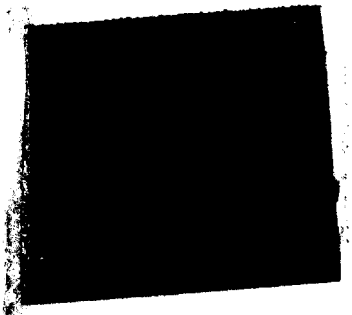
ATLANTIDE REPORT No. 2

Scientific Results of the Danish Expedition to the Coasts of Tropical West Africa
1945–1946



THE CARIDEAN CRUSTACEA OF TROPICAL WEST AFRICA

BY

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DANISH SCIENCE PRESS, LTD
COPENHAGEN 1951

Reprint
issued May 20, 1951

ATLANTIDE – REPORTS

No. 1

Price: 35 Danish Kr. (= about 5.00 U. S. $)

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The Caridean Crustacea of Tropical West Africa

by

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The Danish "Atlantide"-Expedition 1945—46 collected Caridean Decapod Crustacea from numerous localities in the Tropical West African region between Gambia and the Cape Verde Islands in the north and N. Angola in the south. Though the larger part of the collection consists of species from the marine littoral region, interesting material has also been obtained from the deep sea and from fresh water. The collection is extremely rich in species and in specimens. The following table clearly shows the importance of the present material:

Number of species of Caridea from Tropical W. Africa:	Deep sea	Littoral zone	Fresh water	Total
Recorded in the literature	20	36	25	81
Collected by the Atlantide-Expedition	16	41	3	60
Recorded here for the first time from W. Africa	8	23	—	31
Described here as new	2	13	—	15
Known at present from W. Africa	28	59	25	112

The "Atlantide" collection of Caridea thus consists of more than half the number of species known from Tropical West Africa and it contains more than $^2/_3$ of the known littoral species from that region. It seemed useful therefore to give in the present paper a list of all the tropical West African Caridea known at present. The account of species which are not represented in the "Atlantide" material has been printed in small type.

The extent of the Tropical West African region was defined by EKMAN (1935, p. 86) as the region between Cape Verde, Senegal (15° N) and Great Fish Bay, S. Angola (17° S). As, however, most of the species of Caridea known from the region between Cape Blanco, Mauritania and Cape Verde, Senegal, are also known S. of the latter locality, I have included in the present enumeration all the species known to occur between Cape Blanco and the Great Fish Bay.

The species are arranged systematically in this list. Of most species a complete synonymy is given. For some forms, however, a complete list of all the references given in literature would be beyond the scope of the present paper; therefore in these cases a restricted synonymy is given, viz., only references to the original description of the species and to those records dealing with West African specimens are listed. These restricted synonymies are specially marked. Of new or imperfectly known species descriptions and figures are given. At the end of the text dealing with the species remarks on its geographical distribution are given, while the distribution within West Africa has been more extensively dealt with. For the sake of uniformity in the spelling of the geographic names, the orthography is that used in J. BARTHOLOMEW The Times Handy Atlas (London, 1935).

Some general remarks on the geographical distribution of the West African Caridea may be given here. Only little can be said about the deep sea species. Most of these have a wide distribution throughout the Atlantic and Indo-westpacific regions, a few, like *Acanthephyra sexspinosa* Kemp, are restricted to the Central and South Atlantic Ocean. Of more interest are the littoral species. A very large number of littoral species found in the Tropical West African region also occurs in the Mediterranean and often northwards to S. England. These species (as *Pandalina profunda*, *Parapandalus narval*, *Alpheus macrocheles*, *Alpheus dentipes*, *Athanas nitescens*, *Thoralus cranchii*, *Palaemon serratus*, *Pontonia flavomaculata*, *Balssia gasti*, and *Typton spongicola*) mostly occur as far south as the Cape Verde Islands, French and Portuguese Guinea and Sierra Leone, but have not been reported from localities farther south. These species are generally represented by specimens which are distinctly smaller than those from the Mediterranean, so that they probably live here in circumstances which are not optimal. A few European species go much farther down along the African west coast; these are *Palaemon elegans* (to S. Africa), *Periclimenes scriptus* (to the Belgian Congo), *Pontonia pinnophylax* (to N. Angola), and *Pontophilus sculptus* (to S. Africa), while *Pontocaris cataphracta* not only inhabits the entire West African coast, but has also been reported from the Indo-westpacific region. There are several species which the West African fauna has in common with that of East America: *Discias atlanticus*, *Alpheus malleator*, *Alpheus rugimanus*, *Alpheus floridanus*, *Alpheus intrinsecus*, *Automate evermanni*, *Trachycaris restrictus*, *Latreutes parvulus*, and *Lysmata moorei*. COUTIÈRE, in his various publications on Alpheidae, reports several species (*Alpheus macrochirus*, *Alpheus paracrinitus*, *Alpheus edwardsii* and *Alpheopsis trispinosus*) which according to him occur in the West African and the Indo-westpacific regions. I myself did not find any Indo-westpacific species in the West African collection, though some of the species have their nearest relatives in the Indo-westpacific fauna (*Processa guineana*, *Athanas amazone*, *Palaemonella atlantica*, *Periclimenes platalea*, *Pontophilus wolffi*). Our knowledge

The abdomen is smooth, all segments are dorsally rounded. The fourth and sixth segments, however, are slightly carinate in their extreme posterior part, both end in a distinct posteriorly directed tooth. The distal margin of the pleurae is slightly convex or almost straight. Both the anterior and the posterior angles of the pleurae are broadly rounded in the first five segments, the anterior angle of the third to fifth segments are produced somewhat anteriorly. Neither the pleura nor the posterolateral angle of the sixth segment ends in a spine. The sixth segment is somewhat less than twice as long as the fifth. The telson measures about $^3/_4$ of the length of the sixth abdominal segment. It is elongate, narrowing posteriorly. The dorsal surface of the telson shows a broad distinct longitudinal median groove, which extends throughout the length of the telson and is broadest near the posterior margin. This posterior margin is evenly convex and bears a strong spine at either end. Between these lateral spines about 6 shorter spinules are present.

The eyes are well developed. The cornea is rounded and well-pigmented, it stands obliquely on the stalk.

The basal segment of the antennular peduncle reaches with less than half its length beyond the eyes. The anterior margin bears several small spinules. The stylocerite almost reaches the end of the basal segment, it is rather narrow when seen in dorsal view. In lateral view it is broader, widening somewhat distally; the upper margin ends in a distinct tooth, the anterior margin is convex and connected with the lower margin by a broadly rounded angle. A rounded dorsal lobe is present at the base of the stylocerite. The second segment of the antennular peduncle is distinctly shorter than the third. There are two simple flagella, the upper of which has about 12 broadened basal joints.

The scaphocerite reaches somewhat beyond the antennular peduncle. The outer margin is slightly convex and ends in a distinct tooth, which reaches with its full length beyond the lamella. The scaphocerite is slightly more than three times as long as broad; the greatest breadth is in the basal half of the scale. The antennal peduncle reaches to the middle of the antennular peduncle. A strong, obliquely downwards directed, sharp spine is present near the base of the scaphocerite.

The mandible consists of an incisor process, which is high and broad and ends in strong teeth; no palp is present. The maxillula has the lower endite small, the upper endite is well developed, and ends in six strong and long teeth, the palp is large and simple. The maxilla has the palp well

Fig. 1. *Pasiphaea semispinosa* n. sp. a, anterior part of body in lateral view; b, abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped; j, third maxilliped; k, first pereiopod; l, second pereiopod; m, third pereiopod; n, fourth pereiopod; o, fifth pereiopod; p, first pleopod of male; q, second pleopod of male. a, b, ×3; c—i, ×7; j—o, ×5; p, q, ×8.

of the distribution of most Caridea, however, does not allow any definite conclusions to be drawn from the available data, other than stating the close relationship with the European and East American faunas and the much less clear affinity to the Indo-westpacific Caridea.

The fresh water fauna shows partly a distinct relation to that of tropical America. *Atya scabra* occurs both in tropical West Africa and in tropical America, the records of this species from other regions are doubtful. *Atya gabonensis* is most closely related to the American *Atya crassa* (Smith). *Macrobrachium macrobrachion*, *M. chevalieri*, *M. felicinum*, *M. zariquieyi* and *M. vollenhoveni* are very closely related to species from tropical America (respectively *Macrobrachium acanthurus* (Wiegm.), *M. heterochirus* (Wiegm.), *M. olfersii* (Wiegm.), *M. crenulatum* Holth., and *M. carcinus* (L.) from eastern America and respectively *M. tenellum* (Smith), *M. occidentale* Holth., *M. digueti* (Bouv.), *M. hancocki* Holth., and *M. americanum* Bate from western America). The genus *Caridina*, however, has a wide distribution throughout the Indo-westpacific region and is not represented in American waters.

The present material is preserved in Universitetets Zoologiske Museum, Copenhagen, Denmark. A set of duplicates is deposited in the Rijksmuseum van Natuurlijke Historie, Leiden, Holland and in British Museum (Nat. Hist.), London.

Family **Pasiphaeidae.**

Pasiphaea semispinosa n. sp.

(Fig. 1).

Material examined:

Station 135, off Angola, 7°55′ S, 12°38′ E; eel trawl, 235–460 m. depth, bottom mud; March 17, 1946, $13h^{40}$—$15h^{40}$. — 1 specimen 66 mm.

Description. The rostrum is well developed, directed obliquely upwards, and curved slightly forwards. It is rather broad at the base. The tip of the rostrum reaches as far forwards as the anteromedian point of the carapace. The carapace proper is smooth, the upper margin rounded. A faint oblique carina is visible in the posterolateral part of the carapace. The anterior margin of the carapace is produced forwards in the median dorsal part to a broadly triangular lobe, which has the apex rounded. This lobe reaches almost to the base of the ophthalmic peduncles. The lower orbital angle is broadly rounded. Below this angle the anterior margin of the carapace is concave; it forms a broadly rounded convex angle near the upper part of the antennal base. From this point the margin runs obliquely backwards till it meets with the lateral margin of the carapace. This last distance of the anterior margin shows a convex part in the middle. This convexity is flanked by two concave parts. A distinct anteriorly directed spine is present slightly behind the convex part of the lower region of the anterior margin.

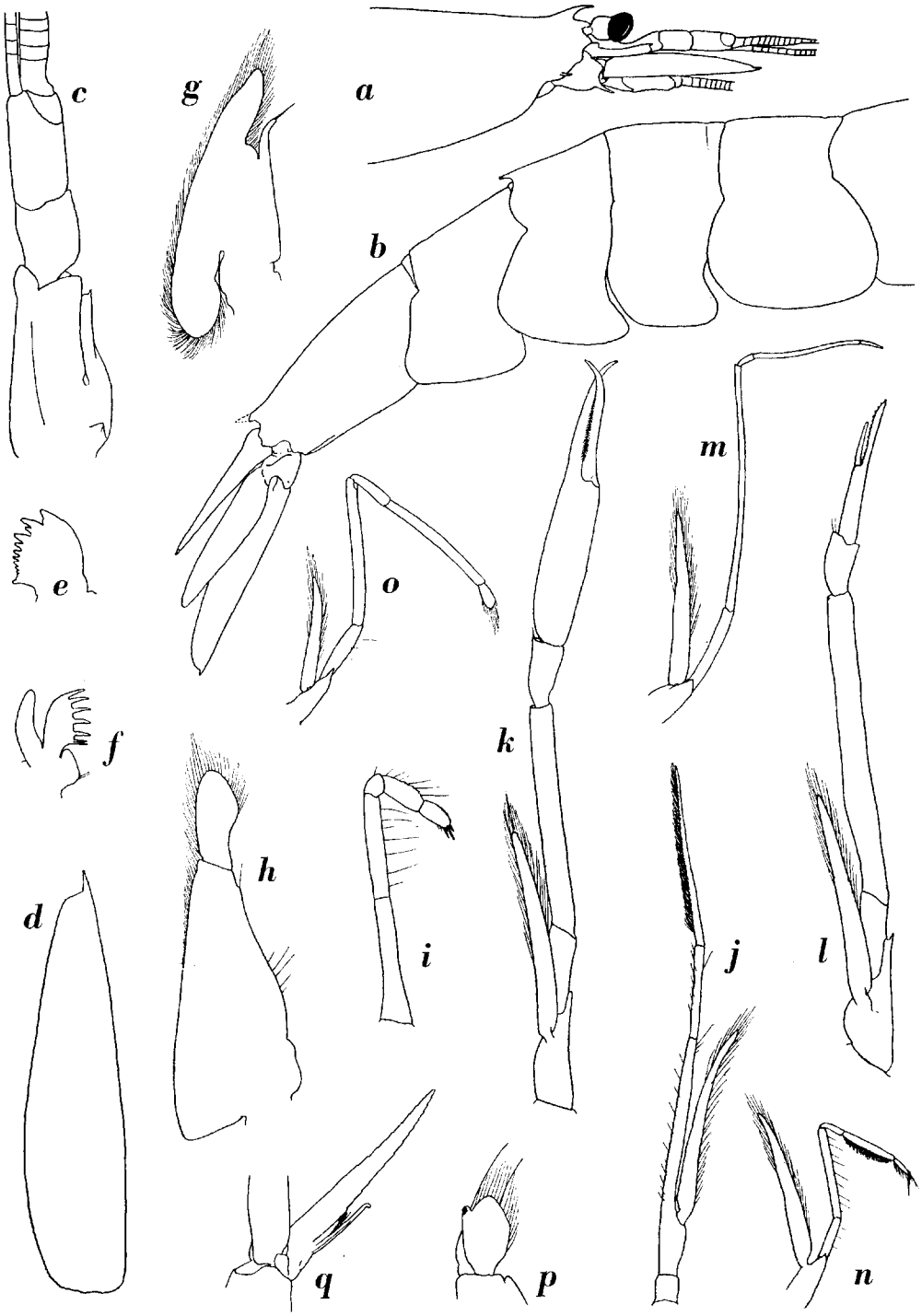

Fig. 1.

developed and the scaphognathite large, no endites are visible. The first maxilliped is reduced to a large elongate lamella, which shows an articulation in the upper part. The second maxilliped is long and strongly resembles a true leg, the dactylus ends in three strong spines and has the upper margin serrate, just like the upper margin of the propodus; no epipod or exopod is present. The third maxilliped reaches slightly beyond the scaphocerite. The last joint is elongate and slender, being twice as long as the penultimate joint and shorter than the antepenultimate. A well developed exopod is present.

The branchial formula runs as follows:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
pleurobranchs	—	—	—	1	1	1	1	1
arthrobranchs	—	—	—	1	1	1	—	—
podobranchs	—	—	—	—	—	—	—	—
epipods	—	—	—	—	—	—	—	—
exopods	—	—	1	1	1	1	1	1

The exopods of all pereiopods are well developed. The first legs reach with the fingers beyond the scaphocerite. The fingers are slender, their cutting edge is toothed, the tips are crossing. The palm is slightly swollen, it is $^4/_3$ as long as the fingers. The carpus measures $^2/_5$ of the length of the palm, it is narrowed proximally. The merus is $^4/_3$ as long as the palm, it is entirely unarmed. The ischium is about $^1/_3$ of the length of the merus, it also bears no spines at all, just like the basis. Both second pereiopods in my specimen are damaged, one of them is broken off at the merus, the other probably has lost the chela, as the latter has now regenerated and is entirely abnormal in shape. This regenerated chela is very narrow and has the fingers unequal in length, one of them has the cutting edge teeth-less, in the other the edge bears several small teeth. The carpus is normal in shape and shows much resemblance to that of the first leg. The merus is distinctly longer than that of the first leg, it also bears no spines at all. The ischium is as in the first leg. The basis, however, ends in a distinct sharp antero-ventral tooth. The third pereiopod has all joints slender, it reaches to the base of the antennal peduncle. The dactylus is about $^1/_4$ of the length of the propodus, which is somewhat curved. The carpus is short, being slightly shorter than the dactylus. The merus is long and slender, it is about 1.5 times as long as the three ultimate joints together. The ischium is almost $^1/_3$ of the length of the merus. The fourth pereiopod is distinctly shorter than the third, it reaches slightly beyond the base of the second pereiopod. All joints are slender. The propodus is about 2.5 times as long as the dactylus, while the carpus is about as long as the latter joint. The merus is somewhat

shorter than the dactylus, the propodus and carpus combined, it is about twice as long as the ischium. The last leg is distinctly longer than the preceding one. It reaches slightly beyond the base of the third maxilliped. The dactylus is short and rather broad, it measures $^1/_5$ of the length of the propodus. The carpus is almost twice as long as the dactylus and about $^1/_3$ of the length of the merus. The ischium is somewhat less than half as long as the merus.

My specimen, a male, has the endopod of the first pleopod broadly ovate, with a short appendix interna, which bears some hooks at the top. All other pleopods have the endopod with a slender appendix interna. In the second pleopod the appendix masculina is much shorter than the appendix interna. The uropods are elongate. The exopod is longest and has the outer margin slightly convex and ending in a simple tooth, which reaches beyond the posterior margin of the exopod.

The present new species belongs to the subgenus *Pasiphaea* s. s., which is characterized by having the posterior margin of the telson straight or somewhat convex. *Pasiphaea semispinosa* may be distinguished from all other species belonging to this subgenus by having the meri of the first two pairs of pereiopods totally unarmed. In this respect it is closest to *Pasiphaea unispinosa* Wood-Mason from India, which has the merus of the first legs smooth, that of the second pair provided with one spine only (*Pasiphaea cristata* Bate resembles Wood-Mason's species in this respect; as the shape of the tip of the telson of *P. cristata* is unknown, it cannot be said with certainty whether that species belongs in the present subgenus). A second character distinguishing this species from all other species of *Pasiphaea* s. s. is the presence of a distinct tooth on the posterior margin of the fourth abdominal segment. *Pasiphaea orientalis* Schmitt from Formosa has a similar tooth, which, however, is placed on the posterior margin of the third abdominal segment. It is not known whether Schmitt's species resembles the present form in the smoothness of the meri of the first two pairs of pereiopods, since Schmitt (1931) does not describe this character of his specimen.

Parapasiphaë sulcatifrons Smith 1884.

Restricted synonymy:

Parapasiphaë sulcatifrons Smith 1884, p. 384, pl. 5 fig. 4, pl. 6 figs. 1—7.
Parapasiphaë sulcatifrons Balss 1925, p. 236, fig. 10.

Distribution. This species, of which I have seen no West African material is recorded from that region by Balss (1925): off French Congo, 5°6′ S, 9°58′ E, depth 0—1500 m. The species has been reported from depths between 700 and 5400 m.; according to Chace (1940) it is most abundant between 1460 and 1640 m. It is known from the N. Atlantic Ocean from Greenland and Iceland southwards, from the British Islands, the eastcoast of the U. S. A., the Bay of Cadiz (Spain), Madeira, West Africa, South Africa and the southern Indian Ocean.

Psathyrocaris infirma Alcock & Anderson 1894.

(Fig. 2).

Psathyrocaris infirma Alcock & Anderson 1894, p. 159.
Psathyrocaris infirma Alcock & Anderson 1895, pl. 12 fig. 7.
Psathyrocaris infirma Alcock 1899, p. 32.
Psathyrocaris infirma Alcock 1901, p. 71.
Psathyrocaris infirma De Man 1920, p. 4.
Psathyrocaris infirma Balss 1925, p. 236, fig. 9.
Psathyrocaris infirma Calman 1939, p. 187.

Material examined:

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; otter trawl, 260—650 m. depth, bottom mud; March 1, 1946, 14^h10^m—15^h40^m. — 1 specimen 66 mm., 4 fragments.

Station 135, off Angola, 7°55′ S, 12°38′ E; eel trawl, 235—460 m. depth, bottom mud; March 17, 1946, 13^h40^m—15^h40^m. — 8 specimens 61—65 mm., 1 fragment.

The rostrum shows the highly arched upper margin, so characteristic of this species. The carapace bears the carinae which are described by ALCOCK (1901) as follows: "the post-orbital ridge of the carapace is straighter [than in *P. fragilis*] and its branch that runs towards the lower border of the carapace gives off a loop that rejoins the post-orbital ridge". This also has been figured by ALCOCK & ANDERSON (1895, pl. 12 fig. 7). In my material, however, these carinae are not fully connected with each other. The post-orbital ridge in my specimens is interrupted just before the place where the loop described by ALCOCK rejoins it, while also ALCOCK's side branch is no regular branch as it starts a small distance below the postorbital ridge. A sinuous groove is present in the anterolateral region of the carapace. This situation of grooves and ridges does not agree with that shown in BALSS's (1925) figure of the species.

The telson is elongate and provided with a longitudinal groove on the upper surface. Two pairs of minute spinules are present in the distal fourth of the dorsal surface. The posterior border of the telson is somewhat produced distally in the middle; in my specimens implantations of several spines may be seen on this border, the spines themselves are lacking.

The mouthparts quite agree with the figures given by WOOD-MASON & ALCOCK (1893) of those of *Psathyrocaris fragilis*. The only differences are that the molar process of the mandible bears less teeth, and that the exopod of the second and third maxillipeds is much better developed.

Fig. 2. *Psathyrocaris infirma* Alc. & And. a, anterior part of body in lateral view; b, mandible; c, maxillula; d, maxilla; e, first maxilliped; f, second maxilliped; g, third maxilliped; h, first pereiopod; i, third pereiopod; j, fifth pereiopod; k, endopod of first pleopod of male; l, endopod of second pleopod of male; m, endopod of third pleopod of male; n, endopod of second pleopod of female. a, ×3; b, c, ×10; d—g, i, j, ×7; h, k—n, ×6.

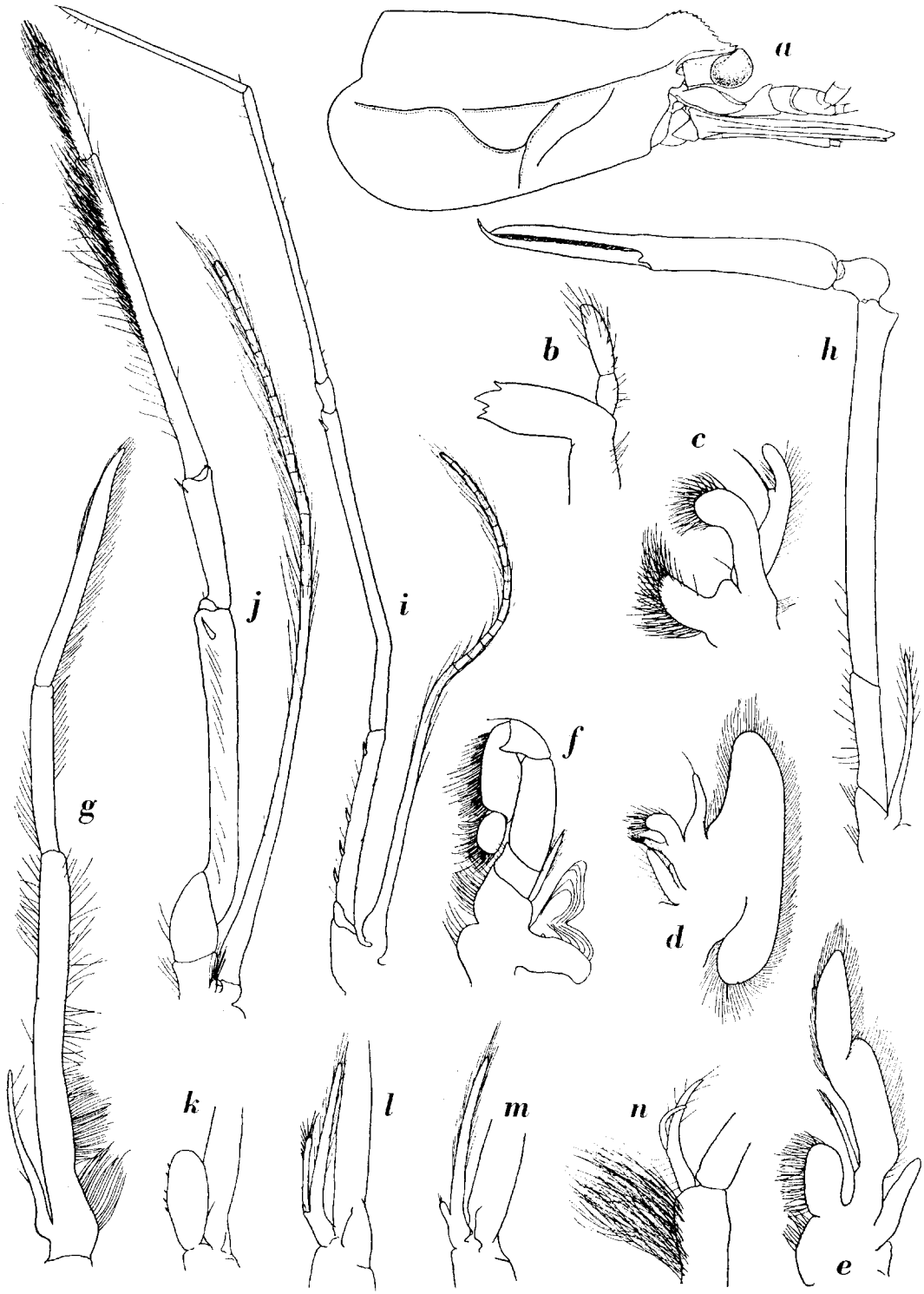

Fig. 2.

The branchial formula is like that given by ALCOCK (1901, p. 68) for the genus, only the pleurobranch of the fifth pereiopod is much reduced and no arthrobranch is seen on the fourth leg of my specimens.

In none of my specimens either of the second legs is present. The first legs are equal. They differ from ALCOCK's (1901) description by having the fingers only slightly shorter than the palm and not "less than half the length of the palm". It is probable that ALCOCK in his description made an error using the word "palm" instead of "chela", ALCOCK & ANDERSON's (1895) figure of the species and that of BALSS (1925), show the situation as it is in my specimen. ALCOCK (1901) furthermore states that the carpus of this first leg has the "anterior border bulging strongly beyond its articular facets". In my specimen it is the posterior (or rather proximal) margin which shows that feature. The third and fourth legs are similar. They resemble the legs figured by BALSS, (1925, fig. 9), though in BALSS's drawing the ischium of the third leg is shown two-jointed; this is probably due to the fact that the legs are fragile and very often have cracks. In BALSS's figure of the fourth leg a movable spine is shown in the postero-distal part of the merus and ischium, these spines are also present in my material. Similar spines, not figured by BALSS are present in the third leg and some additional spines occur on the rest of the posterior margin of the ischium both in the third and fourth legs, all of which are present in my specimens. The fifth leg in my specimens strongly resembles BALSS's figure, a posterodistal spine on the merus excepted.

The first pleopod of the male has the endopod short and ovate, with some minute spinules on the inner margin; it bears no appendix interna. The following pleopods have the endopod long and slender and provided with a small appendix interna. The second pleopod of the male in addition possesses a well developed appendix masculina, which bears distinct spines in the distal part of the inner margin and on the top. The appendix interna of this pleopod is much smaller than in the following, being visible only as a minute lobe at the base of the appendix masculina. The female has the endopods of all pleopods long and slender, that of the second pleopod is provided with a distinct appendix interna, which bears the usual minute hooks at the apex. No appendix interna is present on any of the other pleopods of the female. A very large tuft of feathered hairs is present on the inner side of the protopod of the pleopods of the female. The uropods are very slender and elongate, they distinctly overreach the telson. The outer margin of the exopod ends in a small tooth, which bears a movable spine on its inner side.

Only one of my females (65 mm. in length) bears eggs. These eggs are relatively enormously large, being 3.5—5.0 mm. in diameter. The specimen in question carried only two eggs in all.

Distribution. The species has been recorded from depths varying between 740 and 1080 m. It is known from the Gulf of Aden, from off East Africa, from the Indian Ocean S. of the south point of India and from the Andaman Sea. It is now recorded for the first time from the Atlantic Ocean. The depth at which the Atlantide specimens were taken is smaller than that of any of the specimens recorded from the Indian Ocean.

Of the genus *Psathyrocaris* 5 species are known at present, all five occurring in the Indo-westpacific region, while one of these species, *Psathyrocaris fragilis* Wood-Mason & Alcock, is represented in the Atlantic region (Bay of Biscay) by a separate variety *P. fragilis* var. *atlantica* Caullery.

Family **Atyidae.**

Caridinopsis chevalieri Bouvier 1912.

Caridinopsis Chevalieri Bouvier 1912, p. 300, figs. 1—4.
Caridinopsis Chevalieri Bouvier 1912a, p. 563.
Caridinopsis Chevalieri Bouvier 1914, pp. 576, 578.
Caridinopsis Chevalieri Bouvier 1925, p. 93, figs. 175—193.
Caridinopsis chevalieri J. Roux 1935b, p. 25.

Distribution. This fresh water species is known from Ouria (Kissi) near Sampuyara, Upper Niger basin, French Guinea (Bouvier, 1912, 1912a, 1914, 1925) and from Man, Nigoualé and Danané, Ivory Coast (Roux, 1935b).

Caridina africana Kingsley 1882.

Caridina africana Kingsley 1882, p. 127, pl. 1 fig. 3.
Caridina togoensis Hilgendorf 1893, p. 156.
Caridina togoensis Hilgendorf 1893b, p. 217.
Caridina africana Sharp 1893, p. 111.
Caridina africana Ortmann 1895, p. 404.
Caridina africana De Man 1897, p. 170, pl. 15 fig. 2.
Caridina togoënsis stuhlmanni Hilgendorf 1898, p. 35.
Caridina togoensis Rathbun 1900, p. 314.
Caridina togoensis Decorsei Bouvier 1904, p. 131.
Caridina togoensis Bouvier 1905, p. 74.
Caridina togoensis Decorsei Bouvier 1905, pp. 74, 81, fig. 5.
Caridina africana Bouvier 1905, p. 74.
Caridina togoensis Decorsei Lenz 1910, p. 131.
Caridina togoensis breviatus Lenz 1910, p. 131.
Caridina africana Lenz 1912, p. 5.
Caridina togoensis Bouvier 1913, p. 464.
Caridina togoensis Decorsei Balss 1914, p. 97.
Caridina africana (with the forms *typica, natalensis, aegyptiaca, Roubaudi, togoensis, Decorsei*, and *Stuhlmanni*) Bouvier 1925, p. 212, figs. 470—477.
Caridina togoensis (with the varieties *Stuhlmanni, Decorsei, breviatus, Kasaiensis, Kwamouthensis*, and *Schoutedeni*) De Man 1925, p. 7, figs. 2 a—2 t6.

Caridina togoensis Schmitt 1926, pp. 11, 64, figs. 1—62.
Caridina togoensis stuhlmanni Gauthier 1927, p. 127.
Caridina togoensis stuhlmanni J. Roux 1927, p. 243.
Caridina togoensis stuhlmanni J. Roux 1928, p. 69.
Caridina africana aegyptiaca Gordon 1930, p. 34, figs. 6, 13a.
Caridina africana togoensis J. Roux 1933, p. 339.
Caridina africana Gordon 1933, p. 357, fig. 4.
Caridina africana Stuhlmanni J. Roux 1935, p. 241.
Caridina africana togoensis J. Roux 1935b, p. 23.
Caridina africana stuhlmanni J. Roux 1935b, p. 23.
Caridina africana stuhlmanni Caroli 1941, p. 5.
Caridina togoensis Roth-Woltereck 1942, p. 293, figs. 15—18.
Caridina africana Barnard 1950, p. 661, fig. 123, m, n.

This species is very variable and numerous varieties or forms have been described, which according to most modern authors cannot be maintained. A study of a large material of this species from all points of its range of distribution is highly desirable.

Distribution. This fresh water species has been reported from the greater part of Africa. In the eastern part of Africa it is known from the Nile basin from Victoria Lake down to Cairo (Bouvier, 1925; Roux, 1927; Gordon, 1930, 1933), from the Omo River, Ethiopia, which empties into Lake Rudolf (Roux, 1935; Caroli, 1941), Lake Edward (Gordon, 1933), Undussuma, Tanganyika territory (Hilgendorf, 1898), Zulu land (Kingsley, 1882; Sharp, 1893; Ortmann, 1895) and from Natal (De Man, 1897; Lenz, 1912). In the western half of Africa its range of distribution may be divided into two parts. Firstly the waters of those systems, which have no direct connection with the sea (like Rudolf and Edward Lakes in the eastern half) and secondly, the waters of those systems, which empty into the Atlantic Ocean. To the first group belong the following localities: Tassili des Ajjers, Central Sahara (Gauthier, 1927), numerous localities (Gribingui, Bangoran and Ba-Karé Rivers, Fort Crampel, Fort Archambault and Djintilo) in the basin of the Shari River, which empties into Chad Lake (Bouvier, 1904, 1905, 1925; Balss, 1914). The following localities may be placed in the second group: French Guinea (Bouvier, 1925), Collangui and Ditinn, Futa Jallon, N.W. French Guinea (Bouvier, 1925), Tuba, Danané, Toumodi, Nigouaé, and near Man, W. Ivory Coast (Roux, 1935b), Baoulé River, Ivory Coast (Bouvier, 1925), near Bougouni and Gao, French Sudan (Roux, 1935b), Banfora, Lérarba, Bobo-Diulasso, and Ouagadougou, Upper Volta (Roux, 1935b), Adeli and Bismarckburg, Togo (Hilgendorf, 1893), Say, French Niger Colony (Bouvier, 1925), Fort Sibut (= Krébédjé) and region of Mpoko River, Ubangi-Shari (Bouvier, 1904, 1905, 1925), Ntem region and Ngoko River, branch of Sanga River, Cameroons (Bouvier, 1925), Ivindo basin, Gabon (Bouvier, 1925), Lambaréné, Gabon (Roux, 1927), near Stanley pool and Brazzaville, French Congo (Bouvier, 1925), very numerous localities throughout Belgian Congo, from near the mouth of the Congo to Faradje in the N.E. and Elizabethville in the S.E. (Lenz, 1910; Balss, 1914; De Man, 1925; Schmitt, 1926; Roux, 1933; Roth-Woltereck, 1942).

Caridina gabonensis Roux 1927.

Caridina gabonensis Roux 1927, p. 239, figs. 1—7.

Distribution. The species is only known from the original specimens, which were collected near Lambaréné, Gabon, in fresh water.

Caridina indistincta Calman 1926.

Caridina indistincta Calman 1926, p. 244, fig. 3.
Caridina indistincta Roth-Woltereck 1942, p. 290, fig. 14.
Caridina ? indistincta Barnard 1950, p. 660, fig. 124, o, p.

Distribution. The species was first described by CALMAN (1926) from specimens from the fresh waters of Queensland. Then in 1942 Mrs. ROTH-WOLTERECK recorded it from West Africa, unfortunately, she had no specimens from Queensland with which to compare her West African specimens. The West African localities all lie in S. E. Belgian Congo, they are: Lubumbashi River near Elizabethville, Luapula River near Kasenga, and various localities on Moéro Lake. BARNARD (1950) refers some specimens from Victoria Falls, Zambesi River, with some doubt to this species.

Caridina nilotica (P. Roux) 1833.

Restricted synonymy:

Pelias niloticus P. Roux 1833, p. 73, pl. 7 fig. 1.
Caridina nilotica Roth-Woltereck 1942, p. 279, figs. 12, 13.

Distribution. *Caridina nilotica* is the most common species of *Caridina* in the Indo-westpacific region, it is known from E. Africa to the Malay Archipelago, Australia and Fiji. It has been reported from the whole of eastern Africa, from the entire Nile basin in the north to Natal in the south, and from the isolated lakes as, e. g., Tanganyika Lake. The only record of this species from a river system which empties into the Atlantic Ocean is that by ROTH-WOLTERECK (1942) who records a female specimen of this species, which was found among specimens of *Caridina africana* from Upemba Lake, Belgian Congo (Congo River basin).

Caridina spencebatei De Man 1892.

Caridina typus Bate 1888, p. 704, pl. 119 fig. 3.
Caridina Spencebatei De Man 1892, p. 371.
Caridina Spence Batei Bouvier 1905, p. 93.

This is a species incerta and it was treated by BOUVIER (1905) as such. BATE (1888) described the species as *Caridina typus* H. Milne Edw. on a specimen from São Antonio Valley, São Thiago, Cape Verde Islands. Now *Caridina typus* is a species, which is widely distributed throughout the Indo-westpacific area from E. Africa to the Bonin and Riukiu Islands, to Australia and the islands of the South Pacific.

DE MAN (1892) found some minor differences between his specimens of *Caridina typus* and the description and figures of BATE. This induced him to give a new name to BATE's form.

The possibility exists, however, that BATE's material indeed belongs to *Caridina typus* H. Milne Edw. and that it is incorrectly labelled, originating in reality from a locality in the Indo-westpacific area. This becomes the more probable since BATE (1888) reports from the same locality in the Cape Verde Islands another species, *Atya serrata* Bate, which like *Caridina typus* is widely distributed in the Indo-westpacific region and (apart from a rather doubtful record from Liberia) also has not been reported from West Africa by other authors.

Atya ? africana Bouvier 1904.

(Fig. 3).

Atya africana Bouvier 1904, p. 138.
Atya africana Bouvier 1905, p. 120, fig. 24.
Atya africana Bouvier 1925, p. 305, figs. 682—689.
Atya africana De Man 1925, p. 26, figs. 3a, b.

Material examined:

Station 57, off Liberia, 5°59′ N, 10°27′ W; bottom sample Cxi; Van Veen grab, 62 m. depth, bottom muddy sand; January 8, 1946, $10^{h}55$.—1 specimen 9 mm.

Station 119, off Cameroons, 2°55′ N, 9°21′ E; stramin net 100 cm., 5 m. wire; February 28, 1946, $19^{h}56$. — 6 specimens 11—12 mm.

Station 127, Boma, Belgian Congo: stramin net 100 cm.; March 10, 1946; $22^{h}8$.—13 specimens 9—14 mm.

The specimens are obviously juveniles of a species of *Atya*. Small as they are, their chelae are exactly like those of adult specimens of the species of *Atya*. In general appearance and in the shape of the rostrum the animals bear a close resemblance to *Atya africana*, and therefore are, provisionally, considered identical with that species. As, however, very little is known of juvenile *Atya*'s and of the way in which the various parts of the body change shape during the development, I am not able to refer the specimens with certainty to Bouvier's species.

The rostrum is rather slender, it reaches to or beyond the base of the last segment of the antennular peduncle and tapers regularly towards the apex. There are no distinct lateral teeth, but the lateral margin shows a trace of a blunt angle in the middle of its length. The median dorsal carina of the rostrum is distinct throughout its course and on each side it is bordered by a rather deep longitudinal excavation. The lower median carina of the rostrum is distinct but not high, it is provided with up to two small teeth in the extreme distal part. The carapace is smooth, the antennal spine is well developed and sharp, the pterygostomian angle is somewhat produced but is rounded at the tip, it bears no spine.

The abdomen is smooth. The fourth segment has the pleurae ending in a bluntly pointed angle, while the pleurae of the fifth segment are acute. Soft and rather long setae are placed on the margins of the abdominal pleurae. The telson is slender, being somewhat more than three times as long as its basal breadth. The upper surface bears two pairs of spines, which are placed so as to divide the telson into three equal parts. Two longitudinal rows of hairs are present on the upper surface of the telson too. The posterior margin of the telson ends in a median point, the postero-lateral angles are produced somewhat backwards. The posterior margin of the telson bears 4 pairs of spines: the two inner pairs are rather long, setose

and equal in size, the two outer pairs are shorter and naked, except for a row of short hairs along the inner side of the longer spines. The inner of these naked spines measure $^2/_3$ of the length of the setose spines, the outer naked spines are very short.

The eyes have the cornea large, being broader and longer than the stalk.

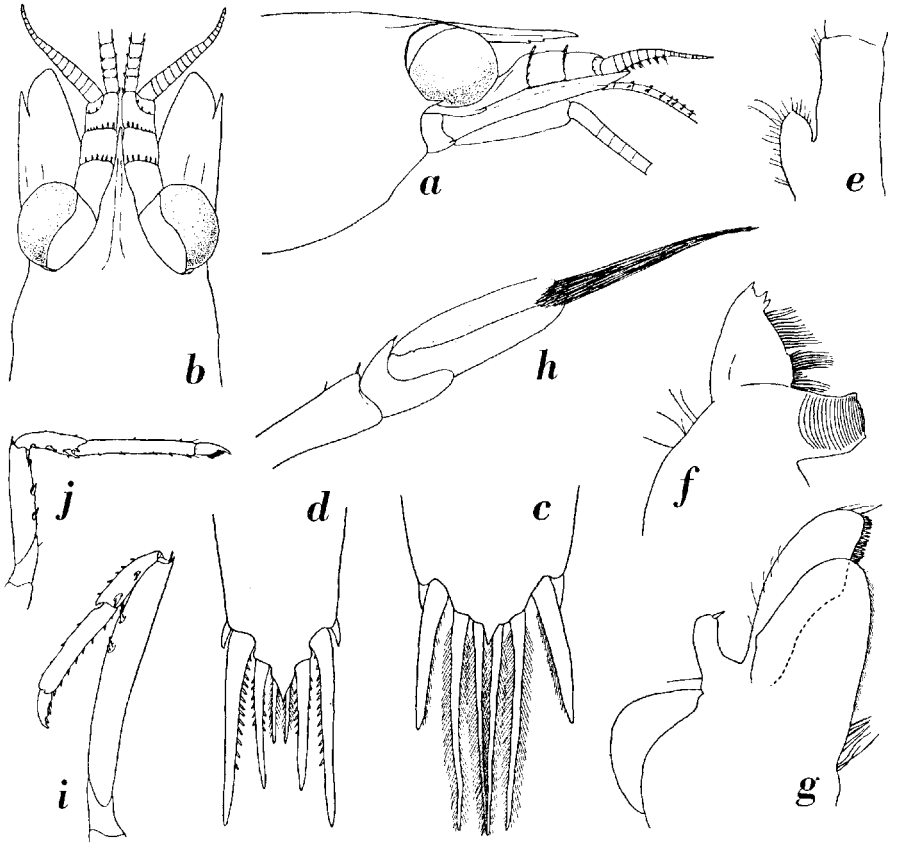

Fig. 3. *Atya* ? *africana* Bouvier (specimen from Boma except no. d). a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, tip of telson; d, tip of telson (specimen from Sta. 119); e, base of antennular peduncle; f, mandible; g, maxillula; h, chela of first leg; i, third leg; j, fifth leg. a, b, i, j, ×15; c, d, ×80; e, ×20; f, g, ×40, h, ×18.

The antennular carina is truncated anteriorly. The antennular peduncle has the basal segment elongate. The stylocerite, when seen from above, is broad with a rather broadly rounded apex. It reaches only slightly beyond the middle of the basal segment. The first, second and third segments of the peduncle are provided with spinules on the anterior margin. A double row of spinules is furthermore present in the basal part of the upper surface of the lower antennular flagellum.

The scaphocerite is rather slender and overreaches the antennular peduncle for a small distance. It is about 2.5 to 3 times as long as broad. The outer margin is convex. The final tooth is far surpassed by the lamella, which has the apex rather sharp.

The mandible has the incisor process broad, ending in three denticles and with the inner margin provided with long hairs. The molar process is finely striated. The maxillula has the lower endite much higher than broad, it partly covers the upper endite, which has the inner margin with numerous spines; the palp ends in a small spinule. The maxilla is as figured by BOUVIER (1925, p. 23, fig. 58) for *Atya scabra* (Leach), the number of hairs at the tip of the scaphognathite being smaller, however, and the lower of the two endites ends distally in a pointed tip, which is concealed behind the lower part of the upper endite. The maxillipeds are similar to those of *Atya scabra* (Leach) as figured by BOUVIER (1925, p. 25, figs. 59—61). Also the branchial formula is like that given by BOUVIER (1925, p. 28) for *Atya*, though I could see no epipods on the 4th legs.

The first two pairs of legs are exactly similar to those of the adults. The third leg is slender. The dactylus bears about 4 spines on the posterior margin and ends in a dark coloured curved tip. The propodus has the anterior as well as the posterior margin provided with a longitudinal row of spinules, while such a row is also present on the inner surface. The propodus is 2.5 times as long as the dactylus and almost 1.5 times as long as the carpus. The carpus possesses two movable spines on the outer surface, while one movable spine is placed in the distal part of the posterior margin of the carpus; a row of spinules is present on the anterior margin. The merus is longer than the three previously mentioned joints together. In the distal half of the posterior margin it bears two movable spines, while two small spinules are placed in the distal part of the anterior margin. A longitudinal row of hairs extends over the outer surfaces of the propodus, carpus, and merus. The fourth leg is very similar to the third, but has the merus shorter; this joint is about as long as the dactylus, propodus, and carpus together. The fifth leg has the merus still shorter, here it is about as long as the propodus. The dactylus of the fifth leg has a row of about 7 comb-like arranged spinules on the posterior margin just behind the apex. The spinules on the propodus are smaller in number than in the third leg. Both the carpus and the merus bear three strong movable spines on their posterior margins. In the other respects the fifth leg resembles the third.

The endopod of the first pleopod is very small and almost circular in outline. In the second pleopod of my specimens no appendix masculina is (yet) present. The uropods are elongate. The outer of the two lobes of the basal segment has the inner side concave, the outer convex. The exopod bears a transverse row of about 10 to 12 spinules near the end of the straight outer margin.

This description and also the figures 3a—c, e—j are made on the specimens from Boma. The Cameroons specimens differ in several points: The rostrum is longer, always reaching beyond the antennular peduncle. The obtuse angle of the lateral margin of the rostrum is slightly more pronounced. The pleurae of the fourth abdominal segment are pointed. The pereiopods are provided with exopods, those of the first three or four pairs being well developed. The merus of the third leg bears 4 movable spines on the posterior margin. The telson differs in having the posterior margin provided with differently shaped spines, the number of which (8) is the same as in the Boma specimens: the outer pair is very short, of the three other pairs the inner one is the shortest, the outer one the longest. The inner pair is setose, the next pair bears minute spinules on both sides, while the longest pair has the inner margin only provided with spinules. The uropodal exopod bears a transverse row of about 6 spinules in the distal part of the upper surface. The bottom sample specimen quite agrees with the animals from off Cameroons.

The differences mentioned here are great, but they may be due to the different stages of development. The specimens from Boma show more resemblance to the adult form (absence of exopods on the pereiopods, shape of the telson), than the specimens from Stations 57 and 119. The smallest specimen from Boma, 9 mm. in length, is, however, quite identical with the other material from the same lot and is different from the largest specimen from Sta. 119. The Boma specimens were collected in fresh or brackish water, while the specimens from Sta. 57 and 119 were taken in pure sea water. This might indicate that the early stages of this species are spent in the sea and that, when growing older, it returns to fresh water, just as is the case in some species of the Palaemonid genus *Macrobrachium*.

As far as I can see there are only two records of *Atyidae* from sea water in the literature, viz. that of *Caridina vitiensis* Borr. from Galle, Ceylon (PEARSON, 1905), and that of *Caridina nilotica gracilipes* De Man and *Caridina lanceifrons* Yu from S. China (YU, 1936). Probably in both cases an error in the labelling caused that marine localities were stated for otherwise pure fresh water species; this is especially true of YU's specimens, since other fresh water species too are reported by him from the same locality. Therefore, the only reliable record of an Atyid from salt water which I know (except the above record of the Atlantide specimens) is that communicated to me by Dr. FENNER A. CHACE, Jr., Curator of the division of marine invertebrates, U. S. National Museum, Washington, D. C., U. S. A. Dr. CHACE informed me that he himself received an Atyid shrimp from Biscayne Bay, Florida, which was collected in salt water. As his material consisted of one specimen only Dr. CHACE refrained from publishing it and kindly permitted me to mention this find in the present paper.

Distribution. Up till now *Atya africana* was only known from fresh water in Gabon and Belgian Congo. The records in literature are: Ogowé River near Samkita, Gabon (Bouvier, 1904, 1905, 1925), Boué, Gabon (Bouvier, 1925), Mbuma, Belgian Congo (De Man, 1925).

Atya intermedia Bouvier 1904.

Atya intermedia Bouvier 1904, p. 137.
Atya intermedia Bouvier 1905, p. 119, fig. 23.
Atya intermedia Bouvier 1906, p. 493.
Atya intermedia Bouvier 1925, p. 308, figs. 690—695.

Distribution. This species has been recorded only from fresh waters of São Thomé Island in the Gulf of Guinea, where it has been found in the Rio do Ouro.

Atya scabra (Leach) 1815.

Restricted synonymy:
Atys scaber Leach 1815, p. 345.
Atya sulcatipes Newport 1847, p. 159, pl. 8 fig. 1.
Atya scabra White 1847, p. 74.
Atya sulcatipes A. Milne Edwards 1864, p. 147.
Atya scabra Greeff 1882, p. 35.
Atya scabra Greeff 1884, p. 54.
Atya scabra Osorio 1887, pp. 222, 230.
Atya sulcatipes Bate 1888, p. 694, pl. 118, pl. 119 fig. 1.
Atya scabra Osorio 1888, p. 189.
Atya scabra Osorio 1889, pp. 129, 137, 139.
Atya scabra Osorio 1891, p. 47.
Atya scabra Osorio 1891a, p. 140.
Atya scabra Osorio 1892, p. 200.
Atya scabra Ortmann 1895, p. 409.
Atya scabra Osorio 1895, p. 249.
Atya scabra Osorio 1895a, p. 251.
Atya margaritacea claviger Aurivillius 1898, p. 14, pl. 3 figs. 5—8.
Atya scabra Osorio 1898, pp. 186, 194.
Atya scabra p. p. Rathbun 1900, p. 313.
Atya scabra Bouvier & Lesne 1901, p. 13.
Atya scabra Bouvier 1904, p. 138.
Atya scabra Bouvier 1905, p. 121, fig. 25.
Atya scabra Osorio 1905, p. 102.
Atya scabra Bouvier 1906, p. 493.
Atya scabra Osorio 1906, p. 150.
Atya scabra Balss 1914, p. 97.
Atya scabra Balss 1925, p. 239.
Atya scabra Bouvier 1925, p. 314, figs. 55—67, 703—706.
Atya scabra De Man 1925, p. 27, figs. 4a—c.
Atya scabra Monod 1933, p. 461.

Distribution. *Atya scabra* is known from the fresh waters of West Africa, the West Indies, the east coast of America from Mexico to Venezuela, and its west

coast from Lower California to Costa Rica. It has also been reported from New Caledonia and Australia. The West African records are: Cape Verde Islands (WHITE, 1847; OSORIO, 1888; BOUVIER, 1904, 1905, 1925), São Nicolãu, Cape Verde Islands (NEWPORT, 1847), Ribeira Brava, São Nicolãu, Cape Verde Islands (OSORIO, 1905), São Antonio Valley, São Thiago, Cape Verde Islands (BATE, 1888), Fernando Po (BOUVIER, 1904, 1905, 1925), Rio Papagaio, Principe (OSORIO, 1889), Rio Banzu, Principe (OSORIO, 1895a), São Thomé (GREEFF, 1882, 1884; BOUVIER & LESNE, 1901; BOUVIER, 1904, 1905, 1906, 1925), Agua Grande, São Thomé (OSORIO, 1887), Batepá and Obó Vermelho (OSORIO, 1889), Rio Quija (OSORIO, 1891), Manuel Jorge River (OSORIO, 1891a), Rio Gumoela and Portinho (OSORIO, 1892), Rio Agua Izé, São Thomé (OSORIO, 1906), Rio São João, Anno Bom (OSORIO, 1895), Craterlake, Anno Bom (BALSS, 1914), Etome, Cameroons (AURIVILLIUS, 1898), Victoria, Cameroons (BALSS, 1925), near Tiko, Bimbia River near Dikullu and Kienké River near Kribi, Cameroons (MONOD, 1933), Mbuma, Mayumbe, Belgian Congo (DE MAN, 1925), Duque de Bragança, N. Angola (OSORIO, 1887). It is possible, however, that some of these records are based on other species of *Atya*. Thus all the specimens from Liberia published by Miss RATHBUN (1900) as *Atya scabra* are actually *Atya gabonensis* Giebel as pointed out by BOUVIER (1925, p. 317, footnote).

Atya gabonensis Giebel 1875.

Atya gabonensis Giebel 1875, p. 52.
Euatya sculptilis Koelbel 1884, p. 317, pl. 2 fig. 8, pl. 3 figs. 1—8.
Atya sculptata Ortmann 1890, p. 465.
Atya gabonensis Ortmann 1895, p. 410.
Atya gabonensis Ortmann 1897, p. 185.
Atya scabra p. p. Rathbun 1900, p. 313.
Atya gabonensis Thompson 1901, p. 22.
Atya gabonensis Bouvier 1904, p. 138.
Atya gabonensis Bouvier 1905, p. 123, fig. 26.
Atya scabra Johnston 1906, p. 862.
Atya gabonensis Bouvier 1925, p. 317, figs. 707, 708.
Atya gabonensis Monod 1933, p. 461.
Atya gabonensis Irvine 1947, p. 306, fig. 211.

Distribution. The species inhabits fresh waters of West Africa. The records in literature are: Africa (ORTMANN, 1890), Félou River, Senegal (BOUVIER, 1904, 1905, 1925), Kayes, French Sudan (BOUVIER, 1904, 1905, 1925), Liberia (JOHNSTON, 1906), St. Paul's River near Mt. Coffee, Beulah and Muhlenburg Mission, Liberia (RATHBUN, 1900), Kpong, Volta River, Gold Coast (IRVINE, 1947), Yabassi, Wouri River, Cameroons (MONOD, 1933), Gabon (GIEBEL, 1875), Ngomo, Ogowé River, Gabon (BOUVIER, 1925). KOELBEL's (1884) record of this species from the Orinoco River, Venezuela is doubtful.

Atya serrata Bate 1888.

Restricted synonymy:

Atya serrata Bate 1888, p. 699, pl. 119 fig. 2.
Atya serrata Ortmann 1895, p. 410.
Ortmannia Alluaudi Bouvier 1925, p. 269, figs. 607—610, 616—629, 634—638.
Atya serrata Bouvier 1925, p. 294, figs. 611—615, 630 633.

Distribution. It is doubtful whether this species, which is widely distributed throughout the Indo-westpacific area, also occurs in West Africa. There are only two West African records of this species in the literature: São Antonio Valley, São Thiago, Cape Verde Islands (BATE, 1888; BOUVIER, 1925), St. Paul River near Millsburg and Muhlenburg, Liberia (BOUVIER, 1925).

Family **Oplophoridae.**

Acanthephyra brevirostris Smith 1885

Restricted synonymy:

Acanthephyra brevirostris Smith 1885, p. 504.
Acanthephyra brevirostris Lenz & Strunck 1914, p. 327.

Distribution. The species is known from off the eastcoast of the U. S. A., from Bermuda and the Bahamas, from off West Africa, from near Marion Island (S.W. Indian Ocean) and from off the coast of Ecuador. The only West African record is that given by LENZ & STRUNCK (1914) from S.W. of Liberia, 0°46′ N, 18°59′ W. Adult specimens are known from depths between 1800 and 5300 m, CHACE (1940) records juveniles from 1200 to 1800 m depth.

Acanthephyra sexspinosa Kemp 1939

Acanthephyra purpurea Ortmann 1893, p. 43.
Acanthephyra purpurea p. p. Lenz & Strunck 1914, p. 326.
Acanthephyra purpurea p. p. Balss 1925, p. 252.
Acanthephyra sexspinosa Kemp 1939, p. 575.
Acanthephyra sexspinosa Barnard 1950, p. 669.

Material examined:

Station 62, off Liberia, 4°16′ N, 8°18′ W; stramin net 200 cm., 400 m. wire; January 10, 1946, $20h^{10}$—$20h^{55}$. — 10 specimens 34—85 mm.

Station 139, off Liberia, 1°30′ N, 10°10′ W; stramin net 200 cm., April 2, 1946, $4h^{00}$. — 23 specimens (including 5 ovigerous females, 74—80 mm) 59—83 mm.

In 1939 KEMP published a revision of the *purpurea* group of the genus *Acanthephyra*. This very important paper at last wiped out the confusion regarding the exact number and status of the different species belonging to this group.

The present specimens all perfectly agree with KEMP's new species *Acanthephyra sexspinosa*. In all old specimens the posterior dorsal spines of the fourth and fifth abdominal segments are lacking, but in small specimens these spines are distinct, though being much smaller than those of the third and sixth segments. The telson generally possesses 6 dorsal pairs of spines, sometimes there are 5 or 7 pairs.

Distribution. The species has been collected from depths between 200 and 4000 m. It occurs in the "Central and South Atlantic from 17° N to

18° S" (KEMP, 1939). The other records in literature are: S. of Cape Verde Islands (ORTMANN, 1893), Central Atlantic Ocean: 5°27′ N, 21°41′ W; 0°46′ N, 18°59′ W; 0°6′ S, 18°18′ W (LENZ & STRUNCK, 1914), off Sierra Leone: 8°58′ N, 16°27′ W; off Ivory Coast: 0°56′ N, 4°34′ W; 0°55′ N, 4°37′ W; 0°20′ N, 6°45′ W; off Gold Coast: 1°51′ N, 0°31′ E; 1°14′ N, 2°10′ W; off Nigeria: 3°11′ N, 5°34 E; 3°31′ N, 7°25′ E; off French Congo: 0°25′ N, 7°0′ E; 1°56′ S, 7°40′ E; 3°55′ S, 7°48′ E; off Belgian Congo: 5°6′ S, 9°58′ E; off Angola: 9°31′ S, 9°46′ E; 11°28′ S, 10°24′ E (BALSS, 1925).

Acanthephyra acanthitelsonis Bate 1888.

Acanthephyra acanthitelsonis Bate 1888, p. 745, pl. 125 fig. 3.
Acanthephyra acanthitelsonis Kemp 1906, p. 8.
Acanthephyra purpurea acanthitelsonis Lenz & Strunck 1914, p. 327.
Acanthephyra acanthitelsonis Balss 1925, p. 254.
Acanthephyra acanthitelsonis Kemp 1939, p. 574.
Acanthephyra acanthitelsonis Chace 1947, p. 16.
Acanthephyra acanthitelsonis Barnard 1950, p. 668.

Material examined:

Station 82, off Gold Coast, 5°27′ N, 0°07′ E; stramin net, 200 cm., 1731 m. wire; January 29, 1946, 16^{h30}—18^{h00}. — 5 specimens 61—70 mm.

Station 139, off Liberia, 1°30′ N, 10°10′ W; stramin net, 200 cm., April 2, 1946, 4^{h00}. — 13 specimens (including 1 ovigerous female, 116 mm.) 97—125 mm.

The specimens agree perfectly with the descriptions given by KEMP (1939) and BATE (1888).

There has been some difference of opinion about the status of this species. Some authors considered it synonymous with *Acanthephyra purpurea*, while others regarded it as a variety of that species. KEMP (1939), in his revision of the *purpurea* group of the genus *Acanthephyra*, showed it to be a good species.

Distribution. The species has been recorded from hauls from 1200 to 4000 m depth, with a doubtful record from 200 m. KEMP (1939) states the species to live in the "Central and South Atlantic, from about 14° N to 28° S." The other records are: Off Sierra Leone: 8°58′ N, 16°27′ W (BALSS, 1925), S.W. of Sierra Leone: 1°47′ N, 24°26′ W; 1°22′ N, 26°36′ W (BATE, 1888), S.W. of Sierra Leone: 0°46′ N, 18°59′ W (LENZ & STRUNCK, 1914), off Liberia: 6°29′ N, 14°35′ W; off Ivory Coast: 0°20′ N, 6°45′ W; 0°26′ N, 6°32′ W; 0°55′ N, 4°37′ W; 0°56′ N, 4°34′ W; off Gold Coast: 1°14′ N, 2°10′ W; 1°51′ N, 0°31′ E; off Nigeria: 2°36′ N, 3°27′ E; 3°11′ N, 5°34′ E; off French Congo: 0°25′ N, 7°0′ E; 1°56′ S, 7°40′ E; 3°55′ S, 7°48′ E; off S.W. Africa: 21°53′ S, 6°58′ E; 28°28′ S, 6°13′ E (BALSS, 1925). Very interesting are CHACE's (1947) records of this species from Bermuda and the Bahamas.

Acanthephyra kingsleyi Bate 1888.

Acanthephyra kingsleyi Bate 1888, p. 751, pl. 126 fig. 4.
Acanthephyra Kingsleyi Kemp 1906, p. 22.
Acanthephyra Kingsleyi De Man 1920, p. 45.
Acanthephyra Kingsleyi Balss 1925, p. 251.
Acanthephyra purpurea p. p. Chace 1936, p. 27.

This species is only known from the type specimen. Though KEMP (1906), DE MAN (1920) and BALSS (1925) regarded it to be a good species, CHACE (1936) synonymized it with *Acanthephyra purpurea* A. Milne Edw. KEMP (1939) in his excellent revision of the *purpurea* group of the genus *Acanthephyra*, in which he splits the old species *A. purpurea* into several distinct species, does not mention *A. kingsleyi* at all.

Distribution. The type originates from S.W. of Sierra Leone, 2°25′ N, 20°1′ W, from a depth of 4500 m.

Acanthephyra acutifrons BATE 1888.

Acanthephyra acutifrons p. p. Bate 1888, p. 749, pl. 126 fig. 3.
Acanthephyra acutifrons Kemp 1906, p. 22.
Acanthephyra acutifrons De Man 1920, p. 43.
Acanthephyra acutifrons Balss 1925, p. 261.
Acanthephyra acutifrons Chace 1936, p. 27.
Acanthephyra acutifrons Chace 1940, p. 146, fig. 23.
Acanthephyra acutifrons Chace 1947, p. 19.

Material examined:

Station 139, off Liberia, 1°30′ N, 10°10′ W; stramin net 200 cm.; April 2, 1946, 4^{h00}. — 1 specimen 41 mm.

The posterior tooth of the third abdominal segment is larger than that figured in BATE's (1888) and in CHACE's (1940) papers. It reaches slightly beyond the middle of the fourth abdominal segment. In all other respects my specimen agrees with the descriptions and figures given in the literature of *Acanthephyra acutifrons*.

KEMP (1906, p. 20) pointed out that of the specimens which BATE referred to *Acanthephyra acutifrons*, only the type from off the Aru Islands belongs to that species and that the specimens from near the Philippines are *Acanthephyra curtirostris* Wood-Mason & Alcock.

Distribution. The species has been recorded from hauls from depths varying between 1270 and 2400 m., and from hauls with 1600 to 2400 m. wire out. It is known from the Atlantic as well as from the Indo-westpacific areas. It has been recorded from Bermuda, the Bahamas, the West Indies, the Gulf of Mexico, the Indian Ocean S. of Sumatra and from the Malay Archipelago. The present specimen is the first to be recorded from West Africa.

Acanthephyra stylorostratis (Bate) 1888.

Restricted synonymy:

Bentheocaris stylorostratis Bate 1888, p. 726, pl. 123 fig. 4.
Bentheocaris stylorostris Lenz & Strunck 1914, p. 325.

Distribution. The species is known from the Atlantic Ocean off the coast of New Jersey (U. S. A.), near Bermuda, near the Bahamas, near Madeira, the Canary and Cape Verde Islands; in addition, it occurs off Natal and probably in the southern Pacific near the Tuamotu Islands. The only West African record is that given by Lenz & Strunck (1914), who state no exact position of the locality whence their specimens originate, but only say that it lies W. of the Cape Verde Islands. The species has been reported from depths between 1000 and 5000 m.

Notostomus vescus Smith 1886.

Restricted synonymy:

Notostomus vescus Smith 1886, p. 676.
Acanthephyra brevirostris Bate 1888, p. 751, pl. 126 figs. 5, 6 (non Smith 1884).
Acanthephyra batei Faxon 1895, p. 167.
Acanthephyra Batei Kemp 1906, p. 22.
Acanthephyra batei Lenz & Strunck 1914, p. 327.

Distribution. The species is known from S. of Iceland, off the east coast of the U. S. A., near Bermuda, the Bahamas, off Portugal, off the West African coast, the Bay of Bengal and the Philippine Islands. The West African localities are: S.W. of Sierra Leone, 1°22′ N, 26°36′ W (Bate, 1888) and 0°46′ N, 18°59′ W (Lenz & Strunck, 1914). It has been reported from depths between 900 and 5300 m.

Notostomus perlatus Bate 1888.

Restricted synonymy:

Notostomus perlatus Bate 1888, p. 831, pl. 134 fig. 2.
Notostomus perlatus Balss 1925, p. 268, fig. 36.

Distribution. The species has been reported from Bermuda, the Bahamas, the Gulf of Mexico (from these three localities with some doubt), from off Pernambuco, Brazil, the Gulf of Guinea, off E. Africa, the Indian Ocean near the Chagos Archipelago, off Sumatra and near Celebes. The West African records are: South of the Ivory Coast, 0°56′ N, 4°34′ W[1]) (Balss, 1925), South of the Gold Coast, 1°14′ N, 2°10′ W. The species is reported from depths between 1200 and 3900 m.

Notostomus longirostris Bate 1888.

Notostomus longirostris Bate 1888, p. 833, pl. 135 fig. 4.
Notostomus atlanticus Lenz & Strunck 1914, p. 330.
Notostomus atlanticus De Man 1920, p. 46.
Notostomus longirostris De Man 1920, p. 46.
Notostomus atlanticus Stephensen 1923, p. 61, fig. 20.

[1]) Balss (1925) gives this position as 0°56′ N, 4°34′ E, which obviously is a misprint since in all other places of his paper the situation of this station is given as 4°34′ W.

Notostomus longirostris Balss 1925, p. 268.
Notostomus longirostris Chace 1936, p. 28.
Notostomus longirostris Welsh & Chace 1937, p. 64, fig. 3.
? *Notostomus westergreni* ? Chace 1940, p. 171, fig. 43.
Notostomus atlanticus Chace 1947, p. 26, figs. 1, 2.

Material examined:

Station 82, off Gold Coast, 5°27′ N, 0°07′ E; stramin net 200 cm., 1731 m. wire; January 29, 1946, 16^{h30}—18^{h00}. — 1 specimen 36 mm.

The specimen is juvenile, but agrees well with the descriptions given in the literature. The carapace, which is 10 mm. in length (rostrum excluded), is only slightly vaulted dorsally and bears much resemblance to CHACE's (1947) fig. 2.

CHACE (1947) does not synonymize *Notostomus atlanticus* and *N. longirostris* "for the type of the latter is a specimen with a carapace length of only 8 mm., and yet the dorsal carina of the carapace is strongly vaulted." The measurements given by BATE for his specimen of *Notostomus longirostris* are the following:

Length,	entire	64 mm. (2.5 in.)
—	of carapace	19 mm.
—	of rostrum	11 mm.
—	of pleon	45 mm.

CHACE evidently thought that BATE's measurement of the carapace included the rostrum, since the carapace length found by CHACE must have been obtained by subtracting the length of the rostrum (11 mm.) from that of the carapace (19 mm.). Dr. ERLING SIVERTSEN, director of the Videnskapsselskapets Museum at Trondheim, Norway, when studying the Caridea of the "Michael Sars" Expedition, also encountered this problem of the identity or distinctness of *Notostomus longirostris* and *N. atlanticus*. During a visit to the British Museum in 1949 Dr. SIVERTSEN was able to measure BATE's type specimen of *Notostomus longirostris* and found the length of the carapace (rostrum excluded) of the animal to be 19 mm. Dr. SIVERTSEN kindly permitted me to use this observation before he published it himself. I wish here to thank him for his courtesy in letting me use this observation, which solves the whole problem. CHACE's mistake obviously was that he supposed BATE to have included the length of the rostrum when giving the length of the carapace. In the beginning I took it for granted, as CHACE obviously also did, that BATE gave as the entire length of the animal the length from the tip of the rostrum to the tip of the telson. As the total of BATE's measurements for the carapace and the pleon equalled his length for the whole animal, it could only be concluded that the length of the rostrum is included in that of the carapace. The cause of all trouble now

lies in the fact that BATE consistently excludes the length of the rostrum when stating the whole length of the animal. This is quite obvious when we look at the measurements given by BATE for those species which have the rostrum longer than the carapace proper (e. g., *Heterocarpus alphonsi*, p. 633; *Plesionika spinipes*, p. 646; *Plesionika unidens*, p. 648; *Oplophorus longirostris*, p. 766; *Stylodactylus orientalis*, p. 854). It is also evident from BATE's figure of *Notostomus longirostris* that the specimen does not have a rostrum of 11 mm., a carapace of 8 mm. and a pleon of 45 mm.

Another character which has been used to separate *N. longirostris* and *N. atlanticus* is the presence in the latter form of a distinct median lateral carina on the rostrum, which carina is not shown in BATE's (1888) figure of the type of *N. longirostris* nor is it mentioned in his description. CHACE (1947, p. 27), who was able to examine specimens of this species from the Philippines, already pointed out that the presence of this carina was omitted probably erroneously by BATE in his description and figure. I have at my disposal several specimens from the Malay Archipelago, some of which were collected very close to the type locality of BATE's species. In this material too the median lateral carina of the rostrum is distinct. My Gold Coast specimen, moreover, resembles the material from the Malay Archipelago in all points. For these reasons I can only come to the conclusion that *Notostomus longirostris* Bate and *N. atlanticus* Lenz & Strunck are one species.

The relation between *Notostomus longirostris* Bate, *N. patentissimus* Bate and *N. westergreni* Faxon is not very clear. A large material of these three forms is needed to decide whether or not they are good species.

Distribution. The species has been taken from hauls from 1100 to 3500 m. depth and from hauls with 1200 to 2400 m. wire. BALSS (1925) records a capture from the surface. This species has been found both in the Atlantic and the Indo-westpacific regions, viz. at Bermuda, the Bahamas, S.W. of Spain, N. of New Amsterdam (Indian Ocean) and off Banda. LENZ & STRUNCK (1914) record the species from N.W. of the Cape Verde Islands, 20°41′ N, 31°53′ W.

Ephyrina bifida Stephensen 1923.

Restricted synonymy:

Ephyrina bifida Stephensen 1923, p. 58, fig. 18.
Ephyrina Benedicti Balss 1925, p. 269, figs. 38, 39.

Distribution. *Ephyrina bifida* is known with certainty only from the Bermuda region, the Bahamas, the Bay of Biscay and from the Gulf of Guinea. The West African record is that of BALSS (1925) from S. of the Ivory Coast, 0°55′ N, 4°37′ W. The species has been reported from depths between 720 and 4000 m.

Hymenodora glacialis (Buchholz) 1874.

Restricted synonymy:

Pasiphaë glacialis Buchholz 1874, p. 279, pl. 1 fig. 2.
Hymenodora mollicutis Bate 1888, p. 848, pl. 137 fig. 2.
Hymenodora glacialis Lenz & Strunck 1914, p. 331, fig. 5.
Hymenodora glacialis Balss 1925, p. 270.
Hymenodora glacialis Balss 1927, p. 269.

It is very probable that all the West African material of the above mentioned authors, or part of it belongs to *Hymenodora gracilis* Smith, which species was not separated by them from *H. glacialis*.

Distribution. Since in most records *H. glacialis* and *H. gracilis* are not distinguished, it is very difficult to obtain a clear picture of the range of distribution of both species. "*Hymenodora glacialis*" has been reported from the entire Atlantic Ocean from the Polar Sea to the region of Cape of Good Hope, from the southern Indian Ocean, the Arabian Sea, off N.E. Africa, the Sea of Okhotsk and from off the west coast of America from the Bering Sea to Ecuador. The West African records are: near Cape Verde Islands, 14°39′ N, 21°51′ W (Balss, 1925), off Sierra Leone, 6°29′ N, 14°35′ W (Balss, 1927), off Sierra Leone, 5°27′ N, 21°41′ W (Lenz & Strunck, 1914), S.W. of Sierra Leone, 2°25′ N, 20°1′ W (Bate, 1888), off Liberia, 1°27′ N, 10°16′ W (Balss, 1927), S. of the Gold Coast, 1°51′ N, 0°31′ E (Balss, 1927), off Angola, 11°28′ S, 10°24′ E (Balss, 1925). The species has been recorded from the surface down to a depth of 5400 m.

Systellaspis braueri (Balss) 1914.

Restricted synonymy:

Acanthephyra braueri Balss 1914a, p. 594.
Systellaspis Braueri Balss 1925, p. 245, textfigs. 16—20, pl. 21.

Distribution. The species has been collected near Bermuda, in the Bay of Biscay, in the Gulf of Guinea, near the Bay of Bengal and off the coast of California. The only West African records are those of Balss (1914a, 1925) from S. of the Ivory Coast, 0°26′ N, 6°32′ W and 0°56′ N, 4°34′ W. It is known from depths between 1300 and 4000 m.

Systellaspis debilis (A. Milne Edwards) 1881.

Restricted synonymy:

Acanthephyra debilis A. Milne Edwards 1881, p. 13.
Acanthephyra debilis Lenz & Strunck 1914, p. 327.
Systellaspis debilis Balss, 1925, p. 242.

Material examined:

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; otter trawl, 260—650 m. depth, bottom mud; March 1, 1946, 14^h10^m—15^h40^m. — 2 ovigerous females 76 and 79 mm., 1 very badly damaged specimen, about 65 mm.

The two ovigerous females agree well with the figures and descriptions given in the literature of this well-known species. The other specimen is in a very poor condition, but certainly also belongs to this species.

Distribution. The species has been recorded from hauls from depths varying between 25 and 3000 m. It is widely distributed in the Atlantic Ocean and known from several localities in the Indo-westpacific region. It has been recorded from S. of Iceland, the Faeroes, British waters, Bay of Biscay, off Portugal, the Azores, W. of the Canary Islands, near the Cape Verde Islands, off the east coast of the U. S. A. (Virginia and N. Carolina), Bermuda, the Bahamas, West Africa, South Africa, off East Africa, the Indian Ocean S. of the Keeling Islands, the Malay Archipelago and the Hawaiian Islands. The West African records are: Near the Cape Verde Islands: 17°28′ N, 29°42′ W (LENZ & STRUNCK, 1914), off Nigeria: 2°36′ N, 3°27′ E (BALSS, 1925), off Belgian Congo: 5°6′ S, 9°58′ E[1]) (BALSS, 1925).

Systellaspis cristata (Faxon) 1893.

Acanthephyra cristata Faxon 1893, p. 206.
Acanthephyra cristata Faxon 1895, p. 162, pl. 43 fig. 1.
Systellaspis gibba Alcock & Anderson 1896, pl. 25 fig. 2.
Acanthephyra cristata Anderson 1896, p. 94.
Acanthephyra cristata Alcock 1899, p. 31.
Acanthephyra cristata Alcock 1901, p. 82.
Acanthephyra cristata Kemp 1906, p. 22.
Systellaspis cristata De Man 1920, p. 43.
Systellaspis cristata Balss 1925, p. 244, figs. 14, 15.
Systellaspis cristata Chace 1936, p. 29.

Material examined:

Station 139, off Liberia, 1°30′ N, 10°10′ W; stramin net 200 cm.; April 2, 1946, 4^{h00}. — 1 specimen 64 mm.

The description given by FAXON agrees well with the present specimen. FAXON's figure, however, shows some differences. Here the minute spinules on the posterior margin of the fourth and fifth abdominal segments, close to the base of the pleurae are not shown. Furthermore, the spine on the third segment is better developed than shown in the figure of FAXON's. The specimen perfectly agrees with ALCOCK & ANDERSON's (1896) pl. 25 fig. 2. ALCOCK (1901), in his description of the species, states that the "distal end of the outer border of the basal joint of the antennular peduncle is not produced, and the scale at the basal end of that border is hardly half the length of the joint." In my specimen, however, the outer border of the first joint of the antennular peduncle is distinctly produced forwards into a rounded lobe, which bears a small spinule at the top. Moreover, the stylocerite reaches beyond the middle of this joint. The stylocerite is rather broad and placed perpendicularly on the basal joint proper. It ends in a rather sharp point and has a distinct lobe in the posterior part of the upper margin.

[1]) In BALSS's paper this locality is erroneously indicated as lying in 5°6′ N, instead of 5°6′ S.

Distribution. The species has been recorded from hauls from 0 to 1620 and 3200 m. depth. It is far from common and has only been recorded in the literature from the following localities: the west coast of Africa, the Arabian Sea, near Ceylon and the Gulf of Panama. The only previously known West African specimen was obtained off Sierra Leone, 8°58′ N, 16°27′ W (BALSS, 1925).

Family **Nematocarcinidae.**

Nematocarcinus cursor A. Milne Edwards 1881.

Restricted synonymy:

Nematocarcinus cursor A. Milne Edwards 1881, p. 14.

Material examined:

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; Sigsbee trawl, 530—850 m. depth, bottom mud; March 1, 1946, $9^{h}45^{m}$. — 9 specimens (including 1 ovigerous female, 90 mm.) 86—92 mm.

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; otter trawl, 260—650 m. depth, bottom mud; March 1, 1946, $14^{h}10^{m}$—$15^{h}40^{m}$. — 1 fragment.

Station 135, off Angola, 7°55′ S, 12°38′ E; Sigsbee trawl, 360—440 m. depth, bottom mud; March 17, 1946, $8^{h}42^{m}$—$9^{h}15^{m}$. — 277 specimens (included 16 ovigerous females, 82—104 mm.) 34—104 mm.

Station 135, off Angola, 7°55′ S, 12°38′ E; eel trawl, 235—460 m. depth, bottom mud; March 17, 1946, $13^{h}40^{m}$—$15^{h}40^{m}$. — 188 specimens (included 86 ovigerous females, 77—101 mm.) 54—102 mm.

This rich material agrees well with the descriptions and figures given in the literature. In most specimens part of the legs or all of them are broken, but enough characters remain for a safe identification.

Distribution. *Nematocarcinus cursor* is stated to have been collected from depths varying between 209 and 2033 m. It seems to live on the bottom and to prefer a muddy bottom. The species has been recorded in the literature from the east coast of the U. S. A. (from off New Jersey southwards), the West Indies, and from the Indo-westpacific region from the Gulf of Aden and the Zanzibar area to the Malay Archipelago, Fiji and Kermadec Island. Up till now it was not known from West Africa.

Nematocarcinus exilis (Bate) 1888.

Restricted synonymy:

Stochasmus exilis Bate 1888, p. 823, pl. 132 fig. 14.
Nematocarcinus ensifer exilis Lenz & Strunck 1914, p. 330.

According to DE MAN (1920, p. 75) *Nematocarcinus gracilipes* A. Milne Edwards has been collected off the Cape Verde Islands, but I could find no confirmation of this statement in the literature. *Nematocarcinus gracilipes* belongs to those species,

which have never been adequately described. The name was published for the first time in 1884, when it appeared with a figure in a popular paper by FILHOL on the "Talisman" Expedition in the French serial "La Nature" (vol. 12, p. 232, fig. 1). FILHOL does not give any description of the species and even does not mention its name in the text of his article; the name "*Nematocarcinus gracilipes* (A. M. Edw.)" occurs only under the figure. An anonymous English version of the part of FILHOL's paper dealing with the Crustacea was published in the same year (1884) in "Nature" (see Anonymous, 1884). In this paper also the figure of *Nematocarcinus gracilipes* was inserted. The same figure, each time with the name *Nematocarcinus gracilipes* (A. M. Edw.), may also be found in FILHOL's (1885) "Vie au fond des mers" (p. 140, fig. 45) and in PERRIER's (1886) "Explorations sous-marines" (p. 295, fig. 213). In none of these publications has any description of the species been given, except for the general remarks on the length of the antennae and legs, the size of the eyes and the body colour. Also no mention is made of the locality whence the animals captured by the "Talisman" originated. DE MAN's (1920) indication of the Cape Verde Islands as the type locality of the species is probably based on the following remark made in the paper in "Nature" (vol. 29, p. 532): "Of the Crustacea belonging to the group of Macrura, the one to which the crayfish and shrimps belong, many were taken at very great depths. Off the Cape Verd Islands, from a depth of 500 metres, a thousand individuals of a new species of *Pandalus* were taken. Among the most remarkable of all of these forms is the one which . . . we are enable to give the accompanying illustration. Named *Nematocarcinus gracilipes* by ALPHONSE MILNE-EDWARDS, it was, when taken fresh from a depth of 850 metres, of a splendid rose colour." It is evident that the locality "Off the Cape Verd Islands" relates to the new species of *Pandalus* and not to *Nematocarcinus*. That the latter was collected at a different Station is also indicated by the fact that it came from 850 m. and not from 500 m. depth.

FILHOL's figure makes the identity of *Nematocarcinus gracilipes* with *N. exilis* pretty certain. If this should really prove to be the case, then the dubious name *Nematocarcinus gracilipes* Filhol (1884) should have priority over the well established name *Nematocarcinus exilis* Bate (1888).

Distribution. This species occurs in the eastern Atlantic Ocean from S. of Iceland to N. of St. Helena, it has been found also in the Mediterranean and near the Canary Islands. The only record within the region under consideration is that of LENZ & STRUNCK (1914) from N. of St. Helena, 12°11′ S, 6°16′ W. *Nematocarcinus exilis* has been reported from depths varying between 1200 and 4000 m.

Family **Disciadae.**

Discias atlanticus Gurney 1939.

(Fig. 4).

Discias atlanticus Gurney 1939, p. 388, figs. 1—13.
Discias atlanticus Monod 1939, p. 557.
Discias atlanticus Gurney & Lebour 1941, p. 95, figs. 2 t – z, a^1, figs. 3 a – z.

Material examined:

Station 40, off São Pedro Bay, São Vicente, Cape Verde Islands; triangular dredge (45 cm), 40 m. depth, bottom foraminifera; December 11, 1945, $14h^{10}$. — 1 specimen 12 mm.

Station 123, off Gabon, 2°03′ S, 9°05′ E; Sigsbee trawl and otter trawl, 50 m. depth, bottom mud; March 5, 1946, $8h^{45}$. — 1 specimen 12 mm.

The two specimens, both males, agree in most respects with GURNEY's (1939) description of *Discias atlanticus*. The few points on which they show differences, however, seem to be too insignificant to be of specific value. A larger material of both American and West African specimens is needed to decide whether these forms are one species or not.

The rostrum of my specimens differs from the figure given by GURNEY

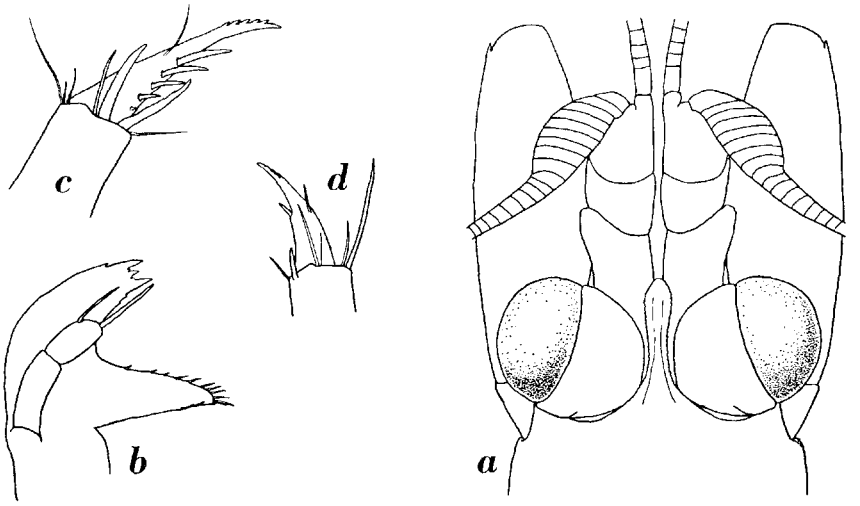

Fig. 4. *Discias atlanticus* Gurney. a, anterior part of body in dorsal view; b, mandible; c, dactylus of third pereiopod; d, dactylus of fifth pereiopod. a, ×25; b d, ×100.

in being somewhat narrowed behind the apex, the lateral margins being slightly concave in the proximal $^3/_4$ of their length. Furthermore, this concave part of the lateral margin of the rostrum is minutely serrate. The hairs on the orbital margin as described by GURNEY are hardly visible, but they are present. As shown in GURNEY's fig. 2 the lower orbital angle is rounded with the very small antennal spine placed close to it.

The abdomen is exactly as in the Bermuda specimens. The sixth segment is a little less than twice as long as the fifth. The telson has the dorsal surface in the posterior $^2/_5$ of its length provided with two pairs of spines which are placed on the lateral margins. The posterior margin is exactly as in GURNEY's fig. 3.

The eyes and antennulae are as described by GURNEY. About 10 of the lower joints of the upper antennular flagellum are conspicuously broadened, this broadened part regularly narrows distally.

The scaphocerite is somewhat broader (especially near the middle) than figured by GURNEY, but shows all the other features given in the figure of the English author.

The mandible has the incisor process ending in three teeth; between each two of these teeth a small denticle is present. Furthermore one denticle is visible on the upper and two on the lower margin of the process. The molar process bears several hair-like spines. The palp is well developed and consists of two distinct joints, the ultimate of which bears two strong setae. The maxillula, maxilla and the first and third maxillipeds are like those described and figured by GURNEY. The second maxilliped has the exopod somewhat longer than in GURNEY's figure, reaching distinctly beyond the curved endopod.

The first two pairs of legs fully agree with the description and figures given by GURNEY. The last three legs in general agree well with GURNEY's description and figures, though some discrepancies may be observed. The propodus of leg 4 has 5 spines just like that of leg 3 and 5. The dactylus is described by GURNEY as "in each leg simple, but with very minute spines at end". In my material the dactylus is not simple: the ventral margin of the dactylus of leg 3 bears 5 rather slender spines in the middle, while a row of 5 short spines is placed on the upper margin close to the tip (these probably are the spines meant by GURNEY). The same is true of the fourth leg, but here the ventral spines are smaller and only three in number. In the fifth leg I observed only one ventral and 4 dorsal spinules. A dorsal hair is present on each of the dactyli.

Distribution. Adult specimens of this species were obtained from shallow water plankton (GURNEY, 1939); MONOD (1939) gives a depth of 15—20 m. for this species. Larvae have been recorded (GURNEY & LEBOUR, 1941) from depths of 60 to 300 m. The species has been described for the first time as late as 1939 from The Reach, Bermuda (GURNEY, 1939), whence later (GURNEY & LEBOUR, 1941) also the larvae were reported. MONOD (1939) reports the species from Basse-Terre, Guadeloupe. The present specimens from the Cape Verde Islands and Gabon thus double the number of localities from where the species is known and at the same time constitute the first record of this species outside American waters.

Family **Processidae.**

Processa canaliculata Leach 1815.

Restricted synonymy:
Processa canaliculata Leach 1815a, pl. 41.
Nika edulis Ortmann 1893, p. 49.
Nika edulis Lenz & Strunck 1914, p. 323.
Processa canaliculata Balss 1916, p. 30.
Processa canaliculata Odhner 1923, p. 5.
Processa canaliculata Monod 1933, p. 465.

Distribution. For a long time *Processa canaliculata* was considered a cosmopolitan species, and forms all over the world have been identified with it. In 1936

LEBOUR showed that even the European material of *Processa* comprises at least two distinct species and it gradually became evident that most records of *Processa canaliculata* (or *Nika edulis*, which up till 1936 was synonymized with *Processa canaliculata*) were erronous. The Atlantide-Expedition collected a large material of *Processa* from West Africa, but none of the specimens proved to be a genuine *P. canaliculata*, on the contrary, all three species are new to science. It is therefore highly improbable that the specimens recorded in literature under the name *Processa canaliculata* Leach or *Nika edulis* Risso from West Africa indeed belong to those species. Only by examination of the material can its identity be made out. The West African records of the species are: Cape Blanco, Mauritania (MONOD, 1933), São Vicente, Cape Verde Islands (ORTMANN, 1893), Porto Grande, São Vicente (LENZ & STRUNCK, 1914), Pedra de Lume, Sal (MONOD, 1933), Baixo de João Leitão, S. of Boavista, Cape Verde Islands (ORTMANN, 1893), Nyanga River, French Congo (BALSS, 1916), Mussera, N. Angola (BALSS, 1916), Porto Alexandre, S. Angola (ODHNER, 1923).

Processa intermedia n. sp.

(Figs. 5, 6).

Material examined:

Station 38, Porto Grande, São Vicente, Cape Verde Islands, 16°53′ N, 25°00′ W; triangular dredge (45 cm.), 9 m. depth, bottom sand; December 10, 1945, $11h^{20}$. — 1 specimen 7 mm.

Station 39, São Pedro Bay, São Vicente, Cape Verde Islands, 16°50′ N, 25°04′ W; triangular dredge (45 cm.), 41–50 m. depth, bottom foraminifera and corals; December 10, 1945, $14h^{40}$. — 18 specimens (including 1 ovigerous female, 15 mm.) 8—15 mm.

Station 44, off French Guinea, 10°22′ N, 16°22′ W; Sigsbee trawl, otter trawl and triangular dredge (45 cm.), 41—55 m. depth, bottom brown sand and shells; December 17, 1945. — 14 specimens (including 3 ovigerous females, 18—19 mm.) 9–19 mm.

Station 54, off Liberia, 6°05′ N, 10°25′ W; bottom sample CIII; Petersen grab, 22 m. depth, bottom coarse sand; January 8, 1946, $7h^{42}$. — 1 specimen 7 m.

Station 73, off Gold Coast, 4°50′ N, 1°40′ W; bottom sample EV; Van Veen grab, 33 m. depth, bottom sand; January 23, 1946, $10h^{18}$. — 1 specimen 9 mm.

Station 73, off Gold Coast, 4°50′ N, 1°40′ W; bottom sample EVI; Van Veen grab, 33 m. depth, bottom sand; January 23, 1946, $10h^{22}$. — 1 specimen 8 mm.

Station 146, off French Guinea, 9°27′ N, 14°48′ W; Sigsbee trawl and otter trawl, 50 m. depth, bottom shells and foraminifera; April 13, 1946, $14h^{20}$. — 7 specimens 8–12 mm.

Station 148, off French Guinea, 9°57′ N, 15°22′ W; Sigsbee trawl, 25 m. depth, bottom shells and hydroids; April 14, 1946, $16h^{25}$—$16h^{55}$. — 2 ovigerous females 33 and 34 mm.

Station 153, off French Guinea, 10°49′ N, 16°39′ W; Sigsbee trawl,

42 m. depth, bottom coarse sand; April 16, 1946, 13h20—13h50. — 1 specimen 14 mm.

Description. The rostrum is slender, when seen either from above or in side view; but it is distinctly higher proximally than distally. It does not

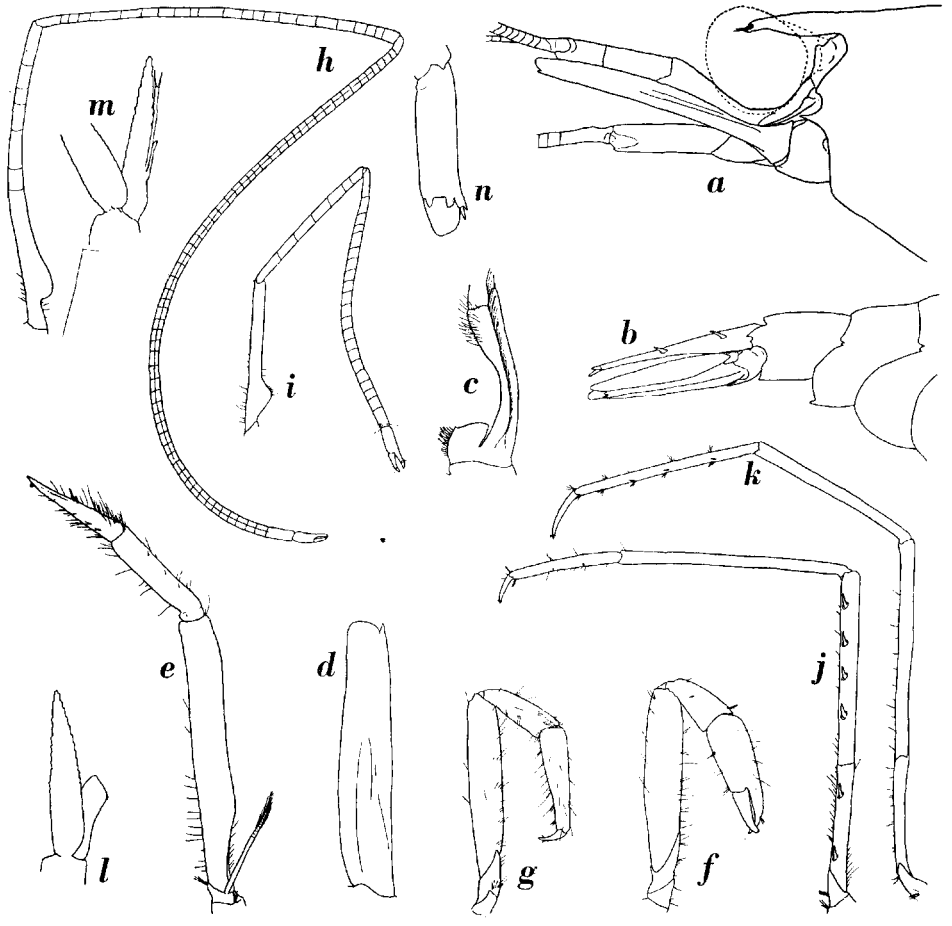

Fig. 5. *Processa intermedia* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, base of antennular peduncle; d, scaphocerite; e, third maxilliped; f, right first pereiopod; g, left first pereiopod; h, right second pereiopod; i, left second pereiopod; j, third pereiopod; k, fifth pereiopod; l, first pleopod of male; m, second pleopod of male; n, exopod of uropod. a, c, d, ×7; b, e—k, n, ×5; l, m, ×17.

reach the end of the eyes. The tip is bifid with the lower tooth reaching distinctly beyond the upper; between the two teeth a tuft of hairs is present. The upper margin is evenly, but slightly, convex; the lower margin bears some hairs, it is convex in the proximal, somewhat concave in the distal part. The carapace is smooth. The lower orbital angle forms a rectangle with a rounded apex. A distinct and sharp antennal spine is placed on the

anterior margin of the carapace some distance below the orbital angle. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first four segments are broadly rounded, that of the fifth is provided with a distinct posteriorly directed tooth at the top. The pleura of the sixth segment is broadly triangular and ends in a sharp point. The posterolateral angle of this segment forms a broadly truncated process, which reaches over the base of the telson; the posterior margin of this process either forms a broad point or is provided with a spine. The sixth segment is less than 1.5 times as long as the fifth and slightly longer than high. The telson is a little less than twice as long as the sixth abdominal somite. Its dorsal surface bears two strong pairs of spines, the posterior of which is placed in the middle of the telson. Numerous hairs are scattered over the dorsal surface of the telson, a distinct transverse row of these hairs is visible in the basal part of the telson. A longitudinal groove which widens posteriorly runs throughout the length of the telson. The posterior margin of the telson ends in a sharp median point, which is flanked by two pairs of strong spines. The outer pair of spines is about half as long as the inner. Between the inner spines a pair of plumose setae is present.

The eyes are very large, being much larger than in *Processa edulis*, they are about 1.5 times as broad as the greatest breadth of the scaphocerite.

The antennular peduncle just reaches the end of the scaphocerite, it is about $^2/_3$ of the length of the carapace (rostrum excluded). The stylocerite is short and broad, it is about $^1/_4$ as long as the basal segment of the peduncle. The anterior margin of the stylocerite is broadly truncated and almost straight; at the outer angle a small spinule is visible. The third segment is about $^2/_3$ of the length of the second. The shorter antennular flagellum is about as long as the peduncle.

The scaphocerite is slender, it is about 5 times as long as broad, and it broadens only very slightly in the middle of its length. The outer margin is slightly sinuous. The final tooth is distinct and reaches as far as the lamella. The antennal peduncle reaches to the end of the second segment of the antennular peduncle.

The mouthparts are like those in *Processa edulis* (Risso). The mandible consists of a molar process only. The maxillula lacks the lower endite, and the palp is distinctly bifid. The maxilla has the lower endite reduced to a small triangular process, while the two lobes of the upper endite are indicated as small inconspicuous tubercles which bear a tuft of hairs; the palp is distinct. The first maxilliped has the endites of the endopod fused, a palp is present, the exopod has the caridean lobe broad, the epipod is large and bilobed. The second maxilliped has the last joint connected with the penultimate along its longer side, the exopod is well developed and articulated distally, a distinct epipod but no podobranch is present. The

third maxilliped is large, with the larger part of the penultimate joint it reaches beyond the scaphocerite. The last joint is pointed, it bears some spinules and a row of granules. The penultimate joint is about as long as the ultimate and somewhat less than the antepenultimate joint. A small exopod is present.

The branchial formula runs as follows:—

	maxillipeds			perciopods				
	I	II	III	I	II	III	IV	V
pleurobranchs	—	—	—	1	1	1	1	1
arthrobranchs	—	—	—	1	—	—	—	—
podobranchs	—	—	—	—	—	—	—	—
epipods	1	1	1	—	—	—	—	—
exopods	1	1	1	—	—	—	—	—

The first legs are strong and unequal. The right hand is chelate, while the left is simply hooked. When stretched forward these legs reach to or beyond the end of the scaphocerite. The fingers of the right leg are about $^3/_5$ of the length of the palm. The carpus is $^5/_6$ as long as the palm and about $^1/_3$ of the length of the merus. The left leg has the dactylus simple and $^2/_7$ of the length of the propodus. The carpus is $^3/_4$ as long as the propodus

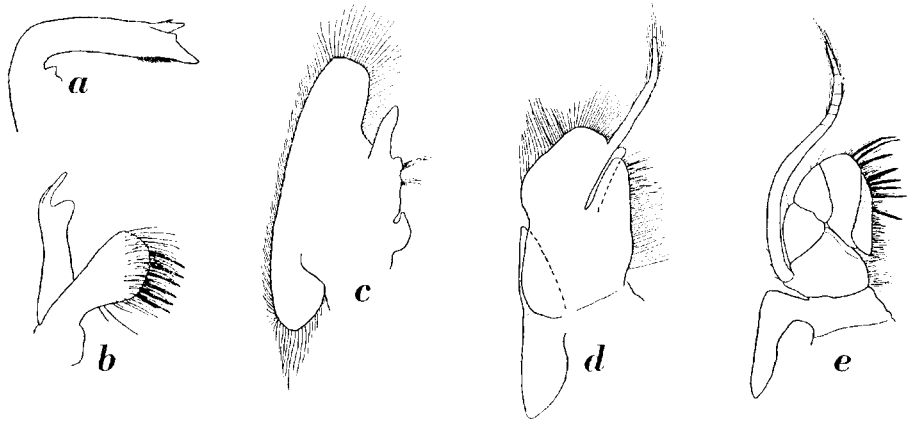

Fig. 6. *Processa intermedia* n. sp. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped. a, b, ×20; c—e, ×15.

and $^2/_5$ of the length of the merus. The second legs are very unequal in length. The right leg is very much longer than the left. It reaches with $^2/_3$ of the merus beyond the scaphocerite (in juveniles the mero-carpal articulation reaches only $^2/_3$ of the length of the scaphocerite). The chela is small, the carpus is about as long as the merus and the ischium taken together, it consists of about 28—65 joints. The merus is somewhat longer than the

ischium (in young specimens it is somewhat shorter) and consists of about 10 to 20 joints, which are less distinct than those of the carpus. The ischium bears the usual lobe at the inner side of its base and it consists of about 7 indistinctly marked joints. The left leg reaches with the mero-carpal articulation about to the end of the eye or even less far. The general shape and the relation between the segments is like that in the right leg. The segments are shorter, however, and consist of less joints: the carpus has about 14 to 20 joints, the merus 5 to 7, while no joints could be observed in the ischium. The last three pairs of legs are slender. They have the dactylus simple. The third leg reaches with $^1/_3$ to $^1/_4$ of the carpus beyond the scaphocerite. The dactylus measures $^2/_7$ of the length of the propodus. The latter is $^1/_2$ to $^2/_3$ as long as the carpus. The merus is about $^4/_5$ of the length of the carpus or almost quite as long as that joint, it is 1.5 times as long as the ischium. On the outer surface of the merus a longitudinal row of 4 or 5 strong movable spines is present, two similar spines are placed on the outer surface of the ischium. No spines are seen on the other joints. The fourth leg strongly resembles the third, but it has the carpus and propodus longer. The carpus is still longer than the propodus, though the difference is not as great as in the third leg. The merus bears 5 to 6, the ischium 2 spines on the outer surface. The fifth leg reaches with $^4/_5$ of the propodus, or with the whole joint, beyond the scaphocerite. The dactylus is longer than in the two previous legs, it is $^2/_7$ of the length of the propodus. The propodus is as long as or slightly longer than the carpus. Its posterior margin is provided with 5 movable spines, which are evenly divided over the margin. The distal of these spines is placed near the base of the dactylus. A small movable spine is generally placed at the inner side of each of the above mentioned spines. No spines are present on the other joints of this leg.

The pleopods of the female are normal in shape, those of the second to fifth pair possess a well developed appendix interna, which is absent from the endopod of the first pair. The endopod of the first pleopod of the male is broadly lamellar and bears a number of small curved hooks in the distal half of the inner margin. The endopod of the second pleopod of the male has the appendix masculina very elongate and slender, being about twice as long as the appendix interna. The uropods are elongate and reach about as far as the tip of the telson. The outer margin of the exopod ends in a tooth, which bears a strong movable spine at the inner side. A suture runs inward from the final tooth, the posterior part of the exopod being movably connected with the anterior part along this suture. Two broad and blunt posteriorly directed teeth, which are placed just anterior to the suture are present on the upper surface of the exopod.

Size. The males seen by me were generally smaller than the females. The ovigerous females vary rather strongly in size (15 to 34 mm.). The

eggs are numerous and small, being 0.3 to 0.6 mm. in diameter. The juveniles generally have the carpus of the longer second leg consisting of less joints than in the adults. In my ovigerous females the number of joints varies between 40 and 65, males have generally about 30 joints in the carpus of the longer leg, though I have seen a specimen with 60 joints there. The character of the tooth at the tip of the pleurae of the fifth abdominal segment is already visible in very juvenile specimens, but sometimes (e. g., in my juvenile of Station 146) it is not very distinct.

Type. Holotype is the larger female from Station 148, the other specimens are paratypes.

This species shows most resemblance to *Processa edulis* (Risso), but in some respects it is closer to *P. canaliculata* Leach. Like *P. edulis* it has the pleurae of the fifth abdominal segment toothed at the apex, but the eyes are relatively larger than in that species, while the scaphocerite is narrower. The left second leg resembles that of *P. canaliculata* by not reaching beyond the eye with the carpo-meral articulation. The spinulation of the propodus of the last leg is like in *P. canaliculata*. Furthermore the new species resembles *P. canaliculata* in possessing an arthrobranch on the first pereiopod. This arthrobranch is absent in my *edulis* material, while it is present in my specimens of *P. canaliculata*. The differences from *Processa canaliculata* may be found in the shape of the pleurae of the fifth abdominal segment, and in the fifth leg, which has the propodus somewhat longer than (sometimes almost equal to) the carpus.

Distribution. As is shown by the present material *Processa intermedia* inhabits depths of 9 to 50 m. and seems to prefer a sandy bottom. It is found on the coasts of the Cape Verde Islands, French Guinea, Liberia and the Gold Coast.

Processa borboronica n. sp.

(Fig. 9).

Material examined:

Station 49, off Sierra Leone, 7°29′ N, 13°38′ W; Sigsbee trawl, 74—78 m. depth, bottom muddy sand; December 30, 1945, 8^{h20}. — 2 specimens 12 and 29 mm.

Station 49, off Sierra Leone, 7°29′ N, 13°38′ W; bottom sample; Van Veen grab, 78 m. depth, bottom muddy sand; December 30, 1945, 7^{h59}. — 1 specimen 12 mm.

Station 60, off Liberia, 5°06′ N, 9°34′ W; Sigsbee trawl, 78 m. depth, bottom mud; January 9, 1946, 9^{h50}. — 1 specimen 26 mm.

Station 85, off Gold Coast, 5°37′ N, 0°38′ E; Sigsbee trawl, 50 m. depth, bottom greyish mud; January 30, 1946, 10^{h20}—10^{h50}. — 1 specimen 25 mm.

Station 151, off French Guinea, 10°40′ N, 16°44′ W; bottom sample Kv;

Petersen grab, 86 m. depth, bottom coarse sand; April 16, 1946, 9^{h45}. - 1 specimen 9 mm.

Description. The rostrum is slender in dorsal as well as in lateral view, the posterior part is only slightly higher than the anterior. It fails to reach beyond the eyes, and is unarmed. The apex is bifid, the lower tooth reaches somewhat beyond the upper, hairs are present between the two teeth. The carapace is smooth, the lower orbital angle is broadly and bluntly angular. A small, but distinct antennal spine is placed on the anterior margin of the carapace some distance below the lower orbital angle. The anterolateral angle of the carapace is broadly rounded.

The abdomen is smooth, the pleurae of the first four segments are broad; they are, however, more truncated than rounded, because the outer margin of each is rather straight. The posterior tip of the pleura of the fifth segment is about rectangular, while the outer margin is slightly concave. The sixth segment is less than 1.5 times as long as the fifth. The pleura is broad, its tip is rectangular and ends in a minute point. The telson is about twice as long as the fifth abdominal segment, it has the same shape as that of the previous species.

The eyes are very large, being almost twice as broad as the scaphocerite. The cornea is broad, kidney-shaped.

The antennular peduncle does not reach to the end of the scaphocerite. The stylocerite is more than $^1/_3$ of the length of the basal segment of the peduncle. The anterior margin of the stylocerite is produced into a narrow anteriorly directed rounded lobe on the inner side, the outer anterior angle bears a minute tooth. The second and third segments of the peduncle together are as long as the first. The third is $^3/_5$ of the length of the second. The shorter antennular flagellum is about as long as the antennular peduncle.

The scaphocerite is slender, it is more than 6 times as long as broad. The outer margin is slightly sinuous. The final tooth is small, but distinct, it reaches about as far forwards as the truncated anterior margin of the lamella. The antennal peduncle reaches to the end of the first segment of the antennular peduncle.

The oral parts (except for the third maxilliped) show no appreciable differences from those of the previous species. Also the branchial formula is the same. The third maxilliped reaches with the last two joints beyond the antennular peduncle. The penultimate joint is as long as or somewhat longer than the ultimate. The antepenultimate joint is about twice as long as the ultimate two joints combined.

The first legs are unequal, the left being simple, the right chelate. They reach about to the end of the scaphocerite. Of the chelate leg the fingers are about $^2/_3$ of the length of the palm. The carpus is as long as the palm and somewhat more than $^1/_3$ of the length of the merus. The simply clawed

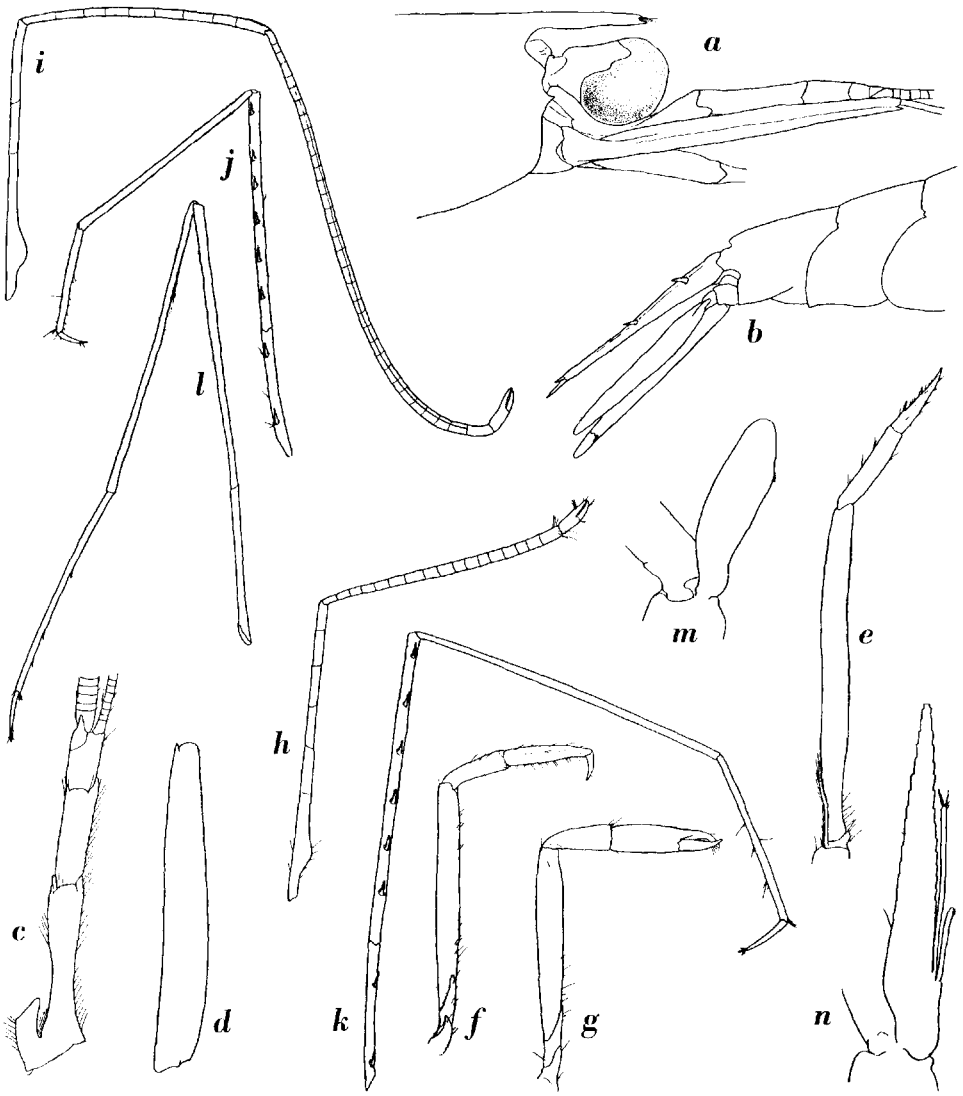

Fig. 7. *Processa borboronica* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, third maxilliped; f, left first pereiopod; g, right first pereiopod; h, left second pereiopod; i, right second pereiopod; j, third pereiopod; k, fourth pereiopod; l, fifth pereiopod; m, endopod of first pleopod of male; n, endopod of second pleopod of male. a, c, d, ×9; b, e –l, ×6; m, n, ×17.

leg has the dactylus about $^1/_3$ of the length of the propodus, which is $^4/_3$ as long as the carpus. The merus is almost three times as long as the carpus. An arthrobranch is present at the base of the first legs. The second legs are strongly unequal. The right second leg reaches with the mero-carpal articulation somewhat beyond the scaphocerite (in juveniles it reaches less far forwards). The carpus consists of 33– 36 joints (in juveniles 20) and is

about 10 times as long as the chela. The merus is about half as long as the carpus and consists of 9 joints. The ischium is somewhat longer than the merus, it bears the usual lobe at its base and shows some subdivisions. The left leg reaches with the mero-carpal articulation slightly beyond the eye, but fails to reach the end of the first segment of the antennular peduncle. The carpus is about 6 times as long as the chela and consists of 17 joints. The merus is $^3/_5$ of the length of the carpus and is subdivided into 4 joints. The ischium is about as long as the carpus, it possesses the basal lobe and is very indistinctly articulated. The third leg is slender, it reaches with the merus somewhat beyond the antennal peduncle. The dactylus is slightly less than $^1/_3$ of the length of the propodus. The propodus is about half as long as the carpus (it is longer than that in juveniles). The merus is slightly longer than the carpus. The ischium is about half as long as the merus. The merus has the outer surface provided with 6 strong movable spines, the ischium bears two such spines. No spines are present on any of the other joints. The fourth leg reaches with the merus to the end of the scaphocerite. The dactylus is $^1/_3$ of the length of the propodus, which is somewhat more than half the length of the carpus (being slightly shorter than the carpus in juveniles). The carpus is about as long as the merus, which is twice as long as the ischium. The merus bears 6, the ischium 2 spines on the outer surface. The fifth pereiopod reaches with the merus to $^4/_5$ of the length of the scaphocerite. The dactylus is very slender, it measures $^1/_4$ of the length of the propodus. The propodus bears three widely separated spines on the posterior margin, while this margin bears a tuft of hairs near the base of the dactylus. The carpus is longer than the propodus, in some cases its length only slightly exceeds that of the propodus, sometimes, however, it is 1.4 times as long as the latter joint. The merus is almost twice as long as the ischium. No spines are present on the merus or the ischium.

The first two pairs of pleopods of the male closely resemble those of the previous species: the endopod of the first pleopod, however, is somewhat more slender in the present species than in *Processa intermedia*, though it is sometimes broader than figured here; the appendix masculina of the second pleopod reaches only $^2/_3$ to $^3/_4$ of the length of the endopod. The uropods are as in the previous species.

Type. Holotype is the specimen from Station 85, the other specimens are paratypes.

Processa borboronica is most closely related to *P. canaliculata* Leach. It may be considered the West African representative of that species. It differs from *P. canaliculata* in the very long and slender appendages, in the shape of the pleurae of the fifth abdominal segment, which in *P. canaliculata* have the lower margin convex, and finally the stylocerite of the present species is quite different from that of *Processa canaliculata*.

The specimen of 12 mm. from Station 49 is in such a poor condition, that its identity cannot be given with certainty.

Distribution. *Processa borboronica* has been found on the African west coast from French Guinea to he Gold Coast. It seems to live at depths of 50 to 86 m. on a muddy or sandy bottom.

Processa parva n. sp.
(Fig. 8).

Material examined:

Station 45, off French Guinea, 9°23′ N, 15°07′ W; Sigsbee trawl and otter trawl, 30—34 m. depth, bottom sand; December 18, 1945, 15 h—18 h. — 1 specimen 13 mm.

Station 52, anchorage of Monrovia, Liberia; bottom sample CI; Van Veen grab, 11 m. depth, bottom sand; January 3, 1946, 9 h. — 6 specimens (including 1 ovigerous female, 12 mm.) 6—12 mm.

Station 55, off Liberia, 6°03′ N, 10°25′ W; bottom sample CVII; Petersen grab, 44 m. depth, bottom sandy mud; January 8, 1946, $8h^{45}$. — 1 ovigerous female 11 mm.

Station 77, anchorage of Accra, Gold Coast; bottom sample 77I; Van Veen grab, 10 m. depth, bottom muddy sand; January 29, 1946, $7h^{30}$. — 5 specimens 9—11 mm.

Station 77, anchorage of Accra, Gold Coast; bottom sample 77II; Van Veen grab, 10 m. depth, bottom muddy sand; January 29, 1946, $7h^{35}$. — 1 specimen 10 mm.

Station 98, off Nigeria, 5°56′ N, 4°26′ E; bottom sample FI; Van Veen grab, 100 m. depth, bottom fine mud; February 15, 1946, $9h^{22}$. — 1 specimen 11 mm.

Station 113, off Nigeria, 4°05′ N, 7°09′ E; bottom sample HIV; Petersen grab, 30 m. depth, bottom mud; February 22, 1946, $15h^{10}$. — 1 specimen 8 mm.

Station 123, off Gabon, 2°03′ S, 9°05′ E; Sigsbee trawl and otter trawl, 50 m. depth, bottom mud; March 5, 1946, $8h^{45}$. — 2 specimens 10 and 11 mm.

Station 145, off French Guinea, 9°20′ N, 14°15′ W; Sigsbee trawl and ottertrawl, 32 m. depth, bottom shells and foraminifera; April 13, 1946, $7h^{45}$—$10h^{10}$. — 1 ovigerous female 16 mm.

Station 161, off Bathurst, Gambia; otter trawl, 18 m. bottom very fine sand; April 24, 1946, $13h^{00}$. — 3 specimens (including 2 ovigerous females, 15 and 17 mm.) 10—17 mm.

Description. The rostrum is slender in lateral as well as in dorsal view, the posterior part is, however, distinctly higher than the anterior. It does not reach the end of the eyes. The apex is bifid, the lower tooth projects

only slightly beyond the upper. Hairs are present between the two teeth. The carapace is smooth. The lower orbital angle is broadly rounded and little pronounced. The antennal spine is very small and placed a small distance below the lower orbital angle. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first five abdominal segments are rounded. That of the fifth segment has the posterolateral angle rounded, and has no tooth there; its lower margin is convex. The sixth abdominal segment is only slightly longer than the fifth; its pleura is broadly triangular and ends in a small sharp, posteriorly directed top. The telson is about 1.5 times as long as the sixth segment, its shape is like that of the previous two species.

The eyes are large, the cornea being about twice as broad as the scaphocerite. In juveniles the cornea is expanded to a less degree.

The antennular peduncle reaches about to the end of the scaphocerite. The stylocerite has the anterior margin straight, with the outer angle produced into a sharp tooth. It is about $^1/_3$ of the length of the basal segment. The second joint is about 1.5 times as long as the third.

The scaphocerite is six times as long as broad. The final tooth slightly overreaches the lamella.

The mouthparts show no essential differences from those of *Processa intermedia*. The third maxilliped reaches with the last two joints (or with the last joint only) beyond the scaphocerite. The penultimate joint is somewhat longer than the ultimate. The latter bears some spines. The antepenultimate joint is about twice as long as the penultimate.

The first legs are unequal and reach to about the end of the scaphocerite. I found no arthrobranch in this species. The right leg is chelate. The fingers are $^2/_3$ as long as the palm, which is as long as the carpus. The merus is about five times as long as the fingers. The left leg is simply clawed. The dactylus is about $^2/_5$ of the length of the propodus and half as long as the carpus. The merus is twice as long as the propodus. The second legs are equal or practically equal. They reach with the mero-carpal articulation halfway to the eye. The carpus is about five times as long as the chela and consists of about 10 joints. The merus is $^3/_5$ of the length of the carpus and 6 indistinct joints are visible in it. The ischium is as long as the merus and with one or two indistinct subdivisions. The lobe at the inner side of the base of the ischium is not much pronounced. The third and fourth legs both reach with the merus to the middle of the eye. The dactylus of the third leg is $^2/_5$ of the length of the propodus and about $^1/_4$ of the length of the carpus. The latter is $^4/_5$ of the length of the merus, while the ischium is $^3/_5$ as long as the merus. The merus bears 5, the ischium 2 movable spines on the outer surface, while the other joints are unarmed. The fourth leg shows much resemblance to the third, but is longer. The dactylus is $^2/_5$ of

the length of the propodus, the propodus is $^2/_3$ as long as the carpus, which is as long as the merus. The ischium is slightly more than half as long as the merus. The ischium bears 2, the merus 6 movable spines on the outer surface. The fifth leg reaches somewhat less far forwards than the third and fourth legs. The dactylus is about half as long as the propodus, which

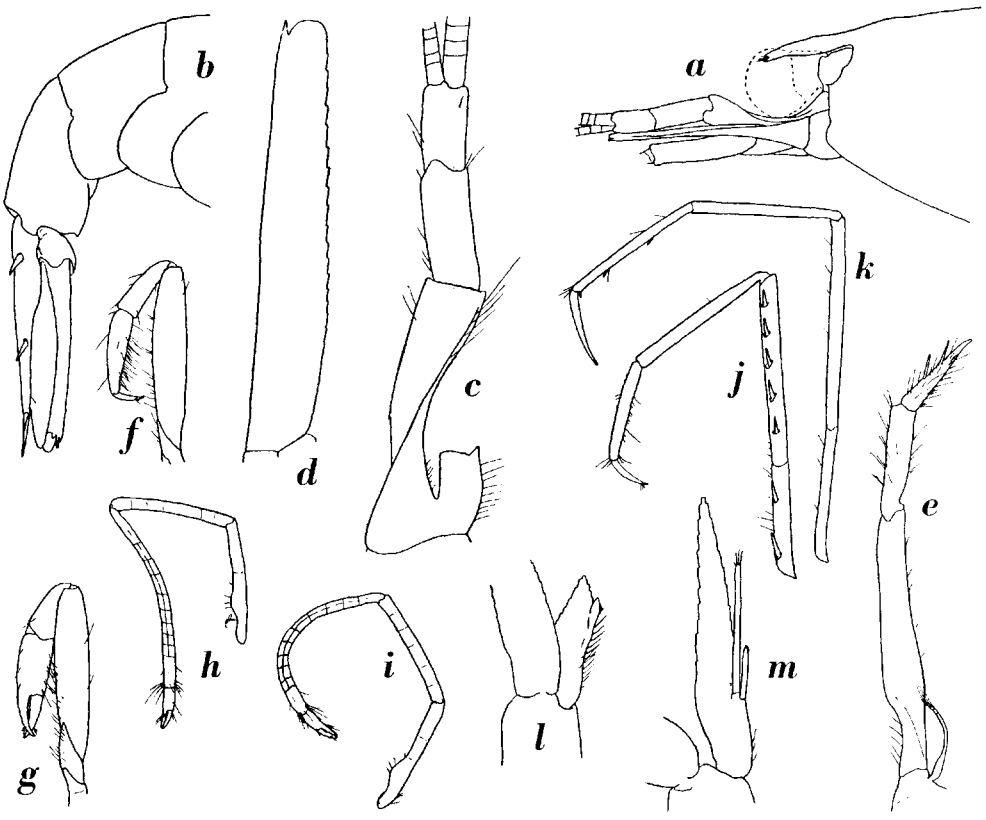

Fig. 8. *Processa parva* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, third maxilliped; f, left first pereiopod; g, right first pereiopod; h, left second pereiopod; i, right second pereiopod; j, third pereiopod; k, fifth pereiopod; l, endopod of first pleopod of male; m, endopod of second pleopod of male. a, b, e k, ×10; c, d, ×20; l, m, ×25.

is as long as or slightly longer than the carpus. The merus is somewhat longer than the propodus and 1.5 times as long as the ischium. Two small spines are present on the posterior margin of the propodus, while a third is placed near the base of the dactylus. The other joints are unarmed.

The first pleopod of the male has the endopod provided with an appendix interna, which for the larger part is fused with the endopod proper, but the top is free and bears some curved small hooks at its inner side. Strong setae are present at the inner side of the endopod. The second pleopod

of the male has the appendix masculina very long and slender, as in the previous species. The uropods are normal in shape.

The eggs are numerous and small, measuring 0.3 to 0.5 mm. in diameter.

In juvenile specimens the legs reach not as far forwards as in adults.

The specimen from Station 145 is quite aberrant. The rostrum ends in a simple tip, the antennal spine is absent and the whole body is somewhat more thickset than in my other specimens. In all other characters the specimen, however, closely resembles those of the present new species. As, however, the specimen possesses only the first and second pereiopods of the right side and lacks all other legs, it is difficult to ascertain whether the specimen is abnormal or whether it belongs to a different species.

Type. Holotype is the larger ovigerous female from Station 161.

Processa parva differs from all known Atlantic species by having the right and left second pereiopods equal or nearly equal. It is most closely related to *Processa aequimana* Paulson from the Red Sea and the Malay Archipelago. It has the shape of the second legs and that of the endopod of the first male pleopod in common with this species. It differs, however, from *P. aequimana* in the shape of the stylocerite, while GURNEY (1937) states that the propodus of the fifth leg of *P. aequimana* possesses no spines; such spines are, however, present in *P. parva*.

Family **Pandalidae.**

Pandalina profunda Holthuis 1946.

(Fig. 9).

Pandalus brevirostris Hoek 1882, p. 22, pl. 1 fig. 10 (non Rathke, 1843).
Pandalus brevirostris A. Milne Edwards 1883, pl. 26 fig. 2.
Pandalina brevirostris Schellenberg 1928, fig. 7.
Pandalina profunda Holthuis 1946, p. 281, figs. 1a—c.
Pandalina profunda Zariquiey Alvarez 1948, p. 258, figs. 1, 3.

Material examined:

Station 163, off Senegal, 13°43′ N, 17°23′ W; Sigsbee trawl and otter trawl, 65—89 m. depth; April 25, 1946, 10h00. — 2 specimens (1 ovigerous female, 14 mm.) 14 and 15 mm.

These two specimens in general points agree well with the type specimens of *Pandalina profunda*, though they are much smaller. Both specimens have 8 dorsal teeth on the rostrum, the 5 or 6 proximals being movable, the 3 or 2 distals not. The lower margin of the rostrum bears 2 teeth in both specimens. In the types the third pereiopod has the joints provided with many more spinules than in the West African specimens. The dactylus of this leg in the specimens from Senegal bears only 1 spine in the proximal part of the posterior margin.

In the type material from the Barents Sea the number of ventral teeth of the rostrum is 5 to 7. In A. MILNE EDWARDS's specimen from off Portugal the number of ventral teeth is 2, while ZARIQUIEY (1948) states his three specimens to have 2, 3, and 4 ventral rostral teeth. This seems to indicate that the southern forms constantly have less ventral teeth than those from northern regions. It would be extremely interesting to examine a large material of *Pandalina* from many localities throughout its range of distribution.

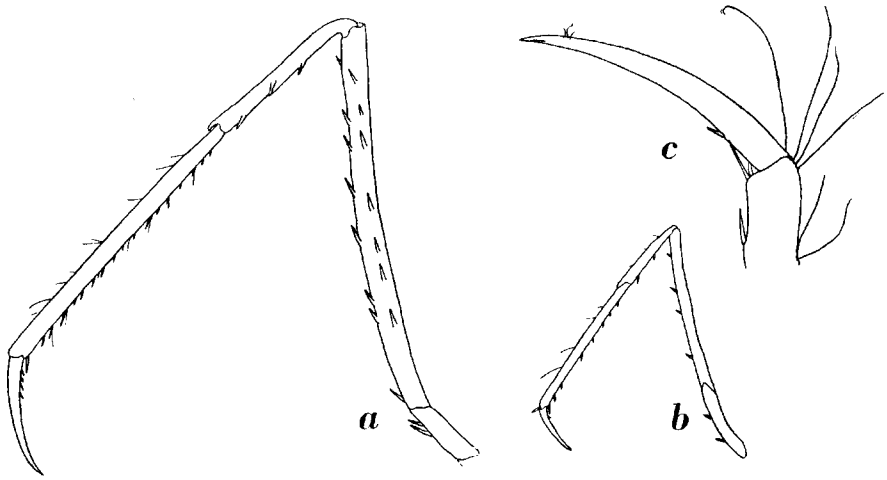

Fig. 9. *Pandalina profunda* Holthuis. a, third leg of type specimen from Barents Sea; b, third leg of specimen from Atlantide Expedition; c, dactylus of third leg of specimen from Atlantide Expedition. a, b, ×10; c, ×50.

Distribution. The distribution of the present species is insufficiently known, and it is very probable that it has been confused with *P. brevirostris* (RATHKE) by many authors. The only certain records are: Barents Sea (350 m. depth); Bergen, Norway; Shetland Islands (238 m. depth); off Portugal (1068 m. depth); off the Catalonian coast of Spain (50 and 70 m. depth).

Plesionika martia (A. Milne Edwards) 1883.

(Fig. 10).

Restricted synonymy:

Pandalus martius A. Milne Edwards 1883, Rec. Fig. Crust. nouv. peu conn., pl. 21.
Plesionika martia Balss 1925, Wiss. Ergebn. Valdivia Exped., vol. 20, p. 278.

Material examined:

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; Sigsbee trawl, 530—850 m. depth, bottom mud; March 1, 1946, 9^{h45}. — 5 specimens (including 2 ovigerous females, 135 and 155 mm.) 130—155 mm.

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; otter trawl, 260—650 m. depth, bottom mud; March 1, 1946, 14^{h10}—15^{h40}. — 1 male about 120 mm.

Station 135, off Angola, 7°55′ S, 12°38′ E; eel trawl, 235—460 m. depth, bottom mud; March 17, 1946, $13^{h}40$—$15^{h}40$. — 1 ovigerous female about 120 mm.

Description. The rostrum is slender, in the proximal part it is directed downwards, but the distal half is curved upwards. It reaches with about half its length beyond the scaphocerite. The dorsal margin of the rostrum bears 8 or 9 teeth in its proximal part; six or seven of these proximal teeth are placed close together, the first three or four lying behind the posterior margin of the orbit. The last tooth lies above the second or third joint of the antennular peduncle, it is widely separated from the previous, which sometimes is separated from its predecessor by a fairly great distance. There is no subapical tooth. The lower rostral margin is closely and evenly serrate, as in *P. ensis* (A. Milne Edwards). The first ventral tooth lies anteriorly of the last dorsal tooth. Each lateral surface of the rostrum bears a longitudinal row of hairs running along the lower margin. These hairs are placed close together and almost entirely conceal the ventral rostral teeth. A distinct longitudinal carina is present on the lateral surfaces of the rostrum, posteriorly this carina reaches slightly beyond the posterior limit of the orbit. The rostral carina reaches about to the middle of the carapace. A small tubercle is present in the middorsal line of the carapace at about $^{1}/_{6}$ of the length of the carapace (rostrum excluded) from the posterior margin. A faint carina is visible on the lateral surface of the carapace. This carina is far less distinct than in *Plesionika carinata* n.sp. The orbit closely resembles that of *P. ensis*. The antennal spine is large, the pterygostomian spine well developed and directed somewhat downwards. Body scales are present on the carapace; where these scales are rubbed off, small pits in the carapace show their implantations.

The abdomen also bears body scales. The pleurae of the first three segments are broadly rounded. The posterior margin of the third segment is evenly convex and does not bear any tooth. The pleura of the fourth segment has the lower margin convex and the tip broadly rounded. The fifth segment has the pleurae ending in a triangular lobe, which ends at the top in a minute point. As shown by the figures, the shape of the pleurae of the fourth and fifth segments is quite different from that of the corresponding segments of *Plesionika ensis*. The sixth abdominal segment is twice as long as the fifth, its pleurae are small, rounded and ending in a spine. The posterolateral angle ends in a sharp point, which overhangs the base of the telson. The telson is about as long as the sixth abdominal segment. Its dorsal surface bears three pairs of spines, the first of which is placed somewhat before the middle, the second lies at about $^{2}/_{3}$ of the length of the telson, while the third is placed somewhat closer to the second pair than to the posterior margin of the telson. This posterior margin ends in

an acute point and bears three pairs of spines. The outer of these spines are very short and placed before (not by the side of) the intermediate spines, just as in *P. ensis*.

The eyes are as in *Plesionika ensis*, but have the ocellus still less distinct.

The antennula is very similar to that of *P. ensis*, except in the shape of the stylocerite. The latter reaches slightly beyond the basal segment of the

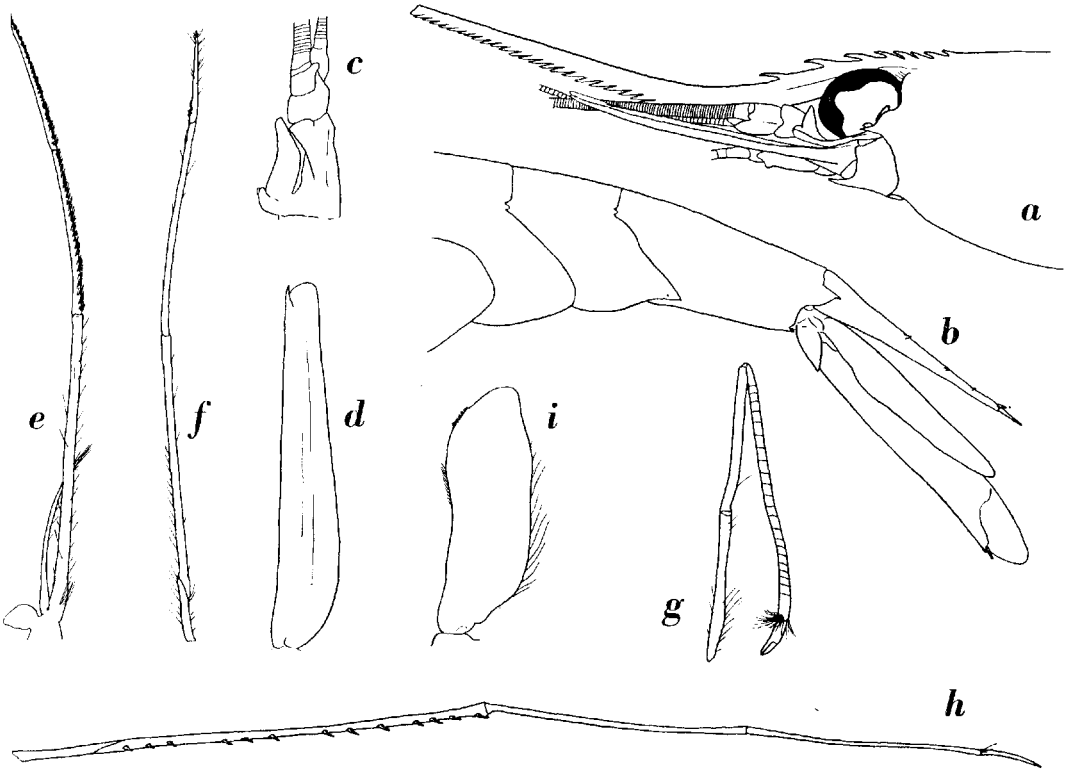

Fig. 10. *Plesionika martia* (A. Milne Edw.). a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, third maxilliped; f, first pereiopod; g, second pereiopod; h, third pereiopod; i, endopod of first pleopod of male. a—h, ×2.5; i, ×7.

antennular peduncle. Its top is broadly rounded with a tubercular point at the inner half. The erect process near the base of the stylocerite has the top indistinctly cleft and provided with a tuft of hairs.

The scaphocerite reaches with more than half its length beyond the antennular peduncle. It is six times as long as broad. The final tooth reaches to the end of the lamella or is somewhat overreached by it.

The mouthparts are essentially the same as those of *P. ensis*. The third maxilliped reaches with about half the ultimate joint beyond the scaphocerite. The branchial formula is as in *P. ensis*.

The first periopod reaches with the chela beyond the scaphocerite. The chela has the dactylus microscopically small. The carpus is slightly more than twice as long as the chela and slightly shorter than the merus. The second legs are equal. They reach to the end of the scaphocerite. The carpus is fully six times as long as the chela, it consists of about 22 joints. The merus and ischium are subequal in length and together about as long as the carpus and chela combined. The last three legs are very slender. The third reaches with almost half the carpus beyond the scaphocerite. The dactylus is simple and it is somewhat less than $^1/_3$ of the length of the propodus. The propodus is slightly shorter than the carpus. The merus is about 1.5 times as long as the carpus, its posterior margin bears 13 spines. The ischium is short and without spines. The fourth leg reaches with part of the carpus beyond the scaphocerite. It differs from the third by having the carpus and propodus longer and the merus shorter. The propodus is 9 times as long as the dactylus, slightly more than 1.5 times as long as the carpus and somewhat longer than the merus. Like in the third leg a row of spines (10 in number here) is present on the posterior margin of the merus, while no spines are present on the lateral surfaces of that or any other joint. The fifth leg reaches with the propodus only beyond the scaphocerite. The dactyli of the fifth legs are lacking in all my specimens. The propodus is almost 1.5 times as long as that of the fourth leg, it is distinctly more than twice as long as the carpus and 1.8 times as long as the merus. The propodus bears numerous minute spinules on the posterior margin, while the merus possesses 7 strong movable spines in the distal half of the posterior margin.

The pleopods are normal in shape. The endopod of the first pleopod of the male is figured here. The second pleopod is similar to that of *Plesionika acanthonotus*.

The uropods are elongate and slender and have the usual shape.

The eggs are numerous and small, their diameter is 0.4 to 0.5 mm.

Distribution. The species is known from off S.W. Ireland, the Bay of Biscay, throughout the Mediterranean, near Bermuda, the Gulf of Guinea, the Cape of Good Hope region, the Indo-westpacific region from the Gulf of Aden and the East African coast to Japan and Hawaii. The only West African record is that by Balss (1925) from off Gabon, 1°56′ S, 7°40′ E. The species has been recorded from depths between 165 and 2100 m.

A. Milne Edwards (1888) and Kemp (1910) figure the pleurae of the fourth and fifth segments of *Plesionika martia* like they are in *P. ensis*. Furthermore Senna (1902) and Kemp (1910) state the stylocerite of this species to be acutely pointed and do not mention anything about the peculiar shape of this organ, Caullery (1896) figures the stylocerite as an elongate process which regularly tapers towards an acute point. This evidence at

first made me suppose that the West African form should be different from the typical *Plesionika martia*, but direct comparison of the Atlantide material with material from the Mediterranean (N.E. coast of Spain, off the Golfo de Rosas, August 9, 1950) showed that it is perfectly identical with the Mediterranean form an thus with the typical *Plesionika martia*. We must therefore accept that small inaccuracies are present in the figures of A. MILNE EDWARDS (1888), CAULLERY (1896), and KEMP (1910).

Plesionika ensis (A. Milne-Edwards) 1881.
(Fig. 10).

Acanthephyra ensis A. Milne Edwards 1881, p. 14.
Pandalus ensis A. Milne Edwards 1883, pl. 18.
Plesionika uniproducta Bate 1888, p. 641, pl. 113 fig. 1.
Pandalus ensis Faxon 1896, p. 161.
Pandalus ?ensis Alcock & Anderson 1899, p. 284.
Acanthephyra ensis Young 1900, p. 476.
Pandalus (Plesionika) ensis Alcock 1901, p. 96.
Plesionika uniproducta Moreira 1901, p. 8.
Pandalus ensis Coutière 1905a, p. 675.
Pandalus ensis Rathbun 1906, p. 914.
Plesionika ensis De Man 1920, p. 106.
Plesionika uniproducta de Man 1920, p. 107.

Material examined:

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; Sigsbee trawl, 530—850 m. depth, bottom mud; March 1, 1946, $9h^{45}$. — 12 specimens (including 3 ovigerous females, 92—125 mm.) 80—125 mm.

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; otter trawl, 260—650 m. depth, bottom mud; March 1, 1946, $14h^{10}$—$15h^{40}$. — 2 specimens 75 and 120 mm., 1 damaged female.

Description. The rostrum is very long and slender, in my specimens it reaches with half its length or more beyond the scaphocerite. It is curved upwards. The upper margin bears five or six teeth in the basal part. The proximal four of which are placed close together, the fifth (and sixth) are more widely spaced. The third or fourth tooth lies just over the orbit, while the ultimate tooth is placed over the second or third joint of the antennular peduncle. The first tooth is movable. Distally of the five or six basal teeth the rostrum is smooth, a distinct subapical tooth excepted. The lower margin is evenly serrate by the presence of numerous teeth which are placed close together. The number of these teeth is rather variable. In some of the specimens there are more than 45 of them, while another possesses only 28 ventral rostral teeth, which are distinctly more separated from each other than in the specimens with the larger number of ventral teeth. The first ventral tooth lies somewhat in front of the last dorsal tooth. Both lateral surfaces of the rostrum have some hairs near the ventral margin, these

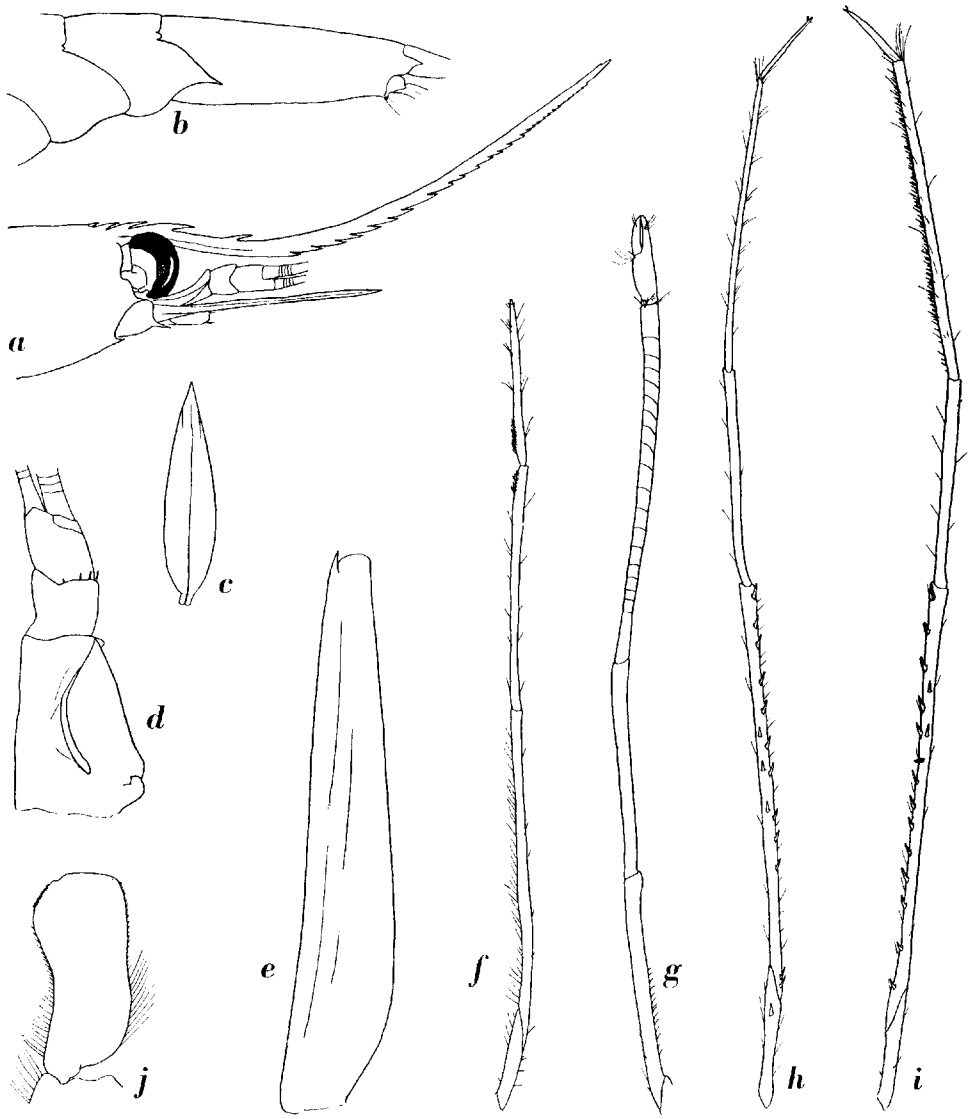

Fig. 11. *Plesionika ensis* (A. Milne Edwards). a, anterior part of the body in lateral view; b, posterior part of the abdomen in lateral view; c, body scale; d, antennular peduncle; e, scaphocerite; f, first pereiopod; g, second pereiopod; h, third pereiopod; i, fifth pereiopod; j, endopod of first pleopod of male. a, f—i, ×2.5; b, ×6; c, ×43; d, e, ×6.5; j, ×12.

hairs, however, are never as numerous as in *Plesionika martia* (A. Milne Edw.), and they do not conceal the ventral teeth. A rather strong lateral carina is present on the rostrum, this carina fades away a short distance behind the orbit. At $^1/_6$ of the length of the carapace (rostrum excluded) measured from the posterior margin, the middorsal line bears a small erect tubercle. The surface of the carapace bears no carinae, but it is pitted by the implantations of numerous small scales. These scales are elongate and pointed, they cover the carapace, but when they are rubbed off (which happens very

easily), small pits mark their former presence. The posterior margin of the orbit is distinctly convex and bears some hairs. The antennal and pterygostomian spines are distinct.

The abdomen too is provided with body scales. The posterior margin of the third segment is produced in the median to a distinct tooth. The pleurae of the first four segments are broadly rounded, that of the fifth ends in a sharp posteriorly directed tooth. The fifth abdominal segment is less than half as long as the sixth. The telson is as long as the sixth abdominal somite. It bears three pairs of dorsal spines, the first of which is placed somewhat before the middle, the second at $^2/_3$ of the length of the telson, while the third pair is situated about halfway between the second pair and the posterior margin. This posterior margin is narrow and ends in a median point. There are three pairs of spines placed on this margin. The intermediate spines are longest, the outer ones are shortest and placed before and not by the side of the intermediate spines.

The eyes are large with a distinct ocellus.

The stylocerite reaches about to the end of the first segment of the antennular peduncle, it is broad and ends in a sharp point. The outer margin is feebly convex. An erect rather narrow and truncate process is present in the basal part of the outer margin of the stylocerite. The second segment of the peduncle is distinctly shorter than the third. Some small spinules are placed on the anterior margin of the second segment, no such spinules are seen by me on either the first or third segments.

The scaphocerite is very elongate and slender, it reaches with about half its length beyond the antennular peduncle. It is about four times as long as broad. The antennal peduncle reaches about to the end of the first joint of the antennular peduncle.

The mouthparts do not differ essentially from those described and figured for *Plesionika acanthonotus* (p. 64). The mandible has the molar process with some blunt teeth. The palp of the first maxilliped is longer and more slender than that of *P. acanthonotus*. BATE's (1888) figures of the mouthparts of *Plesionika uniproducta* are exactly as found by me in the present specimens. The third maxilliped reaches slightly beyond the scaphocerite. The penultimate joint is as long as the ultimate and almost half as long as the antepenultimate.

The branchial formula runs as follows:

	maxillipeds			pereiopods				
	I	II	III	I	II	III	IV	V
pleurobranchs	—	—	—	1	1	1	1	1
arthrobranchs	—	—	2	1	1	1	1	—
podobranchs	—	1	—	—	—	—	—	—
epipods	1	1	1	1	1	1	1	—
exopods	1	1	1	—	—	—	—	—

The first leg reaches slightly beyond the scaphocerite in juveniles, it just fails to reach the end of that scale in large specimens. The chela has the dactylus microscopically small. The chela is $^2/_3$ as long as the carpus and half as long as the merus. The second legs are equal, they reach to the end of the scaphocerite. The carpus is four times as long as the chela and consists of about 20 joints. The merus is 0.6 times as long as the carpus and about as long as the ischium. The third leg reaches with about half the propodus beyond the scaphocerite. The dactylus is simple, it is about $^1/_3$ of the length of the propodus and $^2/_5$ of the length of the carpus. The merus is $^4/_3$ as long as the propodus, it is provided with about 8 to 12 spines on the posterior margin, while some more spines are present on the inner surface. The ischium is short and provided with one spine. The fifth leg reaches slightly less far forwards than the third. The dactylus is $^1/_4$ of the length of the propodus, which is 1.5 times as long as the carpus. The merus is distinctly longer than the propodus. The propodus bears on its posterior margin a large number of short hair-like spinules. The merus is provided with a row of about 12 posterior spines, and some spines are also present on the inner surface.

The pleopods are normal in shape. The endopod of the first pleopod of the male is somewhat more truncate than in *Plesionika acanthonotus*. The second pleopod of the male is as in the latter species.

The eggs are numerous and small, having a diameter of 0.5 to 0.6 mm.

Distribution. The species has been recorded from depths between 100 and 1250 m. It is known from the West Indies, from off the Brazilian east-coast (9°5′ S, 34°50′ W), the Andaman Sea and the Hawaiian Islands.

ALCOCK (1901) places *Plesionika uniproducta* Bate as a doubtful synonym under *Plesionika ensis*. According to the descriptions these two species show a close resemblance. In fact, the only differences are in the shape of the rostrum. In BATE's figure the basal crest of the rostrum consists of seven teeth, with one more tooth in front of the crest, furthermore the rostrum is rather short, reaching with less than half its length beyond the scaphocerite. The ventral margin of the rostrum in BATE's figure bears less teeth, which moreover are more widely spaced than in A. MILNE EDWARDS's figure of *P. ensis*. In the latter figure the rostrum is more curved. BATE remarks that the basal crest of the rostrum in his male specimen is provided with seven, in his female with five teeth. In this character BATE's female does not differ from A. MILNE EDWARDS's figure of an ovigerous female of *P. ensis*. My specimens have the rostrum about as long and slender as the specimen figured by MILNE EDWARDS, but the ventral denticulation in one of the females more resembles *Plesionika uniproducta*, in being far less crowded than in *P. ensis* of MILNE EDWARDS. The character of the width of the serrations of the ventral margin of the rostrum thus proves to be of

little importance, it being variable even in my small material. Therefore, I only can consider *P. uniproducta* a synonym of *P. ensis*.

Plesionika carinata n. sp.

(Fig. 12).

Material examined:

Station 62, off Liberia, 4°16′ N, 8°18′ W; stramin net 200 cm., 400 m. wire; January 10, 1946, $20h^{10}$—$20h^{55}$. — 3 specimens 39—48 mm.

Station 135, off Angola, 7°55′ S, 12°38′ E; eel trawl, 235—460 m. depth, bottom mud; March 17, 1946, $13h^{40}$—$15h^{40}$. — 12 specimens (including 4 ovigerous females, 85–94 mm.) 76–94 mm.

Description. The rostrum is very slender, it is about 1.5 times as long as the carapace and far overreaches the scaphocerite. It is curved downwards beyond the eye, but in the ultimate $^2/_3$ of its length it is directed upwards. There are 6 or 7 dorsal teeth. The first three teeth are placed behind the orbit. The teeth become larger and more widely spaced distally. The ultimate dorsal tooth stands above the base of the third segment of the antennular peduncle. The rest of the upper margin is smooth. The lower margin bears 13 to 15 teeth, which are placed rather close together. These ventral teeth start at a level, which lies somewhat in front of the end of the antennular peduncle. The ultimate sixth part of the lower margin of the rostrum is devoid of teeth. A distinct lateral carina is present on each lateral surface of the rostrum, slightly behind the orbit this carina fades away. The dorsal carina of the rostrum continues beyond the middle of the carapace and then disappears. A small blunt tubercle is visible in the posterior sixth of the median line of the carapace. A distinct broad curved carina is present in the posterior upper half of each lateral surface of the carapace. At about the middle of its length this carina gives off a much less distinct dorsal branch, which is directed anteriorly. Just above the posterior half of the lateral margin of the carapace there are two parallel sharp carinae. The integument of the carapace is rather soft, it is covered with minute scales, the implantations of which are visible as small pits, when the scales are rubbed off. Like in *Plesionika ensis* and *P. martia* the posterior margin of the orbit is somewhat convex and bears a row of hairs. The antennal and pterygostomian spines are distinct and of the same shape as in *P. ensis*.

The abdomen, like the carapace, is covered with minute scales. All segments are rounded dorsally. The posterior margin of the third segment is broadly convex and does not possess a median tooth. The pleurae of the first four segments are broadly rounded. That of the fifth is posteriorly produced, but ends in a rounded top, which sometimes bears a minute apical spinule. The sixth segment is about twice as long as the fifth. The pleurae of the sixth segment are small and have an acute tooth near the tip.

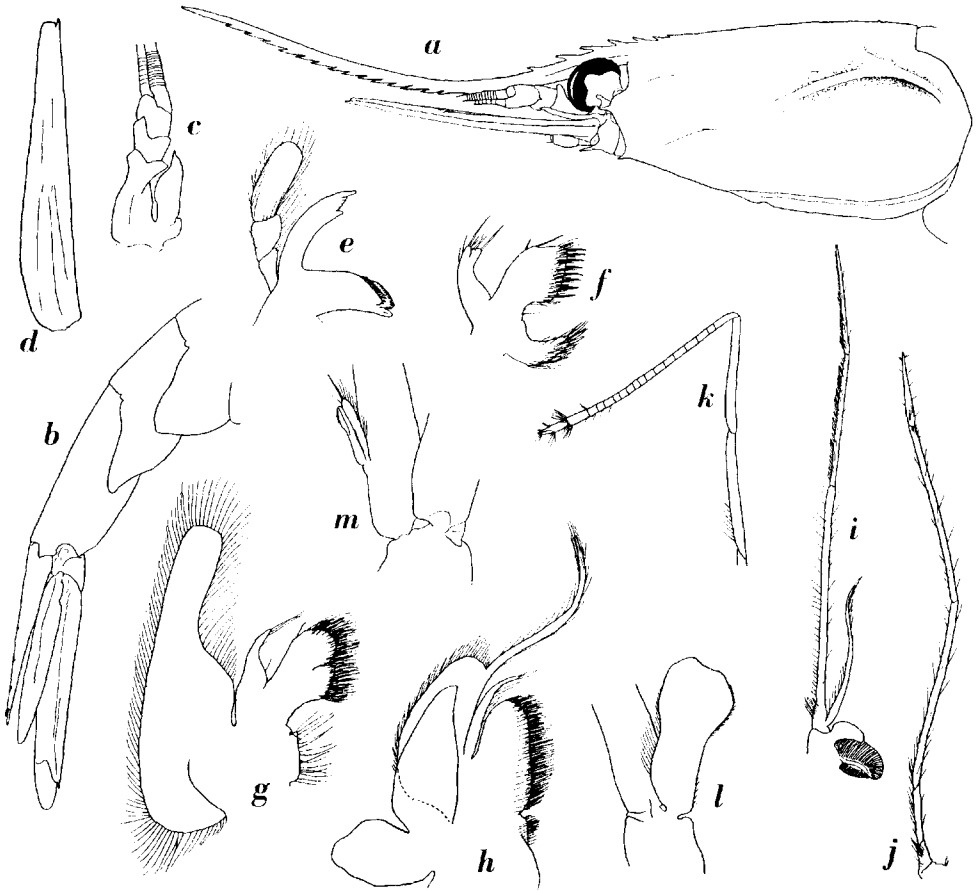

Fig. 12. *Plesionika carinata* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, third maxilliped; j, first pereiopod; k, second pereiopod; l, endopod of first pleopod of male; m, endopod of second pleopod of male. a, b, ×2; c, d, ×3; e–g, ×6.5; h, ×5; i–k, ×2.5; l, m, ×6.

The posterolateral angles of that segment end in a sharp angle. The telson is about as long as the sixth abdominal segment. The upper surface of the telson bears three pairs of spines, the anterior of which lies slightly behind the middle of the telson. This anterior pair is distinctly smaller than the two posterior pairs, which are placed so as to divide the distance between the anterior pair and the posterior margin of the telson into three equal parts. The posterior margin of the telson is provided with three pairs of spines, the intermediate of which are longest. The outer spines, which are the shortest of the three pairs, are placed before and not by the side of the intermediate pair.

The eyes are large and have the ocellus indistinct.

The antennular peduncle has the basal segment provided with a large stylocerite, which reaches beyond the middle of the second segment of the peduncle. The outer margin of the stylocerite at first is straight, but in the distal part it curves inwards towards the acute tip; the inner margin is distinctly convex. A small erect process is present at the base of the stylocerite, the tip of this process is truncate and slightly emarginate. The second and third segments of the peduncle are short.

The scaphocerite reaches with more than half its length beyond the antennular peduncle. It is more than five times as long as broad. The outer margin is about straight and ends in a small but distinct final tooth, which distinctly overreaches the lamella. A strong external spine is present on the antennal peduncle near the base of the scaphoçerite.

The oral parts are similar to those of *Plesionika acanthonotus*. The mandible has the incisor process ending in two large and some small teeth, the molar process bears some spinules, the palp is triarticulated. The maxillula has the lower endite slender, the upper is broader, the palp is bilobed. The maxilla has the lower endite strongly reduced, only traces of the two lobes are visible, the upper endite is well developed and distinctly cleft, the palp and scaphognathite are normal in shape. The exopods of the three maxillipeds are well developed. The endites of the first maxilliped are separated by a distinct notch, a palp and a distinct caridean lobe are present, the epipod is deeply bilobed. The second maxilliped is exactly like that of *Plesionika acanthonotus*. The third maxilliped reaches with half the ultimate joint or less, beyond the scaphocerite (in juveniles with somewhat more than half that joint). The ultimate joint is somewhat shorter than the penultimate, which is slightly more than half the length of the antepenultimate joint.

The branchial formula runs as follows:

	maxillipeds			pereiopods				
	I	II	III	I	II	III	IV	V
pleurobranchs	–	–	–	1	1	1	1	1
arthrobranchs	–	–	2	1	1	1	1	–
podobranchs	–	1	–	–	–	–	–	–
epipods	1	1	1	1	1	1	–	–
exopods	1	1	1	–	–	–	–	–

This formula differs from that of the previous species of *Plesionika* only in lacking the epipod of the fourth pair of pereiopods.

The first legs reach with half the propodus or somewhat less (in juveniles with part of the carpus) beyond the scaphocerite. The dactylus is microscopically small. The carpus is about $2^1/_2$ times as long as the chela and about as long as the merus. The second legs are equal, they almost reach the end

of the scaphocerite. The chela is small, it is about $^1/_6$ of the length of the carpus. The latter is divided into 17 to 19 joints, the first and last of which are longest. The merus is somewhat more than half as long as the carpus and as long as or shorter than the ischium. The last three legs are excessively long and slender. None of my specimens has any of the legs complete: of all the legs at least the dactylus and part of the propodus are lacking. The third leg reaches with the greater part of the carpus beyond the scaphocerite, the fourth leg reaches with the merus to the end of the antennular peduncle, while the fifth leg reaches with part of the propodus beyond the scaphocerite. Of the third leg the carpus is at most $^2/_3$ as long as the propodus, while in the fifth it is also distinctly shorter than the propodus. In all three pairs the carpus is slightly shorter than the merus. The merus bears about 13 to 18 posterior spines in the third leg, these spines are divided over the whole length of that joint. In the fourth leg there are 14 to 18 posterior spines on the merus, while the merus of the fifth leg bears 4 to 7 posterior spines in the ultimate half.

The first pleopod of the male has the endopod ovate with a broadly truncate and somewhat emarginate top. In the distal part of the inner margin a row of minute curved hooks is present. The second pleopod of the male has the appendix masculina short, being about as long as the appendix interna. The other pleopods are normal in shape.

The uropods are elongate. The exopod has the outer margin ending in a tooth, which on its inner side bears a movable spine. A diaeresis is present. The endopod is much shorter than the exopod.

The eggs are numerous and small, their diameter is 0.5 to 0.6 mm.

Type. Holotype is the largest specimen from Station 135.

The present species is most closely related to *Plesionika martia*. It may be distinguished at once, however, by the much stronger carinate carapace and the absence of an epipod from the base of the fourth pereiopod. Furthermore in *P. martia* the rostrum bears many more lower rostral teeth than in *P. carinata*.

Plesionika acanthonotus (Smith) 1882.
(Fig. 13 b—t).

Pandalus acanthonotus Smith 1882, p. 61, pl. 13 figs. 10, 11.
Pandalus Parfaitii A. Milne Edwards 1883, pl. 21.
Pandalus geniculatus A. Milne Edwards 1883, pl. 25.
Nothocaris geniculatus Bate 1888, p. 661, pl. 116 fig. 4.
Pandalus geniculatus Adensamer 1898, p. 624.
Nothocaris geniculata Moreira 1901, p. 8.
Pandalus geniculatus Coutière 1905a, p. 675.
Plesionika acanthonotus De Man 1920, p. 105.
Plesionika geniculata De Man 1920, p. 106.

Plesionika Parfaiti De Man 1920, p. 107.
Plesionika geniculatus Zariquiey Alvarez 1946, p. 64, fig. 68.

Material examined:

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; Sigsbee trawl, 530—850 m. depth, bottom mud; March 1, 1946, $9h^{45}$. — 5 specimens 57—84 mm.

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; otter trawl, 260—650 m. depth, bottom mud; March 1, 1946, $14h^{10}$—$15h^{40}$. — 2 fragments.

Station 135, off Angola, 7°55′ S, 12°38′ E; Sigsbee trawl, 360—470 m. depth, bottom mud; March 17, 1946, $8h^{42}$–$9h^{15}$. — 4 specimens (including 1 ovigerous female, 70 mm.) 44—70 mm.

Station 135, off Angola, 7°55′ S, 12°38′ E; eel trawl, 235—460 m. depth, bottom mud; March 17, 1946, $13h^{40}$—$15h^{40}$. — 24 specimens (including 14 ovigerous females, 58—74 mm.) 52—74 mm.

The shape of the rostrum is rather variable, sometimes it falls short of the end of the antennular peduncle, sometimes it overreaches this peduncle distinctly. Generally, however, it falls far short of the extremity of the scaphocerite (only in some specimens from Station 120 does it overreach this scale). It is rather high and directed slightly or distinctly upwards. The upper margin bears three to five movable spines and 10 to 12 immovable teeth. The first or second of the teeth is placed above the posterior limit of the orbit. The teeth are regularly arranged over the rostrum up to the apex, sometimes leaving a small unarmed stretch just in front of the tip. The lower margin bears 3 to 8 much smaller teeth. The surface of the carapace and abdomen is covered with minute ovate body-scales which end in a sharp tip. The carapace bears an antennal spine just below the broadly rounded lower orbital angle, while also a distinct pterygostomian spine is present.

The abdomen is smooth, but body-scales are present. All the segments are rounded above. The third somite has the posterior margin convex and somewhat produced in the middle. The pleurae of the first four segments are broadly rounded, that of the fifth ends in a minute tip. The sixth segment is twice as long as the fifth, it has the pleurae small and rounded, ending in a small posteriorly directed tooth, the posterolateral angle of the segment ends in a sharp point, which overhangs the lateral basal part of the telson. The telson is as in *P. ensis*.

The eyes are large. The cornea is much broader than the eyestalk. No distinct ocellus is present.

The basal segment of the antennular peduncle is deeply hollowed and forms a protection for the eye. The stylocerite reaches almost to the end of the basal segment of the peduncle, its outer margin is nearly straight and ends in a small spinule; the inner margin at first is straight too, but in the distal part it curves to the final spinule. Near the base of the stylocerite

there is a short erect, truncate process. The second segment of the peduncle is distinctly shorter than the third. Some small spinules are placed on the anterior margin of the second segment.

The scaphocerite is slightly less than three times as long as broad. The outer margin is sinuous, the final tooth is distinct, it is curved somewhat inwards and is slightly overreached by the lamella. The antennal peduncle reaches to the end of the second segment of the antennular peduncle. A strong spine is present at the base of the scaphocerite.

The mandible has the incisor process ending in several teeth, the molar process ends in two blunt lobes and bears several minute spinules; the palp is well developed and three-jointed. The maxillula has the lower endite slender, the upper endite is broad, the palp is bilobed. The maxilla has the lower endite strongly reduced, the upper is divided into two well developed lobes, the palp and the scaphognathite are well developed. The maxillipeds all have the exopods well developed. The first maxilliped has the endites of the basis and the coxa separated by a distinct notch, the palp is slender, the caridean lobe distinct, the epipod large and bilobed. The second maxilliped has both the last and the penultimate joints elongate, the last joint is connected with its long side to the narrow side of the penultimate joint. The epipod is large and bears a well developed podobranch. The third maxilliped is very slender, it reaches with the last joint (sometimes with part of the penultimate joint) beyond the scaphocerite. The penultimate joint is slightly longer than the ultimate and it is slightly shorter than half the length of the antepenultimate joint. The branchial formula is as in *Plesionika ensis*.

The first leg reaches with the chela, and sometimes with part of the carpus, beyond the scaphocerite. The dactylus is extremely small and only visible under strong magnification. The propodus measures $^4/_7$ of the length of the carpus and is less than half as long as the merus. The second legs are equal, they reach with the chela beyond the scaphocerite. The chela is about $^1/_5$ to $^1/_6$ of the length of the carpus. The latter consists of about 17 to 22 joints, the first and last of which are longest. The merus is about half as long as the carpus and distinctly shorter than the ischium. Some strong spine-like hairs are placed in the proximal half of the inner margin of the ischium. The third leg reaches with the larger part of the carpus beyond the scaphocerite. In my males the dactylus is $^1/_3$ of the length of the propodus, in the ovigerous females it is relatively shorter, being only $^1/_4$ of the length of the propodus. The carpus is shorter than the propodus, while it is about half as long as the merus. This latter joint bears about 4 to 8 spines on the posterior margin and 6 to 12 on the outer surface (in the females the numbers of spines seem to be larger than in the males). The ischium bears 1 or 2 posterior spines. The other joints are unarmed. The fourth leg is very similar to the third. The fifth leg reaches with half

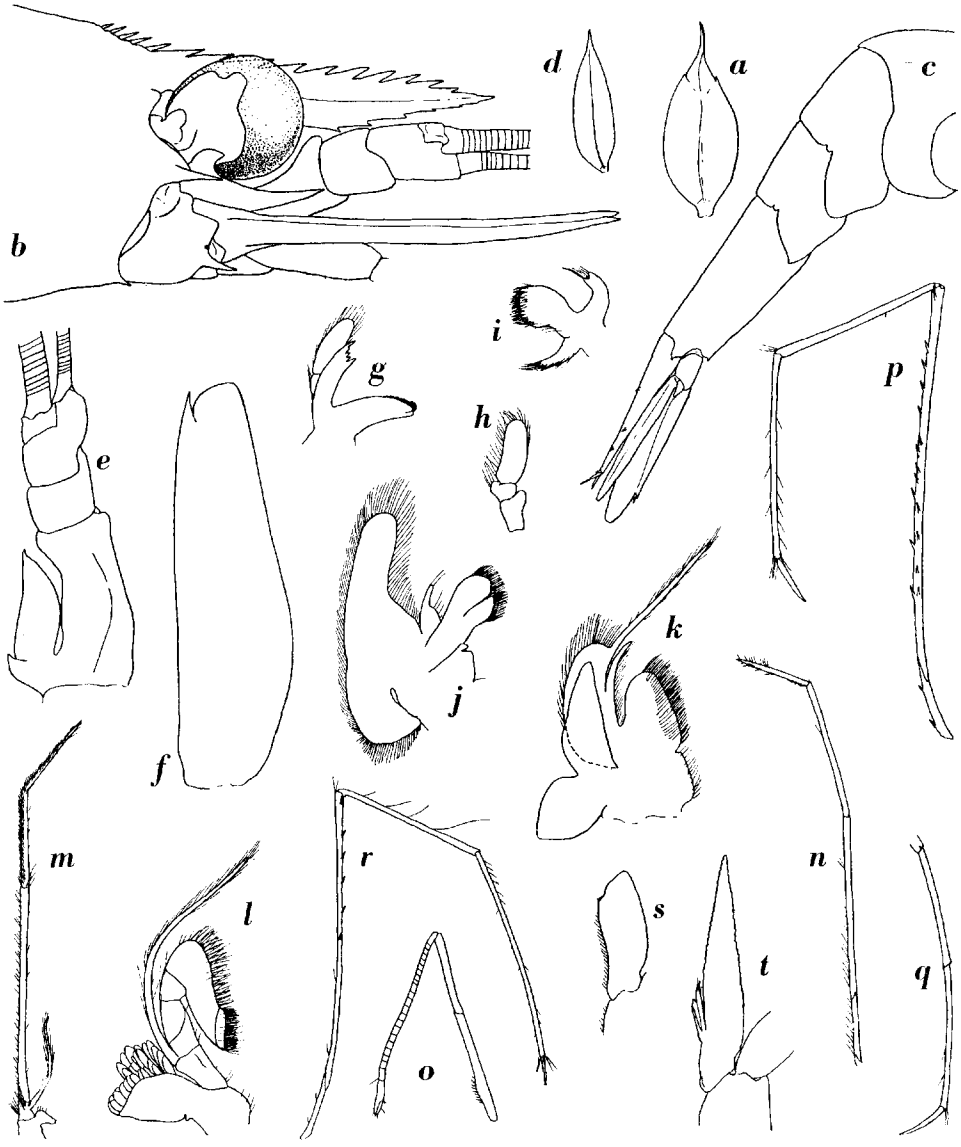

Fig. 13. *Plesionika heterocarpus* (Costa). a, body scale.
Plesionika acanthonotus (Smith). b, anterior part of body in lateral view; c, posterior part of abdomen in lateral view; d, body scale; e, antennular peduncle; f, scaphocerite; g, mandible; h, mandibular palp; i, maxillula; j, maxilla; k, first maxilliped; l, second maxilliped; m, third maxilliped; n, first pereiopod; o, second pereiopod; p, third pereiopod of female; q, distal part of third pereiopod of male; r, fifth pereiopod; s, endopod of first pleopod of male; t, endopod of second pleopod of male. a, d, ×85; b, e—l, s, t, ×6.5; c, m—r, ×2.5.

the carpus beyond the scaphocerite. The dactylus is small and measures about $^1/_7$ of the length of the propodus. The carpus is $^3/_4$ of the length of the propodus and slightly more than half as long as the merus. The ischium is very short. The merus bears 6 or 7 posterior spines. The sternum in the males is swollen between legs 3 to 5 and less distinctly so between the other legs. Between the bases of each pair of legs three bulb-like swellings can be seen, one large central and two smaller lateral ones, which are placed slightly posterolaterally of the big swelling. In the females these swellings are less distinct.

The first pleopod of the male has the endopod broadly ovate. A number of small hooks are placed in the distal half of the inner margin. This inner margin also bears some hairs. In the females this endopod is narrower, it is tongue-like produced at the top, no hooks are present. The second pleopod of the male has the appendix masculina slightly longer than the pointed appendix interna. Both appendages are relatively short.

The uropods are elongate. The exopod has the outer margin ending in a tooth, which at its inner side bears a movable spine. A diaeresis is present on the exopod.

The eggs are numerous and small, their diameter is from 0.5 mm. to 0.7 mm.

Distribution. The species has been reported from off South Carolina (U. S. A.), off Porto (Portugal), off Creta, off N.E. Spain and off N.E. Brazil. It was found at depths between 420 and 1350 m.

Remarks. The two specimens from Station 120 ($14\,h^{10}$—$15\,h^{40}$) are heavily damaged: both lack the abdomen and all the legs. It is not certain therefore whether it is correct to place them here. Their rostrum is much longer and more slender than that of the other specimens referred here to *Plesionika acanthonotus*. It overreaches the scaphocerite, while in one of the specimens it has 7, in the other 8 ventral teeth. Since no other characters could be found to separate these specimens from those of Station 135 and Station 120 ($9\,h^{45}$), they are provisionally identified with SMITH's species. The length of the rostrum in the other specimens also shows some variation, it sometimes slightly overreaches the antennal peduncle and sometimes falls short of it, while its lower margin bears 3 to 7 teeth. Not only in the length, but also in the shape does the rostrum of this species show a considerable variation. Sometimes it is short and straight (especially in juvenile specimens), sometimes it is longer and curved upwards near the apex. Some of my specimens have the rostrum perfectly agreeing with SMITH's figure of the rostrum of his type specimen, in others (fig. 13b) it is more like A. MILNE EDWARDS's figure of *Pandalus Parfaitii*. Some of the large specimens have the rostrum shaped as in A. MILNE EDWARDS's figure of *Pandalus geniculatus*, though none of them has the distal unarmed portion of the upper

margin as long as shown there: generally the rostrum is toothed up to the apex, but in a few specimens there is a small unarmed stretch. Through the kindness of Dr. R. ZARIQUIEY ALVAREZ of Barcelona, I was able to examine some material of *Plesionika geniculata* from the Mediterranean off the Catalonian coast of Spain. This material too has the unarmed portion of the rostrum of varying length. As I could find no structural differences between this Mediterranean material and the Atlantide specimens, I come to the conclusion that *Pandalus acanthonotus* Smith, *Pandalus geniculatus* A. M. Edw. and *Pandalus Parfaitii* A. M. Edw. are nothing but forms (perhaps growth stages) of one species, which thus has to bear the oldest trivial name: *acanthonotus*. The types of *P. Parfaitii* and *P. geniculatus* were obtained from the same haul, which was made by the Travailleur Expedition off the Portuguese coast.

Plesionika heterocarpus (Costa) 1871.

(Fig. 13a).

Restricted synonymy:
Pandalus heterocarpus Costa 1871, p. 89, pl. 2 fig. 3.
Plesionika heterocarpus Odhner 1923, p. 4.

Material examined:

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; Sigsbee trawl, 530—850 m. depth, bottom mud; March 1, 1946, 9^h45^m. — 5 specimens (including 1 ovigerous female, 66 mm.) 66—74 mm.

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; otter trawl, 260—650 m. depth, bottom mud; March 1, 1946, 14^h10^m—15^h40^m. — 5 specimens (including 1 ovigerous female, 60 mm.) 50—60 mm., and 6 fragments.

Station 135, off Angola, 7°55′ S, 12°38′ E; Sigsbee trawl, 360—440 m. depth, bottom mud; March 17, 1946, 8^h42^m—9^h15^m. — 1 ovigerous female 95 mm.

The specimens show no differences from the Mediterranean specimens. The number of joints in the carpus of the second legs varies considerably: in my ovigerous female from Station 135 the left (= longer) second pereiopod has the carpus consisting of 230 joints, while the right second pereiopod has the carpus about 30-jointed. In other specimens these numbers are much smaller, they may even be 84 and 18 respectively. The body scales are broadly ovate and each lateral margin bears a small tooth near the base of the apex.

I fully agree with ADENSAMER (1898) that *Pandalus sagittarius* A. Milne Edwards and *P. longicarpus* A. Milne Edwards belong to the present species.

Distribution. The species has been reported from depths between 92 and 680 m. It is known from the entire Mediterranean from the Sea of Marmara and the Cyclades to Algeria and the Catalonian coast of Spain. As far as I know there are only three records of this species outside the Mediterranean, viz. off Portugal, 38°3′ N, 11°32′ W (A. MILNE EDWARDS, 1883, under the name *Pandalus longicarpus*), near Madeira, 32°40′ N, 18°54′ W (A. MILNE EDWARDS, 1883, under the name *Pandalus sagittarius*), and Porto Alexandre, Angola (ODHNER, 1923).

Parapandalus narval (Fabricius) 1787.

Restricted synonymy:
Astacus Narval Fabricius 1787, p. 331.

Material examined:
Station 154, off Portuguese Guinea, 11°54′ N, 17°14′ W; Sigsbee trawl and otter trawl, 55—80 m. depth, bottom bluish mud; April 17, 1946, $11h^{00}$—$14h^{00}$. — 12 specimens (including 2 ovigerous females, 81 and 88 mm.) 56—88 mm.

The specimens show no differences whatsoever from Mediterranean specimens of this species.

The name *Parapandalus narval* is used here as a synonym of *Parapandalus pristis* (Risso). The species named by numerous authors *Parapandalus narval* (H. Milne Edw.) should be called *Plesionika edwardsii* (Brandt) (vid. HOLTHUIS, 1947a, p. 316).

The characters given by DE MAN (1920) in his key to the species of the genus *Parapandalus*, to distinguish between *P. longicauda* (Rathbun) and the present species (named *Parapandalus pristis* by DE MAN), are somewhat misleading. The tubercle in the posterior sixth of the median dorsal line of the carapace is present both in *P. longicauda* and *P. narval*, though in the latter species it often is not very distinct. In juvenile specimens of *P. narval* the rostrum is straighter than in old animals. The most important difference between the two species thus seems to be that in *P. narval* the ultimate joint of the third maxilliped is distinctly shorter than the penultimate, whereas these joints are subequal in *P. longicauda*.

Distribution. The species is a sublittoral form. It is recorded from depths up to 500 m. It occurs in the Western Mediterranean and the Adriatic, while it has also been recorded from the Red Sea and the Canary Islands. The locality whence the present specimens were obtained, off Portuguese Guinea, thus is the southernmost place whence the species is known.

Family **Alpheidae.**

Alpheus macrocheles (Hailstone) 1835.

Restricted synonymy:
Hippolyte macrocheles Hailstone 1835, p. 395.
non *Alpheus megacheles* Coutière 1899, p. 37.
non *Alpheus macrocheles* Rathbun 1900, p. 312.
non *Alpheus macrocheles* Balss 1916, p. 20.
Crangon (*Alpheus*) *macrocheles* Monod 1933, p. 462, figs. 1 D, E.

Material examined:

Station 39, São Vicente, Cape Verde Islands, 16°50′ N, 25°04′ W; triangular dredge (45 cm.), 41—50 m. depth, bottom Foraminifera and corals; December 10, 1945, 14^h40^m. — 2 specimens 8 and 9 mm.

Station 44, off French Guinea, 10°22′ N, 16°22′ W; Sigsbee trawl, otter trawl and triangular dredge (45 cm.), 41—45 m. depth, bottom brown sand and shells; December 17, 1945. — 4 specimens 7—11 mm.

Station 145, off French Guinea, 9°20′ N, 14°15′ W; Sigsbee trawl and otter trawl, 32 m. depth, bottom shells and Foraminifera; April 13, 1946, 7^h45^m—10^h10^m. — 1 specimen 12 mm.

Station 146, off French Guinea, 9°27′ N, 14°48′ W; Sigsbee trawl and otter trawl, 50 m. depth, bottom shells and Foraminifera; April 13, 1946, 14^h20^m. — 1 specimen 7 mm.

Station 153, off French Guinea, 10°49′ N, 16°39′ W; Sigsbee trawl, 42 m. depth, bottom coarse sand; April 16, 1946, 13^h20^m—13^h50^m. — 7 specimens (including 2 ovigerous females, 17—20 mm.) 14—22 mm.

A comparison of the present material with specimens from the Mediterranean did not show any differences between the two forms, except in size. Pesta (1918) gives as the average size of Mediterranean specimens of this species 25—30 mm. All the Atlantide specimens are much smaller.

Coutière (1899) states that *Alpheus Pontederiae* of Rochebrune, according to Rochebrune's description, in all probability is identical with the present species. Coutière here makes a mistake, since Rochebrune in his description distinctly states that the orbital hoods are unarmed, while they bear an anterior spine in *Alpheus macrocheles*. Rochebrune's *Alpheus Pontederiae* is a good species (vid. p. 85). Rathbun's (1900) and Balss's (1916) records of *Alpheus macrocheles* from West Africa are based on Rochebrune's record of *A. Pontederiae*. The first reliable record of *Alpheus macrocheles* from the West African coast is that of Monod (1933) from Cape Blanco, Mauritania.

Distribution. The species inhabits the sublittoral zone, it never occurs so near the coast as *Alpheus dentipes* Guérin. It is known from the eastern Atlantic from the S. coast of England and the Channel Islands to the Cape

Verde Islands and French Guinea. It occurs throughout the Mediterranean from the Aegean Sea to the coasts of Spain and Morocco. The species also has been reported from the West Indies. The only West African record in the literature is: Cape Blanco, Mauritania (MONOD, 1933).

Alpheus platydactylus Coutière 1897.

Alpheus platydactylus Coutière 1897, p. 306.
Alpheus platydactylus Coutière 1899, p. 215, fig. 258.
Alpheus platydactylus Balss 1916, p. 20.
Alpheus platydactylus Coutière 1938a, p. 187.

COUTIÈRE supposes that this species is perhaps only a variety of *Alpheus macrocheles* (his 1899 figure of this form bears even the name *Alpheus megacheles platydactylus*). It represents *Alpheus macrocheles* in deeper water and may be connected with it by transitional forms.

Distribution. The species is known from depths ranging from 75 to 600 m. It is only known from the original records (COUTIÈRE, 1897): Cape Verde Islands; Azores (38°52′50″ N, 27°23′05″ W; 38°03′40″ N, 28°34′45″ W); Stations 8, 9 and 52 of the Travailleur Expeditions. As COUTIÈRE does not mention from which of the three (1880, 1881 or 1882) Travailleur Expeditions this latter collection originates, the exact situation of the stations cannot be given with certainty. They lie either in the W. Mediterranean, in the Bay of Biscay, off the westcoast of Portugal, off Madeira, or near the Canary Islands.

Alpheus dentipes Guérin 1832.

Restricted synonymy:
Alpheus dentipes Guérin Méneville 1832, p. 39, pl. 27 fig. 3.
Alpheus streptochirus Stimpson 1860, p. 30.
Alpheus streptochirus A. Milne Edwards 1878, p. 230.
Alpheus streptochirus Kingsley 1882, p. 117.
Alpheus cristidigitus Bate 1888, p. 546, pl. 97 fig. 3.
Alpheus cristidigitus Ortmann 1893, p. 44.
Alpheus dentipes Coutière 1897b, p. 196.
Alpheus dentipes Coutière 1899, pp. 19, 43.
Alpheus dentipes Lenz & Strunck 1914, p. 318.
Alpheus dentipes Balss 1916, p. 20.
Alpheus streptochirus Balss 1916, p. 21.
Crangon (Alpheus) dentipes Monod 1933, p. 462.

Material examined:

Station 38, Porto Grande, São Vicente, Cape Verde Islands, 16°53′ N, 25°00′ W; triangular dredge (45 cm.), 9 m. depth, bottom sand; December 10, 1945, 11h20. — 20 specimens (including 4 ovigerous females, 9—13 mm.) 6—14 mm.

Station 39, São Pedro Bay, São Vicente, Cape Verde Islands, 16°50′ N, 25°04′ W; triangular dredge (45 cm.), 41—50 m. depth, bottom Foraminifera

and corals: December 10, 1945, 14 h^{40}. — 28 specimens (including 6 ovigerous females, 10—14 mm.) 6—14 mm.

Station 40, off São Pedro Bay, São Vicente, Cape Verde Islands; triangular dredge (45 cm.), 40 m. depth, bottom corals; December 11, 1945, 14 h^{10}. — 8 specimens (including 3 ovigerous females, 11—12 mm.) 9—12 mm.

Station 40, anchorage São Pedro Bay, São Vicente, Cape Verde Islands; bottom sample Aiv; Van Veen Grab, 32 m. depth, bottom sand, corals, and Foraminifera; December 11, 1945, 7 h^{00}. — 1 specimen 11 mm.

Station 43, Praia, São Thiago, Cape Verde Islands; Sigsbee trawl, 22 m. depth, bottom corals; December 13, 1945, 14 h^{40}. — 40 specimens (including 7 ovigerous females, 11—14 mm.) 6—14 mm.

Station 44, off French Guinea, 10°22′ N, 16°22′ W; Sigsbee trawl, otter trawl and triangular dredge, 41—45 m. depth, bottom brown sand and shells; December 17, 1945. — 1 ovigerous female 12 mm.

Station 146, off French Guinea, 9°27′ N, 14°48′ W; Sigsbee trawl and otter trawl, 50 m. depth, bottom shells and Foraminifera; April 13, 1946, 14 h^{20}. — 1 ovigerous female 12 mm.

As already pointed out by Coutière (1897b, p. 196; 1899, pp. 19, 43) *Alpheus streptochirus* Stimpson and *Alpheus cristidigitus* Bate are synonyms of *Alpheus dentipes* Guérin. Both Stimpson's and Bate's species are based on specimens from the Cape Verde Islands. When comparing the large material of the Atlantide Expedition with Mediterranean specimens, I could not find any good difference between the two groups, so that I agree with Coutière in considering the West African specimens belonging to the same species as the Mediterranean form. It is strange, however, that the West African specimens never attain the large size of the Mediterranean individuals. Pesta (1918) gives as the size of Adriatic specimens of this species 20 to 25 mm.; this size is also given in Zariquiey's (1946) work on Spanish Decapods. The collection of the Leiden Museum contains specimens from Naples measuring 27 mm. In the present West African collection, which consists of 98 specimens, 22 of which are ovigerous females, no specimens larger than 14 mm. are found. In the literature only three measurements of West African specimens have been given. The type of Stimpson's *Alpheus streptochirus* is "0.5 poll.", thus 12.5 mm., Bate's type of *Alpheus cristidigitus* is 10 mm. long, while A. Milne Edwards (1878) gives as the length of the specimen identified by him as *Alpheus streptochirus* 50 mm. The latter measurement of course is absurd and probably due to some error. The two other fall within the range of the size of my material from West Africa.

Risso (1816, p. 86) described a new species of shrimp under the name *Nika Variegata*. In 1826 (p. 78) he described it again, now under the name *Hippolytes variegatus*, and he also gave a figure of the animal. This figure shows an animal which with its heavy first and very slender second legs

can be nothing but an Alpheid. Because the eyes are free and the rostrum rather long, I at first took it for a species of *Athanas*. In a paper on the Siboga Hippolytidae (HOLTHUIS, 1947, p. 24) I identified it with *Athanas nitescens* (Leach). This identification is not supported by RISSO's figure of *Hippolytes variegatus* which shows the first leg to be much higher than is ever found in *Athanas nitescens*. At that time I thought that this might be due to incorrectness of the figure. Now I am quite convinced that my previous identification of RISSO's species is wrong. RISSO (1826, p. 79) states that the animals, which live in cavities between the rocks of the shore, make a curious noise, which is caused by the flicking of the fingers of the first pair of legs. This noise can be heard when the sea withdraws. Of the Mediterranean Alpheids, according to PESTA (1918), only *Synalpheus laevimanus* (Heller) and *Alpheus dentipes* Guér. are known with certainty to make such a clicking noise. *Alpheus glaber* (Olivi) and *A. macrocheles* (Hailst.) may also be able to do so, but *Athanas* certainly does not make this kind of noise. RISSO's description of the habitat only fits for *Athanas* and for *Alpheus dentipes*. The two other species of *Alpheus* and *Synalpheus laevimanus* never live as close to the shore as *Alpheus dentipes*. RISSO's description of *Nika Variegata* and *Hippolytes variegatus* in all respects agrees with *Alpheus dentipes* and differs in several respects from all the other three Mediterranean Alpheids (the habitat only fits for *Athanas*, the colour only for *Athanas* and *Synalpheus*, the clicking noise for *Synalpheus* and perhaps for *Alpheus glaber* and *A. macrocheles*). It is safe, therefore, to identify *Nika variegata* Risso and *Hippolytes variegatus* Risso with *Alpheus dentipes* Guérin. In RISSO's figure the rostrum and the eyes have been incorrectly drawn, while the larger first leg is only very crudely done. This is probably the reason why RISSO's species has not been identified by later authors. A strict application of the International Rules of Zoological Nomenclature should make it necessary to substitute the trivial name *variegatus* of *Nika variegata* Risso (1816) for the trivial name *dentipes* of *Alpheus dentipes* Guérin (1832), RISSO's name being the older of the two. As GUÉRIN's name *dentipes* is of long standing and since it has been used by almost all carcinologists dealing with the species, it would be inconvenient to have that name changed to the practically unknown name of RISSO's. It is therefore my intention to apply to the International Commission on Zoological Nomenclature for a suspension of the Rules in this case; a proposal will therefore be submitted to place the name *dentipes* of *Alpheus dentipes* Guérin on the Official List of Specific Names. Pending the decision of the Commission, the commonly used name for the species is adopted here.

Distribution. This littoral species is known from the entire Mediterranean and Black Sea, from Portugal, the Azores and from W. Africa. It has also been reported from Bermuda, the West Indies, California, and Lower California.

According to modern authors, however, the Bermudan and West Indian specimens belong to a separate species: *Alpheus peasei* Armstrong, while also the Californian specimens are said to form a distinct species: *Alpheus clamator* Lockington. The West African records of *Alpheus dentipes* are: Cape Blanco, Mauritania (MONOD, 1933), Cape Verde Islands (STIMPSON, 1860; A. MILNE EDWARDS, 1878), off São Vicente: 16°57′15″ N, 25°1′W (BATE, 1888), São Vicente, Cape Verde Islands (ORTMANN, 1893), Porto Grande, São Vicente (LENZ & STRUNCK, 1914), Baixo de João Leitão, S.W. of Boavista, Cape Verde Islands (ORTMANN, 1893), Anno Bom, Gulf of Guinea (COUTIÈRE, 1897b).

Alpheus tuberculosus Osorio 1892.

Alpheus tuberculosus Osorio 1892, p. 201.
Alpheus tuberculosus Osorio 1898, p. 194.
Alpheus tuberculosus Rathbun 1900, p. 313.
non *Alpheus tuberculosus* Balss 1914, p. 98, figs. 1—5.
Alpheus tuberculosus Balss 1916, p. 21.

OSORIO's description of the present species does not make it possible to identify it with any of the known species. In the tuberculation of the chelae it probably shows most resemblance to *A. malleator* Dana, but it differs from that species by having the meri of the third and fourth legs provided with an anteroventral tooth. From *Alpheus dentipes* Guérin it should differ in the shape of the chelae. Examination of the type or extensive collecting of Alpheids in the type locality may solve the riddle of the identity of this form.

Distribution. The species is only known from the original record: Jogo-Jogo, São Thomé, Gulf of Guinea (OSORIO, 1892).

Alpheus malleator Dana 1852.

Restricted synonymy:
Alpheus malleator Dana 1852, p. 23.
Alpheus pugilator A. Milne Edwards 1878, p. 229.
Alpheus malleator Coutière 1899, p. 31.
Alpheus tuberculosus Balss 1914, p. 98, figs. 1—5.
Alpheus malleator edentatus Balss 1916, p. 22.

This form was first described from West Africa by A. MILNE EDWARDS, who considered it to be a new species, *A. pugilator*. COUTIÈRE (1899) showed that A. MILNE EDWARDS's species is identical with *A. malleator* Dana. BALSS (1914) identified specimens of the present species with *A. tuberculosus* Osorio, but in 1916 the same author corrected this error. The variety *edentatus* Zimmer, to which BALSS now brings his specimens differs from the typical *A. malleator* by having only one spine on the orbital hood and not two or more. SCHMITT (1924a) pointed out that the absence of the spines probably is a juvenile character, so that the varietal name *edentatus* cannot be maintained.

Distribution. This littoral species has been recorded from the Pacific coast of America (Gulf of California, Ecuador, Galápagos Islands), from the West Indies

and Brazil and from W. Africa. The West African records are: Cape Verde Islands (A. MILNE EDWARDS, 1878), Lome, Togo (BALSS, 1916), Jogo-Jogo, São Thomé[1]) (BALSS, 1916), Anno Bom (BALSS, 1914).

Alpheus rugimanus A. Milne Edwards 1878.

Alpheus rugimanus A. Milne Edwards 1878, p. 230.
Alpheus Ridleyi Pocock 1890, p. 518.
Alpheus rugimanus Coutière 1898c, p. 249, figs. 6—8.
Alpheus rugimanus Coutière 1899, pp. 44, 221, figs. 267—269.

Short descriptions of this species were given by A. MILNE EDWARDS (1878) and POCOCK (1890). The latter described it under the name *Alpheus Ridleyi* from Fernando Noronha. COUTIÈRE (1899, p. 44), after having examined the types of both MILNE EDWARDS's and POCOCK's species, came to the conclusion that these forms are identical. The only known figures of this species have been given by COUTIÈRE (1898c, 1899), they represent the chelae of the first pair of legs.

Distribution. *Alpheus rugimanus* is only known from the Cape Verde Islands (A. MILNE EDWARDS, 1878; COUTIÈRE, 1898 c) and from Fernando Noronha (POCOCK, 1890).

Alpheus macrochirus Richters 1880.

Restricted synonymy:
Alpheus macrochirus Richters 1880, p. 164, pl. 17 figs. 31—33.
Alpheus macrochirus Coutière 1905, p. 882.

Distribution. This species has a wide distribution in the Indo-westpacific area, from E. Africa to Polynesia, it has also been recorded once from the Gulf of California. COUTIÈRE (1905) reports it from French Congo. This record, however, has to be considered with some reserve.

Alpheus paracrinitus Miers 1881.

Restricted synonymy:
Alpheus paracrinitus Miers 1881, p. 365, pl. 16 fig. 6.
Alpheus paracrinitus Kingsley 1882, p. 123.
Alpheus paracrinitus Osorio 1887, p. 230.
Alpheus paracrinitus Osorio 1889, p. 137.
Alpheus ascensionis Ortmann 1893, p. 45.
Alpheus paracrinitus Osorio 1898, p. 194.
Alpheus paracrinitus Coutière 1899, p. 34.
Alpheus paracrinitus Rathbun 1900, p. 313.
Alpheus paracrinitus Balss 1916, p. 20.

The species was first described by MIERS from Senegal. Comparing ORTMANN's description of *Alpheus ascensionis* with that of MIERS of *Alpheus paracrinitus*, the resemblance is so close that the two forms obviously belong to one and the same species. MIERS's figure of the anterior part of the body of one of his specimens is the only figure existing of West African representatives. COUTIÈRE (1905, p. 901,

[1]) This locality, given by BALSS, 1916, probably is an error for Anno Bom.

pl. 82 figs. 37, 38) gives various figures of Indo-westpacific specimens, which he thinks belong to *Alpheus paracrinitus* and to a variety *bengalensis* of that species. As COUTIÈRE has not seen MIERS's type specimens and probably not even West African representatives of the species, his identification of Indo-westpacific specimens with this species should be taken with some reserve. A direct comparison of Indo-westpacific specimens and West African specimens, which both should belong to this species, is highly desirable.

Distribution. The species is a littoral form. It is known from West Africa and has furthermore been recorded from the Indo-westpacific region (Red Sea, and the South Sea Islands: Laysan, Johnston, Palmyra and Clipperton). The variety *Alpheus paracrinitus bengalensis* Cout. has been recorded from the Indian Ocean (Minikoi) and the South Sea Islands: Wake and Palmyra. The West African records of the species are: Goree Island, Senegal (MIERS, 1881), Praia das Conchas, São Thomé (OSORIO, 1889), Loanda, Angola (OSORIO, 1889), Ascension (ORTMANN, 1893).

Alpheus talismani Coutière 1898.

(Fig. 14).

Alpheus Talismani Coutière 1898, p. 32, figs. 3, 4.
Alpheus Talismani Coutière 1899, pp. 148, 232, figs. 142, 287.
Alpheus Talismani Balss 1916, p. 21.

Material examined:

Station 56, off Liberia, 6°01′ N, 10°26′ W; bottom sample CIX; Van Veen grab, 50 m. depth, bottom mud; January 8, 1946, 10^h03^m. — 1 specimen 13 mm.

Station 66, off Ivory Coast, 4°27′ N, 7°07′ W; bottom sample DII; Van Veen grab, 66 m. depth, bottom sandy mud; January 11, 1946, 16^h10^m. — 1 specimen 8 mm.

Station 85, off Gold Coast, 5°37′ N, 0°38′ E; Sigsbee trawl, 50 m. depth, bottom greyish mud; January 30, 1946, 10^h20^m—10^h50^m. — 1 specimen 12 mm.

Station 99, off Nigeria, 5°58′ N, 4°38′ E; bottom sample FIII; Van Veen grab, 61 m. depth, bottom fine mud; February 15, 1946, 10^h26^m. — 1 specimen 9 mm.

Station 114, off Nigeria, 4°01′ N, 7°12′ E; bottom sample HV; Petersen grab, 52 m. depth, bottom mud; February 22, 1946, 16^h38^m. 1 specimen 10 mm.

Station 135, off Angola, 7°55′ S, 12°38′ E; Sigsbee trawl, 360—440 m. depth, bottom mud; March 17, 1946, 8^h42^m—19^h15^m. — 3 specimens 26—33 mm.

Station 135, off Angola, 7°55′ S, 12°38′ E; eel trawl, 235—460 m. depth, bottom mud; March 17, 1946, 13^h40^m 15^h40^m. — 1 specimen 28 mm.

Station 136, off Angola, 8°30′ S, 13°14′ E; triangular dredge (45 cm.), 45 m. depth, bottom mud; March 18, 1946, 7^h22^m—7^h42^m. — 1 specimen 16 mm.

The species has been described and figured by COUTIÈRE on a single specimen from the Talisman Expedition. COUTIÈRE only deals with the anterior region of the body and with the large first leg. These agree well with those of my material.

In my specimens the rostrum is short and directed somewhat upwards. The shape of the postrostral carina is as in *Alpheus glaber* (Olivi). The orbital hoods are not spiny. The shape of the carapace and the abdomen is quite similar to that in *Alpheus glaber*. The pleurae of the fifth segment end in a small sharp point. The telson is slightly more elongate than in *A. glaber*, and it has the posterior margin somewhat more convex. The differences in the antennulae and antennae between the present species and the closely related *Alpheus glaber* have already been pointed out by COUTIÈRE. The relation between the lengths of the various parts is variable to a certain degree. In some of my large specimens the scaphocerite, the antennular, and the antennal peduncles are of equal length, in another the scaphocerite reaches slightly beyond the two peduncles, while in a third it is as in COUTIÈRE's figure, where the scaphocerite overreaches the antennular peduncle, while the end of the antennal peduncle falls distinctly short of the extremity of the antennular peduncle. The second segment of the antennular peduncle is relatively much longer than in *Alpheus glaber*.

In my largest specimen, a male, both first legs are present. The larger of these is even more elongate than that figured by COUTIÈRE. The dactylus is less than $^1/_4$ of the length of the palm. The carpus is $^1/_5$ of the length of the palm, this too is more slender than in COUTIÈRE's figure. The merus is three times as long as the carpus, it bears the anterodorsal spine, which also has been described and figured by COUTIÈRE. The inner lower margin of the merus bears some movable spines and it ends in a distinct anteroventral tooth, just as in *A. glaber*. The smaller leg is about as long as the larger. This too is extremely slender. The fingers are unarmed and slender, they are half as long as the palm. The carpus is slightly longer than that of the larger leg, but of the same general shape. The merus is exactly like that of the larger leg. The second to fifth legs, which are figured here, have essentially the same shape as in *A. glaber*, but are somewhat more slender. In one of my largest female specimens (26 mm. in length) only the smaller first leg is present. This leg is as slender as that of the male, but it has the fingers only slightly shorter than the palm. The palm is three times as long as the carpus and as long as the merus.

Also the pleopods and uropods are as in *Alpheus glaber*. The second pleopod of the male has the endopod provided with an appendix masculina and an appendix interna. In both sexes an appendix interna is present on the endopods of the second to fifth pleopods.

The specimens from the bottom samples are here considered to be juveniles of the present species. There are several important differences

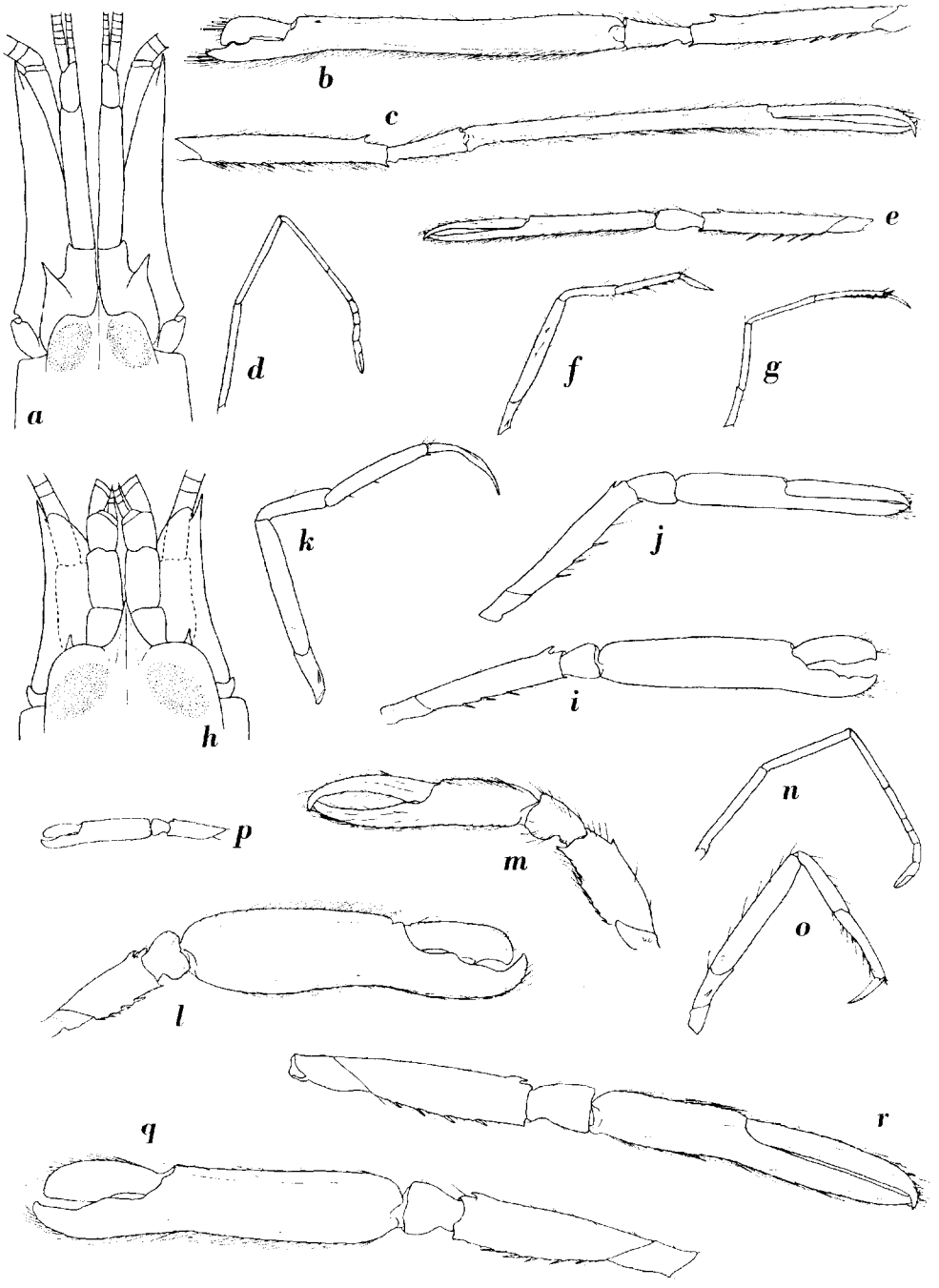

Fig. 14. *Alpheus talismani* Cout. Adult male: a, anterior part of body in dorsal view; b, larger first leg; c, smaller first leg; d, second leg. Adult female: e, first leg; f, third leg; g, fifth leg. Juvenile specimen: h, anterior part of body in dorsal view; i, larger first leg; j, smaller first leg; k, third leg.

Alpheus glaber (Olivi). Normal specimen from Barcelona: l, larger first leg; m, smaller first leg; n, second leg; o, third leg. Specimen from off Cabo Norfeo: p, q, larger first leg; r, smaller first leg. a, q, r, ×6; b, c, l, m, p, ×2; d g, n, o, ×2.5; h, ×24; i—k, ×17.

from the adult specimens. These differences are most distinct in the smallest specimen, which is figured here. In these juveniles the whole cephalic region is less slender. The rostrum is shorter and broader, the antennula has the second joint less than twice (instead of more than four times) as long as broad. The scaphocerite also is decidedly less slender, it is about three times as long as broad instead of about 5 times. The second legs are slender but relatively less so than in the adults. Of the large leg the dactylus is slightly less than half as long as the palm. The chela is 6 times as long as high. The carpus is about $^1/_6$ of the length of the palm and $^1/_4$ of the length of the merus. The smaller second leg has the fingers somewhat longer than the palm. The carpus, merus and ischium are as in the larger leg. The meri, like those of the adult specimens have a distinct anterodorsal and an anteroventral tooth, and in addition movable ventral spines. The third leg is peculiar in having the dactylus excessively long; this joint is only a little shorter than the propodus. It has the same dorso-ventrally depressed, shovel-like shape as in *Alpheus glaber* and the adult specimens of *A. talismani*. The posterior margin of the propodus bears some spinules. The carpus is $^5/_7$ of the length of the propodus and it is half as long as the merus. The small male from Station 136 (16 mm. long) is more or less intermediate between the specimen of 8 mm. and that of 33 mm.; the smaller chela of this male shows a great resemblance to that of the female from Station 135, the larger chela lacks in this male. The specimen from Station 85 lacks both first legs, but in the remaining characters it strongly ressembles the specimen from Station 136.

If we compare *Alpheus glaber* with *A. talismani* we find that the only difference between the two species is the great slenderness of the appendages of the latter form. It is therefore important to ascertain the range of variability of the slenderness of the appendages in both species. That this variability in *A. talismani* is considerable is borne out by the present material, especially if the adult forms are compared with the juveniles. But also in the adult specimens the slenderness of the larger first chela seems to be variable, at least the chela figured by COUTIÈRE is distinctly less slender than that of my largest male. Unfortunately, we do not know whether COUTIÈRE's specimen is a male or a female. The difference in the shape of the smaller first leg of the large male and female in my material, makes it probable that a similar sexual difference might exist in the larger first leg too. My material of *Alpheus glaber* does not show much variation in the slenderness of the first chelipeds. Rather aberrant is a specimen of this species sent to me for examination by Dr. R. ZARIQUIEY ALVAREZ of Barcelona, Spain. This specimen, which is 25 mm. in length, was collected in deep water off Cabo Norfeo, N.E. Spain (this cape forms the northern limit of the Golfo de Rosas), in September 1947. It is a male and has the first legs more slender than any material of the typical *Alpheus glaber* seen by me. The

chela of the larger leg is five times as long as high (in normal specimens it is only about 4 times as long as high), and the merus of the leg is distinctly more slender than that of typical specimens of *Alpheus glaber*. The legs, however, are relatively small for a specimen of its size, so that they are possibly abnormal in some way or other. On the whole, we know too little about *Alpheus talismani* as well as of *A. glaber* to form a definite opinion on the status of the first form. For comparison I have added to the figures of *Alpheus talismani*, those of the first pair of legs of the Cabo Norfeo specimen of *Alpheus glaber*, and those of both first, one of the second and one of the third legs of a normal specimen of *Alpheus glaber* (Olivi). The latter specimen originates from the vicinity of Barcelona (P. ANTIGA leg.; coll. Rijksmuseum van Natuurlijke Historie, Leiden, Holland).

Distribution. *Alpheus talismani* up till now was only known from the original record by COUTIÈRE from the Cape Verde Islands (depth 410 - 450 m.).

Alpheus floridanus Kingsley ssp. *africanus* Balss 1916.

(Fig. 15).

Alpheus floridanus africana Balss 1916, p. 21, fig. 5.

Material examined:

Station 53, anchorage of Marshall, Liberia; dip net, with electric light; January 5, 1946, 20^{h30}. — 1 specimen 17 mm.

Station 72, off Gold Coast, 4°52′ N, 1°42′ W; bottom sample Eiv; Van Veen grab, 24 m. depth, bottom mud and shelly sand; January 23, 1946, 8^{h45}. — 1 specimen 12 mm.

Station 75, off Gold Coast, 4°43′ N, 1°41′ W; bottom sample Evii; Van Veen grab, 46 m. depth, bottom muddy sand; January 23, 1946, 13^{h45}. — 1 specimen 13 mm.

As already remarked by BALSS (1916) the present form shows a very close resemblance to *Alpheus floridanus* Kingsley. A sharp keel runs from the rostrum backwards and reaches somewhat beyond the middle of the carapace. Slightly before its middle this keel shows a sudden but rather inconspicuous elevation. The ocular hoods are pronounced and separated from the rostral keel by a deep depression. No ocular spines are present. As in the typical species there are numerous scattered short hairs on the carapace.

The abdominal pleurae in my specimens are very short. Those of the first five segments are rounded. The telson is of the usual shape. In my West African specimens it is somewhat more slender than in specimens of the typical form from the West Indies.

The antennulae and antennae are like those figured by ZIMMER (1913) for *A. floridanus*. The spine at the apex of the stylocerite in my African specimens is longer than that in ZIMMER's figure, but such longer spines were also found in my West Indian material.

The main difference between the typical *A. floridanus* and its subspecies *africanus* may be found in the shape of the first legs, as already pointed out by BALSS (1916). In the African form the legs are more slender than in those from the West Indies. In my largest specimen the larger leg is even more slender than that figured by BALSS for the type of the present sub-

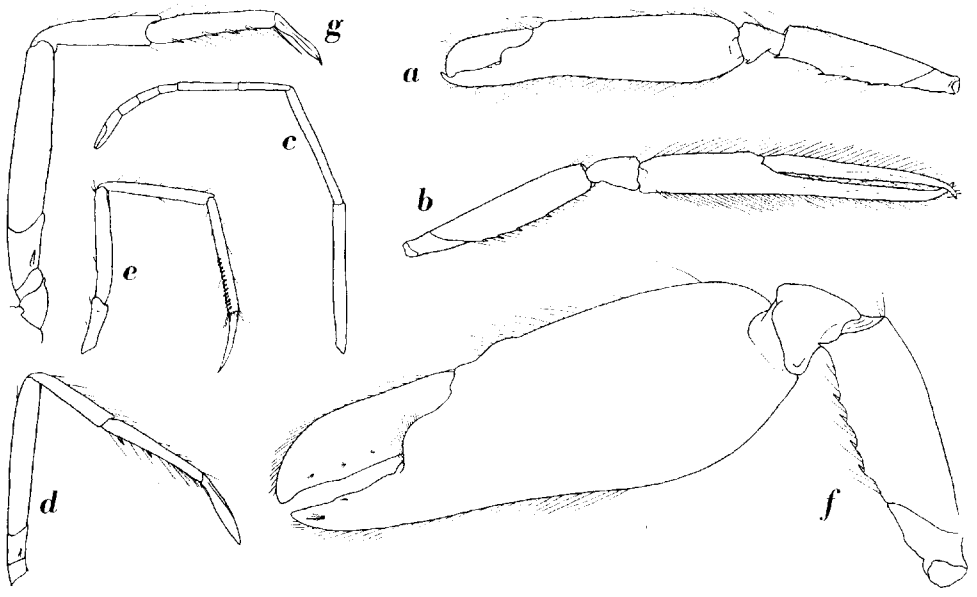

Fig. 15. *Alpheus floridanus africanus* Balss. a, larger first leg; b, smaller first leg; c, second leg; d, third leg; e, fifth leg.
Alpheus floridanus floridanus Kingsley, specimen from Curaçao. f, larger first leg; g, third leg. a—g, ×6.

species. In the large leg of this specimen the dactylus is about half as long as the palm; the chela is 4.5 times as long as broad (in BALSS's figure the palm is 1.8 times as long as the dactylus and the chela is 3 times as long as broad, while in specimens of the West Indian form these figures are 1.5 and 2.7 respectively). The carpus is short and bears a ventral spine. It is $^1/_5$ of the length of the palm. The merus, which is about three times as long as the carpus, bears no dorsal spine, but the antero-internal angle of its lower surface ends in a distinct sharp tooth, while there are four movable spines on the rest of the inner margin of the lower surface. BALSS (1916) states that the merus is triangular and bears no spines in the distal part. This may be an oversight on his part, since such spines are present

in my African as well as in my American material. The small chela is more slender than in the typical species, but the general shape is the same. The merus does not possess an inner antero-ventral spine, but there are movable spines on the ventral margin. The second leg is similar to that of the typical species. Here too the proximal joint of the carpus is shorter than the second joint. The following legs have the dactylus simple. In the third the dactylus is depressed and somewhat shovel-like in shape, just as in *A. talismani*. These last legs are more slender than in *A. floridanus floridanus*. For comparison the third leg of *Alpheus floridanus floridanus* is figured here also.

The present form shows much affinity to *A. talismani*, especially to the younger specimens, but is easily recognizable by the dorsal keel on the carapace, by the absence of the dorsal spine on the merus of the first legs, and by having the proximal joint of the carpus of the second leg shorter than the following joint.

Distribution. *Alpheus floridanus africanus* Balss up till now was only known from Balss's (1916) original record. Balss's specimen was found at Wappu, Ivory Coast, at a depth of 40 m. *Alpheus floridanus floridanus* Kingsley is known from Florida and the West Indies, it is a littoral form too.

Alpheus bouvieri A. Milne Edwards 1878.

(Fig. 16).

Alpheus Edwardsii Dana 1852a, p. 542 (non *Athanas Edwardsii* Audouin 1826).
Alpheus Edwardsii Dana 1855, atlas, p. 11, pl. 34 fig. 2.
Alpheus Bouvieri A. Milne Edwards 1878, p. 231.
Alpheus edwardsii Bate 1888, p. 542, pl. 97 fig. 1.
Alpheus Edwardsii p. p. Pocock 1890, p. 518.
Alpheus Bouvieri Coutière 1898a, p. 131, fig. 1.
Alpheus Bouvieri Coutière 1898c, p. 249, figs. 3—5.
Alpheus Bouvieri Coutière 1899, p. 237, fig. 291.
Alpheus Edwardsii De Man 1899, p. 311.
Alpheus bouvieri Rathbun 1900, p. 312.
Alpheus Bouvieri Coutière 1905, p. 907, pl. 85 fig. 44.
Alpheus Bouvieri Balss 1916, p. 21.
non *Alpheus Bouvieri* Monod 1927, p. 594.
Crangon (Alpheus) Bouvieri Monod 1933, p. 462, figs. 1 A—C.

Material examined:

Station 38, Porto Grande, São Vicente, Cape Verde Islands, 16°53′ N, 25°00′ W; bottom sample $A_{I\ 39}$; Van Veen grab, 9 m. depth, bottom sand; December 10, 1945, $11h^{00}$. — 1 ovigerous female 12 mm.

Station 40, off São Pedro Bay, São Vicente, Cape Verde Islands; triangular dredge (45 cm.), 40 m. depth, bottom corals; December 11, 1945, $14h^{10}$. — 29 specimens (including 9 ovigerous females, 11—13 mm.) 7—17 mm.

Station 40, anchorage of São Pedro Bay, São Vicente, Cape Verde Islands; bottom sample Arv $_{49}$; Van Veen grab, 32 m. depth, bottom sand, corals and Foraminifera; December 11, 1945, 7h^{00}. — 1 specimen 12 mm.

Station 43, Praia, São Thiago, Cape Verde Islands; Sigsbee trawl, 22 m. depth, bottom corals; December 13, 1945, 14h^{40}. — 25 specimens (including 1 ovigerous female, 12 mm.) 6—12 mm.

The rostrum is short and simple, it is directed straight forwards and almost reaches the end of the basal segment of the antennular peduncle. Posteriorly, the rostrum continues in a ridge, which is short and not very sharp, it ends near the base of the ocular hoods. The latter are well pronounced. Their anterior margin is rounded and bears no spine. From the rostral carina the ocular hoods are separated by a deep depression. A distinct cardiac notch is present in the posterior margin of the carapace.

The carapace and abdomen are smooth, being without hairs. The first four segments of the abdomen have the pleurae broadly rounded. The fifth pleurae end in an acute tip. The sixth segment has the posterolateral angles rounded. The telson is of the usual shape, being about quadrangular in outline, with the top somewhat narrower than the base and widened in the middle. Of the two dorsal pairs of spines the anterior is placed slightly before the middle of the telson, the other is situated somewhat closer to the anterior pair than to the posterior margin of the telson. This posterior margin bears in its extreme lateral parts one short outer and one longer inner spine. Between the inner spines the margin is provided with numerous hairs.

The eyes are pigmented and wholly concealed under the orbital hoods.

The antennula has the stylocerite broad and ending in a slender point, which reaches about to the base of the second segment of the peduncle. This second segment is distinctly longer than the third.

The scaphocerite is three times as long as broad, it reaches slightly beyond the end of the antennular peduncle. The outer margin is concave and ends in a strong terminal tooth, which far overreaches the lamella. The antennal peduncle reaches as far forwards as the lamella. A distinct spine is present at the outer side of this peduncle near the base of the scaphocerite.

The oral parts are of the normal shape. The palp of the first maxilliped is long and slender, it is divided into 2 joints; the caridean lobe is narrow and the epipod is slightly bilobed. The third maxilliped has the ultimate joint twice as long as the penultimate. The antepenultimate segment is 3.5 times as long as the penultimate. No pleurobranch is present, the arthrobranch is well developed. The branchial formula is normal.

The first legs are strongly unequal. The larger of these legs has the chela strongly resembling that of *Alpheus pontederiae*. The upper margin of the dactylus is semicircular; the ventral margin is provided with a large tooth, which fits in a cavity of the fixed finger. The palm is about twice as long

as high. The upper as well as the lower margin are provided with a deep incision. There is a triangular depression in the upper half of both the outer and inner surface. The carpus is very short. The merus is about $^1/_3$ of the length of the palm. The ventral surface of the merus has the outer margin ending in a sharp anterior tooth, while furthermore two movable spines are placed on that margin. The smaller first leg of the male is more slender. The fingers have no teeth, they are somewhat shorter than the palm.

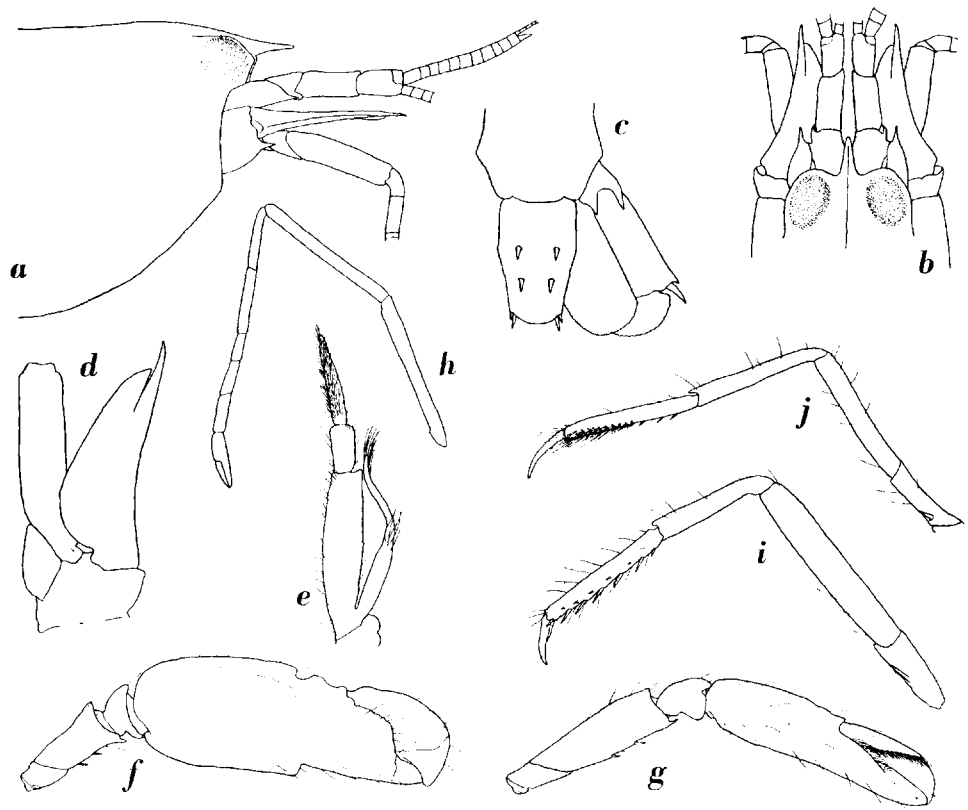

Fig. 16. *Alpheus bouvieri* A. Milne Edw. a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, telson and right uropod in dorsal view; d, scaphocerite; e, third maxilliped; f, larger first pereiopod of male; g, smaller first pereiopod of male; h, second pereiopod; i, third pereiopod; j, fifth pereiopod. a—c, e, g—j, ×9; d, ×14; f, ×4.

From the base of the fingers near the cutting edge, an oblique row of hairs extends up to the upper margin of the dactylus, in the fixed finger this row of hairs runs parallel to the cutting edge. These rows of hairs are much less distinct in the female. The carpus and merus are relatively longer than those of the large leg, but they are of the same general shape. The merus bears a tooth and spines similar to those of the merus of the large leg. The second leg is slender. The fingers are as long as the palm. The carpus is about four times as long as the chela. The proximal joint of the carpus

is slightly shorter than the next. The third and fourth joints together are about as long as the second, the fourth being slightly longer than the third. The fifth or distal joint is slightly longer than the fourth. The merus is about as long as the ischium and $^2/_3$ as long as the carpus. The last three legs have the dactylus simple. The propodus of the third leg is three times as long as the dactylus, its posterior margin bears a row of spinules, while some smaller spinules are present on the outer surface. The carpus is somewhat shorter than the propodus and $^3/_4$ of the length of the merus. The ischium is short and bears a spine on the outer surface. The fifth leg is more slender than the third. The dactylus is $^3/_7$ of the length of the propodus. The latter bears several spinules on the posterior margin and numerous transverse rows of hairs in the distal part of that margin. The carpus is as long as the propodus, and also of the same length as the merus. The ischium, as in the third leg, bears a spine on the outer surface.

In both sexes the endopod of the second to fifth pleopods is provided with an appendix interna. The endopod of the second pleopod in the male, moreover, bears an appendix masculina, which is about as long as the appendix interna. The uropods are broad. The protopod ends in two slender, posteriorly directed spines, which reach over the bases of the exo- and endopod. The exopod has the outer margin ending in a tooth, which at its inner side bears a strong uncoloured spine, no other spines or teeth are present on the diaeresis.

The eggs are rather numerous, they are 0.4 to 0.5 mm. in diameter.

In my material the first (= proximal) joint of the carpus of the second legs is constantly shorter than or equal to the second joint. I never found specimens in which the first joint was longer than the second. In DANA's (1855) pl. 34 fig. 2e and in COUTIÈRE's (1905) pl. 85 fig. 44c, this first joint is shown to be longer than the second, which is also indicated in DANA's description of *Alpheus Edwardsii*. BATE's (1888) pl. 97 fig. 1, however, entirely agrees with my material. As no other differences between my material and the descriptions and figures given of DANA's specimens of "*Alpheus Edwardsii*" and the type specimens of *Alpheus bouvieri* A. Milne Edwards, can be found, the present material is considered to belong to A. MILNE EDWARDS's species. A reexamination of the type material certainly is highly desirable, however.

Only part of POCOCK's (1890) specimens of "*Alpheus Edwardsii*" belongs to the present species, as pointed out by COUTIÈRE (1899, p. 44), who examined POCOCK's material. The other specimens referred by POCOCK to *Alpheus Edwardsii* actually belong to *Alpheus armillatus* H. Milne Edwards.

Distribution. The species is a littoral form. It has been reported from the West African coast, from Fernando Noronha off N.E. Brazil (POCOCK, 1890), from Panama (COUTIÈRE, 1898a, 1905), from Jibuti (COUTIÈRE,

1898c) and from Minikoi, Maldive Archipelago (COUTIÈRE, 1905). The West African records are: Azores (COUTIÈRE, 1905), Los Islands, French Guinea (MONOD, 1933), Cape Verde Islands (A. MILNE EDWARDS, 1878; COUTIÈRE, 1898a, 1905), off São Vicente (BATE, 1888), São Thiago, Cape Verde Islands (DANA, 1852a), Victoria, Cameroons (BALSS, 1916), Gabon (COUTIÈRE, 1905; BALSS, 1916), French Congo (COUTIÈRE, 1898a; BALSS, 1916). COUTIÈRE (1905) described a variety of this species as *Alpheus Bouvieri Hululensis*; this variety is known from the Red Sea and the Maldive Archipelago. *Alpheus Bouvieri Bastardi* Coutière (1898a) from the Red Sea, the Western Indian Ocean, the Malay Archipelago and Panama was given the rank of a full species by COUTIÈRE (1905). COUTIÈRE's (1905) statement that the type specimens of this species originate from the Canary Islands obviously is a mistake: the Cape Verde Islands are meant.

The specimens recorded by MONOD (1927) under the name *Alpheus Bouvieri* actually belong to *A. pontederiae* Rochebrune as pointed out by MONOD (1928).

Alpheus edwardsii (Audouin) 1826.

Restricted synonymy:

Athanas Edwardsii Audouin 1826, p. 91.
Alpheus Edwardsi Coutière 1898a, p. 133.

Distribution. This species is widely distributed throughout the Indo-westpacific region. Most records of this species from West Africa are based on specimens of *Alpheus bouvieri*. The only exception seems to be COUTIÈRE's (1898a) record, since this author is well aware of the existence of *A. bouvieri* and compares his specimens of *A. edwardsii* with that species. It remains desirable, however, that COUTIÈRE's specimens be reexamined. COUTIÈRE records his specimens of *A. edwardsii* from the Cape Verde Islands.

Alpheus pontederiae Rochebrune 1883.

(Fig. 17).

Alpheus Pontederiae Rochebrune 1883, p. 174.
Alpheus Edwardsi Aurivillius 1898, p. 30 (non *Athanas Edwardsii* Audouin 1826).
Alpheus megacheles Coutière 1899, p. 37 (non Norman, 1868).
Alpheus macrocheles Rathbun 1900, p. 312 (non *Hippolyte macrocheles* Hailstone, 1835).
Alpheus macrocheles Balss 1916, p. 20.
Crangon langi Schmitt 1926, p. 20, fig. 63.
Alpheus Bouvieri Monod 1927, p. 594 (non A. Milne Edwards, 1878).
Alpheus Langi Monod 1928, p. 252.

Material examined:

Station 110, Creek, Bonny River opposite Opobo, Niger Delta, Nigeria;

Sigsbee trawl, 8—15 m. depth, bottom soft grey mud; February 21, 1946, $16h^{00}$–$16h^{20}$. — 1 specimen 26 mm.

A very useful description of this species was given by SCHMITT (1926), who named it *Crangon langi*. My only specimen agrees in almost all respects with SCHMITT's description and figures, the only difference being in the shape of the smaller chela of the first pair of legs. The specimen figured by SCHMITT possesses a strong setiferous carina on the dactylus of the smaller chela. This crest is absent in my specimen. As SCHMITT's figure is made after a male and my specimen is a female, the difference in the shape of the chela in all probability is only due to sex.

The synonymy of the present species is somewhat confused. This is mainly due to the fact that COUTIÈRE (1899, p. 37) identifies ROCHEBRUNE's species with *Alpheus macrocheles* (Hailstone)[1]), without having had access to the type material of *Alpheus pontederiae*. COUTIÈRE states: "Le type de cette Alphée [*Alpheus pontederiae*] est aujourd'hui perdu, mais je crois pouvoir l'identifier, d'après la description de l'auteur, avec *A. megacheles*, Hailstone." ROCHEBRUNE's description runs as follows: "Carapace lisse, en forme de tuile, assez large en arrière, étroite et comprimée en avant, où elle se termine en un rostre court, très aigu, caréné en dessus; bord antérieur des voûtes orbitaires large et arrondi; pattes antérieures très inégales; bras mince, lisse, sans épine; main gauche très volumineuse, aplatie, fortement sillonnée sur les faces planes, terminée en dessus et en dessous par un fort tubercule anguleux; pinces comprimées portant à la base un tubercule arrondi et au milieu une dent obtuse, et bordée de soies grisâtres; pouce lenticulaire très grand à soies grises éparses; main droite petite, de forme pyramidale, à pinces étroites allongées couvertes de petits tubercules et de long poils; pouce triangulaire contourné en dehors; 2e paire de pattes très longues, grêles, terminées par deux doigts extrêmement petits et courts; les autres pattes plus fortes."

As ROCHEBRUNE expressly states that the anterior margin of the orbital hoods is broad and rounded, I cannot accept COUTIÈRE's identification: in *Alpheus macrocheles* there is a distinct anterior spine on each of the orbital hoods. Furthermore ROCHEBRUNE says that the merus of the first legs does not bear any spine, and that the palm of the larger leg on both sides ends in an angular tubercle. The only species which shows these characteristics is *Alpheus langi* (Schmitt), which species resembles *Alpheus pontederiae* also in the habitat. ROCHEBRUNE states that his species was found between floating clusters of the herb *Eichhornia natans* (P. Beauv.) (— *Pontederia*

[1]) The name *Alpheus megacheles* (Hailst.) used by COUTIÈRE is a lapsus for *Alpheus macrocheles* (Hailst.). This lapsus was first introduced in literature by NORMAN (1868, p. 175), who is followed by many other authors.

natans) in rivers of Senegal at the time when their water is saltish. *Alpheus langi* is now recorded from brackish water of river mouths (present material), from decayed wood in a river (Aurivillius, 1898), from brackish water, under stones, pieces of wood or other hard objects and in tunnels in mangrove swamps (Schmitt, 1926), and from decaying wood (Monod, 1927). *Alpheus macrocheles* (Hailst.) is found only in the deeper littoral waters. We may therefore safely identify *Alpheus pontederiae* Rochebrune with *Crangon langi* Schmitt.

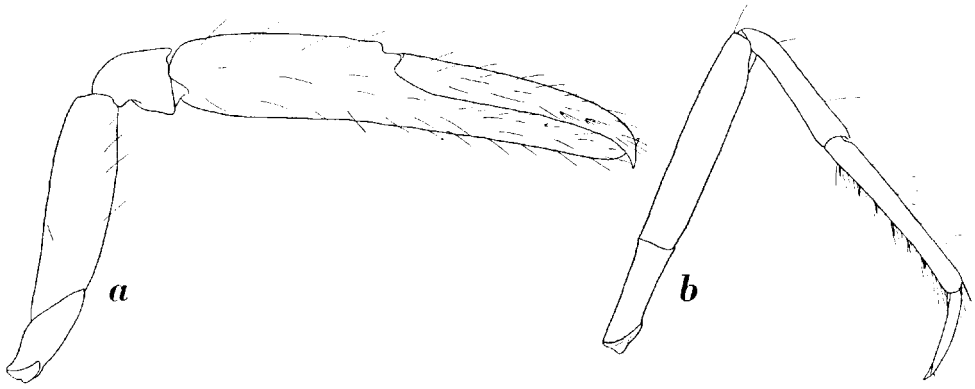

Fig. 17. *Alpheus pontederiae* Rochebrune. a, smaller first leg of female; b, third leg. a, b, ×7.

Distribution. The habitat of the present species is discussed above. It is only known from West Africa. The records in literature are: Mouths of Leybar, Thiank and Dakar-Bango Rivers, Senegal (Rochebrune, 1883), river near Bibundi, Cameroons (Aurivillius, 1898), Souelaba, and Kwelekwele Island in Malimba Bay, Cameroons (Monod, 1927), Banana, Belgian Congo (Schmitt, 1926).

Alpheus intrinsecus Bate 1888.

Alpheus intrinsecus Bate 1888, p. 557, pl. 100 fig. 1.
Alpheus intrinsecus Osorio 1892, p. 201.
Alpheus intrinsecus Osorio 1898, pp. 186, 194.
Alpheus intrinsecus Coutière 1899, p. 96, fig. 64.
Alpheus intrinsecus Rathbun 1900, p. 313.
Alpheus intrinsecus Moreira 1901, p. 10.
Alpheus intrinsecus Moreira 1905, p. 131.
Alpheus intrinsecus Balss 1916, p. 20.
Alpheus intrisecus Luederwaldt 1919, p. 430.
Alpheus intrinsecus Balss 1925, p. 292, fig. 75.
Crangon intrinsecus Schmitt 1926, p. 23.
Alpheus intrinsecus Monod 1927, p. 594.
Alpheus intrinsecus Luederwaldt 1929, p. 52.

Material examined:

Station 148, off French Guinea, 9°57′ N, 15°22′ W; Sigsbee trawl, 25 m. depth, bottom shells and hydroids; April 14, 1946, 16^{h25}—16^{h55}. — 1 ovigerous female 19 mm.

The present specimen agrees well with the description and figures given by BATE (1888) of this characteristic species. The scaphocerite has the final tooth directed straight forwards, it is not curved inwards as shown in BATE's figure 1c″. As in BALSS's (1925) specimen, the present female has the carpus of the second legs five- and not six-jointed. BATE's statement that the carpus of the second leg in his specimen is six-jointed probably is either a mistake or BATE's specimen is abnormal in that respect. The antero-ventral teeth on the meri of the third and fourth legs, which are not mentioned in BATE's description, are much more distinct in my specimen than they are in BATE's figure.

The Atlantide specimen is intact, safe for the absence of the smaller first leg.

Distribution. The species lives in shallow littoral waters. It is reported from depths between 13 and 36 m. (BATE, 1888), 24 m. (MOREIRA, 1905), and from a piece of coral which was washed ashore (SCHMITT, 1926). The species is known from West Africa and from the Brazilian coast off Bahia (BATE, 1888), and near São Sebastião (MOREIRA, 1905; LUEDERWALDT, 1919, 1929). The West African records are: Victoria, Cameroons (BALSS, 1925), Jogo-Jogo, São Thomé, Gulf of Guinea (OSORIO, 1892), Banana, Belgian Congo (SCHMITT, 1926). OSORIO's (1892, p. 201) remarks that BATE states that this species appears to be common in the tropical and temperate regions of the Atlantic Ocean from Bermuda in the north to St. Paul's Rocks in the south, is erroneous. BATE does not make this statement for *Alpheus intrinsecus*, but for "*Alpheus minus*", the next species treated by him (BATE, 1888, p. 559).

Synalpheus parfaiti Coutière 1898.

(Fig. 18).

Synalpheus laevimanus Parfaiti Coutière 1898b, p. 191.
Synalpheus laevimanus Parfaiti Coutière 1899, p. 145, fig. 138.
?*Synalpheus laevimanus parfaiti* Rathbun 1902, p. 110.
Synalpheus parfaiti Coutière 1909, p. 64, fig. 37.
Synalpheus parfaiti Balss 1914, p. 101.
Synalpheus Parfaiti Balss 1916, p. 19.

Material examined:

Station 44, off French Guinea, 10°22′ N, 16°22′ W; Sigsbee trawl, otter trawl and triangular dredge (45 cm.), 41—45 m. depth, bottom brown sand and shells; December 17, 1945. — 2 specimens 8 and 9 mm.

Station 145, off French Guinea, 9°20' N, 14°15'W; Sigsbee trawl and otter trawl, 32 m. depth, bottom shells and Foraminifera; April 13, 1946, $7h^{45}$—$10h^{10}$. — 3 specimens (including 1 ovigerous female, 10 mm.) 8—10 mm.

Station 151, off French Guinea, 10°40' N, 16°44'W; Sigsbee trawl, 65 m. depth, bottom coarse sand; April 16, 1946, $8h^{55}$. — 1 ovigerous female 14 mm.

Station 153, off French Guinea, 10°49' N, 16°39'W: Sigsbee trawl, 42 m. depth, bottom coarse sand; April 16, 1946, $13h^{20}$—$13h^{50}$. — 8 specimens (including 2 ovigerous females, 9 and 14 mm.) 5—14 mm.

Fig. 18. *Synalpheus parfaiti* Cout. Smaller first leg. ×10.

The best description and figures given of the present species are those of COUTIÈRE (1909) in his revision of the American *Synalpheus* species. COUTIÈRE's description is based on a single specimen, of which the smaller first leg is lacking. The following details concerning the present material give additional information on the various characters of this species and their variability. The rostrum is much narrower than the lateral teeth. The latter are blunt. The rostral carina is short and sharp, but variable in length. The pterygostomian angle of the carapace is sharply pointed. The abdominal pleurae in the female are broadly rounded. In the male the pleura of the first segment anteriorly is almost rectangular and posteriorly it ends in a curved hook, similar to that figured by COUTIÈRE (1899, fig. 360) for *Synalpheus laevimanus longicarpus*. Also the other pleurae show a close resemblance to those shown in that figure. The pleurae of the third and the fourth abdominal segments, however, have the anterior part produced into a rather narrow point. In the telson of the male the dorsal spines are much stronger than in the female.

The antennulae are somewhat more elongate than shown in COUTIÈRE's (1909) figure, but otherwise fully agree with it. Sometimes the stylocerite reaches beyond the end of the basal segment of the antennular peduncle, and in other cases it fails to reach so far.

The antennae too are like those in COUTIÈRE's specimen. The external spine of the basicerite fails generally to attain the end of the antennular peduncle, though it overreaches the scaphocerite. The lamella of the scaphocerite is very variable in size, sometimes it is almost absent, sometimes it is as well developed as shown in COUTIÈRE's figure. The development of the lamella is sometimes different in the left and right antennae of one individual.