setae. Pereopods 2 and 3 with propodi much less inflated than 1; carpi lacking robust setae. Pereopods 4–7, carpi slender, rectangular, with free anterior margin. Pleonites 1–5 short, free; pleonite 6 dorsally delineated. Statocyst present in telson.

*Remarks.* The present key to the seven species of *Accalathura* from the Indian Ocean can be used as a complement to Poore and Lew Ton (1990) who provided a key to the species of *Accalathura* from northern Australia and adjacent seas.

Key to the Indian Ocean species of *Accalathura*

- |   |   |
|---|---|
| 1 Uropodal exopod not slender, less than three times longer than wide . . . . .         | 2   |
| – Uropodal exopod slender, triangular, more than three times longer than wide . . . . . | 3   |
| 2 Posterior margin of telson rounded . . . . .  |   |
| . . . . . <i>borradailei</i> Stebbing, 1904 Maldive Islands, India, Thailand            |   |
| – Posterior margin of telson an obtuse angle . . . . .                                  | <i>wardae</i> sp. nov. Aldabra Atoll      |
| 3 Pereopod 1, proximal propodal lobe set at right angle . . . . .                       | 4   |
| – Pereopod 1, proximal propodal lobe set at obtuse angle . . . . .                      | 5   |
| 4 Pereopod 7 propodus with about seven setae on posterior margin . . . . .              |   |
| . . . . . <i>hastata</i> sp. nov. Aldabra Atoll   |   |
| – Pereopod 7 propodus with about 12 robust setae on posterior margin . . . . .          |   |
| . . . . . <i>sladeni</i> (Stebbing, 1910) Cargados Carajos, Andaman Islands, Madagascar |   |
| 5 Posterior margin of telson rounded . . . . .  | <i>phuketensis</i> sp. nov. Phuket Island |
| – Posterior margin of telson an obtuse angle . . . . .                                  | 6   |
| 6 Pereopod 7 propodus with about 12 robust setae on posterior margin . . . . .          |   |
| . . . . . <i>indica</i> (Nierstrasz, 1941) Java Sea, South Africa                       |   |
| – Pereopod 6 [manca] propodus with about six robust setae on posterior margin . . . . . |   |
| . . . . . <i>laevitelson</i> (Kensley, 1975) South Africa                               |   |

*Accalathura hastata* sp. nov.

(Figure 30)

*Type material.* HOLOTYPE: USNM 253138, ovigerous ♀ 13.7 mm, sta F3-85, rubble from intertidal reef flat, Picard Is., Aldabra, 15 March 1985. PARATYPES: USNM 253129, one pre-♂ 11.0 mm, sta F7-85, rubble from intertidal reef flat, Picard Is., Aldabra, 18 March 1985. USNM 153140, three non-ovigerous ♀, 12.8–14.9 mm, 12 juveniles, sta F8-87, rubble from intertidal reef, Passe Hoareau, Aldabra, 11 April 1987.

*Other material examined.* USNM 253141, 12 non-ovigerous ♀, 21 juveniles, from 11 stations on Aldabra, rubble, intertidal, 16 m. USNM 253142, one ovigerous

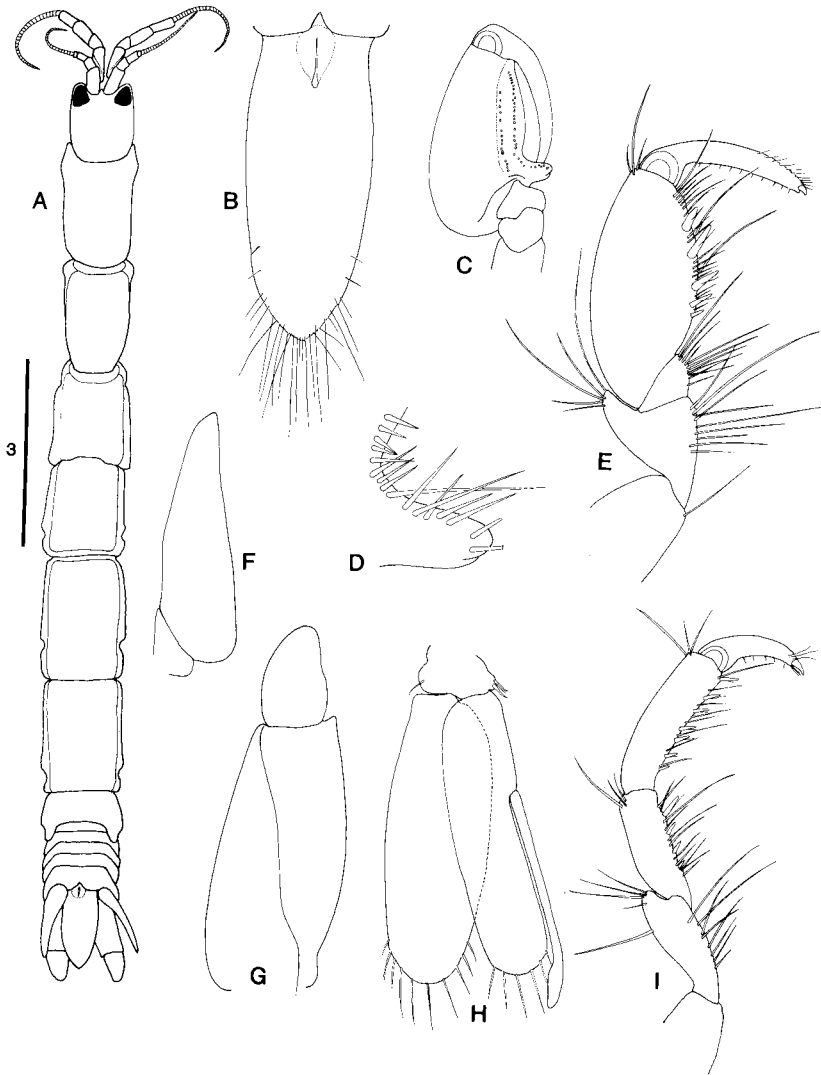


FIG. 30. *Accalathura hastata* sp. nov.: (A) ♂ dorsal view; (B) pleotelson; (C) pereopod 1; (D) pereopod 1, propodal lobe enlarged; (E) pereopod 2; (F) uropodal exopod; (G) uropodal protopod and endopod; (H) ♂ pleopod 2; (I) pereopod 4.

♀, five non-ovigerous ♀, eight juveniles, from seven stations on Aldabra, rubble, intertidal, 2 m, coll. K. Fauchald. USNM 253143, one non-ovigerous ♀, two juveniles, rubble from three stations on outer reef slope off Picard Is., Aldabra, 10 m, coll. J.D. Thomas.

*Diagnosis.* Dorsally pigmented. Telson parallel-sided for much of length, tapering posteriorly to apical angle of about 90°. Pereopod 1, propodus with proximal palmar lobe or 'thumb' at right angle to rest of palm, lobe broadly digitiform. Pereopod 2, propodus 2.5 times longer than wide, with five robust setae on palm. Pereopod 4, carpus with four setae, propodus with seven robust setae on posterior

margin; propodus 3.6 times longer than wide. Pereopod 7, uropodal exopod 3.7 times longer than wide, reaching end of peduncle, latter reaching 85% along telson length, mesiodistal projection slight; endopod distally rounded, reaching beyond telson by half its length, about 1.5 times longer than wide. Pleopod 2 of pre-male, copulatory stylet articulating at proximal third of mesial margin of endopod, distally somewhat expanded.

*Remarks.* With no mature male and only a premale available, in which the copulatory stylet is distally expanded, (suggesting a more complex structure in the mature male), it is difficult to assign the present species to any of the previously described forms.

*Etymology.* The specific name, from the Latin for a spear, refers to the shape of the telson.

***Accalathura phuketensis* sp. nov.**

(Figure 31)

*Type material.* HOLOTYPE: ZMUC, non-ovigerous ♀ 22.6 mm, sta CRU-2018, coral rubble, NW end of Ko Aeo, Phuket Is., Thailand, 3 m, 29 November 1995. PARATYPES: ZMUC, one non-ovigerous ♀ 17.8 mm, two juveniles, sta CRU-2035, fringing reef, Nai Yang Bay, Phuket Is., Thailand, 5 m, 6 December 1995. USNM 253291, one non-ovigerous ♀ 19.2 mm, two juveniles, sta CRU-2032, dead columnar coral, Ko Racha Yai, Phuket Is., Thailand, 3 m, 5 December 1995.

*Other material examined.* ZMUC, one juvenile, sta CRU-2003, dead coral, Ao Patong, Phuket Is., Thailand, 2 m, 16 November 1995. ZMUC, one non-ovigerous ♀, sta CRU-2004, dead coral, Ao Patong, Phuket Is., Thailand, 7 m, 18 November 1995. ZMUC, one juvenile, sta CRU-2005, dead Porites, Ko Hi, Phuket Is., Thailand, 5.4 m, 20 November 1995. ZMUC, one juvenile, sta CRU-2007, dead coral, Ko Hi, Phuket Is., Thailand, 7.2 m, 20 November 1995. ZMUC 0000, one juvenile, sta CRU-2020, coral rubble, Ko Aeo, Phuket Is., Thailand, 3 m, 29 November 1995. ZMUC, two juveniles, sta CRU-2029, coral rubble, Ko Hi, Phuket Is., Thailand, 5 m, 1 December 1995. ZMUC, one juvenile, sta CRU-2033, coral rubble, Ko Racha Yai, Phuket Is., Thailand, 5 m, 5 December 1995.

*Diagnosis.* Female: Body with strong hollow rectangles of pigment on pereonites. Anterolateral corners of cephalon reaching beyond low rostrum. Pleonite 6, posterodistal margin broadly bilobed. Telson narrow, spear-shaped, gently tapering to narrowly rounded setose apex. Pereopod 1, propodus with proximal palmar lobe at obtuse angle to rest of palm, lobe broadly digitiform. Pereopod 2, propodus 3.25 times longer than greatest width, with six stout sensory setae on palm. Pereopod 7, carpus with seven setae on posterior margin; propodus five times longer than wide, with 11 setae on posterior margin. Uropodal exopod slender, apically narrowly acute, about 4.5 times longer than greatest width; endopod distally rounded, about 2.25 times longer than basal width.

*Remarks.* *Accalathura phuketensis* belongs to the group of species characterized by a propodal lobe of pereopod 1 set at an obtuse angle to the palm. Four of these species are known from the Indo-West Pacific: *A. barnardi* (Nierstrasz, 1941), which possesses a telson having six longitudinal ridges and which is broader than in the present species; *A. indica* (Nierstrasz, 1941), which has a uropodal exopod 3.7 times longer than wide, i.e. broader than in *A. phuketensis*; *A. normani* (Nierstrasz, 1941), which has a broader telson than in the present species; and *A. laevitelson* (Kensley,



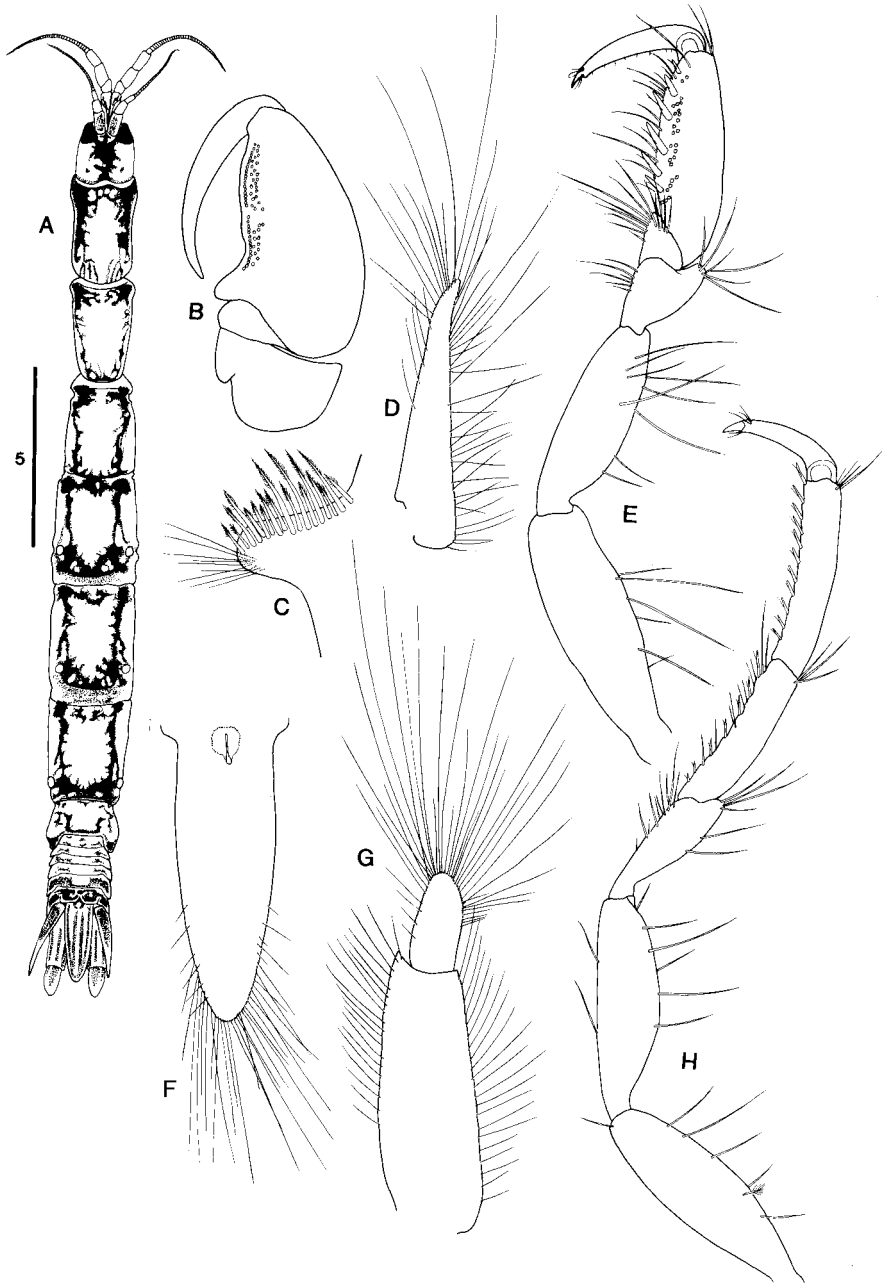


FIG. 31. *Accalathura phuketensis* sp. nov.: (A) ♀ dorsal view; (B) pereopod 1; (C) pereopod 1 propodal lobe enlarged; (D) uropodal exopod; (E) pereopod 2; (F) pleotelson; (G) uropodal protopod and endopod; (H) pereopod 7.

1975), known only from the juvenile holotype and which has less elongate posterior pereopods than *A. phuketensis*.

*Etymology.* The specific name refers to the type locality of this species, Phuket Island, Thailand.

***Accalathura wardae* sp. nov.**

(Figure 32)

*Type material.* HOLOTYPE: USNM 253144, ovigerous ♀ 9.3 mm, sta F8-87, intertidal rubble, Passe Hoareau, Malabar Is., Aldabra, coll. K. Fauchald, 11 April 1987. PARATYPES: USNM 253145, two ♂ 9.9 mm, four non-ovigerous ♀ 8.0–9.5 mm, three juveniles, sta F8-87, same data as holotype.

*Other material examined.* USNM 253146, one non-ovigerous ♀ 9.1 mm, three juveniles, sta K-AL-101, coral rubble from edge of channel, Passe Hoareau, Aldabra,

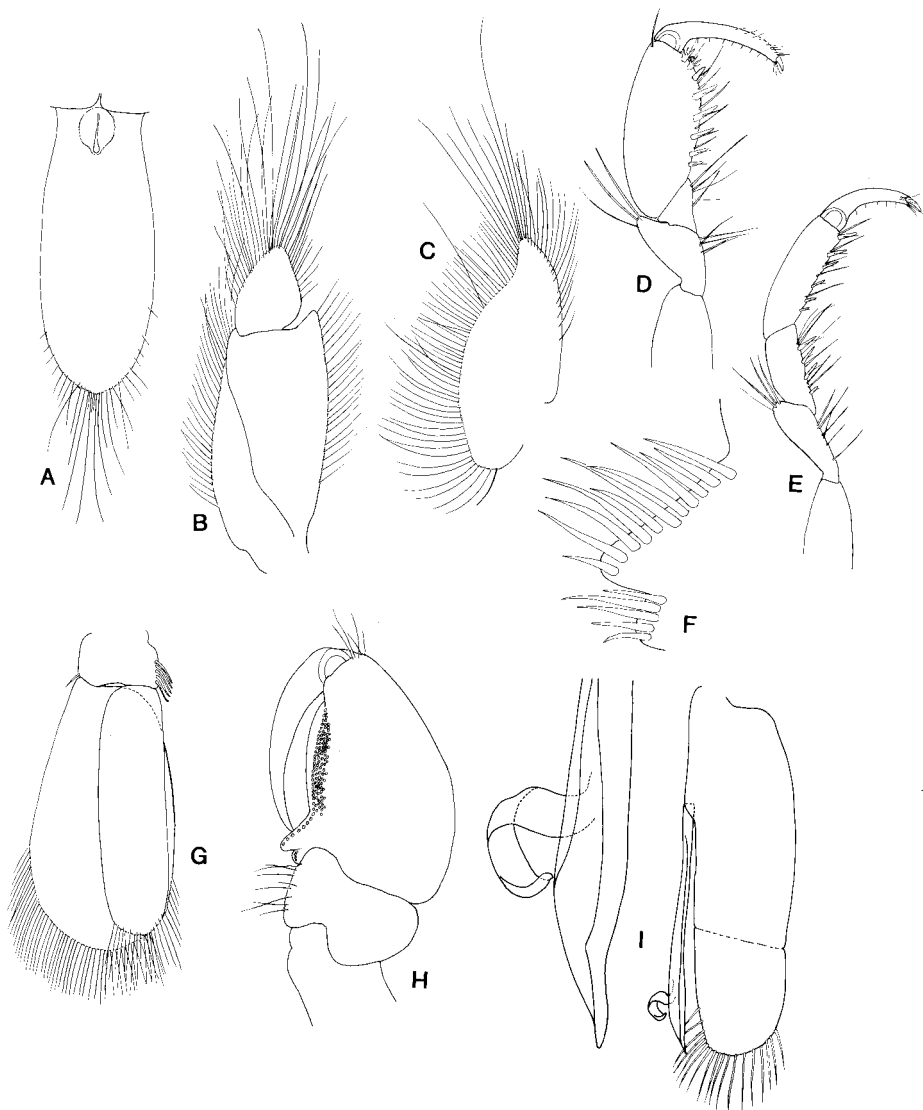


FIG. 32. *Accalathura wardae* sp. nov.: (A) pleotelson; (B) uropodal protopod and endopod; (C) uropodal exopod; (D) pereopod 2; (E) pereopod 4; (F) pereopod 1 propodal lobe enlarged; (G) pleopod 1; (H) pereopod 1; (I) ♂ pleopod 2, with apex of copulatory stylet enlarged.

0.5–1 m, 18 March 1986. USNM 253290, one ♂, sta F-495, intertidal coral rubble, Malabar Is., Aldabra, 8 May 1992.

*Diagnosis.* Female: Scattered irregular red–brown pigment present on cephalon, pereon and pleon; telson with four longitudinal bands. Telson widest at about midlength; lateral margins tapering posteriorly to obtuse-angled setose apex. Pereopod 1, propodus with palmar lobe separated from palm by obtuse angle. Pereopod 2, propodus about 2.5 times longer than wide, palm of propodus with eight setae. Pereopod 4, carpus with four setae on posterior margin; propodus with six setae, about three times longer than wide. Uropodal exopod, lateral margin sinuous, 2.5 times longer than wide; endopod triangular, one-third longer than greatest width; peduncle with mesiodistal angle triangular.

Male: Antennular flagellum of 20 articles, clusters of aesthetascs on articles 2–7. Pereopod 1 as in female, but with much denser band of subpalmar setae on mesial surface of propodus. Pleopod 2, copulatory stylet articulating at midlength of mesial margin of endopod; stylet apically reaching to apex of endopod, apically acute, with subapical curled strap-like structure.

*Remarks.* The uropodal structure of *A. vulpia* Poore and Lew Ton, 1990, from Queensland, Australia, closely resembles that of the present material; the propodal palm of pereopod 1, however, is less setose. Of the four described species of *Accalathura* from the Indian Ocean, three possess elongate slender uropodal exopods; *A. borradalei* has a broadened uropodal exopod, but the telson is posteriorly broadly rounded. The distinctive copulatory stylet of the male further separates the present species.

*Etymology.* The species is named for Linda Ward of the Department of Invertebrate Zoology, National Museum of Natural History, who collected the type material while a participant in the Aldabra research program.

### Genus *Leptanthura* Sars, 1899

*Leptanthura* Sars, 1899: 47; Poore, 1978: 136; Poore, 1980: 61; Poore, 1981: 76.

*Diagnosis.* Eyes usually lacking. Antennular flagellum of three to four articles. Antennal flagellum of four to five articles. Mandibular palp of three articles. Maxillipedal endite obsolete. Pereopod 1 subchelate, propodus inflated. Pereopods 2 and 3 subchelate, propodi not as inflated as in pereopod 1. Pereopods 4–7 with carpi triangular, lacking free anterior margin. Pleopod 1 exopod operculiform. Pleonites short, free. Telson thin, often dorsally concave, with single basal statocyst.

#### Key to the Indian Ocean species of *Leptanthura*

- |  |                                   |              |
|--|-----------------------------------|--------------|
| 1 Uropodal exopod margins dentate . . . . .  | <i>urospinosa</i> Kensley, 1975   | South Africa |
| – Uropodal exopod margins entire . . . . .   |                                   | 2            |
| 2 Telson posteriorly acute . . . . .   | <i>agulhasensis</i> Kensley, 1975 | South Africa |
| – Telson posteriorly broadly rounded . . . . .   |                                   | 3            |
| 3 Uropodal exopod broadly ovate to subcircular . . . . .                                       |                                   | 4            |
| – Uropodal exopod not broadly ovate or subcircular, narrowly ovate or distally acute . . . . . |                                   | 7            |
| 4 Uropodal exopod distinctly notched . . . . .   |                                   | 5            |
| – Uropodal exopod not notched . . . . .  | <i>natalensis</i> Kensley, 1978a  | South Africa |
| 5 Pereopod 1, palm bearing about eight spinulose setae . . . . .                               | <i>maheensis</i> sp. nov.         | Seychelles   |
| – Pereopod 1, palm bearing more than eight spinulose setae . . . . .                           |                                   | 6            |

- 6 Pereopod 1, palm bearing about 11 spinulose setae . . . . . *thalassae* Negoescu, 1980 Gulf of Aden  
 – Pereopod 1, palm bearing about 14 spinulose setae . . . . . *laevigata* (Stimpson, 1855) South Africa, Mozambique
- 7 Uropodal exopod apically acute, with slightly sinuate lateral margin . . . . . *calcis* sp. nov. Aldabra Atoll  
 – Uropodal exopod apically rounded, lateral margin not sinuate . . . . . *minuta* Kensley, 1978a South Africa

***Leptanthura calcis* sp. nov.**

(Figures 33, 34)

*Type material.* HOLOTYPE: USNM 253148, non-ovigerous ♀ 3.4 mm, sta K-AL-87, coral rubble, fore-reef slope, Picard Is, Aldabra, 15 m, 12 March 1986. PARATYPES: USNM 253149, one non-ovigerous ♀ 3.0 mm, sta K-AL-115, coarse sand and coral rubble, patch reef in lagoon, Aldabra, 2–3 m, 6 April 1987. USNM 253150, two non-ovigerous ♀ 3.5 mm, sta F-1-87, intertidal rubble from reef crest, Picard Is., Aldabra, 27 March 1987.

*Diagnosis.* Cephalon with low rounded rostrum; eyes lacking. Telson slightly more than twice longer than basal width, with slight widening in posterior half, posterior margin broadly rounded with few setae. Antennular peduncle with basal article longer and wider than two distal articles together; flagellum of three articles, terminal article bearing three aesthetascs. Antennal flagellum of four articles. Mandibular palp with article 2 longest and widest; terminal article with two short distal setae. Maxillipedal palp having two tiny distal articles. Pereopod 1, carpus triangular, lacking free anterior margin, with single posterodistal seta; propodus expanded, palm slightly concave, lined with seven short spinulose setae, posteriormost seta longest, situated on short lobe; unguis about one-third length of rest of dactylus. Pereopod 2, propodus much less expanded than in pereopod 1, with three spinulose setae plus elongate sensory seta on palm. Pereopod 3, propodus slightly less expanded than in pereopod 2, with two spinulose setae plus elongate sensory seta on palm. Posterior pereopods with carpus triangular, lacking free anterior margin; propodus about three times longer than wide, with single posterodistal seta. Pleopod 1, exopod operculiform, 2.5 times wider than endopod, latter with three distal plumose setae. Uropodal exopod ovate, apically acute, with few elongate marginal setae; endopod almost twice longer than basal width, with numerous elongate distal setae.

*Remarks.* *Leptanthura calcis* belongs to the group of species having small, non-subcircular uropodal exopods, of which three have been recorded from the Indo-West Pacific Ocean: *L. agulhasensis* Kensley, 1975, from South Africa, has a posteriorly more triangular and acute telson and a more triangular and acute uropodal endopod; *L. minuta* Kensley, 1978a, from Natal, South Africa, has an evenly ovate, posteriorly rounded telson. *L. orientalis* Barnard, 1925, from Singapore, (the type of which lacks telson and uropods, see Kensley, 1987: 124), has a narrower pereopod 1 propodus with fewer setae on the palm and more slender and more spinose carpi and propodi of the posterior pereopods.

*Etymology.* The specific name derives from the Greek word '*chalix*' for a pebble or stone and refers to the rubble habitat.

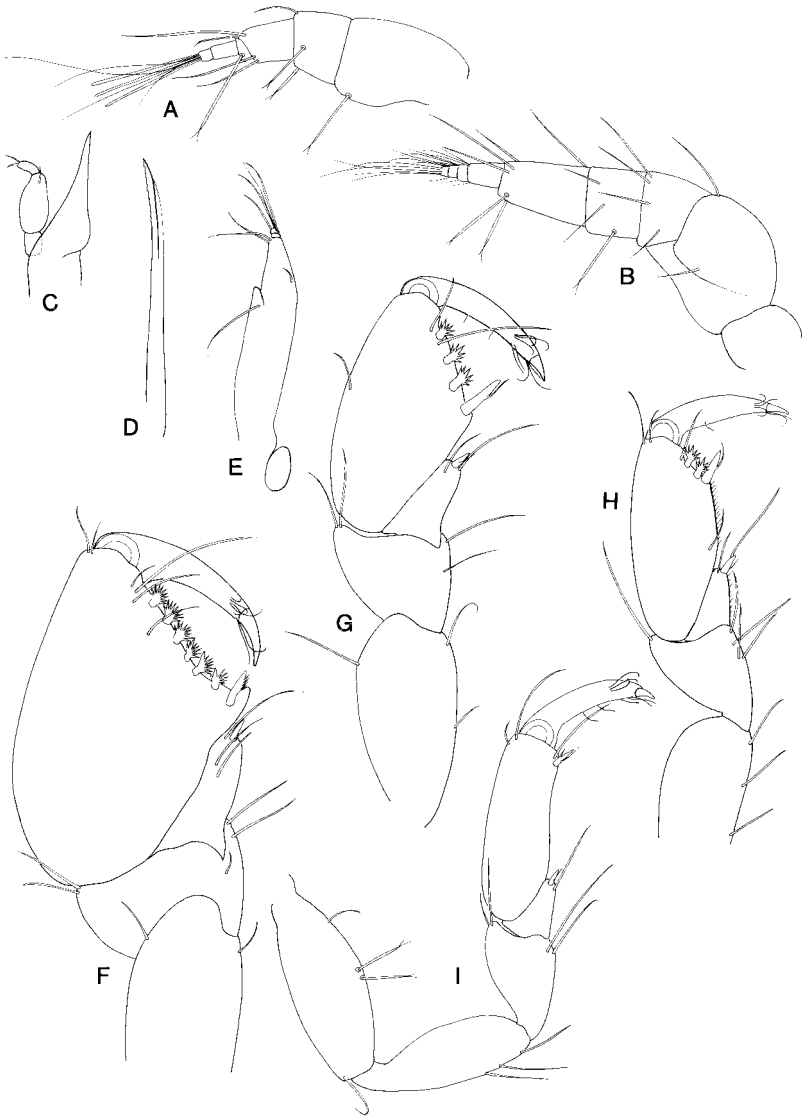


FIG. 33. *Leptanthura calcis* sp. nov.: (A) antennule; (B) antenna (C) mandible; (D) maxilla; (E) maxilliped; (F) pereopod 1; (G) pereopod 2; (H) pereopod 3; (I) pereopod 7.

***Leptanthura maheensis* sp. nov.**  
(Figures 35, 36)

*Type material.* HOLOTYPE: USNM 253154, one ovigerous ♀ 6.5 mm, sta K-SEY-3, rubble and low algal turf, south of Reef Crest Hotel, Mahe Is., 1 m, 29 April 1984. PARATYPES: USNM 253155, two ovigerous ♀ 6.3 mm, one non-ovigerous ♀ 6.5 mm, 20 juveniles, same data as holotype. USNM 253156, three ovigerous ♀ 6.0–6.3 mm, six juveniles, sta K-SEY-1, red coralline algae on boulders, south of Reef Crest Hotel, Mahe Is., 0.5–1 m, 29 April 1984.

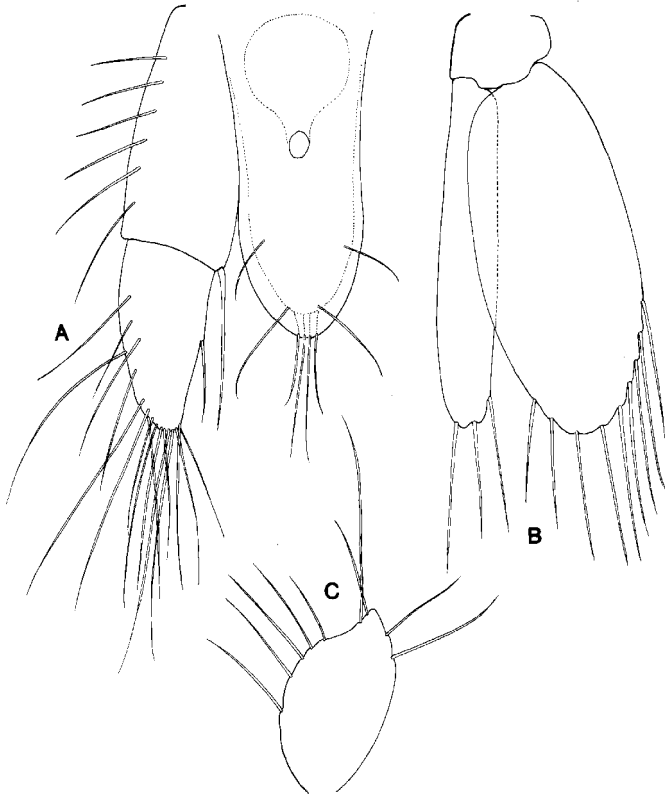


FIG. 34. *Leptanthura calcis* sp. nov.: (A) uropodal protopod, endopod, and pleotelson; (B) pleopod 1; (C) uropodal exopod.

*Other material examined.* USNM 253157, two ovigerous ♀, ten non-ovigerous ♀, from eight stations, rubble and encrusting algal turf, Mahe Is., 0.5–10 m. USNM 253158, one ♂ (damaged), three non-ovigerous ♀, rubble and algae, Aldabra, 6–12 m.

*Diagnosis.* Female: Telson length slightly more than twice greatest width, latter in posterior half, posterior margin broadly rounded, with small apical notch bearing two pairs of setae. Antennular flagellum of three articles, terminal article bearing three aesthetascs. Antennal flagellum of four short setose articles. Maxillipedal palp of three articles, two distal ones tiny. Pereopod 1, carpus triangular, bearing two sensory setae posterodistally; propodus expanded, palm straight with slight proximal triangular lobe, bearing eight spinulose setae. Pereopod 2, carpus with two setae; propodus with seven spinulose setae on palm, proximalmost largest. Pereopod 3, carpus with two setae; propodus barely expanded, palm bearing three robust setae. Posterior pereopods, carpus triangular, lacking free anterior margin; propodus about three times longer than greatest width, with two setae on posterior margin. Pleopod 1, endopod with nine plumose marginal setae distally. Uropodal exopod subcircular, with distinct notch in lateral margin; endopod roughly triangular, 1.5 times longer than basal width, apex setose, narrowly rounded.

Male: (Single damaged specimen available). Antennular flagellum of eight articles bearing dense whorls of aesthetascs. Pereopod 1, propodal palm straight, with irregular band of setae on mesial surface.

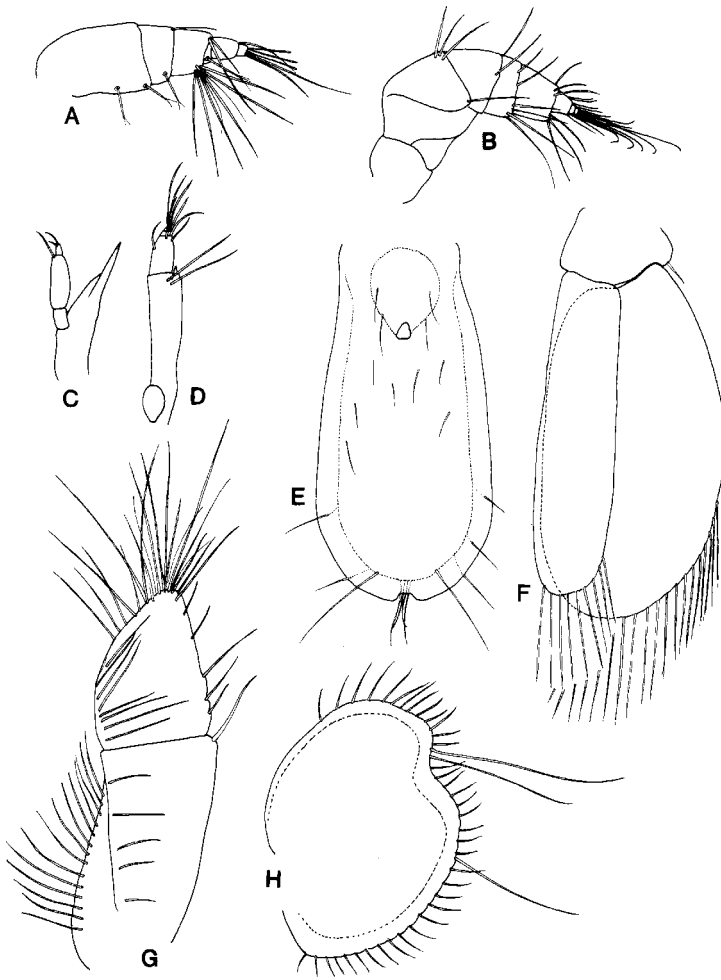


FIG. 35. *Leptanthura maheensis* sp. nov.: (A) antennule; (B) antenna; (C) mandible; (D) maxilliped; (E) pleotelson; (F) pleopod 1; (G) uropodal protopod and endopod; (H) uropodal exopod.

*Remarks.* *Leptanthura maheensis* belongs to the group of species of *Leptanthura* having broad subcircular uropodal exopods. In this group, it is most similar to *L. coralliophila* Müller, 1992b, from Malaysia, especially in the shape of the telson, but differs in lacking the distinct notch in the uropodal exopod, in having a narrower uropodal endopod and fewer spinulose setae on the propodal palm of pereopod 1. *Leptanthura maheensis* is a smaller species than *L. laevigata*, has a uropodal endopod more narrowly triangular and has fewer propodal palmar spinulose setae (eight) than in *L. laevigata* (ten) on pereopod 1. *Leptanthura thalassae* Negoescu, 1980, from the Gulf of Aden, although having a broad, subcircular, notched uropodal exopod, has a telson lacking an apical notch and does not widen posteriorly, as is the case in *L. maheensis*. *Leptanthura flindersi* Poore, 1981, from Tasmania, bears some resemblance to the present species, especially in the shape of the telson and uropods, but has fewer palmar spinulose setae on the propodus of pereopods 1 to 3.

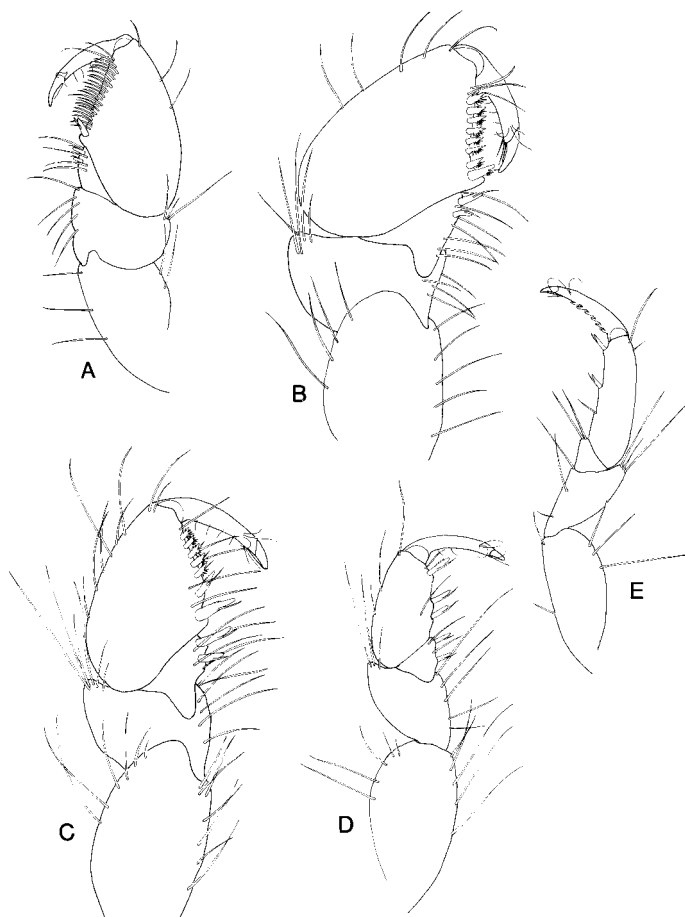


FIG. 36. *Leptanthura maheensis* sp. nov.: (A) ♂ pereopod 1.; (B) ♀ pereopod 1.; (C) pereopod 2.; (D) pereopod 3.; (E) pereopod 7.

*Etymology.* The specific name derives from the type locality, Mahé Island, Republic of Seychelles.

**Genus *Paranthura*** Bate and Westwood, 1868

*Paranthura* Bate and Westwood, 1868: 163; Poore, 1980: 63.

*Diagnosis.* Eyes present. Antennular flagellum of three to six articles. Antennal flagellum of one or two short articles. Mandibular palp of three articles. Maxillipedal endite small or obsolete; palp of one to two articles, terminal article tiny. Pereopod 1 subchelate, propodus inflated. Pereopods 2 and 3, propodi much less inflated. Pereopods 4–7, carpi roughly rectangular. Pleopod 1, exopod operculiform. Pleonites short, usually free, sometimes fused. Telson lacking statocyst.

Key to Indian Ocean species of *Paranthura*

Note: *P. elegans non* Menzies, Roman, 1970, was only mentioned in a list; its true identity remains unknown. *Paranthura neglecta* Beddard, 1886, known from a



single specimen from Kerguelen Island was poorly described and not illustrated. These two species are not included in the following key.

G. Poore (in litt.) notes that the type of *P. latipes* is a male, hence the dorsal setae on the telson, and that the species may be synonymous with *P. punctata*.

- |   |   |   |
|---|---|---|
| 1 | Numerous elongate setae on dorsum of telson . . . . .   |   |
|   | . . . . . <i>latipes</i> Barnard, 1955 [tl 7.5 mm] Mozambique   |   |
| – | Telson lacking numerous elongate setae . . . . .  | 2 |
| 2 | Margin of uropodal exopod dentate . . . . .   |   |
|   | . . . . . <i>urodentata</i> sp. nov. [tl 6.5–8.1 mm] Mahé Island, Seychelles                            |   |
| – | Margin of uropodal exopod feebly serrate or entire . . . . .  | 3 |
| 3 | Uropodal endopod basally wider than long . . . . .  |   |
|   | . . . . . <i>plumosa</i> Pillai, 1966 [tl 10.0 mm] Quilon, India  |   |
| – | Uropodal endopod longer than basal width . . . . .  | 4 |
| 4 | Antennular flagellum in female with seven articles . . . . .  |   |
|   | . . . . . <i>possessia</i> Kensley, 1980b [tl 14.0–15.0 mm] Crozet Island                               |   |
| – | Antennular flagellum in female with fewer than seven articles . . . . .                                 | 5 |
| 5 | Antennular flagellum in female of six articles . . . . .  | 6 |
| – | Antennular flagellum in female of fewer than six articles . . . . .                                     | 7 |
| 6 | Uropodal exopod 1.9 times longer than wide . . . . .  |   |
|   | . . . . . <i>antarctica</i> Kussakin, 1967 [tl 9.0 mm] Antarctic  |   |
| – | Uropodal exopod 2.6 times longer than wide . . . . .  |   |
|   | . . . . . <i>punctata</i> (Stimpson, 1855) [tl 16.0 mm] South Africa                                    |   |
| 7 | Antennular flagellum of female of four articles . . . . .   | 8 |
| – | Antennular flagellum of female of three articles . . . . .  |   |
|   | . . . . . <i>algophila</i> sp. nov. [tl 4.3–5.7 mm] Aldabra Atoll                                       |   |
| 8 | Uropodal exopod twice longer than wide; Pleopod 1, endopod having four distal plumose setae . . . . .   |   |
|   | . . . . . <i>deodata</i> Müller, 1990 [tl 3.9–4.5 mm] Réunion Island                                    |   |
| – | Uropodal exopod 2.3 times longer than wide; Pleopod 1 endopod having ten distal plumose setae . . . . . |   |
|   | . . . . . <i>seychellensis</i> sp. nov. [tl 4.2–5.2 mm] Mahé Island, Seychelles                         |   |

***Paranthura algophila* sp. nov.**

(Figures 37, 38)

*Type material.* HOLOTYPE: USNM 253170, ovigerous ♀ 5.0 mm, sta K-AL-106, intertidal coralline algal mat, near Passe Du Bois, Aldabra, 21 March 1986. PARATYPES: USNM 253171, two non-ovigerous ♀ 5.1–5.9 mm, four juveniles, same data as holotype. USNM 253172, one ♂ 4.3 mm, two ovigerous ♀ 5.7 mm, sta K-AL-103, intertidal coralline alga, Passe Hoareau, Aldabra, 19 March 1986.

*Other material examined.* USNM 253173, one ♂, ten ovigerous ♀, 15 non-ovigerous ♀, 16 juveniles, from 19 stations, algal turf and rubble, Aldabra, intertidal, 8 m.

*Diagnosis.* Female: Telson 2.5 times longer than greatest width at midlength, posterior margin evenly rounded, bearing simple elongate setae. Antennular flagellum of three articles, two distal articles each bearing two aesthetascs. Antennular flagellum of two setose articles. Pereopod 1, carpus triangular, with three distal setae; propodus somewhat expanded, palm convex, separated from low proximal lobe, row of about 14 setae on mesial surface near palm. Pereopods 2 and 3, propodus barely expanded, with four sensory setae on slightly convex palm.

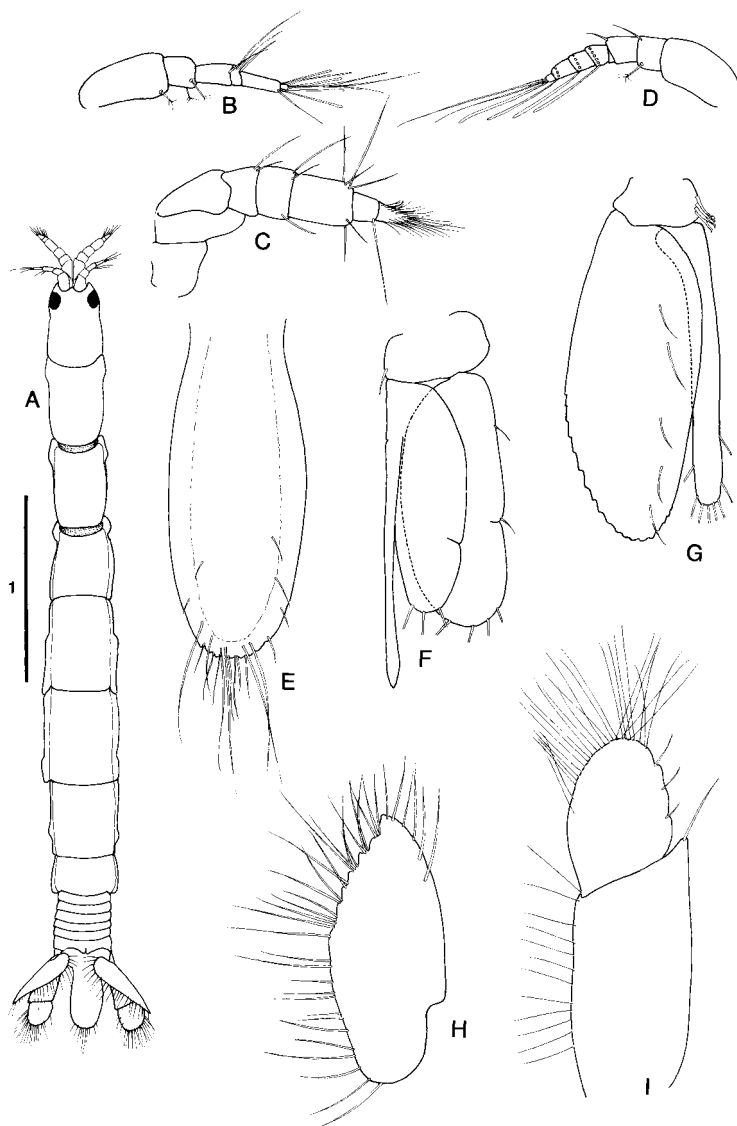


FIG. 37. *Paranthura algophila* sp. nov.: (A) ♀ dorsal view; (B) ♀ antennule; (C) antenna; (D) ♂ antennule; (E) pleotelson; (F) ♂ pleopod 2; (G) pleopod 1; (H) uropodal exopod; (I) uropodal protopod and endopod.

Pereopod 7, carpus with anterior margin slightly shorter than posterior, latter with two setae on posterior margin; propodus three times longer than greatest width, with three sensory setae and several fringed scales on posterior margin. Pleopod 1, exopod 4.5 times wider than endopod, latter not reaching apex of exopod, with eight plumose marginal setae on distal margin. Uropodal exopod elongate-ovate, apically acute, laterodistal margin serrate, setose; endopod distally rounded, setose, about 1.5 times longer than basal width.

Male: Antennular flagellum of five articles, aesthetascs on articles 2–4. Pleopod

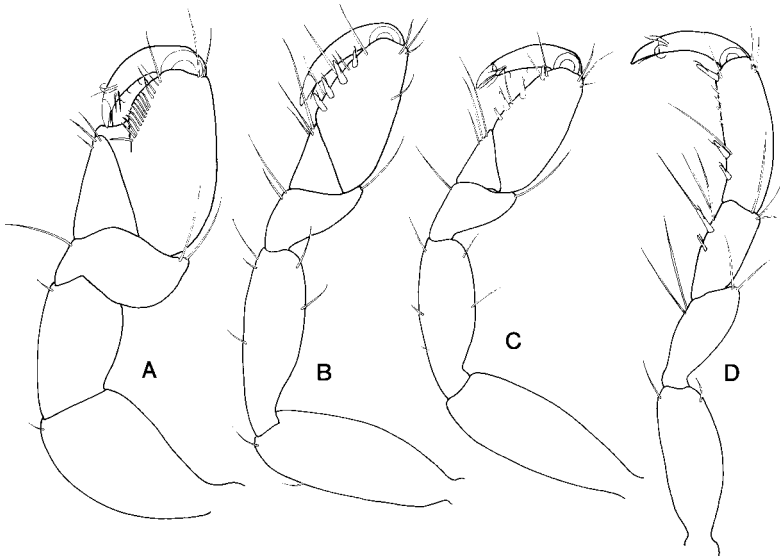


FIG. 38. *Paranthura algophila* sp. nov.: (A) pereopod 1; (B) pereopod 2; (C) pereopod 3; (D) pereopod 7.

2, copulatory stylet articulating in proximal half of mesial margin of endopod, club-shaped, reaching well beyond distal margin of ramus.

*Remarks.* Species of *Paranthura*, aside from total length, tend to be morphologically very similar. Differences in appendages are subtle. The characters used in the above key serve to differentiate the species. The total lengths are included as a guide to the possible size at maturity, thereby providing one more clue to aid in identification.

*Etymology.* The specific name, from the Greek for 'love of', plus alga, refers to the habitat of the species.

***Paranthura seychellensis* sp. nov.**

(Figure 39)

*Type material.* HOLOTYPE: USNM 253174, ovigerous ♀ 5.2 mm, sta J-SEY-2, coralline algae from reef crest, Mahé Beach, Mahé Is., Seychelles, 1–1.5 m, 30 April 1984. PARATYPES: USNM 253175, one ♂ 4.8 mm, five non-ovigerous ♀ 4.1–4.5 mm, eight juveniles, sta J-SEY-2, same data as holotype. USNM 253176, one ♂ 4.1 mm, two juveniles, sta K-SEY-7, coralline algae (mainly *Amphiroa* sp.) on reef flat, Mahé Beach, Mahé Is., Seychelles, 30 April 1984. USNM 253177, one ovigerous ♀ 4.8 mm, one non-ovigerous ♀ 4.2 mm, two juveniles, sta K-SEY-22, algal turf on granite boulders, Anse Marie Louise, Mahé Is., Seychelles, 1 m, 25 March 1989.

*Other material examined.* USNM 253178, eight ♀, five ovigerous ♀, eight non-ovigerous ♀, five juveniles, from 13 stations, rubble and algal turf, Mahé Is., Seychelles, 0.5–6 m.

*Diagnosis.* Female: Telson about 2.5 times longer than greatest width; posterior margin evenly rounded. Antennular flagellum of four articles. Antennal flagellum of single setose article. Pereopod 1, carpus triangular, with few distal setae; propodus expanded, with low proximal lobe, palm straight, with row of 17 subpalmar setae

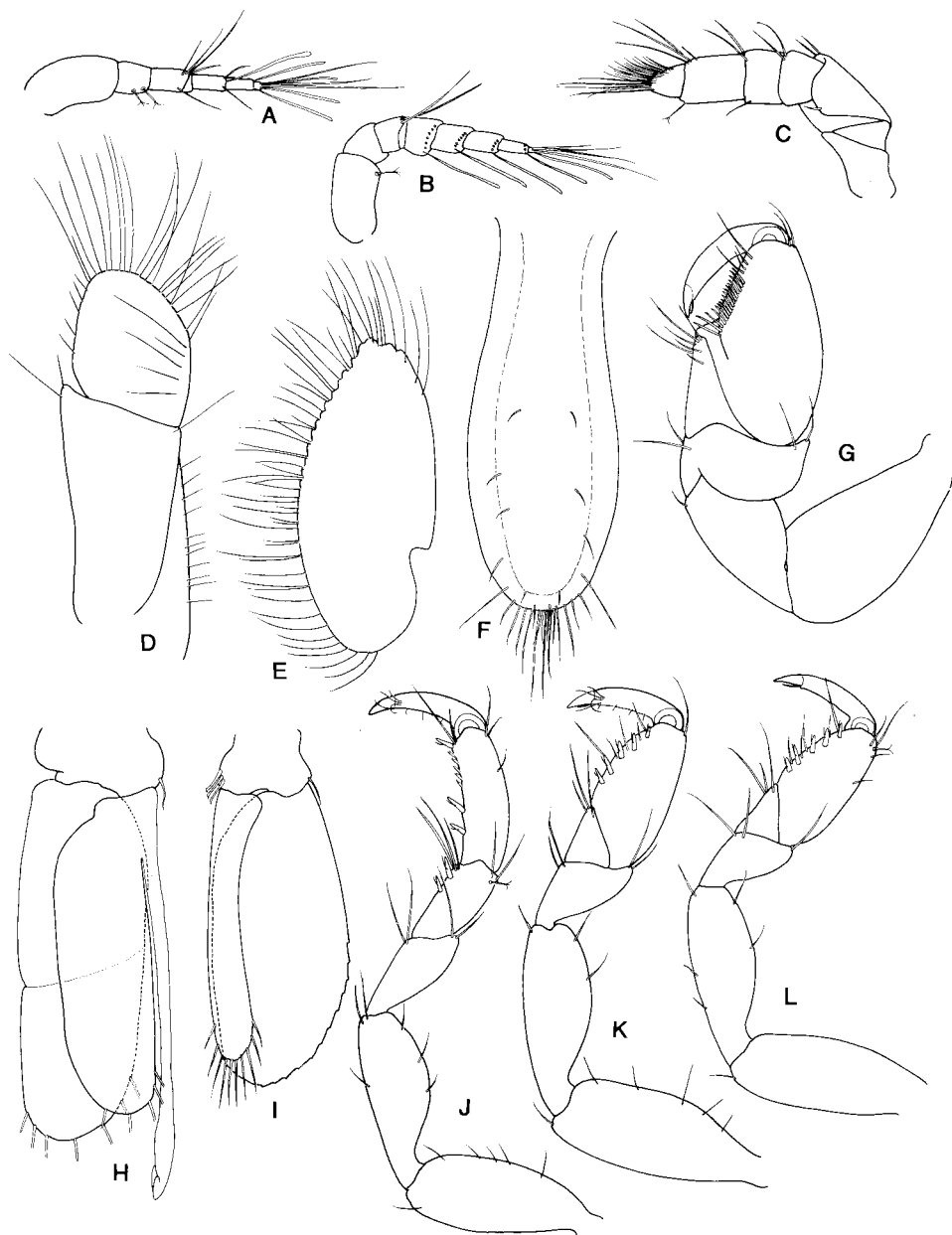


FIG. 39. *Paranthura seychellensis* sp. nov.: (A) ♀ antennule; (B) ♂ antennule; (C) antenna; (D) uropodal protopod and endopod; (E) uropodal exopod; (F) pleotelson; (G) pereopod 1; (H) ♂ pleopod 2; (I) pleopod 1; (J) pereopod 7; (K) pereopod 2; (L) pereopod 3.

on mesial surface. Pereopods 2 and 3, carpus triangular, with three distal setae; propodi barely expanded, with five sensory setae on posterior margin. Pereopod 7, carpus with anterior margin slightly shorter than posterior, with two sensory setae on posterior margin; propodus about three times longer than wide, with three

sensory setae and several fringed scales on posterior margin. Pleopod 1, endopod slightly shorter than, and almost one-quarter width of exopod, with ten distal plumose marginal setae. Uropodal exopod elongate/ovate, distally subacute, lateral margin faintly crenulate; endopod distally rounded, setose, slightly longer than basal width.

Male: Antennular flagellum of six articles, aesthetascs on 2–5. Pleopod 2, copulatory stylet reaching well beyond ramus, club-shaped, apically hooked.

*Etymology.* The specific name derives from the type locality, the Seychelles Islands.

***Paranthura urodentata* sp. nov.**

(Figure 40)

*Type material.* HOLOTYPE: USNM 253180, non-ovigerous ♀ 8.1 mm, sta K-SEY-16, algal turf on boulders, Anse à la Mouche, Mahé Is., Seychelles, 2–5 m, 1 May 1984. PARATYPES: USNM 253181, one non-ovigerous ♀ 6.5 mm, same data as holotype. USNM 253182, two juveniles, sta K-SEY-23, algal turf on reef crest, Anse Marie Louise, Mahé Is., Seychelles, 0.5 m, 25 February 1989.

*Diagnosis.* Female: Telson evenly elongate–ovate, widest at midlength, with cluster of setae on posterior margin. Antennular flagellum of six articles. Pereopod 1, propodal palm convex with low proximal lobe, bearing subpalmar row of about 28 setae on mesial surface. Pereopods 2 and 3, propodus slightly expanded, with eight sensory setae on faintly convex palm. Posterior pereopods with anterior margin of carpus slightly shorter than posterior; propodus bearing five sensory setae and several fringed scales on posterior margin. Pleopod 1, endopod about 0.6 times length of exopod, distal half narrow, bearing four distal plumose marginal setae. Uropodal exopod about 2.7 times longer than greatest width, apically acute, lateral margin dentate, with clumps of setae between teeth; endopod subcircular.

Male: Antennular flagellum of six articles, aesthetascs present on 2–6.

*Remarks.* The combination of a subcircular uropodal endopod and an elongate–ovate uropodal exopod bearing about 12 teeth on the lateral margin, separate this from all previously described species.

## Discussion

The twenty-four anthuridean species described here are placed in 15 genera, none of which is limited to the Indian Ocean. Two genera are recorded from the Indian Ocean for the first time, namely *Heptanthura* and *Pendantthura*. Of the 15 genera, all but two have been recorded from the Atlantic, Indian and Pacific oceans. *Heptanthura* was previously known only from New Zealand, while *Malacanthura* has not been recorded from the Pacific. For the majority, the constituent species are limited to temperate and tropical–subtropical regions; only *Leptanthura* and *Malacanthura* have been recorded from the Antarctic Ocean, while *Eisothistos* and *Paranthura* are represented in the subantarctic region. Even though the distribution of many species of anthurideans is not well known, perusal of the species in the present paper, as well as those in the Indian Ocean species list (see Kensley, in press) reveals an often-seen pattern: very widespread and probably old (tethyan) genera, represented by highly endemic species having very limited distributions (see Kensley, 1998). This pattern emphasizes the vulnerability of shallow-water species to extinction caused by local natural or human-induced disturbances.

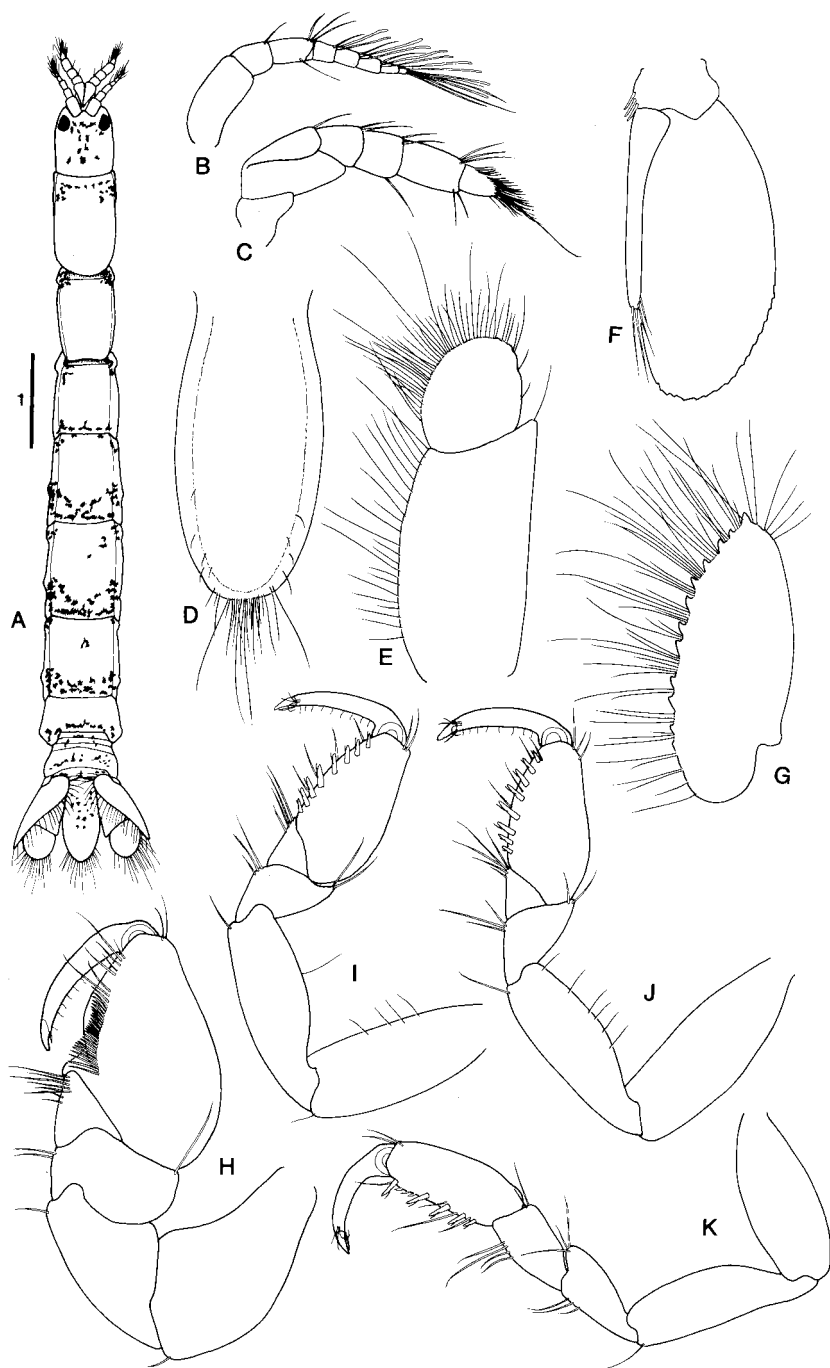


FIG. 40. *Paranthura urodentata* sp. nov.: (A) ♀ dorsal view; (B) antennule; (C) antenna; (D) pleotelson; (E) uropodal protopod and endopod; (F) pleopod 1; (G) uropodal exopod; (H) pereopod 1; (I) pereopod 2; (J) pereopod 3; (K) pereopod 7.

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