The Crustacea Galatheidae from the tropical-subtropical region of West Africa, with a list of the known species*

by

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The Crustacea Galatheidae collected by the "Atlantide" Expedition to West Africa 1945–46 are the basis of this report. In addition various other sources are included herein: (1) "Galathea" Expedition material from off West Africa in 1950; (2) Dr. TH. MORTENSEN's collections from the Canary Islands in 1930; (3) Dr. A. BRINKMANN's collections from Senegal in 1906; (4) Dr. G. THORSON's collections from the Canary Islands in 1947 and from Senegal in 1952; (5) Dr. R. BOURDON's collection from Senegal in 1960; and (6) Dr. A. FIGUEIRA's collection from Madeira in 1960. The collections contain a total of approximately 1100 specimens, divided among 12 species.

The West African Galatheidae have been reported fragmentarily, the main work being that by A. MILNE EDWARDS & BOUVIER (1900), based upon the material collected by the "Travailleur" and "Talisman" Expeditions. Faunal lists were given by DOFLEIN & BALSS (1913) and BALSS (1916), however, the latter did not refer to deep-sea forms. Including these, a total of 24 species has been described from the West African region. The present material was taken from Madeira and southwards along the coast of West Africa as far as the coast of Angola; it is mainly composed of littoral forms. Of 12 species described in this paper, only five are previously known from the area, while six are new and another is newly recorded.

Most of the specimens here examined, including all of the holotypes, are preserved in the collections of the Zoological Museum, University of Copenhagen, and the duplicates are in the Zoological Laboratory, Faculty of Agriculture, Kyushu University, (ZLKU). In the latter case, the catalogue number is indicated in the parenthesis under the lists of material.

For the sake of uniformity in spelling the geographical names, the orthography follows that in J. BARTHOLOMEW, "The Times Atlas of the World", vol. 4, Southern Europe and Africa, 1956 (London).

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DESCRIPTIONS OF SPECIES

Galathea intermedia Lilljeborg, 1851

Galathea intermedia Lilljeborg, 1851, p. 21; BONNIER, 1888a, p. 1687;—1888b, p. 123; ORTMANN, 1892, p. 250, pl. 11, fig. 5; MILNE EDWARDS & BOUVIER, 1894a, p. 252;—1894b, p. 81, pl. 8, figs. 1–10;—1899, p. 74;—1900, p. 277; APPELLÖF, 1906, p. 138; HANSEN, 1908, p. 30; SELBIE, 1914, p. 66, pl. 11, figs. 1–12; BALSS, 1916, p. 40; BOUVIER, 1922, p. 41; SCHELLENBERG, 1928, p. 83, figs. 63, 64; BULL, 1936, p. 49; EALES, 1939, p. 130; BARNARD, 1947, p. 378;—1950, p. 483, fig. 91, a–e; HOLTHUIS & GOTTLIEB, 1958, p. 73; HOLTHUIS, 1961, p. 36, fig. 11, b; NUNES-RUIVO, 1961, p. 6; RIEDL, 1963, p. 283, pl. 96; FOREST, 1965, p. 348.

Galathea Parroceli Gourret, 1887, p. 1034.

Galathea Giardi: BARROIS, 1888, p. 21, pl. 2, fig. 1.

Material:

"Atlantide" St. 38, Porto Grande, São Vicente, Cape Verde Islands (16°53'N, 25°00'W), 9 m, sand, 10 Dec. 1945.—2 ♂♂, 3 ovig. ♀♀.

St. 39, San Pedro Bay, São Vicente, Cape Verde Islands (16°50'N, 25°04'W), 41–50 m, foraminiferans and corals, 10 Dec. 1945.—1 ♂, 1 ovig. ♀.

St. 40, off San Pedro Bay, São Vicente, Cape Verde Islands, 40 m, corals, 11 Dec. 1945.—6 ♂♂, 3 ovig. ♀♀, 8 ♀♀.

St. 43, Bay of Praia, San Tiago, Cape Verde Islands, 22 m, corals, 13 Dec. 1945.—2 ♂♂, 1 ovig. ♀.

St. 44, off French Guinea (10°22'N, 16°22'W), 41–55 m, sand and shells, 17 Dec. 1945.—76 ♂♂, 46 ovig. ♀♀, 32 ♀♀, 7 juv.

St. 45, off French Guinea (9°23'N, 15°07'W), 30–34 m, sand, 18 Dec. 1945.—2 ♂♂, 3 ovig. ♀♀, 1 ♀.

St. 49, off Sierra Leone (7°29′N, 13°38′W), 74–78 m, muddy sand, 30 Dec. 1945.—2 ♂♂, 3 ovig. ♀♀.

St. 51, off Sierra Leone (7°14′N, 12°57′W), 108 m, sand and greenish mud, 31 Dec 1945.—1 ovig. ♀.

St. 60, off Liberia (5°06′N, 9°34′W), 78 m, sandy mud, 9 Jan. 1946.—1 ♀.

St. 68, off Ivory Coast (4°38′N, 6°18′W), 80–90 m, mud, 12 Jan. 1946.—1 ovig. ♀.

St. 70, off Gold Coast (4°50′N, 2°49′W), 60–65 m, mud and calc. polyzoans, 15 Jan. 1946.—1 ♂, 2 ovig. ♀♀, 1 ♀.

St. 85, off Gold Coast (5°37′N, 0°38′E), 28–40 m, mud, 30 Jan. 1946.—2 ♂♂, 1 ovig. ♀.

St. 123, off Gabon, French Equatorial Africa (2°03′S, 9°05′E), 49–50 m, mud, 5 Mar. 1946.—1 ovig. ♀.

St. 136, off Angola (8°30′S, 13°14′E), 45 m, mud, 18 Mar. 1946.—1 ♂.

St. 141, off Freetown, Sierra Leone, 15 m, sand, 9 Apr. 1946.—2 ovig. ♀♀.

St. 145, off French Guinea (9°20′N, 14°15′W), 32 m, shells, 13 Apr. 1946.—66 ♂♂, 29 ovig. ♀♀, 15 ♀♀, 21 juv., 25 postlarvae.

St. 146, off French Guinea (9°27′N, 14°48′W), 50–51 m, shells and foraminiferans, 13 Apr. 1946.—2 ♂♂, 3 ♀♀, 34 juv., 117 postlarvae.

St. 147, off French Guinea (9°28′N, 14°58′W), 45 m, shells and foraminiferans, 14 Apr. 1946.—36 ♂♂, 14 ovig. ♀♀, 21 juv., 60 postlarvae (1 ♂, 1 ovig. ♀, 1 postlarva, ZLKU 14299).

St. 148, off French Guinea (9°57′N, 15°22′W), 25 m, shells and hydroids, 14 Apr. 1946.—6 ♂♂, 2 ovig. ♀♀, 2 postlarvae.

St. 151, off French Guinea (10°40′N, 16°44′W), 65 m, coarse sand, 16 Apr. 1946.—1 ♂, 2 ovig. ♀♀, 1 ♀, 1 juv.

St. 153, off French Guinea (10°49′N, 16°39′W), 42 m, coarse sand, 16 Apr. 1946.—7 ♂♂, 4 ovig. ♀♀, 5 ♀♀, 15 juv., 1 postlarva.

St. 161, off Bathurst, Gambia, 18 m, very fine sand, 24 Apr. 1946.—2 ♂♂.

St. 163, off Senegal (13°43′N, 17°23′W), 65–89 m, 25 Apr. 1946.—3 ♂♂, 4 ovig. ♀♀.

"Galathea" St. 4, Tenerife-Dakar (22°19′N, 17°05′W), 62 m, bryozoans, 2 Nov. 1950.—3 ♂♂, 5 ovig. ♀♀, 1 juv.

St. 49, Ilha das Rolas (0°00′, 6°32′E), 42 m, corals, 29 Nov. 1950.—4 ♂♂, 7 ovig. ♀♀, 1 ♀.

Brinkmann Coll., Dakar, Senegal, 3.6 m, Feb. 1906.—3 ♂♂.

Dakar, Senegal, 18–22 m, Feb. 1906.—6 ♂♂, 5 ovig. ♀♀, 1 ♀.

Dakar, Senegal, ca. 9 m, 21 Feb. 1906.—10 ♂♂, 5 ovig. ♀♀, 1 ♀.

Mortensen Coll., off Las Palmas, Gran Canaria, ca. 150–160 m, 25 Mar. 1930.—13 ♂♂, 3 ovig. ♀♀, 8 ♀♀.

Off Las Palmas, Gran Canaria, 36–54 m, 27 Mar. 1930.—2 ovig. ♀♀.

Porto de la Luz, Gran Canaria, ca. 100 m, 28 Mar. 1930.—2 ♀♀.

Porto de la Luz, Gran Canaria, ca. 200 m, 2 Apr. 1930.—4 ♂♂, 1 ovig. ♀, 3 ♀♀.

Thorson Coll., Porto de los Christianos, Tenerife, Canary Islands, 20 m, algae and corals, 16 Mar. 1947.—1 ♂, 2 ovig. ♀♀, 2 ♀♀.

Porto de los Christianos, Tenerife, Canary Islands, 40–60 m, stony bottom with red lime algae, 1 May 1947.—11 ♂♂, 3 ovig. ♀♀, 5 ♀♀.

Porto de los Christianos, Tenerife, Canary Islands, 20–35 m, sand and red algae, 14 May 1947.—2 ♂♂, 2 ♀♀.

Goree, Dakar, Senegal, 20 m, ascidians, 16–29 Feb. 1952.—6 ♂♂, 3 ovig. ♀♀.

Between Goree and Tiaroje, Dakar, 15–20 m, shells, stones and ascidians, Feb.–Mar. 1952.—4 ♂♂, 5 ovig. ♀♀.

Between Goree and Tiaroje, Dakar, 15–20 m, shells, stones and ascidians, 5 Apr. 1952.—10 ♂♂, 7 ovig. ♀♀.

Between Kaji Channel and Goree, Dakar, 7.5–9.5 m, sand, 8 Apr. 1952.—7 ♂♂, 3 ovig. ♀♀.

Measurements: The largest male measures 9.0 mm and the largest ovigerous female 7.7 mm in carapace length.

Remarks: For description and illustrations of the external features, the reader is referred to SELBIE (1914). Approximately 900 specimens were obtained from the various localities given above and consist of various stages from postlarvae to large individuals. It was observed with complete certainty that distinguishing characters such as the shapes of the antennule and third maxilliped were distinct even in postlarvae having the carapace 1.8 mm long. The dentation of the anterior upper border of the pterygostomial flap seems to be an important character (BARNARD, 1950). It was not distinct in the postlarvae or juveniles, but was seen in specimens which had a carapace more than 2.3 mm long and showed a sexually dimorphic character such as differentiation of the pleopods.

Chelipeds are considerably variable in shape and size. As has been mentioned by SELBIE (l.c.), the chelipeds in the young male are similar to those of the female. The largest male specimen is stout, with the carapace 9.0 mm long and the cheliped 28.9 mm, so that the cheliped is about three times as long as the carapace. The smallest male is less well-developed, with the cheliped being about one and a half times as long as the carapace. The large cheliped arm is thickly furnished with plumose setae on the inner margin, however, the small cheliped arm is smooth without any plumose setae. The fingers are gapped or not gapped in the male, but those gapped occur only in the large and well-developed cheliped. On the other hand, the fingers of the female have a straight cutting edge, without being gapped. The well-developed and large chelipeds were never seen in the female, which therefore seems to indicate a sexually dimorphic character.

BARNARD (l.c.) recorded a 25 mm long carapace for a South African specimen, which is about three times as long as the largest of the present material. However, no marked difference is found between BARNARD's specimen and the present material, both having the prolonged merus of the third maxilliped with two inner marginal

spines and having a series of spines on the anterior margin of the pterygostomial flap, a feature characteristic of this species.

Distribution: The species is known from the Faeroes and Norwegian fjords and southwards, and from the Mediterranean, the Azores, Madeira, the Canary and Cape Verde Islands, Senegal Bay of Guinea and South Africa. It is most abundant from shallow water down to about 100 m. Its bathymetric range in the literature is from 4 to 318 m.

Galathea nexa Embleton, 1834

Galathea nexa Embleton, 1834, p. 71 (not seen); BELL, 1847, p. 204, 1 fig.; BULL, 1936,* p. 42, pl. 1, figs. 1–3; pl. 2, figs. 1–6; pl. 3, fig. 1; pl. 4, figs. 2, 5; pl. 5, figs. 1–4; pl. 6, figs. 1, 4, 5; NUNES-RUIVO, 1961, p. 5; RIEDL, 1963, p. 283, pl. 96; FOREST, 1965, p. 347.

Material:

Mortensen Coll., Porto de la Luz, Gran Canaria, ca. 200 m, 2 Apr. 1930.—5 ♂♂, 7 ovig. ♀♀, 1 ♀ (1 ♂, 1 ovig. ♀, ZLKU 14302).

Measurements: The largest male attains 10.3 mm and the largest ovigerous female 9.0 mm in the length of carapace including rostrum.

Remarks: Many workers have discussed the identity of *Galathea nexa* Embleton and *G. dispersa* Bate. However, according to BULL (1936), the two are clearly different. BULL pointed out the considerable differences between them, in external features and colours of adults as well as of larvae.

The present material agrees quite well with *G. nexa* as clarified by BULL (l.c.), with some minor exceptions as follows: The chelipeds have scattered spinules on the surface of the palm, whereas in BULL's description they are smooth on the same segment. In the specimens here examined the carapace is armed with a single spine on the anterior branchial region just behind the cervical groove, while such a spine is not mentioned by BULL.

Distribution: According to BULL (1936), the species is taken from the British Islands and its adjacent waters from the Shetland Islands to Killeany Bay, Aran Islands, Ireland, in 27 to 36 m, and also from Tenerife, the Canary Islands. Recently it was recorded from the Portuguese coasts, in 26 to 170 m (NUNES-RUIVO, 1961), and the Mediterranean in 30 to 98 m (RIEDL, 1963; FOREST, 1965).

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* Complete synonymy in this paper.

Galathea rufipes Milne Edwards & Bouvier, 1894

(Fig. 1)

Galathea rufipes Milne Edwards & Bouvier, 1894a, p. 252;—1899, p. 74;—1900, p. 280, pl. 29, figs. 4–8; BOUVIER, 1922, p. 42.

Material:

"Atlantide" St. 40, off San Pedro Bay, São Vicente, Cape Verde Islands, 40 m, corals, 11 Dec. 1945.—10 ♂♂, 5 ovig. ♀♀, 4 ♀♀ (1 ♂, 1 ovig. ♀, ZLKU 14304).

Description: The rostrum (Fig. 1a) is about twice as long as broad, with four teeth on each side. The dorsal surface is rather concave and without any setae. The external orbital angle is rounded and unarmed. The lower margin of the orbit has one to three spines.

The carapace, not including the rostrum, is as long as broad with one pair of gastric spines. The cervical groove is rather distinct. The hepatic region has a well-developed anterolateral spine. There are also two spines on the lateral margin of the anterior branchial region and three on that of the posterior branchial region.

The basal segment of the antennule (Fig. 1b) is armed with three distal marginal spines, the one on the inner margin being rather slender. The first segment of the antennal peduncle (Fig. 1c) extends anteriorly to form a strong spine. The second segment is armed with both inner and outer marginal spines, but the third segment is without any spine.

The ischium of the third maxilliped (Fig. 1d) is nearly as long as the merus, its outer margin is prolonged to form a spine and the inner margin has a short spine distally. The inner toothed ridge has about 26 closely placed denticles. The merus is armed with two inner marginal spines of large size and with a small outer distal marginal spine. The outer margin of the carpus is unarmed.

The anterior margin of the third thoracic sternite (Fig. 1e) is not produced but rounded with weak denticulation, its middle portion is slightly notched.

The chelipeds (Fig. 1a) are equal in length and shape. They are furnished with long setae and are one and a half times as long as the carapace. The arm has about four inner marginal spines, two longitudinal rows of spinules on the dorsal surface, three or four outer marginal spinules, and a strong spine on the distal margin of the ventral surface. The wrist is spinous on the margins and surface, i.e., three spines on the outer margin, two longitudinal rows of dorsal spinules, each of about six in number, and four spines on the inner margin, the anterior second of which is the largest. The palm is longer than the finger, being armed with spinules on both margins and one or two rows of spinules dorsally. The fingers are not gapped in either sex. The movable finger is equal to the wrist in length, with a spine on the inner distal margin.

The ambulatory legs are sparsely furnished with short setae. The merus of the first ambulatory leg has eight to ten spines on the outer margin, and a single spine on

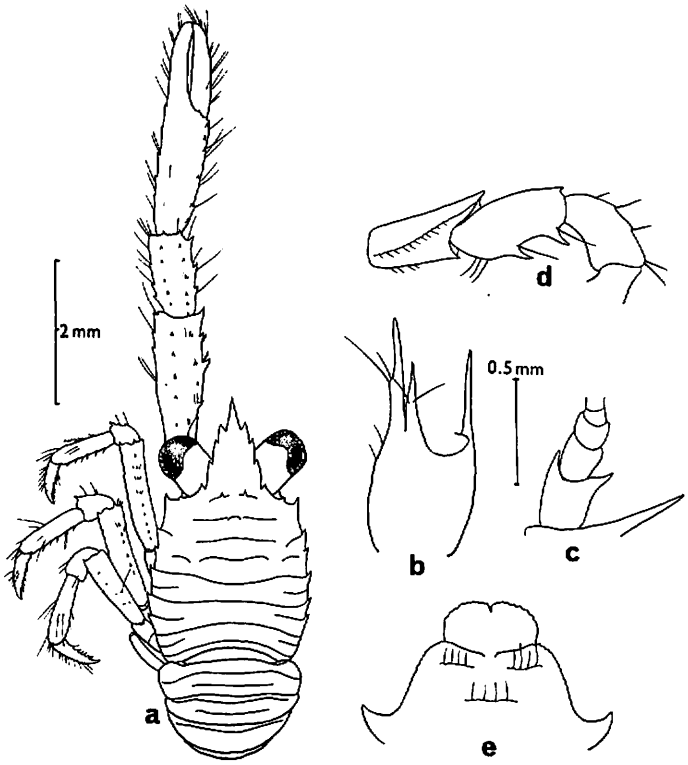

Fig. 1. *Galathea rufipes* Milne Edwards & Bouvier; *a*, animal in dorsal view; *b*, basal segment of right antennule; *c*, right antennal peduncle; *d*, endopod of right third maxilliped; *e*, anterior part of sternal segments.

the distal end of the inner margin. The carpus bears three or four spines on the outer margin; its inner margin does not form a spine at the distal corner. The propodus is sparsely furnished with long setae, chiefly on the outer and distal margins, its inner margin bearing six or seven movable spines. The dactylus is setose and serrated into six or seven teeth on the inner margin, with broad setae springing from their bases. The second and third ambulatory legs are similar to the first in shape, but weak in armature. The merus of the third is almost smooth on the outer margin but has a single spine dorsally.

Epipods are present only on the first pair of pereiopods.

Measurements: The largest male attains 4.3 mm and the largest ovigerous female 3.8 mm in carapace length.

Remarks: The present material agrees with MILNE EDWARDS' and BOUVIER's diagnoses and illustrations with some exceptions as follows: (1) In the present material the fingers of the cheliped are not gapped in either sex and are slightly shorter than the palm, whereas in that of MILNE EDWARDS and BOUVIER, where the descriptions and figures were originally based upon the male specimen, the fingers are strongly gapped and about half as long as the palm. (2) The outer margin of the merus of the

third maxilliped is armed with a single spine distally in the present material, but with two spines in that of the French workers.

Distribution: The species has been taken from the Gulf of Gascogne, the Azores, and the Cape Verde Islands, in depths of 52 to 629 m.

Galathea capillata n. sp.

(Fig. 2)

Material:

"Atlantide" St. 145, off French Guinea (9°20'N, 14°15'W), 32 m, shells, 13 Apr. 1946. —17 ♂♂, 6 ovig. ♀♀, 9 ♀♀ (holotype: ovig. ♀; 1 ♂, 1 ovig. ♀, ZLKU 14306).
St. 147, off French Guinea (9°28'N, 14°58'W), 45 m, shells and foraminiferans, 14 Apr. 1946.—1 ♂.

Diagnosis: Rostrum flat, broad at base, devoid of tubercles dorsally, with four lateral teeth. Outer orbital angle with a spinule.

Carapace furnished with plumose setae dorsally, without gastric spines but armed with anterolateral spines, two or three spines on anterior branchial region and two to four on posterior branchial region.

Basal antennular segment with three terminal spines. First segment of antenna with a minute spine, and third segment with an inner distal marginal spine.

Merus of third maxilliped more than twice as long as ischium, with four minute spines on distal third of inner margin, and one outer distal marginal spine.

Third thoracic sternite of rectangular shape with a notch at middle of anterior margin.

Chelipeds short, somewhat depressed, with long coarse, and plumose setae. Fingers not gapped. Ambulatory legs comparatively short and broad, thickly furnished with plumose setae. Inner margin of dactylus with three or four spines, each with a broad seta.

Epipods present on first three pairs of pereiopods.

Description of holotype (ovigerous female): The rostrum is as long as broad and widened at the base, being about half as broad as the carapace. The lateral margin has four teeth, the basal of which is the smallest. The central tooth is serrated marginally. The dorsal surface is flat, squamiferous without scaly tubercles but with short setae and long setae, particularly near the angles between the lateral teeth. The outer orbital angle is armed with a spinule.

The carapace, excluding the rostrum, is as long as broad. The dorsal surface is sparsely furnished with long plumose setae which are particularly thick on the gastric region and on the mid-transverse ridges. There is no spine on the gastric region. The hepatic region is armed with an anterolateral spine only. There are also two or three

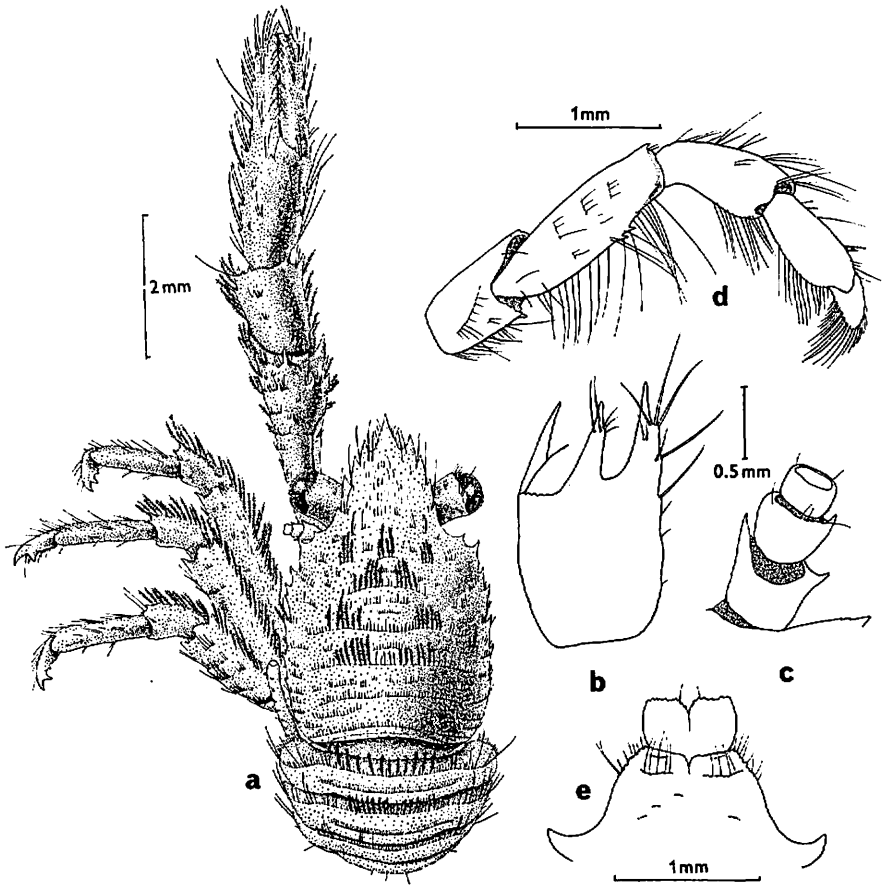

Fig. 2. *Galathea capillata* n. sp., paratype, ♂; *a*, animal in dorsal view; *b*, basal segment of left antennule; *c*, right antennal peduncle; *d*, endopod of right third maxilliped; *e*, anterior part of sternal segments.

marginal spines on the anterior (two on the left, three on the right), and three on the posterior branchial region.

The abdominal segments are very setose, with plumose setae.

The basal segment of the antennule has three stout spines on the distal margin, the outermost being the largest. The first segment of the antenna bears a minute spine on the distal corner. The second segment is armed with minute spines on both the outer and the inner distal margins. The third segment has an inner distal marginal spine.

The ischium of the third maxilliped is half as long as the merus, with two inner distal marginal spines, its inner toothed ridge bearing about 18 denticles. The merus has on the distal third of the inner margin four small spines of which the distal two tend to disappear; its outer margin is also spined at the distal corner. The carpus is smooth and unarmed.

The sternum of the third thoracic somite is of rectangular shape with a notch at the median part of the anterior margin.

The chelipeds are rather short, being slightly longer than the carapace. They are somewhat depressed and have long coarse setae particularly on the margins and ventral surface. The arm abruptly becomes small toward the base, bearing about seven dorsal spines, one inner distal marginal spine of large size and three stout outer distal marginal spines. The margins and dorsal surface are furnished with short plumose setae. The wrist is slightly longer than broad and setose with plumose setae, with two rows of spines dorsally, each of four spines, and also with two outer marginal and two inner marginal spines, the proximal one of the latter being well developed. The palm is one and a half times as long as broad and shorter than the movable finger. It is slightly tuberculous dorsally, without plumose setae but with long coarse setae, and armed with about four outer marginal and four inner marginal spines, and a single spine at the anterior margin which articulates with the movable finger. The fingers, being not gapped, have tubercular teeth on the cutting edge and are furnished with coarse setae, particularly on the dorsal surface close to the cutting edge. The movable finger has about five marginal spines, the distal one of which is rather in eminence. The immovable finger bears about four marginal spines.

The ambulatory legs are comparatively short and broad, and are thickly furnished with plumose setae. In the first pair the merus is broad, not scaliform, and has about eight spines on the outer margin, three on the inner margin and another one situated inside of the inner distal marginal spine. The carpus has five spines and a spinule on the outer margin, its inner margin being smooth at the distal corner. Two or three tubercular teeth are also present on the dorsal surface. The propodus has on the inner margin three spines which are slender and movable. The dactylus bears on the inner margin three or four spines, each with a broad seta, of which the distal spine is particularly developed. The second ambulatory leg is quite similar to the first. The third is shorter than the preceding legs and weak in armature, so that the merus has about five outer marginal and two inner marginal spines, and two or three tubercular teeth on the dorsal surface.

The eye is furnished with plumose setae.

Epipods are present on the first three pairs of pereiopods.

Measurements of holotype (in mm):

Length of carapace including rostrum	9.4
Breadth of carapace	6.1
Length of rostrum	2.9
Breadth of rostrum	2.7
Length of cheliped	17.7
Length of wrist	2.8
Length of palm	3.5
Breadth of palm	2.0
Length of movable finger	4.1

Remarks: The species is very allied to *Galathea squamifera* Leach, from which it is distinguished by the following characters: (1) In *G. squamifera* the body is of large size with many striae on the carapace, and the cheliped and rostrum each bear scaly tubercles, while the present species is small with fewer and incomplete striae on the carapace, and the cheliped and rostrum lack scaly tubercles. (2) *G. squamifera* has two gastric spines, but in *G. capillata* the gastric region is smooth without any spines. (3) In *G. squamifera* the merus of the third maxilliped bears a large spine at the distal end of the inner margin, however, in the present species the distal spine on the inner margin is small and not so developed as in the former species.

Galathea venusta n. sp.

(Fig. 3)

Material:

"Atlantide" St. 125, off Belgian Congo (5°02'S, 11°14'E), 55 m, mud, 7 Mar. 1946.—2 ♂♂ (holotype: larger ♂).

Diagnosis: Rostrum long, flat and smooth dorsally, with four lateral teeth. Outer orbital angle unarmed.

Carapace longer than broad, sparsely furnished with long setae. Gastric region with three or four spines on first transverse ridge and two on both edges of second transverse ridge. Lateral margin armed with six spines, two of them on hepatic region, one on anterior branchial and other three on posterior branchial region.

Basal antennular segment with two outer terminal spines only. First segment of antennal peduncle with a prolonged spine, and third segment without any spine.

Merus of third maxilliped as long as ischium, with two inner marginal and two outer marginal spines.

Third thoracic sternite roughly rectangular and embayed at anterior margin.

Chelipeds about one and a half times as long as carapace, somewhat cylindrical, and furnished with long setae. Fingers gapped or not gapped. Ambulatory legs slender, with few setae. Inner margin of dactylus serrated, with six broad setae.

Epipods present on first three pairs of pereiopods.

Description: The rostrum is long, being almost twice as long as broad. The lateral margin is armed with four teeth, the basal of which is smaller than the anterior three. The dorsal surface is flat and smooth. The outer orbital angle is smooth and unarmed.

The carapace, not including the rostrum, is longer than broad, rather smooth, and sparsely provided with long plumose setae dorsally. The gastric region has three spines on the first transverse ridge. Behind these are two spines which are situated at both ends of the second transverse ridge. The hepatic region bears a well-developed anterolateral spine and a small marginal spine, the latter being situated behind the former and slightly dorsal in position. There is also a single spine behind the insertion of the antenna and below the second hepatic marginal spine. The anterior

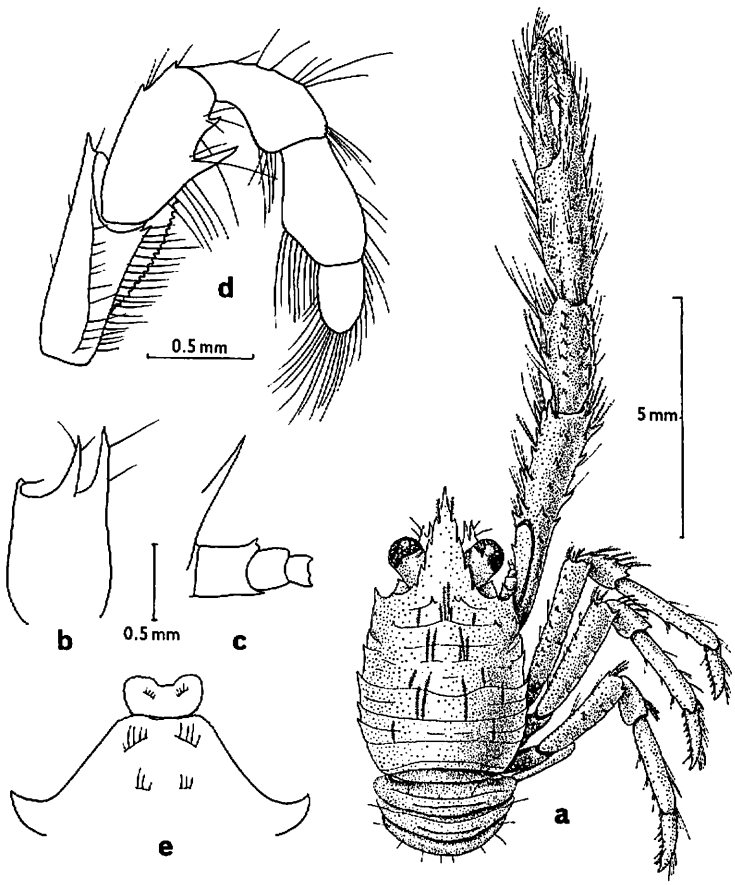

Fig. 3. *Galathea venusta* n. sp., holotype, ♂; *a*, animal in dorsal view; *b*, basal segment of left antennule; *c*, left antennal peduncle; *d*, endopod of right third maxilliped; *e*, anterior part of sternal segments.

branchial region has a single spine laterally and lacks a spine at its anterior corner; the posterior branchial region has three marginal spines.

The basal segment of the antennular peduncle (Fig. 3 b) has two outer distal marginal spines of equal size, without any spines on the inner margin. The spine on the first segment of the antenna (Fig. 3 c) is greatly prolonged anteriorly. The second segment has a small spine on each of the inner and outer distal marginal angles; the third segment does not bear any spine.

The ischium of the third maxilliped (Fig. 3 d) is as long as the merus, with a small spine at each distal marginal angle. The inner toothed ridge has about 26 denticles. The merus has two inner marginal spines, the proximal one being the larger and situated at the middle. It is also armed with two spinules on the distal half of the outer margin.

The third thoracic sternite (Fig. 3 e) is roughly rectangular and embayed at the anterior margin.

The chelipeds (Fig. 3 a) are equal in length and shape, about one and a half times as long as the carapace, spinose and furnished with long setae. The arm is long, sparsely furnished with plumose setae among coarse setae, and very spinous; the spines are rather acute. The wrist is shorter than the movable finger and armed with three inner marginal, four or five outer marginal and three ventral spines, and two longitudinal rows of spinules dorsally each of about six in number, the inner margin being sparsely furnished with plumose setae. The palm is as long as the movable finger and has six outer marginal spines and a longitudinal row of dorsal spinules which is close to the smooth inner margin. The fingers are gapped on both left and right sides, with a slightly produced tubercular tooth at the proximal portion of the cutting edge of the movable finger.

The ambulatory legs are rather slender and furnished with few setae. The merus of the first ambulatory leg is devoid of long setae and has plumose ones only on the distal margin; it bears eight spinules on the outer (upper) margin, its inner (lower) marginal angle also being spined. The carpus is weakly raised longitudinally on the dorsal surface and has five outer marginal spines, with long plumose setae. The propodus has four inner marginal spines which are all slender and movable. The inner margin of the dactylus is serrated, with about six broad setae. The second ambulatory leg is similar to the first, but the meral spines are very minute and the carpal spines entirely absent. The third leg is more weak in armature than the second, so that the merus lacks marginal spines except for distal ones but has a single dorsal spine. The distal two segments of the first three pairs of legs are equal in armature.

Epipods are present on the first three pairs of pereiopods.

Measurements of holotype (in mm):

Length of carapace including rostrum	6.5
Breadth of carapace	3.7
Length of rostrum	2.4
Breadth of rostrum	1.5
Length of cheliped	14.5
Length of wrist	2.5
Length of palm	3.3
Breadth of palm	1.2
Length of movable finger	3.3

Remarks: The species is closely related to *Galathea intermedia* Lilljeborg in the shape of the antennule, but it differs in the following respects: (1) In *G. intermedia* the epipods are present only on the first pair of pereiopods, but the present species has them on the first three pairs of pereiopods. (2) The anterior branchial region has two or three marginal spines in *G. intermedia*, however, in *G. venusta* it bears only one, and is without a spine at the anterior marginal end. (3) In the third maxilliped, the merus of *G. intermedia* is twice as long as the ischium, while that of the present species is as long as the ischium.

Galathea wolffi n. sp.

(Fig. 4)

Material:

"Atlantide" St. 120, off Rio Muni, Spanish Guinea (2°09'N, 9°27'E), 260–650 m, mud, 1 Mar. 1946.—3 ♂♂, 4 ovig. ♀♀, 1 ♀ (holotype: ovig. ♀; 1 ♂, 1 ovig. ♀, ZLKU 14308).

Diagnosis: Rostrum flat, narrow and scaly dorsally, with four lateral teeth. Outer orbital angle unarmed.

Carapace as long as broad, rugose, flattened and covered with coarse setae. Four or five spines or spinules on hepatic margin, three spines on anterior branchial, and three spines and one spinule on posterior branchial margin. No spines on gastric region.

Basal antennular segment with two outer terminal spines, no inner spine. First segment of antennal peduncle with a short spine, third segment lacking spine.

Merus of third maxilliped slightly shorter than ischium, with two inner marginal spines of large size and two outer marginal spinules.

Third thoracic sternite of triangular shape with a notch at anterior median margin.

Chelipeds somewhat depressed, robust, squamiferous and thickly furnished with plumose setae. Fingers not gapped. Ambulatory legs robust, squamiferous and furnished with plumose setae. Inner margin of dactylus with seven spines, each with a broad setae.

Epipods present on first three pairs of pereiopods.

Description of holotype (ovigerous female): The rostrum (Fig. 4 a) is narrow and scale-like, being about twice as long as broad. The lateral margin is armed with four teeth, the basal of which is well developed. The outer orbital angle is rounded and unarmed.

The carapace is as long as broad, not including the rostrum. The dorsal surface is rugose, flattened and covered with coarse setae. The hepatic region is armed with two spines and three spinules laterally. Three spines are placed on the side of the anterior branchial region. The posterior branchial region has three marginal spines of large size, and an accessory small spine is present between the first and the second marginal spines on the right side.

The eye has a circlet of well-developed setae which cover the corneal region.

The basal segment of the antennule (Fig. 4 b) bears two spines distally, the inner distal marginal angle being smooth without any spine. The first segment of the antennal peduncle (Fig. 4 c) has a short spine. The second segment bears an outer marginal and an inner distal marginal spine, the third segment has no spine.

The ischium of the third maxilliped (Fig. 4 d) is slightly longer than the merus, with a small spine at the inner distal marginal angle, its inner toothed ridge bearing about 21 closely placed denticles. The merus is furnished with long setae, two inner

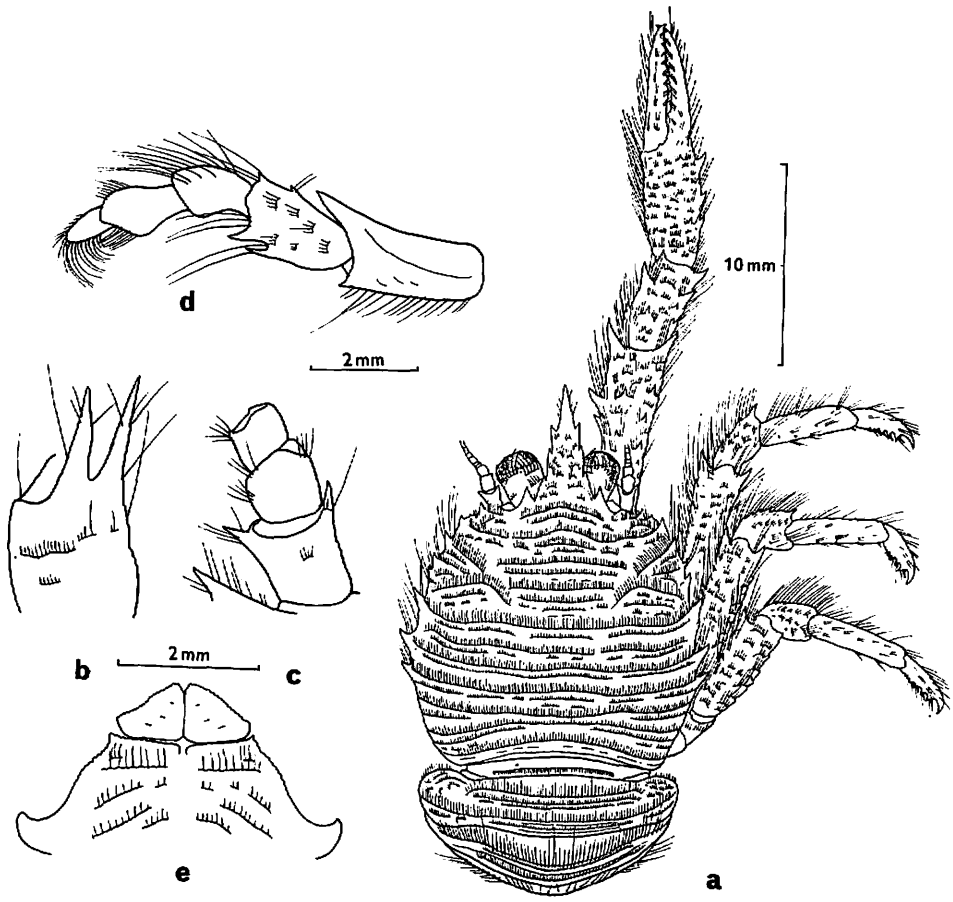

Fig. 4. *Galathea wolffi* n. sp., holotype, ovig. ♀; *a*, animal in dorsal view; *b*, basal segment of left antennule; *c*, left antennal peduncle; *d*, endopod of left third maxilliped; *e*, anterior part of sternal segments.

marginal spines of large size and two outer marginal spinules. The carpus is unarmed and equal to each of the distal two segments in length.

The third thoracic sternite (Fig. 4 e) to which the third maxilliped attaches, is of triangular shape with a notch at the minutely dentated anterior margin.

The chelipeds (Fig. 4 a) are equal in length and shape, nearly as long as the carapace, depressed, robust, squamiferous above and thickly furnished with plumose setae. The arm is spinous, the outer distal marginal and inner two marginal spines being constantly large. The wrist is shorter than the movable finger, and has three inner marginal spines, the median being the largest. Spines or spinules are also placed on the dorsal surface and lined up longitudinally in two rows. The palm is as long as the movable finger, with three large outer marginal spines, four inner marginal and four dorsal spinules. The fingers are not gapped, and are unarmed and furnished

with non-plumose, coarse setae, having the cutting edges with rather large tubercular teeth. The tips of the fingers are sharp and cross each other.

The ambulatory legs are very robust, squamiferous and furnished with plumose setae particularly on the outer (upper) margin. In the first pair, the merus has eight spines on the outer margin, and two on the inner (lower) margin. The carpus bears five outer marginal spines, the dorsal surface having no spine but being slightly raised, with short setae. The inner margin of the propodus has a pair of spines distally. The dactylus is armed with seven spines which decrease in size proximally, and a broad seta springs from each of the bases of the spines. The second pair of ambulatory legs is similar to the first. The third pair is weak in armature, so that the merus has one outer distal marginal spine and three dorsal spines, and the carpus has a smooth outer margin. The distal two segments of the third pair of legs are similar to those of the preceding two pairs.

Epipods are present on the first three pairs of pereiopods.

Measurements of holotype (in mm):

Length of carapace including rostrum	18.3
Breadth of carapace	13.8
Length of rostrum	5.7
Breadth of rostrum	2.9
Length of cheliped	31.5
Length of wrist	4.7
Length of palm	6.7
Breadth of palm	2.9
Length of movable finger	6.7

Remarks: The species is very allied to *Galathea strigosa* (Linnaeus) and *G. faiali* Nunes-Ruivo in the general appearance, but it is distinguished from them by the following characters: (1) The epipods are not present on any of the pereiopods in *G. strigosa*, and only on the first pair in *G. faiali*, whereas they are present on the first three pairs in *G. wolffi*. (2) The carapaces of both *G. strigosa* and *G. faiali* are armed with spines dorsally, while that of *G. wolffi* entirely lacks spines. (3) The basal rostral tooth of *G. wolffi* is well developed and comparatively larger than those of the other two species.

Munida curvimana Milne Edwards & Bouvier, 1894

Munida curvimana Milne Edwards & Bouvier, 1894a, p. 256;—1900, p. 287, pl. 29, figs. 12–16; Holthuis & Gottlieb, 1958, p. 75, fig. 14; Nunes-Ruivo, 1961, p. 10, fig. 3, a–d, pl. 1, b.

Munida Rondeletii: Osólio, 1923, p. 58, pl. 16, fig. 3.

Material:

Mortensen Coll., off Las Palmas, Gran Canaria, ca. 150–160 m, 25 Mar. 1930.—13 ♂♂, 3 ovig. ♀♀, 7 ♀♀.

Porto de la Luz, Gran Canaria, ca. 200 m, 2 Apr. 1930.—53 ♂♂, 20 ovig. ♀♀, 16 ♀♀ (1 ♂, 1 ovig. ♀, ZLKU 14310).

Measurements: The largest male measures 14.3 mm, and the largest ovigerous female 11.9 mm in carapace length.

Remarks: All of the specimens agree well with the descriptions and illustrations given by MILNE EDWARDS & BOUVIER (1894a, 1900), as well as those by the subsequent workers. No additional characters of significance were noted.

Distribution: The species has been taken from off the coasts of Portugal, Morocco, Cape Spartel, Cape Branc, Branc Islet, Madeira and Haifa Bay, Mediterranean, in depths of 48 to about 280 m.

Munida tenuimana Sars, 1872

(Fig. 5)

Munida tenuimana Sars, 1872, p. 257;—1883, p. 44, pl. 1, fig. 6; APPELLÖF, 1906, p. 139, pl. 2, fig. 2; HANSEN, 1908, p. 34, pl. 2, fig. 4 a, pl. 3, fig. 1 a; SELBIE, 1914, p. 77, pl. 11, figs. 15, 16; STEPHENSEN, 1935, p. 43, 76; BRINKMANN, 1936, p. 14, pl. 5, fig. 18 b; STEPHENSEN, 1939, p. 12; ZARIQUIEY, 1952, p. 197, fig. 6; RIEDL, 1963, p. 283, pl. 96.

Material:

Figueira Coll., off Funchal, Madeira, Lobster-pot, ca. 300 m, 27 June 1961.—1 ♀.

Measurements: The carapace, including the rostrum, is 18.7 mm long and 9.2 mm broad.

Remarks: The present material agrees well with HANSEN's description and illustrations (1908). BRINKMANN (1936) illustrated the merus of the third maxilliped and showed no spine at the distal end of the outer margin. However, the only specimen examined here bears a small spine at the same place. The species is well marked by its short and small cheliped.

Distribution: The species is known from the Davis Strait, west of Greenland, west and south of Iceland, Norwegian fjords, Skagerrak, the Shetlands and off Ireland in depths of 95 m to 1460 m. Recently RIEDL (1963) described it from the Adriatic Sea, Mediterranean, in depths of 400 to 1000 m.

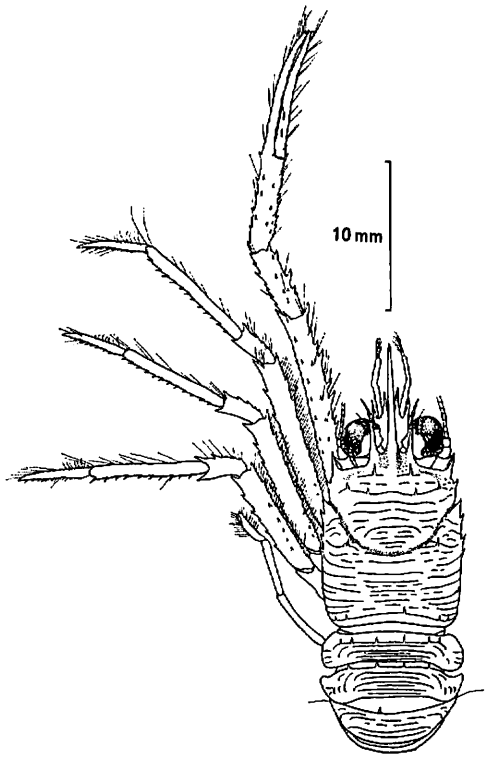

Fig. 5. *Munida tenuimana* Sars, in dorsal view.

Munida speciosa von Martens, 1878

(Fig. 6)

Munida speciosa von Martens, 1878, p. 133; STUDER, 1883, p. 28, pl. 2, fig. 14 a, b; ODHNER, 1923, p. 14; BARNARD, 1950, p. 492.

Material:

"Atlantide" St. 120, off Rio Muni, Spanish Guinea (2°09'N, 9°27'E), 260–650 m, mud, 1 Mar. 1946.—5 ♂♂, 4 ovig. ♀♀ (1 ♂, ZLKU 14312).

"Galathea" St. 92, off River Congo (6°40'S, 11°35'E), 380 m, sand and mud, many fragments of corals, 10 Dec. 1950.—1 sp.

Bourdon Coll., off Kayar, Senegal, 200 m, 23 June 1960.—2 ♀♀.

Description: The rostrum measures about one-third of the carapace length. It is spiniform and directed slightly upwards. The supraorbital spine terminates midway on the rostrum, diverging slightly outwards.

The carapace is slightly longer than broad and irridescent above. The cervical groove is distinct. On the epigastric region there are one pair of large spines and two or three spines at each side of the large pair. Behind these are two spines laterally. The hepatic region has a well-developed anterolateral spine and a small marginal

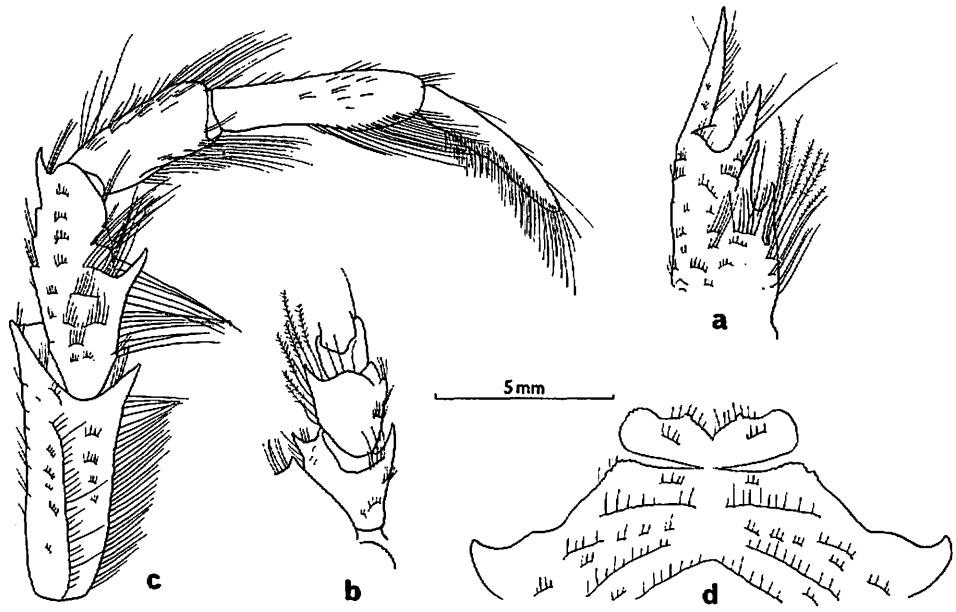

Fig. 6. *Munida speciosa* von Martens; *a*, basal segment of left antennule; *b*, left antennal peduncle; *c*, endopod of right third maxilliped; *d*, anterior part of sternal segments.

spine behind it. Three spines are on the lateral margin of the anterior branchial region and two on that of the posterior branchial region. There are two spines and sometimes additional spinules behind the bifurcation of the cervical groove. The postcervical spines are usually four in number, two of them sometimes being small or lacking.

The eye is well dilated, without a circlet of setae.

The second abdominal segment has nine to 15 tubercles dorsally, and the third four to nine tubercles.

The basal segment of the antennule (Fig. 6 a) is robust, with a large spine on the inner distal margin and three spines on the outer margin. The surface is scaly and the outer margin is thickly covered with long setae, those of the proximal portion being fairly plumose. The first segment of the antenna (Fig. 6 b) has only a small spine. The second segment has a slightly developed distal marginal spine on each side, and the third segment an inner distal marginal spine.

In the third maxilliped (Fig. 6 c) the ischium is about as long as the merus, with a developed spine on the inner distal margin. The merus is moderately setose and has a large median spine on the inner margin, its outer margin bearing a well-developed distal spine and three or four eminences. The distal three segments are not flat but rather cylindrical. The sternal segment (Fig. 6 d) of the third thoracic somite is notched at the median of the anterior margin and has one or two tubercles on the anterior margin.

The cheliped is rather slender and subcylindrical, attaining about 2.5 times the

length of the carapace. The surface is scaliform, devoid of long setae and covered with fine setae on the scales. The arm is spinous with setae on the proximal half of the inner margin. There are six strong spines on the inner margin, eight on the dorsal surface and one on the outer margin; 11 spines are also present on the inner margin close to the ventral surface. The wrist is smooth on both margins, with three large spines on the distal margin, which articulates with the palm. The palm has eight inner marginal spines, the distal portion of which lacks spines. There are also two spines on the outer margin and a single spine on the distal portion of the dorsal surface. The fingers are not gapped; their cutting edges are tuberculous. The movable finger is shorter than the palm and about 2.5 times as long as the wrist. It bears a small spine on the proximal portion of the outer margin and two spines on the ventral surface close to the outer margin.

The ambulatory legs are covered with short setae on the outer margin. The merus of the first pair is scaly above and bears 11 outer marginal spines and one inner marginal spine; the latter is situated at the distal end and is well developed. The carpus is also scaly dorsally, with a large and a small outer marginal spine, and a well-developed inner marginal spine which is situated at the distal end. The propodus is slender, with 20 to 30 notches on the inner margin. The dactylus is serrated on the inner margin, with short broad setae, and is setose on the distal half of the outer margin and on the dorsal surface. The second pair of legs is similar to the first. The third pair is rather weak in armature; the merus has eight to ten spines on the outer margin, and its inner distal marginal end is similar to the preceding legs.

Epipods are absent from all the pereiopods.

Measurements: The largest male measures 39.8 mm and the largest ovigerous female 37.0 mm, from the tip of the rostrum to the posterior margin of the carapace.

Remarks: As no detailed description of the species has been given previously, a full description has been presented here. Illustrations of the animal are shown in STUDER (1883).

The species is very allied to *Munida iris rutllanti* Zariquiey in the armature of the carapace, from which it differs in the following respects: (1) In *M. iris rutllanti* the merus of the third maxilliped bears three inner marginal spines of equal size, while it has a large spine in *M. speciosa*. (2) The second abdominal segment of *M. iris rutllanti* is armed with about seven tubercular teeth dorsally and the third is smooth or sometimes two-tubercled, however, the present species bears a series of tubercles on each of the second and third abdominal segments. These facts were confirmed by the examination of a specimen of *M. iris rutllanti* from the Mediterranean supplied through the courtesy of Dr. R. BOURDON. A young specimen having a carapace 6.0 mm long was taken from "Galathea" St. 92. This specimen has fewer transverse ridges on the carapace and is weak in armature of the abdominal segments, so that the second segment is armed with four spines or tubercles on the anterior stria and the third segment with four slight eminences.

Distribution: The species has been taken from the Bijagos Islands, off Portuguese Guinea and Port Alexander, Angola, in 270 m depth.

Munida guineae n. sp.

(Fig. 7)

Material:

"Atlantide" St. 120, off Rio Muni, Spanish Guinea (2°09'N, 9°27'E), 260–650 m, mud, 1 Mar. 1946.—3 ♂♂, 1 ovig. ♀♀, 1 ♀ (holotype: ♂; 1 ♂, ZLKU 14313).

Diagnosis: Rostrum slightly sigmoid and stout. Carapace longer than broad and robust dorsally. Gastric region with three pairs of spines. Lateral margin with seven spines, two of them on hepatic region, four on anterior branchial and other one on posterior branchial region. Two postcervical spines.

Eyes well dilated, without circlet of setae.

Second, third and fourth abdominal segments armed with six, four and four spines, respectively.

Basal antennular segment with three spines on outer margin; inner terminal spine not present. First segment of antenna with a short spine, and third segment without any spine.

Third maxilliped sparsely setose. Merus shorter than ischium, with a large spine at middle of inner margin.

Chelipeds long, cylindrical, spinous and covered with plumose setae. Ambulatory legs robust and furnished with plumose setae, especially on merus, carpus and propodus. Inner margin of dactylus weakly serrated, with seven to 11 short broad setae.

Epipods absent from all pereiopods.

Description of holotype (male): The rostrum (Fig. 7 a) is rather stout, not horizontal but slightly sigmoid. The supraorbital spine curves upwards and slightly outwards, not quite reaching the middle of the rostrum.

The carapace, exclusive of the rostrum, is longer than broad and rather robust dorsally. The epigastric region is transversely armed with three pairs of spines, the median pair being larger than the others. Behind this transverse row are four spinules on the second transverse ridge, two of them at both edges being tuberculous. The hepatic region has two spines laterally; one of them is a well-developed anterolateral spine. The anterior branchial region bears four spines on the lateral margin and a minute one behind the bifurcation of the cervical groove. The posterior branchial region has a single marginal spine. There is also a pair of postcervical spines.

The eyes are well developed and dilated, without a circlet of setae.

The second, third and fourth abdominal segments have on their anterior transverse ridges six, four and four spines, respectively.

The basal segment of the antennule (Fig. 7 b) is prolonged, with three spines on the outer margin, the distal two of them being very long. The inner distal marginal

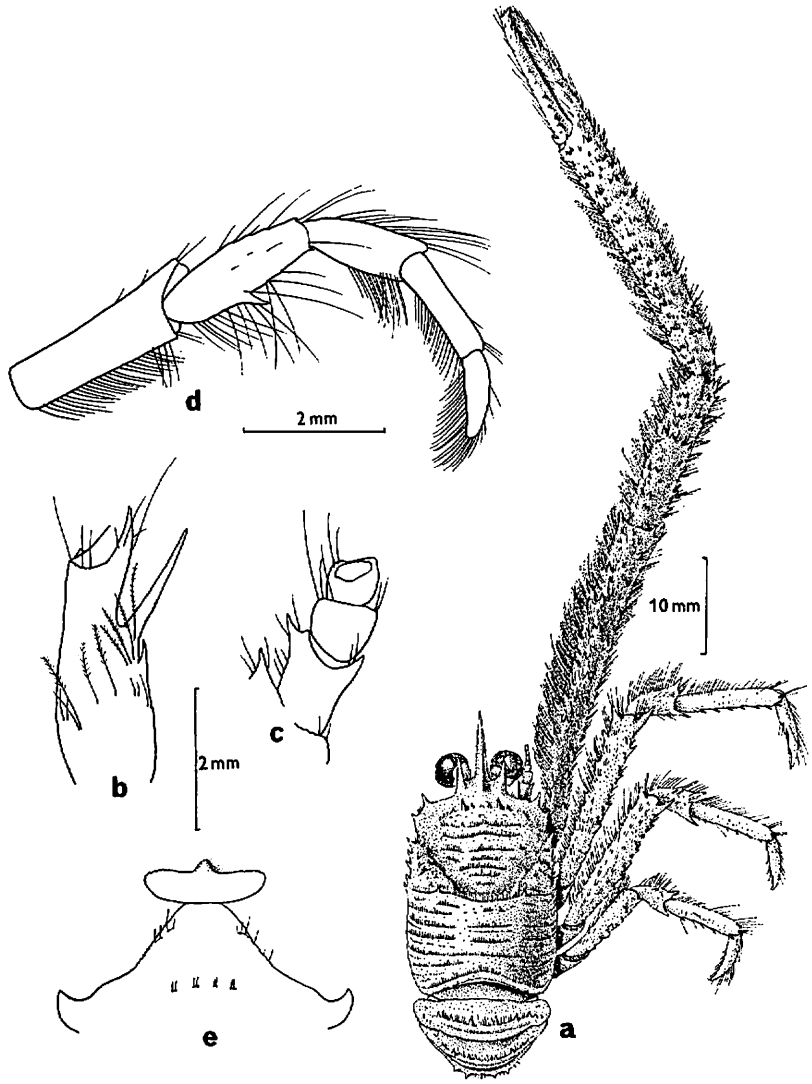

Fig. 7. *Munida guineae* n. sp., holotype, ♂; *a*, animal in dorsal view; *b*, basal segment of left antennule; *c*, left antennal peduncle; *d*, endopod of right third maxilliped; *e*, anterior part of sternal segments.

angle slightly protrudes anteriorly but does not form a spine. The first segment of the antennal peduncle (Fig. 7 c) has a short spine on the lower distal margin. The third segment does not bear any spine.

The third maxilliped (Fig. 7 d) is sparsely setose. The merus is shorter than the ischium, with a large spine at the middle of the inner margin, the outer margin having no spine.

The sternum of the third thoracic segment (Fig. 7 e) is prolate with a prominent projection at anterior median margin.

The chelipeds (Fig. 7 a) are cylindrical, robust, spinous, almost three times as long as the carapace, and thickly covered with plumose setae. The arm bears eight inner marginal spines, two rows of dorsal spines, and one outer distal marginal spine. There are also six spinules ventrally which are situated rather close to the outer margin. The wrist is as long as the movable finger, with seven outer marginal spines which are not lined up in a row, seven dorsal and four inner marginal spines, the ventral surface also having about five spines. The palm is robust, with two rows of dorsal spinules, one of them is very close to the inner margin and composed of about 14 spinules and the other is situated at the median line, composed of 12 spinules. The inner margin has nine spines of small size, the outer margin including the immovable finger bears 21 spines which are not regularly lined up, two of them being constantly situated at the tip of the immovable finger. The fingers are not gapped, their tips are curved inwards towards each other. The movable finger is about two-thirds of the length of the palm; it bears a rather large spine at the proximal portion of the inner margin and about ten spinules or tubercles on the dorsal surface close to the non-cutting margin.

The ambulatory legs are also robust, slender, and thickly furnished with plumose setae chiefly on the merus, carpus and propodus. In the first pair, the merus has on the outer (upper) margin 12 spines which decrease in size towards the base of the segment, and on the inner (lower) margin four spines, the distal of which is strongly developed. The carpus has three outer marginal spines and one inner marginal spine of large size which is situated at the distal end. The propodus is armed with seven movable spines on the inner margin. The dactylus is very weakly serrated on the inner margin, with 11 broad setae, each one springing from the base of a serrated tooth. The following two pairs of ambulatory legs are similar to the first but weak in armature. In the second pair the merus bears 11 outer marginal and four inner marginal spines, the carpus two outer marginal and one inner distal marginal spines. The propodus and dactylus are similar to those of the first. In the third pair the merus is entirely devoid of spines but very robust. The carpus is more smooth than that of the second pair, with both the inner and the outer distal marginal spines. The propodus bears six inner marginal spines, and the dactylus eight broad setae on the inner margin.

Epipods are absent from all pereiopods.

Measurements of holotype (in mm):

Length of carapace including rostrum	27.6
Breadth of carapace	14.4
Length of rostrum	7.8
Length of supraorbital spine	3.2
Length of cheliped	90.0
Length of wrist	15.3
Length of palm	21.5
Breadth of palm	4.2
Length of movable finger	15.3

Remarks: The species is very allied to *Munida rugosa* (Fabricius), from which it is distinguished by the shape of the basal segment of the antennule. According to ZARIQUIEY (1952), *M. rugosa* (= *M. bamffia*) has the basal antennular segment with a large inner terminal spine. However, in *M. guineae* the inner terminal spine is lacking.

Munidopsis bispinata n. sp.

(Fig. 8)

Material:

"Atlantide" St. 120, off Rio Muni, Spanish Guinea (2°09'N, 9°27'E), 260–650 m, mud, 1 Mar. 1946.—3 ♂♂, 6 ovig. ♀♀, 1 ♀ (holotype: ovig. ♀; 1 ♂, 1 ovig. ♀, ZLKU 14314).

St. 123, off Gabon (2°03'S, 9°05'E), 50 m, mud, 5 Mar. 1946.—1 ♀.

Diagnosis: Rostrum spiniform and curved upwards. Carapace longer than broad and rather convex, with raised or granulated transverse ridges on the posterior third of lateral portions. Gastric region with one pair of spines behind eyes and one or two spines on median line behind that pair. Cardiac spine present. Lateral margin with two spines, one of them anterolateral and other one on anterior branchial region.

Eyes rounded with smooth surface.

Second, third and fourth abdominal segments each armed with a single spine on anterior transverse ridge.

Basal antennular segment with three terminal spines of large size. First segment of antennal peduncle with a minute spine at inner distal margin.

Merus of third maxilliped slightly longer than ischium, with one outer distal marginal and three or four inner marginal spines, distal one of the latter very small.

Chelipeds stout, cylindrical except for distal two segments. Fingers not gapped. Ambulatory legs stout, strigose and setose. Inner magin of dactylus with six to nine spines.

Epipods absent from all pereiopods.

Description of holotype (ovigerous female): The rostrum is well developed, spiniform and curved upwards, with a lateral carina on each side.

The carapace is longer than broad, exclusive of the rostrum. The dorsal surface is rather convex, the regions are somewhat distinct. The gastric region has a pair of spines behind the eyes and one or two spines on the median line behind that pair. There is also a cardiac spine. The lateral margin has a well-developed anterolateral and a rather large branchial spine. The cervical groove is deep medially. The posterolateral parts of the carapace are raised with somewhat granulated transverse ridges.

The eyes are rather rounded, with a smooth surface.

The second, third and fourth abdominal segments each have a single spine on the anterior transverse ridge.

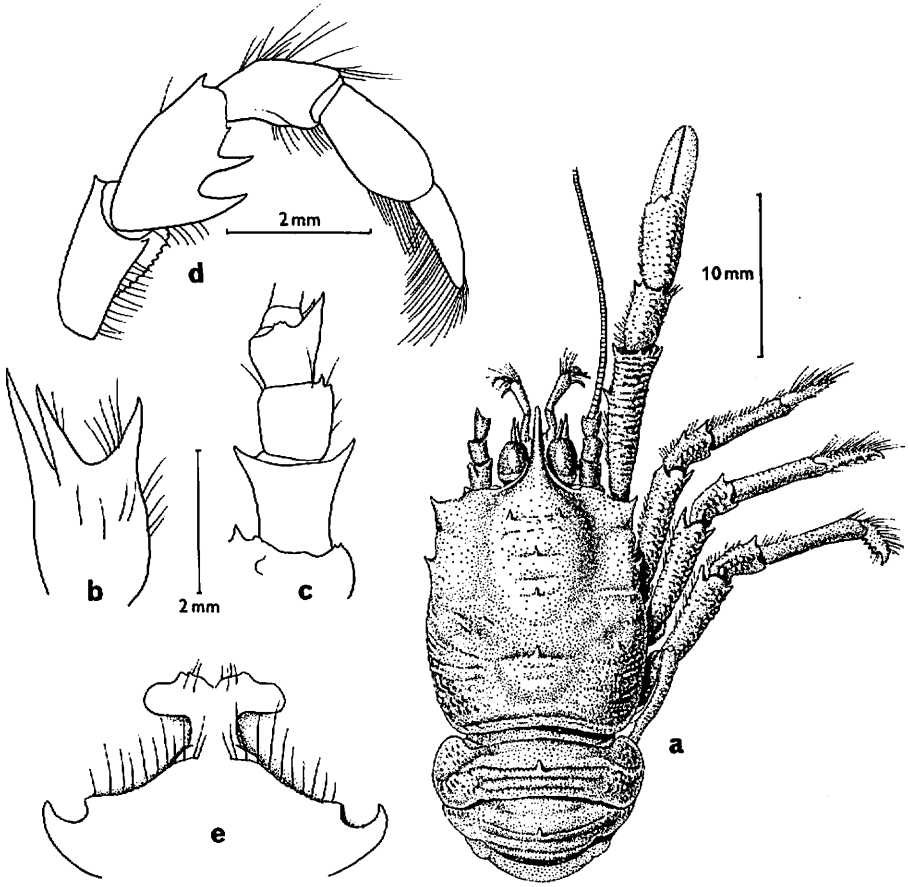

Fig. 8. *Munidopsis bispinata* n. sp., paratype, ovig. ♀; *a*, animal in dorsal view; *b*, basal segment of right antennule; *c*, left antennal peduncle; *d*, endopod of right third maxilliped; *e*, anterior part of sternal segments.

The basal segment of the antennule is armed on the distal margin with three spines of large size, and sparsely furnished with coarse setae. The first segment of the antenna has no anterior prolongation but a small tubercular tooth. The second segment bears an outer distal marginal and an inner distal marginal spine. The third segment has a minute spine on the outer distal margin.

The ischium of the third maxilliped is shorter than the merus, the inner toothed ridge having about 21 closely placed denticles. The merus has the inner margin with three spines, the distal one of which is very minute. It also bears an outer marginal spine distally.

The sternum of the third thoracic segment (Fig. 8e) is a little apart from that of the fourth and laterally expanded, with two elevations anteriorly between which a shallow valley is present. The fourth thoracic sternite is broad and has a narrow, deep hollow on each side with which the cheliped is articulated.

The chelipeds are equal in shape and length, rather stout, rugose and cylindrical except for the two distal segments, and are covered with fine plumose setae. They are about as long as the carapace when measured from the tip of the rostrum to the tip of the finger. The arm has four spines on the distal margin which articulates with the wrist, two of them being on both lateral margins, one dorsal and the other ventral. There are also two spines midway on the inner margin of the left arm but one on the right arm. The wrist is nearly as long as the palm and slightly shorter than the finger, with five spines on the distal margin; four of them are dorsolateral and the other ventral. The palm is somewhat depressed, with a minute spine at the distal margin which articulates with the movable finger. The fingers are not gapped, rather smooth but setose and end in rounded tips. The cutting edges are dentated.

The ambulatory legs are stout, rugose and setose. In the first pair, the merus is very rugose and has an inner and an outer distal marginal spine. The carpus bears two outer marginal spines, its dorsal surface being raised longitudinally. The propodus is not robust, the inner margin is smooth and unarmed. The dactylus is particularly setose on the outer margin, with seven inner marginal spines. The second pair is very similar to the first, with the exception that the carpus has a single outer distal marginal spine and the dactylus bears six inner marginal spines. The third pair is shorter than the preceding two pairs but resembles the second.

None of the pereiopods have epipods.

Measurements of holotype (in mm):

Length of carapace including rostrum	23.2
Breadth of carapace	16.3
Length of cheliped	36.7
Length of wrist	5.2
Length of palm	6.5
Breadth of palm	3.0
Length of movable finger	7.0

Remarks: The species is very allied to *Munidopsis simplex* A. Milne Edwards and *M. curvirostra* Whiteaves in general features, but differs in having two large lateral spines on the carapace.

Munidopsis tropeorhyncha n. sp.

(Fig. 9)

Material:

"Atlantide" St. 120, off Rio Muni, Spanish Guinea (2°09'N, 9°27'E), 260–650 m, mud, 1 Mar. 1946.—1 ♂ (holotype).

Diagnosis: Rostrum triangular and carinated dorsally. Carapace as long as broad exclusive of rostrum, granulated dorsally and divided into distinct regions, without

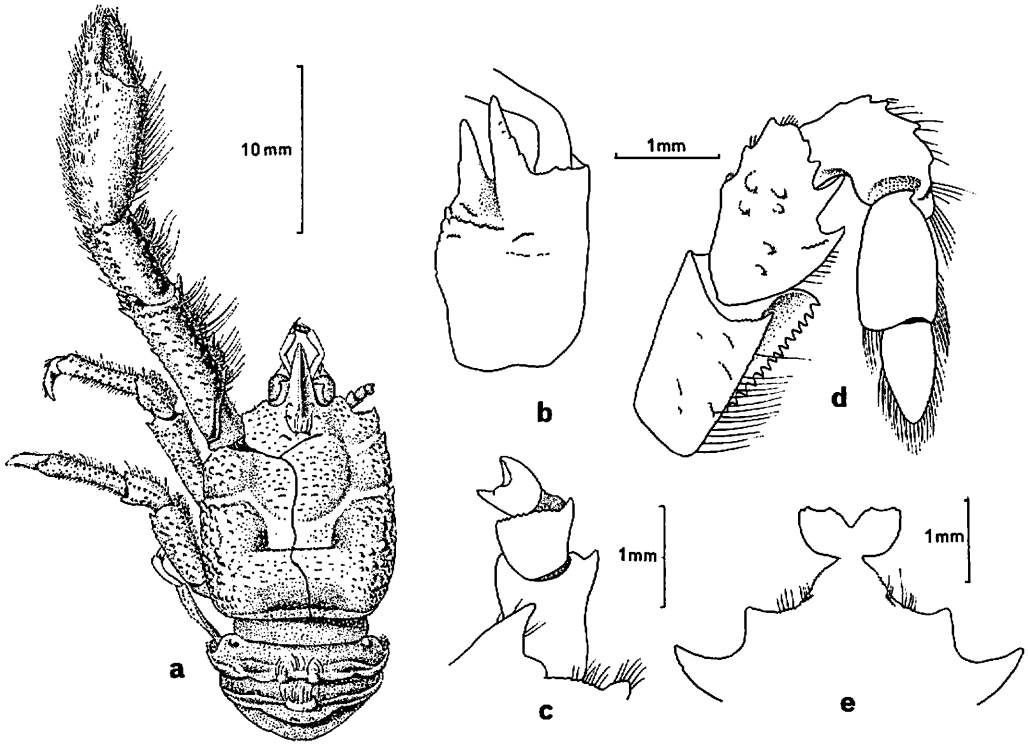

Fig. 9. *Munidopsis tropeorhyncha* n. sp., holotype, ♂; *a*, animal in dorsal view; *b*, basal segment of right antennule; *c*, left antennal peduncle; *d*, endopod of right third maxilliped; *e*, anterior part of sternal segments.

marked spines marginally. Anterior part of gastric region with plumose setae. Eye considerably large with a blunt spine dorsally.

Second and third abdominal segments carinated transversely, each with two tubercles mid-dorsally, the latter segment having also two tubercles behind.

Basal antennular segment with two terminal spines externally. First segment of antennal peduncle with a stout spine at inner distal margin.

Merus of third maxilliped as long as ischium, internally having four spines which decrease in size distally. Carpus toothed externally.

Cheliped stout, depressed, and tuberculated above with long setae. Ambulatory legs covered with tubercles except for dactyli and furnished with fine setae anteriorly.

Epipods absent from all pereiopods.

Description of holotype (male): The rostrum (Fig. 9a) is rather developed and triangular. The dorsal surface is carinated longitudinally with short soft setae.

The carapace, from the base of the rostrum to the posterior margin, is as long as broad. The dorsal surface is considerably vaulted transversely, rugose and granulate, particularly on the lateral portions. The anterior gastric region has a slight elevation

and is furnished with plumose setae. The cervical groove is deep, and the median part just behind the groove is deeply hollowed. The border of the anterior and posterior branchial regions is distinct.

The eye has a blunt spine dorsally.

The dorsal surfaces of both the second and third abdominal segments are carinated transversely. The second segment has two large tubercles on the posterior margin, its lateral side ending in a blunt spine. The third is also armed with two tubercles on the anterior transverse ridge and two small tubercles on the posterior margin.

The basal segment of the antennule (Fig. 9b) is stocky in shape and armed with two spines on the outer distal margin. The antennal peduncle (Fig. 9c) has the first segment produced forwards at the inner terminal angle. The second and the third segments have each a terminal spine of small size externally.

The ischium of the third maxilliped (Fig. 9d) is as long as the merus, with an inner distal marginal spine, its inner toothed ridge bearing 18 closely placed denticles. The merus has four inner marginal spines which decrease in size distally, and also bears three outer marginal spines. The carpus has six outer marginal spines.

The third thoracic sternite (Fig. 9e) has the anterior margin deeply notched. The fourth is broad and has a deep, broad hollow on either side to which the cheliped attaches.

The cheliped (Fig. 9a) is depressed and widened distally, about twice as long as the carapace, and sparsely furnished with long setae. The arm has tubercular teeth, the three inner marginal teeth being of rather large size. The wrist is shorter than the movable finger, with a prominent spine on the inner margin and three rows of tubercular teeth placed longitudinally, one of them being on the outer margin and the other two on the dorsal surface. The palm is broad and rather flattened. It is longer than the movable finger and slightly more than half as long as broad, with about eight spinules placed dorsally near the inner margin. The fingers are not gapped, the cutting edges being armed with large tubercles.

The ambulatory legs are tuberculous above, excepting the dactylus. They are thickly furnished with plumose setae chiefly on the outer margins of the merus and carpus, and with short coarse setae on the other portions. The dactylus is rather smooth with a slightly serrated inner margin.

Epipods are not present on any of the pereiopods.

Measurements of holotype (in mm):

Length of carapace including rostrum	15.8
Breadth of carapace	11.2
Length of cheliped	32.4
Length of wrist	4.9
Length of palm	7.8
Breadth of palm	4.8
Length of movable finger	5.7

Remarks: A single specimen, the carapace of which is damaged to considerable extent, was taken from a muddy bottom. It resembles *Munidopsis media* A. Milne Edwards & Bouvier, but differs from it in the following: (1) In *M. media*, the carapace has two eminent gastric spines and two other spines on the posterior transverse ridge, however, such spines are all absent from the present species. (2) The cheliped of *M. tropeorhyncha* is stout, while that of *M. media* is comparatively small, as seen in illustration given by the French workers (1900, pl. 30, fig. 25). (3) The rostrum is carinated longitudinally in both species, but its lateral margin is denticulated in *M. media* and smooth in the present species.

A LIST OF THE SPECIES KNOWN FROM THE TROPICAL-SUBTROPICAL REGION OF WEST AFRICA, WITH REMARKS ON THE ZOOGEOGRAPHY

As the records for the West African galatheids are scattered, for the sake of convenience we have given a list of all the species known from EKMAN's (1953) tropical-subtropical region of West Africa. Of 31 species recorded from that area, eight species belong to the Guinean fauna or are restricted to tropical West Africa, the region between the Cape Verde Islands (15°N) and the Great Fish Bay, Angola: *Galathea capillata*, *G. venusta*, *G. wolffi*, *Munida speciosa*, *M. tropicalis*, *M. guineae*, *Munidopsis bispinata* and *M. tropeorhyncha*. The other 23 species are referable to the Mauretanian fauna. Eight species of the latter intrude into the Mediterranean but most of the members are littoral and of common occurrence off West European, from the Norwegian fjords and southwards: *Galathea intermedia*, *G. nexa*, *G. squamifera*, *G. strigosa*, *Munida curvimana*, *M. tenuimana* and *M. rugosa*. Among them, however, *G. intermedia*, which is the commonest species in European waters, occurs most abundantly in tropical West Africa and reaches to South Africa (BARNARD, 1950). Likewise *G. dispersa* is known from South Africa (BARNARD, l.c.), but it has never been recorded from the Guinean faunal region.

On the other hand, nine species are known to afford evidence of an amphi-Atlantic communication: *Galathea agassizi*, *Munida microphthalma*, *M. iris*, *M. sanctipauli*, *M. subcaeca*, *Munidopsis rostrata*, *M. crassa*, *M. curvirostra* and *M. tridentata*, of which three show further wide-spread distribution in both the Atlantic and the Indo-Pacific regions (*Munida microphthalma*, *Munidopsis rostrata* and *M. tridentata*). These members are, as known in some other decapod crustaceans, all deep-sea or abyssal forms.

1. *Galathea agassizi* Milne Edwards, 1880

Galathea Agassizii Milne Edwards, 1880, p. 47.
Galathea agassizi: MILNE EDWARDS & BOUVIER, 1894a, p. 252.

Galathea Agassizi: MILNE EDWARDS & BOUVIER, 1897b, p. 17, pl. 1, figs. 6–15;—1900, p. 282, pl. 6, fig. 7; BOUVIER, 1922, p. 43.
Galathea agassizii: CHACE, 1942, p. 30.

Distribution: Known from the coasts of Morocco, Cabo Bojador, the Canary and Cape Verde Islands, in 150 to 1642 m, and in the western Atlantic from the Lesser Antilles off St. Lucia, St. Vincent and Barbados, in 269 to 384 m and from the north coast of Cuba, in 817 m depth (CHACE, 1942.).

2. *Galathea capillata* n. sp.

See this paper, p. 68.

3. *Galathea dispersa* Bate, 1859

Galathea dispersa Bate, 1859, p. 3; BONNIER, 1888a, p. 1688;—1888b, p. 124; MILNE EDWARDS & BOUVIER, 1894a, p. 252;—1894b, p. 79; —1899, p. 72; —1900, p. 278, pl. 29, figs. 2, 3; BOUVIER, 1922, p. 42; BULL, 1936, p. 46, pl. 1, figs. 4–6; pl. 3, fig. 3; pl. 4, figs. 1, 4; pl. 5, figs. 5–8; pl. 6, figs. 2, 3, 6; BARNARD, 1947, p. 378;—1950, p. 486, fig. 91, f–h; NUNES-RUIVO, 1961, p. 4.

Distribution: Taken from the Norwegian fjords southwards to the Gulf of Cadiz, the Mediterranean, the Canary Islands and Madeira, in shallow waters to 550 m, and also from the South African coast, in depths of 24 to 110 m.

4. *Galathea intermedia* Lilljeborg, 1851

See this paper, p. 62.

5. *Galathea nexa* Embleton, 1834

See this paper, p. 65.

6. *Galathea rufipes* Milne Edwards & Bouvier, 1894

See this paper, p. 66.

7. *Galathea squamifera* Leach, 1814

Galathea squamifera: BELL, 1847, p. 197, with fig.; STUDER, 1883, p. 27; BONNIER, 1888a, p. 1687;—1888b, p. 124; ORTMANN, 1892, p. 249, pl. 11, fig. 4 i; MILNE EDWARDS & BOUVIER, 1894a, p. 252;—1899, p. 72;—1900, p. 276, pl. 29, fig. 1; SELBIE, 1914, p. 69; BOUVIER, 1922, p. 41; SCHELLENBERG, 1928, p. 84, fig. 65;

BULL, 1936, p. 49, pl. 3, fig. 2; pl. 4, fig. 3; CHAPMAN & SANTLER, 1955, p. 373; HOLTHUIS & GOTTLIEB, 1958, p. 73; LUTHER & FIEDLER, 1961, p. 150, pl. 21; NUNES-RUIVO, 1961, p. 4.

Distribution: The species has been taken from Helgoland, the North Sea southwards to the west of Gibraltar, the Mediterranean, the Azores, the Canary and Cape Verde Islands and off Senegal. It is found from tidemarks to a depth of 180 m.

8. *Galathea strigosa* (Linnaeus, 1761)

Galathea strigosa: BELL, 1847, p. 200, with fig.; BONNIER, 1888a, p. 1688;—1888b, p. 125; ORTMANN, 1892, p. 250, pl. 11, fig. 6 i; MILNE EDWARDS & BOUVIER, 1894a, p. 252;—1900, p. 282; APPELLÖF, 1906, p. 135; SELBIE, 1914, p. 72; BOUVIER, 1922, p. 42; SCHELLENBERG, 1928, p. 81, fig. 61; FIGUEIRA, 1960, p. 6; LUTHER & FIEDLER, 1961, p. 150, pl. 21; RIEDL, 1963, p. 283, pl. 96.

Distribution: Known from the Norwegian fjords southwards to west of Gibraltar, the Azores, the Canary Islands, the Mediterranean and the Adriatic Sea. It frequently occurs under stones between tidemarks but rarely goes down to a depth of 590 m.

9. *Galathea venusta* n. sp.

See this paper, p. 71.

10. *Galathea wolffi* n. sp.

See this paper, p. 74.

11. *Munida curvimana* Milne Edwards & Bouvier, 1894

See this paper, p. 76.

12. *Munida guineae* n. sp.

See this paper, p. 81.

13. *Munida iris* Milne Edwards, 1880

Munida iris Milne Edwards, 1880, p. 49; MILNE EDWARDS & BOUVIER, 1894a, p. 256; —1897b, p. 21, pl. 11, figs. 2–7;—1900, p. 285; BOUVIER, 1922, p. 44.
Munida sp. indet. SMITH, 1882, p. 22, pl. 10, fig. 1.
Munida Caribaea? Smith, 1883, p. 40, pl. 3, fig. 11.

Distribution: Known from off Spanish West Africa, the Canary and Cape Verde Islands, in depths of 130 to 540 m, and in the western Atlantic from the coast of North America and the West Indies, in 100 to 480 m.

14. *Munida microphthalma* Milne Edwards, 1880

Munida microphthalma Milne Edwards, 1880, p. 51; CHACE, 1942,* p. 40, fig. 16; ZARIQUIEY, 1952, p. 156.

Distribution: Known from the Bay of Biscay, off Morocco, the Cape Verde Islands and Ascension Island, in 627 to 2160 m; in the northern Atlantic south of Iceland, in 1980 to 2090 m; and in the western Atlantic from the Gulf of Mexico to Martinique and St. Vincent, in depths of 677 to 1880 m (CHACE, 1942).

15. *Munida rugosa* (Fabricius, 1775)

Munida bamffica: MILNE EDWARDS & BOUVIER, 1894a, p. 325;—1894b, p. 83, pl. 7, figs. 1–7;—1899, p. 75, pl. 4, figs. 6–16;—1900, p. 299, pl. 29, fig. 18; APPELLÖF, 1906, p. 139; HANSEN, 1908, p. 32; SELBIE, 1914, p. 73, pl. 11, figs. 13, 14; BOUVIER, 1922, p. 43.

Munida bamffia: BRINKMANN, 1936, p. 13, pl. 5, figs. 16 a, 16 b, 16 c; RIEDL, 1963, p. 283, pl. 96.

Munida rugosa: ZARIQUIEY, 1952, p. 158, fig. 3.

Distribution: The species is known in the northern Atlantic between Jan Mayen and Greenland, and south and west of Iceland, in 200 to 1200 m; it also occurs from the west coast of Norway southwards to the Gulf of Cadiz, and further extends into the Mediterranean and the Adriatic Sea, in 20 to 1360 m. The West African records are those given by MILNE EDWARDS & BOUVIER (1900) and BOUVIER (1922), from Madeira, Cabo Bojador and the Cape Verde Islands, in 400 to 628 m; however, it remains questionable whether the West African species is identical with *M. rugosa.*

16. *Munida sanctipauli* Henderson, 1885

Munida sancti-pauli Henderson, 1885, p. 411;—1888, p. 142, pl. 3, fig. 6; BARNARD, 1950, p. 489, fig. 92, b; ZARIQUIEY, 1952, p. 156.

Munida Sancti-Pauli Milne Edwards & Bouvier, 1894a, p. 256;—1894b, p. 85, pl. 8, figs. 11–23;—1899, p. 74;—1900, p. 293, pl. 5, fig. 8; pl. 29, figs, 19–21; BOUVIER, 1922, p. 44, pl. 4, figs. 12, 13.

Distribution: Known from off Morocco, Cabo Bojador, the Azores, the Canary and Cape Verde Islands and South Africa, in depths of 150 to 1385 m, and in the southwestern Atlantic from St. Paul's rock, in 18 to 110 m.

* For synonymy see this paper.

17. *Munida speciosa* von Martens, 1878

See this paper, p. 78.

18. *Munida subcaeca* Bouvier, 1922

Munida subcaeca Bouvier, 1922, p. 46, pl. 5, figs. 2, 3; CHACE, 1942, p. 43, fig. 17, 18; ZARIQUIEY, 1952, p. 156.

Distribution: The species has originally been taken from Madeira and Tenerife, the Canary Islands, in 1530 to 1700 m, and subsequently been known in the western Atlantic from the north coast of Cuba, St. Croix and off Morro Castle, in depths of 830 to 1400 m.

19. *Munida tenuimana* Sars, 1872

See this paper, p. 77.

20. *Munida tropicalis* Milne Edwards & Bouvier, 1897

Munida tropicalis Milne Edwards & Bouvier, 1897a, p. 364;—1900, p. 286, pl. 29, figs. 9–11.

Distribution: Known only from La Praya, the Cape Verde Islands, in 150 to 275 m.

21. *Munidopsis acutispina* Benedict, 1902

Munidopsis acutispina Benedict, 1902, p. 315.
Munidopsis aculeata Milne Edwards & Bouvier, 1894a, p. 275;—1899, p. 82;—1900, p. 327, pl. 31, figs. 1–4.

Distribution: Known from Azores and off Cabo Bojador, Spanish West Africa, in 698 to 845 m.

22. *Munidopsis bispinata* n. sp.

See this paper, p. 84.

23. *Munidopsis crassa* Smith, 1885

Munidopsis crassa Smith, 1885, p. 494; MILNE EDWARDS & BOUVIER, 1894a, p. 275; —1899, p. 82; BOUVIER, 1922, p. 47, pl. 1, fig. 5; GORDON, 1955, p. 239, figs. 1 A, 2 A, 2 A'; SIVERTSEN & HOLTHUIS, 1956, p. 46, pl. 4, fig. 1.

Distribution: The species has been taken in the western Atlantic from North America (North Carolina), in 1000 to 4700 m, and in the eastern Atlantic from the Bay of Biscay, between the Azores and Portugal and north of the Canary Islands, in 4255 to 4700 m.

24. *Munidopsis curvirostra* Whiteaves, 1874

Munidopsis curvirostra Whiteaves, 1874, p. 212; SMITH, 1882, p. 21, pl. 8, figs. 2, 3, 3 a; HANSEN, 1908, p. 36, pl. 3, figs. 2 a–2 e; SELBIE, 1914, p. 84, pl. 13, figs. 1–4; SIVERTSEN & HOLTHUIS, 1956, p. 47.

Munidopsis longirostris Milne Edwards & Bouvier, 1897a, p. 365;—1899, p. 82;—1900, p. 314, pl. 4, fig. 1; pl. 30, figs. 5–9.

Distribution: Known in the northern Atlantic from the Davis Strait and Iceland, in 650 to 1800 m; in the western Atlantic from New Foundland, Bay of St. Lawrence and off North Carolina, in 360 to 1267 m; and in the eastern Atlantic it has been taken from Ireland, Bay of Biscay and off Cape Ghir, Morocco, in depths of 1490 to 2212 m.

25. *Munidopsis livida* (Milne Edwards, 1886)

Orophorhynchus lividus: MILNE EDWARDS & BOUVIER, 1894a, p. 287, fig. 12;—1900, p. 343, pl. 4, fig. 3; pl. 31, figs. 17–22.

Distribution: Known from Cape Ghir, Morocco, in a depth of 2115 m.

26. *Munidopsis media* Milne Edwards & Bouvier, 1894

Munidopsis media Milne Edwards & Bouvier, 1894a, p. 275;—1900, p. 325, pl. 30, fig. 25.

Distribution: Taken from north of Spain and west of Spanish West Africa, in depths of 640 to 882 m.

27. *Munidopsis polymorpha* Koelbel, 1892

Munidopsis polymorpha: CALMAN, 1904, p. 213, fig. 1; WOLFF, 1961, p. 147.

Distribution: This species is restricted to Lanzarote, the Canary Islands, where the animal lives in the pond with a depth of 2 to 8 m in the dark cave which communicates with the sea by subterranean channels.

28. *Munidopsis rostrata* (Milne Edwards, 1880)

Galacantha rostrata Milne Edwards, 1880, p. 52.

Munidopsis rostrata: CHACE, 1942,* p. 75.

Distribution: This is one of the most wide-spread species in the genus, and has been known from west of Iceland, off Morocco and Cape Point, South Africa; in the western Atlantic from off New Jersey to Bequia in the Lesser Antilles; in the Indo-Pacific from the Arabian Sea, Bay of Bengal and off the Banda Islands in the Moluccas; and in the eastern Pacific off the Galapagos Islands and off Valparaiso, Chile. It is recorded from depths between 1680 and 2910 m (CHACE, 1942).

29. *Munidopsis talismani* Milne Edwards & Bouvier, 1894

Munidopsis Talismani Milne Edwards & Bouvier, 1894a, p. 275;—1900, p. 316, pl. 30, figs. 10–14.

Distribution: Known from off Spanish West Africa, in 830 to 1113 m.

30. *Munidopsis tridentata* (Esmark, 1857)

Munidopsis tridentata: CHACE, 1942,* p. 88.

Distribution: Known in the eastern Atlantic from off Norway in 270 to 540 m, off the coast of Ireland in 110 to 1600 m, in the Bay of Biscay in 1200 to 1480 m, off the Azores in 830 to 1250 m, off the west coast of Africa from off Morocco to Spanish West Africa and the Cape Verde Islands in 593 to 2165 m; in the western Atlantic off the north coast of Cuba in 660 to 1200 m; and in the Indian Ocean in 380 to 1200 m (CHACE, 1942).

31. *Munidopsis tropeorhyncha* n. sp.

See this paper, p. 86.

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