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CRUSTACEA : GALATHEIDAE

BY
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INTRODUCTION

THE Indian Ocean Galatheidae obtained by the " John Murray " Expedition are referable to thirty species and one variety which are distributed among four genera as follows : The genus *Galathea* is represented by nine species, *Munida* by eight (sub-family Galatheinae), *Galacantha* by two and *Munidopsis* by eleven species and one variety (sub-family Munidopsinae). Of these *Galathea cymbulaerostris*, *Munida roshanei* and *Munidopsis (Munidopsis) wardeni* Anderson var. *mabahiss* are described as new.

Galathea pusilla Henderson, *G. aculeata* Haswell, *G. pubescens* and probably *G. whiteleggei* are recorded for the first time from the Indian Ocean. The " John Murray " species of *Galathea* were taken at depths between 29-457, *Munida* 55-1170, *Galacantha* 1789-2080, and *Munidopsis* 494-2312 metres. The maximum number of species was collected from the Zanzibar area.

Through the kindness of the authorities I was able to study named material of Galatheidae in the collection of the British Museum (Nat. Hist.), Muséum National D'Histoire Naturelle, Paris, and Zoologisch Museum, Amsterdam. Specimens determined by Melin of *Galathea orientalis*, *G. ternatensis* and *G. serrirostris* were kindly sent on loan from Naturhistoriska Riksmuseet, Stockholm.

The following abbreviations have been used : c.l. = carapace length from the orbital border to the posterior margin of the carapace ; c.l. + r. = carapace length from the tip of the rostrum to the posterior margin of the carapace ; ch.l. = length of the cheliped.

The " John Murray " material on which the present report is based will be deposited in the British Museum (Nat. Hist.).

GEOGRAPHICAL DISTRIBUTION OF THE GALATHEIDEA COLLECTED

St. B. rectangular dredge, 16 fathoms [Data on label insufficient could be M.B. I (b)—Red sea, 29 metres.]

Galathea gardineri Laurie
aculeata Haswell
orientalis Stimpson

South Arabian coast:

St. M.B. II (c), rectangular dredge, 29 metres.

Galathea cymbulaerostris n. sp.

St. 43, otter trawl, 83-100 metres.

Galathea orientalis Stimpson

St. 45, triangular dredge 4, 38 metres.

Galathea orientalis Stimpson
whiteleggei Grant and McCulloch

St. 50, triangular dredge 4, 1536–1939 metres.

Munidopsis (Munidopsis) dasypus Alcock

St. 54, Agassiz trawl, 1046 metres.

Munidopsis (Munidopsis) spinihirsuta Lloyd

(*Munidopsis*) *scobina* Alcock

(*Galathodes*) *trifida* Henderson

Red Sea:

St. 9, otter trawl, 30 fathoms [= ? St. 10 ; net and depth on the label seem to agree with those for St. 10 of the same date in the published station list].

Galathea gardineri Laurie

aculeata Haswell

elegans Adams and White

Munida japonica Stimpson

St. 10, otter trawl, 55 metres.

Galathea pusilla Henderson

gardineri Laurie

Gulf of Aden:

St. 26, Agassiz trawl, 2312 metres.

Galacantha rostrata A. Milne-Edwards

Munidopsis (Orophorynchus) ciliata Wood-Mason

St. 34, Agassiz trawl, 1022 metres.

Munida andamanica Alcock

Munidopsis (Munidopsis) wardeni Anderson *mabahiss* var. nov.

St. 35, otter trawl, 457–549 metres.

Munida andamanica Alcock

St. 184, Agassiz trawl, 1270 metres.

Munidopsis (Munidopsis) dasypus Alcock

(*Galathodes*) *trifida* Henderson

(*Elasmonotus*) *cylindrophthalmus* Alcock

St. 185, Agassiz trawl, 2000 metres.

Galacantha rostrata Milne-Edwards

Munidopsis (Munidopsis) stylirostris Wood-Mason

St. 188, Agassiz trawl, 528 metres.

Munida roshanei n. sp.

andamanica Alcock

Northern area of Arabian Sea:

St. 62, Agassiz trawl, 1893 metres.

Galacantha rostrata A. Milne-Edwards

trachynotus Anderson

Gulf of Oman:

St. 71, otter trawl, 106 metres.

Munida roshanei n. sp.

Zanzibar area:

St. 106, Agassiz trawl, 183–194 metres.

Munida japonica Stimpson

tricarinata Alcock

- St. 107, Agassiz trawl, 421-457 metres.
Galathea pubescens Stimpson
Munida vigiliarum Alcock
incerta Henderson
- St. 108, Agassiz trawl, 732 metres.
Munidopsis (Munidopsis) wardeni Anderson
- St. 109, Agassiz trawl, 640 metres.
Munida andamanica Alcock
Munidopsis (Bathyankeystes) tenax Alcock
- St. 111, Agassiz trawl, 73-165 metres.
Galathea spinosirostris Dana
- St. 112, Peterson type, 113 metres.
Munida elegantissima de Man
- St. 115, otter trawl, 640-658 metres.
Munida incerta Henderson.
- St. 118, Agassiz trawl, 1789 metres.
Galacantha rostrata Milne-Edwards
- St. 122, otter trawl, 732 metres.
Munidopsis (Munidopsis) wardeni Anderson
- Maldive area:*
- St. 143, Agassiz trawl, 797 metres.
Munidopsis (Munidopsis) wardeni Anderson
(Munidopsis) wardeni mabahiss var. nov.
(Bathyankeystes) tenax Alcock
- St. 145, Agassiz trawl, 494 metres.
Munidopsis (Elasmonotus) cylindrophthalmus Alcock
(Galathodes) regia Alcock and Anderson
- St. 149, triangular dredge 4, 238 metres.
Munida tricarinata Alcock
- St. 153, triangular dredge 4, 256-293 metres.
Munida tricarinata Alcock
- St. 154, Agassiz trawl, 457 metres.
Munida andamanica Alcock
tricarinata Alcock
- St. 158, Agassiz trawl, 686-1170 metres.
Munida microps Alcock

Family GALATHEIDAE Dana

The family Galatheidae is at present divided into two sub-families with the following genera: sub-family Galatheinae Ortman : *Galathea* Fabr., *Munida* Leach, *Bathymunida* Balss, *Cervimunida* Benedict, and *Pleuroncodes* Stimpson ; sub-family Munidopsinae Ortman : *Galacantha* A. Milne-Edwards and *Munidopsis* Whiteaves. Both genera of the Munidopsinae are represented in the "John Murray" collection but only two of the Galatheinae genera, namely, *Galathea* and *Munida*.

KEY TO THE DETERMINATION OF THE SUB-FAMILIES AND
INDIAN OCEAN GENERA OF THE FAMILY GALATHEIDAE

- I. Integument crisp, not strongly calcified ; carapace with well-developed hairy striae ; eyes faceted and well pigmented ; exopod of first maxilliped terminates in a flagellum GALATHEINAE Ortman
 A. Rostrum triangular, flat or concave dorsally, lateral margins with spines *Galathea* Fabr.
 B. Rostrum styliform, flanked by supra-orbital spines *Munida* Leach
- II. Integument thick, strongly calcified ; transverse, hairy striae of carapace weak or absent ; eyes non-faceted and non-pigmented ; exopod of first maxilliped does not terminate in a flagellum MUNIDOPSINAE Ortman
 A. Rostrum with a horizontal basal, and an abruptly upturned distal, part ; carapace with one or more mid-dorsal gigantic spines *Galacantha* A. Milne-Edwards
 B. Rostrum horizontal, carapace without mid-dorsal spines *Munidopsis* Whiteaves

Sub-family GALATHEINAE Ortman
Genus *GALATHEA* Fabr.

The genus *Galathea* comprises over fifty species the great majority of which are found in the Indo-Pacific region. Unfortunately, several species of the genus are still poorly known : the original descriptions of many are inadequate and often without figures and the types are not always accessible. Moreover, very little is known about the variations which may occur with age and sex.

Doflein and Balss in 1913 tabulated the geographical and bathymetric distribution of the species known to them (1913, p. 169). Since then various authors have suggested various alterations, for example : Bull (1936) has shown that *G. dispersa* Bate is a species distinct from *G. nexa* Embleton. Grant and McCulloch, after comparing the specimens of *G. australiensis* Stimpson with the four type specimens of *G. corallicola* Haswell, regard the latter as a synonymy of *G. australiensis* (1906, p. 45). This view was adopted by Melin who also regarded *G. aegyptica* Paulson as a synonym of it (1939, p. 56). And Balss himself (in 1915, p. 2) had put *aegyptica* Paulson, *brevimanus* Paulson and *longimanus* Paulson as synonyms of *australiensis*. Further, Grant and McCulloch considered only *G. deflexifrons* Haswell as synonymous with *G. elegans*, they neither included *longirostris* Dana nor agreed with Henderson in regarding it as identical with *grandirostris* Stimpson. Laurie (1926, p. 134), however, says that " There does not appear to me to be any distinction of specific value between *elegans*, *grandirostris*, *longirostris* and *deflexifrons*." Melin (1939) considers only *grandirostris* as a synonymy of *elegans*. The diagnostic features of certain closely related species are still imperfectly known, such as those between *orientalis* Stimpson and *acanthomera* of the same author.

As far as I know, since Balss compiled his list, the following species have been described :

- G. biungiculata* Miyake, 1953 (? = *G. gardineri* Laurie)
G. bolivari Zariquiey, 1950
G. gardineri Laurie, 1926
G. inflata Potts, 1915
G. longirostris Yokoya, 1936 (preoccupied by *G. longirostris* Dana, 1852)
G. mauritiana Bouvier, 1915
G. minuta Potts, 1915
G. platycheles Miyake, 1953
G. providentia Laurie, 1926
G. serrirostris Melin, 1939 (? = *G. pusilla* Henderson)

- G. submagnifica* Laurie, 1926
G. ternatensis Melin, 1939
G. tridentirostris Miyake, 1953

KEY TO THE DETERMINATION OF THE INDIAN OCEAN SPECIES OF GENUS GALATHEA FABR.

- I. Rostrum with one lateral spine *G. pusilla* Henderson
 II. Rostrum with more than one lateral spine.
 A. Rostrum with three lateral spines.
 I. Second abdominal tergum with one transverse groove.
 A. Striae on carapace broken into squamiform scales.
 1. All striae of carapace broken *G. gardineri* Laurie
 2. Only anterior striae broken.
 a. All striae anterior to cervical groove broken *G. aculeate* Haswell
 b. Third anterior stria and some lateral ones broken *G. spinosorostris* Dana
 B. Striae of carapace more or less continuous.
 1. One pair of gastric spines only, hepatic spines absent *G. orientalis* Stimpson
 2. Two pairs of gastric spines, one pair of hepatic spines ? *G. whiteleggei* Grant and McCulloch
 II. Second abdominal tergum with three transverse grooves.
 A. Several spines present on anterior and lateral surface of carapace *G. pubescense* Stimpson
 B. Only one pair of gastric spines present *G. cymbulaerostris* n. sp.
 B. Rostrum with seven small lateral teeth *G. elegans* Adams and White

Galathea pusilla Henderson

(Fig. 1A-C)

Galathea pusilla Henderson, 1885, p. 407.*Galathea pusilla*, Henderson, 1888, p. 121, pl. xii, figs. 1, 1a and b; Thomson, 1898, p. 193, pl. xxi, fig. 7; Whitelegge, 1900, p. 185; Grant and McCulloch, 1906, p. 49, pl. iv, figs. 5, 5a.? *Galathea serrirostris* Melin, 1939, p. 72, figs. 43-47.OCCURRENCE : *Red Sea* : St. 10, otter trawl, 55 metres, 1 male (c.l. + r. = 2.5 mm.), 4 females (c.l. + r. slightly over 2-3 mm.), chelipeds and legs missing.

DISTRIBUTION : Australia : Off Twofold Bay; Off Bondi (New South Wales); Mast Head Islands (Queensland); New Zealand : Cook Strait Cable, Waganui, Peterson Inlet; ? Japan : Bonin Island.

DESCRIPTIVE REMARKS : *Galathea pusilla* is known from several specimens, all of which came from the Pacific. As far as I am aware the "John Murray" specimens are the first to be recorded from the Indian Ocean. They are rather small, measuring from two to three mm. in carapace length, including the rostrum. Two of the bigger females are ovigerous. The carapace of an ovigerous female is illustrated in Fig. 1A. The pattern of striae is more or less constant in all the specimens. In the type Henderson described two pairs of spines on the gastric region. Thomson's specimens also had the same number of gastric spines, but the specimens described by Grant and McCulloch and, according to them, those taken by the "Thetis" had only a single pair of spines on the gastric region. In all the "John Murray" specimens this region is armed with five spines arranged in a more or less convex row; the median spine is larger than the others. The type of *G. pusilla* is present in the British Museum (Nat. Hist.) and was available for study but unfortunately the gastric

region is mutilated and it is not possible to count the spines. In the type specimen the lateral margins of the rostrum are convex whereas in the "John Murray" specimens the rostrum is more triangular and the basal rostral spines are much larger.

The antennule and the merus of the third maxilliped are illustrated in Fig. 1B and C.

The chelipeds and legs of all the specimens are missing.

The single male specimen is small and in rather poor condition. As far as could be seen only the second pair of pleopods is present, and the endopods are slender with rather long setae fringing its posterior margin.

REMARKS : The Indian Ocean specimens differ from the type in having a triangular rostrum, larger basal rostral spines and an extra spine on the gastric region. The spine on the inner margin of the third maxilliped is also somewhat more proximally placed.

Melin (1939, p. 72) referred several specimens collected from Bonin Island to *G. serrirostris* n. sp. A male specimen from Port Lloyd was very kindly sent to me on loan by the authorities of the Naturhistoriska Riksmuseet, Stockholm. The specimen had the tip of its rostrum bent, the right spine at the base of rostrum wanting and the gastric spines much smaller than figured by Melin (1939, fig. 43). On the whole the specimen showed a great resemblance to Henderson's species except that the anterior striae of the carapace were almost continuous. The chelipeds were short and stout measuring about twice the length of the carapace, including rostrum. The merus of the third maxilliped agreed with that of the type of *G. pusilla*. With only one specimen available it is somewhat difficult to ascertain the exact systematic position of *G. serrirostris*.

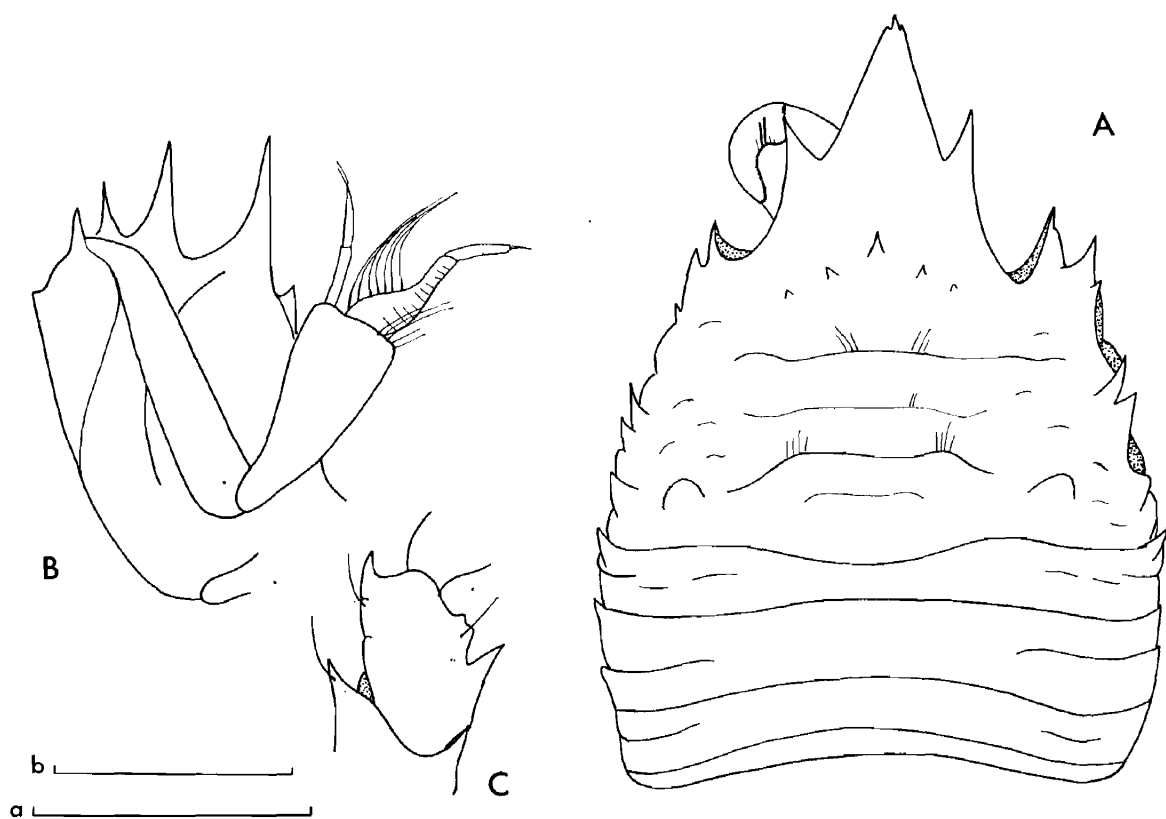


FIG. 1. *Galathea pusilla* Henderson. A. Carapace of female, dorsal view (scale $b = 1$ mm.). B. Right antennule, dorsal view (scale $a = 0.5$ mm.). C. Middle part of right third maxilliped (scale a).

Galathea gardineri Laurie

(Fig. 2)

Galathea gardineri Laurie, 1926, p. 131, pl. 9, figs. 1-5.? *Galathea biungiculata* Miyake, 1953, p. 199, figs. 1 and 2.

OCCURRENCE : St. B, rectangular dredge, 16 fathoms, 2 males (c.l. + r. = 4.45 mm., ch.l. = 8-9 mm.). [Data on label insufficient, could be St. M.B. I (b), 29 meters.]

Red Sea : St. 9, otter trawl, 30 fathoms, 2 females (c.l. + r. = 5 mm., ch.l. = 10 mm.). [In published station list only triangular dredge 4 and 245 meters are given.]

St. 10, otter trawl, 55 metres, 2 males (c.l. + r. = 3.5-5.5 mm., no chelip.), 4 females (c.l. + r. = 4-4.5 mm.).

DISTRIBUTION : Indian Ocean, ? Japan.

REMARKS ON MATERIAL : One of the two females from St. 9 is ovigerous, the chelae are slightly unequal measuring 10 mm. in length. The other female is infested by some species of Rhizocephala, its chelipeds are unequal. The left chela is heavier and 10 mm. in length, the other is slender and reaches only to the distal margin of the palm of the other chela. Of the four females taken at St. 10,

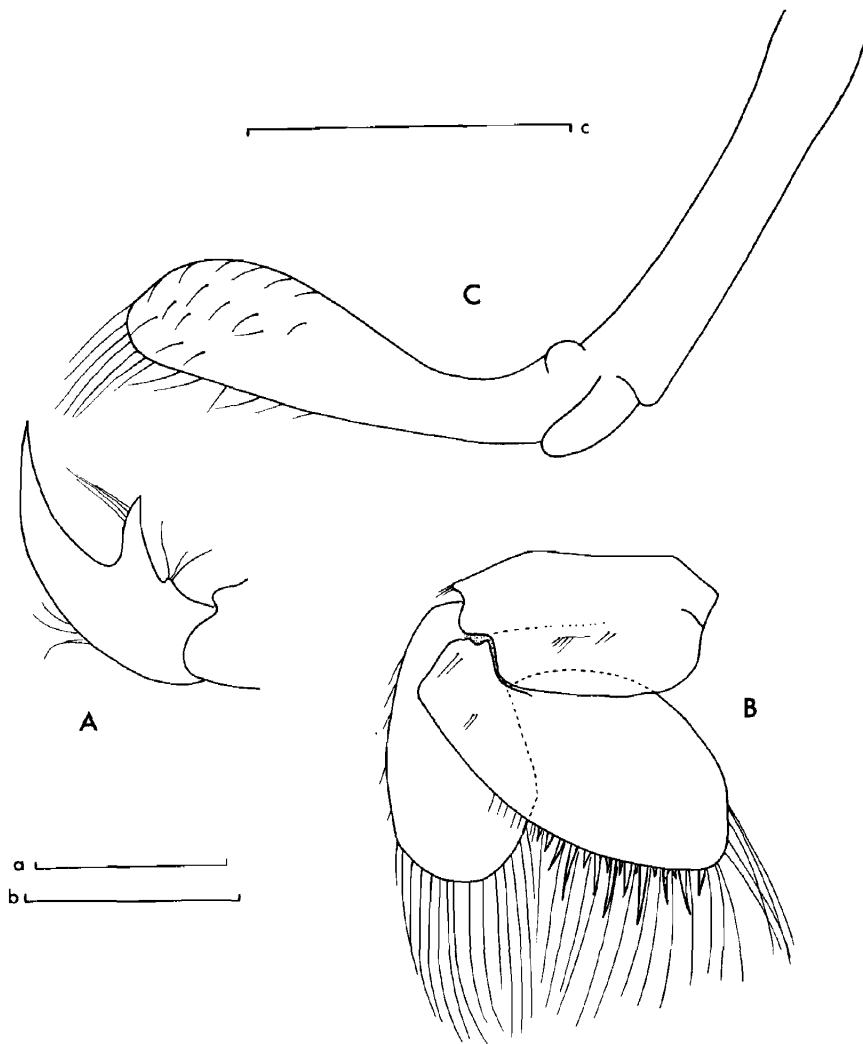


FIG. 2. *Galathea gardineri* Laurie. A. Dactylus of walking leg (scale $a = 0.5$ mm.). B. Left uropod, dorsal view (scale $b = 1$ mm.). C. Left second pleopod of male, dorsal view (scale $c = 0.25$ mm.).

only one, measuring 4 mm. in carapace length, including rostrum, is non-ovigerous, and the chelipeds measure 8 mm. in length ; all the others are ovigerous and the chelipeds are not attached to the body.

DESCRIPTIVE NOTES : This species was established by Laurie in 1926 for two males and one ovigerous female collected from the Indian Ocean. The largest specimen was the female measuring 4 mm. in carapace length. The " John Murray " material consists of four males and six females and the largest specimen present is a male with the carapace 5.5 mm. long. All these specimens agree rather well with the original descriptions and figures. The few differences noticed are probably due to individual variations, since the specimens at hand also show some differences particularly in the density of hairs on body and limbs and also in the spinosity of the dorsum. Some of the older specimens are densely setose and most of the broken striae of the carapace are tipped with spinules while in the youngest specimen the hairs are scanty and only the anterior and lateral striae of the carapace have spinules. Furthermore, Laurie had observed four spinules on the posterior border of the carapace of the female ; this appears to be a variable character because in the " John Murray " specimens the posterior border is spinose in the largest male and in only one ovigerous female (c.l. + r. = 4.5 mm.).

The dactylus of a walking leg is illustrated in Fig. 2A. As can be seen it is very characteristic, terminating in a strong claw proximal to which is a strong spine with a small setose tubercle at its base.

The uropods are particularly interesting in having an elongate and laterally directed sympod (Fig. 2B). The endopod is partly flexed underneath the sympod, so that its lateral margin becomes posterior in natural position. Furthermore, this posteriorly directed margin of the endopod has stout, flexible, spine-like setae in addition to the normal ones.

As in *G. pusilla* the first pair of pleopods are absent in the male. The second pair of pleopods of the present species shows a striking resemblance to that of *G. pusilla*. The left pleopod of *G. gardineri* is represented in Fig. 2C.

REMARKS : *G. biungiculata* was described by Miyake (1953) for one ovigerous female and according to him the specimen differed from *G. gardineri* in the armature of chelipeds and carapace. But, as shown above, the specimens are liable to individual variation as far as the spines of the dorsum are concerned. Further, Miyake (1953, p. 202) points out that his specimen "... is provided with five spines on the inner margin of the merus of the second ambulatory leg instead of no spines as in the case of *G. gardineri*". Laurie's (1926, p. 133) descriptions of the meri of the ambulatory legs runs as follows: " The lower margin of the merus bears spines throughout its length in the 1st walking leg but only on the distal portion in the 2nd and 3rd." The " John Murray " specimens agree with the description given by Laurie in having the lower margin of the merus of the first leg spinose, the meri of the second and third legs are spinose distally but the rest of the margin is very strongly serrated. On the whole the two species are so near to each other that it is highly probable that with more information on the variation they might be put together. The only difference I can see between the two species is that in Miyake's (1953, fig. 2, c 3) specimen the inner margin of the third leg is unarmed whereas in the Indian Ocean specimens it has a few distal spines.

Galathea aculeata Haswell

(Figs. 3A, B and 4A)

Galathea aculeata Haswell, 1882, p. 761.

Galathea aculeata, Haswell, 1882, p. 162 ; Whitelegge, 1900, p. 190 ; Grant and McCulloch, 1906, p. 48, pl. iv, figs. 4, 4a. Not *Galathea aculeata*, Henderson, 1888, p. 120.

OCCURRENCE : St. B, rectangular dredge, 16 fathoms, 1 male (c.l. + r. = 7 mm., ch.l. = 15 mm.), 1 ovig. female (c.l. + r. = 6 mm., ch.l. = 13 mm.) [data incomplete].

Red Sea : St. 9, otter trawl, 30 fathoms, 2 females (c.l. + r. = 4-5 mm., ch.l. = 11 mm., detached), larger female ovig. [In published station list only triangular dredge 4 and 245 metres are given.]

DISTRIBUTION : Australia : Holborn Island and Port Molle.

DESCRIPTIVE REMARKS : The observations of Whitelegge (1900) and Grant and McCulloch (1906) were based on Haswell's type material ; all three authors questioned the identity of the "Challenger" specimens with the Australian species. On re-examining the "Challenger" specimens in the British Museum (Nat. Hist.) collection I can confirm that they certainly do not belong to *G. aculeata* Haswell. On the other hand, the "John Murray" specimens listed above do seem to be referable to *G. aculeata*. This, therefore, is the first authentic record of the species from the Indian Ocean.

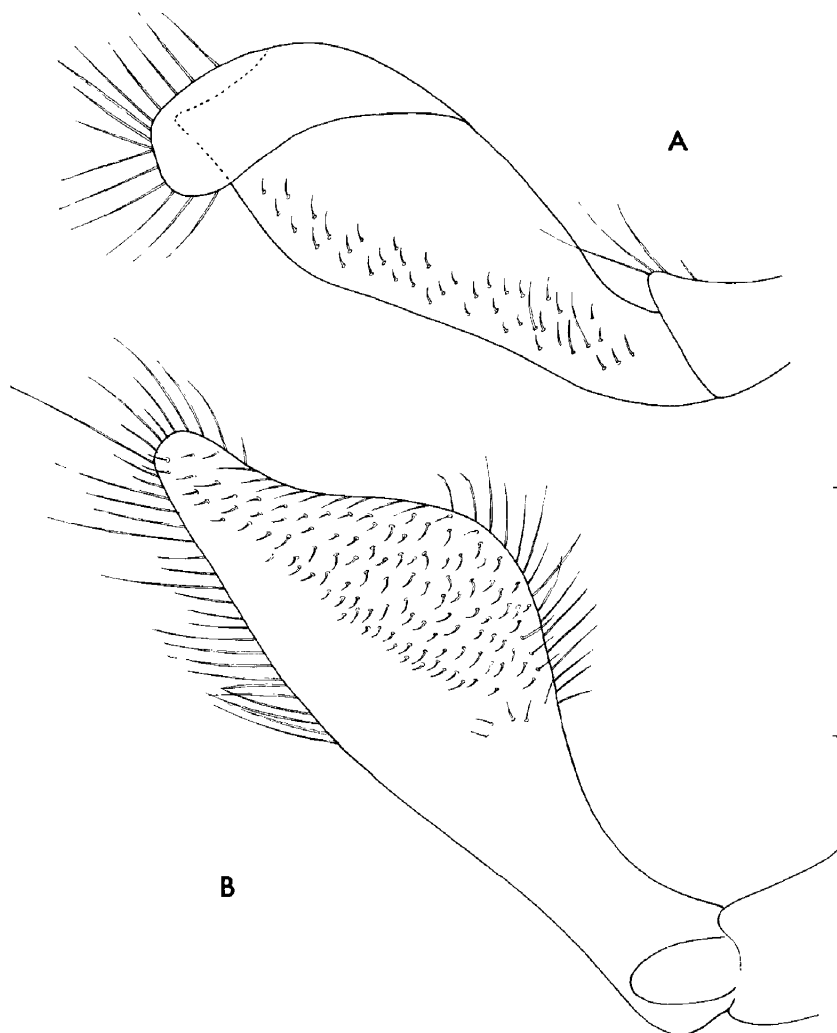


FIG. 3. *Galathea aculeata* Haswell, male. A. Endopod of left first pleopod, dorsal view. B. Distal part of left second pleopod, ventral view. (Scale = 0.25 mm.)

In the "John Murray" specimens the anterior squamiform striae are not only fringed with hairs but some of them are also tipped with spinules. Moreover, the rostral spines are acute, slender and deeply incised.

The basal segment of the antennule has three spines distally, which are more or less sub-equal in length and the outer ones are directed somewhat laterally.

According to Grant and McCulloch (1906, p. 49) the merus of the third maxilliped "... has two prominent spines on its inner margin and its outer margin is trispinose". The merus of the third maxilliped of the male is illustrated in Fig. 4A; it agrees with the above description except that the median spine on the outer margin is bifurcate. It may also be pointed out here that the armature of this margin is much weaker in all the other "John Murray" specimens which are all females.

Describing the chela Grant and McCulloch say that "The hand of the female is equal in length to the carapace, and is as long as the rest of the limb. Dactylus much longer than the palm." (p. 49). The present specimens agree with the type in having the chela as long as the carapace but in all instances the rest of the limb exceeds the palm by 1 mm. Moreover, the relative length of the dactylus and palm is also variable: in the female from St. B the dactylus is as long as the palm but in the male it is shorter than the palm. A detached cheliped is present in the same tube which contains two females taken from St. 9. In this cheliped, which I think must belong to the larger female, the dactylus exceeds the length of the palm by only 0.5 mm. In the male, on the other hand, the dactylus falls short by 1 mm.

In the male the first pair of pleopods is also present. The dorsal view of the first left endopod and ventral view of that of the second are illustrated in Figs. 3A and 3B.

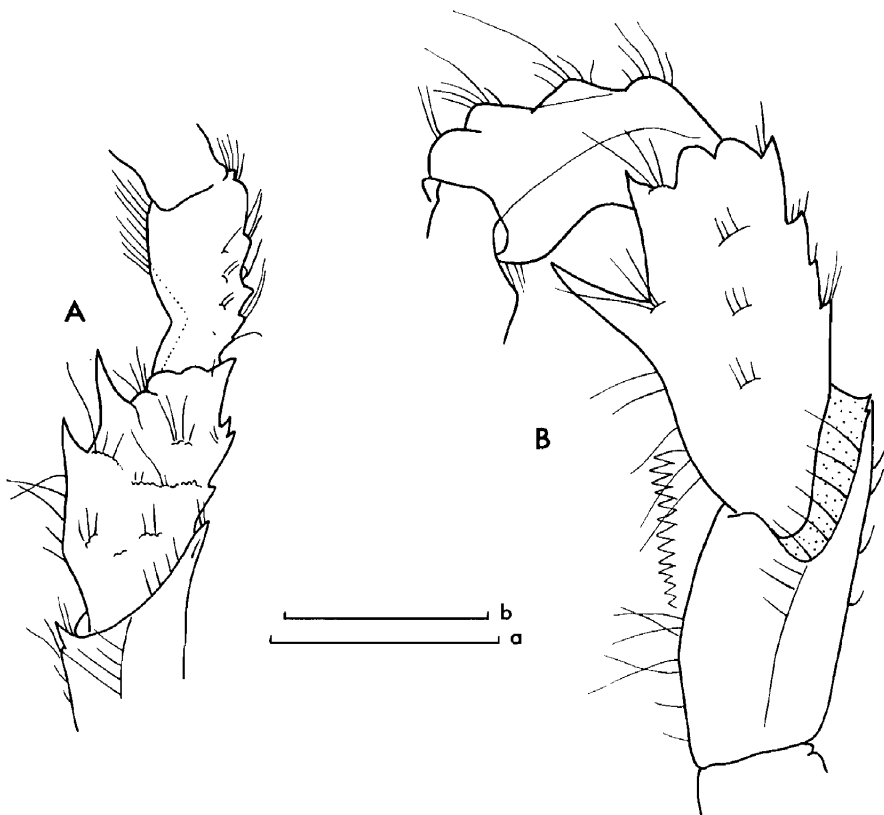


FIG. 4. *Galathea aculeata* Haswell: A. Part of left third maxilliped (scale $a = 1$ mm.). *Galathea spinosorostris* Dana: B. Ischium, merus and carpus of left third maxilliped (scale $b = 0.5$ mm.).

Galathea spinosirostris Dana

(Figs. 4B and 5)

Galathea spinosirostris Dana, 1852, p. 480.*Galathea spinosirostris*, Dana, 1855, pl. 30, fig. 9 ; Lenz, 1910, p. 566 ; Laurie, 1926, p. 124 ; Miers, 1884, p. 560.*Munida spinulifera* Miers, Southwell, 1909, p. 121, pl., fig. 12.

OCCURRENCE : *Zanzibar area* : St. 111, Agassiz trawl, 73-165 metres, 1 female (c.l. + r. = 5.5 mm., ch.l. = 13.5 mm.).

DISTRIBUTION : Indo-Pacific.

DESCRIPTIVE REMARKS : The "John Murray" material of *G. spinosirostris* consists of a single female. The carapace is illustrated in Fig. 5. In general it agrees with Southwell's figure in the pattern of striae but differs mainly in having an oblique frontal margin which is armed with a slender spine. Moreover, a pair of gastric spines is also present which is neither shown in Southwell's figure nor mentioned by Laurie. They are quite evident in Dana's figure (1855, pl. 30, fig. 9a).

The basal segment of the antennule has three distal spines. The outer spine is slightly longer than the two sub-equal median spines, and it is also somewhat wider near the base.

The merus of the third maxilliped is shown in Fig. 4B ; as already pointed out by Laurie (p. 125) "... the distal tooth of the inner border of the merus is smaller than in Dana's figure ". The low

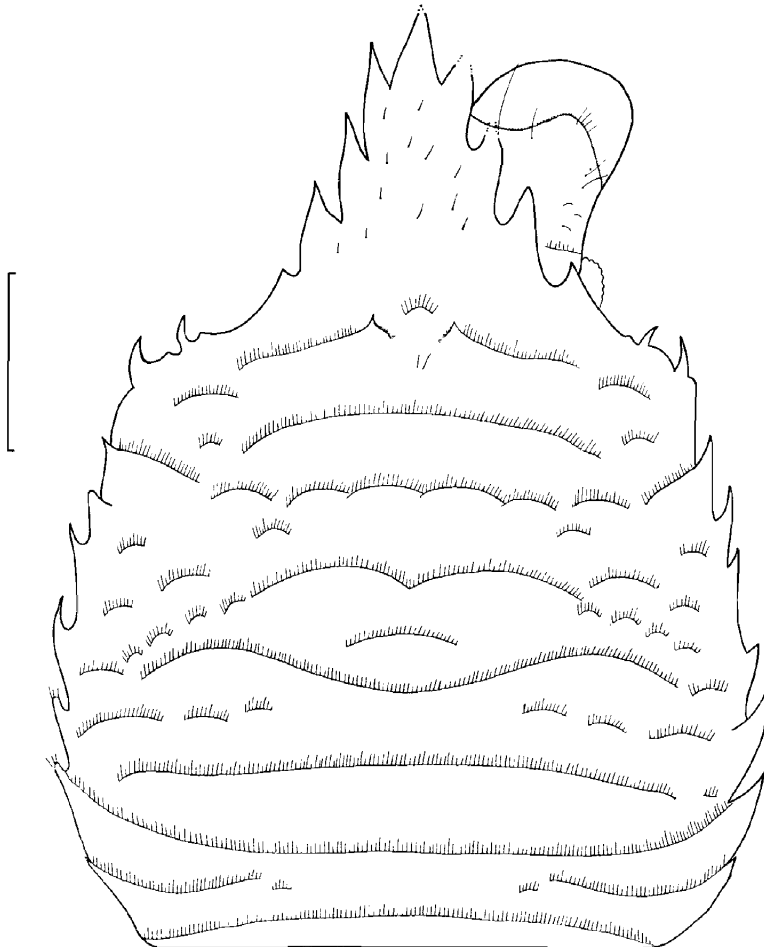


FIG. 5. *Galathea spinosirostris* Dana : Carapace, dorsal view (scale = 1 mm.).

rounded elevations on the outer border of the carpus, mentioned by Laurie, are quite prominent.

The chelipeds, as represented by Southwell (1909, pl., fig. 12), are long and slender. The fingers of the chela are as long as the palm and their inner margins are in contact throughout.

Galathea orientalis Stimpson

(Figs. 6 to 8)

Galathea orientalis Stimpson, 1858, p. 252.

Galathea orientalis, Stimpson, 1907, p. 231 ; Melin, 1939, p. 63, figs. 36-38 (also see for other references).

OCCURRENCE : *Red Sea* : St. B, rectangular dredge, 16 fathoms, 3 specimens. [Data insufficient.]

South Arabian Sea : St. 43, otter trawl, 83-100 metres, 1 male.

St. 45, triangular dredge 4, 38 metres, several specimens.

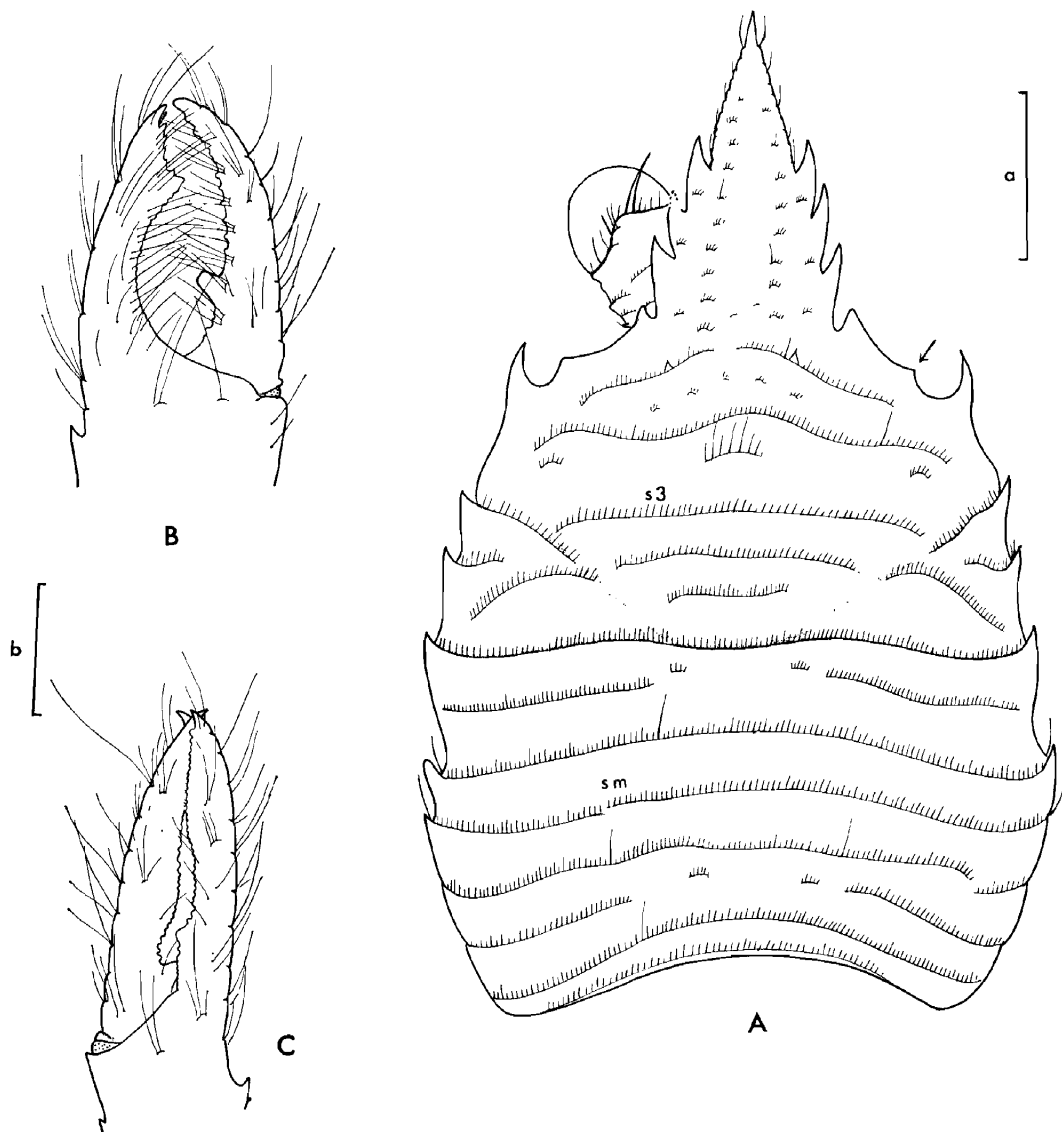


FIG. 6. *Galathea orientalis* Stimpson. A. Carapace of male, dorsal view ; s3 third anterior stria, sm third post-cephalic stria (scale a = 1 mm.). B. Left chela of older male (scale b = 1 mm.). C. Right chela of male (scale b).

DISTRIBUTION : Hong Kong to Japan, and Bonin Island.

REMARKS ON MATERIAL : The material consists of several specimens belonging to both sexes. The carapace length measures from 2.5 to 6.6 mm., including rostrum. The chelipeds of most specimens and the legs of almost all specimens are detached. The following are the measurements of those specimens which had the chelipeds attached :

Males : c.l. + r. = 6.5 mm., chelipeds unequal measuring 14 and 15 mm. in length ; c.l. + r. = 6.6 mm., ch.l. = 15 mm.

Females : c.l. + r. = 4, 5, 6 and 7.5 mm., ch.l. = 7, 11, 12 and 14 mm. respectively.

DESCRIPTIVE NOTES : The carapace of a male is illustrated in Fig. 6A. The outer orbital angle (indicated by an arrow) is either acuminate as shown in the figure or it may be furnished with a slender spine. The antero-lateral spine is strong and is usually followed by four or five spines of which the last two are situated posterior to the cervical groove. The gastric region is armed with two small spines. In nearly all the specimens the setose striae of the carapace are as shown in Fig. 6A except in the youngest specimens where the stria labelled *sm* is not continuous in the middle being represented only at the sides of the carapace. Also, the precephalic striae *s3* is rather sinuous and not straight. The rostrum is long and pointed at the apex ; the first three lateral teeth are curved and deeply incised ; the dorsal surface of the rostrum is furnished with squamiform scales fringed with fine hairs. The second and the third abdominal tergum have each a slight transverse groove, the posterior margin of which is raised into a setose ridge. The remaining terga are smooth and without any sculpturing.

The eyes are rather characteristic especially in having hairs on the distal margin of the peduncle at least a few of which are remarkably stout and long.

The basal segment of the antennule has its distal margin armed with three sharp and laterally directed spines (Fig. 7A).

The basal segment of the antennal peduncle has its inner, distal angle produced into an acuminate, triangular process which may even exceed the distal margin of the third segment. The same angles of the two following segments are spinose. The outer, distal angle of the second segment is produced into a spine which scarcely reaches as far as the middle of the third segment.

In the third maxilliped the inner, distal angle of the ischium is produced into a spine which in some specimens may be very strongly developed (Fig. 8A). The armature of the merus varies quite considerably ; in the majority of specimens it is as represented in Fig. 7B, where the inner margin has two spines separated by a small tubercle and the outer margin has three spine-like projections. In a few specimens however, the merus has three spines on its inner margin (Fig. 8A). This variation does not seem to be related to the age or sex of the specimens. On the other hand, in all the specimens measuring from 2.5-4 mm. in carapace length (including rostrum) only the basal spine is developed, anterior to which are two sharp projections (Fig. 8B) ; the outer margin is almost smooth. The outer margin of the carpus, as far as I can see, is always without spines.

The chelipeds are long and slender. In the older males the left chela is heavier and the fingers are strongly curved (Figs. 6B, C). The two chelipeds are either equal or one of them may be slightly the longer. In the male from St. 43, where both the chelipeds are attached, the slender cheliped is the longer. All the ambulatory legs are detached, one of them is represented in Fig. 8C ; the number of spines on the posterior margin of propodus vary from 4-6 and the anterior margin of the carpus is either spinose or strongly serrated.

Both the anterior and posterior margins of the endopod of the first male pleopod are curved as illustrated in Fig. 7C. The endopod of the second pleopod is flat and broad in some males but in some the dorsal surface is pushed downwards so as to form a gutter-like concavity on this surface—giving a slender and narrow appearance to the endopod (Fig. 7D).

REMARKS : de Man (1907, p. 402) gave a detailed description of *G. acanthomera* from a male specimen from the Inland Sea of Japan and of Ortman's specimens of *G. orientalis* Stimpson which he redetermined as *G. acanthomera*. He also pointed out a few characters distinguishing this species from *G. orientalis*. The "John Murray" specimens, on the whole, seem to be referable to *G. orientalis* except that the dactylus of the chela has a single tooth instead of being bidentate and there are a few long hairs on the carapace and abdomen.

Melin (1939, p. 63) described specimens from Bonin Island as belonging to *G. orientalis* and mentioned that the specimens showed variation in the number of teeth present on the dactylus of the chela. Through the kindness of the authorities of the Naturhistoriska Riksmuseet, Stockholm, a few of Melin's specimens were available to me for comparison with the Indian Ocean material. The "John Murray" specimens agree rather well with them, specially in the number of spines on the lateral margin of the carapace and in the form of the rostrum, eyes, and chela (there was only one detached cheliped with a gaping chela). But they differ in having distinct setose scales on the rostrum, an anteriorly directed salient on the gastric region and three complete post-cephalic striae

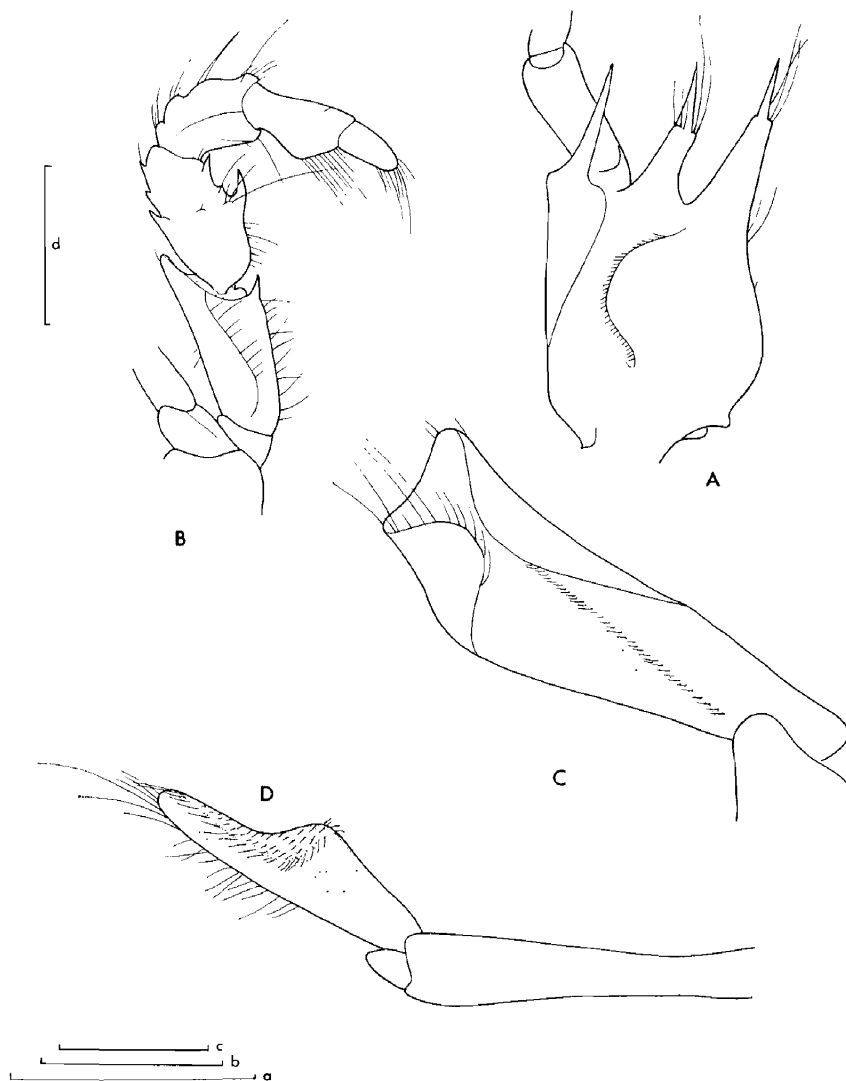


FIG. 7. *Galathea orientalis* Stimpson. A. Basal segment of right antennule, dorsal view (scale $c = 1$ mm.). B. Endopod of right third maxilliped (scale $d = 1$ mm.). C. Endopod of left first pleopod, dorsal view (scale $a = 0.25$ mm.). D. Left second pleopod, ventral view (scale $b = 0.5$ mm.).

in the majority of specimens. Moreover, the outer margin of the carpus of the third maxilliped appears to be without any distinct spines.

Though *G. acanthomera* and *G. orientalis* have been regarded as distinct species by several authors the features differentiating the two species are still insufficiently known.

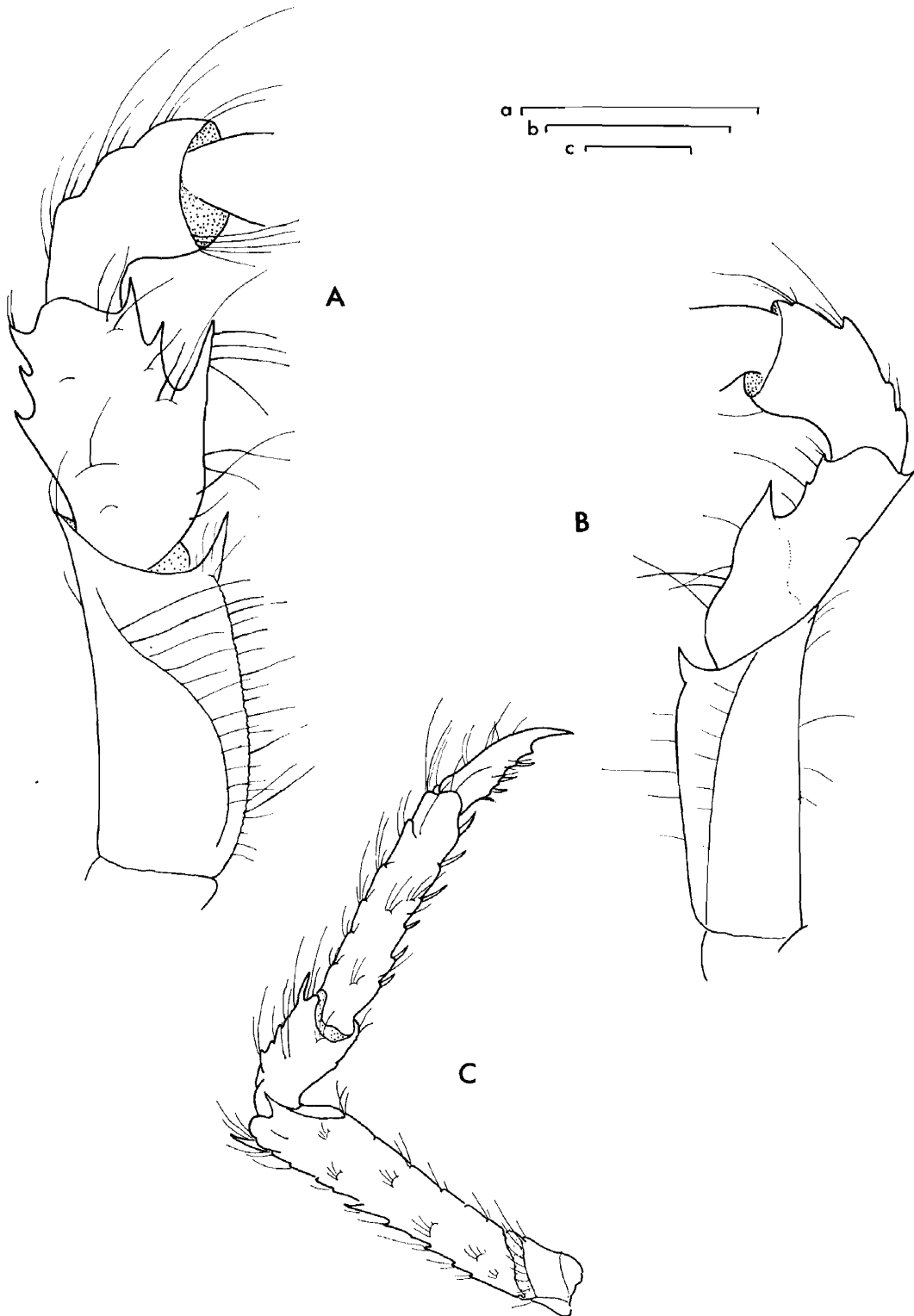


FIG. 8. *Galathea orientalis* Stimpson. A and B. Ischium, merus and carpus of third maxilliped from two specimens (A at scale *b*, B at scale *a* = 0.5 mm.). C. Ambulatory leg (scale *c* = 1 mm.).

Galathea whiteleggei Grant and McCulloch*

(Fig. 9)

Galathea sp. Whitelegge, 1900, p. 191.*Galathea whiteleggei* Grant and McCulloch, 1906, p. 45, pl. iv, figs. 2, 2a.

OCCURRENCE : *South Arabian coast* : St. 45, triangular dredge 4, 38 metres, 1 male (c.l. + r. = 7.5 mm., ch.l. = 18 and 17 mm.).

DISTRIBUTION : Australia : New South Wales.

DESCRIPTIVE NOTES : The anterior part of the carapace is represented in Fig. 9A. The striae of the carapace, posterior to the short stria labelled *sc* are very similar to those of *Galathea orientalis* (Fig. 6A) except that the third post-cervical (cf. Fig. 6A, *sm*) is represented in the middle third of the carapace by broken lines and the striae immediately anterior and posterior to it are not straight but somewhat sinuous. The gastric region has four spines and one spine is present on each hepatic area. The rostrum is long and acuminate, the dorsal surface is covered with numerous scales.

The dorsal surface of each of the second and third abdominal terga has a transverse groove, that of the fourth has a small groove near each lateral margin. The remaining two are smooth.

The basal segment of the antennule has three distal spines in most species of the genus.

The ischium, merus and the carpus of the third maxilliped are illustrated in Fig. 9B.

The chelipeds are long, spiny and slightly unequal, the left cheliped is one millimetre longer than the right. The fingers of the chela have acuminate tips and are only slightly shorter than the palm. None of the legs are attached, those present in the same tube have a spinosity very similar to those of *G. orientalis*.

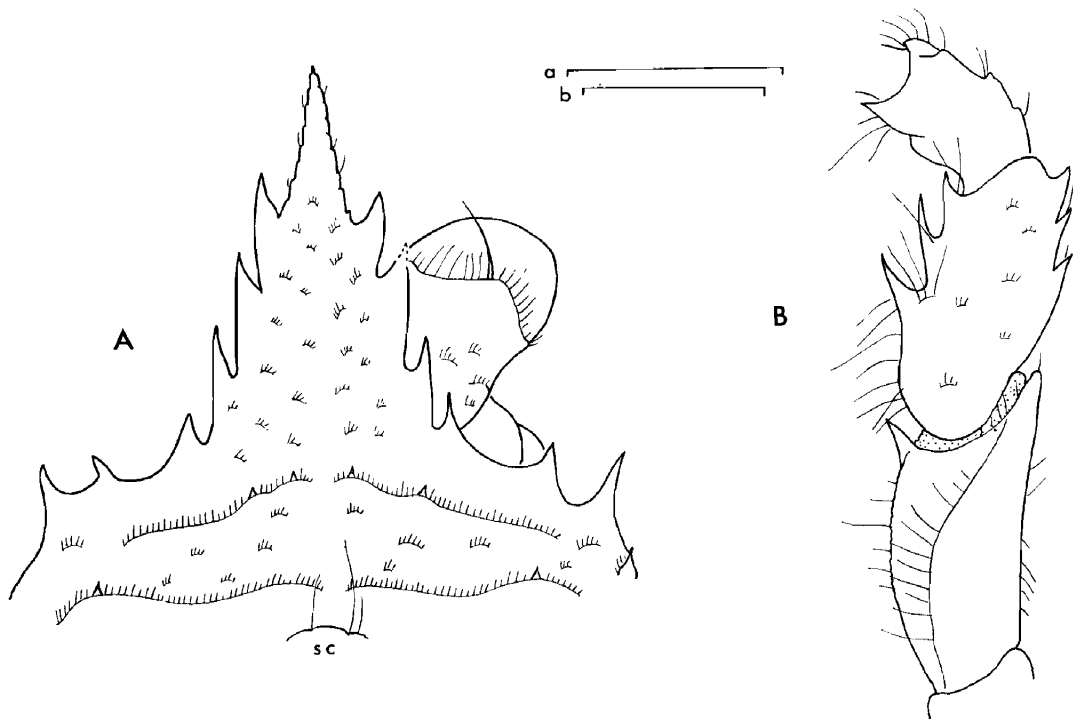


FIG. 9. ? *Galathea whiteleggei* Grant & McCulloch. A. Anterior part of carapace (scale *b* = 1 mm.) ; *sc*, short stria. B. Ischium, merus and carpus of left third maxilliped (scale *a* = 1 mm.).

* The spelling of the specific name should be "*whiteleggei*" since it is named after Whitelegge.

The first and second pleopods are also similar to those of *G. orientalis* except that the endopod of the second pleopod is flat and broad.

REMARKS : In general the description of *G. whiteleggei* given by Grant and McCulloch applies well to the "John Murray" specimen except that the rostrum is not "... mesially grooved" (1906, p. 46) and an additional pair of gastric spines are present. Grant and McCulloch have not given any description of the abdominal terga ; in Fig. 2 (1906), however, there are two transverse grooves on each of the second and third terga. In the "John Murray" specimen there is only one transverse groove, which makes the identity of this specimen doubtful.

Galathea pubescens Stimpson

Galathea pubescens Stimpson, 1858, p. 252.

Galathea pubescens, Stimpson, 1907, p. 233 ; Balss, 1913 (a), p. 12, figs. 11, 12 ; Yokoya, 1933, p. 57 ; Miyake, 1957, p. 86.

OCCURRENCE : *Zanzibar area* : St. 107, Agassiz trawl, 421-457 metres, 1 male (c.l. = 4 mm.).

DISTRIBUTION : Japan.

REMARKS : The "John Murray" specimen is imperfect : the rostrum is missing beyond the first pair of lateral spines, and the carapace is also incomplete posteriorly. The third maxillipeds are imperfect and neither the chelipeds nor any of the ambulatory legs are present except a fragment of one of the legs. As far as I can judge from the present condition of the specimen it belongs to *G. pubescens* and agrees with the descriptions and figure of the species given by Balss (1913, p. 12, fig. 11). Although Balss says : "Die Abdomen segmente tragen je vier Furchen, von denen die mittlere am tiefsten ist", it is probable that "vier" is a misprint because his Fig. 11 shows only three grooves on the second and the third segments (as in the "John Murray" specimens).

In all essential features the first and second pair of pleopods are similar to those of *G. gardineri*.

Galathea cymbulaerostris n. sp.

(Fig. 10)

OCCURRENCE : *South Arabian coast* : St. M.B. II (c), rectangular dredge, 29 metres, 1 male (c.l. + r. = 6 mm., ch.l. = 8 and 9 mm.). Register No. of holotype : 1966 · 2 · 4 : 46.

DESCRIPTION : The anterior part of the carapace is illustrated in Fig. 10A. The pattern of striae on the remaining surface of the carapace is very similar to that of *G. orientalis* except that here each stria has a faint groove posteriorly. The antero-lateral spine is strong and posterior to it there are seven spines on the lateral margin of the carapace. The rostrum is short and broad and on the concave dorsal surface there are a few minute scales ; the ventral surface has a median keel.

The first abdominal tergum has a transverse ridge, the second and third terga have each a wide median transverse groove and the two halves thus formed are again subdivided by narrower trans-

verse grooves. The tergum of each of the next two segments has additional small grooves. The last tergum has a setose ridge near the anterior margin and another some distance from it, the latter forms a wide "W" posterior to which is a smaller but shorter ridge.

The basal segment of the antennule is produced into three distal spines.

The inner margin of the merus of the third maxilliped has a single large spine and two rather sharp projections anterior to it (Fig. 10B).

The chelipeds are short, being only one and a half times as long as the carapace, and are fairly stout. The right cheliped is slightly longer than the left and is shown in Fig. 10C. The ambulatory legs are similar to those of *G. orientalis* in their spinosity.

The first and second pleopods are very similar to those of *G. whiteleggei*.

RELATIONSHIP : In having a short and broad rostrum and three grooves on the second abdominal tergum this species is very near to *G. australiensis* Stimpson, from which it differs in having only one spine on the inner margin of the merus of the third maxilliped and much shorter chelipeds.

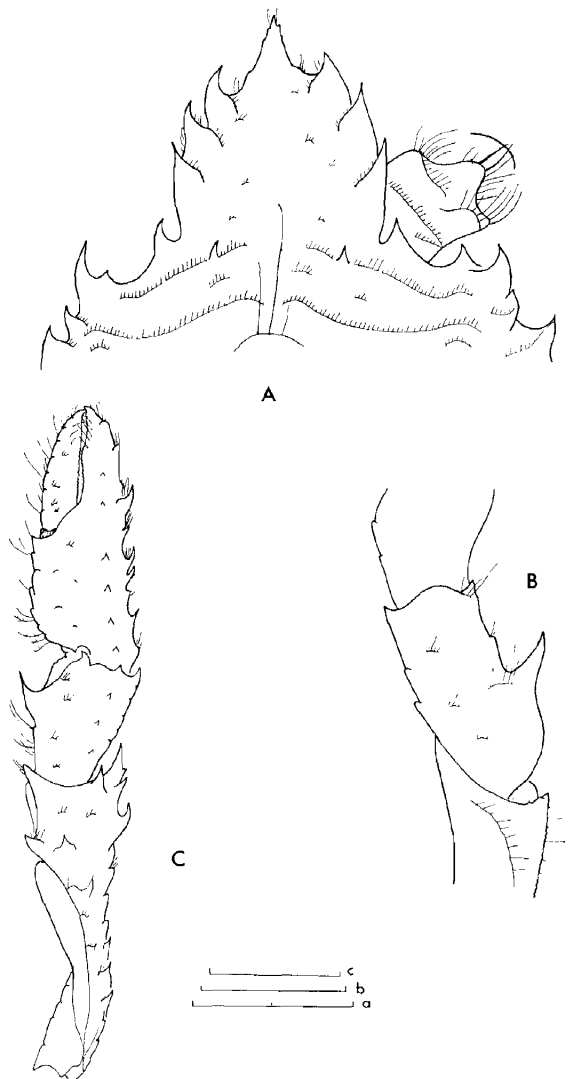


FIG. 10. *Galathea cybulaerostris* n. sp. A. Anterior part of carapace (scale $c = 1$ mm.). B. Merus of right third maxilliped (scale $b = 0.5$ mm.). C. Right cheliped (scale $a = 2$ mm.).

Galathea elegans Adams and White

(Fig. 11)

Galathea elegans Adams and White, 1848, pl. XII, fig. 7.*Galathea elegans*, Miers, 1884, p. 278; de Man, 1887, p. 455; 1902, p. 7; Walker, 1887, p. 112; Henderson, 1888, p. 117; 1893, p. 431; Ortman, 1894, p. 23; Borradaile, 1900, p. 421; Grant and McCulloch, 1906, p. 50; Southwell, 1906, p. 220; 1909, p. 120, fig. 11; Lenz, 1910, p. 566; Balss, 1913, p. 4; 1921, p. 22; 1924, p. 42; Potts, 1915, p. 83; Laurie, 1926, p. 133; Gordon, 1935, p. 7; Miyake, 1938, p. 37; Melin, 1939, p. 77, figs. 48-53; Barnard, 1947, p. 379; 1950, p. 487, fig. 91, i-k.? *Galathea grandirostris* Stimpson, 1858, p. 252; Henderson, 1888, p. 119; Southwell, 1906, p. 221.

OCURRENCE : *Red Sea* : St. 9, otter trawl, 30 fath., 1 male (c.l. + r. = 10.5 mm., ch.l. = 18 mm.) [In published list triangular dredge 4 and 245 metres are given for St. 9.]

DISTRIBUTION : Indo-Pacific.

DESCRIPTIVE REMARKS : *G. elegans* is represented in the "John Murray" collection by a single male, measuring 10.5 mm. in carapace length. The rostrum is nearly as long as the carapace and is slightly depressed anteriorly. Barnard (1950, p. 488) states that the cervical groove is not continuous across the carapace. In the "John Murray" specimen the cervical groove is very distinct and stretches across the dorsum.

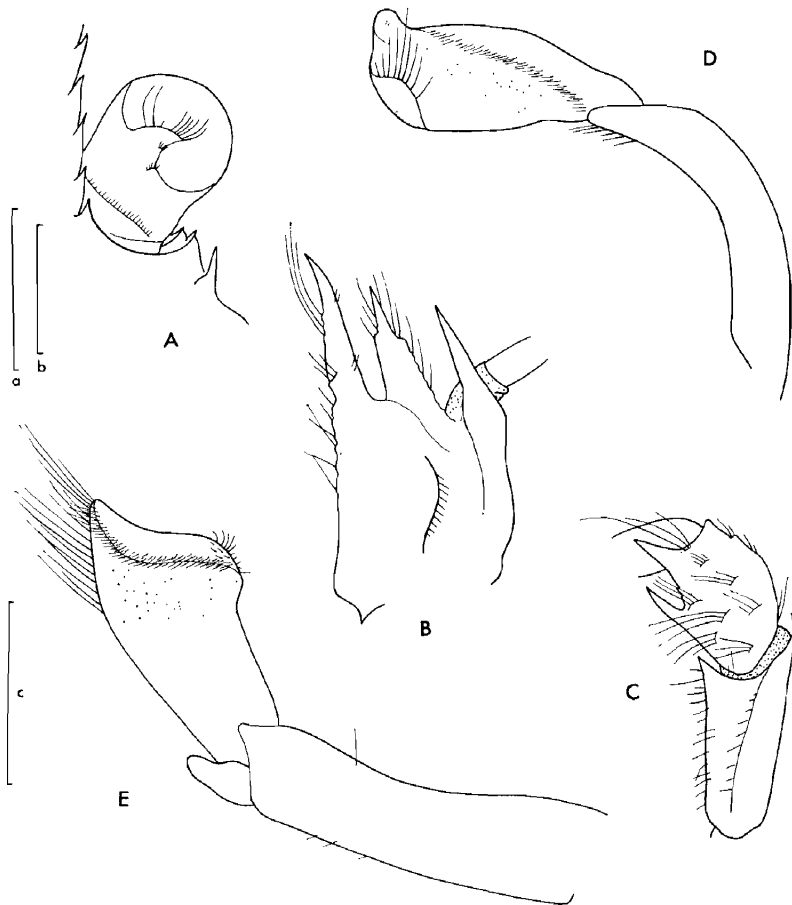


FIG. 11. *Galathea elegans* Adams & White, male. A. Right eye (scale *a* = 1 mm.). B. Basal segment of left antennule (scale *b* = 1 mm.). C. Ischium and merus of left third maxilliped (scale *a*). D. Left first pleopod, dorsal view (scale *c* = 0.5 mm.). E. Left second pleopod, ventral view (scale *c*).

The eye is rather characteristic in having over the cornea a beak-like prolongation of the stalk which is fringed with setae as represented in Fig. 11A.

The basal segment of the antennule has three spines distally (Fig. 11B) ; these spines are directed outwards, and become progressively longer from median to lateral.

The merus of the third maxilliped is shorter than the ischium, its inner margin is bispinose and the outer is only obscurely serrated (Fig. 11C).

The first and second pleopods are illustrated in Fig. 11D and E.

(For remarks on the synonymy see p. 174.)

Genus *MUNIDA* Leach

Chace (1942, p. 31) estimated that this genus comprises approximately 82 species ; of these Doflein and Balss (1919, p. 172) have tabulated 69 according to their known geographical and bathymetric distribution. As far as I know only one species and two sub-species have been described as new since the publication of Chace's paper ; they are : *M. kuboï* Yanagita 1949 ; *M. sarsi meridionalis* and *M. iris rutlanti* Zariquiey 1952.

KEY TO THE DETERMINATION OF THE INDIAN OCEAN SPECIES OF GENUS *MUNIDA*

- I. Abdomen unarmed.
 - I. Supra-orbital spines reaching as far as, or beyond, the outer border of cornea ; merus of third maxilliped with two spines on inner margin ; chelipeds about twice the length of carapace *M. elegantissima* de Man
 - II. Supra-orbital spines short, do not reach as far as the outer border of cornea ; merus of third maxilliped with three spines on inner margin ; chelipeds about three times the length of carapace *M. roshanei* n. sp.
- II. Abdomen armed (except in one juvenile of *M. japonica*).
 - I. Only the second abdominal tergum with a row of spines on its anterior border.
 - A. Eyes small, not wider than their stalks ; chelipeds a little more than twice the length of carapace. *M. microps* Alcock
 - B. Eyes wider than their stalks ; chelipeds usually less than twice the length of carapace.
 - a. Eyes with a conspicuous fringe of "lashes" ; about thirteen spines in the transverse gastric row ; a median, longitudinal row of two to three spines on gastric area *M. japonica* Stimpson
 - b. Eyes generally without a conspicuous fringe of "lashes", about eight spines in the transverse gastric row, no median gastric spines *M. andamanica* Alcock
 - II. More than one abdominal tergum armed.
 - A. The anterior margin of second tergum with a row of spines, same border of the third tergum with a pair of median spines ; chelipeds about two and a half times as long as the carapace *M. vigilantium* Alcock
 - B. Second, third and fourth abdominal terga armed.
 - a. Anterior and posterior borders of the second, third and fourth terga armed ; carapace with a mid-dorsal row of spines ; posterior margin of carapace armed *M. tricarinata* Alcock
 - b. Only the anterior margin of second and third terga, and both margins of fourth tergum, armed. *M. incerta* Henderson

Munida elegantissima de Man

(Fig. 12)

Munida elegantissima de Man 1902, p. 726, pl. 24, fig. 42.

Munida elegantissima, Laurie, 1926, p. 138.

Munida alcocki Southwell 1906, p. 222, text-fig. 2.

OCCURRENCE : *Zanzibar area* : St. 112, Peterson type, 113 metres, 1 male (c.l. + r. = 12.5 mm., ch.l. = 23 mm.) ; 1 ovig. female (c.l. + r. = 9 mm., ch.l. = 19 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : Both the " John Murray " specimens referred to this species agree rather well with the original description and figures given by de Man (1902). They differ from specimens described by Laurie (1926) in having the antero-lateral spines of the carapace directed inwards and also in possessing a single spine in the cervical triangle (Laurie's as well as Southwell's specimens

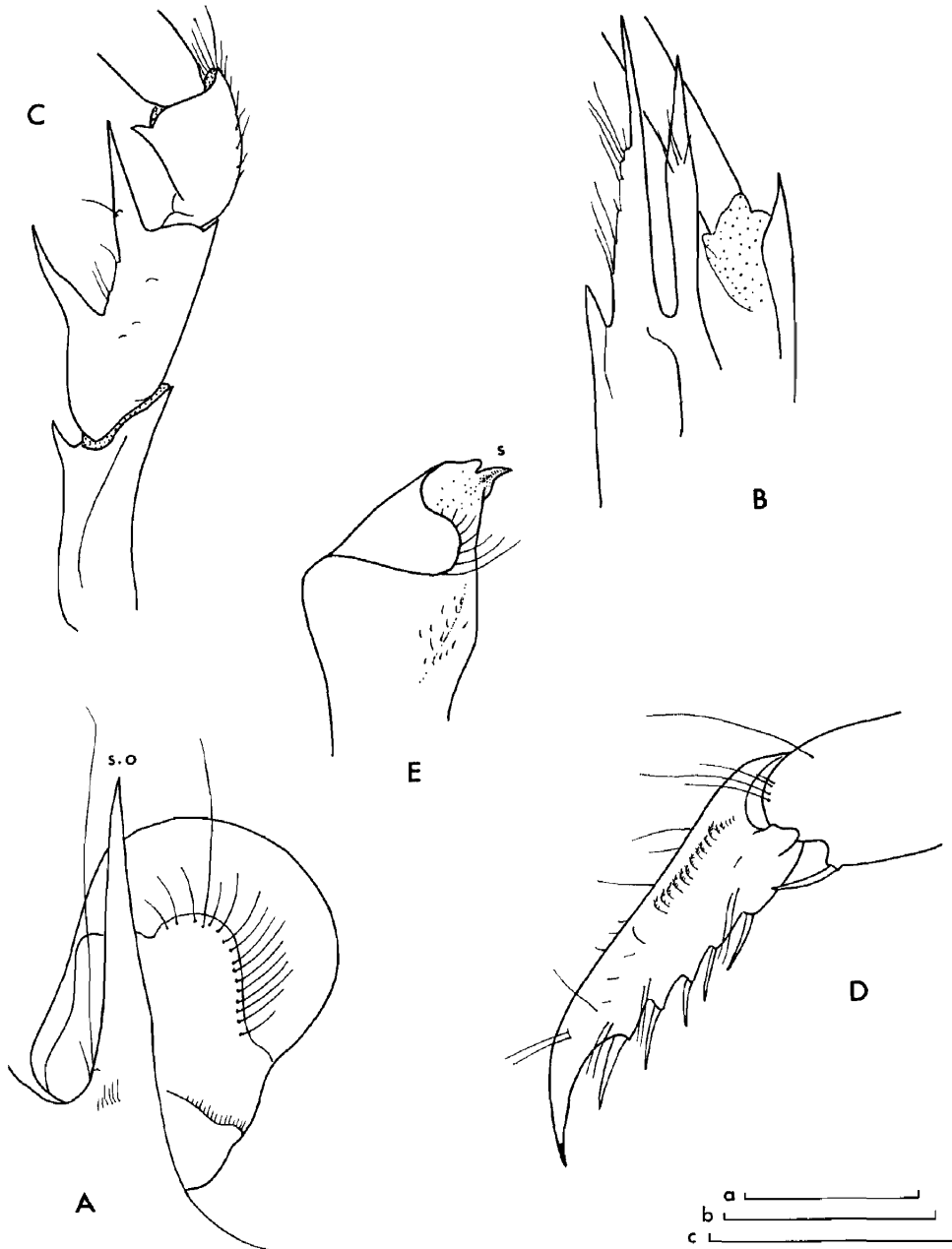


FIG. 12. *Munida elegantissima* de Man, male. A. Right eye and supra-orbital spine, *s.o.* (scale *a* = 1 mm.). B. Distal part of basal segment of right antennule, dorsal view (scale *b* = 1 mm.). C. Ischium, merus and carpus of left third maxilliped (scale *a*). D. Dactylus of left first ambulatory leg (scale *a*). E. Apex of left first pleopod (scale *c* = 0.5 mm.) ; *s* = spout.

had additional spines in this triangle). The supra-antennal spines are just a little shorter than the antero-lateral ones. In the male the supra-orbital spine extends beyond the cornea (Fig. 12A, *s.o.*); in the female it reaches only as far as the outer border of the cornea. The ocular peduncles are not so hairy in the "John Murray" specimens as illustrated by de Man (1902, pl. 24, fig. 42). There is a fringe of short hairs near the base of the peduncle and only in the female are there a few scattered hairs near the cornea.

The distal border of the basal segment of the antennule has four spines, two short and two long, as illustrated in Fig. 12B.

The ischium of the third maxilliped has a distal spine on its inner margin; the merus has two strong spines on the same margin (Fig. 12C).

The chelipeds are long and slender as shown by de Man (1902, fig. 42b). The fingers of the chela are not quite twice the length of the palm. The posterior margin of the dactylus of each ambulatory leg is spinose and terminates in a strong claw (Fig. 12D).

The distal portion of the first pleopod of the male is represented in Fig. 12E; as can be seen the apical margin, besides being curled and setose, is also produced into a sharp projection or spout (*s*), which in the natural position lies dorsal and posterior. The second pleopod resembles that of *M. microps* in having the central portion of the endopod broad and spinose, however, its apex is narrow and rounded.

Munida roshanei n. sp.

(Fig. 13)

OCCURRENCE : *Gulf of Oman* : St. 71, otter trawl, 106 metres, 1 male (c.l. + r. = 7 mm., ch.l. = 21 mm.). Holotype. Register No. 1966 · 2 · 4 : 50

Gulf of Aden : St. 188, Agassiz trawl, 528 metres, 1 male (c.l. + r. = 7.5 mm., no chelipeds).

DESCRIPTION : The anterior part of the carapace is represented in Fig. 13A. The rostrum which is less than half the length of the carapace is slightly arched and bears a fairly strong mid-dorsal carina which, when viewed in profile, appears to be serrated. The supra-orbital spines are short, pointed and also carinate. The spine on the antero-lateral angle of the carapace is strongly developed and is followed by six lateral spines. In addition to the transverse row of spines on the gastric region there are also three small spines arranged longitudinally in line with the mid-dorsal carina of the rostrum. A pair of small lateral spines is present immediately behind the first continuous transverse stria of the gastric region. A spine is situated behind the anterior fork of the cervical groove and another spine behind the bifurcation of the cervical groove. The transverse striae of the carapace are all fringed with short setae interspersed with a few longer ones. The abdomen is unarmed. The second, third and fourth terga have each a median transverse groove and on each half thus formed are one or two finer grooves. The posterior margin of each groove is hairy. The anterior margins of these terga are also hairy with long hairs at regular intervals.

The eyes are slightly broader than the stalks and fringed with extremely fine setae (Fig. 13A).

The basal segment of the antennule has four spines arranged as shown in Fig. 13B. The basal segment of the antenna is produced at its antero-median angle into a sharp spine; the antero-median and the antero-lateral angles of the following segment are produced into curved spines (Fig. 13C).

The inner margin of the merus of the third maxilliped is armed with three sub-equal spines (Fig. 13D).

The chelipeds are long and slender, being three times as long as the carapace. The inner margin of the merus, carpus and the palm is spiny and in addition there is a row of spines on the dorsal surface of these segments, median to the row on the inner margin. The entire surface of the cheliped is covered with setose scales some of which may be tipped with minute spines. The inner margin of the merus has a thick fringe of rather short hairs. The inner margin of the ischium is serrated and the outer distal angle is produced into a small curved spine. The great length of the cheliped is mainly due to the chela which exceeds half the length of the appendage (ch.l. = 21 mm., length of chela = 11 mm., length of fingers = 5 mm.). The fingers are not quite half the length of the palm, and their characteristic form is illustrated in Fig. 13E.

The first and second pair of pleopods are both present and show a strong resemblance to those of *M. japonica* (cf. Fig. 16) ; the second pair approaches more closely the adult form.

RELATIONSHIP : In the form of the chela and the armature of the carapace, *M. roshanei* shows a close resemblance to *M. kuboii* Yanagita, from which it can easily be distinguished by the shorter

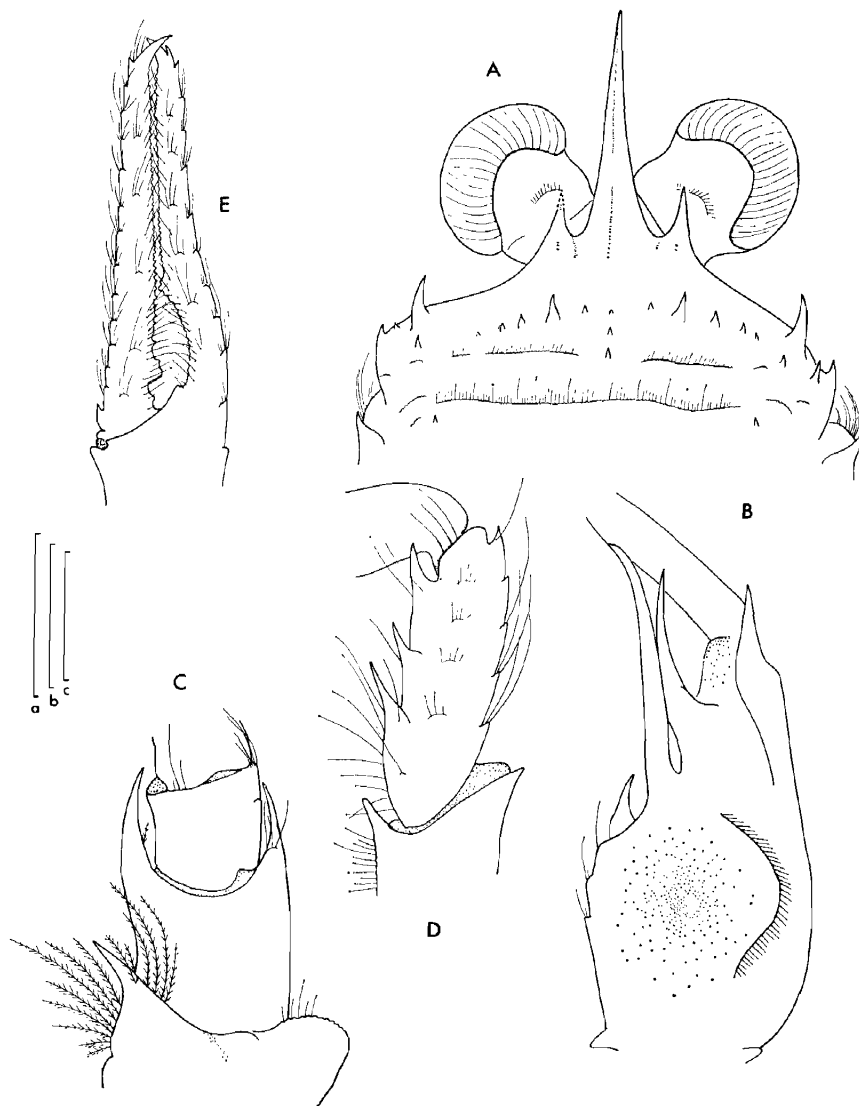


FIG. 13. *Munida roshanei* n. sp. A. Anterior part of carapace (scale $c = 1$ mm.). B. Basal segment of left antennule, dorsal view (scale $b = 0.5$ mm.). C. Basal segments of antennal peduncle (scale b). D. Middle part of left third maxilliped (scale b). E. Right chela (scale a).

chelipeds and the shorter fingers of the chela. In *M. kuboï* the chelipeds are four times as long as the carapace and the movable finger is two-thirds the length of the palm. Moreover, the abdomen in *M. roshanei* is unarmed and the merus of the third maxilliped has three spines on its inner margin—instead of two in *M. kuboï*.

Munida microps Alcock

(Fig. 14)

Munida microps Alcock, 1894, p. 326.

Munida microps, Alcock, 1901, p. 240, Ill. Zool. Investigator, Crust., pl. XIII, fig. 5.



FIG. 14. *Munida microps* Alcock, male. A. Distal part of basal segment of right antennule, dorsal view (scale $c = 1$ mm.). B. Merus of left third maxilliped (scale c). C. Left chela (scale $a = 1$ mm.). D. Endopod of left first pleopod, dorsal view (scale $b = 1$ mm.); l , curled anterior margin. E. Distal part of left second pleopod, ventral view (scale b); $sp.$, coiled sperm cord.

OCCURRENCE : *Maldive area* : St. 158, Agassiz trawl, 686-1170 metres, 1 male (c.l. + r. = 20 mm., ch.l. = 41 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : In the "John Murray" specimen the gastric area is armed with ten spines, eight of which are arranged in a more or less transverse row, while the outer pair is further back on a level with the first transverse stria. The second pair of the gastric spines is the largest, the first and fourth pairs are quite small. Another pair of smaller spines is situated at the level of the third stria and in line with the last (outer) pair of spines just mentioned. As stated by Alcock "A spinule or two are found within the area enclosed by the bifurcation of the cervical groove." (1901, p. 240). In the "John Murray" specimen two spines are present in the right cervical triangle but only one on the left side. The anterior margin of the second abdominal tergum has ten spines, two more than the maximum number described in the types.

The basal segment of the antennule has four spines (Fig. 14A). The smallest is situated distally on the inner margin of the segment. The three spines on the outer margin are long and sharp, the central one is curved and directed upwards. The antennal spines are similar to those of *M. vigiliarum* (see p. 202).

The inner margin of the ischium of the third maxilliped ends distally in a small (? articulated) spine, while the same margin of the merus has a large proximal and a much smaller distal spine (Fig. 14B). The latter spine is hidden by the long hairs of the segment and can easily be overlooked (it was not mentioned by Alcock).

Alcock stated that the chelipeds are not equal in the males (1901, p. 241); in the "John Murray" specimen they are symmetrical. Their spines are long, sharp and curved. The merus and carpus each have three longitudinal rows of spines and the merus, in addition to these, has an outer row of much smaller spines. The palm of the chela is spinose on both its borders, the fingers are as represented in Fig. 14C. The next three pairs of legs are similar to those of *M. vigiliarum* as figured by Alcock (1901, pl. 13, fig. 5).

Fig. 14D represents the anterior view of the first pleopod, which has a setose lobe (*l*) near the apex. The second pleopod is represented in Fig. 14E; a spermatic cord (*s*) is attached to the basal part of the endopod, and a similar but much coiled cord emerges from each genital opening.

Munida japonica Stimpson

(Figs. 15-16)

Munida japonica Stimpson, 1858, p. 252.

Munida japonica, Stimpson, 1907, p. 235; Miers, 1879, p. 51; Ortman, 1892, p. 254, pl. 11, fig. 11; Borradaile, 1900, p. 422; de Man, 1902, p. 724; Doflein, 1902, p. 644; Southwell, 1906, p. 221; Balss, 1913, p. 15, fig. 14; 1916, p. 3; Laurie, 1926, p. 135; Yokoya, 1933, p. 58; Melin, 1939, p. 85, figs. 54-57.

Munida japonica japonica Yanagita, 1943, p. 24, fig. 7.

OCCURRENCE : *Red Sea* : St. 9, otter trawl, 30 fathoms, 1 male (c.l. + r. = 6 mm., ch.l. = 11 mm.); 2 females (c.l. + r. = about 11 mm., ch.l. = 18 mm.). [In published list only triangular dredge 4 and 245 metres are given.]

Zanzibar area : St. 106, Agassiz trawl, 183-194 metres, 2 males (c.l. + r. = more than 7-12 mm., ch.l. = 11.5-21 mm.); 1 female (c.l. + r. = 10 mm., ch.l. = 18 mm.).

DISTRIBUTION : Indo-Pacific.

DESCRIPTIVE NOTES : It has already been pointed out by earlier authors that this species exhibits a certain degree of variation in several of its characters. However, the six "John Murray" specimens, three males and three females, show differences which are not of any great significance.

The front part of the carapace of a female from St. 106 is illustrated in Fig. 15A. The rostrum, which is about half the length of the carapace is arched dorsally in the basal two-thirds, the remaining portion is finely serrated and the extreme tip is upturned. The supra-orbital spines are less than half the length of the rostrum and are arched over the eyes. The number of spines in the transverse gastric row is not constant. In both the females from St. 9 there is an extra spine median to the right large gastric spine (Fig. 15A, s). In the male from the same station the left large spine is bifurcated, and the last pair is missing reducing the number of spines in each half to five. Moreover, in the females from St. 9 there are three spines forming the median gastric row but in all others there are only two spines ; the last one may be represented by a scale.

The anterior margin of the second abdominal tergum is armed with 2-7 teeth. In the youngest male they are absent, in another small male from St. 106 they are only poorly developed.

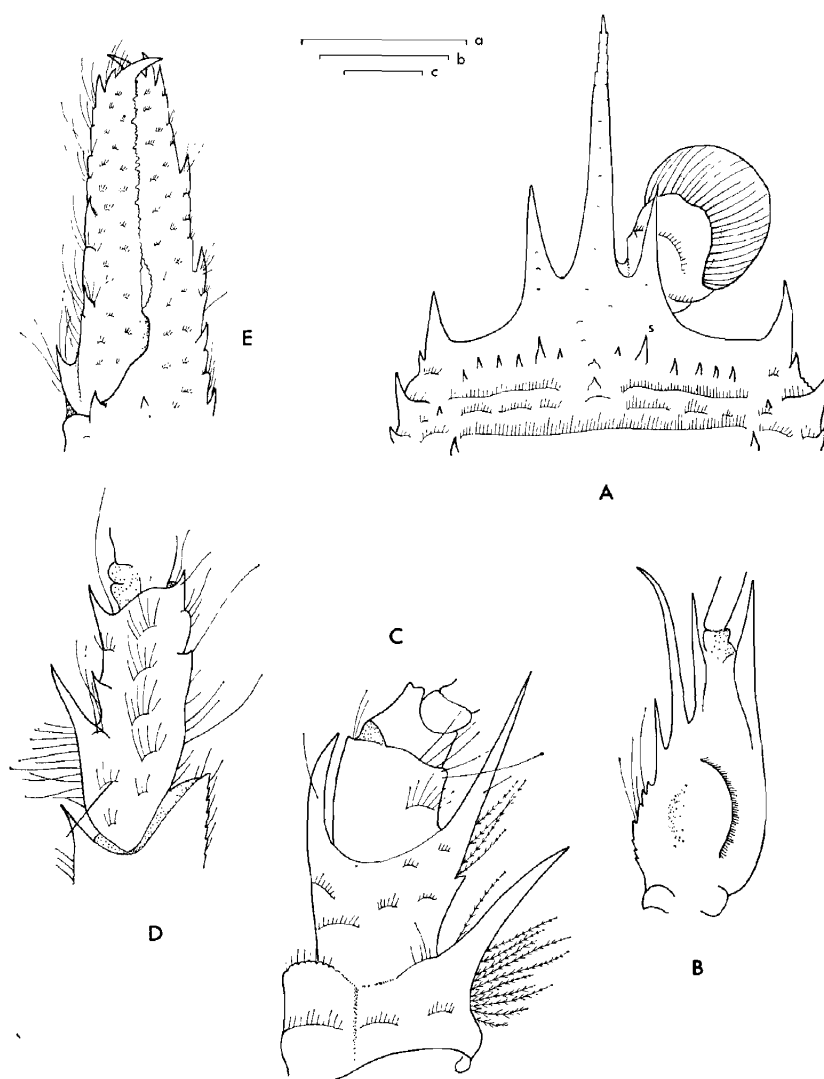


FIG. 15. *Munida japonica* Stimpson. A. Anterior part of carapace of female (scale $c = 1$ mm.). B. Basal segment of left antennule, dorsal view (scale $b = 1$ mm.). C. Left antennal peduncle, ventral view (scale $a = 1$ mm.). D. Merus of left third maxilliped (scale a). E. Right chela (scale c).

The eyes are characterized by a conspicuous fringe of "lashes" (Fig. 15*A*). The basal part of the antennule and antenna are shown in Fig. 15*B, C*. The merus of the third maxilliped is armed with three spines on the inner margin (Fig. 14*D*); the median spine may be developed or it may be represented by a tubercle.

The chelipeds are less than twice the length of the carapace, the fingers of the chela are only a little longer than the palm, their spinosity is as illustrated in Fig. 15*E*.

In the males both first and second pairs of pleopods are present. The endopod of the first pleopod is membranous, the anterior margin is setose and curled dorsally (Fig. 16*A*). Posteriorly, on the dorsal surface, is a fold or a thickening (*t*) which is bordered on the median side by stout curved setae. The endopod of the second pleopod is narrow, and boomerang-shaped, armed on the margins and ventral surface with spines as shown in Fig. 16*B*. In the younger male (c.l. + r. = 7 mm.—tip of rostrum broken) the pleopods show an early stage of development (Fig. 16*C, D*).

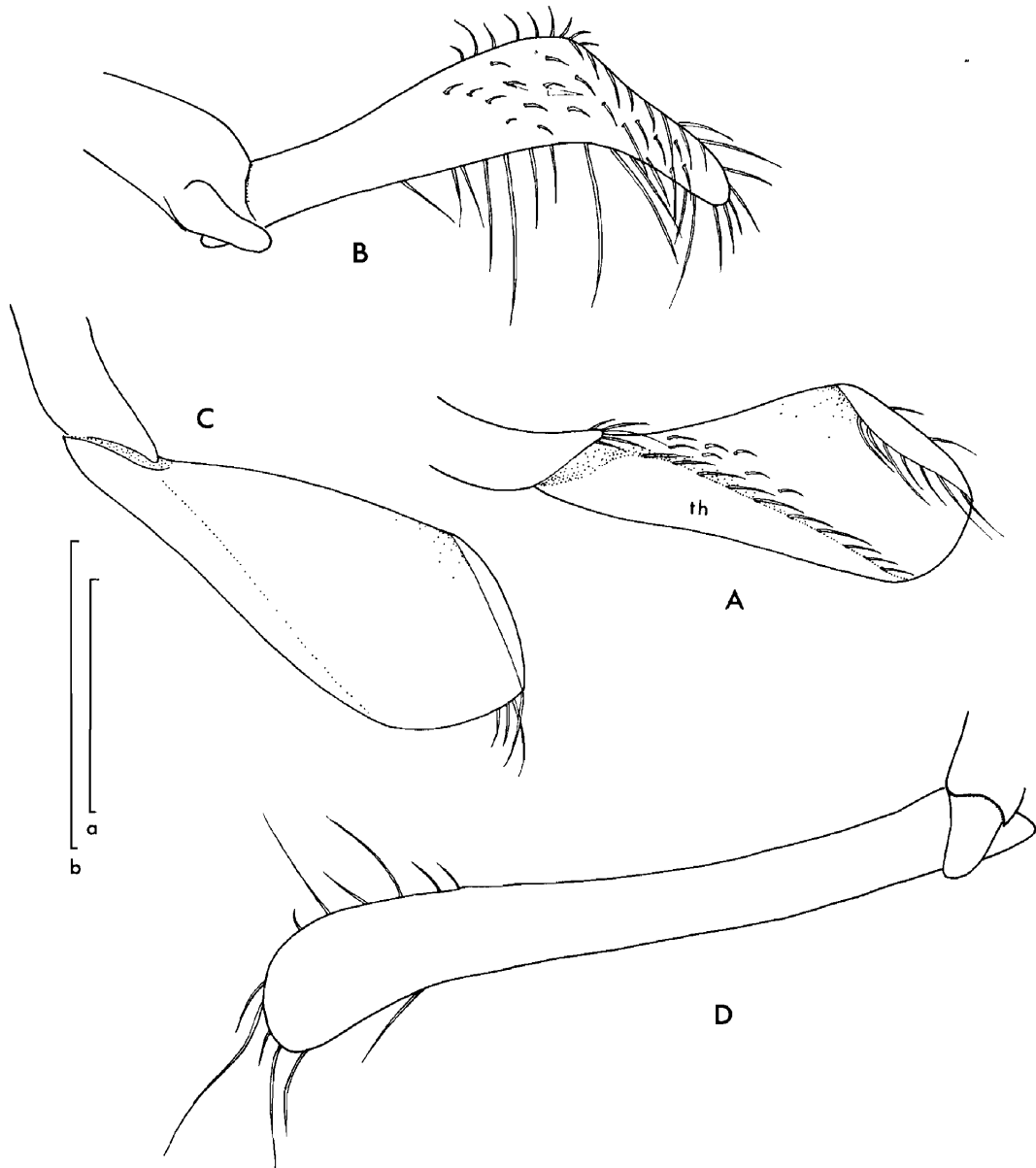


FIG. 16. *Munida japonica* Stimpson, male. A. Endopod of left first pleopod of adult, dorsal view (scale *a* = 0.5 mm.); *th*, thickening of fold on posterior dorsal surface. B. Distal part of right second pleopod of adult, ventral view (scale *a*). C and D. Distal part of left first and second pleopods of a young specimen (scale *b* = 0.25 mm.).

Munida andamanica Alcock

(Figs. 17-19)

Munida militaris var *andamanica* Alcock 1894, p. 321.*Munida militaris* var *andamanica*, Boone, 1935, p. 42, pl. 10.*Munida andamanica* Alcock, 1901, p. 242, Ill. Zool. Investigator Crust., pl. XII, fig. 2.*Munida andamanica*, Kemp and Sewell, 1912, p. 25 ; Balss, 1913, p. 17 ; Doflein and Balss, 1913, p. 143 ; Yokoya, 1933, p. 63 ; Yanagita, 1943, p. 29.*Munida curvatura* Benedict, 1902, p. 253.

FIG. 17. *Munida andamanica* Alcock. A. Dorsal view of female from St. 34 (scale $b = 5$ mm.). B. Dactylus of last ambulatory leg (scale $c = 2$ mm.). C. Anterior part of carapace of male from St. 188 (scale $a = 2$ mm.).

OCCURRENCE : *Gulf of Aden* : St. 34, Agassiz trawl, 1022 metres, 8 males (c.l. + r. = 18.5-34 mm.) ; 9 females (c.l. + r. = 20-29 mm.).

St. 35, otter trawl, 457-549 metres, 1 male (c.l. = 13 mm., ch.l. = 33 mm.).

St. 188, Agassiz trawl, 528 metres, 1 male (c.l. = 7 mm., ch.l. = 16 mm.).

Zanzibar area : St. 109, Agassiz trawl, 640 metres, 1 male (c.l.+r.=20 mm., ch.l.=60.5 mm.).

Maldive area : St. 154, Agassiz trawl, 456 metres, 1 male (c.l.+r.=16.5 mm., ch.l.=24 mm.).

REMARKS ON MATERIAL : Out of a total of twenty-one specimens in the " John Murray " collection twelve are males and nine females. The youngest is a male with the carapace measuring 7 mm., the largest is also a male, its carapace 22 mm. in length (not including rostrum). Most specimens do not have chelipeds attached, where present they measure less than twice the length of the carapace including rostrum, except in the male from St. 109 where they are about three times as long as the carapace. The largest detached cheliped from St. 34 is rather stout and is 75 mm. long. Only one female (c.l. + r. = 26 mm.) is ovigerous.

DESCRIPTIVE REMARKS : The " John Murray " specimens agree fairly well with the original description of the species. It has already been shown by previous authors that their specimens differed slightly from the type in the spinosity of the carapace. A careful examination of the " John Murray " specimens showed that there is considerable variation not only in the number of spines on the carapace but also in the relative length of the antennular spines as well as in the number of spines present on the second segment of the antenna, merus of the third maxilliped, and the anterior margin of the second abdominal tergum, as given below :

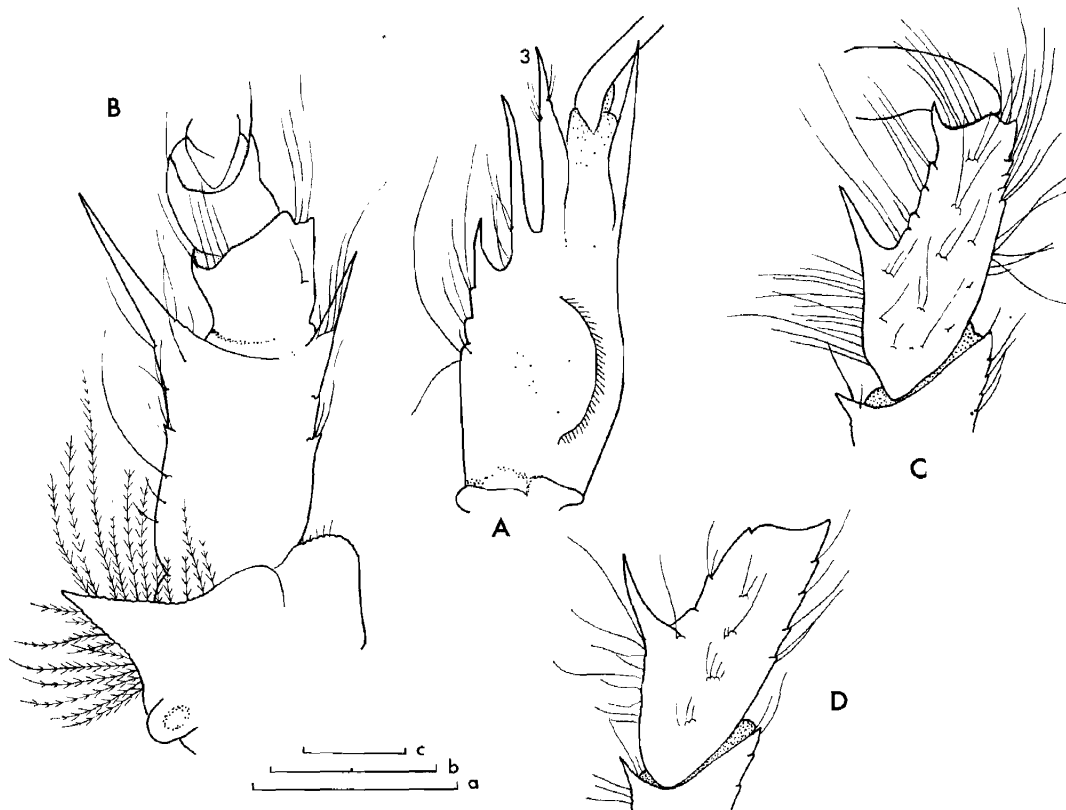


FIG. 18. *Munida andamanica* Alcock. A. Basal segment of left antennule of figured female from St. 34, dorsal view (scale $c = 1$ mm.). B. Left antennal peduncle of same, ventral view (scale c). C. Merus of left third maxilliped of same (scale $b = 2$ mm.). D. Merus of left third maxilliped of male from St. 188 (scale $a = 1$ mm.).

The carapace of a female is illustrated in Fig. 17A, a pair of small spines are present immediately behind the large gastric pair which are in line with the supra-orbital spines. These small spines are present in several specimens and may be quite conspicuous; in some they may be represented by small tubercles or may be present only on one side or may be totally lacking. The spines behind the bifurcation of the cervical groove are always present but the pair of spines behind the anterior fork of the cervical groove are not always present; they are wanting on several specimens and in another specimen only one is present. The anterior margin of the second abdominal tergum is furnished with seven to ten spines, those in the middle are usually larger than the lateral ones.

The eyes are large and globular but the conspicuous fringe of setae mentioned by Alcock (1901, p. 242) is not noticeable in all specimens.

The basal segment of the antennule is armed with four spines. In the majority of specimens the third spine (counting from the inner side—labelled 3 in Fig. 18A) is the longest, in some the second and third spines are sub-equal but in a very few specimens the second extends far beyond the third (2 in Fig. 19A). The basal segments of the antenna in most of the specimens are as represented in Fig. 18B but in some specimens the antero-median angle of the basal segment may be produced into a much larger spine and the inner margin of the next segment may have an additional spine or spines (Fig. 19B).

The inner margin of the merus of the third maxilliped is furnished with a much larger proximal and a smaller distal spine (Fig. 18C), a spine-like projection may be present between them (Fig. 19C). In the youngest male the merus has only the large proximal spine and the distal one is represented by a small projection as shown in Fig. 18D.

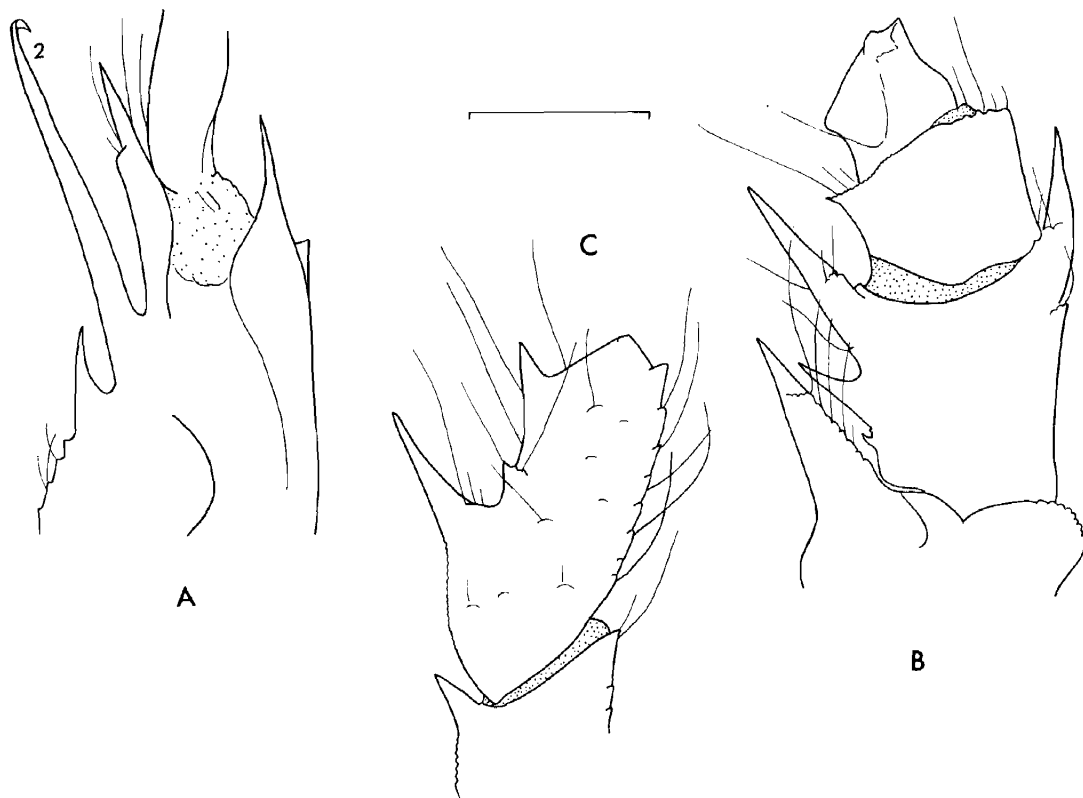


FIG. 19. *Munida andamanica* Alcock. A. Distal part of basal segment of right antennule, dorsal view. B. Left antennal peduncle. C. Merus of left third maxilliped. (Scale = 1 mm.)

The chelipeds are less than twice the length of the carapace except in a male from St. 109 where they are a little more than three times the length of carapace (Alcock also had one male where the chelipeds were exceptionally long—1901, p. 243). The chelipeds are beset with long plumose setae which may give a feathery look to the appendage (Fig. 17A), but usually the hairs are so clamped to the surface that it is not easy to determine their nature. The second, third and fourth legs agree with the description given by Alcock, the long hairs mentioned by him are also plumose like those of the chelipeds. The dactylus of the fourth leg is illustrated in Fig. 17B.

The first and second pair of pleopods of the males are very similar to those of *M. microps* (see Figs. 14D, E), except that the anterior curled margin of the first pleopod is more heavily setose and the apical angle is produced into a spout which is strikingly similar to that of *M. elegantissima* (Fig. 12E).

The youngest male from St. 188 differs from all the others in having a very long and strongly serrated rostrum (incomplete) as shown in Fig. 17C and which measures 4 mm. in length (c.l. = 7 mm.). After I had made the drawing it came off and the line of break is indicated by a double dotted line. In nearly all the others the rostrum is a little more than half the length of carapace, strongly uptilted and finely serrated near the apex.

Munida vigiliarum Alcock

(Fig. 20)

Munida vigiliarum Alcock, 1901, p. 243.

Munida vigiliarum, Doflein and Balss, 1913, p. 147, pl. XIII, fig. 2.

OCCURRENCE : *Zanzibar area* : St. 107, Agassiz trawl, 421–457 metres, 1 male (c.l. + r. = 15 mm., ch.l. = 41 mm.).

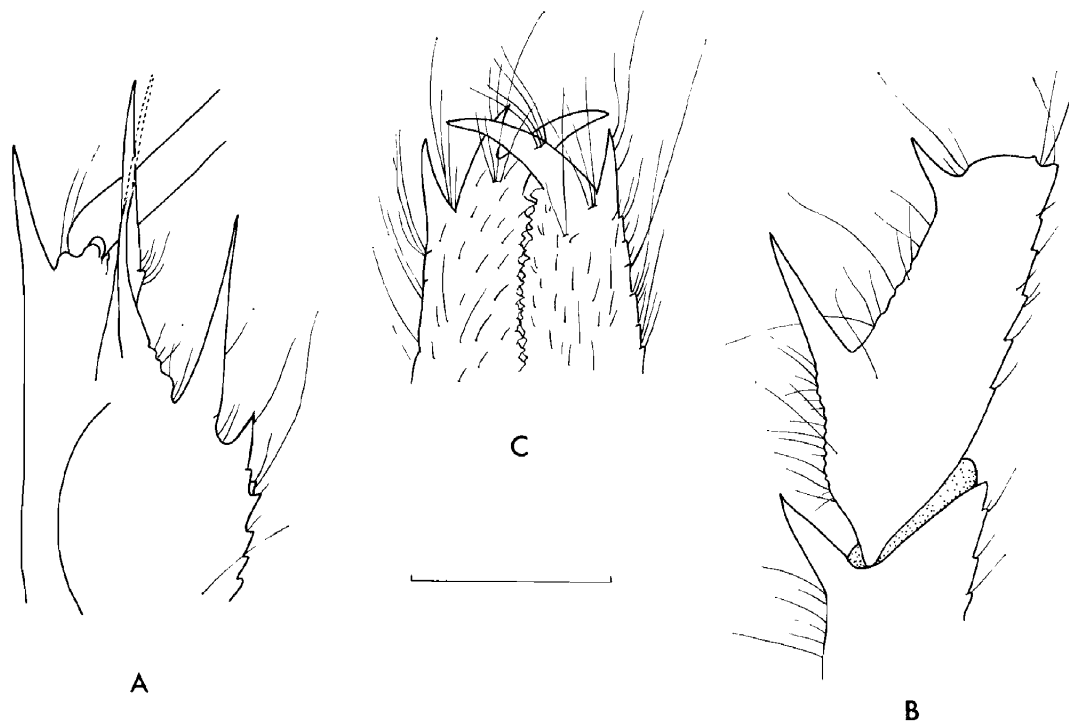


FIG. 20. *Munida vigiliarum* Alcock. A. Basal segment of right antennule, dorsal view. B. Middle part of left third maxilliped. C. Tip of left chela. (Scale = 1 mm.)

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : This species was described by Alcock in 1901 and was for the first time figured by Doflein and Balss (1913, pl. XIII, fig. 2). The "John Murray" material consists of a single male which differs from the earlier specimens as described below :

Alcock (1901, p. 244) writes that the "Antero-lateral border of carapace [is] with 7 spines." Doflein and Balss figure eight spines (3 + 3 + 2) on the lateral border of the carapace. In the "John Murray" specimen there is another small spine behind the third spine, placed immediately anterior to the first cervical branch (4 + 3 + 2). The transverse gastric row consists of ten spines. The two sub-median spines are small and each has laterally two large and one small spine, these eight spines make a more or less straight row. The last pair of spines stands further back and more laterally. The two median spines shown by Doflein and Balss are not present in the "John Murray" specimen, nor were they mentioned by Alcock. In addition to the spines behind the bifurcation of the cervical groove there is also a small spine in the right cervical triangle. The supra-orbital spines do not reach as far as the distal margin of the cornea. The abdomen, as pointed out by Alcock, is armed with a row of spines on the anterior margin of the second tergum and a pair on the same margin of the following tergum.

The ocular peduncle has few tufts of hairs and the cornea is fringed with short "lashes".

The basal segment of the antennule has five spines, four of which are long and sharp as represented in Fig. 20A. The basal segment of the antenna has its disto-median angle produced into a spine; the following segment has two spines, of which the inner is the longest of the antennal spines.

The ischium of the third maxilliped has a spine on its disto-median angle. The merus has a large proximal and a small distal spine on its inner border (Fig. 20B). Alcock mentions only one spine on this segment.

The chelipeds are long and sub-equal, they are hairy as well as thorny. Four longitudinal rows of spines extend from the merus to the palm, the outer and the inner of these rows are also continued on to the fingers. The tip of the chela is represented in Fig. 20C. The spinosity of the walking legs has been described by Alcock and is as figured by Doflein and Balss, except that they have shown the dactyli to be annulated. In the "John Murray" specimen they are very similar to those of *M. andamanica* (Fig. 17B), except that the row of plumose hairs, near the base of the segment, is placed more medially.

The first and second pair of pleopods show a striking resemblance to those of *M. andamanica*.

Munida tricarinata Alcock

(Fig. 21)

Munida tricarinata Alcock, 1894, p. 324.

Munida tricarinata, Alcock, 1901, p. 246 ; Ill. Zool. Investigator, Crust., pl. XII, fig. 1 ; Laurie, 1926, p. 138.

OCCURRENCE : *Zanzibar area* : St. 106, Agassiz trawl, 183-194 metres, 1 male in poor condition (c.l. + r. = 10 mm.).

Maldivé area : St. 149, triangular dredge, 238 metres, 1 male (c.l. + r. = 14 mm., ch.l. = 55 mm.) ; 3 ovig. females (c.l. + r. = 12-14 mm., ch.l. = 44-47 mm.).

St. 153, triangular dredge 4, 256-293 metres, 2 females, larger ovig. (c.l. + r. = 13 mm., 16 mm., ch.l. missing—50 mm.).

St. 154, Agassiz trawl, 457 metres, 1 male (c.l. + r. = 7 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTION : Since Alcock's description of the species was rather brief, the following description and illustrations are based on the "John Murray" male taken at St. 149 :

The carapace is nearly as long as it is broad (not including the rostrum). The lateral margins, which are slightly convergent anteriorly as well as posteriorly, are armed with a large antero-lateral spine and about eight smaller spines following it. The entire surface of the carapace is covered with small tubercles, from the centre of each of which arises an anteriorly directed spinule, flanked by hairs of about the same length. Scattered among these are a few spineless tubercles which, nevertheless, have a fringe of hairs. The rostrum is short and acutely triangular with a broad depressed base and an upturned tip which does not reach beyond the cornea. The rostral carina is continued



FIG. 21. *Munida tricarinata* Alcock, male. A. Dorsal view of right antennule (scale $a = 1$ mm.). B. Dorsal view of right antenna (scale a). C. Merus of left third maxilliped (scale a). D. Dactylus of first ambulatory leg (scale $b = 1$ mm.). E. Distal part of left second pleopod, ventral view.

over the gastric region which has on the anterior half two to three minute spines followed by three bigger spines. As a continuation of this median series, the cardiac region has three to four still larger spines. The posterior margin of the carapace is furnished with small spines, of which the median is largest and most conspicuous. Thus a median row of prominent spines extends from the gastric region to the posterior margin of the carapace. There are two more longitudinal rows of slightly smaller spines, one on either side of the median row; the anterior and the largest spine of each of these lateral rows is placed behind and only slightly lateral to the supra-ocular spines. The supra-ocular spines are just over half the length of rostrum (Alcock, pl. XII, fig. 1).

The second to fourth abdominal terga are grooved transversely, both margins of the groove being carinate. The anterior carinae of all three segments have each four spines, two of which are submedian in position and the other two are placed near the lateral margins. A few small spines are present on either side and posterior to the lateral spines. The posterior carina of the second and the third tergum has a pair of sub-median spines in the same position as the anterior one, but the fourth has only a single median spine as already pointed out by Laurie (1926, p. 139). A few small spines are present on the second pleura while the next two have hairy ridges. The elaborate sculpture of the last two somites is represented by Alcock (1901, pl. XII, fig. 1). The telson of the males, except in the youngest, has a few spinēs in the centre of the dorsal surface.

The eyes are remarkably flat. The cornea is narrow and crescent-like. The ocular peduncles widen out distally and have three half rings of hairs.

The basal segment of the antennule becomes narrow distally giving a characteristic shape to the segment (Fig. 21A). Moreover, there are no spines present on this segment. The disto-median angle of the basal segment of the antenna is produced into a spine of enormous size (Fig. 21B), which affords an important feature in the recognition of the species. The second segment has distally a small spine on the outer, and a much larger bifurcated one on the inner, border.

The inner distal margin of the ischium of the third maxilliped has a spine, and another spine is present on the inner border of the merus (Fig. 21C).

The entire surface of the long and sub-equal chelipeds is covered with hairy scales which are more conspicuous on the palm of the chela and rather obscure on the ischium. Furthermore, the ischium has just a pair of posteriorly directed spines on the proximal border, one on each margin. These spines abut against the much larger, anteriorly directed processes of the preceding segment. The merus has a dorsal, an inner, and a ventral, longitudinal row of spines which are continued on the carpus where they are smaller in size. Only the inner margin of the palm has a few spinules. The fingers of the chela are nearly as long as the palm. The fixed finger bifurcates at the tip to hold the claw-like tip of the movable finger. The fixed finger also has a fringe of short hairs on the proximal half just above the serrated inner margin. The next three pairs of legs are long and remarkably flattened dorso-ventrally. Their surface is covered with setose scales. The ischium has a spine distally on its posterior margin. Both the anterior and posterior margins of the merus are spiny, the distal spine of the posterior row is much larger than the others. The anterior margin of the carpus and the posterior margin of the propodus is spiny, the inner distal angle of the carpus is also provided with a spine. The propodus and the dactylus are very thin and blade-like; the dactylus is illustrated in Fig. 21D. The posterior border is smooth except for one or two small spines on the dactylus of the first pair. The anterior border bears a row of plumose setae proximally and simple hairs distally, as illustrated.

In the males of *M. tricarinata* the first pair of pleopods are wanting. The endopod of the second pleopod is represented in Fig. 21E. The distal margin of the endopod is curled ventrally and fringed with long hairs. In the youngest male (c.l. + r. = 7 mm.) the endopod is hardly differentiated from the stalk, but in the male measuring about 10 mm. in carapace length the characteristic adult form has been attained.

Munida incerta Henderson

(Fig. 22)

Munida incerta Henderson, 1888, p. 130, pl. XIII, fig. 4.*Munida incerta*, Barnard, 1926, p. 122 ; 1950, p. 492, fig. 92 ; Yanagita, 1943, p. 15, 1 and 2.

OCURRENCE : Zanzibar area : St. 107, Agassiz trawl, 421-457 metres, 7 males (c.l. + r. = 12.5-34 mm., ch.l. = 32.5-92 mm.).

St. 115, otter trawl, 640-658 metres, 1 female (c.l. + r. = 20 mm. tip of rostrum broken—no cheliped).

DISTRIBUTION : Philippine Islands ; Delagoa Bay, Portuguese East Africa ; Japan.

DESCRIPTIVE REMARKS : This species is very closely related to *M. tricarinata* but the two species can easily be distinguished from each other. The rostrum and supra-orbital spines are arched in *M. incerta* and a spine of considerable size is present behind each supra-orbital spine. Moreover, on either side of the cardiac area is a row of three spines arranged longitudinally. The lateral margin of carapace is armed with six spines. The entire surface of the carapace is covered with hairy striae. The anterior margin of each of the second to fourth abdominal terga has four widely separated spines. A median spine is present on the posterior margin of the fourth tergum only.

The antennule differs from that of *M. tricarinata* in having spines on the distal margin of the basal segment (Fig. 22A). The antennae of the two species are very similar ; in *M. tricarinata* the spine of the basal segment slightly exceeds twice the length of segments 2-4 whereas in *M. incerta* it is just one and a half times their combined length ; the inner spine of the following segment has the small subsidiary spine situated nearer its base and not so distal as in *M. tricarinata* (cf. Fig. 21B).

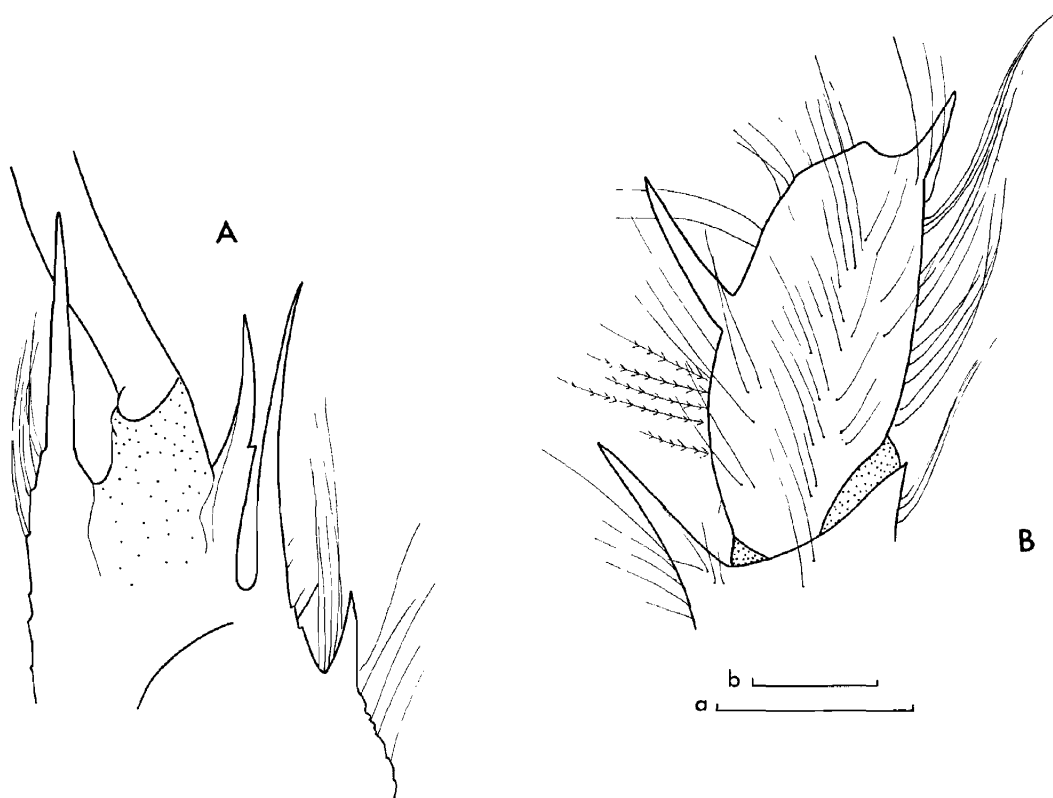


FIG. 22. *Munida incerta* Henderson. A. Distal part of basal segment of right antennule, dorsal view (scale $a = 1$ mm.). B. Merus of left third maxilliped (scale $b = 1$ mm.).

The ischium of the third maxilliped has its disto-median angle produced into a strong spine, an equally strong spine is present on the inner margin of the merus (Fig. 22B). The outer distal angle of the merus also has a spine which is smaller than the other two spines.

The chelipeds are either equal or somewhat unequal. The spinosity of the chelipeds and of the walking legs are similar to those of *M. tricarinata*. In the largest specimen, which is a male, the chelipeds are very stout and the setose scales on the surface are very prominent. In the smaller specimens they become progressively smaller so that in the smallest male they are scarcely apparent. Further, the chelipeds of the young specimens are slender, hardly stouter than the walking legs. The fingers of the chela, in the largest specimen, have two projections near the base which fit in the corresponding excavations of the opposed finger.

The first pair of pleopods is absent in the males. The second pair resembles those of *M. tricarinata*. In the juvenile male (c.l. + r. = 12.5 mm.) the second pleopod shows an early stage of development; the endopod is represented by a finger-like lobe which is only about a third as long as the stalk and the apex is neither curled nor fringed with hairs.

Sub-family **MUNIDOPSINAE** Ortmann

Genus **GALACANTHA** A. Milne-Edwards

Doflein and Balss (1913, p. 174) tabulated the known geographical and bathymetric distribution of the following six species, comprising the genus *Galacantha*: *G. camelus* Ortmann, *G. diomedea* Faxon, *G. rostrata* A. Milne-Edwards, *G. spinosa* A. Milne-Edwards, *G. trachynotus* Anderson, *G. valdiviae* Balss.

Boone (1927) added *G. barbarae* as a new species from the Atlantic. Chace (1942) on the basis of his extensive study of the Atlantic species merged this genus with *Munidopsis*. He considered *diomedea*, *rostrata*, *spinosa*, *trachynotus* and *valdiviae* as representing the typical forms of the genus and *G. camelus* as an intermediate step between the two genera. Dr. Chace also regarded the various sub-genera of *Munidopsis* as unnatural groups. In this report, however, the genus *Galacantha* is regarded as a separate genus and the "John Murray" species of the genus *Munidopsis* are grouped according to the various sub-genera. Although they may not form natural groups this subdivision is rather convenient in handling the systematics of such a big genus.

KEY TO THE DETERMINATION OF THE INDIAN OCEAN SPECIES OF GENUS *GALACANTHA* A. MILNE-EDWARDS

- I. Carapace covered with setose tubercles, posterior margin unarmed; dactyli of walking legs not flattened dorso-ventrally *G. rostrata* A. Milne-Edwards
- II. Carapace covered with spiny tubercles, posterior border spiny; dactyli of walking legs flattened dorso-ventrally. *G. trachynotus* Anderson

Galacantha rostrata A. Milne-Edwards

(Figs. 23, 24)

Galacantha rostrata A. Milne-Edwards, 1880, p. 52.

Galacantha rostrata, Smith, 1882, p. 21, pl. 9, figs. 2, 2a; 1884, p. 355; Milne-Edwards and Bouvier, 1894, p. 271; 1897, p. 60, pl. 4, figs. 21-24; 1900, p. 308, pl. 6, fig. 9; Faxon, 1895, p. 78, pl. B, figs. 1, 1a; Alcock, 1901, p. 275; Stebbing, 1908, p. 20; Hansen, 1908, p. 35; Barnard, 1950, p. 494, figs. 92, e-f.

Munidopsis rostrata Smith, 1885, p. 493; 1886, p. 45, pl. 6, figs. 1, 1a; Chace, 1942, p. 75.

Galacantha talismani Filhol, 1885, pl. 3; Perrier, 1886, p. 341, text-fig. 242(8).

Galacantha talismani Henderson, 1888, p. 167, pl. xx, fig. 1.

Galacantha bellis Henderson, 1885, p. 413 ; 1888, p. 167, p. xix, fig. 6.

Galacantha areolata Wood-Mason and Alcock, 1891, p. 200 ; 1894, p. 173 ; Ill. Zool. Investigator, Crust., pl. LV, figs. 5, 5a (= *G. rostrata*).

Galacantha investigatoris Alcock & Anderson, 1894, p. 173 ; Ill. Zool. Investigator, Crust., pl. XII, fig. 4.

Galacantha rostrata var *investigatoris* Alcock, 1901, p. 276.

Galacantha faxoni Benedict, 1902, p. 304.

OCCURRENCE : *Gulf of Aden* : St. 26, Agassiz trawl, 2312 metres, 1 ovig. female (c.l. + r. = 22 mm., ch.l. = 24 mm.).

St. 185, Agassiz trawl, 2000 metres, 1 female (c.l. + r. = 28 mm., ch.l. = 30 mm.).

Northern area of Arabian Sea : St. 62, Agassiz trawl, 1893 metres, 1 ovig. female (c.l. + r. = 8 mm., ch.l. = 10 mm.).

Zanzibar area : St. 118, Agassiz trawl, 1789 metres, 1 male (c.l. + r. = 21 mm., ch.l. = 29 mm.).

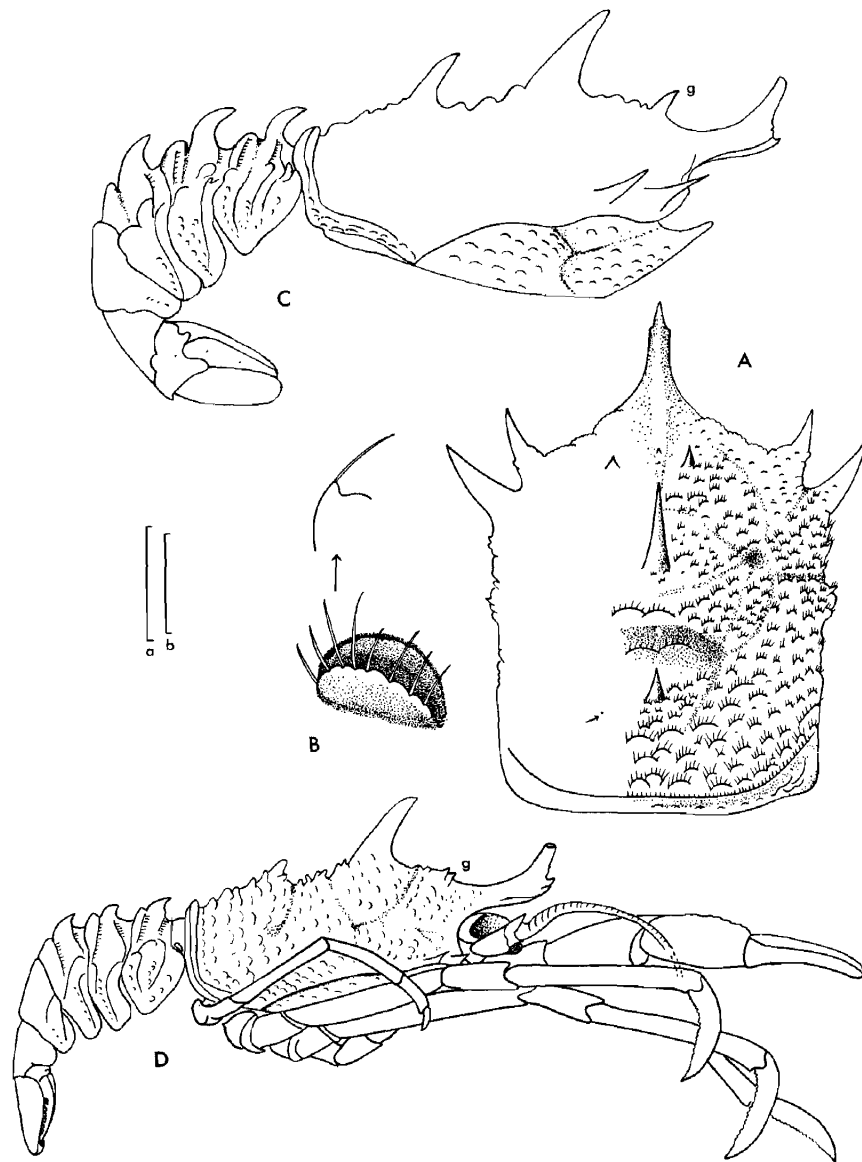


FIG. 23. *Galacantha rostrata* A. Milne-Edwards. A. Carapace of female, dorsal view (scale *a* = 6 mm.). B. One scale from carapace (its position indicated by an arrow in A) highly magnified with, above, diagrammatic profile of same. C. Lateral view of female, scales omitted from carapace (scale *b* = 6 mm.) ; *g*, gastric spine. D. Lateral view of male (scale *b*) ; *g*, gastric spines.

DISTRIBUTION : Atlantic, Indo-Pacific.

DESCRIPTIVE REMARKS : The carapace of the largest female is represented in Figs. 23A and C. The distal portion of the rostrum is directed almost vertically upwards and the lateral teeth at its base are only very slightly developed. The entire surface of the carapace is covered with tubercles. These tubercles, however, vary in size and structure on the different areas of the carapace. A small anterior area has simple tubercles, while the greater part of the carapace is covered with scaliform tubercles. A close study of the tubercles shows that each has an anteriorly raised and scalloped margin from the recesses of which anteriorly directed setae emerge (Fig. 23B, lower sketch) ; the upper one is a diagrammatic representation of a single tubercle in profile. On the postero-lateral area of the carapace these tubercles are situated close to one another and even run as short ridges. Some of these may become tipped with spinules.

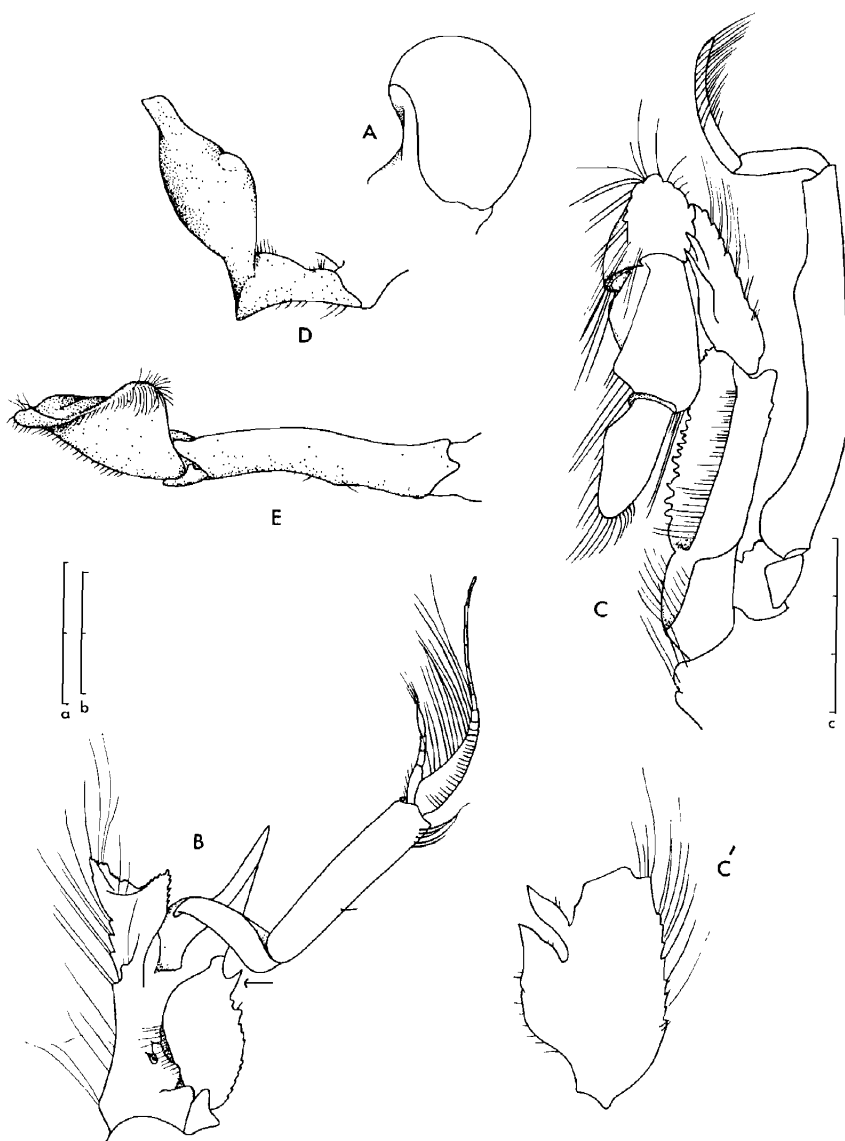


FIG. 24. *Galacantha rostrata* A. Milne-Edwards. A. Right eye, lateral view (scale *a* = 2 mm.). B. Right antennule, dorsal view (scale *b* = 2 mm.). C. Left third maxilliped (scale *c* = 3 mm.). C'. Merus of third maxilliped (scale *a*). D. Left first pleopod of male, ventral view (scale *b*). E. Left second pleopod of male, ventral view (scale *b*).

The abdomen agrees with the description given by Alcock (1901, p. 276) and is illustrated in Fig. 23C.

The ocular peduncle is produced into a scale-like structure on the medial size of the cornea, giving it a reniform appearance (Fig. 24A).

The antennule is represented in Fig. 24B. The merus of the third maxilliped has two large spines on the inner margin (Figs. 24C, C').

In the smallest female which measures 8 mm. in carapace length, including rostrum, the distal part of the rostrum slopes gently upwards and the tubercles on the carapace are simple rounded projections. A median spine is present on each of the second and third abdominal terga but the anterior margin of the fourth is produced into a small, blunt, median tooth-like projection.

The single male specimen belonging to this species differs from the females in having the paired gastric spines smaller (cf. *g* Fig. 23C, D). The carapace is more closely covered with tubercles which, moreover, have all the setae dark amber-coloured (colourless in the female). The median spines on the abdominal terga are smaller than in the female of about the same size (Fig. 23D). The first and second pleopods of the male are illustrated in Figs. 24D, E.

REMARKS : On the basis of some differences Alcock (1901, p. 276) established *investigatoris* as a variety of *G. rostrata*. The "John Murray" specimens, however, belong to the typical form since the lateral rostral teeth are small and the abdomen has very few tubercles—as described by Alcock for *G. rostrata*.

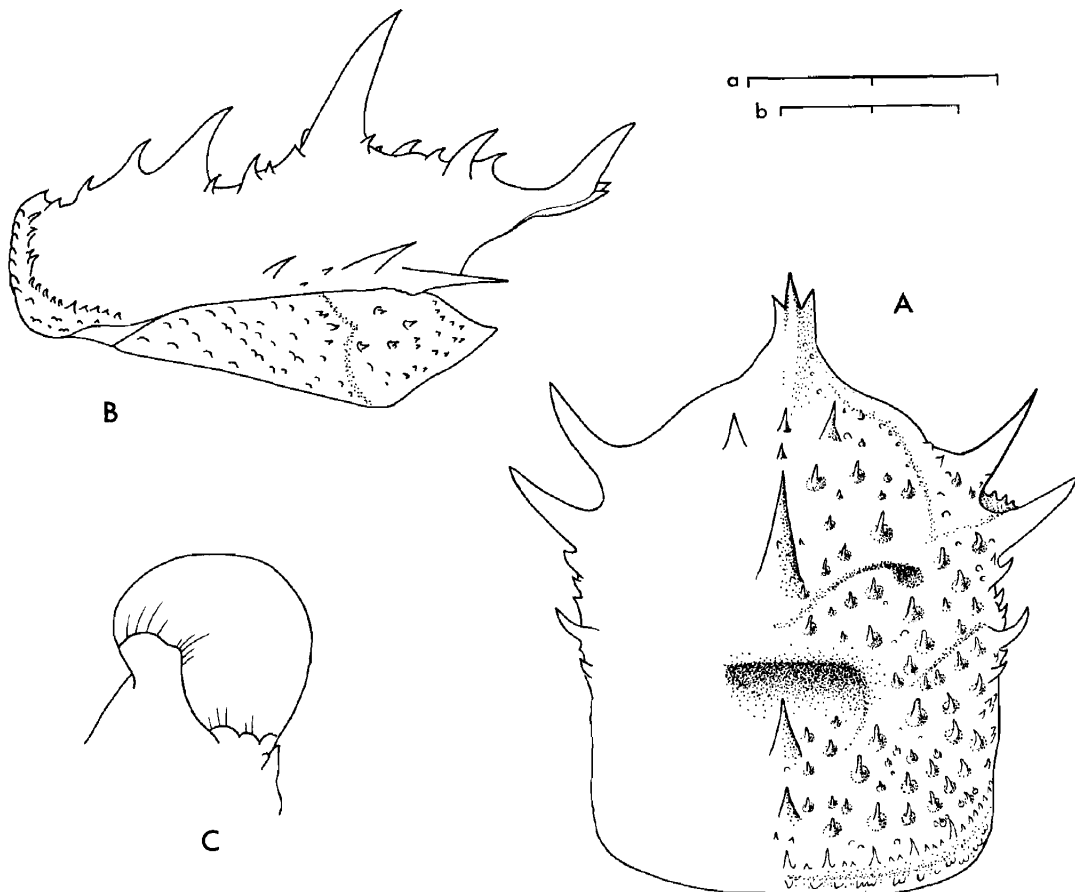


FIG. 25. *Galacantha trachynotus* Anderson, male. A. Carapace, dorsal view (scale *a* = 12 mm.). B. Lateral view of same carapace (scale *a*). C. Right eye, lateral view (scale *b* = 2 mm.).

Galacantha trachynotus Anderson

(Figs. 25, 26)

Galacantha trachynotus Anderson, 1896, p. 100.*Galacantha spinosa* A. M.-Edw. var. *trachynotus* Alcock, 1901, p. 277 ; Ill. Zool. Investigator, Crust., pl. XXV, fig. 3.

OCCURRENCE : *Northern area of Arabian Sea* : St. 62, Agassiz net, 1893 metres, 2 males (c.l. + r. = 28 and 32 mm., ch.l. = 35 and 45 mm. respectively) ; 2 females (c.l. + r. = 26 and 30 mm., ch.l. = 30 and 36 mm. respectively).

DISTRIBUTION : Indian Ocean.

REMARKS ON MATERIAL : The larger female is ovigerous and the larger male is infested with a large Rhizocephalan emerging between abdominal somites 4 and 5.

DESCRIPTIVE REMARKS : Although all four "John Murray" specimens are much larger than the largest specimen recorded by Alcock (1901, p. 277), they agree very well with his description. The carapace of a male, measuring 28 mm. in length, is illustrated in Figs. 24A, B. The fifth and sixth abdominal terga differ from Alcock's description in bearing spines instead of "... some scattered tubercles" (p. 277). The fifth abdominal tergum has a row of spines on its anterior margin which extends over the corresponding pleura, posterior to this there are about four in-

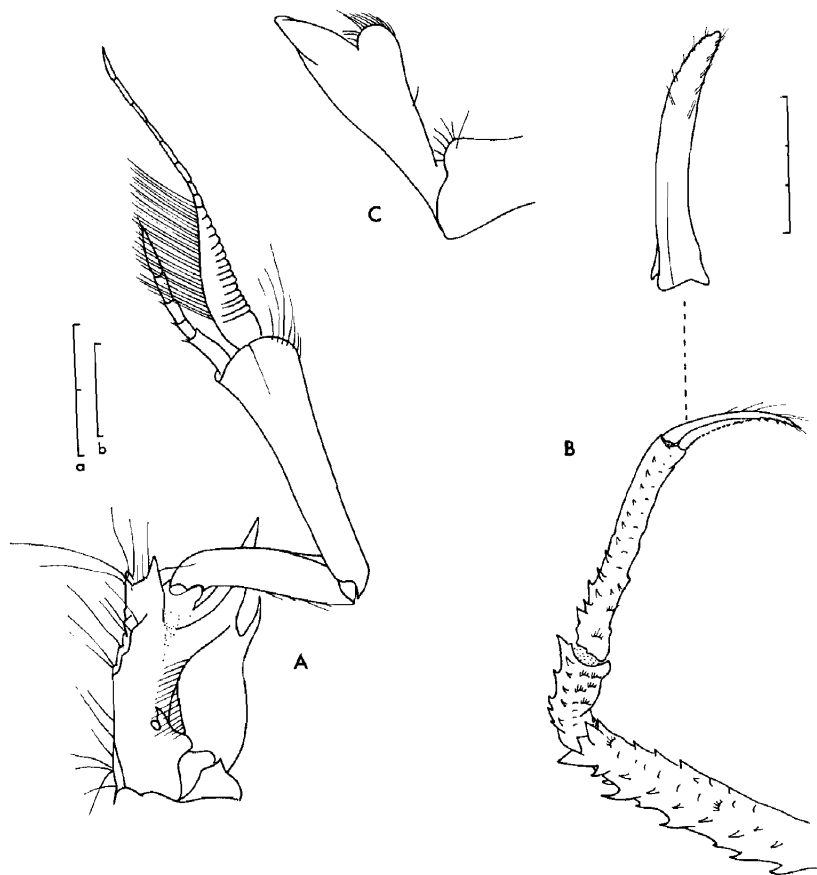


FIG. 26. *Galacantha trachynotus* Anderson. A. Right antennule, dorsal view (scale $a = 2$ mm.). B. Right second leg, lateral view (scale $b = 6$ mm.) and dactylus of same leg from above (scale $c = 3$ mm.). C. Endopod of left first pleopod of male, ventral view (scale a).

definitely arranged rows of small spines, some of which extend over the pleuron. The sixth tergum and the pleura have smaller spines scattered over their surface and still smaller ones are present on the telson.

The eye of *G. trachynotus* differs from that of *G. rostrata* in having a more rounded cornea and the distal border of the stalk setose and sinuous (Fig. 25 C—cf. Fig. 24 A). The antennule is represented in Fig. 26 A.

The dactyli of 2nd to 4th legs are very characteristic. Each dactylus is bent and flattened dorso-ventrally (antero-posteriorly). A row of spinules runs mid-ventrally and the tip is hairy as represented in Fig. 26 B.

The first and second pairs of pleopods resemble those of *G. rostrata*, except that the first one is not so curled and the lobe present on its anterior margin can easily be observed (Fig. 26 C).

Genus *MUNIDOPSIS* Whiteaves

Dr. Chace (1942, p. 69) estimated 115 species in the genus *Munidopsis*; Doflein and Balss (1913, p. 177) had tabulated the known geographical and bathymetric distribution of 106 of these species. The only additions known to me are *M. okadai*, a new species from Japan, described by Yanagita (1942, p. 93), and *M. sundi* described by Sivertsen and Holthuis (1956, p. 44) from near the Azores, North Atlantic.

KEY TO THE DETERMINATION OF THE INDIAN OCEAN SUB-GENERA OF THE GENUS *MUNIDOPSIS*

- I. Propodus of each walking leg armed and expanded distally, to form a subchela with the flexed dactylus.

Bathyankyristes Alcock and Anderson
- II. Propodus of walking legs normal, nor expanded distally to form a subchela with the flexed dactyli.
 - A. Antero-lateral angles of the carapace rounded, lateral borders subcristiform *Elasmonotus* A. Milne-Edwards
 - B. Antero-lateral angles of carapace spiniform, lateral borders not subcristiform.
 - a. Chelipeds shorter than the walking legs; eye-stalks prolonged beyond the eyes as spines.

Orophorynchus A. Milne-Edwards
 - b. Chelipeds longer than the walking legs; eye-stalks not prolonged beyond the eyes.
 1. Rostrum triangular, usually unarmed laterally (occasionally with serrations or spinules).

Munidopsis Whiteaves
 2. Proximal half of rostrum broad and ending anteriorly in a pair of distinct lateral spines; distal part acute and styliform *Galathodes* A. Milne-Edwards

Sub-genus *BATHYANKYRISTES*

Munidopsis (Bathyankyristes) tenax Alcock

(Fig. 27)

Bathyankyristes spinosus Alcock, 1894, 174, pl. ix, fig. 2.

Munidopsis (Bathyankyristes) tenax Alcock, 1901, p. 273; Ill. Zool. Investigator, Crust., pl. LV, fig. 2.

OCCURRENCE : *Zanzibar area* : St. 109, Agassiz trawl, 640 metres, 1 male (c.l. + r. = 23 mm., ch.l. = 36 mm.).

Maldive area : St. 143, Agassiz trawl, 797 metres, 1 female (c.l. + r. = 12 mm., ch.l. = 18 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : The rostrum in the male is a little more than half the length of the carapace, its lateral margins are serrated and hairy. Each of these hairs has at least its distal half plumose, as also have the hairs on the surface of the carapace. The eye is illustrated in Fig. 27A. The basal segment of the antennule has two strong spines on its outer distal margin (Fig. 27B). The distal angles of the basal segment of the antenna are produced into short, triangular processes; the same angles of the following segment each have a large spine; the penultimate segment has a smaller spine on its inner distal angle and another of about the same size mid-ventrally, at the distal margin; the outer distal angle of the ultimate segment is produced into a somewhat rounded process.

The outer margin of the merus of the third maxilliped is serrated and terminates in a distal spine; the inner margin is furnished with a strong median spine (Fig. 27C).

The chelipeds and ambulatory legs are hairy and spiny as described by Alcock (1901, p. 273). Each hair is plumose throughout its entire length.

The endopod of the first pleopod of the male is illustrated in Fig. 27D; the anterior and posterior margins are curled dorsally near the apex to form a sort of spout; the setose lobe on the anterior margin is slightly acuminate.

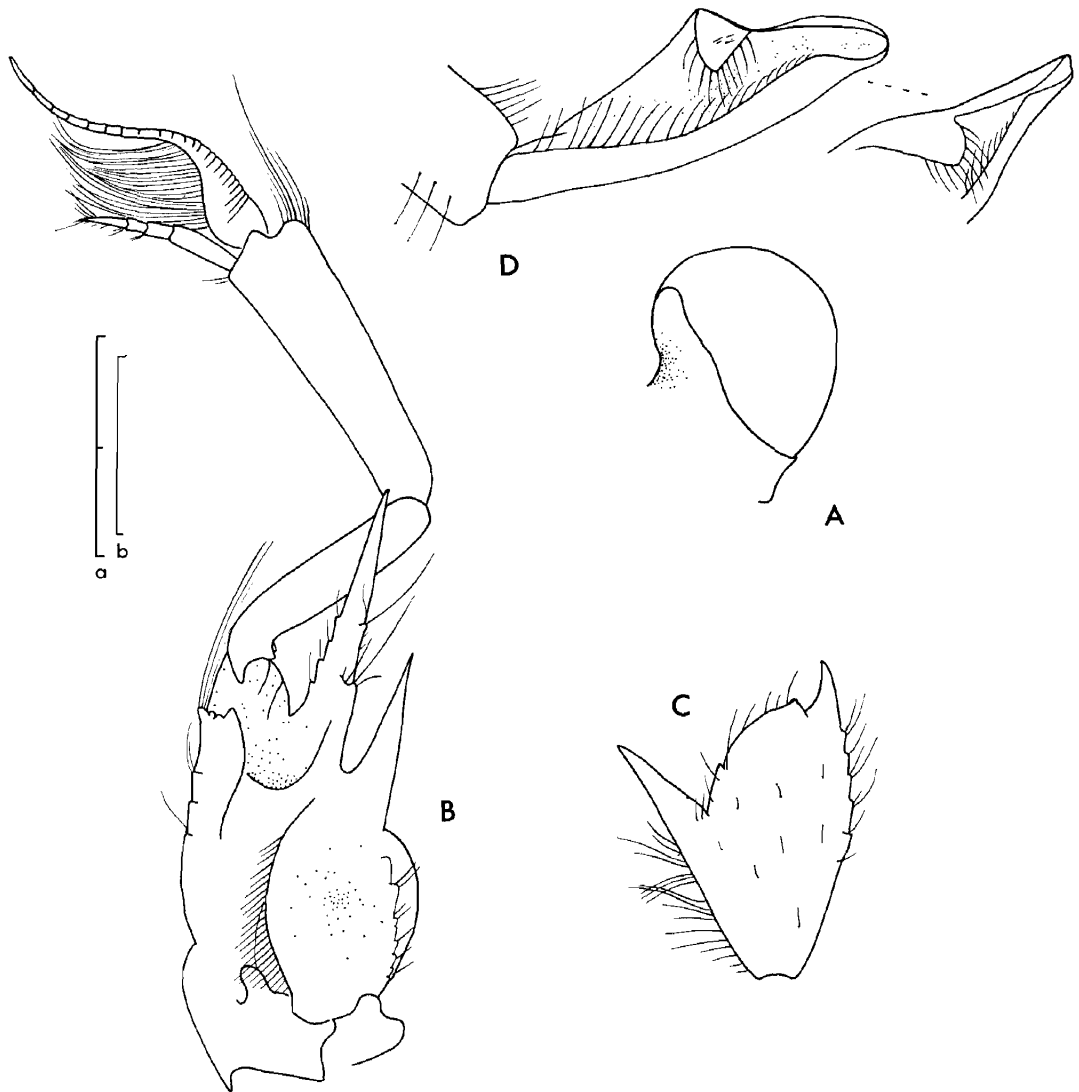


FIG. 27. *Munidopsis (Bathyanstyristes) tenax* Alcock. A. Right eye, lateral view (scale $a = 2$ mm.). B. Right antennule, dorsal view (scale a). C. Merus of left third maxilliped (scale a). D. Endopod of left first pleopod of male, dorsal view and apex of same from a different angle (scale $b = 1$ mm.).

The young female taken at St. 143 differs from the male in that the carapace is less rugose and the hairs are sparse. The rostrum is almost half the length of the carapace. The chelipeds and the ambulatory legs are less hairy and with reduced armature. In all these characters the specimen approaches *M. (Bathyankyristes) levis* Alcock and Anderson (1894 and 1901). But in the "John Murray" specimen the eye-stalks are visible from above, as they are in the male; this has been regarded as one of the distinguishing features between the two species (see Alcock, 1901, p. 251 and 274). In the illustration, however, the artist has shown a small portion of the eye-stalk in dorsal view of *Munidopsis (Bathyankyristes) levis* (1901, pl. LV, fig. 3).

Sub-genus *ELASMONOTUS*

KEY TO THE DETERMINATION OF THE INDIAN OCEAN SPECIES OF THE SUB-GENUS *ELASMONOTUS*

- I. Rostrum triangular but not sharply pointed at the apex; cornea long and cylindrical; cheliped slender, more than twice the length of carapace *M. (Elasmonotus) cylindrophthalmus* Alcock
- II. Rostrum triangular and sharply pointed at the apex; cornea small and globular; cheliped stout and less than one and a half times the length of carapace *M. (Elasmonotus) debilis* Henderson

Munidopsis (Elasmonotus) cylindrophthalmus Alcock

(Figs. 28, 29A, B)

Elasmonotus cylindrophthalmus Alcock, 1894, p. 333.

Munidopsis (Elasmonotus) cylindrophthalmus Alcock, 1901, p. 272; Ill. Zool. Investigator, Crust., pl. XIII, fig. 4.

Munidopsis (Elasmonotus) cylindrophthalma, Doflein and Balss, 1913, p. 159.

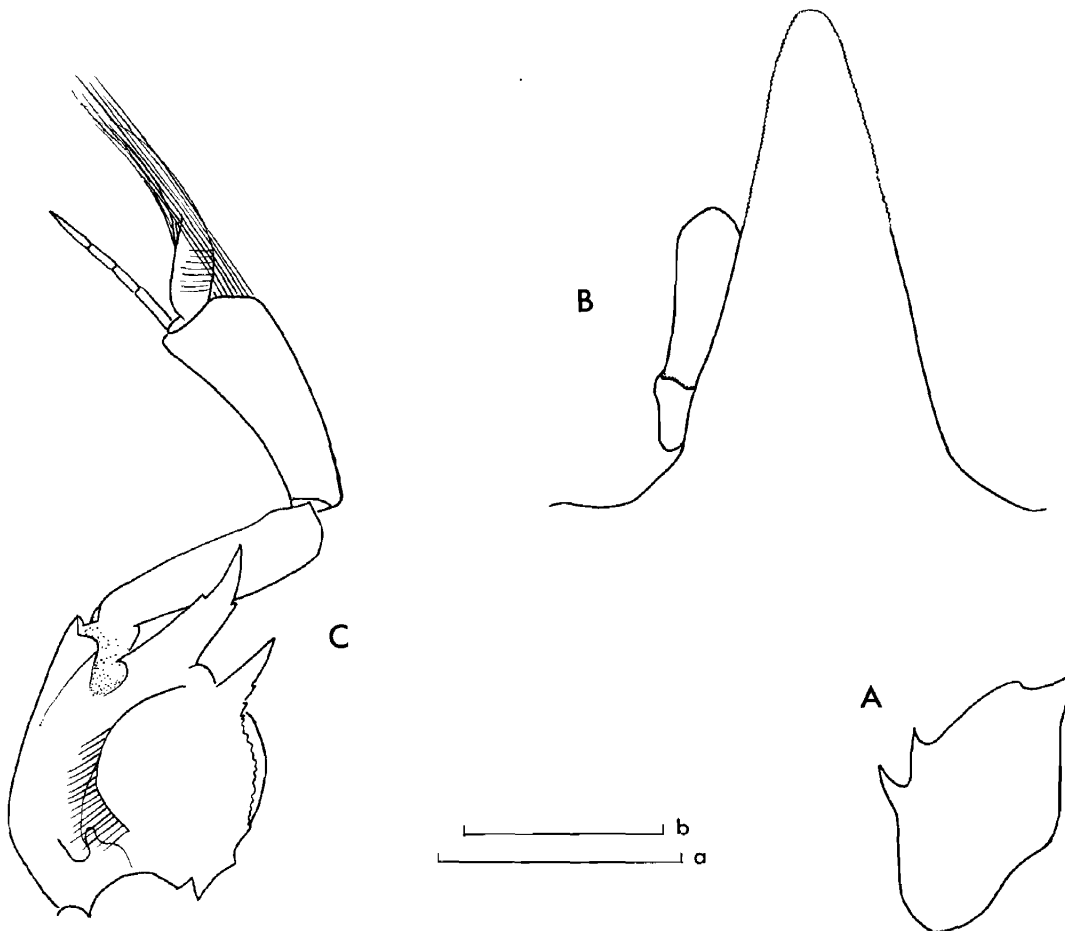


FIG. 28. *Munidopsis (Elasmonotus) cylindrophthalmus* Alcock. A. Rostrum and left eye (scale $b = 1$ mm.). B. Right antennule, dorsal view (scale $a = 1$ mm.). C. Merus of left third maxilliped (scale a).

OCCURRENCE : *Maldive area* : St. 145, Agassiz trawl, 494 metres, 1 female (c.l. + r. = 9.5 mm., ch.l. = 21 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : The single specimen in the "John Murray" collection is illustrated in Fig. 29A, B. It seems referable to Alcock's species although it differs from Alcock's description in the following respects : (1) There are two small spines on the inner margin of the merus of the

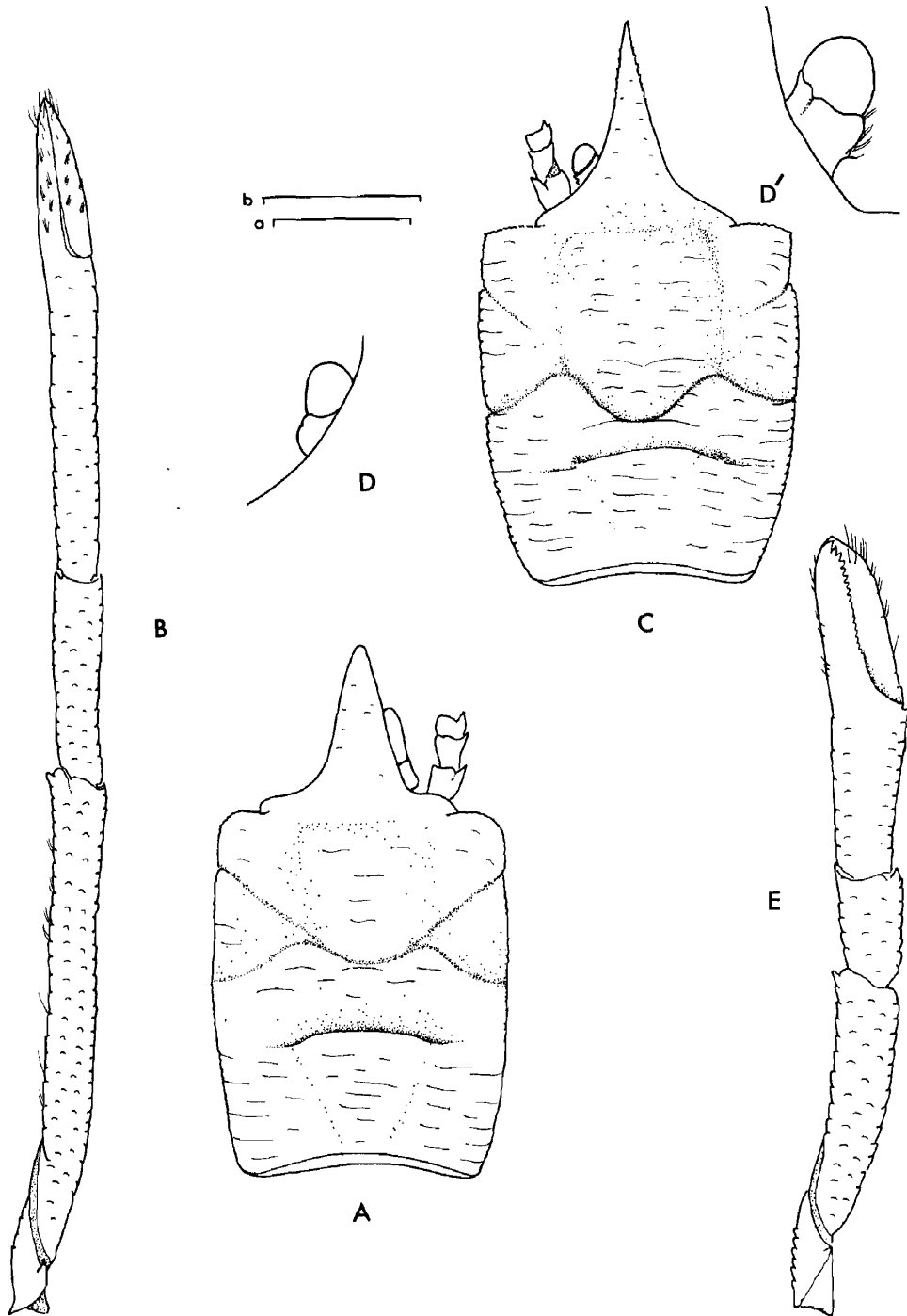


FIG. 29. *Munidopsis (Elasmonotus) cylindrophthalmus* Alcock. A. Dorsal view of carapace (scale $a = 2.5$ mm.). B. Cheliped (scale a). *Munidopsis (Elasmonotus) debilis* Henderson. C. Dorsal view of carapace (scale a). D. Left eye in normal position (scale $b = 1$ mm.). D'. Right eye, pulled out (scale b). E. Right cheliped (scale a).

third maxilliped (Fig. 28A) instead of "two small tubercles" (Alcock, 1901, p. 272). (2) The thoracic legs are not "perfectly smooth" as stated by Alcock; the chelipeds are covered with squamiform scales and there is a small spine on the inner distal angle of the ischium (Fig. 29B). There are similar scales at least on the merus of the walking legs.

The rostrum and the eyes are shown at a higher magnification in Fig. 28B and the antennule is represented in Fig. 28C.

Munidopsis (Elasmonotus) debilis Henderson

(Figs. 29 C-E, 30)

Galathopsis debilis Henderson, 1885, p. 417.

Elasmonotus debilis Henderson, 1888, p. 165, pl. XVIII, fig. 4, 4a (specimen from Philippines only).

OCCURRENCE : *Gulf of Aden* : St. 184, Agassiz trawl, 1270 metres, 1 male (c.l. + r. = 10 mm., ch.l. = 13 mm.).

DISTRIBUTION : Philippine Islands.

DESCRIPTIVE NOTES : The carapace of the "John Murray" specimen is represented in Fig. 29C. The rostrum is sharply pointed and upcurved, the lateral margins are finely serrated. The antero-lateral angles of the carapace are rounded as in *Munidopsis (Elasmonotus) cylindrophthalmus* but rather acuminate. The lateral margins of the carapace are serrated and diverge slightly anteriorly. The gastric area is well defined and rather convex, the entire surface of the carapace is rugose. The second to fourth abdominal terga have each a transverse groove with carinated margins. The anterior carina of each transverse groove is better defined than the posterior one.

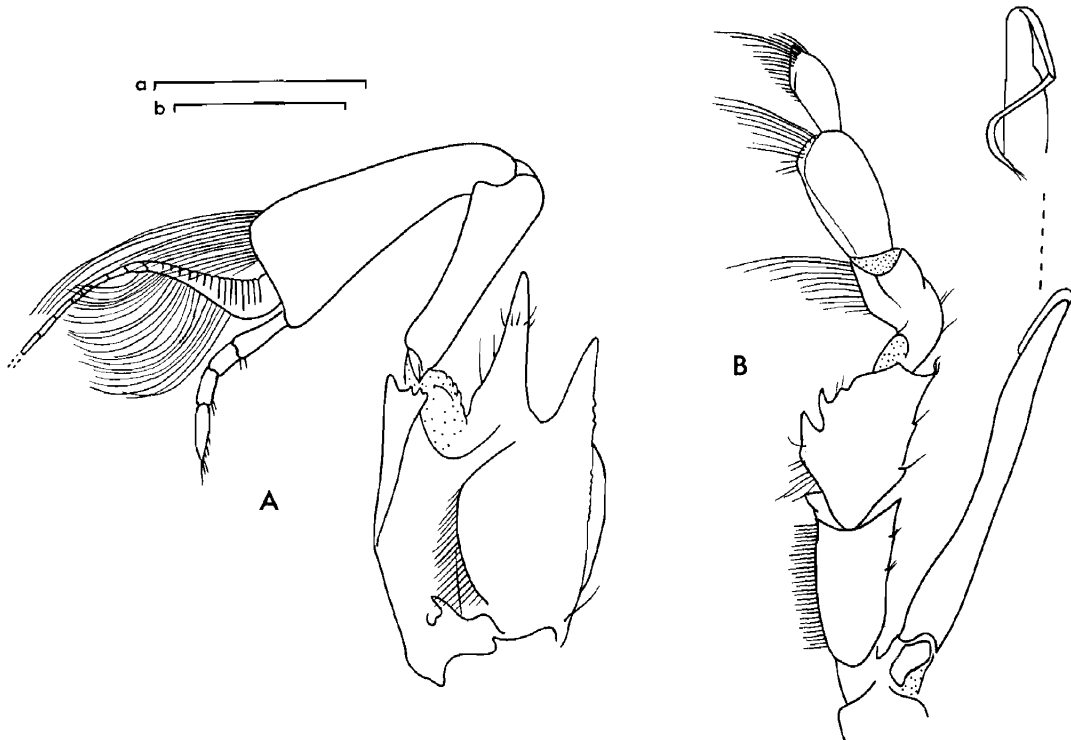


FIG. 30. *Munidopsis (Elasmonotus) debilis* Henderson. A. Right antennule, dorsal view (scale *a* = 1 mm.). B. Left third maxilliped (scale *b* = 1 mm.).

The eyes are remarkably small (Fig. 29*D*, *D'*). The antennule is illustrated in Fig. 30*A*. The inner and outer distal angles of the basal joint of the antennal peduncle are acute. The outer distal angle of each of the following three segments is produced into a spine; the spine of the terminal segment is bifid.

The merus of the third maxilliped has two spines on its inner margin and a small spine on its outer distal angle (Fig. 30*B*).

The single remaining cheliped is short and stout (Fig. 29*E*). The scales covering the dorsal and lateral surfaces of the cheliped have sharp projecting anterior margins. On the ventral surface, which is rather smooth, the outer distal angle of the ischium and both distal angles of the merus are produced into small spines. The same angles of the carpus have small tooth-like projections.

The few ambulatory legs present are, like the cheliped, detached. They measure from eight to nine and a half millimetres in length. The ischium, merus and carpus of each leg is covered with hairy scales. The propodus is quite smooth and the dactylus terminates in a claw, behind which the posterior margin is strongly toothed.

The first and second pleopods are probably not fully developed. However, they are very similar to those of *M. scobina*.

REMARKS: Henderson established this new species for two males, one from Matuku Island, Fiji and the other from the Philippine Islands. Both specimens are in the British Museum (Nat. Hist.) collection and, as stated by Henderson (1888, p. 165), are "in too fragmentary a condition to admit of a detailed description". However, on careful examination these two specimens are seen to differ from one another. The larger one, that from the Philippines, should probably be selected as the lectotype because: (1) the left third maxilliped is missing from the specimen and that is the one represented in Henderson's fig. 4*a*, pl. XVIII, but the right one is still attached and agrees with the description and figure. (2) According to his footnote on p. 166 the artist must have made some mistake over fig. 4 since, according to the measurement given, the cheliped was just a trifle larger than the carapace (presumably including the rostrum). (3) The eyes are smaller than in the specimen from Fiji.

The chief reason for regarding the specimen from Fiji as different is because the eyes are much longer relative to the rostrum, and the cornea is elongated. In fact it seems to be more like *Munidopsis (Elasmonotus) cylindrophthalmus* Alcock. The detached fragment of one cheliped (ischium merus carpus) with this specimen is also much longer than one would expect in *debilis* according to Henderson's measurements. He gave no measurements for the smaller specimen.

Sub-genus *OROPHORYNCHUS*

Munidopsis (Orophorynchus) ciliata Wood-Mason

(Fig. 31)

Munidopsis ciliata Wood-Mason, 1891, p. 200.

Munidopsis ciliata, Faxon, 1895, p. 84.

Munidopsis brevimana Henderson, 1885, p. 414; Rep. Challenger Anomura, 1888, p. 154, pl. xvii, figs. 1 and 2.

Munidopsis (Orophorynchus) ciliata, Alcock, 1901, p. 267; Illus. Zool. Investigator, Crust., pl. XI, fig. 3, 3*a*; MacGilchrist, 1905, p. 248.

OCCURRENCE: *Gulf of Aden*: St. 26, Agassiz trawl, 2312 metres, 1 male (c.l. + r. = 10.5 mm., ch.l. = 9 mm.).

DISTRIBUTION: Indo-Pacific.

DESCRIPTIVE NOTES : The single "John Murray" specimen referred to this species is a juvenile male. Henderson described the carapace as being covered with short transverse ridge-like elevations and "in some specimens also short hairs are sparingly met with". Faxon (1895, p. 84) pointed out that the "Albatross" specimens were more hairy than those described by Henderson. In the "John Murray" specimen the hairs on the carapace are strikingly long. The lateral margins of the rostrum are finely serrated near the apex, some of the more posterior serrations become spinulose (Fig. 31A).

As illustrated in Fig 31A, the eye-stalk extends beyond the cornea as an outer and an inner spine, the inner spine is much longer and its base covers the cornea medially and also extends a little on to the ventral surface so that the cornea is not exposed median to this spine as is shown in Henderson's figure (1888, pl. xvii, fig. 1).

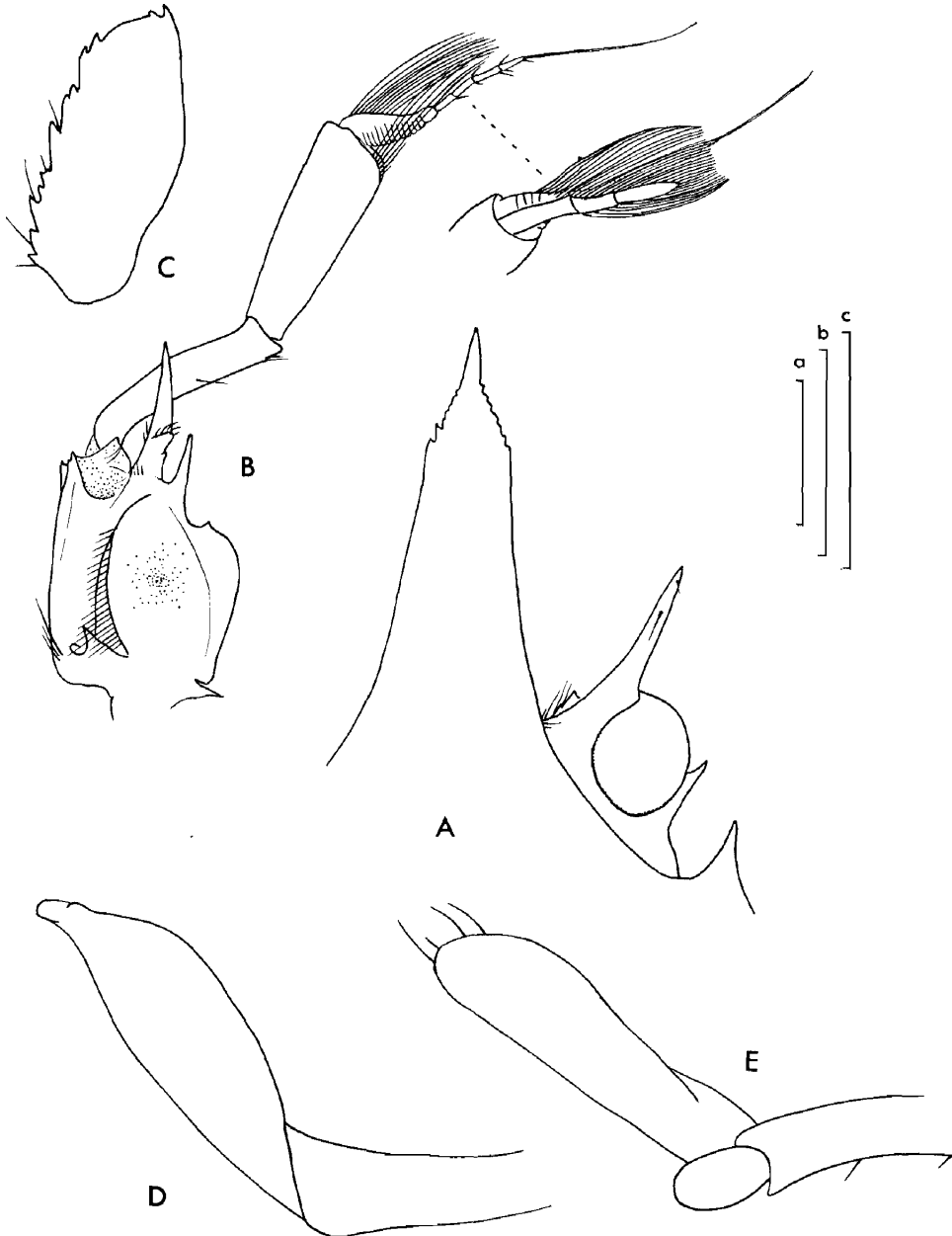


FIG. 31. *Munidopsis (Orophorhynchus) ciliata* Wood-Mason. A. Rostrum and right eye (scale $a = 1$ mm.). B. Right antennule, dorsal view (scale $b = 1$ mm.). C. Merus of left third maxilliped (scale b). D. Left first pleopod of male, ventral view (scale $c = 0.5$ mm.). E. Left second pleopod of male, ventral view (scale c).

The basal segment of the antennule has an inflated lateral margin (Fig. 31*B*), and the external spines are situated more distally than in most other species of this genus. The external flagellum terminates in a long lash which extends far beyond the other hairs which have a characteristic brush-like arrangement (Fig. 31*B*).

The basal segment of the antennal peduncle has its inner and outer distal angles produced into triangular processes. The second segment has a spine on its outer distal angle and only a spinule on the inner one, whereas the following segment has a spine on the inner distal angle and a spinule on the outer one. The outer distal margin of the ultimate segment is produced into a short blunt triangular process.

The merus of the third maxilliped has a serrated inner margin (Fig. 31*C*), but my representation of this segment is somewhat different from Henderson's figure of the same (pl. xvii, fig. 1a).

Alcock has already pointed out the presence of an epipodite on the cheliped (p. 267). It may be added here that this epipodite is as large as that of the third maxilliped.

The first and second pleopods illustrated in Fig. 31*D* and *E* show an early developmental stage.

Sub-genus *MUNIDOPSIS*

KEY TO THE DETERMINATION OF THE INDIAN OCEAN SPECIES OF SUB-GENUS *MUNIDOPSIS*

- I. Epipodites present on chelipeds only *M. (Munidopsis) dasypus* Alcock
- II. No epipodites on chelipeds or legs.
 - A. Body and appendages with hirsute spines *M. (Munidopsis) spinihirsuta* Lloyd
 - B. Body and appendages without hirsute spines.
 - I. Entire posterior border of carapace armed ; cornea ovoid *M. (Munidopsis) scobina* Alcock
 - II. Posterior border of carapace unarmed or with a few median spines ; eyes globular or cylindrical.
 - A. Posterior border of carapace unarmed ; abdominal terga also unarmed ; eyes globular.
 - M. (Munidopsis) stylirostris* Wood-Mason
 - B. Posterior border of carapace armed or unarmed ; second to fourth abdominal terga spinose ; eyes cylindrical.
 - a. Posterior border of carapace unarmed ; gastric and cardiac regions without a row of mid-dorsal spines. *M. (Munidopsis) wardeni* Anderson
 - b. Posterior border of carapace with median spines, gastric and cardiac areas with a row of mid-dorsal spines *M. (Munidopsis) wardeni mabahiss* var. nov.

Munidopsis (Munidopsis) dasypus Alcock

(Fig. 32)

Munidopsis dasypus Alcock, 1894, p. 329.

Munidopsis dasypus, Alcock, 1901, p. 252 ; Ill. Zool. Investigator, Crust., pl. XIII, fig. 9 ; McGilchrist, 1905, p. 245.

OCCURRENCE : *South Arabian coast :* St. 50, triangular dredge 4, 1536–1939 metres, 1 male (c.l. + r. = 17 mm., ch.l. = 32 mm.).

Gulf of Aden : St. 184, Agassiz trawl, 1270 metres, 1 ovig. female (c.l. + r. = 24.5 mm., right ch.l. = 48 mm., left ch.l. = 38 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : In the two "John Murray" specimens, one male and one female, the rostrum has a mid-dorsal carina and the lateral margins are serrated. As pointed out by McGilchrist (1905, p. 245), the number of spines on the posterior margin of carapace are variable. All Alcock's specimens had four spines, McGilchrist's specimens had four to seven spines. In the "John

Murray" male there are five, while in the female the posterior margin of the carapace is armed with eight spines. Second to fourth abdominal terga each with a carinated anterior margin of which that on the fourth is very pronounced in the female.

The eye-stalk is elongate and has an oblique distal margin (Fig. 32A).

The basal segment of the antennule differs slightly in the two sexes. In the male (Fig. 32B) there is a single large spine on the outer side of the distal margin, at the base of which there is a minute spine. The female, on the other hand, has two long spines on the same margin (Fig. 32C). Alcock (1901, p. 252) described the basal segment of the antennule as having "only one of its spines, namely, that at the antero-external angle, long". The antennal peduncle has the disto-lateral angle of the second segment produced into a spine. A small stout spine is present between the base of the antennal peduncle and the eye-stalk, immediately below the oblique frontal margin of the carapace.

The merus of the third maxilliped is serrated on its outer margin and produced into two large spines on the proximal inner one (Fig. 32D).

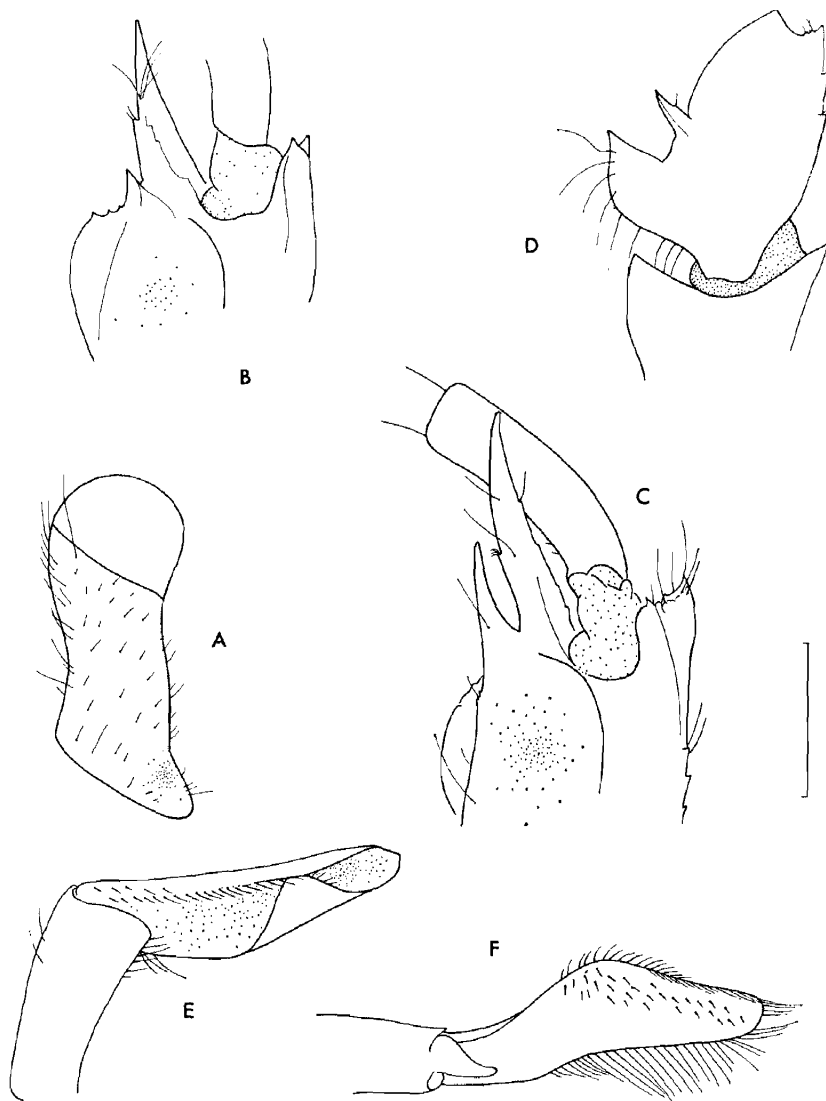


FIG. 32. *Munidopsis (Munidopsis) dasypus* Alcock. A. Right eye of female, lateral view. B. Part of left antennule of male, dorsal view. C. Same of female. D. Middle part of left third maxilliped of female. E. Right first pleopod of male, dorsal view. F. Distal part of right second pleopod of male, ventral view. (Scale = 1 mm.)

The chelipeds and the walking legs have been fully described by the earlier authors. It may be pointed out here that the chelipeds are equal in the male and asymmetrical in the female where the left one exceeds the right by ten millimetres.

The endopods of the first two pairs of male pleopods are illustrated in Figs. 32E, F.

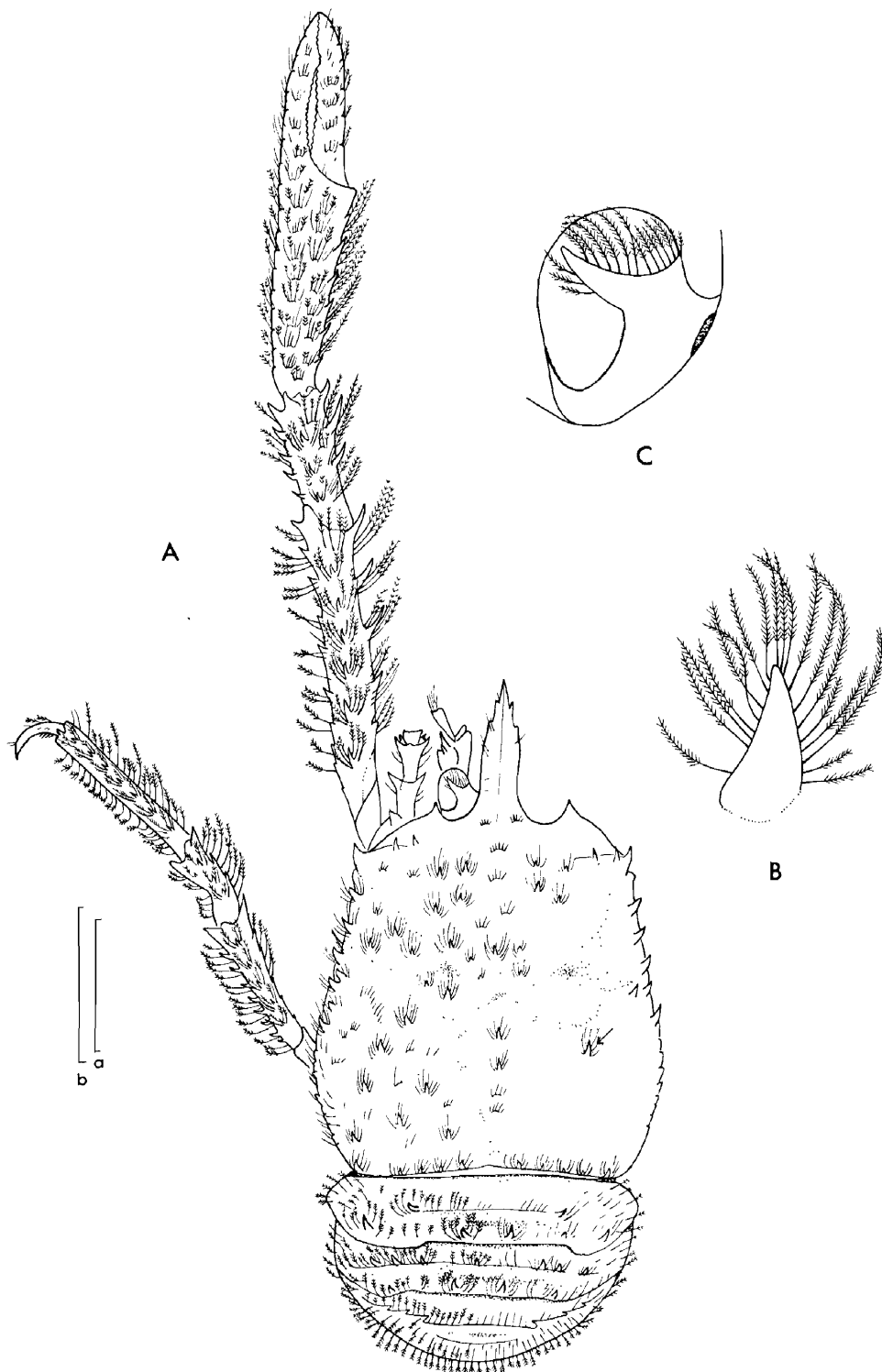


FIG. 33. *Munidopsis (Munidopsis) spinihirsuta* Lloyd. A. Dorsal view of female (scale $a = 5$ mm.). B. Single spine of carapace further enlarged. C. Left eye (scale $b = 1$ mm.).

Munidopsis (Munidopsis) spinihirsuta Lloyd

(Figs. 33, 34)

Munidopsis spinihirsuta Lloyd, 1907, p. 12.

OCCURRENCE : *South Arabian coast* : St. 54, Agassiz trawl, 1046 metres, 8 males (c.l. + r. = 22 mm., ch.l. = 18–45 mm.) ; 7 females (c.l. + r. = 12–18 mm., ch.l. = 19–33 mm.).

DISTRIBUTION : Arabian Sea.

DESCRIPTION : The brief description of *M. (Munidopsis) spinihirsuta* given by Lloyd was based on three small males collected from the Arabian Sea. The "John Murray" Expedition took fifteen specimens, seven of which are females. Two females are ovigerous, their carapace lengths being 12 mm. and 17.5 mm. respectively.

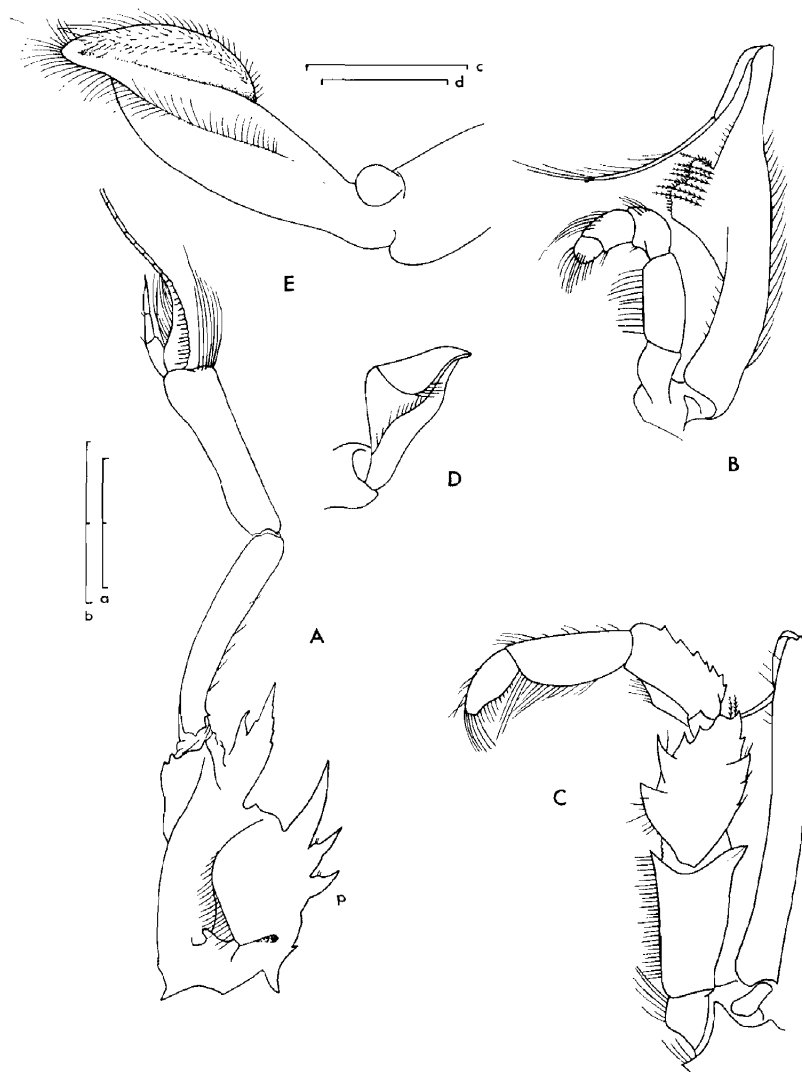


FIG. 34. *Munidopsis (Munidopsis) spinihirsuta* Lloyd. A. Right antennule, dorsal view (scale *b* = 2 mm.). B. Left second maxilliped (scale *a* = 2 mm.). C. Left third maxilliped (scale *a*). D. Endopod of left first pleopod of male, dorsal view (scale *d* = 1 mm.). E. Distal part of left second pleopod of male, ventral view (scale *c* = 1 mm.).

The dorsal view of the larger ovigerous female is illustrated in Fig. 33A. The integument is crisp, unlike that of most members of the sub-family Munidopsinae. The carapace is covered by large well separated spines ; each spine is flanked on either side by long hairs each with the distal half plumose (Fig. 33B). The rostrum is broadly triangular, the lateral margins are serrated near the tip which is upcurved. A median carina extends over the dorsal surface of the rostrum. The second to fourth abdominal terga are each provided with two transverse carinae. The anterior carina of the second tergum is short, with a spine at each lateral end ; the posterior carina is long, extends to the corresponding pleura and is provided with four to five spines. The anterior carinae on each of the two following terga are similar to the posterior one of the second tergum, that is each is armed and extends on to the respective pleura. The posterior carina of the third tergum is short and has about four spines, the same carina of the fourth tergum is unarmed and rather obscure, the spines are similar to those of the carapace. The last two abdominal terga are unarmed. The dorsal surface of all the abdominal terga and of the telson is pubescent. In the males the lateral margins of the telson are fringed with thick, amber coloured setae.

The eye is rather small and the peduncle is produced over the cornea as a curved spine, fringed with plumose hairs (Fig. 33C).

The basal segment of antennule has several spines as illustrated in Fig. 34A. In some specimens the proximal spine *p* may be bifid. The outer distal angle of the basal segment of the antenna is produced into a spine ; both the outer and inner distal angles of the second segment are also produced into fairly long spines ; the distal margin of the following segment has a whorl of four spines.

The second and third maxillipeds are represented in Fig. 34B, C.

The chelipeds are long and slender, measuring a little less than twice the length of the carapace including rostrum. The ischium has a small spine on its outer distal angle (not visible in the figure). Three rows of spines extend over merus and carpus, and the palm has spines only on its inner margin. All the segments except the ischium are hairy. The walking legs are likewise very spiny and hairy ; there are no spines on the posterior margin of the propodus and the same margin of the dactylus is finely serrated. There are no epipodites on the chelipeds or any of the legs.

The first pleopod of the male has a membranous endopod which is curled dorsally (Fig. 34D). The endopod of the second pleopod, which is represented in Fig. 34E, shows some resemblance to that of *Galacantha rostrata* (cf. Fig. 24E).

Munidopsis (Munidopsis) scobina Alcock

(Fig. 35)

Munidopsis scobina Alcock, 1894, p. 330.

Munidopsis scobina, Alcock, 1901, p. 254 ; Ill. Zool. Investigator, Crust., pl. XIII, fig. 1.

OCCURRENCE : *South Arabian coast* : St. 54, Agassiz trawl, 1046 metres, several specimens of both sexes (c.l. + r. = 8-19 mm., ch.l. = 10-27 mm. respectively).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : The " John Murray " specimens differ constantly from Alcock's description in having the body and appendages hairy and the antero-lateral margins of the carapace more convergent than illustrated (Alcock, 1901, pl. XIII, fig. 1). The branchial region has several short transverse ridges. The second to fourth abdominal terga are as described for the type. In the " John Murray " specimens the spinate crests on the second and the third terga have four to eight

spines. The anterior crest of the fourth tergum has two to four spines; on the posterior crest there are only one or two spines which may even be reduced or absent in a few specimens.

The eye is illustrated in Fig. 35A. The spines on the basal segment of the antennule are as represented in Fig. 35B (except in one instance where the proximal spine of the outer margin is wanting in the right appendage). The spines on the antennal peduncle are "remarkably distinct" as pointed out by Alcock (1901, p. 254); the ventral view is represented in Fig. 35C; dorsally the distal margin of each of the second and third segments has a median spine. The inner distal angle of the ischium of the third maxilliped is produced into a spine; the inner margin of the merus has two spines (Fig. 35D) except in a young female where only one spine is present.

The first pair of pleopods in the male is very similar to that of *Munidopsis (Munidopsis) dasypus* (cf. Fig. 32E); the second pair, on the other hand, shows some resemblance to that of *M. (Munidopsis) spinihirsuta*, the left endopod is illustrated in Fig. 35E.

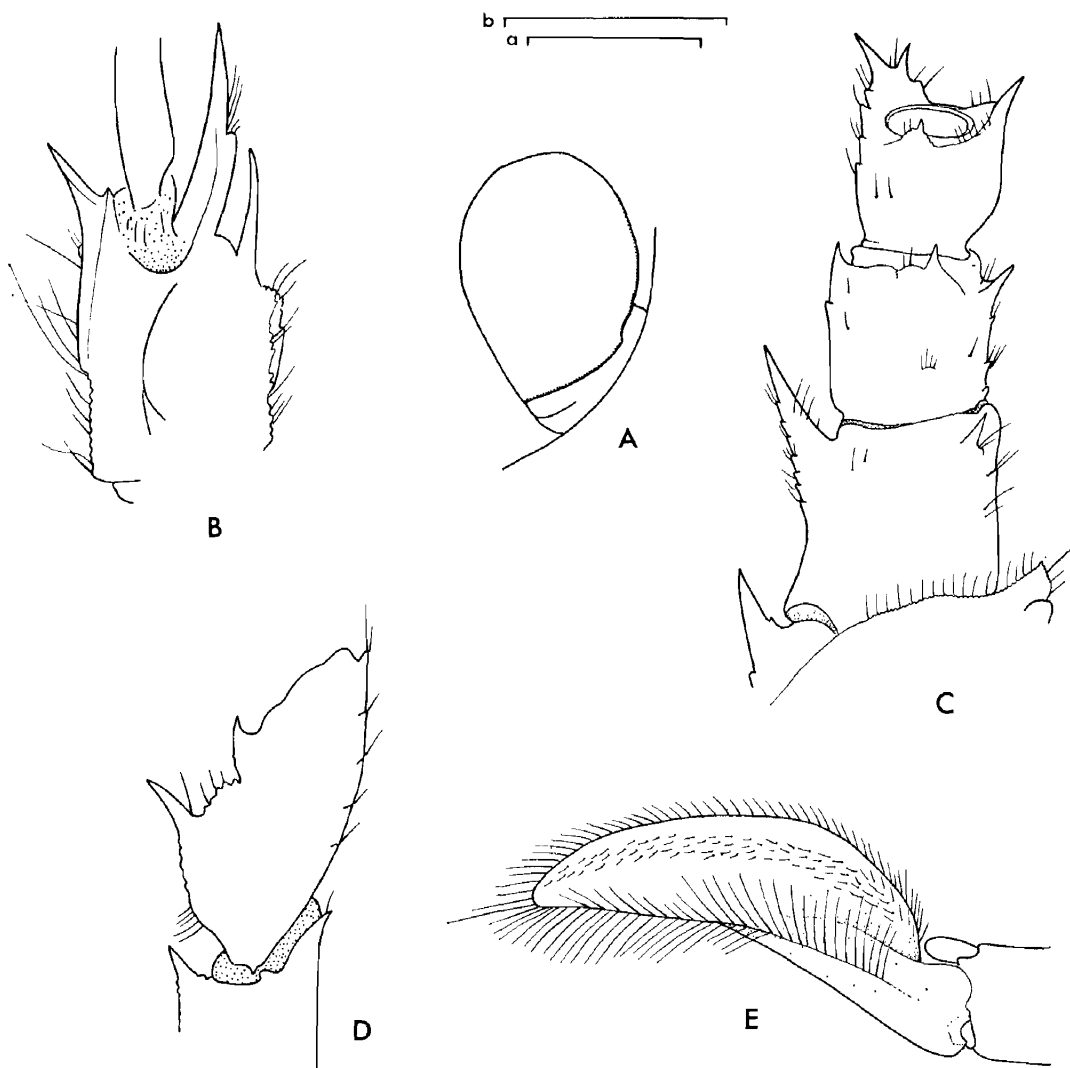


FIG. 35. *Munidopsis (Munidopsis) scobina* Alcock. A. Left eye (scale $a = 1$ mm.). B. Right antennule, dorsal view (scale $b = 1$ mm.). C. Right antennal peduncle, ventral view (scale b). D. Middle part of left third maxilliped (scale a). E. Distal part of left second pleopod of male, ventral view (scale b).

Munidopsis (Munidopsis) stylirostris Wood-Mason

(Fig. 36)

Munidopsis stylirostris Wood-Mason, 1891, p. 201.*Munidopsis stylirostris*, Alcock, 1894, p. 328 ; 1901, p. 256 ; Ill. Zool. Investigator, Crust., pl. XIII, fig. 6.

OCCURRENCE : *Gulf of Aden* : St. 185, Agassiz trawl, 2000 metres, 1 ovig. female (c.l. + r. = 15 mm., ch.l. = 20 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : The single specimen of *M. (Munidopsis) stylirostris* taken by the "John Murray" Expedition is a female. It differs from Alcock's description as follows :

The lateral margins of the carapace are parallel throughout their length and, instead of diverging anteriorly (Alcock, 1901, p. 256), they appear to be somewhat convergent near the antero-lateral angles. The rugosities of the gastric region, mentioned by Alcock, have finely ctenate anterior

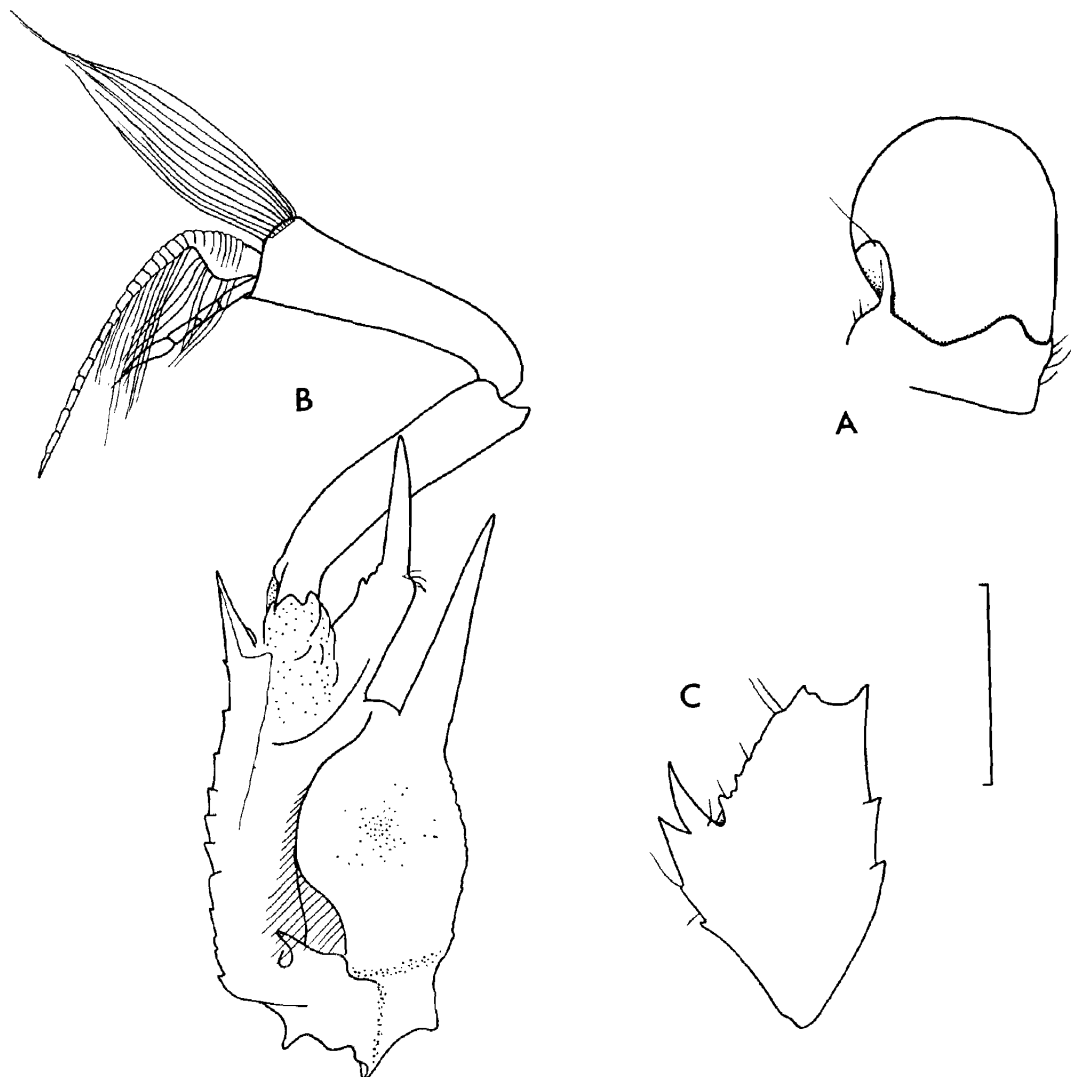


FIG. 36. *Munidopsis (Munidopsis) stylirostris* Wood-Mason. A. Right eye, lateral view. B. Right antennule, dorsal view. C. Merus of left third maxilliped. (Scale = 1 mm.)

margins ; similar rugosities are also present between the two divisions of the cervical groove. Posterior to the cervical groove the rugosities become more numerous but less emphasized. Moreover, only the second and third abdominal terga have "microscopically ctenate crests" (1901, p. 257) on either side of the transverse groove ; the crenulations on the posterior crest of the third tergum are very indistinct. The crests on the fourth tergum are quite smooth.

Alcock stated that the "thoracic legs, except the ischiopodite of the first pair, are almost devoid of hairs" (1901, p. 257). In the illustration, however, the artist depicts long fine hairs on all the legs (Pl. XIII, Fig. 6) and in the "John Murray" specimen all the thoracic legs are provided with rather long hairs at least some of which appear to be plumose. The hairs on the inner margin of the merus, carpus and the palm of the cheliped are quite dense ; the walking legs are less hairy.

The right eye is illustrated in Fig. 36A. The cornea bulges medially and on the same side the short eye-stalk is produced anteriorly into a scale. The basal segment of the antennule has two outer and one inner distal spine (Fig. 36B). The antennal peduncle shows a striking similarity to that of *M. scobina* (cf. Fig. 35C) but differs in being less spiny. The outer distal angle of the basal segment is not developed into a spine as in *M. scobina* but, like the inner distal angle, this angle is also produced into an acute triangular process. The penultimate segment has only a sharp projection on its outer distal angle. The distal outer process of the ultimate segment is not so sharp and spiny. Moreover, there are no dorsal spines on the second and the third segments.

The merus of the third maxilliped has a pair of characteristic spines on its inner margin (Fig. 36C).

Munidopsis (Munidopsis) wardeni Anderson

(Fig. 37A-C)

Munidopsis wardeni Anderson, 1896, p. 99.

Munidopsis wardeni, Alcock, 1901, p. 257 ; Ill. Zool. Investigator, Crust., pl. LV, fig. 1 ; Doflein & Balss, 1913, p. 153.

OCCURRENCE : *Zanzibar area* : St. 108, Agassiz trawl, 786 metres, 1 ovig. female (c.l. + r. = 19 mm., ch.l. = 38 mm.).

St. 122, otter trawl, 732 metres, 1 female (c.l. + r. = 17 mm., ch.l. = 30 mm.).

Maldive area : St. 143, Agassiz trawl, 797 metres, 1 female (c.l. + r. = 11.5 mm., ch.l. = 17 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : The three females of *M. wardeni* taken by the "John Murray" Expedition agree with the "Investigator" specimens except that the cervical groove is weak and the lateral spines in relation to it (Alcock, 1901, p. 258) are wanting. The second to fourth abdominal terga have each a transverse groove the margins of which are raised as finely headed carinae. In the female from St. 122 both the anterior and posterior carinae of the second and third tergum and only the anterior carina of the fourth are armed with median spines. In the largest female only the anterior carina of each of the three terga is armed ; in the youngest specimen even the anterior carina of the fourth tergum is unarmed, only the anterior carina of second and third terga being armed. In all the three specimens the posterior carina of the fourth tergum is less conspicuous than the others, which are very prominent.

The spinosity of the basal segment of the antennule and the merus of the third maxilliped is illustrated in Fig. 37A, B. The right eye is shown in Fig. 37C. The antennal peduncle differs from that of *M. (Munidopsis) stylirostris* only in having a smaller spine at the outer angle of the second segment.

REMARKS : The "Valdivia" specimen referred to this species by Doflein and Balss (1913, p. 153) has no spines on the abdominal terga and McGilchrist (1905, p. 245) gave this as a character for his *M. wardeni* var. *andamanica*. This suggests that these two may be synonymous although Doflein and Balss did not appear to accept the variety as valid.

Munidopsis (Munidopsis) wardeni Anderson *mabahiss* var. nov.

(Figs. 37D-F, 38)

OCCURRENCE : *Gulf of Aden* : St. 34, Agassiz trawl, 1022 metres, 5 males, 5 females (one ovigerous).

Maldive area : St. 143, Agassiz trawl, 797 metres, 4 males, 1 female.

REMARKS ON MATERIAL : From St. 34 the largest specimen is a male measuring 26 mm. in carapace length, including rostrum, and the left, or larger, of the unequal chelipeds is 67 mm. long. An ovigerous female of the same carapace length has the larger cheliped measuring only 49 mm. ; the smallest specimen is a female (c.l. + r. = 9 mm., ch.l. = 19 mm., symmetrical). From St. 143 the largest specimen is again a male with c.l. + r. = 21 mm. and the symmetrical chelipeds are 52 mm. long. The smallest is a female with c.l. + r. = 15 mm. and the symmetrical chelipeds measure 29 mm.

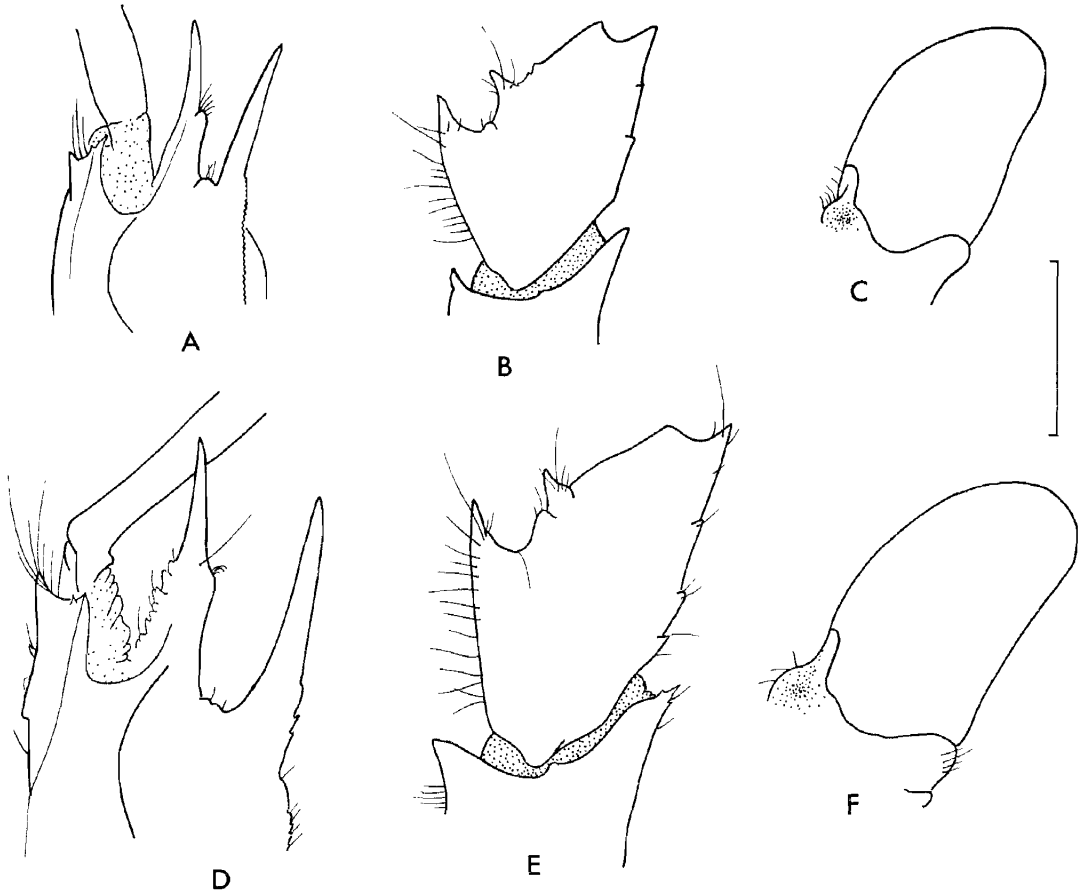


FIG. 37. *Munidopsis (Munidopsis) wardeni* Anderson. A. Part of right antennule, dorsal view. B. Middle part of left third maxilliped. C. Right eye, lateral view. *Munidopsis (Munidopsis) wardeni mabahiss* var. nov. D, E and F as for A, B and C of *wardeni*. (Scale = 1 mm.)

DESCRIPTIVE REMARKS : *M. (Munidopsis) wardeni* var. *mabahiss* differs from *M. wardeni* in being more hairy and in having several spines on the carapace. The gastric region is armed with a pair of anterior spines and a row of four to six mid-dorsal spines, some of which are bifid or even trifid (Fig. 38A). The cardiac area has a prominent spiny crest. The posterior margin of the carapace is raised and has one to several spines in the middle only. The second and third abdominal terga have each a transverse groove, both margins of which are raised and armed with three to six median spines. The anterior margin of the fourth tergum is armed in a similar fashion, but the posterior margin may have one small spine or may be totally unarmed. In young specimens the crest on the cardiac region and the posterior border of the carapace are unarmed. The spines on the abdominal terga are also reduced in size and number.

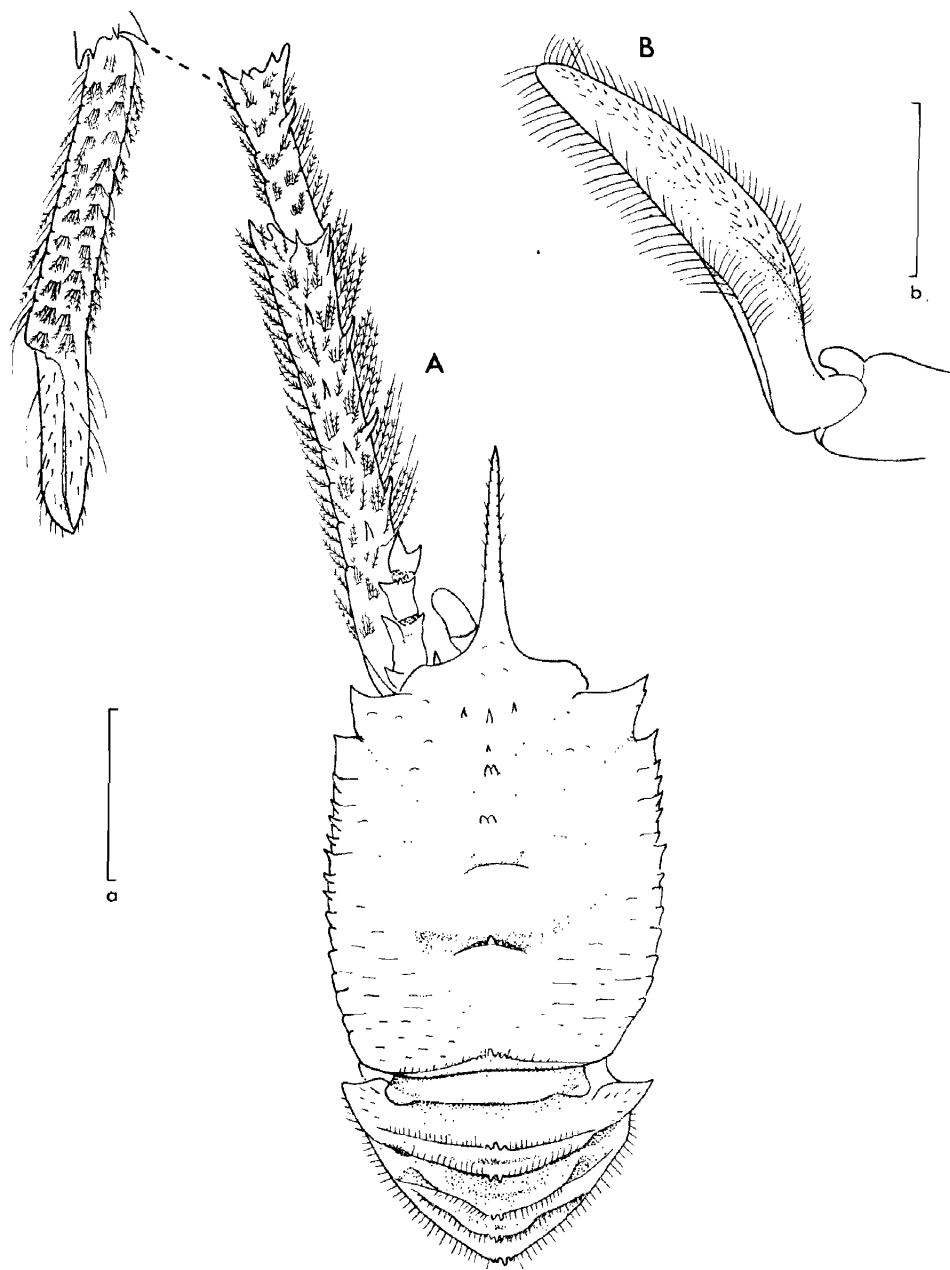


FIG. 38. *Munidopsis (Munidopsis) wardeni mabahiss* var. nov. A. Male, dorsal view (scale $a = 5$ mm.). B. Distal part of left second pleopod of male, ventral view (scale $b = 1$ mm.).

The armature of the antennule, and of the merus of the third maxilliped is very similar to that of *M. wardeni* (Figs. 37D, E). The antennal peduncle of the two varieties are also very similar. The eye of *M. wardeni* var. *mabahiss* is illustrated in Fig. 37F.

In some specimens the carpus of the cheliped has a conspicuous spine on its inner margin (Fig. 38A).

In the males both the first and second pairs of pleopods are developed. The first pleopod shows a strong resemblance to that of *M. dasyopus* except that the apex is here rather truncated and not so acute (cf. Fig. 32F). The endopod of the second pleopod is long and slender (Fig. 38B).

In my opinion the sum total of these differences seems to justify the recognition of a separate variety.

Sub-genus *GALATHODES*

KEY TO THE DETERMINATION OF THE INDIAN OCEAN SPECIES OF THE SUB-GENUS *GALATHODES*

- I. Epipodites present on the chelipeds only ; posterior border of carapace and anterior border of second to fourth terga spinose *M. (Galathodes) regia* Alcock and Anderson
- II. No epipodites on chelipeds or legs ; posterior border of carapace and abdominal terga without spines. *M. (Galathodes) trifida* Henderson

Munidopsis (Galathodes) regia Alcock and Anderson

(Fig. 39)

Munidopsis regia Alcock and Anderson, 1894, p. 168.

Munidopsis (Galathodes) regia, Alcock, 1901, p. 261 ; Ill. Zool. Investigator, Crust., pl. XI, fig. 1 ; Doflein and Balss, 1913, p. 156, text-fig. 23.

Munidopsis triaena Alcock and Anderson, 1894, p. 168.

Munidopsis (Galathodes) triaena, Alcock, 1901, p. 261 ; Ill. Zool. Investigator, Crust., pl. XI, fig. 5.

OCCURRENCE : *Maldive area* : St. 145, Agassiz trawl, 494 metres, 2 males (c.l. + r. = 29 and 43 mm., larger ch.l. = 46 and 74.5 mm. respectively) ; 1 ovig. female (c.l. + r. = 50 mm., ch.l. = 85 mm.).

DISTRIBUTION : Indian Ocean.

DESCRIPTIVE REMARKS : The "John Murray" specimens agree well with the description given by Alcock (1901, p. 261). Alcock described the carapace as being "traversed fore and aft in the middle line by a raised row of coarse granules or spinules, of which one in the postcardium is constant" (1901, p. 261). In the "John Murray" specimens there are three or four spinules which gradually increase in size posteriorly ; the largest is situated on the cardiac region and the anterior small one is placed immediately behind and between the large gastric pair.

The cornea is globular and the eye-stalk is prolonged medially (Fig. 39A). The basal segment of the antennule is furnished with three spines (Fig. 39B). Each of the basal two segments of the antenna have their inner and outer distal angles produced into large spines.

The merus of the third maxilliped (Fig. 39C) as described by Alcock is armed "on the inner border, near the proximal end, with two very large unciform spines, and, on the outer border, distally, with a strong spine" (p. 262). In this respect the "John Murray" specimen agrees with the type and differs from the "Valdivia" specimen where the two spines of the inner border are widely separated (Doflein and Balss, 1913, text-fig. 23).

In the males the chelipeds are unequal ; the larger may be on either side and exceeds the smaller by the length of the dactylus.

The first and second pleopods of the males are slender. The anterior margin of the first endopod is curled dorsally and the same surface is furnished with a row of hairs along the dotted lines represented in Fig. 39D. The second pleopod is represented in Fig. 39E.

Munidopsis (Galathodes) trifida Henderson

(Fig. 40)

Munidopsis trifida Henderson, 1885, p. 415.

Munidopsis trifida, Henderson, 1888, p. 156, pl. xvi, fig. 2 ; Alcock and Anderson, 1894, p. 168.

Galathodes trifidus, Milne Edwards and Bouvier, 1894, p. 279.

Munidopsis (Galathodes) trifida Alcock, 1901, p. 260 ; Ill. Zool. Investigator, Crust., pl. LXX, fig. 1.

OCCURRENCE : *South Arabian coast* : St. 54, Agassiz trawl, 1046 metres, 3 females (c.l. + r. = 10.5, 20 and 21 mm.—largest with eggs).

Gulf of Aden : St. 184, Agassiz trawl, 1270 metres, 1 male (c.l. + r. = 21 mm., ch.l. = 42 mm.).

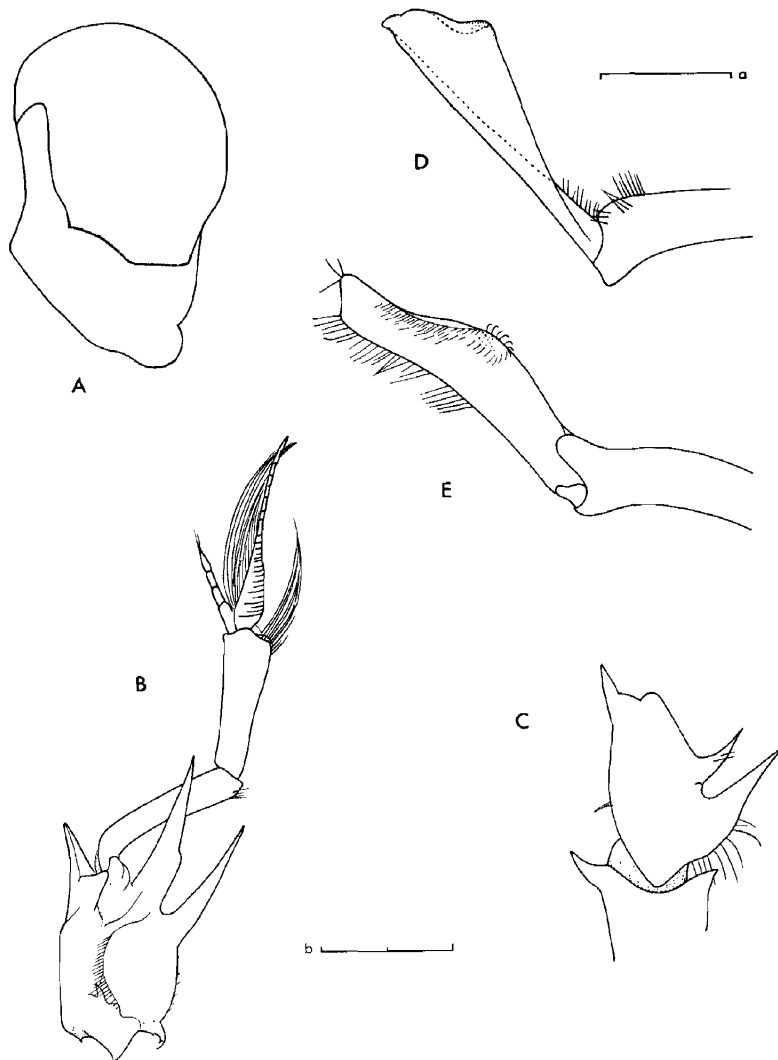


FIG. 39. *Munidopsis (Galathodes) regia* Alcock & Anderson. A. Right eye, lateral view (scale *a* = 1 mm.). B. Right antennule, dorsal view (scale *b* = 2 mm.). C. Merus of right third maxilliped (scale *b*). D. Left first pleopod of male, ventral view (scale *a*). E. Left second pleopod of male, ventral view (scale *a*).

DISTRIBUTION : Atlantic ; Indo-Pacific.

DESCRIPTIVE REMARKS : The four " John Murray " specimens, one male and three females, agree with the earlier descriptions of the species except in some details of the spinosity of the chelipeds and walking legs. In these specimens the chelipeds are missing or incomplete except the left one of the male where the ischium has two distal spines, a large dorsal and a smaller ventral one. The merus is armed with three longitudinal rows of spines, a ring of four spines distally and a few spinules on its ventral surface (in Alcock " ischium " is used by mistake). The carpus has two rows of spines dorsally and a ring of spines on the distal margin of which four are dorsal and two ventral. Both the outer and inner margins of the palm are spinose. The fingers are a little shorter than the palm and the opposed margins are nearly in contact throughout their length. There is no proximal excavation and molariform tooth such as are described and figured for the " Investigator " male (Alcock, 1901, p. 260).

In the walking legs the merus is armed with a row of spines on the anterior margin, in the third one there is an additional row on the dorsal surface ; the posterior margin has a single distal spine.

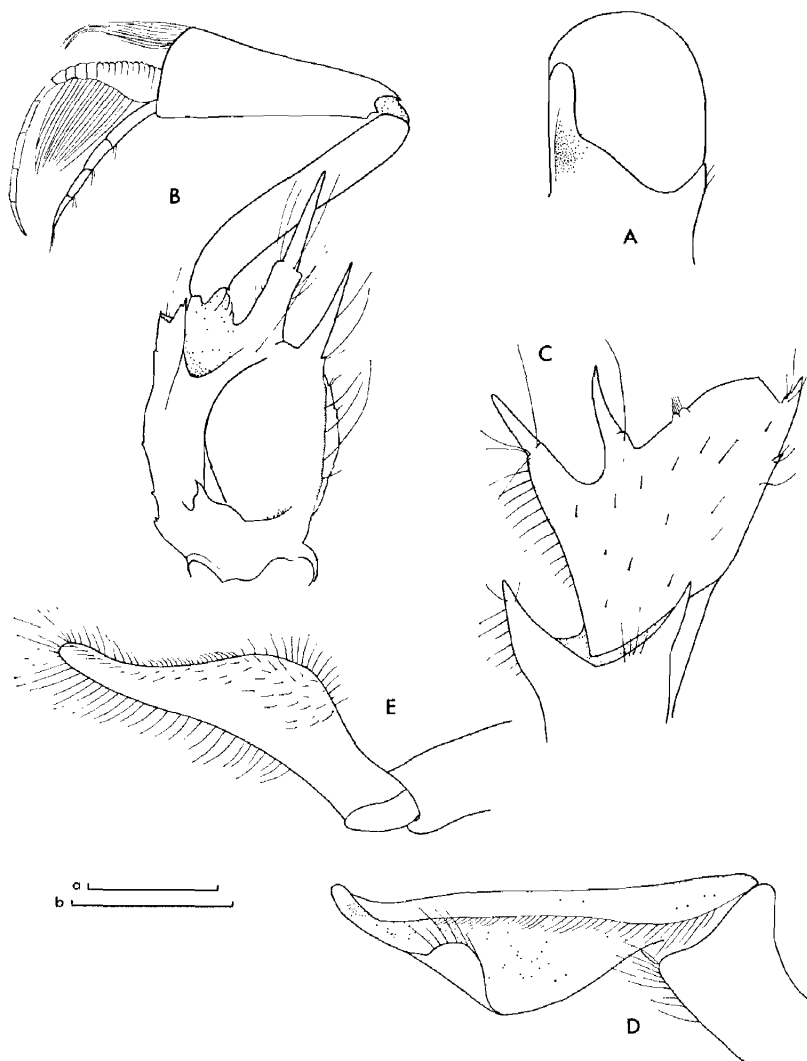


FIG. 40. *Munidopsis (Galathodes) trifida* Henderson. A. Right eye, lateral view (scale $b = 1$ mm.). B. Right antennule, dorsal view (scale $a = 1$ mm.). C. Middle part of left third maxilliped (scale a). D. Distal part of left first pleopod of male, dorsal view (scale b). E. Distal part of left second pleopod of male, ventral view (scale b).

The anterior margin only of the carpus is spiny. The posterior margin of the dactylus is not only serrated but is also provided with horny spines.

The eye is illustrated in Fig. 40A. The basal segment of the antennule has two strong external spines (Fig. 40B). The antennal peduncle differs from that of *M. regia* in having only one (outer) spine on the distal margin of the second segment.

The ischium of the third maxilliped has two strong distal spines. The merus has two large spines on its inner margin and one smaller one on the outer distal angle (Fig. 40C). In the male the proximal spine on the inner border of the merus is considerably broadened at the base.

The first and second pleopods of the male are illustrated in Figs. 40D, E. They are remarkable in having long tapering apices.

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