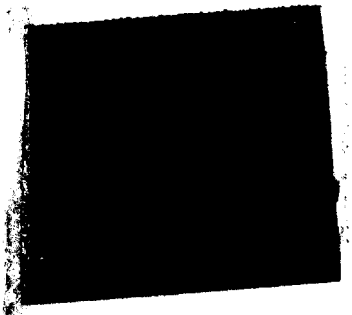
ATLANTIDE REPORT No. 2

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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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.

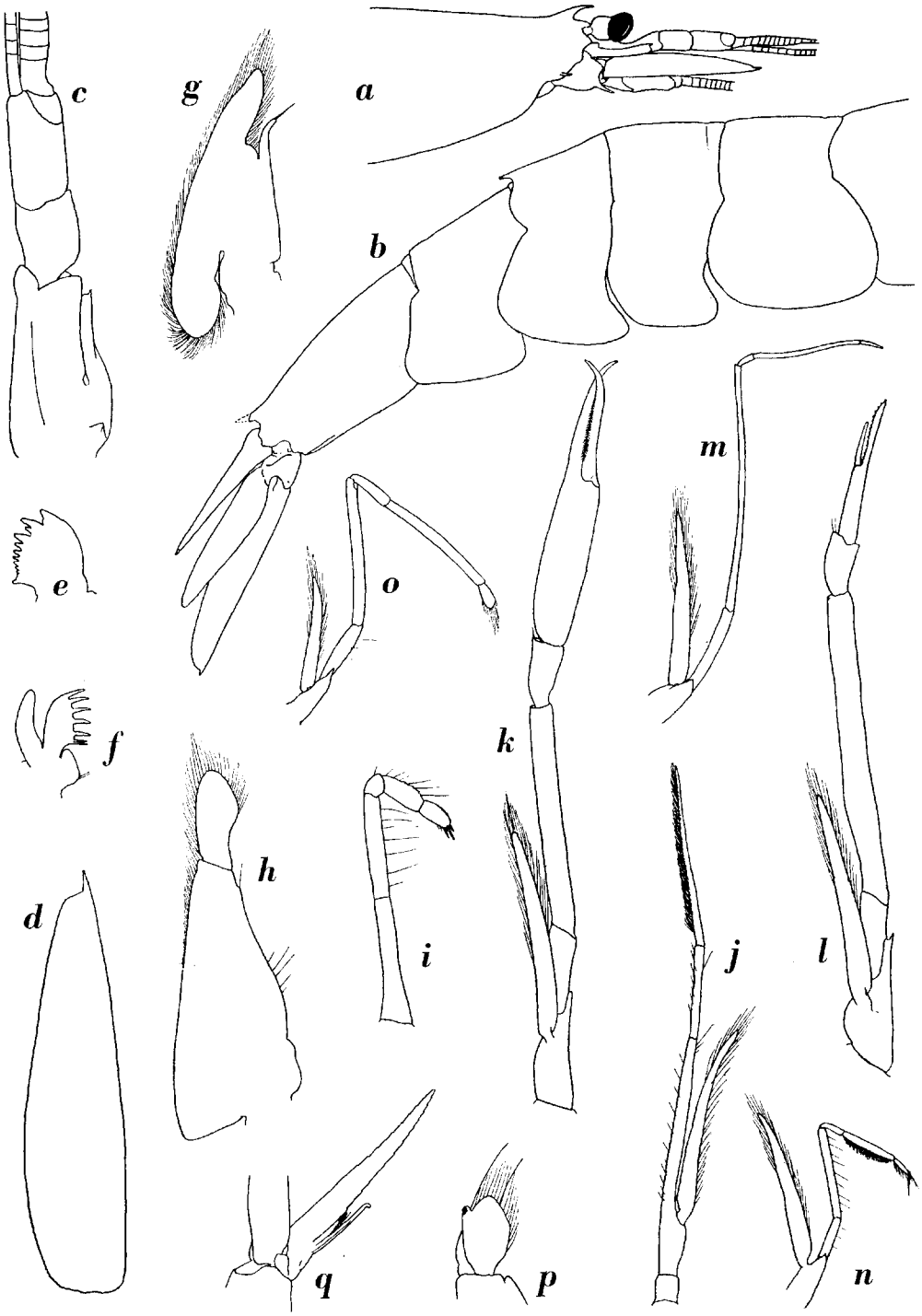

Fig. 1.

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.

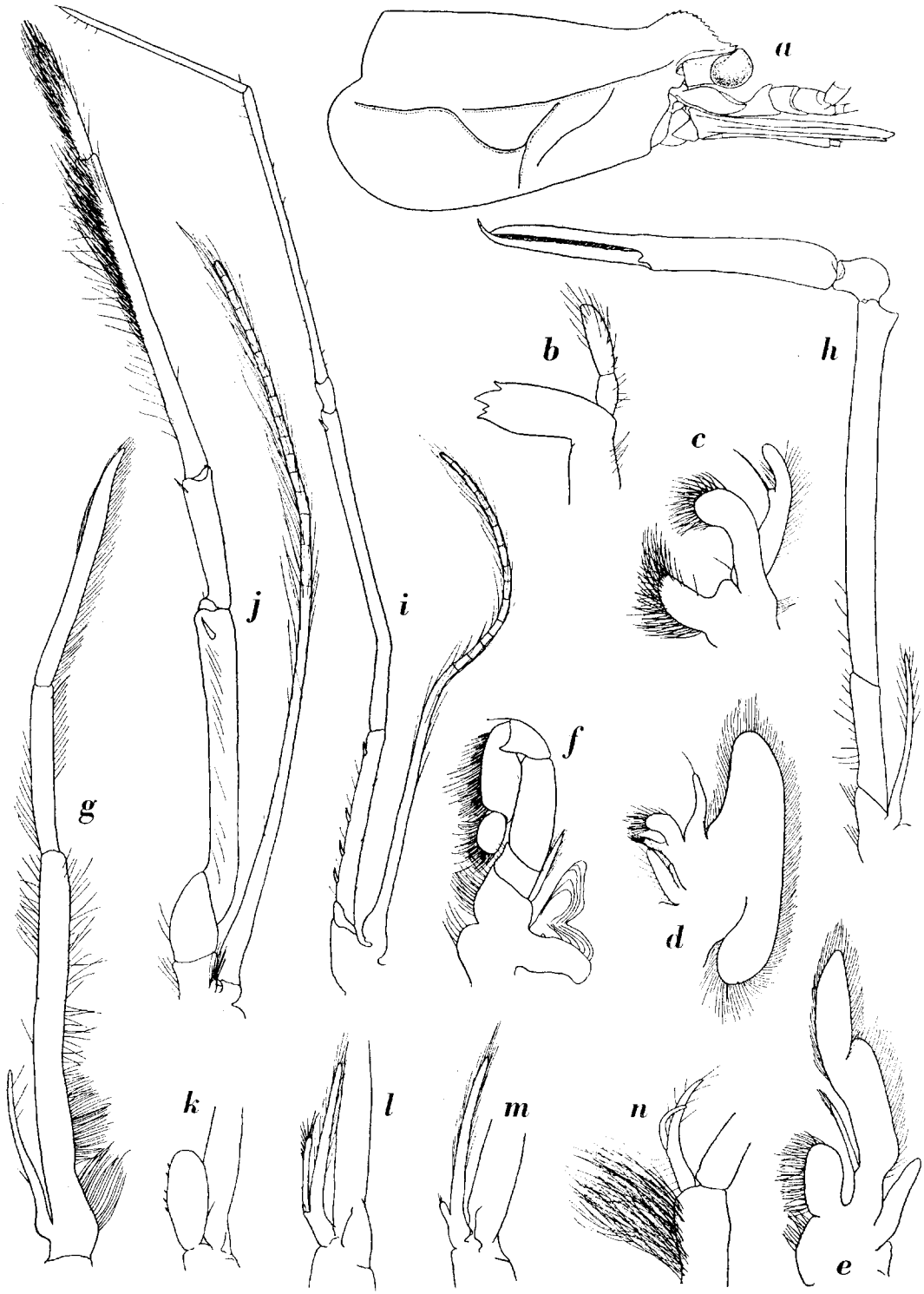

Fig. 2.

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.

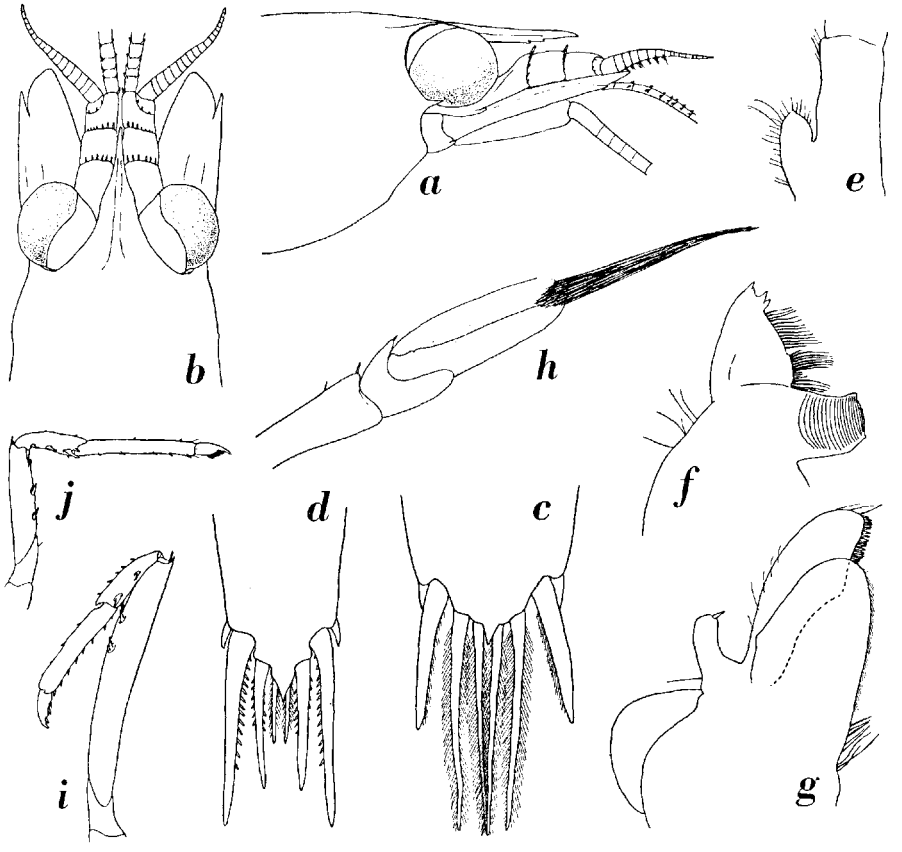

Fig. 3. *Atya* ? *africana* Bouvier (specimen from Boma except no. d). a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, tip of telson; d, tip of telson (specimen from Sta. 119); e, base of antennular peduncle; f, mandible; g, maxillula; h, chela of first leg; i, third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

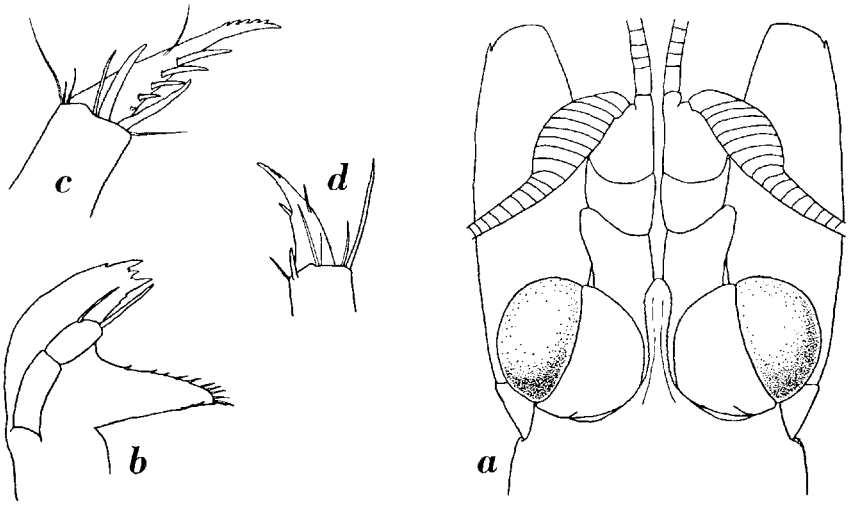

Fig. 4. *Discias atlanticus* Gurney. a, anterior part of body in dorsal view; b, mandible; c, dactylus of third pereiopod; d, dactylus of fifth pereiopod. a, ×25; b d, ×100.

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

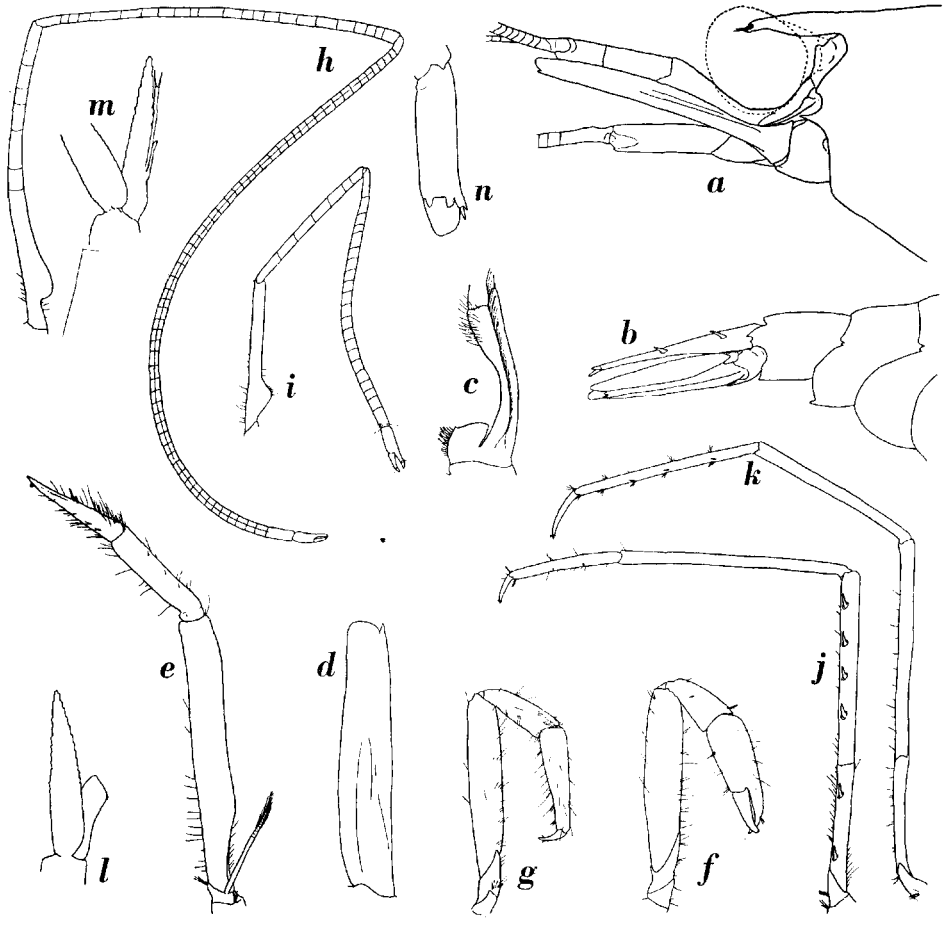

Fig. 5. *Processa intermedia* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, base of antennular peduncle; d, scaphocerite; e, third maxilliped; f, right first pereiopod; g, left first pereiopod; h, right second pereiopod; i, left second pereiopod; j, 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

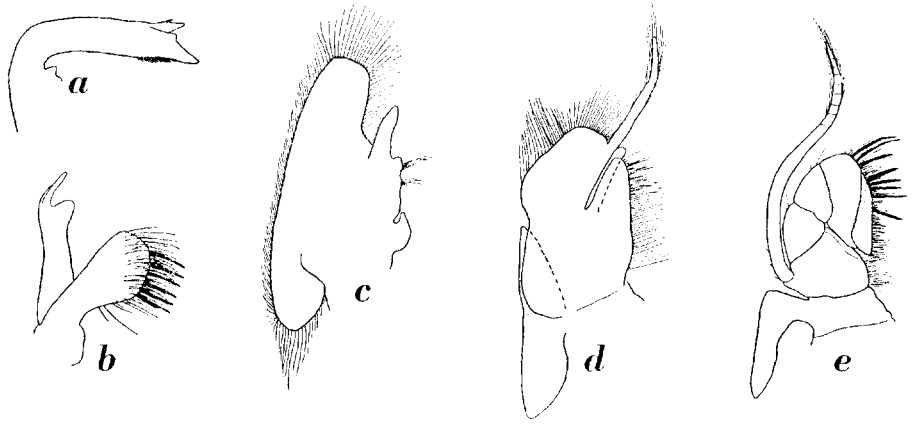

Fig. 6. *Processa intermedia* n. sp. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped. a, b, ×20; c—e, ×15.

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

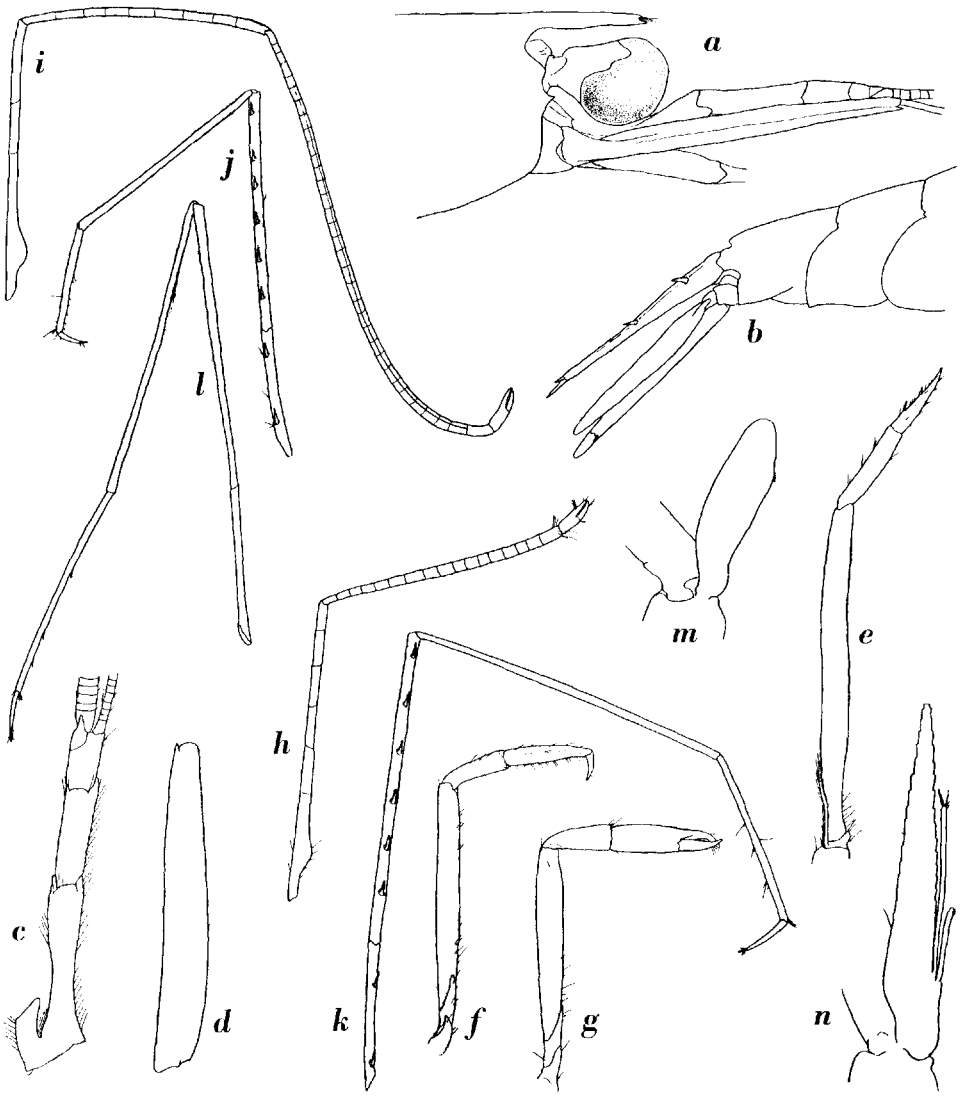

Fig. 7. *Processa borboronica* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, third maxilliped; f, left first pereiopod; g, right first pereiopod; h, left second pereiopod; i, right second pereiopod; j, third 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

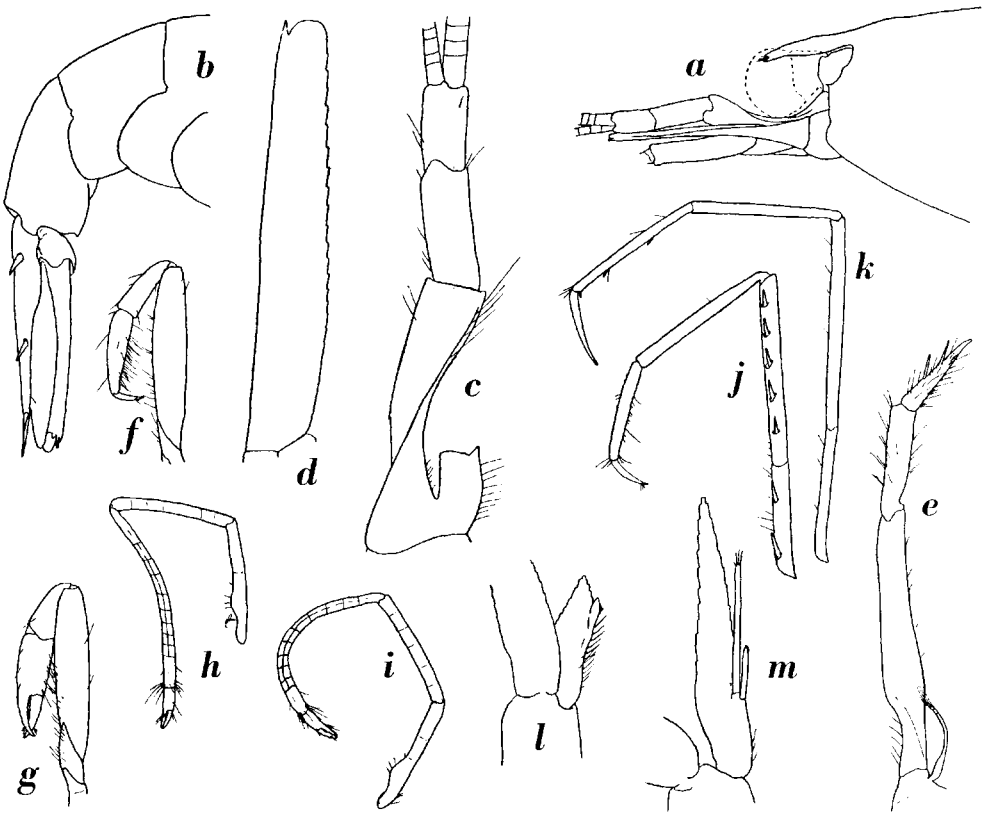

Fig. 8. *Processa parva* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, third maxilliped; f, left first pereiopod; g, right first pereiopod; h, left second pereiopod; i, right second pereiopod; j, third pereiopod; 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.

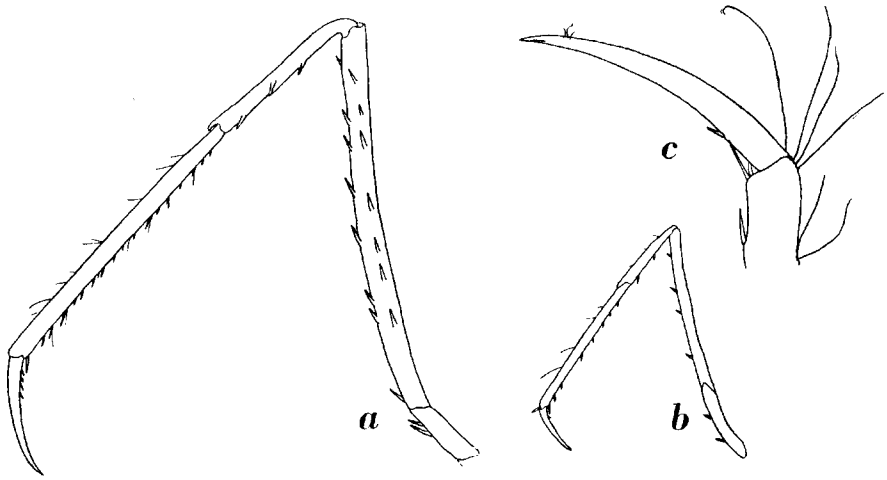

Fig. 9. *Pandalina profunda* Holthuis. a, third leg of type specimen from Barents Sea; b, third leg of specimen from Atlantide Expedition; c, dactylus of third leg of specimen from Atlantide Expedition. a, b, ×10; c, ×50.

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

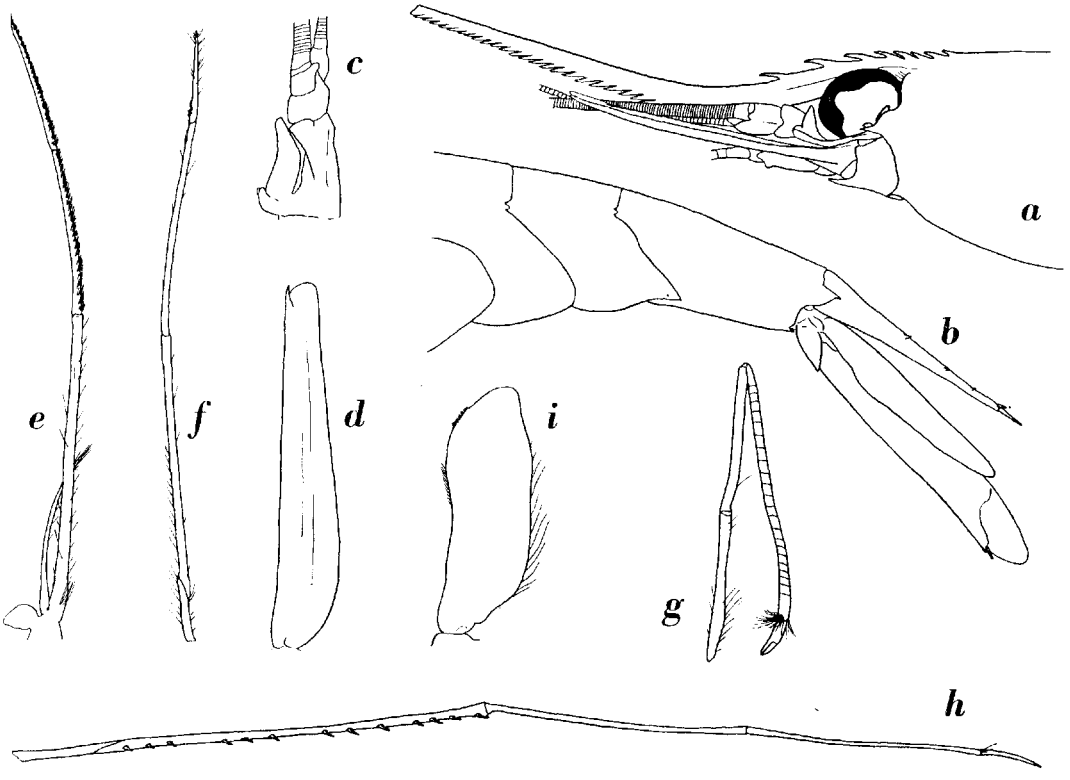

Fig. 10. *Plesionika martia* (A. Milne Edw.). a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, third maxilliped; f, first pereiopod; g, second pereiopod; h, third pereiopod; i, endopod of first pleopod of male. a—h, ×2.5;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

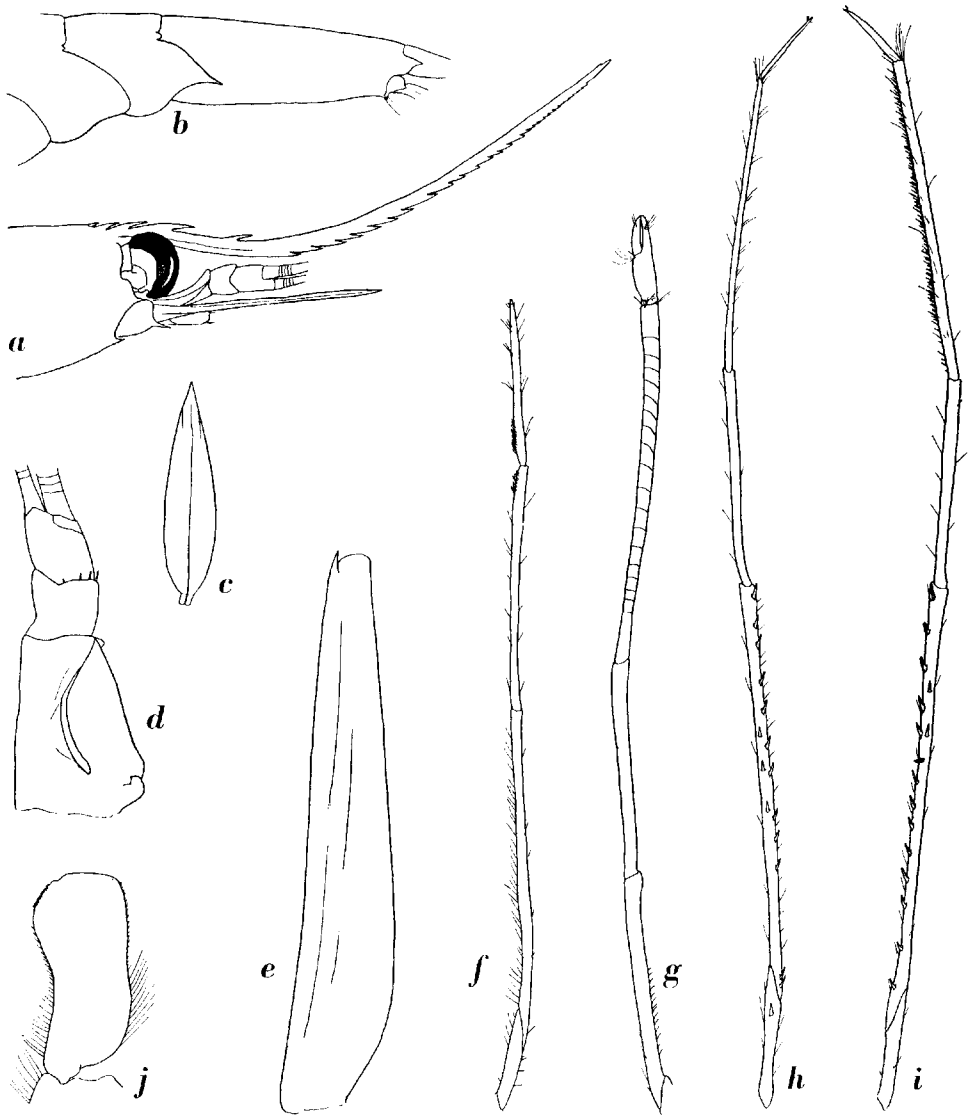

Fig. 11. *Plesionika ensis* (A. Milne Edwards). a, anterior part of the body in lateral view; b, posterior part of the abdomen in lateral view; c, body scale; d, antennular peduncle; e, scaphocerite; f, first pereiopod; g, second pereiopod; h, third pereiopod; i, fifth pereiopod; j, endopod of first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

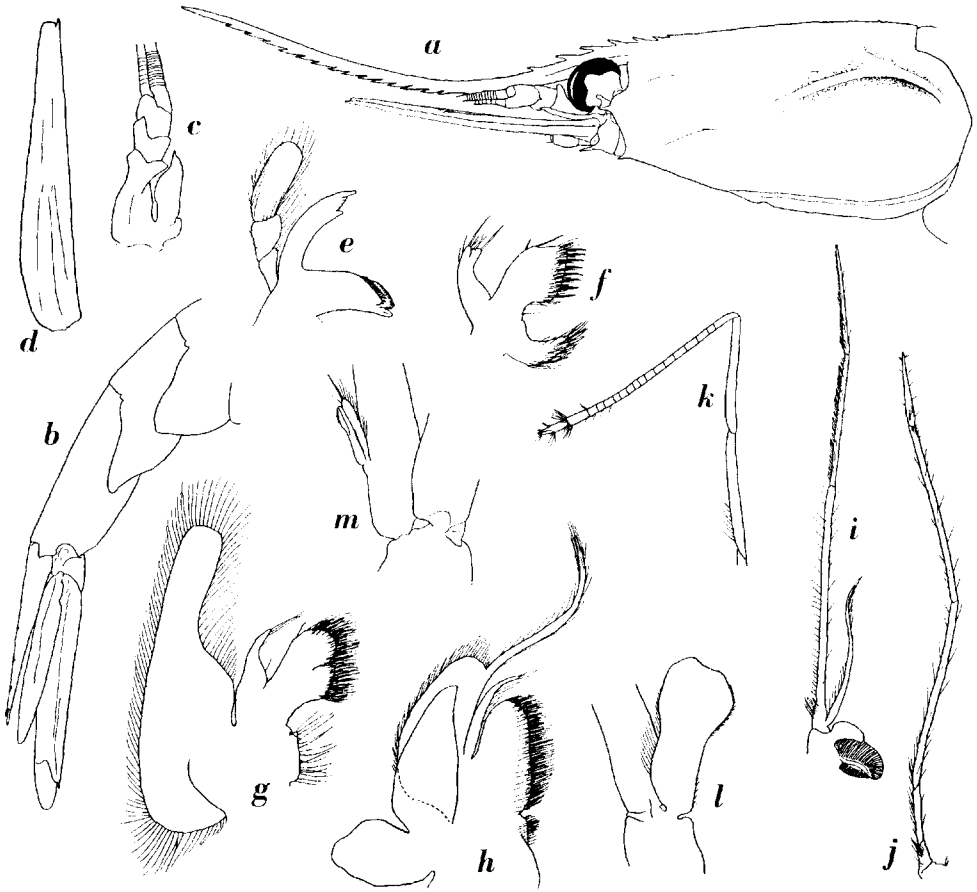

Fig. 12. *Plesionika carinata* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennular peduncle; d, scaphocerite; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, third maxilliped; j, first pereiopod; k, second pereiopod; l, endopod of 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

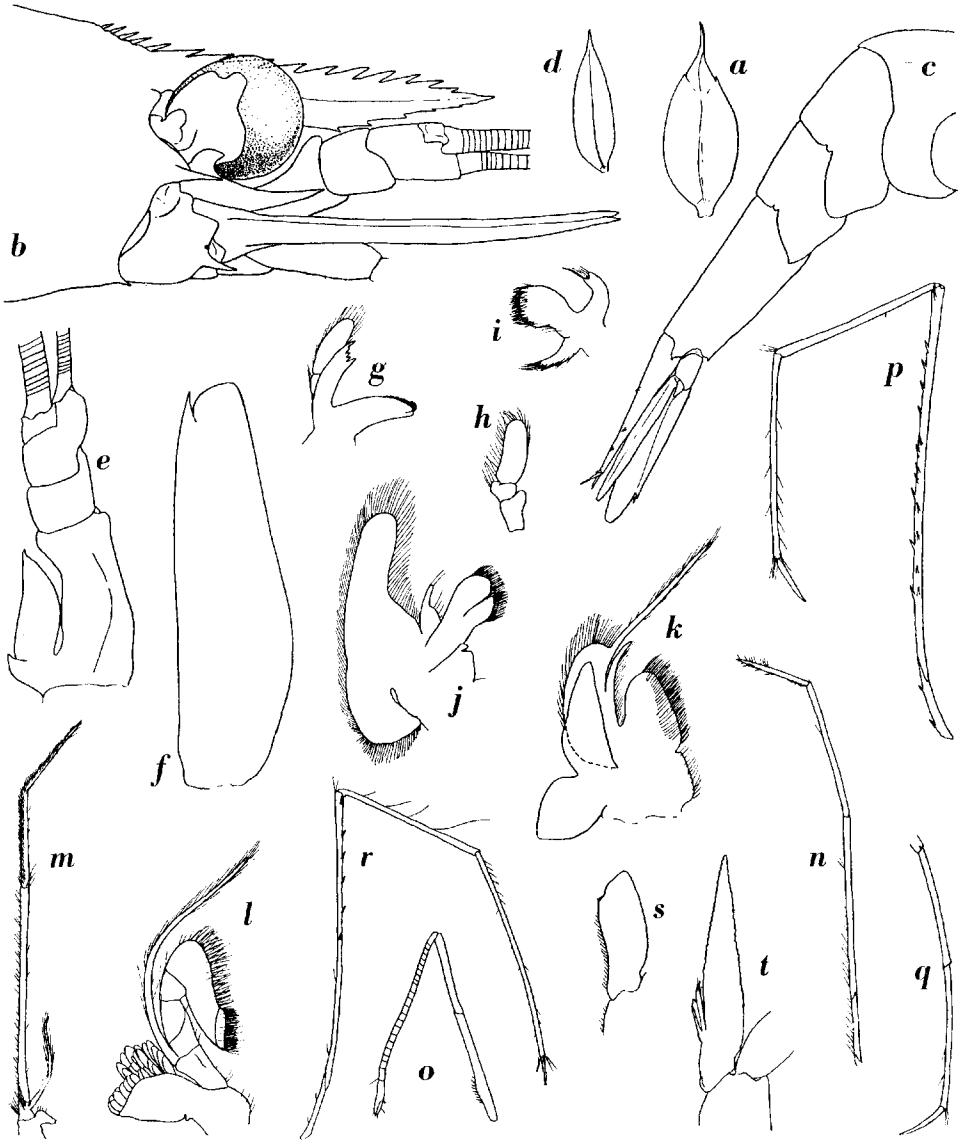

Fig. 13. *Plesionika heterocarpus* (Costa). a, body scale.
Plesionika acanthonotus (Smith). b, anterior part of body in lateral view; c, posterior part of abdomen in lateral view; d, body scale; e, antennular peduncle; f, scaphocerite; g, mandible; h, mandibular palp; i, maxillula; j, maxilla; k, first 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

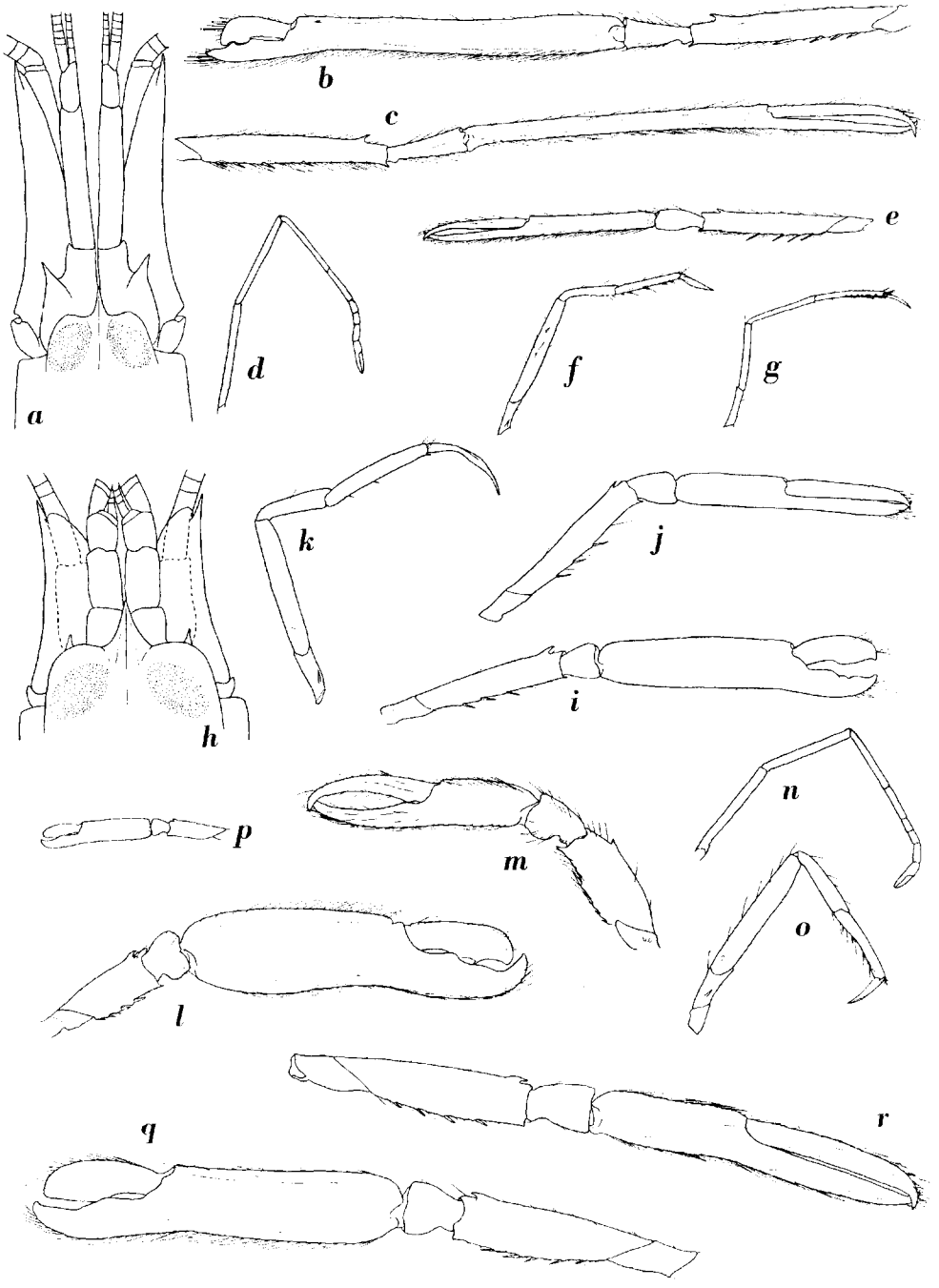

Fig. 14. *Alpheus talismani* Cout. Adult male: a, anterior part of body in dorsal view; b, larger first leg; c, smaller first leg; d, second leg. Adult female: e, first leg; f, third leg; g, fifth leg. Juvenile specimen: h, anterior part of body in dorsal view; i, larger first leg; j, smaller first leg;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

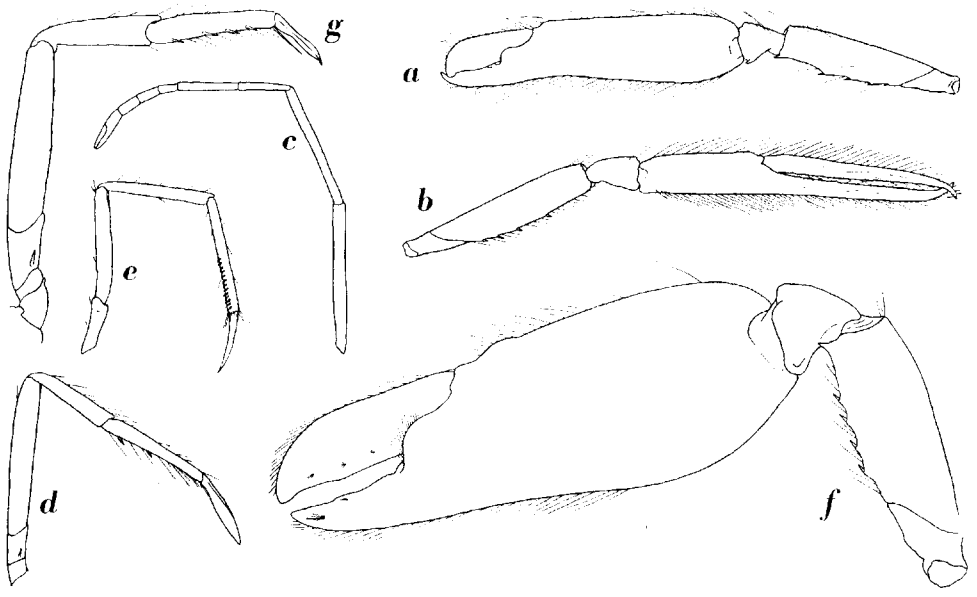

Fig. 15. *Alpheus floridanus africanus* Balss. a, larger first leg; b, smaller first leg; c, second leg; d, third leg; e, fifth leg.
Alpheus floridanus floridanus Kingsley, specimen from Curaçao. f, larger first leg; g, third leg. a—g, ×6.

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.

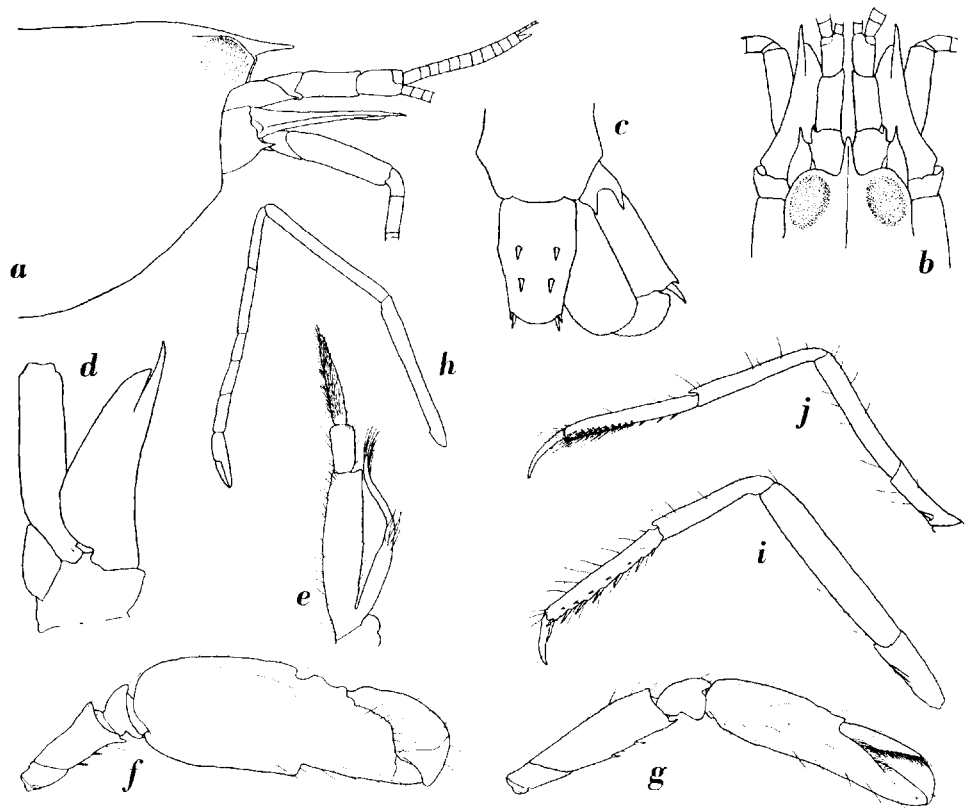

Fig. 16. *Alpheus bouvieri* A. Milne Edw. a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, telson and right uropod in dorsal view; d, scaphocerite; e, third maxilliped; f, larger first pereiopod of male; g, smaller first pereiopod of male; h, second pereiopod; i,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

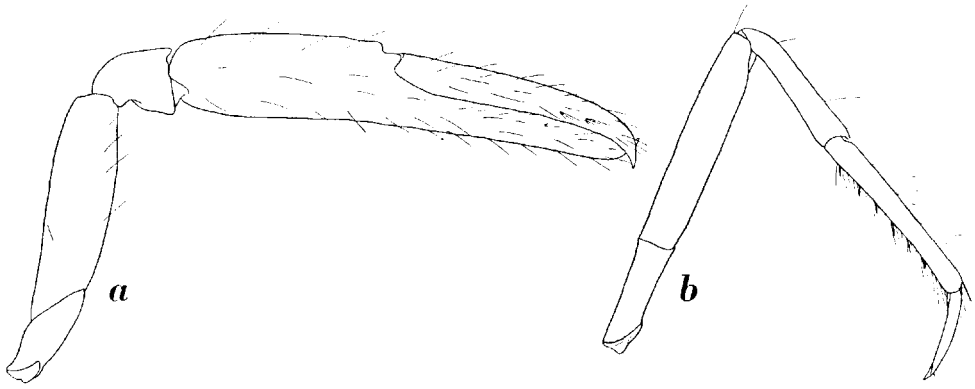

Fig. 17. *Alpheus pontederiae* Rochebrune. a, smaller first leg of female; b, third leg. a, b, ×7.

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.

The larger first leg is as figured by COUTIÈRE, though sometimes the palm is somewhat higher. The distal end of the upper margin of the merus in some specimens ends in a minute spine. This spine sometimes is inconspicuous or absent in other specimens. The smaller leg is of the *laevimanus* type. The fingers are $^2/_3$ of the length of the palm. The dactylus bears a large tuft of hairs on the dorsal surface. The carpus is short and conical, it is more than half as long as the palm. The carpus of the second leg in one of my specimens consists of 6 instead of 5 joints, this of course is an abnormality, since in the other material the number of carpal joints is 5.

The eggs are fairly numerous in the larger females, few in the smaller. They measure 0.4 to 0.6 mm. in diameter.

Colour. Most of the colour has disappeared in my specimens, but the fingers of the large chela have the margins tinged with pink, while the tips are horny yellow.

Distribution. The species is known only from the coast of West Africa. The specimens from Porto Rico and St. Thomas referred by RATHBUN (1902) to the present species obviously belong to one of the closely related American forms. The records of the present species are: Prampram, Gold Coast (BALSS, 1916), Anno Bom, Gulf of Guinea (COUTIÈRE, 1898b, 1909; BALSS, 1914, 1916). The present material thus considerably extends the known range of distribution of the species.

Synalpheus senegambiensis Coutière 1908.

(Fig. 19).

Synalpheus Paulsoni Senegambiensis Coutière 1908a, p. 202.
Synalpheus paulsoni senegambiensis Coutière 1909, p. 92.
Synalpheus paulsoni senegambiensis 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—55 m. depth, bottom sand and shells; December 17, 1945. — 28 specimens (including 6 ovigerous females, 9—12 mm.) 6—12 mm.

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, 15h—18h. — 2 ovigerous females 14 and 18 mm.

Station 141, off Freetown, Sierra Leone; Commercial otter trawl, 15 m. depth, bottom sand; April 9, 1946, 11h—16h. — 18 specimens (including 1 ovigerous female, 19 mm.) 5—19 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,

$7h^{45}$—$10h^{10}$. — 26 specimens (including 3 ovigerous females, 14—17 mm.) 5—17 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, $14h^{20}$. — 8 specimens (including 3 ovigerous females, 12—22 mm.) 10—22 mm.

Station 147, off French Guinea, 9°28′ N, 14°58′ W; Sigsbee trawl, 45 m.

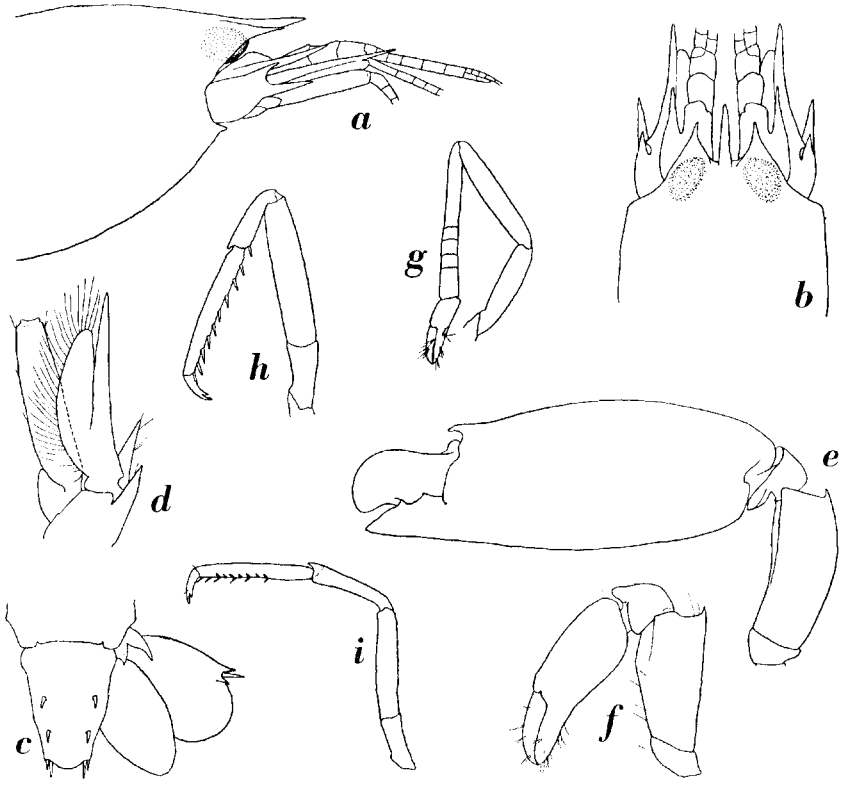

Fig. 19. *Synalpheus senegambiensis* Cout. a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, telson and right uropod in dorsal view; d, scaphocerite; e, larger first pereiopod; f, smaller first pereiopod; g, second pereiopod; h, third pereiopod; i, fifth pereiopod. a—c, e—i, ×10; d, ×15.

depth, bottom shells and Foraminifera; April 14, 1946, $8h^{55}$—$9h^{35}$. — 4 specimens (including 2 ovigerous females, 9 and 17 mm.) 6—17 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 specimen 10 mm.

Station 153, off French Guinea, 10°49′ N, 16°39′ W; Sigsbee trawl, 42 m. depth, bottom coarse sand; April 16, 1946, $13h^{20}$—$13h^{50}$. — 25 specimens (including 7 ovigerous females, 11—14 mm.) 8—14 mm.

The present species was described for the first time as a variety of the Indo-westpacific *Synalpheus paulsoni* Nobili, but in my opinion it de-

serves full specific rank. COUTIÈRE's description is extremely short, giving only very few details; furthermore COUTIÈRE's type and only specimen was damaged. A new description, based on the extensive material of this species of the Atlantide Expedition, is given here.

The rostrum is narrow and slender. It reaches to or slightly beyond the end of the basal segment of the antennular peduncle and slightly surpasses the corneal teeth. The base of the rostrum bears at its ventral side a process, which is directed vertically downwards. This process is triangular with an emarginate tip, when seen from the front; it is very narrow when looked at from the side. The corneal teeth are somewhat broader than the rostrum and end in a narrow sharp point. Between the corneal hoods and the rostrum the carapace is deeply hollowed. The pterygostomian angle of the carapace ends in a rather sharp tooth.

The abdomen has the pleurae of the first two segments broadly rounded. In the males the first, third and fourth segments show no hook-shaped angles as in *S. parfaiti*. The pleurae of the third segment of the males have the tip about rectangular, those of the fourth and fifth segments end in posteriorly directed, rather sharp, points. In the female the pleurae of the third and fourth segments are rounded, that of the fifth segment is pointed. The telson is broadly triangular, with curved lateral margins and a broad convex posterior margin. The posterolateral angles are somewhat produced and blunt. The upper surface of the telson bears two pairs of well developed but not very strong spines. The first of these two pairs of spines stands slightly before, the second slightly behind the middle of the telson. There are two pairs of posterior spines.

The antennulae have the stylocerite slender and regularly tapering towards the sharp apex, which reaches to or slightly beyond the middle of the second segment of the peduncle. The second segment of this antennular peduncle is slightly longer than the third. The flagella are normal.

The scaphocerite has the final tooth strong and reaching beyond the antennular peduncle. The lamella is well developed. It is slender and just attains the end of the antennular peduncle, it reaches as far forwards as the carpocerite (= last joint of the antennal peduncle). The two spines of the basicerite are distinct, the upper is the smaller of the two. The outer reaches about to the end of the basal segment of the antennular peduncle. The carpocerite is almost four times as long as broad.

The oral parts are normal. The palp of the first maxilliped consists of two joints.

The larger first pereiopod has the chela almost three times as long as high. The fingers are distinctly less than half as long as the palm. The dorsal margin of the palm ends in a distinct anteriorly directed spine. In some specimens, and especially in the larger ones, this spine is reduced to a rounded tubercle. The carpus is very small and narrow. The merus

is half as long as the palm and has its upper margin ending in a small but distinct anterior spine. The smaller first leg has the chela slightly less than three times as long as high. The fingers are $^2/_3$ of the length of the palm, the latter bears no spine. There is no conspicuous tuft of hairs on the upper margin of the dactylus. The carpus is short and cup-shaped, it is half as long as the palm. The merus is distinctly longer than the palm and has the upper margin ending in an anteriorly directed spine. The second legs are equal. The chela has the fingers about as long as the palm. The carpus is $^7/_3$ of the length of the chela, it consists of 5 joints. The proximal of these is about as long as the others together. The 3 intermediate joints are of equal length, the distal joint is twice as long as each of the intermediates. The merus is $^5/_6$ of the length of the carpus and 1.4 times as long as the ischium. The last three legs have the dactylus biunguiculate. The two claws of the dactylus are about equal, slender and placed so that their general direction follows the curve of the dactylus. The propodus of the third leg is 3.5 times as long as the dactylus and is provided on its lower margin with a row of spinules. The carpus is about half as long as the propodus. The merus is longer than the propodus. The fifth leg differs from the third by having transverse rows of hairs or minute spinules placed in the ultimate part of the posterior margin of the propodus, by having the carpus $^2/_3$ of the length of the propodus, and by having the merus shorter than the latter joint. None of the last three legs has the merus provided with spinules.

The pleopods of the male have neither an appendix masculina nor an appendix interna. In the females there is an appendix interna on the second to fifth pleopods. The uropods are broadly ovate. The outer margin of the exopod is convex and ends in two sharp teeth, between which a movable spine is present.

The eggs are rather numerous and are 0.5 to 0.7 mm. in diameter.

In his very short description of the present form COUTIÈRE states the merus of the smaller first leg to be unarmed, while it actually has the upper margin ending in a spine in all my specimens. COUTIÈRE's remark therefore is probably due to a mistake.

Distribution. The species is a littoral form, the present material is found at depths ranging between 15 and 65 m. The only record in literature is that of COUTIÈRE (1908a, 1909), who reports one specimen from Cape Verde, Senegal (not the Cape Verde Islands as stated by BALSS, 1916). The Atlantide collection shows that the species is far from rare and that it occurs from French Guinea to Sierra Leone.

Synalpheus neptunus (Dana) 1852.

Restricted synonymy:

Alpheus neptunus Dana 1852, p. 22.
Alpheus neptunus Doflein 1900, p. 127.

Distribution. This species is widely distributed throughout the Indo-westpacific region. DOFLEIN's (1900) record of it from the West African coast is very doubtful, the more so as his material was obtained through a dealer and does not bear an accurate locality label. DOFLEIN does not give any details of his material.

Coutière (1899, p. 453) mentions specimens from Cape Lopez, Gabon, which he thinks to be closely related to, if not identical with, *Synalpheus neptunus*; on p. 25 of his 1909 paper Coutière mentions these specimens again and states that they are "with difficulty separable" from *Synalpheus latastei tenuispina* Cout., a Brazilian form. The identity of Coutière's specimens is not certain, since he gives no other data concerning this material.

Alpheopsis haugi Coutière 1906.

Alpheopsis Haugi Coutière 1906, p. 376, figs. 1, 2.

Distribution. This is a fresh water species, which has been found in a lake 200 km. from the sea shore. Up till now the only record of this species is that of COUTIÈRE (1906) from Ngômô near the Ogowé River, Gabon.

Alpheopsis monodi Sollaud 1932.

Alpheopsis Monodi Sollaud 1932, p. 375, figs. 1, 2.

Distribution. Like the previous species, this also is a fresh water form. It has been reported by SOLLAUD (1932) from near the coast of the Manoka Bay, Cameroons. It was collected together with *Macrobrachium macrobrachion* (Herklots), which might indicate that the water was slightly brackish.

Alpheopsis trispinosus (Stimpson) 1860.

Betaeus trispinosus Stimpson 1860, p. 32.
Betaeus trispinosus Haswell 1882, p. 192.
Alpheopsis trispinosus Coutière 1896, p. 382.
Alpheopsis trispinosus Coutière 1899, pp. 73, 190, 259, 315, figs. 26, 96, 120, 168, 228—231, 315, 396.
Alpheopsis trispinosus Coutière 1906, p. 377.
Alpheopsis sp. De Man 1922, p. 24, pl. 3 fig. 12.
Alpheopsis trispinosus Sollaud 1932, p. 376.
Alpheopsis trispinosus Coutière 1938 b, p. 187.
Alpheopsis trispinosus Hale 1941, p. 266, fig. 4.

Distribution. The species is known from the Malay Archipelago and E. Australia. COUTIÈRE (1896, 1938) records it from the Azores, while the same author (COUTIÈRE, 1906) states it to occur at the West African coast, without, however, giving any exact locality. Finally, SOLLAUD (1932) in a footnote says that the species has been dredged near the Azores and in the Cape Verde region. Since probably neither COUTIÈRE nor Sollaud had Indo-westpacific material of *Alpheopsis trispinosus* at their disposal for comparison with their Atlantic specimens, their identifications should be taken with some reserve.

Jousseaumea jarli n. sp.
(Fig. 20).

Material examined:

Station 112, off Nigeria, 4°12′ N, 7°05′ E ; bottom sample HII; Petersen

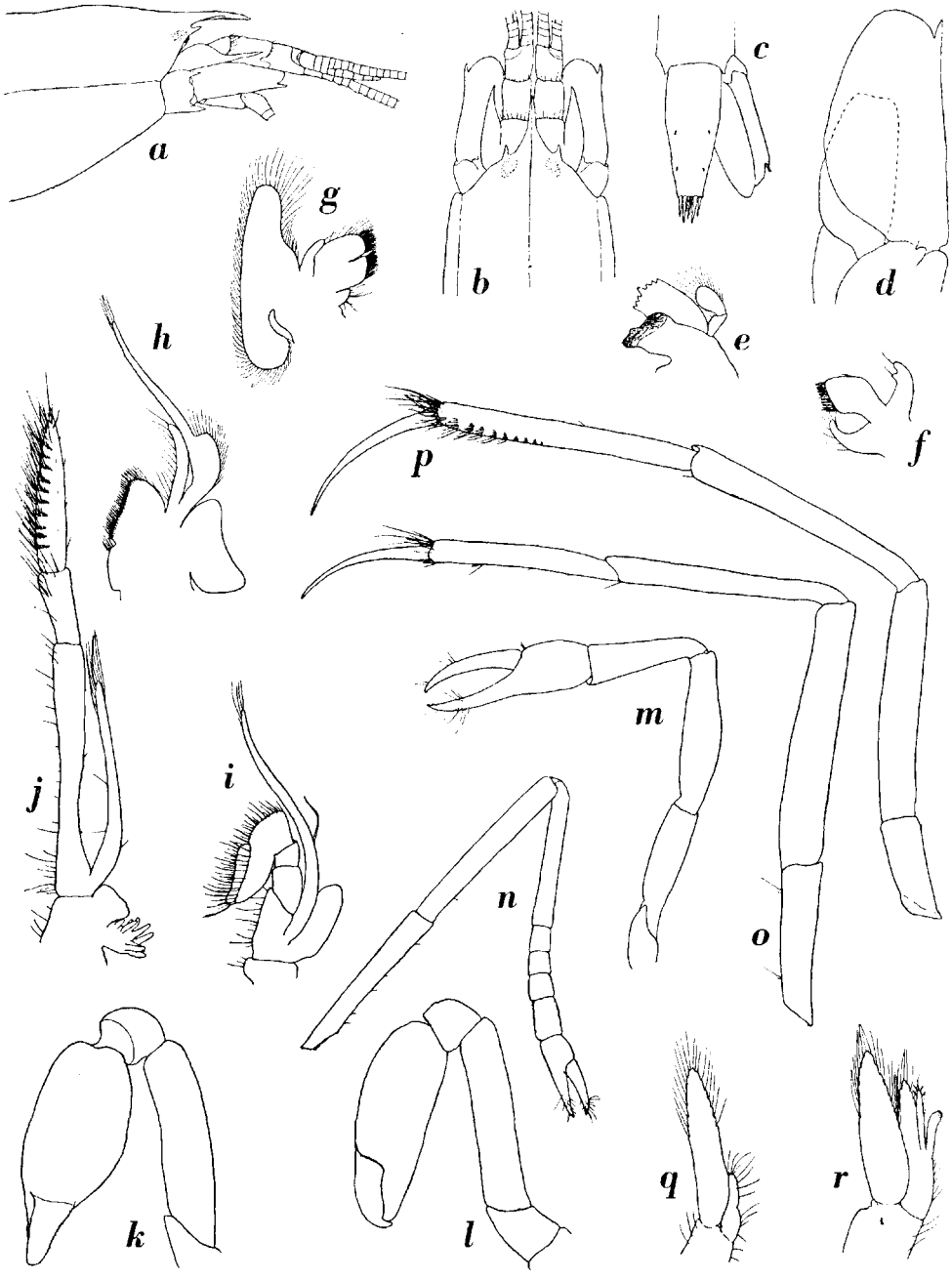

Fig. 20. *Jousseaumea jarli* n. sp. a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, telson and right uropod in dorsal view; d, scaphocerite; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped; j, third maxilliped; k, larger first pereiopod in dorsal view; l, larger first pereiopod in lateral view; m, smaller first pereiopod; n, second pereiopod; o, third pereiopod; p, fifth pereiopod; q, first pleopod of male; r, second pleopod of male. a—c, ×12; d—r, ×25.

grab, 19 m. depth, bottom clayish mud; February 22, 1946, 13h00. — 1 specimen 11 mm.

Description. The rostrum is depressed and slightly curved downwards, it reaches about to the middle of the second joint of the antennular peduncle. The lower surface shows a longitudinal median carina, which obliterates posteriorly. When seen in dorsal view the rostrum is rather narrow and slender in the anterior part, rapidly broadening in the basal part, its lateral margin becoming confluent with the anterior margin of the carapace. The rostrum dorsally is also provided with a sharp median carina, which continues posteriorly as a distinct carina over the anterior third of the carapace. In the posterior two thirds of the carapace this carina is very obscure and finally disappears completely. The anterior margin of the carapace bears a well developed spine just in front of the eyes. The anterior part of the carapace forms a pointed hood over the eyes (the point of this hood being the rostrum). A narrow groove, which is visible as a sharp line extends from the anterior margin of the carapace at the level of the base of the antenna, backwards over $^2/_3$ of the length of the carapace. This groove is seen best when the surface of the carapace is dried. The posterior margin of the carapace is deeply incised at the level of the base of the abdominal pleurae.

The pleurae of the first three abdominal segments are broadly rounded, those of the fourth and fifth segments are pointed. The fifth being more sharply pointed than the fourth. The sixth segment has both the pleurae and the posterolateral angles ending in a sharp point. This segment is somewhat longer than the fifth. The telson is about 1.5 times as long as the sixth abdominal segment. It bears two pairs of dorsal and two pairs of posterior spines. The anterior of the dorsal pairs is placed in about the middle of the telson, the posterior pair lies somewhat closer to the posterior margin of the telson than to the anterior pair of spines. The posterior margin of the telson is straight and does not show a median emargination as the Indo-westpacific species of the genus. There are four posterior spines, two on each half; these spines are well developed and slender, the inner being somewhat longer than the outer. Five hairs are placed between the inner spines.

The eyes dorsally are wholly covered by the carapace, only anteriorly are they exposed. The cornea is rounded and well pigmented. The stalk bears a tubercle at the inner side near the base of the cornea.

The basal segment of the antennular peduncle has the stylocerite broad and pointed, it reaches almost to the end of the second segment of the antennular peduncle. The second segment is somewhat shorter than the first and longer than the third. Some stiff hairs are present on the anterior margin of the segments. The outer flagellum consists of two rami, the first three joints of which are fused. The free part of the shorter ramus consists of about six joints.

The scaphocerite is 2.5 times as long as broad, it fails to reach the end of the antennular peduncle. The outer margin is slightly sinuous, being almost straight. The final tooth is small and reaches about as far forwards as the lamella. The antennal peduncle reaches slightly beyond the middle of the scaphocerite. It bears two spines near the base of the scaphocerite: a large ventral and a smaller inner one.

The oral parts of the species are figured here. The mandible has the palp distinctly two-jointed, the incisor process ends in 7 teeth, the middle one being the largest. The molar process bears numerous spinules. The maxillula is of the normal type with the lower endite slender, the upper endite is truncated and provided with many spinules, the palp is bilobed. The maxilla has the upper endite bifid, the lower is very small, the palp and the scaphognathite are well developed. All maxillipeds bear exopods. The first maxilliped has the endites of the basis and coxa separated by a deep notch, the palp is very long and undivided, the caridean lobe of the exopod is rather small, the outer margin of the epipod is emarginate. The second maxilliped resembles that of *Athanas* in all essential points. The third maxilliped reaches to the end of the scaphocerite. The last joint is twice as long as the penultimate and $^3/_5$ of the length of the antepenultimate. An epipod and an arthrobranch are present. The exopod fails to reach the end of the antepenultimate segment.

The branchial formula runs as follows:

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

The first legs are distinctly unequal. The left is short and robust, the right longer and more slender. The left reaches slightly beyond the end of the antennal peduncle. The fingers are about half as long as the palm, they are unarmed, rather short and high, but laterally compressed. The palm is strongly depressed, being much broader than high. The carpus is very short and broad, it is less than half as long as the palm. The merus is distinctly longer than the palm, it is rather narrow. The ischium is short. The right leg reaches with part of the palm beyond the antennal peduncle. The fingers are 1.5 times as long as the palm, they are curved and unarmed. The carpus is slender, being slightly longer than the fingers, it widens distally. The merus, which measures $^5/_4$ of the length of the carpus, is

elongate, being widest in the middle. The ischium is about as long as the carpus. The second legs are equal, they reach with the chela beyond the scaphocerite. The fingers are about twice as long as the palm. The carpus is three times as long as the chela and is divided in 5 joints. The proximal of these joints is about $^4/_3$ as long as the other joints together. The following three joints are of equal size, while the fifth is about 1.5 times as long as each of the three shortest joints. The merus is about $^5/_7$ of the length of the carpus and slightly longer than the ischium. The last three legs are slender and have the dactylus simple. The third reaches with the larger part of the propodus beyond the scaphocerite. The dactylus is very long and slender, it is about $^4/_5$ of the length of the propodus. The latter bears two spines on its posterior margin, one of which is placed near the base of the dactylus. The carpus is 1.2 times as long as the propodus and slightly shorter than the merus. The ischium is somewhat more than half as long as the merus. The fifth leg reaches with a small part of the propodus beyond the scaphocerite. The dactylus is slender and measures $^3/_5$ of the length of the propodus. The latter has the posterior margin provided with transverse rows of hairs in the distal part. The carpus is slightly shorter than the propodus and about as long as the merus. The ischium is short.

My only specimen, a male, has the endopod of the first pleopod small, elongate, and somewhat constricted before the middle. The endopod of the second pleopod has the appendix masculina longer than the appendix interna, it almost reaches the tip of the endopod. Appendices internae are present on the second to fifth pleopods. The uropods are ovate. The outer margin of the exopod ends in a tooth, which at its inner side bears a movable spine.

Of the genus *Jousseaumea* 10 species are known at present, 7 of these inhabit the Indo-westpacific area, three are known from the Atlantic coast of America. Up till now the genus has not been recorded from the West African coast. *Jousseaumea jarli* differs from all Indo-westpacific species by having the posterior margin of the telson straight and not emarginate in the middle. In the shape of the telson the present new species shows most resemblance to *J. arubae* Schmitt from Aruba (Netherlands West Indies). Unfortunately, the shape of the telson in the two other known Atlantic species, *J. ortmanni* (Rankin) and *J. trigona* Rathbun, is not known. From all three Atlantic species the present form differs by having the dactyli of the last three pereiopods very long and slender. Like *J. ortmanni* and *J. arubae*, it differs from *J. trigona* in not having the carapace provided with 9 sharp longitudinal carinae. In the shape of the supracorneal spines it resembles most *J. ortmanni*, these spines are much less distinct in *J. arubae* and completely absent in *J. trigona*. From the available data it seems most probable that *Jousseaumea jarli* n. sp. is most closely related to *J. ortmanni* (Rankin).

Athanas nitescens (Leach) 1814.

(Fig. 21).

Restricted synonymy:

Palaemon nitescens Leach 1814, p. 401.
Athanas veloculus Bate 1888, p. 529, pl. 96 fig. 1.
Athanas nitescens Ortmann 1893, p. 44.
Athanas nitescens Coutière 1896, p. 380.
Athanas nitescens veloculus Coutière 1896, p. 380.
Athanas nitescens Coutière 1911, p. 1.
Athanas nitescens Balss 1916, p. 18.
Athanas nitescens Monod 1933, p. 462.
Athanas nitescens Coutière 1938, p. 267.

Material examined:

Station 141, off Freetown, Sierra Leone; Commercial otter trawl, 15 m. depth, bottom sand; April 9, 1946, 11h—16h. — 4 specimens (including 2 ovigerous females, 8 and 9 mm.) 7—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, $7h^{45}$—$10h^{10}$. — 8 specimens (including 1 ovigerous female, 7 mm.) 4—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, $14h^{20}$. — 1 ovigerous female 9 mm.

Station 148, off French Guinea, 9°57′ N, 15°22′ W; Sigsbee trawl, 25 m. depth, bottom shells and hydroids; April 14, 1946, $16h^{25}$—$16h^{55}$. — 5 specimens (including 3 ovigerous females, 8—11 mm.) 7—11 mm.

The rostrum is straight. The lower margin is slightly convex, the upper margin is straight or somewhat convex too. It reaches to or slightly beyond the second segment of the antennular peduncle and fails to reach as far as the stylocerite. The rostrum is somewhat winged laterally, so that it is more or less ⊥-shaped in transverse section. The orbit is provided with three teeth. The upper (= supra-corneal tooth) is situated close to the lateral margin of the rostrum and is separated from it by a rather broad but pointed incision. The apex of this supra-corneal tooth is rounded. The extra-corneal tooth is longest and rather sharp and slender. The infra-corneal tooth is shorter than the extra-corneal, it is broader and less sharply pointed. Between the teeth the margin of the orbit is concave: between the supra- and extra-corneal teeth the distance is much larger than between the extra- and infra-corneal teeth. The size and situation of the teeth, however, is rather variable. No other teeth or spines are present on the carapace. The antero-lateral angles are rounded.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, that of the fourth ends in a rectangular posterior angle,

while the posterior angle of the pleura of the fifth segment is sharply pointed. The sixth abdominal segment is about as long as the fifth. The postero-lateral angles of the sixth segment end in a small spine. A small but rather broad plate is present near the base of the uropods. This plate articulates

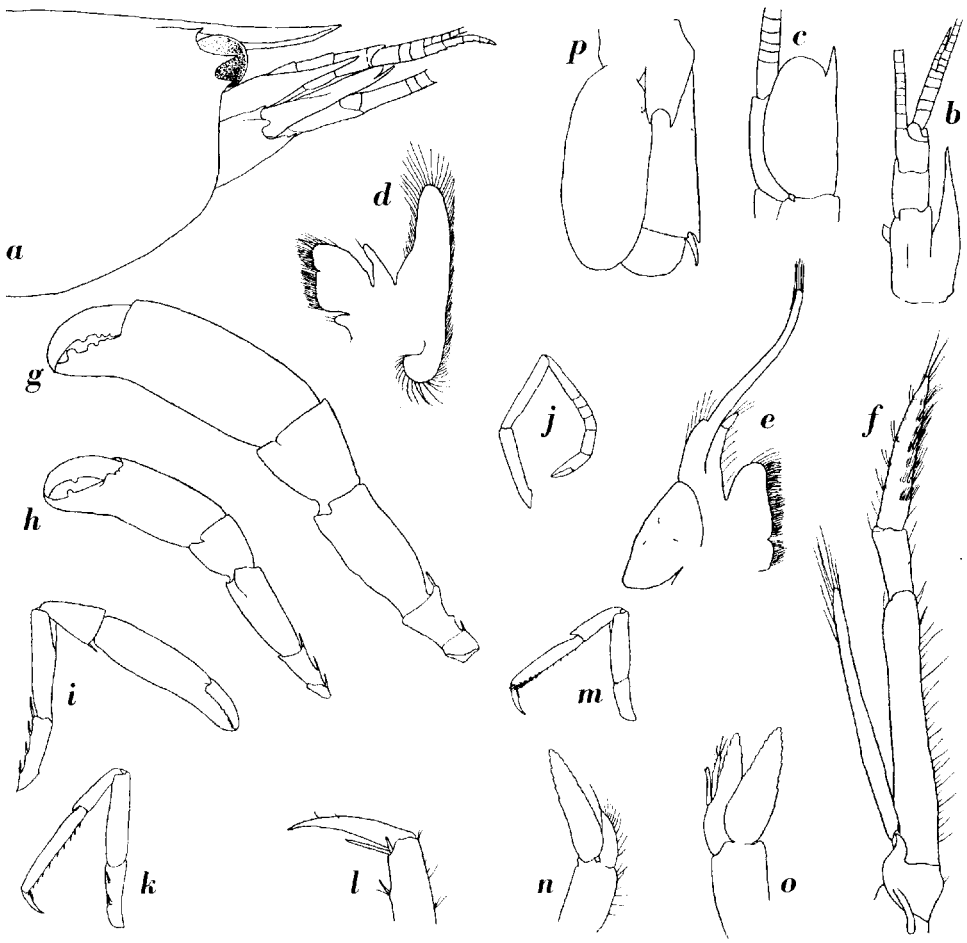

Fig. 21. *Athanas nitescens* (Leach). a, anterior part of body in lateral view; b, antennula; c, antenna; d, maxilla; e, first maxilliped; f, third maxilliped; g, larger first pereiopod of male; h, smaller first pereiopod of male; i, first pereiopod of female; j, second pereiopod; k, third pereiopod; l, dactylus of third pereiopod; m, fifth pereiopod; n, first pleopod of male; o, second pleopod of male; p, uropod. a–c, ×17; d–f, n–p, ×20; g–k, m, ×9; l, ×40.

with the sixth abdominal segment; it tapers posteriorly and ends there in a sharp point. The telson is slightly longer than the sixth abdominal segment, it is rather broad and tapers only slightly posteriorly, ending in a broad posterior margin. The dorsal surface of the telson bears two pairs of spines. These spines divide the telson into three transverse sections, the middle of which is the shortest. The posterior margin is broadly convex

and bears numerous hairs. At either lateral end the posterior margin bears two spines. The outer of these spines is shortest and about half as long as the inner, which is slender and overreaches the top of the telson.

The eyes have the cornea rounded and partly concealed by the corneal teeth. The eye is rather easily retractable, this is the reason why in some specimens it projects farther out of the orbit than in others.

The antennular peduncle has the stylocerite long, reaching about to the middle of the third segment of the peduncle. This stylocerite is fairly broad at the base but becomes slender distally, it is curved slightly inwards. The second segment of the peduncle is the shortest of the three, or is as long as the third. The upper flagellum consists of two rami, which are fused for 3 to 5 joints, the free part of the shorter ramus consists of 3 to 5 joints.

The scaphocerite reaches to or somewhat beyond the antennular peduncle. The outer margin is straight or slightly convex and ends in a terminal tooth, which overreaches the lamella. The lamella is broadest near the base and narrows slightly towards the apex, which is broadly rounded. The antennal peduncle bears two spines near the base of the scaphocerite, one is placed on the dorsal side the other on the ventral.

The mandible and maxillula are like those figured by COUTIÈRE (1899, figs. 147, 158). The maxilla is of the usual type, resembling COUTIÈRE's (1899) figure 165 of that organ of *Synalpheus minor*; the lower endite is rather broad and bears two setae at the top. The first maxilliped has the endites of the basis and coxa separated by a small notch; the palp consists of two joints; the exopod is long and has the caridean lobe extremely narrow; the epipod is not bilobed, but oval in shape. The third maxilliped reaches to the end of the antennular peduncle. The last joint is 2.5 times as long as the penultimate and somewhat more than half as long as the antepenultimate joint. The exopod is strong and slightly overreaches the antepenultimate joint. A slender epipod is present, but there is no arthrobranch. The branchial formula runs as follows:

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

In adult males the first pereiopod reaches with the entire carpus beyond the scaphocerite. A reduced exopod is present at the base of this pereiopod. The first legs are unequal in size. The larger leg has the fingers less than

half as long as the palm. The fixed finger is almost straight, the dactylus is strongly curved. Both fingers bear 4 distinct blunt teeth on the cutting edge, the anterior of these teeth is largest. The anterior tooth of the dactylus lies about in the middle of the cutting edge, that of the fixed finger is placed much closer to the tip of the finger. The palm is slightly compressed and smooth. It is slightly more than twice as long as high. The carpus is short, it is less than half as long as the palm, and about as long as broad. The anterior margin possesses a narrow incision on the outer side and a broad incision on the inner side. The merus measures $^2/_3$ of the length of the palm, it is about twice as long as broad. The ischium is about half as long as the merus and bears three spines on the upper margin: two in the middle and one at the antero-dorsal point. The basis possesses an antero-dorsal spine too. The smaller leg resembles the larger strongly, except for its size. The fingers each bear one tooth on the cutting edge, the dactylus has this tooth almost in the middle of the edge, in the fixed finger it is placed closer to the tip of the finger. The hairs of the fingers here are more numerous than in the large leg. The fingers measure $^2/_3$ of the length of the palm. The carpus is about half as long as the palm. The merus is 1.5 times as long as the carpus and 2.5 times as long as the ischium. In the female the second legs are equal in shape and size. They reach with the chela and a small part of the carpus beyond the scaphocerite. The fingers are somewhat less than half as long as the palm. Both fingers are straight and close over their entire length. The cutting edges bear several (5 or 6) small sharp irregularly placed teeth in the proximal $^2/_3$ of their length. The teeth of the fixed finger are placed somewhat in front of those of the dactylus. The palm is elongate, being almost three times as long as high. The carpus is more slender than in the males, it is half as long as the palm and about 1.5 times as long as high. The merus is about $^6/_7$ of the length of the palm. The ischium is half as long as the palm. Its upper margin bears 4 spines. The second legs are equal in shape and size. They are slender and reach with the chela or part of it beyond the scaphocerite. The chela has the fingers longer than the palm. The carpus is about 2.5 times as long as the chela. It consists of 5 joints, the proximal of which is longest, being somewhat shorter than the other joints together. The next 3 joints are of equal length, together they measure about $^2/_3$ of the length of the first joint. The distal joint is about twice as long as each of the three short joints. The merus is about $^5/_7$ of the length of the carpus, and is slightly longer than the ischium. The third leg reaches with the dactylus beyond the scaphocerite. The dactylus is slender and simple. The propodus is almost three times as long as the dactylus. Its posterior margin bears several (about 10) small spinules, distributed over its whole length. A longer spine is furthermore present on this margin close to the base of the dactylus. The carpus is half as long as the propodus. The merus is somewhat shorter than the propodus and about

1.5 times as long as the ischium. The fourth leg strongly resembles the third, only it is less slender. The fifth leg reaches slightly beyond the base of the scaphocerite. The dactylus is like that in the third leg, the propodus is somewhat more than twice as long as the dactylus. Its posterior margin bears several small spinules, and in the distal half it is provided with several transverse rows of hairs. As in the third leg a longer spine is present on the posterior margin of the propodus near the base of the dactylus. The carpus is 0.6 times as long as the propodus and $^3/_4$ of the length of the merus. The ischium is $^3/_5$ of the length of the merus.

The endopod of the first pleopod of the male is small and pointed, the outer margin is more convex than the inner. The second pleopod of the male has the appendix masculina well developed, being longer than the appendix interna, but it fails to reach the top of the endopod. Appendices internae are present on the endopod of the first to fifth pleopods in both sexes. The uropods reach beyond the end of the telson. The protopod bears an elongate posteriorly directed process, which ends in two teeth, the margin between which is deeply concave. This process reaches over the base of the exopod. The endopod is ovate. The exopod has the outer margin straight and ending in a tooth, which at its inner side is provided with a long and strong movable spine. A straight diaeresis is present.

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

The above description is based on the specimens from Station 148, which show the closest resemblance to the records in the literature of the typical *Athanas nitescens* (Leach). One of the ovigerous females agrees in every respect with KEMP's (1910) figure of the species.

The specimens from Stations 141, 145, and 146 differ from the above description in the following points:

1. They are smaller.
2. The rostrum overreaches the stylocerite and surpasses the base or even the middle of the third segment of the antennular peduncle.
3. The infra-corneal tooth is very little pronounced.

The present material is too small to decide whether these differences indicate separate forms or whether they are merely due to differences in habitat or to individual variation. If, however, this second form proves to be a distinct species or subspecies, the specific or subspecific name *veloculus* BATE should be used for it, since BATE's description of his species agrees best with the present material from Stations 141, 145, and 146.

Distribution. *Athanas nitescens* is a littoral species. It has been recorded in the literature from S. Norway southwards to the Cape Verde Islands, from the Mediterranean and the Black Sea. As will be pointed out (p. 107)

at least part of the specimens recorded from the Mediterranean as *Athanas nitescens* belong to the species *Athanas laevirhincus* (Risso). As the two species up till now have not been distinguished by most authors, we do not know their exact range of distribution. The West African records are very few. BATE is the first to record the species from the Cape Verde Islands. He thought his specimens to belong to a new species which he named *Athanas veloculus*. As later authors pointed out this species is identical with *A. nitescens*, accepting thereby some errors in BATE's figures. As far as I can see from BATE's description and figures (the latter indeed containing a large number of inaccuracies) his specimens mostly resemble my *Athanas* specimens from Stations 141, 145 and 146. Also COUTIÈRE (1896, 1911, 1938) gives the Cape Verde Islands, without a more precise indication, as a locality whence *Athanas nitescens* has been obtained. ORTMANN (1893) records the species from Boavista and from Baixo de João Leitão, S. of Boavista, both localities in the Cape Verde Islands. Finally, COUTIÈRE (1911, p. 2) states to have examined material of this species from Cape Verde, Senegal; this is the only record of the species from the West African main land. It is not certain whether ORTMANN's and COUTIÈRE's specimens belong to the present or to the next species, as these were not distinguished at that time. The records by BALSS (1916) and MONOD (1933) of the present species from the Cape Verde Islands are based on those by BATE, ORTMANN and COUTIÈRE.

Athanas nouvelae n. sp.

(Fig. 22).

Material examined:

Station 39, São Pedro Bay, São Vicente, Cape Verde Islands, 16°50′ N, 25°04′ W; bottom sample AII $_{40}$; Van Veen grab, 22 m. depth, bottom sand and corals; December 10, 1945, 13h^{55}. — 2 specimens 6 and 7 mm.

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}. — 27 specimens (including 4 ovigerous females, 7—9 mm.) 5—10 mm.

Station 40, anchorage of São Pedro Bay, São Vicente, Cape Verde Islands; bottom sample AIV $_{48}$; Van Veen grab, 32 m. depth, bottom sand, corals and Foraminifera; December 11, 1945, 7h^{00}. — 3 specimens 7—8 mm.

Description. The rostrum is slender and distinctly curved upwards, the upper margin generally being distinctly concave. The lower margin is convex. The apex is pointed and reaches slightly to distinctly beyond the base of the third segment of the antennular peduncle, at the same time overreaching the stylocerite. It is more slender than that of *Athanas nitescens*, and the lateral wings are narrower. The corneal teeth are almost as in *A. nitescens*, their arrangement is rather variable, but here generally the

extra-corneal tooth is less slender than in *A. nitescens*, and it is only slightly longer than the infra-corneal tooth.

The abdomen and the telson are as in *A. nitescens*, only the pleurae of the fifth segment are generally more pointed.

The eyes are as in the previous species.

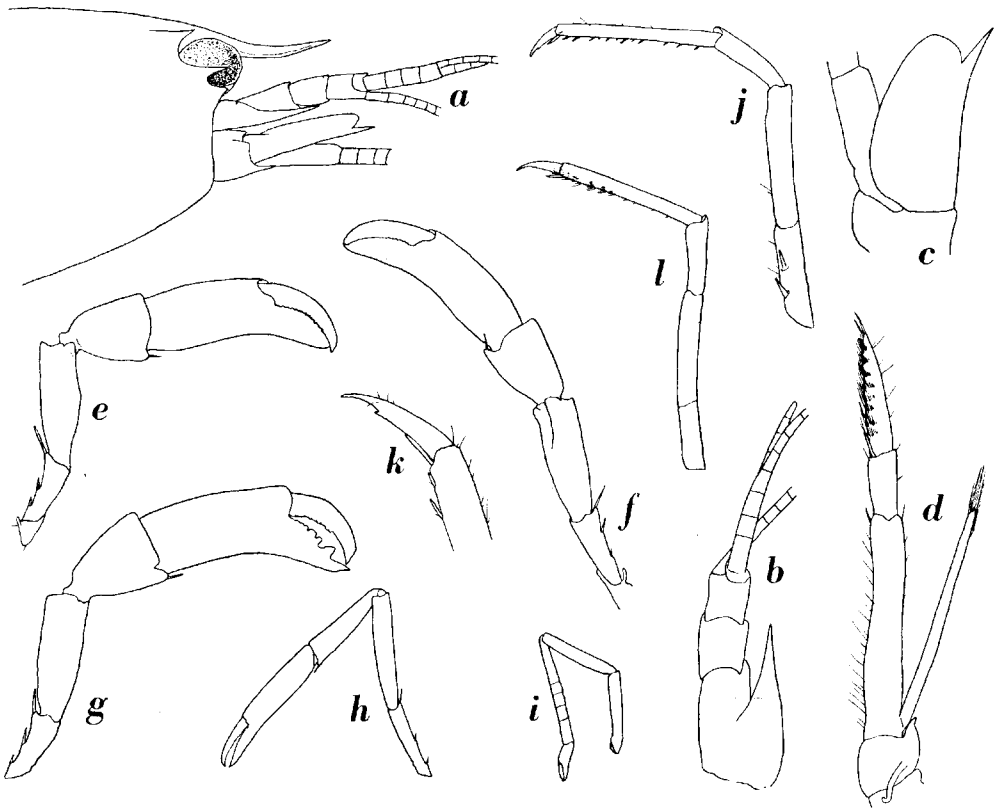

Fig. 22. *Athanas nouvelae* n. sp. a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, third maxilliped; e, f, left and right first pereiopods of intact male; g, loose large first pereiopod of male; h, first pereiopod of female; i, second leg; j, third leg; k, dactylus of third leg; l, fifth leg. a, ×25; c, d, ×36; e—j, l, ×10; k, ×50.

The stylocerite is slender, but fails to reach the end of the second segment of the antennular peduncle, or just attains the articulation between the second and third segments. The upper antennular flagellum has the two rami fused for 3 or 4 joints.

The scaphocerite reaches the end of the antennular peduncle. The outer margin is concave. The final tooth is directed outwards, and slightly overreaches the lamella.

The mouthparts are similar to those of *A. nitescens*. The penultimate joint of the third maxilliped is somewhat more slender, however. The

ultimate joint being twice as long as the penultimate and about half as long as the antepenultimate. The branchial formula is the same as in the previous species. Here too a reduced exopod is present at the base of the first pereiopods.

The first pereiopods of the male reach with the chela beyond the scaphocerite. They probably are unequal. My material contains a large cheliped similar to that of the males of *Athanas nitescens*, this cheliped is detached and it cannot be said with certainty to which male it belongs. The only larger male in my material with both second legs attached, has them equal and much more like the chela of the female of *A. nitescens*. Figures are given here of the loose large chela and the two chelae of the above mentioned male specimen. In the detached cheliped the fingers are slightly more than half as long as the palm. The dactylus is distinctly curved, the fixed finger is almost straight. The cutting edge of the fixed finger bears about 7 broad and blunt teeth, the distals of which are largest. A short distance before the tip the cutting edge is unarmed. The dactylus bears one broad tooth somewhat before the middle of the cutting edge, while some four small teeth are placed behind it. The palm is twice as long as high. The carpus measures $^3/_5$ of the length of the palm and $^3/_4$ of that of the merus, it is somewhat longer than broad. The merus is 2.6 times as long as high, and is 1.6 times as long as the ischium. The ischium bears three dorsal spines. The largest male in which both the left and the right first pereiopod are still attached is 10 mm. long. The legs are equal in shape and practically equal in size. The fingers are $^3/_4$ of the length of the palm, they close perfectly and the dactylus is only slightly curved. There are numerous irregular small teeth on the cutting edge, as in the female of *A. nitescens*. The palm is smooth, somewhat compressed and about twice as long as broad. The carpus is $^2/_3$ of the length of the palm, it is about 1.2 times as long as broad. The merus is 1.5 times as long as the carpus and about three times as long as broad. The ischium is somewhat longer than half the merus and bears three spines on the dorsal margin. In the females the first legs are equal, they reach with part of the carpus beyond the scaphocerite. The fingers are slender and close over their whole length, the dactylus is not strongly curved. The dentition is as in the female of *A. nitescens*. The palm is about twice as long as the fingers and about four times as long as high. The carpus is about four times as long as high too and it is only slightly shorter than the palm. The merus is 1.2 times as long as the palm and 1.6 times as long as the ischium. The ischium bears three dorsal spines. The second legs are equal and reach with a small part of the carpus beyond the scaphocerite. The fingers are about equal in length to the palm. The other joints are exactly as in *A. nitescens*. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus is provided with a small accessory tooth on the posterior margin. Only

under a strong magnification can the bifid nature of the dactylus be seen. The propodus is four times as long as the dactylus and bears several small spines over the whole length of the posterior margin. The distal of these spines, which is placed near the base of the dactylus is strongest. The carpus is half as long as the propodus. The merus is somewhat shorter than the propodus and 1.5 times as long as the ischium. The latter joint bears two spines. The fourth leg resembles the third in every essential respect. The fifth leg reaches about to the middle of the scaphocerite. The dactylus, like in the third and fourth legs, is minutely bifid. The propodus is three times as long as the dactylus. Its posterior margin bears some minute spines in addition to the stronger spine at the base of the dactylus, furthermore there are several transverse rows of hairs placed in its distal part. The carpus is half as long as the propodus, while the merus is $^3/_4$ of the length of the propodus. The ischium is unarmed and about half as long as the merus.

The pleopods and uropods very closely resemble those of *A. nitescens*.

The eggs are fairly large and few in number, they are 0.5 to 0.7 mm. in diameter.

Type. Holotype is the largest ovigerous female from Station 40.

Up till now the European specimens of *Athanas* were placed into one species: *Athanas nitescens* (Leach). Madame NOUVEL (1941) was the first to point out differences between various groups of European specimens. She divided *Athanas nitescens* into three types: Type I and II occurring on the Atlantic coast of France, Type III being found in the Mediterranean. Madame NOUVEL attaches a great value to the colour of the eyes of spirit specimens and the shape and relative length of the corneal teeth. In my specimens, however, the colour of the eye is very variable. In specimens from one locality and obviously belonging to one species, the eye may be black or blue, or even blue with a large black spot. The rate of persistence of the dark pigment of the eye in preserved specimens is probably to a large extent due to the nature and composition of the preservative. Mme NOUVEL's Type I has the eyes blue, her Type II possesses black eyes. The other differences mentioned by Mme NOUVEL for these two types seem to be very small and variable, at least the characters used vary considerably in my material. Mme NOUVEL remarks (NOUVEL, 1941, pp. 10, 12) that the differences are not constant and that specimens of Type I and Type II in all probability interbreed. Perhaps Type I and II are forms or varieties of *A. nitescens*, but certainly do not deserve the status of separate species or even subspecies. Type III is different. Of this type I could examine six specimens collected in the summer of 1949 by Dr. R. ZARIQUIEY ALVAREZ and myself in several localities of the N.E. coast of Spain just S. of Cabo de Creus, and moreover several specimens from San Antonio, Ibiza Island,

which Dr. ZARIQUIEY was so kind to send me for examination. All these Mediterranean specimens perfectly agree with Mme NOUVEL's description and figure of her Type III and differ from her Type I and II and from other accounts given of Atlantic specimens of *A. nitescens* (e. g. the beautiful figure given by KEMP, 1910). In my opinion the Mediterranean form must be considered a different species from the Atlantic form, as the differences between them are important and as far as can be ascertained, constant. The main points in which the Mediterranean form differs from the Atlantic form are:

1. The rostrum is longer and more slender, it reaches beyond the stylocerite and is distinctly curved upwards, having the upper margin concave.
2. The fifth abdominal segment has the pleurae more sharply pointed.
3. The stylocerite is shorter and generally straighter.
4. The scaphocerite has the outer margin concave.
5. The third maxilliped is more slender.
6. The first legs of the female have the carpus very long and slender, being only slightly shorter than the palm and four times as long as high.

Especially the last character in my opinion is very important.

Mme NOUVEL (1941, pp. 12, 13) repeatedly mentions that the Mediterranean form is "la forme de l'*Athanas nitescens* typique". This, however, is not true. *Athanas nitescens* has been described for the first time by LEACH (1814) under the name *Palaemon nitescens* from "the southern coast of Devonshire". Thus the Atlantic form is the typical *Athanas nitescens* (Leach), while the Mediterranean form has to get another name. As far as I can see the first name available is RISSO's (1816) *Palemon Laevirhincus*. RISSO's (1816, p. 108) description of this species runs as follows: "9 P[alémon]. Bec Lisse. N. *P[alemon]. Laevirhincus.* N. *P. Rostro parvo, subulato, subtus infraque laevi.* N. Cette espèce termine la progression que la nature paroît avoir suivie dans le nombre des dentelures du rostre des palémons. Son corps est d'un noir foncé, parsemé de quelques taches blanchâtres. Le corcelet est uni avec deux petites pointes sur le devant; il est terminé par un petit rostre subulé, lisse et uni de chaque côté. Les pièces latérales ont deux épines. Le dernier segment de l'abdomen est adhérent à une plaque arrondie, noire, lisérée de blanc, terminée par quatre filets roides; cette pièce sert de pivot aux écailles natatoires qui sont bordées de gris. La femelle porte des œufs noirâtres, en mai. *Dimens. long.* 0,030. *larg.* 0,005. *Séjour: sur les bas fonds.*" In 1826 RISSO (p. 75) names the species *Alpheus levirhincus* and gives the following description: "Un noir foncé, parsemé de quelques taches blanchâtres, couvre son corps; le corselet est garni de deux pointes, avec un petit rostre subulé, lisse et sans dents; l'œil est brillant; les antennes

extérieures assez longues; les pièces latérales bi-épineuses; la première paire de pattes courte, la seconde noirâtre, pointillée de gris; les autres, annelées de blanc et de violet; l'abdomen terminé en pointe sur les côtés; les écailles caudales oblongues, bordées de poils; la plaque du milieu subarrondie, lisérée de blanc, terminée par quatre filets. La femelle pond des œufs noirâtres au printemps. Long. 0,034, larg. 0,005. Séj. Régions des algues. App. Mars, mai." Of the comparatively few Macrura from the Mediterranean which have the rostrum simple, the present *Athanas* is the only one which agrees with the colour description given by Risso. The Sergestidae and Pasiphaeidae are colourless transparent, sometimes tinged with red or purple, moreover they do not inhabit the "région des algues". *Hippolyte inermis*, which has been described by Risso (1816) previously as *Palemon Olivieri*, does not have the rostrum small and subulate, while ventral teeth are usually present; this species is generally of a plain green or yellowish brown colour. *Typton spongicola* Costa, *Pontonia flavomaculata* Heller and *Pontonia pinnophylax* (Otto) all have the body colourless transparent, in *Pontonia flavomaculata* it is marked with distinct scattered yellow spots, in *P. pinnophylax* with opaque white bands. The only species with which *Palemon laevirhincus* may be identified is the present species of *Athanas*. In this species the body colour is rather variable, but very dark specimens often occur. I have myself seen a large female, which had the body very dark reddish brown with white spots and a white dorsal line, while the legs were banded with white and the telson had a white posterior margin. This agrees so well with Risso's description that in my opinion it seems best to accept Risso's name for the Mediterranean species of *Athanas*. The name of this species will thus be *Athanas laevirhincus* (Risso, 1816). A synonym of this name is *Arete diocletiana* Heller (1862). In a recent publication (Holthuis, 1947, p. 24) I identified *Nika variegata* Risso, 1816 (= *Hippolytes variegatus* Risso, 1826) with *Athanas nitescens* (Leach). This, however, is an error, Risso's species is the same as *Alpheus dentipes* Guérin (vid. p. 71).

The present Atlantide material from the Cape Verde Islands is very closely related to *Athanas laevirhincus*, but nevertheless proved to possess various constant differences, which induced me to describe it as belonging to a new species. In all the Mediterranean material seen by me the dactylus of the last three pairs of pereiopods is perfectly simple. Also Mme Nouvel (1941) states her French material to have that dactylus simple. My Cape Verde Islands specimens on the contrary have this dactylus constantly biunguiculate. Furthermore, the eggs of the Mediterranean specimens seen by me are smaller, being only 0.4 to 0.55 mm. in diameter. It would be of the greatest importance to examine a large collection of *Athanas* from many localities throughout the range of distribution of *Athanas* "*nitescens*" s. l., in order to ascertain the variability and the range of distribution of the various species up till now confounded under this name.

It is a great pleasure to name the present new species for Mme LOUISE NOUVEL—VAN RYSSELBERGE, whose interesting observations made her conclude that *Athanas nitescens* Leach as held by most authors is not a homogeneous species.

Athanas grimaldii Coutière 1911.

Athanas Grimaldii Coutière 1911, p. 1, figs. 1—6.
Athanas Grimaldii De Man 1911, p. 146.
Athanas grimaldii Lenz & Strunck 1914, p. 316, pl. 20 figs. 5, 6.
Athanas Grimaldii Balss 1916, p. 19.
Athanas grimaldii Stebbing 1921, p. 18.
Athanas grimaldii Schmitt 1926, p. 19.
Athanas Grimaldii Coutière 1938, p. 267, pl. 6 fig. 13.

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, $11h^{20}$. — 2 specimens 7 and 12 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, $14h^{40}$. — 1 male 12 mm., 1 ovigerous female 14 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. — 5 specimens 10—18 mm.

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, 15h—18h. — 1 specimen 8 mm.

This species belongs in the group containing *Athanas nitescens* (Leach), *A. laevirhincus* (Risso) and *A. nouvelae* n. sp. It is still more heavily built than the former of these three species. The rostrum is shorter, the extra- and infra-corneal teeth are placed very close together. The pleurae of the fifth abdominal segment end in an acute angle, which is not turned backwards. The first legs are somewhat more heavy than in *A. nitescens*, the carpus is relatively shorter. Sometimes the ischium bears more than three dorsal spines. As in *A. nitescens* and *A. nouvelae* a reduced exopod is visible at the base of the first pereiopod. The second legs are as in *A. nitescens*, but the last three legs differ from those of that species by having the dactylus minutely biunguiculate. The second pleopods of the male are curious by the extreme elongation of the appendix masculina, which overreaches the top of the endopod. The endopod of the first pleopod of the male is similar to that of *A. nitescens*.

The eggs are numerous and small, being 0.35 to 0.6 mm. in diameter.

BARNARD (1950, pp. 730, 731) states that "it can scarcely be claimed

that *grimaldii* is really distinct from *nitescens*; *e. g.* Lenz and Strunck (1914) find the accessory denticle on the dactyls of 3rd—5th legs in Mediterranean examples of *nitescens* as well as in *grimaldii*." The difference shown in the shape of the rostrum, carapace and especially that in the pleopods, show that *A. grimaldii* is a perfectly good species, distinct from *A. nitescens*. Lenz & Strunck (1914, p. 317) do not state that their Mediterranean specimen have the dactylus biunguiculate, though their remark is apt to be misleading: "Dicht vor der Kralle steht jedesmal eine sehr starke, schwach gebogene, spitz endigende Borste, etwa zwei Drittel so lang wie die Kralle.... Man könnte sie fast als Nebenkralle ansehen, sie findet sich aber in gleicher Weise auch bei den mir aus Neapel vorliegenden *A. nitescens*." The "Borste", which according to Lenz & Strunck may easily give the dactylus ("Kralle") the appearance of being biunguiculate, is not the accessory tooth, but the strong spine at the end of the posterior margin of the propodus.

Distribution. This seems to be a littoral form, though Coutière besides two records of specimens from 16 m. depth gives one from a depth of 91 m. and another from 155 m. Schmitt (1926) reports the species to be commensal in a species of *Pinna*. It seems to be a rather characteristic species of the West African coast, though it has been reported once from the west-coast of France and once from South Africa. The records in literature are: Near Belle Isle, Brittany, W. France (Coutière, 1911, 1938), Porto Grande, São Vicente, Cape Verde Islands (De Man, 1911; Lenz & Strunck, 1914), near Santa Luzia, Cape Verde Islands (Coutière, 1911, 1938), near Boa-vista, Cape Verde Islands (Coutière, 1911, 1938), Lagos, Nigeria (Balss, 1916), São Paulo de Loanda, Angola (Schmitt, 1926), near Durban, Natal (Stebbing, 1921). Barnard (1950, p. 729) reports upon the material identified as *Athanas grimaldii* by Stebbing (1921, p. 18), together with a mutilated ovigerous female from False Bay, which Stebbing (1915, p. 88) described as *Athanas* sp., and some unpublished material from Algoa Bay, East London and Durban, as *Athanas* cf. *nitescens* or *grimaldii*. The identity of the South African specimens is thus not certain at all.

Athanas amazone n. sp.

(Fig. 23).

Material examined:

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}. — 1 ovigerous female 7 mm.

Description. The rostrum is straight, slender and ends in a sharp point. It fails to attain the end of the second segment of the antennular peduncle and reaches about as far forwards as the stylocerite. The orbital margin

bears only two teeth: the supra-corneal tooth is absent. The extra-corneal tooth is distinct and sharply pointed. The infra-corneal tooth is broad and fairly little pronounced. The carapace is smooth and has the anterolateral angle broadly rounded.

The abdomen has the pleurae of the first four segments rounded, that of the fifth ends in a small, sharp, posteriorly directed tooth. The sixth segment is about 1.5 times as long as the fifth. The posterolateral angles of the sixth segment are truncated. The usual movable plate is present near the bases of the uropods, it is fairly broad and pointed. The telson is as long as the sixth abdominal segment. The shape of the telson is like that of *A. nitescens*, being only a little more elongate, the arrangement of the spines is the same as in the latter species.

The eyes are well developed. The cornea is well pigmented.

The antennular peduncle has the stylocerite straight, slender and pointed. It reaches about as far forwards as the tip of the rostrum. The second segment is longer than the third, together they are longer than the first. The upper flagellum has the two rami fused for a distance of 4 joints. The free part of the shorter of the two rami consists of 1 joint only; this joint bears some hairs at the top.

The scaphocerite reaches slightly beyond the antennular peduncle. The outer margin is straight or somewhat concave. Its breadth is $^3/_8$ of its length. The final tooth is directed forwards and slightly outwards. The lamella is somewhat produced antero-internally and slightly overreaches the tooth. The last segment of the antennal peduncle is very long and distinctly overreaches the scaphocerite. A small spine is present near the lower side of the base of the scaphocerite.

The mouthparts have not been dissected in order not to damage the only available specimen. The third maxilliped reaches slightly beyond the middle of the scaphocerite. It has the general shape of that of *Athanas nitescens*, though the ratios between the lengths of the various parts are different. The ultimate segment is 1.4 times as long as the penultimate and half as long as the antepenultimate segment. The exopod fails to reach to the end of the antepenultimate segment. The branchial formula is exactly like that of *Athanas nitescens*.

Though my specimen is a female the first pereiopods are strong and distinctly unequal. The larger of the two legs reaches with part of the merus beyond the scaphocerite. The fingers are $^3/_4$ of the length of the palm, they are slender and close over their entire length. The dactylus bears two large teeth on the cutting edge, while the fixed finger possesses only one tooth in this place. The palm becomes higher posteriorly. The lower margin of the palm and of the fixed finger are provided with a row of small tubercles. The carpus is slender and somewhat longer than the chela. It gradually narrows proximally and bears tubercles on the upper and lower margins.

The merus is very broad, especially in the middle. It is distinctly longer than the carpus. The inner side of the merus is concave and forms an elongate depression, the margins of which are provided with small tubercles. The ischium is about half as long as the merus and has both margins provided with tubercles. The carpus and the chela are generally directed backwards, the carpus then fits in the depression of the inner surface of the

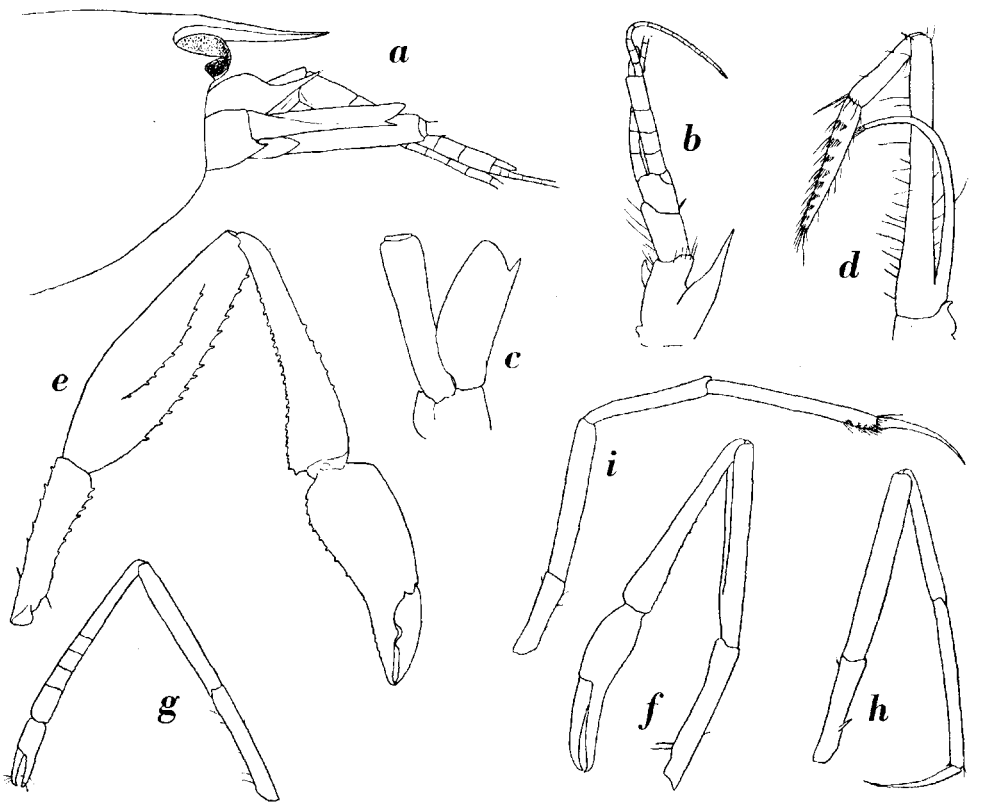

Fig. 23. *Athanas amazone* n. sp. a, anterior part of body in lateral view; b, antennula; c, antenna; d, third maxilliped; e, larger first pereiopod; f, smaller first pereiopod; g, second pereiopod; h, third pereiopod; i, fifth pereiopod. a—i, ×24.

merus. The smaller first leg is more slender than the larger. It reaches with the larger part of the carpus beyond the scaphocerite. The fingers are slender and unarmed. They are slightly longer than the palm and close over their entire length. The palm is smooth and somewhat swollen in the middle. The carpus is slender, slightly narrowing posteriorly. It is about 1.2 times as long as the chela and bears some tubercles ventrally. The merus too is slender, it is of the same breadth throughout its length and does not show the broadening in the middle as the merus of the large leg. It is as long as the carpus, and, as in the large leg, it has a depression at the inner side

for the reception of the carpus, when the carpus and chela are directed backwards. The ischium is about $^2/_3$ of the length of the merus. The second legs are equal. They reach slightly beyond the scaphocerite. The chela has the fingers about as long as the palm and it is about $^1/_3$ of the length of the carpus. The latter is divided into 5 joints, the proximal of which is as long as the four distals together. The following 3 joints are of equal length, while the fifth joint is somewhat less than twice as long as each of the three short joints. The merus is about $^3/_4$ of the length of the carpus, it is slightly longer than the ischium. The last three pairs of legs are slender and have the dactylus simple. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus is extremely slender, it measures $^3/_5$ of the length of the propodus. The latter has the posterior margin unarmed, except for a small spinule near the base of the dactylus. The carpus is $^4/_5$ of the length of the propodus. The merus is slightly longer than the propodus. The ischium measures $^4/_7$ of the length of the merus, it bears a strong spine at the inner side near the base. The fifth leg reaches with part of the dactylus beyond the scaphocerite. The dactylus is similar to that of the third leg, it also measures $^3/_5$ of the length of the propodus. The propodus differs from that of the third leg by having the posterior margin provided with transverse rows of short setae in the distal part. The carpus is slightly less than $^4/_5$ of the length of the propodus, while the merus is slightly shorter than the latter joint. The ischium bears no spine and is about half as long as the merus.

The pleopods and uropods of my only specimen are similar to those of the females of *Athanas nitescens*.

The eggs are relatively few, they measure 0.3 to 0.4 mm. in diameter.

This species is the first representative of the *dimorphus* group of the genus *Athanas* which is known from the Atlantic region. It is most closely related to *Athanas minikoensis* Cout. and *A. orientalis* Pearson, both from the Indo-westpacific region. It agrees with these two species in the unequal first legs of the female, in the simple dactyli of the last three pairs of pereiopods and in the absence of the supra-corneal tooth. But it differs from both these forms in the completely different shape of the first legs of the female, which have the carpus longer than the chela and as long as the merus, and which have most of the joints provided with tubercles.

Automate talismani Coutière 1900.

Automate dolichognatha Coutière 1896, p. 385 (non de Man, 1888).
Automate dolichognatha Coutière 1897 a, p. 235.
Automate Talismani Coutière 1900, p. 357.
Automate Talismani Coutière 1902, p. 340.

Distribution. Coutière (1896) gave a short description of *Automate dolichognatha* De Man, without stating the locality whence his material originated. In his 1897a paper the same author remarks that his 1896 description was based on two specimens

of DE MAN's species from the Cape Verde Islands and that notwithstanding some differences he does not deem it necessary to separate them as a distinct species from this Indo-westpacific form. In 1900 COUTIÈRE for the first time uses the name *Automate Talismani*. His type specimens of that species were collected by the Talisman Expedition off the Cape Verde Islands and he remarks that it was these specimens "que nous n'avions pu jusqu'alors distinguer avec sûreté de *A. dolichognatha* de Man". There is hardly any doubt therefore that COUTIÈRE's (1896, 1897a) specimens of *A. dolichognatha* are the same as his 1900 specimens of *A. Talismani*, the more so as he remarks in 1897 that his specimens were collected by the Talisman Expedition. In 1902 COUTIÈRE described the species and stated that his two specimens originated from "Puerto-Grande (Açores)", he does not refer to the earlier records. In no geographic dictionary or atlas could I find a reference to a locality named Puerto Grande or Porto Grande in the Azores, while Porto Grande is a much frequented harbour of São Vicente, Cape Verde Islands. It seems very probable to me that the type locality of *Automate Talismani* is Porto Grande, São Vicente, Cape Verde Islands, and that COUTIÈRE's 1896, 1897a, 1900 and 1902 material of *Automate dolichognatha* or *A. Talismani* from the Cape Verde Islands or the "Azores" is exactly the same lot. This latter supposition is confirmed by the fact that COUTIÈRE in 1897 as well as in 1902 mentions that his material consists of two specimens only.

Automate evermanni Rathbun 1902.

(Fig. 24).

Automate evermanni Rathbun 1902, p. 112, fig. 22.
Automate evermanni Schmitt 1935, p. 139, fig. 14.

Material examined:

Station 40, anchorage of São Pedro Bay, São Vicente, Cape Verde Islands; bottom sample AIV $_{49}$; Van Veen grab, 32 m. depth, bottom sand, corals and Foraminifera; December 11, 1945, 7^{h00}. — 1 specimen 12 mm.

Station 55, off Liberia, 6°03′ N, 10°25′ W; bottom sample CVI; Petersen grab, 44 m. depth, bottom sandy mud; January 8, 1946, 8^{h45}. — 1 specimen 14 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, 8^{h45}. — 1 specimen. 9 mm.

Station 57, off Liberia, 5°59′ N, 10°26′ W; bottom sample CX; Van Veen grab, 62 m. depth, bottom muddy sand; January 8, 1946, 10^{h55}. — 1 ovigerous female 11 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 13 mm.

Station 100, off Nigeria, 6°06′ N, 4°29′ E; bottom sample FIV; Van Veen grab, 29 m. depth, bottom soft mud; February 15, 1946, 13^{h00}. — 1 specimen 23 mm.

Station 100, off Nigeria, 6°06′ N, 4°29′ E; bottom sample Fv; Van Veen grab, 29 m. depth, bottom soft mud; February 15, 1946, 13h00. — 1 specimen 10 mm.

The specimens agree in all respects with RATHBUN's description and figures of *Automate evermanni*. The anterior margin of the carapace behind the eyes is deeply emarginate and shows a minute triangular rostrum in the middle. This rostrum does not reach so far forwards as the lateral parts of the anterior margin of the carapace; it is sharply pointed. The carapace is smooth, it is rather strongly compressed, being much higher than broad. No spines are present on the carapace. Very often the anterolateral parts of the carapace are covered with a thin film of mud.

The abdomen is smooth, the pleurae of the first five segments are broadly rounded. The sixth segment has small rounded pleurae and truncated posterolateral angles. In my female specimens there are two long blunt tubercles on the sternum of the sixth abdominal segment close to the pleurae. The sixth segment is as long as the fifth and almost as long as the telson. The telson is triangular, and regularly tapers posteriorly. In its basal third the telson has the lateral margins somewhat constricted. There are two pairs of dorsal spinules. The anterior of these is placed a small distance behind the constriction, the other pair is situated much closer to the anterior pair than to the posterior margin of the telson. This posterior margin is rather narrow, it bears two pairs of spines and one pair of feathered setae, which are placed close together. The outer spines are very short, the inner are much longer and stronger. The setae are placed between the inner spines.

The eyes resemble those of species of the genus *Callianassa*. They lie close together, with the inner margins touching over nearly their entire length. The eyes narrow somewhat anteriorly, but have the tips rounded. The cornea is small and lies a small distance behind the top of the eye and near the outer margin of it.

The antennular peduncle is long and slender. The first segment reaches with much more than half its length beyond the eyes. The stylocerite is large, it reaches beyond $^2/_3$ of the length of the basal segment of the peduncle. The outer margin of the stylocerite is slightly, the inner margin strongly convex. These margins taper towards a sharp apex. The second segment of the peduncle is decidedly longer than the first. Both are slender. The third segment measures $^1/_4$ to $^1/_5$ of the length of the second. The entire antennular peduncle is about $^2/_3$ of the length of the carapace. The two flagella are simple and slender.

The antennal peduncle reaches distinctly beyond the antennular peduncle. The scaphocerite, which lies with its base about level with the middle or $^2/_3$ of the length of the basal antennular segment, reaches somewhat beyond

the middle of the second segment of the antennular peduncle. The last joint of the antennal peduncle (= carpocerite) reaches with about half its length beyond the scaphocerite; it is about three times as long as wide. The outer margin of the scaphocerite is almost straight and ends in a distinct final tooth, which slightly overreaches the lamella.

The mandible has the incisor process strong and ending in about 6 distinct teeth. The molar process bears numerous spinules at the distal surface, the palp is two-jointed. The maxillula has the lower endite slender,

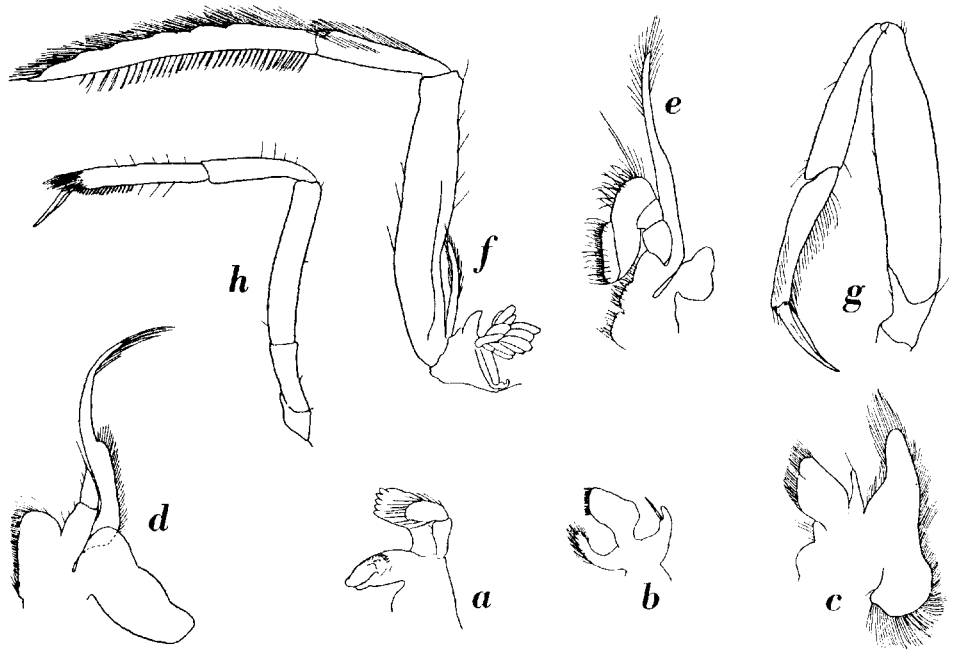

Fig. 24. *Automate evermanni* Rathbun. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped; g, third pereiopod; h, fifth pereiopod. a–f, ×10; g, h, ×7.

the upper is broader and bears short spines at the distal margin, the palp is indistinctly bilobed and bears a strong seta. The maxilla is of the normal shape, with the upper endite large and bilobed, and the lower reduced. All maxillipeds are provided with exopods. The basis and the coxa of the first maxilliped are not visibly separated. The palp is two-jointed, the caridean lobe is narrow and the epipod elongate. The second maxilliped is of the usual shape in members of this family. The third maxilliped is very large, reaching with about the entire last joint beyond the antennal peduncle. The last joint is fully twice as long as the penultimate, it ends in a strong point and the upper margin is undulated. The antepenultimate joint is as long as the ultimate and bears a carina in the basal part of the outer surface. The exopod is small and does not reach the middle of the antepenultimate

segment. An arthrobranch and two epipods are present. One of these epipods is analogous with those of the other maxillipeds, being broad and leaf-like, the second is like the epipods of the pereiopods, being narrow and ribbon-like. The branchial formula of the present species runs as follows:

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

The setobranchs bear one long hair only.

The first legs are strong and unequal. In only one of my specimens both left and right leg of the first pair are present, viz., in that from Station 40. Both first legs reach with part of the palm beyond the antennal peduncle. The two legs agree in all respects with RATHBUN's figures. Of the larger leg the fingers are slightly shorter than the palm and gape slightly. The dactylus has the cutting edge provided with one tooth in the proximal part. The distal part of the cutting edge is slightly convex and bears one minute tooth. The fixed finger also possesses one basal tooth, while, in addition, two broad, blunt and low elevations are visible in the distal part. The distal of these elevations bears a very small tooth, and there are some minute serrations before the tip of the finger. The palm is less than twice as long as broad, it has the lower margin convex. The carpus is short, being about half as long as the palm. It is cup-shaped, near the base it is distinctly constricted. The lower outer part of the anterior margin shows a blunt lobe. The merus is as long as the palm, it has the lower margin more convex than the upper. The small chela is more slender than the larger. The fingers close over their entire length and have the cutting edges entire. The fingers are about as long as the palm. The carpus is more elongate than in the larger leg, it is almost as long as the palm, whereas the merus is longer than the palm. Of both first legs the palm may be slightly rugose by the presence of numerous low, rounded tubercles, which are placed very close together. The second leg reaches with the carpus beyond the scaphocerite. The chela is small and slender, with the fingers shorter than the palm. The carpus is somewhat more than four times as long as the chela, it is divided into five joints. The second (from the base) of these joints is twice as long as the basal joint. The third is decidedly shorter than the second but longer than the rest. The fifth is longer than the fourth, which is about as long as the first. The merus is longer than the ischium,

but shorter than the carpus. The third leg reaches with part of the propodus beyond the antennal peduncle. The dactylus is flattened, with the posterior surface somewhat hollowed. It ends in a sharp point and is almost oval in outline. The outer margin, however, is straighter than the inner. The propodus is 1.6 times as long as the dactylus; its posterior margin bears some spinules near the base of the dactylus. The carpus is about as long as the propodus and $^3/_5$ of the length of the merus. The fourth leg strongly resembles the third. The fifth leg reaches slightly beyond the base of the antenna, it is shorter and narrower than the two previous legs. The dactylus is similar to that of the third leg, but it is smaller. The propodus is about twice as long as the dactylus, it bears no spines. The carpus is $^6/_7$ of the length of the propodus and about $^2/_3$ of the length of the merus.

In the female the endopod of the first pleopod is small and without appendices. The endopods of the other pleopods all possess a slender appendix interna. The uropods are broadly ovate (in my specimens the endopod has the apex somewhat blunter than in RATHBUN's figure). The exopod has the outer margin somewhat convex. This margin ends in a minute sharp tooth, which on its inner side (near the diaeresis) bears a movable spinule, which distinctly overreaches the tooth. RATHBUN's (1902) fig. 22e shows that the spine and the tooth are of about equal size.

In the specimen from Station 100 (bottomsample Fv), which is rather strongly damaged, the dactylus of the third leg is somewhat longer than figured here, moreover it is also more strongly curved.

The present specimens agree in such a degree with the description and figures given by RATHBUN of her *Automate evermanni*, that they must be considered identical with that species.

Distribution. Up till now *Automate evermanni* Rathbun was only known from Porto Rico (off Aguadilla, 225 m.; Mayaguez Harbor, 22—33 m.).

Ogyrides rarispina n. sp.

(Fig. 25).

Material examined:

Station 52, anchorage of Monrovia, Liberia; bottom sample CI; Van Veen grab, 11 m. depth, bottom sand; January 3, 1946, 9^{h00}. — 3 specimens 5—13 mm.

Station 53, anchorage of Marshall, Liberia; hand net, with electric light; January 5, 1946, 20^{h30}. — 17 specimens (including 6 ovigerous females, 13—21 mm.) 8—21 mm.

Station 53, anchorage of Marshall, Liberia; bottom sample CII; Van Veen grab, 12 m. depth, bottom sandy mud; January 7, 1946, 9^{h00}. — 2 specimens (including 1 ovigerous female, 12 mm.) 11 and 12 mm.

Station 77, anchorage of Accra, Gold Coast; bottom sample 771; Van Veen grab, 10 m. depth, bottom muddy sand; January 29, 1946, 7h30. — 1 specimen 13 mm.

Description. The rostrum is short and curved downwards, it is triangular in dorsal view and has the apex rounded. The upper surface of the rostrum is roughened by the presence of minute tubercles. The carapace is provided in the anterior sixth of its median dorsal line with three to five spinules. These spinules do not reach, or just attain, the base of the rostrum. The lower orbital angle is indicated by a broad and shallow curve of the anterior margin of the carapace. A minute antennal spine is present on this margin below the infra-orbital angle. The anterolateral angles of the carapace are rounded. Short hairs are present in the anterior part of the carapace.

The abdomen is smooth and the pleurae of the first five segments are broadly rounded. The sixth segment is about as long as the fifth. The pleurae and posterolateral angles of the sixth segment are rounded. The telson is about as long as the sixth abdominal segment, it is triangular in outline. The lateral margins of the telson show a triangular lateral projection at about $^1/_3$ of their length, measured from the base. At about $^2/_3$ of the length of the lateral margin there are two spines, placed close together. The outer of these spines is the shorter of the two. These spines probably have to be considered the posterior spines, so that the posterior third of the lateral margin of the telson is actually the (much produced) posterior margin. Hairs are present on this posterior margin and not on the lateral margin proper. The upper surface of the telson bears two pairs of spines, the anterior of which is placed level with the projection of the lateral margin, the other pair lies closer to the posterolateral spines. There are three short curved ridges at each half of the underside of the telson. These ridges touch the lateral margin of the telson somewhat anteriorly of the lateral projection. An indication of a fourth ridge may be seen under this lateral projection.

The eyes are very long. They reach to the end of the antennular peduncle. The cornea is short and rounded, the stalk is excessively long. Hairs are present on the stalk.

The antennular peduncle is slender. The basal segment has the stylocerite ending in two slender spines. The lateral of these spines almost reaches to the end of the basal segment and overreaches the upper spine. The second segment is somewhat shorter than the first and is almost twice as long as the third. The flagella are simple.

The antennal peduncle reaches as far forwards as the antennular peduncle. The distal margin of the segment bearing the scaphocerite, is provided with two spines: an outer and a ventral spine. The scaphocerite is rather small, it falls short of the end of the antennal peduncle. The outer margin is almost straight and ends in a small final tooth, the inner margin is convex.

The mandible has the molar process ending in several teeth; its distal end is striate by the presence of various parallel ridges. The incisor process is rather slender and ends in some five teeth. The palp is distinct and two-

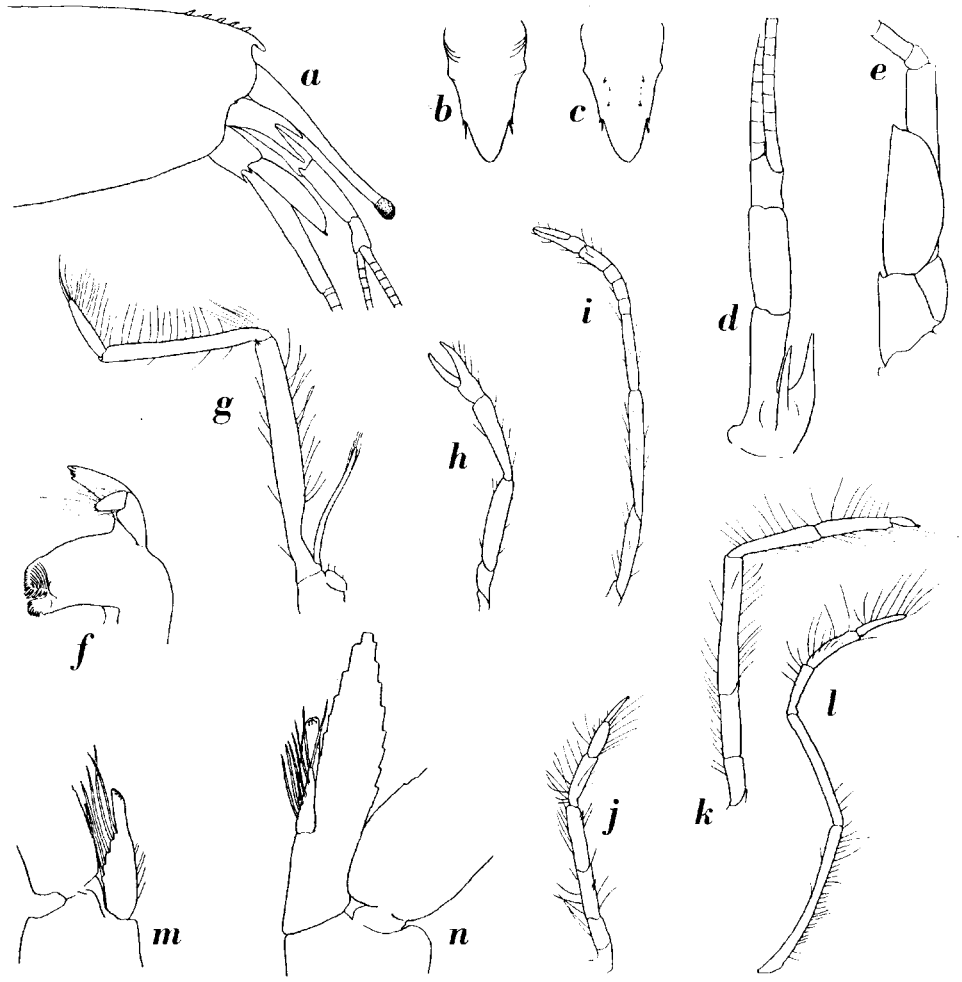

Fig. 25. *Ogyrides rarispina* n. sp. a, anterior part of body in lateral view; b, telson in ventral view; c, telson in dorsal view; d, antennula; e, antenna; f, mandible; g, third maxilliped; h, first pereiopod; i, second pereiopod; j, third pereiopod; k, fourth pereiopod; l, fifth pereiopod; m, endopod of first pleopod of male; n, endopod of second pleopod of male. a—c, g—l, ×10; d, e, ×15; f, ×25; m, n, ×50.

jointed. The basal joint is somewhat widened on one side of its distal portion, but on the other side its lateral margin forms an uninterrupted line with the lateral margin of the distal joint. The arrangement thus being quite different from that in *Ogyrides striaticauda* Kemp. The maxillula, maxilla, first and second maxillipeds do not show any noteworthy difference

from those of *Ogyrides striaticauda* figured by KEMP (1915, p. 286), only in the second maxilliped is the distal margin of the last joint not convex, but almost straight. The third maxilliped reaches with the antepenultimate joint to the end of the scaphocerite. The last joint is about $^2/_5$ as long as the penultimate, while the antepenultimate joint is $^4/_3$ as long as the penultimate. A small and slender spinule is present in the distal part of the antepenultimate joint. The exopod is well developed, an epipod is present. The branchial formula is the same as that given by KEMP (1915, p. 284) for *O. striaticauda*.

The first leg is small, it slightly overreaches the scaphocerite. The fingers are about twice as long as the palm, they are curved and thereby gape. The carpus is somewhat longer than the chela and about as long as the merus. The second legs are longer than the first, they reach with the chela beyond the end of the antennular peduncle. Here too the fingers are about twice as long as the palm. The carpus is almost three times as long as the chela and divided into five joints, the proximal of which is longest (in some specimens the proximal articulation is less distinct than the distals). The merus is about twice as long as the chela. The third leg reaches somewhat beyond the base of the scaphocerite. The dactylus is slightly shorter and conspicuously narrower than the propodus, it ends in some hairs. The carpus is almost 1.5 times as long as the propodus, it is about as long as the ischium and shorter than the merus. Both the ischium and the merus bear a distinct spine. The fourth leg reaches somewhat beyond the eyes, when stretched forwards. The dactylus is broadly ovate and ends in some 4 or 5 short hairs. The propodus is about 2.5 times as long as the dactylus and somewhat shorter than the carpus. The merus is $^7/_5$ of the length of the carpus and about twice as long as the ischium. The fifth leg reaches about as far forwards as the third, it is more slender than the fourth. The dactylus is slender, it is slightly shorter than the propodus, and as long as the carpus. The merus is fully twice as long as the carpus and somewhat shorter than the ischium. Between the bases of the fourth pereiopods a two-pointed sternal process, like the one figured by KEMP (1915, fig. 30d), is present in the males as well as in the females.

The first pleopod of the male has the endopod small, ovate, with the top produced into an appendix interna bearing small curved hooks in the extreme distal part. The endopod of the second pleopod of the male has the appendix masculina short, regularly tapering towards the top and provided with several strong hairs. The appendix interna of this leg is much longer than the appendix masculina. The females have the endopod of the first pleopod slender, without hooks. All other pleopods bear an appendix interna. The uropods are slender, both exo- and endopod taper regularly towards the apex. The exopod is curved slightly outwards, the outer margin bears no spines, it is provided only with some hairs.

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

Juvenile specimens have the eyes relatively shorter and more robust. In my specimens of 5 to 7 mm., the eyes reach about to the base of the last segment of the antennular peduncle. The scaphocerite almost attains the end of the antennular peduncle. The second legs of these small specimens are peculiar in being only 3-jointed.

Type. Holotype is the largest ovigerous female from Station 53 (January 5, 1946).

The present new species differs from most species known, in the number of spinules behind the rostrum: In *Ogyrides alphaerostris* (Kingsley) these spines are absent, in *O. striaticauda* Kemp their number varies between 7 and 9, in *O. mjöbergi* Balss they number 3, in *O. occidentalis* (Ortmann) there are 7 to 9, in *O. orientalis* (Stimpson) 4 or 5, in *O. sibogae* de Man 4, in *O. saldanhae* Barnard 6 to 8, and in *O. yaguiensis* Armstrong 8 to 13. In the number of these postrostral spines *O. rarispina* thus bears most resemblance to *Ogyrides orientalis* (Stimpson), *O. sibogae* de Man, and to *O. mjöbergi* Balss. The status of these three Indo-westpacific species, which are closely related if not identical, is rather uncertain. Yokoya (1927) places *O. sibogae* in the synonymy of *O. orientalis*, but his figures of the telson and the scaphocerite of *O. orientalis* are strongly different from those of *O. sibogae*. *Ogyrides rarispina* differs from all these three species by having the antennal spine sharply pointed. From *O. mjöbergi* and *O. sibogae* it may be distinguished by the shape of the scaphocerite, while it very much resembles that of *O. orientalis*. From the latter species the new form differs, however, by having all four dorsal spinules of the telson placed behind the lateral expansion of the telson. From all species of the present genus *O. raridens* differs by having the carpus of the second leg 5-jointed.

Armstrong (1949) places the genus *Ogyrides* in the family Hippolytidae. *Ogyrides*, it is true, is a very aberrant member of the Alpheidae, and Armstrong probably is correct in removing it from that family, but as far as I can see it will form a very aberrant member of the Hippolytidae. I do not venture at present to form likewise a definite opinion of the place of this genus in the system of the Caridea and therefore leave it provisionally in the family Alpheidae.

Ogyrides occidentalis (Ortmann) 1893.

Ogyris occidentalis Ortmann 1893, p. 46, pl. 3 fig. 4.
Ogyris occidentalis Cary & Spaulding 1909, p. 11.
Ogyris occidentalis Balss 1913, p. 107.
non *Ogyrides occidentalis* Stebbing 1914a, p. 32.
Ogyris occidentalis Balss 1916, p. 20.
Ogyris occidentalis Monod 1927, p. 594.
Ogyrides occidentalis Barnard 1950, p. 728.

Distribution. The type locality of *Ogyrides occidentalis* is the mouth of the Pará (= Tocantins) River, N.E. Brazil (ORTMANN, 1893). The only other American record of the species known to me is that of CARY & SPAULDING (1909) from the Louisiana coast (U. S. A.). All the other records refer to animals from South and West Africa. BARNARD (1947) pointed out that STEBBING's (1914a) animals from Saldanha Bay, S. Africa do not belong to ORTMANN's species but to *Ogyrides saldanhae* Barnard. To this species, according to BARNARD, BALSS's (1913) material from Lüderitz Bay, S.W. Africa probably also belongs. BALSS (1916) reports the species from: Accra, Gold Coast; Victoria, Cameroons; Kabinda, Kabinda; Mucula and Quissembo, N. Angola. MONOD's (1927) record of the species from Cameroons is based on that of BALSS (1916). It seems possible that BALSS's (1916) material does not belong to *O. occidentalis* but to *O. rarispina*. As BALSS gives no details of the shape of his animals, it is impossible to decide this question without examination of the material.

Family **Hippolytidae.**

Merhippolyte agulhasensis Bate 1888.

Restricted synonymy:

Merhippolyte agulhasensis Bate 1888, p. 619, pl. 110 fig. 4.
Merhippolyte agulhasensis Odhner 1923, p. 5.

Distribution. This species is known from deeper water off S. Africa (70—318 m. depth). The only record within the region dealt with here is that by ODHNER (1923) from Porto Alexandre, S. Angola.

Eualus lebourae n. sp.

(Fig. 26).

Material examined:

Station 153, off French Guinea, 10°49′ N, 16°39′ W; Sigsbee trawl, 42 m. depth, bottom coarse sand; April 16, 1946, $13h^{20}$—$13h^{50}$. — 5 specimens (including 1 ovigerous female, 10 mm.) 5—10 mm.

Description. The present species is very closely related to *Eualus occultus* (Lebour). The differences between the two forms, however, are sufficiently constant to justify the separation of the present form as a distinct species.

The rostrum is rather slender, it reaches slightly beyond the eyes and also overreaches the anterior margin of the basal segment of the antennular peduncle. It is slightly curved upwards. The upper margin bears four teeth, the first of which is placed behind the posterior limit of the orbit. The distance between the last tooth and the apex is distinctly greater than that between the last and penultimate teeth. The lower margin bears a single tooth, which is placed close to the apex. The carapace is smooth. It only bears a small antennal spine, which is placed slightly below the rounded lower orbital angle. The anterolateral angle of the carapace is broadly rounded and somewhat produced anteriorly.

The abdomen is smooth. The pleurae of the first three segments are rounded. The fourth and fifth segment have the pleurae ending in a sharp point. The telson bears only three pairs of dorsal spinules, while in *Eualus*

occultus there are four pairs. The posterior margin of the telson ends in a sharp median point and bears three pairs of spines.

The eyes are normal in shape. The cornea is darkly pigmented and rounded. A distinct ocellus is present.

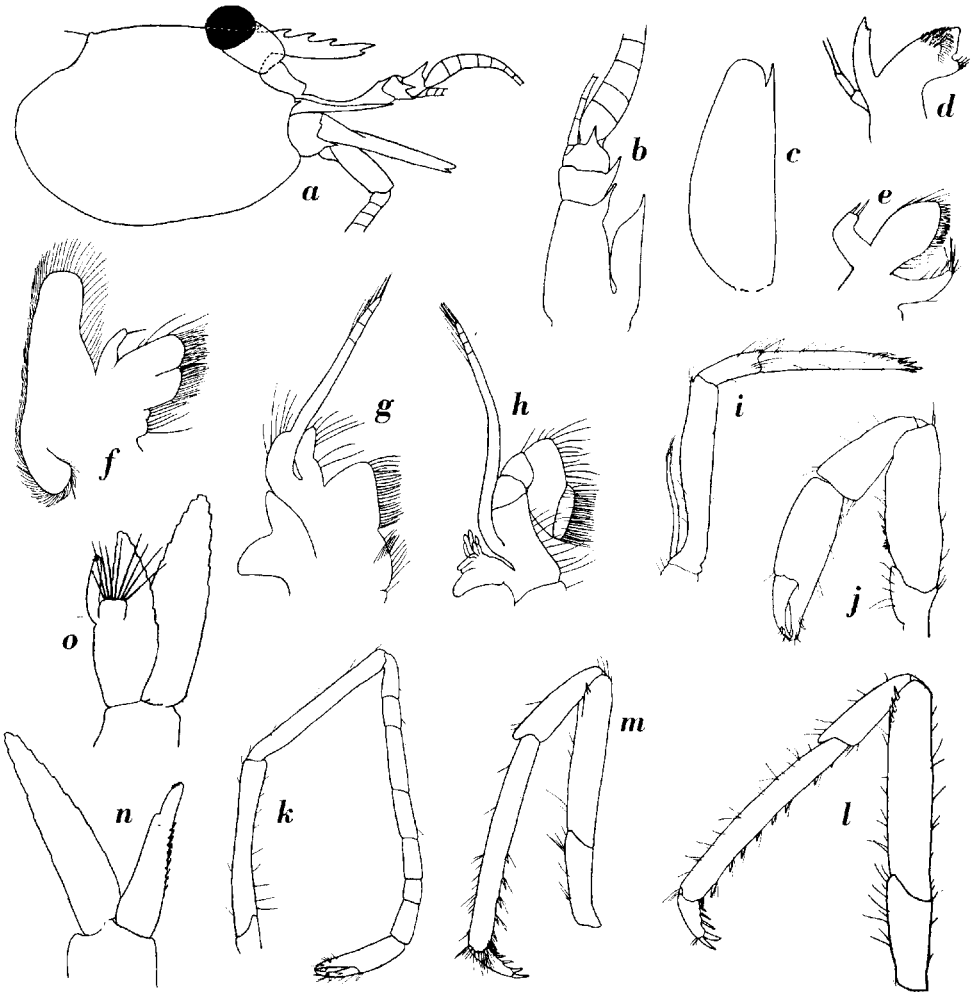

Fig. 26. *Eualus lebourae* n. sp. a, anterior part of body in lateral view; b, antennula; c, scaphocerite; d, mandible; e, maxillula; f, maxilla; g, first maxilliped; h, second maxilliped; i, third maxilliped; j, first pereiopod; k, second pereiopod; l, third pereiopod; m, fifth pereiopod; n, first pleopod of male; o, second pleopod of male. a, ×13; b, c, i—m, ×20; d—h, n, o, ×42.

The antennular peduncle has the stylocerite reaching somewhat beyond the end of the basal segment. The outer margin of the stylocerite is straight, the inner is convex, the apex is sharp. The second and third segments of the antennular peduncle are very short. Each of the three segments bears a large tooth on the anterior margin, those of the first and second segment

are placed more externally than that of the third segment. The upper flagellum is simple and has the basal joints thickened.

The scaphocerite is somewhat more than 2.5 times as long as broad. The outer margin is straight and ends in a tooth, which reaches almost as far as the top of the lamella. The lamella has the top rounded. A spine is present near the base of the scaphocerite.

The mandible possesses a distinct two-jointed palp, the incisor process ends in about 5 small teeth, at the end the molar process is provided with some spines, hairs and ridges. The maxillula has the palp simple, the lower endite is slender, the upper is broader. The lower endite of the maxilla is short and inconspicuously bilobed, the upper endite is well developed and deeply incised. The exopods of all maxillipeds are well developed, that of the first and second maxilliped are articulated in the distal part. The endites of the basis and the coxa of the first maxilliped are separated by a notch, the epipod of this maxilliped is bilobed. The second maxilliped is of the usual shape, an epipod and a podobranch are present. The third maxilliped reaches with the greater part of the ultimate joint beyond the scaphocerite. This joint bears some spines in the distal part, it is twice as long as the penultimate joint and about $^4/_5$ of the length of the antepenultimate joint. This antepenultimate joint bears a spine in the distal part of the outer margin. The exopod reaches somewhat beyond the middle of this joint. The branchial formula runs as follows:

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

The first legs are short, thickset and equal. They do not reach the end of the scaphocerite. The fingers end in dark coloured ungues, they are $^2/_3$ of the length of the palm. The carpus is slightly longer than the palm and $^3/_5$ of the length of the merus. The latter joint bears some small spinules on its inner margin. The second legs are slender, they reach with half the carpus beyond the scaphocerite. The chela is small, with the fingers about as long as the palm. The carpus is three times as long as the chela. It is divided into 7 joints. The ratio of the lengths of the various joints is exactly like that in *Eualus occultus*. The merus is $^3/_5$ of the length of the carpus and about as long as the ischium. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus ends in two strong teeth and

has some three spinules on the posterior margin. The propodus is about three times as long as the dactylus and bears various spinules on the posterior margin. The carpus is slightly less than half as long as the propodus. The merus is about as long as the propodus. The distal part of its outer surface bears a row of three spines near the posterior margin. A distinct epipod is present at the base of this leg. The fourth leg resembles the third, but it lacks the epipod. The fifth leg almost reaches the tip of the scaphocerite. It has the same shape as the third leg, but is somewhat more slender. The merus bears only one spine at the distal posterior angle.

The pleopods of the second to fifth pairs of both sexes are provided with appendices internae. The first pleopod of the male has the endopod elongate and narrowing distally, the tip bears some curved hooks, a row of spinules is present on the inner margin. The second pleopod of the male has the appendix masculina very short and broad. The uropods are elongate. The outer margin of the exopod ends in a tooth, which at its inner side bears a movable spine.

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

Type. Holotype is the ovigerous female.

The species shows a very close resemblance to *Eualus occultus* (Lebour), but may immediately be recognized from it by the presence of an epipod at the base of the third pereiopods and by having the spines at the postero-distal angle of the merus of the last three pairs of legs less numerous. More material of both forms must decide whether the differences in the shape of the rostrum, of the telson and of the appendix masculina are constant or not. The present specimens are also smaller than the specimens of *Eualus occultus* seen by me.

This new species is named for Dr. Marie V. Lebour of Plymouth, whose important studies on European Hippolytidae greatly added to our knowledge of this interesting group of Caridea.

Thoralus cranchii (Leach) 1817.

Restricted synonymy:

Hippolyte Cranchii Leach 1817, pl. 38 figs. 17—21.
Hippolyte cranchi Ortmann 1893, p. 45.
Spirontocaris Cranchi Monod 1933, p. 465.

Material examined:

Station 43, Praia, São Thiago, Cape Verde Islands; Sigsbee trawl, 22 m. depth, bottom corals; December 13, 1945, 14 h^{40}. — 1 specimen 8 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. — 1 ovigerous female 9 mm.

Station 145, off French Guinea, 9°20′ N, 14°15′ W; Sigsbee trawl and otter trawl, 7—10 m. depth, bottom shells and Foraminifera; March 13, 1946, 7 h—10 h. — 18 specimens (including 3 ovigerous females, 9—11 mm.) 5—11 mm.

Station 147, off French Guinea, 9°28′ N, 14°58′ W; Sigsbee trawl, 45 m. depth, bottom shells and Foraminifera; April 14, 1946, $8h^{55}$ $9h^{35}$. — 2 specimens 6 and 8 mm., 1 fragment.

The present specimens show an extremely close resemblance to the typical *Thoralus cranchii*. As far as I can see they differ in two respects only. In the first place the number of spines on the merus in the females is much smaller in the West African specimens. In my ovigerous females the merus of the third leg bears 2 or 3 (generally 2) spines, that of the fourth and fifth legs 1 or 2 (generally 2) spines. Secondly, the West African specimens are smaller than the European. The latter feature, however, is found in almost all West African representatives of European littoral species (e. g., *Alpheus dentipes* Guérin, *A. macrocheles* (Hailst.)). The value of the first difference can only be ascertained after examination of material from more northern localities of the West African coast.

Distribution. This littoral species has been recorded from W. Norway southwards to the Mediterranean and the Cape Verde Islands. The only West African records of the species found by me in literature are: Cape Blanco, Mauritania (Monod, 1933), Baixo de João Leitão, S. of Boavista, Cape Verde Islands (Ortmann, 1893).

Lebour (1936) for the first time pointed out that the form generally considered up to that time to be "*Spirontocaris cranchii*" in reality consists of two species, one of which is the present *Thoralus cranchii* (Leach), the other *Eualus occultus* (Lebour). It is probable therefore that part of the references to *Spirontocaris cranchii* given in literature do not refer to the present species. Thus the exact range of *Thoralus cranchii* is unknown; it is known with certainty, however, from S. England, the Netherlands, the Mediterranean coast of Spain and Naples.

Hippolyte coerulescens (Fabricius) 1775.

Restricted synonymy:

Astacus coerulescens Fabricius 1775, p. 414.
Hippolyte acuminatus Dana 1852, p. 24.
Hippolyte acuminatus Dana 1852a, p. 562.
Hippolyte acuminata Dana 1855, atlas, p. 11, pl. 36 fig. 1.
Virbius acuminatus Ortmann 1893, p. 46.
Hippolyte bidentatus Lenz & Strunck 1914, p. 318.
Hippolyte acuminatus Stebbing 1914, p. 289.
Hippolyte bidentata Odhner 1923, p. 4.
Hippolyte (Virbius) acuminatus Balss 1925, p. 288.

Distribution. This is one of the typical Gulfweed prawns. It is known from the Central Atlantic Ocean from Bermuda and the S.E. coast of the United States of America to the Azores, the Canary and Cape Verde Islands, the Gulf of Guinea and S. Angola. The West African records are: N.W. of the Cape Verde Islands, 18°43′ N, 27°46′ W (STEBBING, 1914), N.W. of the Cape Verde Islands (ORTMANN, 1893), 13 stations on an almost straight line between the Cape Verde Islands and Ascension (ORTMANN, 1893), S.W. of Sierra Leone, 4°07′ N, 20°43′ W (DANA, 1852a), S.W. of Liberia, ca. 0° N, 15° W (LENZ & STRUNCK, 1914), off Liberia, ca. 1° N, 8° W; off Ivory Coast, 0°20′ N, 6°45′ W; off Nigeria, 2°36′ N, 3°27′ E (BALSS, 1925), Porto Alexandre, S. Angola (ODHNER, 1923).

Hippolyte ? longirostris Holthuis 1947.

Restricted synonymy:

Hippolyte longirostris Holthuis 1947, pp. 15, 54.

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^m—16^h55^m. — 6 specimens (including 1 ovigerous female, 7 mm.) 5—8 mm.

The present material shows most resemblance to *Hippolyte longirostris* Holthuis (= *Hippolyte gracilis* (Heller, 1862, non Lilljeborg, 1850). It differs, however, from that species in the following points:

1. The animals are much smaller than specimens of *Hippolyte longirostris* from the Mediterranean, though at least one of them is adult.

2. The rostrum in the ovigerous female is completely unarmed, though a minute notch on the lower margin may indicate a reduced tooth. The other specimens too have the rostrum unarmed or possess a very small ventral tooth close to the apex and a dorsal tooth just before the posterior margin of the orbit.

The genus *Hippolyte* is one of the most difficult genera of Hippolytidae to deal with. Even the European species of it are insufficiently known. Before we know more about the status of the various European species and especially of *Hippolyte longirostris*, of the variability of the various characters and of the forms of the N.W. coast of Africa, it is impossible to fully decide the identity of the present Atlantide material.

Distribution. *Hippolyte longirostris* is known from the south coast of England southwards to the Mediterranean and the Black Sea. It is a littoral form.

Hippolyte species.

Hippolyte sp. ? Osorio 1889, p. 137.
Hippolyte sp. ? Osorio 1898, p. 194.
Hippolyte species Rathbun 1900, p. 313.

In a list of Crustacea from São Thomé, Osorio (1889) mentions *Hippolyte* sp., without giving a description of this species. Since also no more information of this material has been given later, its identity remains unknown. It was collected at Praia das Conchas, São Thomé.

Trachycaris restricta (A. Milne Edwards) 1878.

(Fig. 27).

Hippolyte restrictus A. Milne Edwards 1878, p. 231.
Platybema rugosus Bate 1888, p. 579, pl. 104 fig. 2.
Platybema rugosum Ortmann 1893, p. 47.
Platybema rugosum Rathbun 1902, p. 113.
Platybema rugosus Calman 1906, p. 33 (new genus *Trachycaris* erected).
Platyblema rugosum Bouvier 1918, p. 6.
Trachycaris rugosus Schmitt 1924, p. 82.
Trachycaris rugosus Schmitt 1924a, p. 68.
Trachycaris rugosus Schmitt 1935, p. 156, fig. 23.
Trachycaris rugosus Gurney 1940, p. 123, pls. 1—3.
Trachycaris rugosus Holthuis 1947, p. 16.
Hippolyte restrictus Holthuis 1947, p. 22.
Trachycaris restrictus Holthuis 1949, p. 233, figs. 2, 3.

Material examined:

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]. — 1 specimen 9 mm.

The present specimen agrees well with the description and figures given by me (Holthuis, 1949, p. 233) of an ovigerous female from the Canary Islands. The small differences may be due to the fact that the Atlantide specimen is juvenile. Only two minute teeth are visible on the truncated apex of the rostrum, while the upper margin of the rostrum bears 9 teeth, which are slightly larger than in the Canary Islands specimen. The pleurae of the abdominal segments end in a sharp median tooth, which is directed somewhat posteriorly. In the first five segments smaller teeth are visible on the margin of the pleurae before and behind this median tooth. In the sixth segment the pleurae also end in a sharp point, but bear no additional teeth. The telson is provided with three pairs of lateral and two pairs of posterior spines. The pleopods are small and the endopods bear no appendices.

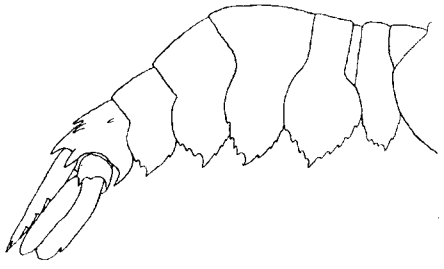

Fig. 27. *Trachycaris restricta* (A. Milne Edw.). Abdomen in lateral view. ×15.

Distribution. The species is a littoral form generally occurring at depths between 0 and 50 m. It is known from the Atlantic coast of America (Ber-

muda, West Indies and N.E. Brazil) and from West Africa. The West African records are: Tenerife, Canary Islands (HOLTHUIS, 1949), Cape Verde Islands (A. MILNE EDWARDS, 1878), Gulf of Guinea (GURNEY, 1940), St. Helena (GURNEY, 1940).

Latreutes fucorum (Fabricius) 1798.

Restricted synonymy:

Palaemon fucorum Fabricius 1798, p. 404.
Latreutes fucorum Stebbing 1914, p. 290.

Distribution. Like *Hippolyte coerulescens* (Fabr.) this is also a typical inhabitant of the Gulfweed. It has been reported from the Atlantic Ocean from near Newfoundland to the West Indies, Bermuda, the Azores and the Cape Verde Islands; there is a doubtful record from the Cape of Good Hope. The only record I could find within the present region is that of STEBBING (1914): N.W. of the Cape Verde Islands, 18°43′ N, 27°46′ W.

Latreutes parvulus (Stimpson) 1866.

(Figs. 28, 29).

Rhynchocyclus parvulus Stimpson 1866, p. 48.
Rhynchocylus parvulus Stimpson 1874, p. 124.
Rhynchocyclus parvulus Kingsley 1878, p. 56.
Concordia gibberosus Kingsley 1879, p. 414, pl. 14 fig. 5.
Rhynchocyclus parvulus Kingsley 1899, p. 716.
Concordia gibberosus Kingsley 1899, p. 716, fig. 17.
Conchordia gibberosa Cary & Spaulding 1909, p. 10.
Concordia gibberosus Fowler 1912, p. 554.
Concordia gibberosus Hay & Shore 1918, p. 391, pl. 26 fig. 11.
Latreutes gibberosus Schmitt 1935, p. 152, fig. 18.
Latreutes gibberosus McDougall 1943, p. 371.
Latreutes parvulus Holthuis 1947, pp. 17, 59.

Material examined:

Station 141, off Freetown, Sierra Leone; Commercial otter trawl, 15 m. depth, bottom sand; April 9, 1946, 11h -16h. — 1 ovigerous female 7 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, $7h^{45}$—$10h^{10}$. — 15 specimens (including 5 ovigerous females, 10—11 mm.) 6—12 mm.

Station 147, off French Guinea, 9°28′ N, 14°58′ W; Sigsbee trawl, 45 m. depth, bottom shells and Foraminifera; April 14, 1946, $8h^{55}$—$9h^{35}$. — 1 specimen 7 mm.

Station 148, off French Guinea, 9°57′ N, 15°22′ W; Sigsbee trawl, 25 m. depth, bottom shells and hydroids; April 14, 1946, $16h^{25}$—$16h^{55}$. — 6 specimens (including 5 ovigerous females, 11—15 mm.) 10—15 mm.

The rostrum is compressed laterally and very high. It is almost circular in outline in the female, more elongate in the male. The upper margin is serrate and bears six to eight teeth in the female, two to four in the male. Some small teeth are present on the tip of the rostrum. The lower margin of the rostrum is entire or bears up to 5 shallow teeth. The ventral part of the rostrum is produced somewhat backwards. The middorsal line of the carapace bears a row of five to seven (generally six) small erect teeth. This row starts somewhat anterior of the middle of the carapace and extends all the way to the base of the rostrum. In the female the carapace is somewhat swollen, the upper margin making thereby a distinct angle near the base of the row of teeth. In the males the upper margin is nearly straight. The anterior margin of the carapace shows a narrow, anteriorly directed lobe, which forms the lower angle of the orbit. A slender spine is placed on this lobe. The anterolateral angles of the carapace end in from two to four teeth. Between the lower orbital angle and the anterolateral angle of the carapace a row of three or four slender spines is placed slightly behind and parallel to the anterior margin of the carapace.

The abdomen is smooth and has the pleurae of the first five segments broadly rounded in both sexes. The sixth segment is somewhat less than twice as long as the fifth. The pleura of the sixth segment is bluntly, the posterolateral angle sharply pointed. A subanal spine is present on the lower surface of the segment. The telson is elongate, it is about as long as the fifth and sixth abdominal segments combined. The dorsal surface bears two pairs of spines, the former being placed in or somewhat before the middle of the telson, the last pair stands halfway between the first pair and the posterior margin. The latter ends in a sharp point and bears two pairs of spines, the outer of which is short, the inner long and slender.

The eyes are well developed and have the cornea globular. In my spirit specimens 4 small dark spots, which are arranged in a quadrangle, are visible on the cornea. The eyestalk bears at the upper inner part of its anterior margin a small truncated process, which overlaps the line separating the cornea from the stalk.

The antennular peduncle has the stylocerite broad and rounded, it is hollowed above, and together with the basal segment of the peduncle forms a cavity for the reception of the eye. The second segment of the peduncle is very short, being much shorter than the third. There are two flagella, the upper of which is the shorter, consisting of about 7 or 8 broad and 1 or 2 narrow joints.

The scaphocerite is short and broad, it is about twice as long as broad. It overreaches the antennular and antennal peduncles, but falls short of the end of the rostrum. The outer margin is almost straight and ends in a small final tooth, which reaches about as far forwards as the lamella. A small spine is present on the outer surface of the antennal peduncle near the base of the scaphocerite.

The mandible bears no palp and possesses no incisor process. The molar process has the distal surface provided with blunt teeth and various spinules. The maxillula has the lower endite slender and ending in some slender spinules, the upper endite is somewhat broader. The palp is simple. The maxilla has the upper endite distinctly bilobed, the lower endite is reduced to an inconspicuous lobe bearing some hairs; the palp and the scaphocerite are well developed. All maxillipeds possess exopods, which are incon-

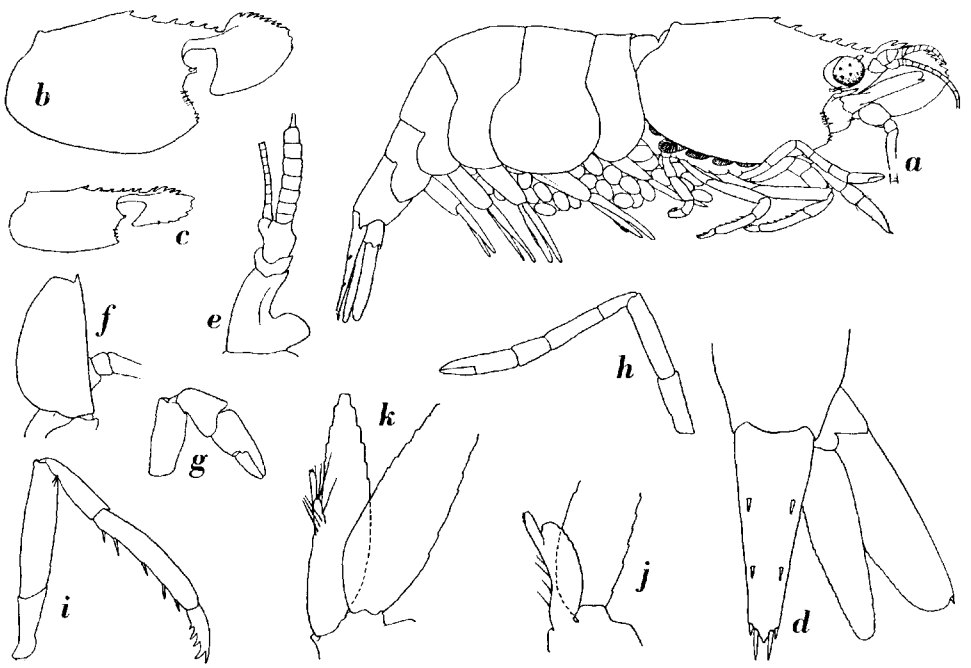

Fig. 28. *Latreutes parvulus* (Stimpson). a, ovigerous female in lateral view; b, carapace of ovigerous female in lateral view; c, carapace of male in lateral view; d, telson and right uropod in dorsal view; e, antennula; f, antenna; g, first pereiopod; h, second pereiopod; i, third pereiopod; j, first pleopod of male; k, second pleopod of male. a—c, ×6; d, g—i, ×17; e, f, ×13; j, k, ×20.

spicuously articulated in the distal part. The first maxilliped has the endites of the basis and coxa distinctly separated, the coxal endite projecting beyond the basal. The palp is very broad, the caridean lobe very narrow. The epipod is well developed and inconspicuously bilobed. The second maxilliped has the last joint short, almost semicircular, it is placed at the end of the penultimate joint. The third maxilliped reaches somewhat beyond the end of the antennal peduncle. The last joint is more than twice as long as the penultimate, and about $^5/_7$ of the length of the antepenultimate joint. Spines are present on the top and in the distal part of the inner margin of the distal joint. The second joint bears two spines on the outer anterior angle, while in the third joint there is a row of about 5 spines along the distal

part of the outer margin. The exopod is short, failing to reach the middle of the antepenultimate segment. The branchial formula runs as follows:

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

The first legs are equal, short and thickset. When stretched forwards they slightly overreach the base of the scaphocerite. The fingers are somewhat shorter and narrower than the palm. The tips of the fingers end in some dark coloured ungues. The palm broadens somewhat posteriorly. The carpus is about as long as the palm, it is about conical, narrowing towards the base. The merus is unarmed and almost as long as the chela. The second legs are slenderer. They reach about to the end of the antennal peduncle. The chela has the fingers slightly shorter than the palm. The carpus is somewhat less than twice as long as the chela. It consists of three joints, the median of which is longest. This median joint is 1.5 times as long as the basal joint. The ultimate joint is slightly shorter than the basal. The merus measures $^2/_3$ of the length of the carpus and is 1.5 times as long as the ischium. The third leg reaches about to the end of the scaphocerite. The dactylus ends in a sharp tooth and bears a row of four teeth on the posterior margin. Of these four teeth the distal is largest, the teeth decrease in size proximally. The propodus is twice as long as the dactylus, it bears 5 posterior movable spines. The carpus is $^5/_8$ of the length of the propodus, while the merus is as long as the latter segment. A movable spine is present in the distal posterior part of the outer surface of the merus. The ischium is half as long as the merus. The fourth and fifth legs in all essential points are similar to the third. The distal posterior spine of the merus, however, lacks in leg 5.

The male has the endopod of the first pleopod small and provided with a small appendix interna. The second pleopod of the male has the appendix masculina short, thickset and provided with several strong hairs. The appendix interna distinctly overreaches the appendix masculina. The other three pleopods have the endopod provided with a small appendix interna. In the female appendices internae are present from the second to fifth pleopods; no appendix is present here on the endopod of the first pleopod. The uropods are elongate. The exopod has the outer margin ending in a small movable spine.

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

Distribution. The species is a littoral form. It has been recorded from the Atlantic coast of the U. S. A. (North Carolina, South Carolina, Florida, Louisiana and Texas) and from the West Indies (Cuba and Porto Rico). It is reported now for the first time from the West African coast.

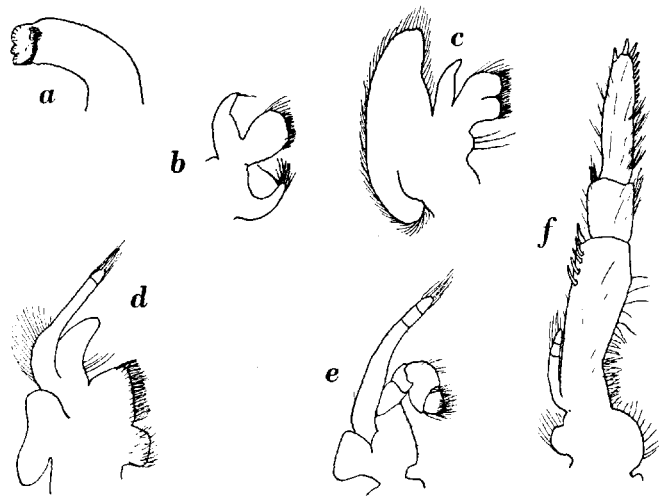

Fig. 29. *Latreutes parvulus* (Stimpson). a, mandible; b, maxilulla; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped. a—f, ×27.

I was able to compare a specimen of this species from Bahia Honda, Cuba (coll. Zoological Museum, Amsterdam) with the Atlantide material. This comparison fully convinced me that the American and West African specimens belong to one species.

Bythocaris cosmetops n. sp.
(Fig. 30).

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}. — 1 ovigerous female 13 mm.

Description. The rostrum is depressed, it is broadly triangular in dorsal view, and ends in a rather blunt median point, which fails to reach the end of the eyestalks when the eyes are directed forwards. The rostrum forms a wing-like expansion over the orbits; these expansions end in a distinct sharp angle, and may be considered to be the supra-orbital teeth. The rostrum bears no teeth on either upper or lower surface, but there is a median dorsal carina. A distinct tooth is present at the middorsal line of the carapace near the base of the rostrum. The orbit is rather deeply sunk,

its lower angle is rounded. The antennal spine is placed closely below this lower orbital angle. No other spines are present on the carapace.

The abdomen is smooth. The posterior margin of the third segment is damaged in the middle. The pleurae of the first two segments in my specimen are broadly rounded, that of the second segment especially is very broad

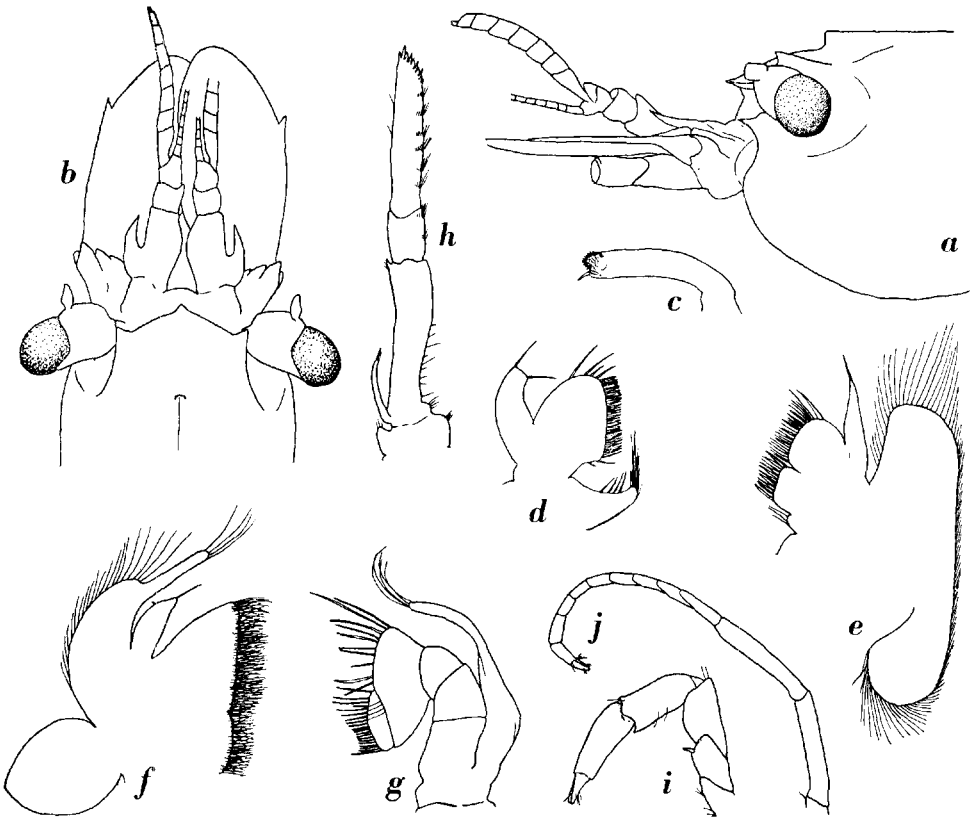

Fig. 30. *Bythocaris cosmetops* n. sp. a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, mandible; d, maxillula; e, maxilla; f, first maxilliped; g, second maxilliped; h, third maxilliped; i, first pereiopod; j, second pereiopod. a, b, h—j, ×20; c—g, ×42.

and it almost completely covers the pleura of the first segment. The pleurae of the third, fourth and fifth segments are pointed. The fifth somite possesses a carina parallel to and placed at some distance from the posterior margin. The sixth segment is somewhat longer than the fifth, its pleurae are small and rounded, each of the posterolateral angles is provided with a small denticle at the top. The telson is longer than the sixth abdominal segment. The dorsal surface bears three pairs of spines, which are placed close to the lateral margins. The anterior pair is placed at $^1/_3$ of the length of the telson measured from its base. The posterior margin of the telson is slightly

convex and bears about 8 spinules, the inner 5 of which are present in my specimen, they are slender.

The eyes have the cornea rounded and well pigmented. The peduncle is peculiar in bearing at the inner side an almost quadrangular compressed lobe, which stands almost at right angles to the peduncle itself.

The basal segment of the antennular peduncle has the stylocerite rather slender and pointed, it almost reaches the end of the segment. The second and third segments are short. The two flagella are simple, the outer consists of about 7 broad and 1 narrow joints, the inner flagellum is narrow.

The scaphocerite far overreaches the antennular peduncle. The outer margin is slightly convex and ends in a distinct but not very large tooth. This tooth is far overreached by the lamella. The scaphocerite is about twice as long as broad.

The mandible is simple, it has neither an incisor process nor a palp. The maxillula has the lower endite slender, the upper endite is much broader, the palp is truncate and bears two hairs. The maxilla has the upper endite well developed and distinctly cleft, the lower endite is reduced to a single lobe; the palp is short and rather broad, it is inserted on the margin of the upper endite; the scaphognathite is well developed. All maxillipeds are provided with an exopod. The first maxilliped has the endites of the coxa and basis separated by a distinct notch, the palp is somewhat broadened in the middle, the caridean lobe is distinct, the epipod is rather broad. The second maxilliped is of the usual shape, the last joint is fused with the penultimate joint along its longer side. There is no distinct epipod at the base of the second maxilliped. The third maxilliped reaches almost to the end of the scaphocerite. The last joint is about three times as long as the penultimate. At the top it bears a row of spines. These spines are of two kinds: slender spines of the usual shape alternate with short broad and flattened spines. The antepenultimate segment of the third maxilliped is somewhat longer than the ultimate and bears a distinct spine at the outer distal angle. A small exopod is present. The branchial formula runs as follows:

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

The first legs are short, equal and thickset, they reach about to the base of the scaphocerite. The fingers are slightly less than half as long as the palm. The carpus is about as long as the palm and longer than the merus.

The ischium is short and bears a spine on the internal margin. The second leg is slender. The chela has the fingers shorter than the palm. The carpus is four times as long as the chela. It is subdivided into 8 joints, the extremes of which are longest. Between the distal joints the articulation is straight, lying about at right angles to the axis of the carpus. Between the proximal joints of the carpus, however, the articulation stands very obliquely on the axis of the carpus. The merus is somewhat more than half as long as the carpus and as long as the ischium. None of the last three pairs of pereiopods is present in the only specimen at my disposal.

The endopod of the first pleopod in my ovigerous female is ovate and bears no appendix. An appendix interna is present on the endopods of the following pleopods. The uropods are elongate ovate. The exopod has the outer margin ending in a distinct tooth on the inner side of which a minute movable spinule is visible.

The eggs are large and few, they measure 0.6 to 0.8 mm.

Some parts of the present specimen, which is preserved in spirit like all the present material, show a dark colour by the presence of dark brown chromatophores. Such dark coloured spots may be observed on the antennal scales, on the carapace (especially in the middorsal line and on the supra-orbital spines), in the middorsal line of the first three abdominal segments, on the pleurae of the third and fourth segments, on the whole of the fifth segment, and on the uropodal endo- and exopods; furthermore a dark coloured band extends over the distal part of the sixth abdominal segment and the basal part of the caudal fan.

Though the specimen is incomplete and other specimens of the same species are not available, the characters are so distinct that it can easily be recognized from all other known species of the genus. Therefore, I do not hesitate to establish a new species on this single imperfect specimen. *Bythocaris cosmetops* differs from all other species of the genus by the ornamentation of the eyestalk and by the absence of a hepatic spine on the carapace. It resembles *Bythocaris leucopis* Sars and *B. simplicirostris* Sars by having a middorsal tooth on the carapace. The shape of the antennulae, antennae and mouth parts, however, like the branchial formula, are similar to that of the species of *Bythocaris* hitherto known.

Of the genus *Bythocaris* five species were known, all of which inhabit the Northern Atlantic Ocean north of the line connecting N. Carolina (U.S.A.) with Ireland and the northern North Sea. The species were found northwards up to Davis Strait, Spitsbergen, the Barents and the Kara Seas. The present species thus extends the known range of distribution of the genus very far southwards.

Lysmata moorei (Rathbun) 1902.

Restricted synonymy:

Hippolysmata moorei Rathbun 1902, p. 115, fig. 23.
Hippolysmata Moorei Balss 1916, p. 23, fig. 6.

Distribution. The littoral species is known from the West Indies and from West Africa. The only West African record is that by BALSS (1916): Sette Camma, Gabon.

Hippolysmata (*Exhippolysmata*) *hastatoides* (Balss) 1914.

Mimocaris hastatoides Balss 1914a, p. 596.
Mimocaris hastatoides Balss 1916, p. 23.
Mimocaris hastatoides Balss 1925, p. 289, textfigs. 68—74, pl. 28.
Exhippolysmata hastatoides De Man 1925, p. 29, figs. 5a, b.
Mimocaris hastatoides Monod 1927, p. 595.
Hippolysmata hastatoides Holthuis 1947, p. 19.

Distribution. The species is known from fresh and salt waters of West Africa. The records in literature are: Victoria, Cameroons (BALSS, 1914a, 1916, 1925), Vista, Belgian Congo (DE MAN, 1925), Boma, Belgian Congo (BALSS, 1916), Quissembo, N. Angola (BALSS, 1916).

Family **Palaemonidae.**

Subfamily ***Palaemoninae.***

Desmocaris trispinosa (Aurivillius) 1898.

Palaemonetes trispinosus Aurivillius 1898, p. 29, pl. 4 figs. 1, 2.
Palaemonetes trispinosus Rathbun 1900, p. 316.
Desmocaris trispinosus Sollaud 1911, p. 913.
Desmocaris trispinosus De Man 1912, p. 202.
Desmocaris trispinosa De Man 1925, p. 31, fig. 6.
Desmocaris trispinosus Schmitt 1926, p. 23.
Desmocaris trispinosa Holthuis 1950, p. 6.

Distribution. This species inhabits fresh water of the West African region. The records in literature are: Gold Coast (SOLLAUD, 1911), Kitta, Cameroons (AURIVILLIUS, 1898), Brazzaville, French Congo (SOLLAUD, 1911), Ottenge River near Banzyville, Belgian Congo (DE MAN, 1912), Banzyville (DE MAN, 1925), Stanleyville (DE MAN, 1925; SCHMITT, 1926), Elisabetha near Basoko, and Banana, Belgian Congo (DE MAN, 1925).

Palaemon serratus (Pennant) 1777.

Restricted synonymy:

Astacus Serratus Pennant 1777, p. 19, pl. 16 fig. 28.
Palaemon serratus Holthuis 1949, p. 241.

Distribution. *Palaemon serratus* is known from Denmark, Holland and the British Isles southwards to Cape Blanco, the Mediterranean and the Black Sea. The only record falling within the region dealt with here is that of HOLTHUIS (1949) from Bahia del Oeste, Cape Blanco, Rio de Oro.

Palaemon elegans Rathke 1837.

Restricted synonymy:

Palaemon elegans Rathke 1837, p. 370, pl. 4 fig. 5.
Palemon squilla Osorio 1888, p. 189.
Leander squilla Ortmann 1893, p. 47.
Palemon squilla Osorio 1898, p. 194.
Leander squilla Balss 1913, p. 107.
Leander squilla Stebbing 1914, p. 286.
Leander squilla Balss 1916, p. 24.
Palaemon squilla Schmitt 1926, p. 24, fig. 64.
Palaemon squilla Monod 1933, p. 464.
Leander squilla Barnard 1950, p. 783.

Material examined:

Station 42, Praia, São Thiago, Cape Verde Islands; handnet, rocky bottom; December 13, 1945, $10h^{00}$. — 14 specimens (including 1 ovigerous female, 27 mm.) 12—28 mm.

Palaemon elegans has often been cited in literature under the name *Leander* (or *Palaemon*) *squilla*. My reasons for changing this name have dealt with in detail in another paper (Holthuis, 1950, pp. 55, 56).

Distribution. *Palaemon elegans* is a littoral species, it is generally found in the upper littoral zone on a rocky bottom. It has been reported from S.W. Norway to the Mediterranean and the Black Sea, and from various localities along the westcoast of Africa till Lüderitz Bay. The West African records are: Cape Blanco, Mauritania (Monod, 1933), São Vicente, Cape Verde Islands (Ortmann, 1893), Porto Grande, São Vicente (Stebbing, 1914), São Thiago, Cape Verde Islands (Osorio, 1888), Bissago, Portuguese Guinea (Balss, 1916), Los Islands, French Guinea (Monod, 1933), Bibundi, Cameroons (Balss, 1916), Gabon (Balss, 1916), São Paulo de Loanda, N. Angola (Schmitt, 1926), Swakopmund, S.W. Africa (Balss, 1916), Lüderitz Bay, S.W. Africa (Balss, 1913, 1916). The specimens mentioned by Stebbing (1910) as *Leander squilla* from S. Africa in reality are *Palaemon pacificus* Stimps. *Palaemon elegans* also is known from the Canary Islands, the Azores and Madeira.

Palaemon maculatus (Thallwitz) 1892.

Leander maculatus Thallwitz 1892, pp. 19, 49.
?*Leander adspersus* Sharp 1893, p. 119.
Leander maculatus Rankin 1898, p. 246.
Palaemon edwardsii Rathbun 1900, p. 314 (non Heller, 1863).
Leander edwardsii Johnston 1906, p. 862.
Palaemon (Laeander) Edwardsii Lenz 1910, p. 126.
Leander Edwardsii Balss 1916, p. 26, figs. 7, 8.
Leander maculatus De Man 1923, p. 3.

Leander maculatus Kemp 1925, p. 290.
Leander maculatus De Man 1925, p. 36, figs. 8 a—d.
Palaemon maculatus Schmitt 1926, p. 25, fig. 65.
Leander maculatus Barnard 1950, p. 782.
Palaemon (Palaeander) maculatus Holthuis 1950, p. 8.

Material examined:

Station 93, Lagoon of Lagos, Nigeria; handnet, bottom sand; February 6, 1946, $10h^{00}$. — 3 specimens 19—25 mm.

Station 93, Fisheries Development Station, Lagos, Nigeria; handnet, bottom mud; February 5, 1946, $10h^{00}$. — 30 specimens (including 11 ovigerous females, 23—32 mm.) 17—36 mm.

Balss (1916) gives a good figure of the present species. An extensive description of it has been published by De Man (1925).

In my material a distinct branchiostegal groove is present. This groove attains the anterior margin of the carapace just above the branchiostegal spine.

The pleurae of the fifth abdominal segment end in a distinct sharp point.

The stylocerite bears no dorsal tooth in the basal part.

The mandible has the palp two-jointed. This is in contradiction with Schmitt's statement that the palp is three-jointed.

The endopod of the first pleopod of the male is elongate ovate with the inner margin almost straight or somewhat concave in the middle. The second pleopod of the male has the appendix masculina slender and a little longer than the appendix interna.

The eggs are numerous and small, being 0.4 to 0.6 mm. in diameter.

Kemp (1925) ranges the present species among the forms which have the shorter ramus of the upper flagellum of the antennula fused with the longer ramus for much less than half its length. As is shown by my material, and also by De Man's (1925) description and figure, the fused part of the shorter ramus is about as long as the free part.

Balss (1916) states the propodus of the fifth pair of pereiopods to have the distal part of the posterior margin provided with a row of small spinules. In reality, however, these are the various transverse rows of short hairs, which are always present in the species of this genus. A few minute spinules occur on the propodus of the fifth as well as of the third and fourth legs, these are, however, distributed throughout the length of the joint and are small in number.

Sharp (1893) in the list of Crustacea of the collection of the Philadelphia Academy of Sciences, mentions a specimen of "*Leander adspersus*" from Liberia. It is possible that Sharp's specimen belongs to *Palaemon maculatus* (Thallw.), but since he does not give a description, this can not be made out with certainty without reexamination of the material.

Distribution. The species inhabits brackish water. It is known only from West Africa. The records in literature are: Liberia (JOHNSTON, 1906), Monrovia and Mount Coffee, Liberia (RATHBUN, 1900), Old Calabar, Nigeria (BALSS, 1916), Ogowé River, Gabon (THALLWITZ, 1892), Chiloango River near Landana, Kabinda (LENZ, 1910), Banana, Belgian Congo (DE MAN, 1923, 1925; SCHMITT, 1926), Great Fish Bay, S. Angola (BALSS, 1916). BALSS (1916) adds to his record of this species from the Great Fish Bay, "Deutsche Tiefsee-Expedition", but in the reports of the Valdivia Expedition no mention is made of this species or any other member of the genus.

Palaemon hastatus Aurivillius 1898.

Palaemon (Leander) hastatus Aurivillius 1898, p. 27, pl. 4 figs. 3—6.
Palaemon hastatus Rathbun 1900, p. 315.
Palaemon (Leander) hastatus Gruvel 1912, p. 16.
Leander hastatus Balss 1916, p. 25.
Leander hastatus Kemp 1917, p. 204.
Leander hastatus Kemp 1925, p. 289.
Leander hastatus De Man 1925, p. 34, figs. 7 a—h.
Palaemon (Nematopalaemon) hastatus Holthuis 1950, p. 9.

Material examined:

Station 101, off Nigeria, 5°59′ N, 4°36′ E; Sigsbee trawl, 17 m. depth, bottom mud; February 15, 1946, 15^{h00}—15^{h55}. — 2 specimens 47 and 48 mm.

Station 130, off Angola, 6°00′ S, 12°14′ E; bottom sample Jvii; Petersen grab, 80 m. depth, bottom mud; March 15, 1946, 9^{h10}. — 1 specimen 22 mm.

Station 131, off Congo River, 5°58′ S, 12°08′ E; Sigsbee trawl and otter trawl, 27 m. depth, bottom sandy mud; March 15, 1946, 11^{h30}—13^{h15}. — 102 specimens (including 50 ovigerous females, 37—55 mm.) 24—57 mm.

Station 143, Konakri, French Guinea, quay; handnet; April 12, 1946, 16^{h00}. — 7 specimens 34—45 mm.

In the juvenile specimen from Station 130 the rostrum is very short, it fails to reach the end of the antennular peduncle. The upper teeth are distinct, but the ventrals are inconspicuous. In this specimen the dactylus of the third leg is slightly shorter than the propodus and carpus together.

The rostral formula is $\begin{matrix} 7 - 10 + 1 \\ 3 - 5 \end{matrix}$. The branchiostegal spine is placed on the anterior margin of the carapace, which below this spine runs obliquely backwards and merges with the lateral margin. There is no branchiostegal groove. In the posterolateral region of the carapace there are two rather deep groove-like depressions, which are also figured by AURIVILLIUS.

The fifth abdominal segment has the pleura posteriorly produced, its apex is broadly rounded. The pleura and the posterolateral angle of the

sixth segment both end in a small sharp point. The telson bears two dorsal pairs of minute spinules, the anterior of which is very small, sometimes absent. Of the two pairs of spinules on the posterior margin of the telson the outer is almost invisible. Two setose hairs are present between the inner spines.

The stylocerite is short and pointed, it bears a large sharp tooth on its dorsal surface. This tooth has the tip curved anteriorly.

The mandibular palp is large and distinctly three-jointed.

The propodus of the fifth pereiopod bears in the distal part of its posterior margin several transverse rows of short hairs. No spinules are visible there.

The endopod of the first pleopod of the male is simple and elongate ovate. The endopod of the second pleopod of the male has the appendix masculina much stronger and slightly longer than the appendix interna. The uropods are very elongate. The blade of the exopod reaches far beyond the end of the outer margin, which is formed by a small tooth. At the inner side of this tooth a slender movable spine is present.

The eggs are numerous and small, being 0.5 to 0.7 mm. in diameter.

Distribution. The species is mainly a marine form, but occurs also in brackish water. It is only known from the West African coast. The records in literature are: Monrovia and Grand Bassa, Liberia (Balss, 1916), Saltpond, Accra and Addah, Gold Coast (Balss, 1916), Grand Popo, Dahomey (Balss, 1916), Beticka ba Mallale, Cameroons (Aurivillius, 1898), Duala, Cameroons (Balss, 1916), Loango, French Congo (Balss, 1916), Kabinda, Kabinda (Balss, 1916), mouth of Congo River (Gruvel, 1912), Vista and Banana, Belgian Congo (De Man, 1925), Boma, Belgian Congo (Balss, 1916), Quissembo, N. Angola (Balss, 1916).

Palaemonetes africanus Balss 1916.

Palaemonetes africanus Balss 1916, p. 27, fig. 9.
Palaemonetes africanus Kemp 1925, p. 316.
Palaemonetes (Palaemonetes) africanus Holthuis 1950, p. 9.

Distribution. This species is only known from the original record: Balss (1916) reports the species from Old Calabar, Nigeria.

Brachycarpus biunguiculatus (Lucas) 1849.

Restricted synonymy:
Palaemon biunguiculatus Lucas 1849, p. 45, pl. 4 fig. 4.

Material examined:

Station 53, off Marshall, Liberia; handnet, collected with electric light; January 1, 1946, $20h^{33}$. — 1 specimen 16 mm.

The specimen is rather damaged, its rostrum is broken and both second legs are absent. The other characters, as for instance the presence of a

hepatic spine, the posterior margin of the telson which bears two pairs of spines and one pair of setae, the presence of a three-jointed mandibular palp, the branchial formula, the biunguiculate dactyli of the last three pairs of pereiopods, these all make the identity of the specimen with *Brachycarpus biunguiculatus* certain. Also the other features are as in LUCAS's species. The upper flagellum of the antennula has the shorter ramus with 5 fused and 3 free joints.

Distribution. *Brachycarpus biunguiculatus* is a littoral form, which has an extremely wide range of distribution: Mediterranean, East American coast from N. Carolina to Venezuela, Bermuda, Bahama Islands, West Indies, West American coast from Mexico to Colombia, Cocos Island, Clipperton Island, Galápagos Islands, Hawaiian Archipelago, Ceylon,? Red Sea. This is the first record of the species from West Africa.

Macrobrachium macrobrachion (Herklots) 1851.

Palemon mabrobrachion Herklots 1851, p. 15 (*Palemon macrobrachion* on p. 25).
Palaemon forceps p. p. Von Martens 1869, p. 28.
Palaemon macrobrachion De Man 1879, p. 177.
Palaemon africanus Kingsley, 1882, p. 107 (non *Macrobrachium africanum* Bate, 1868).
Palaemon macrobrachion Büttikofer 1890, vol. 1, pp. 125, 337; vol. 2, pp. 466, 487.
Palaemon macrobrachion Ortmann 1891, p. 722.
Palaemon africanus Thallwitz 1892, p. 6.
Palaemon macrobrachion Thallwitz 1892, p. 10.
Palaemon africanus Sharp 1893, p. 121.
Palemon macrobrachion Bouvier 1895, p. 160.
Palaemon acanthurus Aurivillius 1898, p. 19 (non WIEGMANN, 1836).
Palaemon africanus De Man 1900, p. 60.
Palaemon macrobrachion De Man 1900, p. 62.
Bithynis acanthurus Rathbun 1900, p. 315.
Palaemon macrobrachion Thompson 1901, p. 19.
Palaemon (Bithynis) acanthurus Lönnberg 1903, p. 46.
Palaemon (Eupalaemon) macrobrachion De Man, 1904, p. 299, pl. 18 figs. 13—16, 19—22, 25, 27, pl. 19 figs. 17, 18, 23, 24, 26, 28, 29.
Palaemon macrobrachion Johnston 1906, p. 862.
Palaemon (Eupalaemon) macrobrachion Lenz 1910, p. 127.
Palaemon (Eupalaemon) macrobrachion De Man 1911b, pp. 261, 262.
Palaemon acanthurus Gruvel 1912, p. 16, pl. 2 figs. 5, 6.
Palaemon (Eupalaemon) macrobrachion De Man 1912a, p. 203, pl. 2 fig. 1, pl. 4 fig. 1a.
Bithynis acanthurus Sendler 1912, p. 206.
Palaemon (Eupalaemon) macrobrachion Balss 1914, p. 98.
Palaemon (Eupalaemon) macrobrachion De Man 1925, p. 38, fig. 9.
Macrobrachium macrobrachion Schmitt 1926, p. 27.
Palaemon (Eupalaemon) macrobrachion J. Roux 1927, p. 238.
Palaemon macrobrachion Sollaud 1932, p. 376.
Macrobrachium macrobrachion Holthuis 1949a, p. 175.
Macrobrachium macrobrachion Holthuis 1950, p. 16.

Material examined:

Station 93, Fisheries Development Station, Lagos, Nigeria; handnet, bottom mud; February 5, 1946, 10h00. — 24 specimens 52—78 mm.

Though none of the present specimens has attained its full size, they may be referred with certainty to this well known species.

HERKLOTS described the present form under the name *Palemon mabrobrachion*, that this spelling is a lapsus for *macrobrachion* is clear, since HERKLOTS in the same paper (on p. 25) uses the correct spelling *macrobrachion*.

Distribution. The species inhabits fresh and brackish waters. It is only known from West Africa. The records in literature are: West Africa (DE MAN, 1879; KINGSLEY, 1882; SHARP, 1893), Coyah River, French Guinea (GRUVEL, 1912), Sierra Leone (VON MARTENS, 1869; THOMPSON, 1901), Liberia (DE MAN, 1904; JOHNSTON, 1906), Grand Cape Mount region, St. Paul River near Bavia, and Hilltown, N.W. of Marshall, Liberia (BÜTTIKOFER, 1890), Butri near Dixcove, Gold Coast (HERKLOTS, 1851), Pra River, Gold Coast (DE MAN, 1904), Ekundu, Cameroons (AURIVILLIUS, 1898), Meme River (AURIVILLIUS, 1898; LÖNNBERG, 1903), Bibundi, N.W. of Victoria, Cameroons (AURIVILLIUS, 1898; SENDLER, 1912), Isongo, W. of Victoria (SENDLER, 1912), near Manoka Bay, Cameroons (SOLLAUD, 1932), between Yukaduma and Assobam, and Mwini River near Campo, both localities in S. Cameroons (BALSS, 1914), Fernando Po Island (HOLTHUIS, 1949 a), Port Gentil near Cape Lopez, Gabon (J. ROUX, 1927), French Congo (BOUVIER, 1895), Brazzaville, French Congo (GRUVEL, 1912), mouth of Chiloango River near Landana, Kabinda (LENZ, 1910), Banana, Belgian Congo (DE MAN, 1912 a, 1925; SCHMITT, 1926), Malela near Banana (SCHMITT, 1926), Ambriz, N. Angola (DE MAN, 1904), Katumbella near Benguella, Angola (DE MAN, 1904). According to RATHBUN (1900) BATE has recorded the present species from St. Helena, I cannot find in which paper Bate did this and the whole thing seems a little dubious to me. GRUVEL's (1912) statement that the species is found at St. Helena obviously is based on RATHBUN's record.

Macrobrachium sollaudii (De Man) 1912.

Palaemon (Eupalaemon) Foai De Man 1904, p. 306, pl. 19 figs. 30—37 (non Coutière, 1902).
Palaemon (Eupalaemon) Foai Lenz 1910, p. 127, pl. 3 fig. 1.
Palaemon (Eupalaemon) Sollaudii de Man 1912, p. 413.
Palaemon (Eupalaemon) Sollaudii de Man 1912 a, p. 205, pl. 1 figs. 2 –2 i.
Palaemon Sollaudi Sollaud 1923, p. 567.
Palaemon (Eupalaemon) Sollaudii de Man 1925, p. 39, figs. 10 a—e.
? *Macrobrachium sollaudii* Schmitt 1926, p. 28.
Macrobrachium sollaudii Holthuis 1949 a, p. 176.
Macrobrachium sollaudii Holthuis 1950, p. 18.

Distribution. The species inhabits West African fresh waters. The records in literature are: Dume, Cameroons (LENZ, 1910; DE MAN, 1912a), Yaunde (DE MAN, 1912a, Kribi River, Cameroons (DE MAN, 1904, 1912a), Bimbili[1]) River, branch of Rio Benito, Rio Muni (LENZ, 1910; DE MAN, 1912a), Rio Nkama near Nkamayop, and Rio Chime near Ebomiku, Rio Muni HOLTHUIS, 1949a), Sanga River, French Congo (DE MAN, 1912a), Ottenge River near Banzyville, Belgian Congo (DE MAN, 1912, 1912a), Elisabetha near Basoko, Ikengo near Coquilhatville, and Mongende near Bolobo, all three localities on the Congo River (DE MAN, 1925), Lulua and Kasai Rivers near Luebo, Belgian Congo (DE MAN, 1925).

Macrobrachium foai (Coutière) 1902.

Palaemon (Eupalaemon) Foai Coutière 1902a, p. 517.
Palaemon (Eupalaemon) sp. (?) Coutière 1902a, p. 519.
non *Palaemon (Eupalaemon) Foai* De Man 1904, p. 306, pl. 19 figs. 30—37.
Palaemon (Eupalaemon) Foai Coutière 1908, p. 574, figs. 1—4.
non *Palaemon (Eupalaemon) Foai* Lenz 1910, p. 127, pl. 3 fig. 1.
Palaemon (Eupalaemon) Foai de Man 1911b, pp. 261, 263.
Palaemon (Eupalaemon) spec. (?) De Man 1911b, pp. 261, 264.
Palaemon (Eupalaemon) Foai De Man 1912a, pp. 198, 200.
Palaemon (Eupalaemon) spec. (?) De Man 1912a, pp. 198, 200.
Macrobrachium foai Schmitt 1926, p. 29, pl. 1 fig. 1.
Macrobrachium foai Holthuis 1949a, p. 176.
Macrobrachium foai Holthuis 1950, p. 14.

The specimens mentioned by DE MAN (1904) and LENZ (1910) as *Palaemon Foai*, are in reality *Macrobrachium sollaudii* (De Man), as pointed out by De Man (1912).

Distribution. The species is only known from the upper Congo basin. The records in literature are: Upper Congo (COUTIÈRE, 1902a, 1908), Stanleyville, Belgian Congo (SCHMITT, 1926).

Macrobrachium lujae (De Man) 1912.

Palaemon (Eupalaemon) Lujae De Man 1912, p. 415.
Palaemon (Eupalaemon) Lujae De Man 1912a, p. 215, pl. 2 figs. 3—3b, pl. 3 figs. 3c– 3e.
Palaemon (Eupalaemon) Lujae De Man 1925, p. 42.
Macrobrachium lujae Schmitt 1926, p. 30, pls. 2, 3, pl. 4 fig. 1.
Macrobrachium lujae Holthuis 1949a, p. 176.
Macrobrachium lujae Holthuis 1950, p. 16.

Distribution. This species is only known from fresh water of the Belgian Congo. The records in literature are: Aba River near Aba (Ubangi River basin), N.E. Belgian Congo (SCHMITT, 1926), Stanleyville (SCHMITT, 1926), Kasai River near Tshikapa and near Kalambaie, Moakechi River near Kamaiembe, and Lulua River near Luebo, all localities lying in the Kasai district of Belgian Congo (DE MAN, 1925), Sankuru River at Kondué near Lusambo, Kasai district, Belgian Congo (DE MAN, 1912, 1912a).

[1]) LENZ (1910) mentions this locality as "Bimfälle", which means falls of the Bim River. DE MAN (1912) refers to it as Bimfille River. On the maps at my disposal I could only find a Bimbili River, which is a tributary river to the Rio Benito, and I suppose this to be the river meant by LENZ.

Macrobrachium dux (Lenz) 1910.

Palaemon (Eupalaemon) dux Lenz 1910, p. 129, pl. 3 figs. 2—5.
Palaemon (Eupalaemon) Lenzii De Man 1911a, p. 225.
Palaemon (Eupalaemon) dux De Man 1911a, p. 225.
Palaemon (Eupalaemon) dux De Man 1911b, pp. 262, 263.
Palaemon (Eupalaemon) Lenzii De Man 1911b, p. 262.
Palaemon (Eupalaemon) dux Lenz 1911, p. 313.
Palaemon (Eupalaemon) dux congoensis De Man 1912, p. 416.
Palaemon (Eupalaemon) Lenzii De Man 1912a, p. 222, pl. 2 figs. 4—4b, pl. 3 figs. 4c—4e.
Palaemon (Eupalaemon) dux De Man 1912a, p. 222, pl. 4 figs. 5—5b.
Palaemon (Eupalaemon) dux congoensis De Man 1912a, p. 229, pl. 4 figs. 6, 6a.
Palaemon (Eupalaemon) dux Balss 1914, p. 98.
Palaemon (Eupalaemon) Lenzii De Man 1925, p. 41, figs. 11a, b.
Palaemon (Eupalaemon) dux (with the varieties *tenuicarpus* and *congoensis*) De Man 1925, p. 43, figs. 10 f, g, 12 a—m.
Macrobrachium dux Schmitt 1926, pp. 33, 65, pl. 4 fig. 2, pl. 5, pl. 6 fig. 1.
Palaemon (Eupalaemon) dux J. Roux 1927, p. 238.
Macrobrachium dux Holthuis 1949a, p. 176.
Macrobrachium dux Holthuis 1950, p. 13.

Schmitt (1926) made it perfectly clear that the forms *Palaemon dux*, *P. Lenzii*, *P. dux congoensis* and *P. dux tenuicarpus* as they are recognized by De Man, are but a single species.

Distribution. The species inhabits West African fresh waters. The records in literature are: Rio Benito, Rio Muni (De Man, 1911a, b; Lenz, 1911), Odavo River, Ogowé basin, Gabon (J. Roux, 1927), Mbima near Uele River, Belgian Congo (De Man, 1912, 1912a), Uele River near Dungu (De Man, 1925), Koloka, between Uele and Ituri Rivers (Balss, 1916), Pilipili near Avakubi (De Man, 1925), Ituri River near Avakubi (Lenz, 1910, 1911; De Man, 1911a, b, 1925; Schmitt, 1926), Niapu near Ituri River (Schmitt, 1926), Ituri River near Panga and near Banalia (De Man, 1925), Kole River, a branch of the Ituri River (De Man, 1912, 1912a, 1925), Elisabetha near Basoko, Congo River (De Man, 1925), Lindi River near Makala and Bafwasende (De Man, 1925), Batama near Lindi River (Schmitt, 1926), Tumba Lake near Bikoro, Lukenie River near Oshwe, Kasai River near Tshikapa, Lukonga River at Kidada near Kitobolo (De Man, 1925), Mateke River near Ganda Lundi, Lundu and Buto-Polo near Chiloango River, Mala River near Mbuma, Vembra River near Kisala, all 5 localities lying in the Chiloango basin (De Man, 1925), Lower Congo, probably near Boma (De Man, 1911a, b).

Macrobrachium raridens (Hilgendorf) 1893.

Palaemon (Eupalaemon?) paucidens Hilgendorf 1893, p. 155 (non De Haan 1841).
Palaemon (Eupalaemon) raridens Hilgendorf 1893a, p. 181.
Palaemon (Macrobrachium) raridens Hilgendorf 1893b, p. 217.
Palaemon paucidens De Man 1900, p. 63.
Bithynis paucidens Rathbun 1900, p. 315.
Palaemon (Eupalaemon) paucidens De Man 1911b, pp. 261, 263, 264.
Palaemon (Eupalaemon) paucidens Lenz 1911, p. 313, figs. a, b.
Palaemon paucidens Gruvel 1912, p. 16.

Palaemon (Eupalaemon) paucidens De Man 1912a, pp. 199, 201.
Palaemon paucidens Sollaud 1923, p. 558, figs. 14—17.
Palaemon (Eupalaemon) Pancidens Irvine 1932, p. 17.
Palaemon (Eupalaemon) paucidens J. Roux 1935b, p. 27.
Palaemon (Eupalaemon) paucidens Irvine 1947, p. 306, fig. 212.
Macrobrachium raridens Holthuis 1949a, p. 176.
Macrobrachium raridens Holthuis 1950, p. 18.

The present species is best known as *Palaemon paucidens* Hilg. This name, however, is preoccupied by the much older name *Palaemon paucidens* de Haan. Hilgendorf (1893a) himself already proposed a new name, *P. raridens*, for the species and moreover used this new name in a later publication. Nevertheless the name *Palaemon raridens* has been overlooked by all subsequent authors.

Distribution. *Macrobrachium raridens* lives in fresh waters of the northern part of tropical West Africa. The records in literature are: Mamu, French Guinea (Gruvel, 1912), Futa Jallon, French Guinea (Sollaud, 1923), Danané, Doukoué, Man, Nigoualé near Man, Lobo near Daloa, and Toumodi, Ivory Coast (J. Roux, 1935b), Gold Coast (Irvine, 1932), Begoro, Gold Coast (Irvine, 1947), Adeli near Bismarckburg, Togo (Hilgendorf, 1893), Nigeria (Sollaud, 1923). J. Roux (1935b, p. 30) states that the present species also inhabits Cameroons, but he does not mention on which data he bases this statement.

Macrobrachium chevalieri (J. Roux) 1935.

?*Palaemon Olfersi* p. p. Greeff 1882, p. 30.
Palaemon (Macrobrachium?) sp. De Man 1904, p. 319, pl. 20 figs. 75—80.
Palaemon (Macrobrachium?) sp. De Man 1912a, p. 199.
Palaemon chevalieri (Macrobrachium) J. Roux 1935a, p. 193, figs. 1, 2.
Macrobrachium chevalieri Holthuis 1949a, p. 177.
Macrobrachium chevalieri Holthuis 1950, p. 13.

Greeff (1882) described a large material of what he considered to be *Palaemon Olfersi*. One of the male specimens (mentioned by him on p. 34) differed from the rest by being much larger, by having the second legs not as much swollen as the other adult males, by having the ischium and merus of the large legs covered on the inner side with felt-like hairs, and by having the fingers not gaping. It seems very probable to me that this large specimen belongs to *Macrobrachium chevalieri* (Roux), though Greeff still gives too few data of the specimen to make its identity certain. The other specimens brought by Greeff to *Palaemon Olfersi* probably are *Macrobrachium zariquieyi* Holth. (vid. there).

Distribution. The species is restricted to West African fresh waters. The records in literature are: Paul, São Antão, Cape Verde Islands (J. Roux, 1935a), ?São Thomé (Greeff, 1882), Katumbella near Benguella, Angola (De Man, 1904; Holthuis, 1949a).

Macrobrachium felicinum Holthuis 1949.

Palaemon (Macrobrachium) Olfersii De Man 1904, p. 314, pl. 20 figs. 54—74.
Macrobrachium felicinum Holthuis 1949a, p. 183.
Macrobrachium felicinum Holthuis 1950, p. 14.

Distribution. The species inhabits fresh waters. It is only known with certainty from the following localities: Pra River, Gold Coast (De Man, 1904), Katumbella near Benguella, Angola (De Man, 1904; Holthuis, 1949a). The species has pro-

bably been recorded more than once under the name *Palaemon* (or *Macrobrachium*) *olfersii*. The West African records of the latter species include *M. felicinum*, *M. zariquieyi* and possibly also *M. chevalieri*. In only very few cases the identity of the specimens recorded can be made out. All the doubtful records are given here under *Macrobrachium zariquieyi* Holth.

Macrobrachium zariquieyi Holthuis 1949.

? *Palaemon Olfersi* Greeff 1882, p. 30.
? *Palaemon Olfersi* Greeff 1884, p. 54.
? *Palaemon Olfersi* Osorio 1887, p. 223.
? *Palemon Olfersi* Osorio 1888, p. 190.
? *Palaemon Olfersi* Osorio 1889, pp. 129, 139 (*Palemon Olfersii* on p. 139).
? *Palaemon Olfersi* Osorio 1891, p. 47.
? *Palaemon Olfersi* Osorio 1892, p. 200.
Palemon spinimanus Bouvier 1895, p. 159, fig. 1.
? *Palaemon Olfersi* Osorio 1895, p. 249.
? *Palemon Olfersii* Osorio 1895a, p. 251.
? *Palaemon Olfersi* Osorio 1895b, p. 57.
? *Palaemon Olfersi* Aurivillius 1898, p. 23.
? *Palemon Olfersi* Osorio 1898, pp. 186, 194.
? *Palaemon olfersii* Doflein 1900, p. 128.
? *Bithynis olfersii* Rathbun 1900, p. 316.
? *Bithynis Olfersi* Bouvier & Lesne 1901, p. 13.
? *Palaemon (Bithynis) Olfersi* Lönnberg 1903, p. 46.
? *Palemon (Macrobachium) Olfersi* Bouvier 1906, p. 493.
? *Palaemon (Macrobrachium) Olfersi* Gravier 1909, p. 78.
Palaemon (Macrobrachium) Olfersi Gravier 1909a, p. 123, figs. 1, 2.
? *Bithynis olfersii* Sendler 1912, p. 207.
? *Palaemon olfersii* Balss 1914, p. 98.
? *Macrobrachium olfersii* Schmitt 1926, p. 40.
Macrobrachium zariquieyi Holthuis 1949a, p. 178, figs. 1, 2.
Macrobrachium zariquieyi Holthuis 1950, p. 19.

Distribution. The present species inhabits fresh-waters of the West African region. At present it is only known with certainty from the following localities: Rio Consul, Fernando Po (Holthuis, 1949a) and São Thomé (Bouvier, 1895), both localities situated in the Gulf of Guinea. Of the rather large number of records of *Palaemon* (or *Bithynis*, or *Macrobrachium*) *olfersii* Wiegm. from West Africa part are in all probability based on this and part on the previous species (*M. chevalieri* and *M. felicinum*). Of all these records only that of Bouvier (1895) could be proved to be based on *M. zariquieyi* and that of De Man (1904) on *M. felicinum*. All the other records give too little information about the material to make the identity of the latter certain. These doubtful records are from the following localities: Etome, Cameroons (Aurivillius, 1898), Meme River (Lönnberg, 1903), Bibundi, N.W. of Victoria (Aurivillius, 1898; Sendler, 1912), Isongo (Sendler, 1912), Victoria, Cameroons (Doflein, 1900), Malela, Belgian Congo (Schmitt, 1926), Biapa, Fernando Po (Osorio, 1895b), Rio Consul, Fernando Po (Balss, 1914), Rio Queté, Principe (Osorio, 1888), Rio Papagaio (Osorio, 1889), Rio Banzu, Principe (Osorio, 1895a), São Thomé (Greeff, 1882, 1884; Osorio, 1887; Bouvier & Lesne, 1901; Balss, 1914), Rio Quija (Osorio, 1891), Portinha (Osorio, 1892), Rio do Ouro, São Thomé (Bouvier, 1906; Gravier, 1909, 1909a), Rio São João, Anno Bom (Osorio,

1895), Crater Lake, Anno Bom (BALSS, 1914). Several authors state that GREEFF reports the species from the island Rolas near São Thomé. This is not true, however, since GREEFF mentions the species only from São Thomé itself. Furthermore GREEFF in another paper described Rolas to be very dry, having no fresh water except for some pools in the rainy season.

Macrobrachium vollenhovenii (Herklots) 1857.

Palaemon Vollenhovenii Herklots 1857, p. 96.
Palaemon jamaicensis p. p. Semper 1868, p. 585.
Palaemon Vollenhovenii De Man 1879, p. 178.
Palaemon Jamaicensis Osorio 1887, p. 230.
Palaemon Jamaicensis Osorio 1888, p. 189.
Palaemon vollenhoveni Büttikofer 1890, p. 487.
Palaemon Jamaicensis p. p. Miers 1891, p. 124.
Palaemon vollenhovenii Ortmann 1891, p. 731.
Palemon Jamaicensis Osorio 1892, p. 200.
Palaemon vollenhovii Thallwitz 1892, p. 14.
Palaemon jamaicensis ? Benedict 1893, p. 540.
Palaemon (Macrobrachium) vollenhoveni Hilgendorf 1893b, p. 217.
Palaemon jamaicensis africanus Bouvier 1895, p. 160.
Palaemon Jamaicensis Osorio 1895b, p. 57.
Palaemon jamaicensis Vollenhoveni Aurivillius 1898, p. 16, pl. 2 figs. 1—5.
Palemon jamaicensis Osorio 1898, pp. 186, 194.
Palaemon Vollenhovenii De Man 1900, p. 64.
Bithynis jamaicensis vollenhovenii Rathbun 1900, p. 315.
Palaemon (Bithynis) jamaicensis Vollenhoveni Lönnberg 1903, p. 45.
Palaemon (Macrobrachium) jamaicensis Vollenhovenii De Man 1904, p. 309, pl. 19 fig. 38.
Palaemon (Macrobrachium) jamaicensis angolensis De Man 1904, p. 314, pl. 19 figs. 39—45, 47, pl. 20 figs. 46, 48—53.
Palemon jamaicensis Osorio 1905, p. 102.
Palaemon vollenhoveni Johnston 1906, p. 862.
Palaemon (Macrobrachium) jamaicensis Vollenhovenii Nobili 1906, p. 297.
Palaemon Jamaicensis Osorio 1906, p. 150.
Palaemon (Macrobrachium) jamaicensis vollenhovenii Pearse 1911, p. 135.
Palaemon jamaicensis Vollenhoveni Gruvel 1912, p. 14, pl. 2 fig. 4.
Palaemon (Parapalaemon) Vollenhovenii De Man 1912a, p. 232.
Palaemon (Macrobrachium) jamaicensis Herklotsii De Man 1912a, p. 239.
Bithynis jamaicensis vollenhovenii Sendler 1912, p. 206.
Palaemon (Macrobrachium) jamaicensis Herclotsii Balss 1914, p. 98.
Palaemon (Parapalaemon) Vollenhovenii De Man 1925, p. 50, figs. 14a—d.
Palaemon (Macrolerocheir) jamaicensis Herklotsii De Man 1925, p. 51, figs. 15a—d.
Macrobrachium vollenhovenii Schmitt 1926, pp. 37, 65, pl. 6 fig. 2, pl. 7.
Palaemon (Parapalaemon) vollenhoweni J. Roux 1927, p. 238.
Macrobrachium Vollenhoveni Monod 1933, p. 464.
Palaemon (Macrobrachium) jamaicensis vollenhoveni J. Roux 1935a, p. 190.
Palaemon (Macrobrachium) vollenhoveni J. Roux 1935b, p. 30.
Macrobrachium vollenhoveni Holthuis 1949a, p. 184
Macrobrachium vollenhovenii Holthuis 1950, p. 19

Material examined:

Station 94, Isheri, Ogun River, 12 miles N. of Lagos, Nigeria; February 8, 1946. — 1 specimen 155 mm.

Station 127, Boma, Belgian Congo; bought; March 10, 1946. — 4 specimens 151 -167 mm.

The specimens from Station 127 all are males and have the chelae rather well developed. These chelae still bear some traces of the original colouration. The fingers are dark blue, almost black, only the tips of the large teeth are pale yellowish brown. Furthermore, there is a broad dark blue longitudinal streak, which extends over the whole length of the upper half of the outer surface of the palm. The lower part of the palm bears a much less sharply defined very pale blue streak. Both these blue streaks are continued on the carpus and the merus; the upper one is more distinct on the palm than on the other joints, the lower is of about the same intensity of colour on all three joints.

Distribution. The present species is very common in West African fresh waters. It has been recorded in literature from: Cape Verde Islands (SEMPER, 1868; OSORIO, 1888; MIERS, 1891; BOUVIER, 1895), São Antão (J. ROUX, 1935a), Ribeira Brava, São Nicolau, Cape Verde Islands (OSORIO, 1905), Senegal (GRUVEL, 1912), Coyah River, French Guinea (GRUVEL, 1912), Liberia (BÜTTIKOFER, 1890; DE MAN, 1904; JOHNSTON, 1906), mouth of Mesurado River near Monrovia, and St. Paul's River near Mount Coffee, Liberia (RATHBUN, 1900), Man, Ivory Coast (J. ROUX, 1935b), Sassandra and Comoe Rivers (GRUVEL, 1912), Assini, Ivory Coast (BOUVIER, 1895), Gold Coast[1]) (HERKLOTS, 1857; BOUVIER, 1895), Pra River, Gold Coast (DE MAN, 1904), Togo (HILGENDORF, 1893b), Abomey, Dahomey (MONOD, 1933), Ahémé Lake and Ouémé River near Zagnanado, Dahomey (GRUVEL, 1912), Lagos, Nigeria (ORTMANN, 1891), Elephant Lake near Johann-Albrechtshöhe, Cameroons (LÖNNBERG, 1903), Meme River (AURIVILLIUS, 1898; LÖNNBERG, 1903), Bibundi (SENDLER, 1912), Efulan, Kribi (PEARSE, 1911), Afán, Nkolumbembe, Cameroons (BALSS, 1914), Bassapó, Fernando Po (OSORIO, 1895b), Rio Consul, Fernando Po (HOLTHUIS, 1949a), Rio Quija and Rio Gamoela, São Thomé (OSORIO, 1892), Rio Agua Izé, São Thomé (OSORIO, 1906), near Cabo San Juan, Rio Muni (NOBILI, 1906), Gabon (BOUVIER, 1895; GRUVEL, 1912), Ogowé River, Gabon (BOUVIER, 1895), Port Gentil near Cape Lopez, Gabon (J. ROUX, 1927), Congo (DE MAN, 1879, 1904; BOUVIER, 1895), Kouilou River, French Congo (BOUVIER, 1895), Upper Congo (RATHBUN, 1900), Matadi and Boma, Belgian Congo (GRUVEL, 1912), Malela (GRUVEL, 1912; SCHMITT, 1926), Ganda Lundi, Kisala, and Mbuma, Mayumbe region, Chiloango basin (DE MAN, 1925), Banana, Belgian Congo (DE MAN, 1912a, 1925), Cuanza River, Angola (GRUVEL, 1912), Cuanza River near Kunga (BENEDICT, 1893), Katumbella (OSORIO, 1887; DE MAN, 1904; GRUVEL, 1912), Benguella and Biballa (OSORIO, 1887), Kunene River, S. Angola (GRUVEL, 1912).

[1]) HERKLOTS (1857) gave as the locality of his type material "côte de Guinée", but as the collector, H. S. PEL, only made collections on the Gold Coast, we safely may assume that as the type locality of the species.

Subfamily ***Pontoniinae.***

Palaemonella atlantica n. sp.

(Fig. 31).

Material examined:

Station 39, São Pedro Bay, São Vicente, Cape Verde Islands, 16°50′ N, 25°04′ W; triangular dredge (45 cm.), bottom Foraminifera and corals; December 10, 1945, 14h40. — 1 ovigerous female 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, 14h10. — 1 ovigerous female 11 mm.

Description. The rostrum is curved somewhat upwards, it reaches about to the end of the antennular peduncle. The upper margin bears 9 teeth. The first two of these are situated on the anterior half of the carapace behind the orbit. The intervals between the teeth become smaller anteriorly. The lower margin of the rostrum bears 2 or 3 teeth. The carapace is smooth. There is a distinct postorbital ridge, which runs upwards from the antennal spine. The lower orbital angle is somewhat triangularly produced. The antennal spine is strong and placed a small distance below the orbital angle on the anterior margin of the carapace. A short carina runs from the antennal spine backwards. The hepatic spine is somewhat smaller than the antennal and is placed behind and below it.

The abdomen is smooth. The third segment has the posterior margin produced slightly backwards in the middle; there is no hump there, however. The pleurae of the first four abdominal segments are broadly rounded. The pleurae of the fourth segment are narrower than those of the first three somites. The pleurae of the fifth segment end in a sharp posteriorly directed point. The sixth segment is a little less than 1.5 times as long as the fifth, its pleurae are small and end in a blunt point, the posterolateral angles, however, are sharply pointed. The telson is 1.5 times as long as the sixth abdominal segment. The dorsal surface bears two pairs of well developed spines, which divide the surface into three almost equal parts. The posterior margin of the telson bears three pairs of spines, the outer of which are short, the intermediate longest. The inner spines are slender, but somewhat shorter than the intermediate.

The eyes are well developed. The cornea is globular and slightly shorter than the stalk. An inconspicuous ocellus is present.

The basal segment of the antennular peduncle is broad. The stylocerite is slender and pointed, it almost reaches the middle of the basal segment. The anterolateral angle of the segment bears a distinct spine, which overreaches the slightly convex anterior margin of the basal segment and attains the middle of the second segment of the peduncle. The second and third segments are rather short, together they are about half as long as the basal

segment. The upper antennular flagellum has the two rami fused for about 9 joints, the free part is very short and consists of about three joints.

The scaphocerite slightly overreaches the antennular peduncle. It is slightly more than three times as long as broad. The outer margin is slightly concave and ends in a sharp final tooth, which distinctly overreaches the lamella. The latter is of about equal breadth throughout its entire length,

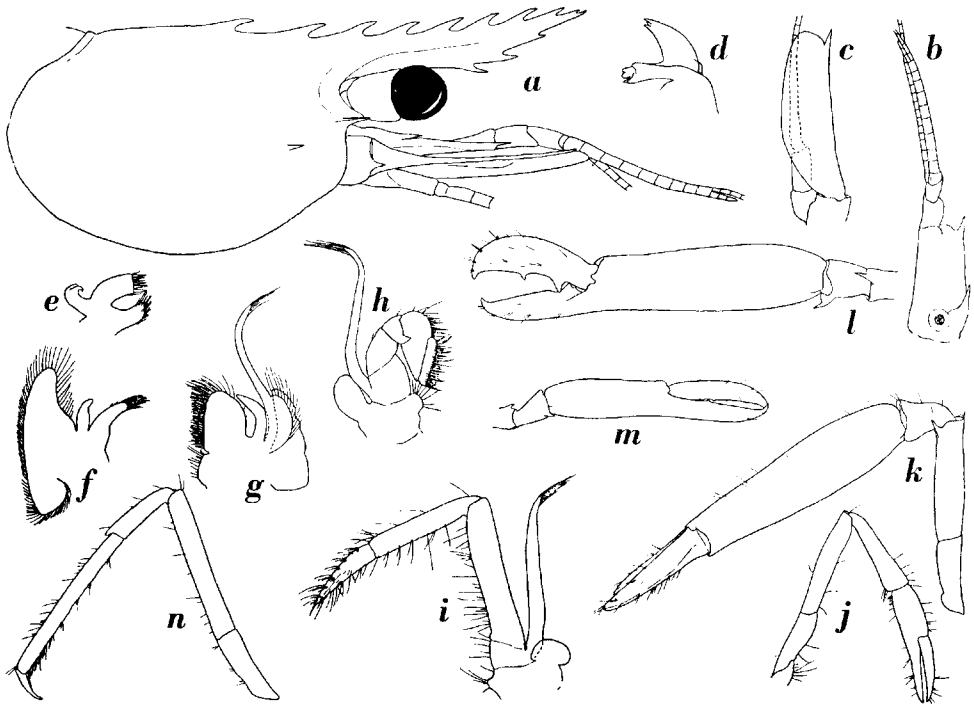

Fig. 31. *Palaemonella atlantica* n. sp. a, carapace in lateral view; b, antennula; c, antenna; d, mandible; e, maxillula; f, maxilla; g, first maxilliped; h, second maxilliped; i, third maxilliped; j, first pereiopod; k, larger second pereiopod in dorsal view; l, distal part of larger second pereiopod in lateral view; m, distal part of smaller second pereiopod; n, third pereiopod. a, ×13; b, c, j, n, ×10; d–i, ×15; k, l, m, ×7.

it only tapers very slightly anteriorly and ends in a broad and rounded anterior margin. The antennal peduncle distinctly fails to reach the middle of the scaphocerite. An external spine is present near the base of the scale.

The mandible possesses a small one-jointed palp, which bears a seta on the apex. The incisor process ends in three sharp teeth, while the molar process bears some broad distal teeth. The maxillula has the lower endite rather slender, the upper one bears some spines and is broader; the palp is distinctly bilobed. The maxilla has the endite simple, the palp is normal, the scaphognathite not very broad. All maxillipeds bear well developed exopods. The first maxilliped has the endites of the basis and coxa separated

by a deep notch, the palp is well developed, the exopod has the caridean lobe rather narrow, the epipod is large, being strongly produced upwards. The second maxilliped is of the usual shape, no podobranch is present on the epipod. The third maxilliped reaches to the end of the first segment of the antennular peduncle. The ultimate joint has $^2/_3$ of the length of the penultimate and is about half as long as the antepenultimate. An epipod is present.

The first pereiopod reaches with part of the chela beyond the scaphocerite. The fingers are unarmed, they are elongate and somewhat longer than the palm. The carpus is about $^4/_5$ of the length of the chela. The merus is almost as long as the chela and less than twice as long as the ischium. The second legs are unequal and rather heavy. The larger reaches with the entire chela beyond the scaphocerite. The fingers are slightly more than half as long as the palm. The dactylus is rather high and has the upper margin distinctly convex. The cutting edge bears two teeth, the anterior of these is the smaller and is placed slightly before the middle of the cutting edge, the posterior tooth is narrowly triangular. The cutting edge of the fixed finger bears one large and one small tooth, which are placed close together behind the posterior tooth of the dactylus. The palm is slightly swollen. The carpus is short and conical, it is about $^1/_4$ of the length of the palm. The anterior margin of the carpus bears a strong subterminal anteriorly directed spine in its lower part. The merus is about half as long as the palm, it bears a distinct anteroventral tooth at its outer surface. The ischium is somewhat more than half as long as the merus. The smaller leg reaches with part of the palm beyond the scaphocerite. The fingers have $^4/_5$ of the length of the palm and are equal in height. The cutting edge of the dactylus bears two minute teeth in its proximal half, while the cutting edge of the fixed finger bears a similar tooth, which is placed between the upper two. The shape of the rest of the leg is almost like that of the larger, the spine on the carpus and the tooth on the merus are also present here, though they are smaller than in the large leg. The last three pereiopods are of about the same shape. The third reaches with a small part of the propodus beyond the scaphocerite. The dactylus is short and simple. The propodus is about four times as long as the dactylus, its posterior margin bears numerous spinules, the distals of which are longest and most crowded. The carpus is $^2/_5$ of the length of the propodus, while the merus is slightly shorter than this joint.

The pleopods in both my female specimens are quite typical of the genus. The uropods are ovate. The outer margin of the exopod ends in a small tooth, which on its inner side bears a movable spinule.

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

Type. Holotype is the specimen from Station 39.

The present species shows most resemblance to *Palaemonella tenuipes* Dana from the Indo-westpacific region, with which species it agrees in the spinulation of the second legs, especially in that of the carpus. *Palaemonella tenuipes* possesses a large subterminal spine on the carpus of the second legs, which spine lacks in all the other Indo-westpacific species. *Palaemonella atlantica* differs from *P. tenuipes* in the broader scaphocerite, which strongly resembles that of *Palaemonella lata* Kemp, by having the mandibular palp only one-jointed, and in the shape of the fingers of the second legs. Unfortunately, I have no specimens of *Palaemonella tenuipes* at my disposal for direct comparison.

Up till now the genus *Palaemonella* was only known from the Indo-westpacific and East Pacific areas. All records in literature of this genus from East American waters were based on species of the genus *Periclimenes*.

Periclimenes (*Periclimenes*) *scriptus* (Risso) 1822.

Restricted synonymy:

Alpheus scriptus Risso 1822, p. 247.
Urocaris de Mani Balss 1916, p. 29, fig. 10.
Periclimenes (Periclimenes) scriptus Kemp 1922, p. 147.

Material examined:

Station 39, São Pedro Bay, São Vicente, Cape Verde Islands, 16°50′ N, 25°04′ W; triangular dredge (45 cm.), bottom Foraminifera and corals; December 10, 1945, $14h^{40}$. — 1 ovigerous female 17 mm.

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, 15h—18h. — 2 specimens 12 and 17 mm.

Station 129, off Angola, 6°0.2′ S, 12°20′ E; bottom sample Jiv; Petersen grab, 12 m. depth, bottom muddy sand; March 15, 1946, $7h^{24}$. — 1 ovigerous female 17 mm.

Station 141, Freetown, Sierra Leone; Commercial otter trawl, 15 m. depth, bottom sand; April 9, 1946, 11h—16h. — 2 ovigerous females 23 and 24 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, $7h^{45}$—$10h^{10}$. — 16 specimens (including 6 ovigerous females, 15—21 mm.) 9—21 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, $14h^{20}$—$16h^{10}$ — 1 specimen 9 mm.

Station 147, off French Guinea, 9°28′ N, 14°58′ W; Sigsbee trawl, 45 m. depth, bottom shells and Foraminifera; April 14, 1946, $8h^{55}$—$9h^{35}$. — 1 specimen 20 mm.

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^m—16^h55^m. — 3 specimens (including 2 ovigerous females, 18 and 19 mm.) 14—19 mm.

Station 151, off French Guinea, 10°40′ N, 16°44′ W; Sigsbee trawl, 65 m. depth, bottom coarse sand; April 16, 1946, 8^h55^m. — 1 ovigerous female 21 mm.

Station 163, off Senegal, 13°43′ N, 17°23′ W; Sigsbee trawl and otter trawl, 65—89 m. depth; April 25, 1946, 10^h00^m. — 1 ovigerous female 21 mm.

The extensive collection of the present species gathered by the Atlantide-Expedition distinctly shows the large variability of various characters. The rostrum sometimes reaches to the middle of the third segment of the antennular peduncle, sometimes it overreaches the scaphocerite. The upper margin may be straight, convex, or slightly concave. The rostral formula is:

$$\frac{2 - 3)\ 7 - 11}{2 - 3}.$$

In the present specimens generally 9 or 10 teeth may be observed on the upper margin. The first of the upper rostral teeth is always placed slightly before or in the middle of the carapace. Sometimes the teeth are regularly divided over the rostrum, but often the distances between the first three teeth are larger than those between the others.

The upper antennular flagellum has the fused part relatively short in the present material, it contains 5 to 10 joints (in the Mediterranean specimens there are up to 16 fused joints), the free joints of the shorter ramus are 3 to 7 in number.

The fingers of the second legs are as long as, somewhat longer, or slightly shorter than the palm. They are always very slender. The carpus in the present material never attains the slenderness of the Mediterranean specimens seen by me. The greater part has the carpus about as slender as figured by me recently (Holthuis, 1949, fig. 4c) for specimens from the Canary Islands, the specimen from Station 151 even being somewhat more slender. The specimen from Station 129 has the carpus about as heavy as in the specimen from Gabon figured by Balss (1916, fig. 10). It looks as if the specimens of this species have the carpus more heavy the more southwards they live. The differences between the present material and Mediterranean specimens are only gradual and even variable in material from one locality, so that I am fully convinced that all these forms belong to one large species. Kemp (1924) already pointed out the probability that *Urocaris de Mani* Balss is identical with *Periclimenes scriptus*. The present material fully confirms this.

Periclimenes scriptus (Risso) and *P. amethysteus* (Risso) are two closely related but undoubtedly distinct species, which both occur in the Mediterranean. The two species have often been confused, so that it is difficult

to form a correct idea of the exact range of distribution of each of them. *Periclimenes scriptus* is known with certainty from the Western Mediterranean, the Adriatic, the Canary Islands and the West coast of Africa down to Belgian Congo. *Dennisia sagittifera* Norman from the Channel Islands is placed by most authors in the present species, it is, however, undoubtedly synonymous with *Periclimenes amethysteus*. So far the only record of *Periclimenes scriptus* from West Africa is that by BALSS (1916) who described and figured the species from Sette Camma, Gabon.

Periclimenes (*Harpilius*) *platalea* n. sp.
(Fig. 32).

Material examined:

Station 39, São Pedro Bay, São Vicente, Cape Verde Islands, 16°50′ N, 25°04′ W; triangular dredge (45 cm.), bottom Foraminifera and corals; December 10, 1945, 14^{h40}. — 3 specimens (including 1 ovigerous female, 17 mm.) 12—17 mm.

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, 15h—18h. — 6 specimens 10—15 m.

Description. The rostrum is straight and reaches only slightly beyond the base of the second segment of the antennular peduncle. The upper margin is convex and bears 8 or 9 teeth. The first of these teeth is very small and placed a great distance behind the other teeth. It is the only tooth situated on the carapace behind the orbit. The lower margin bears no teeth at all. The rostrum is highest just above the posterior margin of the orbit and gradually tapers towards the top. The lower orbital angle is produced forwards into a broadly rounded lobe. The antennal spine is well developed and placed just below this lobe on the anterior margin of the carapace. The hepatic spine is placed behind the antennal spine and lies at about the same level with it, or even slightly higher. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The posterior margin of the third segment is somewhat produced in the middle, but does not form a distinct hump-like organ as for instance in *Periclimenes aesopius* (Bate). The pleurae of the first five abdominal segments are broadly rounded. The sixth segment is twice as long as the fifth. The pleurae of the sixth segment are very small and rounded, the posterolateral angles of the segment end in a blunt point. The telson has $^2/_3$ of the length of the sixth abdominal segment. The dorsal surface bears two pairs of spines, the anterior of which lies in the middle of the length of the telson. The other pair lies about midway between the anterior pair and the posterior margin of the telson. This posterior margin is narrow, it ends in a sharp tip and bears three pairs of spinules. The outer of these spinules are shortest, the intermediate longest.

The eyes are elongate. The cornea is rounded, it is distinctly shorter than, but more than half as long as the stalk.

The basal segment of the antennular peduncle has the stylocerite slender, pointed, and reaching about to the middle of the length of the basal segment. The anterolateral angle of the segment ends in a strong spine directed slightly outwards; it reaches about as far forwards as the anterior margin of the segment. The second and third segments of the peduncle together are more than half as long as the basal segment. The upper antennular flagellum has the two rami fused for 5 or 6 joints, the free part of the shorter ramus also consists of 5 or 6 joints and is slightly shorter than the fused part.

The scaphocerite reaches slightly beyond the antennular peduncle. It is about 4 times as long as broad. The outer margin is slightly concave. The final tooth is strong, but is distinctly overreached by the lamella. The antennal peduncle reaches about to the middle of the scaphocerite, it bears a distinct spine at the outer side near the base of the scaphocerite.

The oral parts are normal in shape. The mandible bears no palp, there are numerous spinules at the end of the molar process; the incisor process ends in three teeth. The maxillula has the lower endite slender, the upper is broader and bears several small spinules, the palp is distinctly bilobed. The maxilla has the endite simple, the palp and scaphognathite are normal in shape. All maxillipeds are provided with well developed exopods. The first maxilliped has the basal and coxal endites fused, the palp is slender, the caridean lobe rather broad and the epipod slightly bilobed. The second maxilliped is of the usual shape, the epipod does not bear a podobranch. The third maxilliped reaches about to the base of the scaphocerite. The last joint is slightly shorter than the penultimate and slightly less than half as long as the antepenultimate. The exopod fails to reach the end of the antepenultimate joint. An epipod is present.

The first pereiopod reaches to or beyond the end of the antennal peduncle. The fingers are slightly shorter than the palm. They are peculiar in being dorsoventrally depressed: when seen in lateral view they are very narrow, but they are broad in dorsal view, while they even are spoon-like broadened near the apex. The fingers thus in a way resemble the bill of a spoonbill (*Platalea leucorodia* L.). The fingers are unarmed. The carpus is about $^5/_4$ as long as the chela and almost as long as the merus. The second legs are equal in shape, but generally somewhat unequal in size. They are slender and reach to or beyond the end of the scaphocerite. The fingers are unarmed and measure $^1/_2$ to $^3/_4$ of the length of the palm. They are of the usual form, being laterally compressed. The palm is elongate. The carpus is slightly longer than the whole chela and has $^5/_7$ of the length of the merus. Both the carpus and the merus bear no spines at all. The ischium is somewhat more than half as long as the merus. The last three legs are of about equal shape. The third reaches about to the end of the scaphocerite. The dactylus

is large, simple and distinctly curved. The propodus is about three times as long as the dactylus, it is slightly curved in the distal part. The posterior margin of the propodus bears some long and slender spines in the distal half. The convex curve of the distal part of the posterior margin, together

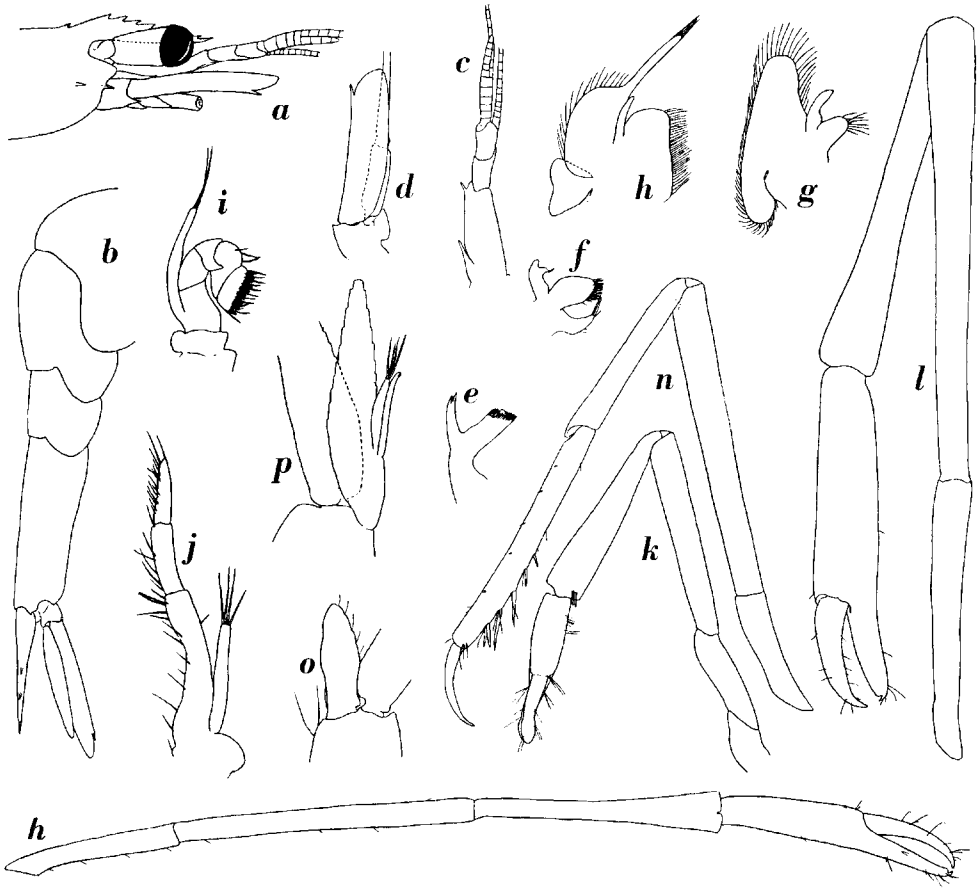

Fig. 32. *Periclimenes platalea* n. sp. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, antennula; d, antenna; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped; j, third maxilliped; k, first pereiopod; l, second pereiopod (specimen from Station 39); m, second pereiopod (specimen from Station 45); n, third pereiopod; o, endopod of first pleopod of male; p, endopod of second pleopod of male. a—d, ×17; e p, ×32.

with the presence of these long spines and the long and curved dactylus give the leg the appearance of a prehensile organ. The carpus is about $^3/_4$ of the length of the propodus and $^3/_5$ of the length of the merus.

The first pleopod of the male has the endopod short and ovate, with some hairs at the inner margin. The endopod of the second pleopod of the male has the appendix masculina slightly shorter and broader than the

appendix interna. The second to fifth pleopods in both sexes bear an appendix interna. The uropods are elongate. The outer margin ends in a tooth, which at its inner margin bears a movable spine.

The eggs are rather few in my ovigerous females and measure about 0.4 to 0.6 mm. in diameter.

Type. Holotype is the largest specimen from Station 45.

The species strongly resembles a yet undescribed form from the Malay Archipelago, which will be described later. The two species agree in having the hepatic spine placed slightly higher than or as high as the antennal, in the slender shape of the antennula and scaphocerite, in the shape of the chelae of the first legs and that of the last three legs. In the Indo-westpacific species, however, the rostrum is more slender and reaches to the end of the antennular peduncle, the eyes have the stalk twice as long as the cornea, while the second legs have the carpus 1.5 times as long as the chela.

Pontonia pinnophylax (Otto) 1821.

Restricted synonymy:

Palaemon pinnophylax Otto 1821, p. 12.
Pontonia tyrrhena Schmitt 1926, p. 40, fig. 66 (non *Astacus tyrrhenus* Petagna 1792).
Pontonia tyrrhena J. Roux 1927, p. 238.
Pontonia pinnophylax Delamare Deboutteville 1948, p. 444.

Distribution. This species lives commensally within species of the genus *Pinna* L. (*Mollusca Lamellibranchiata*). It is known throughout the Mediterranean, the Azores and the West African coast. The West African records are: Port Gentil near Cape Lopez, Gabon (J. Roux, 1927; Delamare Deboutteville, 1948), São Paulo de Loanda, N. Angola (Schmitt, 1926).

Pontonia flavomaculata Heller 1864.

Restricted synonymy:

Pontonia flavomaculata Heller 1864, p. 51.

Material examined:

Station 153, off French Guinea, 10°49′ N, 16°39′ W; Sigsbee trawl, 42 m. depth, bottom coarse sand; April 16, 1946, $13h^{20}$– $13h^{50}$. – 1 specimen 11 mm.

The present specimen lacks both second legs. In all other characters it shows a perfect resemblance to *Pontonia flavomaculata*, so that I do not hesitate to identify it with that species. Like so many West African representatives of Mediterranean species, the present specimen is also much smaller than *Pontonia flavomaculata* specimens from the Mediterranean.

Distribution. *Pontonia flavomaculata* is a species from shallow littoral waters, where it is always found living within Ascidians like *Ascidia mentula*

(O. F. Müll.) and *Ascidia mammillata* (Cuv.). It has been recorded up till now from the Western Mediterranean and the Adriatic, while DE MAN (1926) reported upon several specimens from the Atlantic coast of Morocco, 33°24′ N, 8°24′46″ W and 32°44′30″ N, 9°2′30″ W. The present locality forms the southernmost point of the known range of distribution of the species.

Balssia gasti (Balss) 1921.

Amphipalaemon Gasti Balss 1921, p. 524, figs. 1—8.
Balssia gasti Kemp 1922, p. 267.
Balssia gasti Zariquiey Cenarro 1935, p. 97.
Balssia gasti Zariquiey Cenarro 1935a, p. 101, figs. 1—14.
Balssia gasti Zariquiey Alvarez 1946, p. 87, figs. 111, 112.
Balssia gasti Zariquiey Alvarez 1950, p. 79.

Material examined:

Station 145, off French Guinea, 9°20′ N, 14°15′ W; Sigsbee trawl and otter trawl, bottom shells and Foraminifera; April 13, 1946, 7h—10h. — 3 specimens (including 1 ovigerous female, 12 mm.) 9—12 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 specimen 8 mm.

Station 153, off French Guinea, 10°49′ N, 16°39′ W; Sigsbee trawl, 42 m. depth, bottom coarse sand; April 16, 1946, $13h^{20}$—$13h^{50}$. — 1 ovigerous female 12 mm.

The present specimens agree well with the descriptions and figures given in literature of this rare species. In my material the ovigerous female has the fixed finger of the second legs broadened only at the external side and much less distinctly than in ZARIQUIEY CENARRO's (1935a) figs. 8 and 9. The first legs of my specimens have the carpus about as long as the chela, as in BALSS's (1921) figure. ZARIQUIEY CENARRO, however, figures the carpus distinctly longer than the chela.

The juvenile specimens (all being females) of the present material differ from the ovigerous females in the following points:

1. The three teeth on the dorsal margin of the carapace are of about equal size, the median tooth is not so much inflated as in the ovigerous female.
2. The sixth abdominal segment is almost twice as long as the fifth.
3. The general shape of the pleurae of the third to fifth abdominal segments is as in the ovigerous female, they are rounded with a small blunt lobe on the lower margin. In this lobe the median pleural carina ends. The lobe, however, is much less distinct than in the adults.
4. The pleurae of the fourth abdominal segment do not end in a sharp posteriorly directed spine. Such a spine, however, is present in the fifth segment, just as in the adults.

The eggs are 0.3 to 0.4 mm. in diameter.

Through the courtesy of Dr. RICARDO ZARIQUIEY ALVAREZ of Barcelona, I was allowed to examine three specimens of the present species, which Dr. ZARIQUIEY collected near Cadaqués, N.E. Spain, August 23, 1948. One of these specimens was generously donated by Dr. ZARIQUIEY to the Rijksmuseum van Natuurlijke Historie at Leiden and it now lies before me. This specimen is an ovigerous female of 15 mm. length. It has the sculpture of the body still more pronounced than in ZARIQUIEY CENARRO's (1935a) figure. The dorsal teeth of the carapace are much higher, the middle one is elevated to a kind of ridge, which is indented in the middle, the anterior of the three teeth is very high and narrow. On the rest of the carapace too the ridges and spines are more distinct than in the figures given in literature. The first three abdominal segments each bear a dorsal median crest, while a more or less distinct spine is present at the base of the pleurae of the third and fourth segments, near the posterior margin. The lobes at the ventral margin of the pleurae of the fourth and fifth segments are more distinct than in ZARIQUIEY CENARRO's figure. The chelae of the second legs agree perfectly with the figures in literature. The West African specimens have the sculpture of the body much less pronounced than the Catalonian specimen seen by me. It is not known to me whether the West African material and the specimens dealt with in literature are not yet fully developed, or that the strength of the sculpture of the body in specimens of the same age is variable. The fact that some of the less distinctly sculptured specimens are ovigerous females seems to suggest the latter possibility, but it should be remembered that among the Palaemonidae often sexual maturity is reached before the body has attained its final shape.

Distribution. The species is a littoral form, which does not live in too shallow water, having been found between 20 and 65 m. depth. It lives among *Corallium rubrum* L. Up till now it has only been recorded from Naples (BALSS, 1921) and near Cadaqués, N.E. Spain (ZARIQUIEY CENARRO, 1935, 1935a; ZARIQUIEY ALVAREZ, 1946, 1950). The present records from French Guinea largely extend its known range of distribution.

Typton spongicola Costa 1844.

Restricted synonymy:

Typton spongicola Costa 1844, p. 289.
Typton spongicola Lenz & Strunck 1914, p. 322.
Typton spongicola Balss 1916, p. 28.
Typton spongicola Monod 1933, p. 464.

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; Decem-

ber 10, 1945, $11h^{20}$. — 4 specimens (including 1 ovigerous female, 7 mm.) 5 to 7 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. — 1 specimen 8 mm.

Station 141, Freetown, Sierra Leone; Commercial otter trawl, 15 m. depth, bottom sand; April 9, 1946, 11h—16h. — 1 specimen 5 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—10h. — 1 specimen 5 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, $14h^{20}$—$16h^{10}$. — 1 specimen 7 mm.

Station 147, off French Guinea, 9°28′ N, 14°58′ W; Sigsbee trawl, 45 m. depth, bottom shells and Foraminifera; April 14, 1946, $8h^{55}$—$9h^{35}$. — 1 specimen 5 mm.

The present specimens were carefully compared with specimens of *Typton spongicola* Costa from the Gulf of Naples. Except for the much smaller size, no other differences were found.

Of several specimens part of the legs are detached or lacking.

Distribution. *Typton spongicola* is a littoral form, which lives associated with sponges. It occurs in the Eastern Atlantic from the English south coast to Sierra Leone and is known also from the entire Mediterranean. Lenz & Strunck (1914) report the species from Porto Grande, São Vicente, Cape Verde Islands. Balss's (1916) and Monod's (1933) West African records are based on that of Lenz & Strunck.

Family **Crangonidae.**

Pontocaris cataphracta (Olivi) 1792.

Restricted synonymy:

Cancer cataphractus Olivi 1792, p. 50, pl. 3 fig. 1.
Crangon (Cheraphilus) cataphractus Miers 1881, p. 365.
Pontophilus cataphractus Rathbun 1900, p. 311.
Aegeon cataphractus Balss 1916, p. 31.
Aegeon cataphractus Monod 1933, p. 465.

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, 15h—18h. — 2 specimens 18 and 20 mm.

Station 49, off Sierra Leone, 7°29′ N, 13°38′ W; Sigsbee trawl, 74—78 m. depth, bottom muddy sand; December 30, 1945, $8h^{20}$. — 7 specimens (including 1 ovigerous female, 34 mm.) 8—34 mm.

Station 60, off Liberia, 5°06′ N, 9°34′ W; Sigsbee trawl, 78 m. depth, bottom mud; January 9, 1946, $9h^{50}$. — 2 specimens (including 1 ovigerous female, 27 mm.) 20 and 27 mm.

Station 85, off Gold Coast, 5°37′ N, 0°38′ E; otter trawl, 28—40 m. depth, bottom mud; January 30, 1946, $11h^{45}$—$16h^{15}$. — 5 specimens (including 1 ovigerous female, 32 mm.) 18—32 mm.

Station 102, off Nigeria, 5°34′ N, 4°50′ E; triangular dredge (45 cm.) and 3 otter trawls, 27—29 m. depth, bottom mud; February 16, 1946, $9h^{40}$—$15h^{50}$. — 4 specimens (including 1 ovigerous female, 35 mm.) 29—35 mm.

Station 116, off Nigeria, 4°01′ N, 7°56′ E; otter trawl with 2 bords, 66 m. depth, bottom mud; February 23, 1946, $10h^{40}$—$14h^{00}$. — 3 specimens 32—41 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 19 mm.

Station 133, off N. Angola, 7°19′ S, 12°40′ E; Sigsbee trawl and eel trawl, 47 m. depth; March 16, 1946, $8h^{45}$—$10h^{40}$. — 10 specimens (including 1 ovigerous female, 32 mm.) 22—35 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, $7h^{45}$—$10h^{10}$. — 2 specimens 23 and 25 mm.

Station 147, off French Guinea, 9°28′ N, 14°58′ W; Sigsbee trawl, 45 m. depth, bottom shells and Foraminifera; April 14, 1946, $8h^{55}$—$9h^{35}$. — 5 specimens 16—23 mm.

Station 161, off Bathurst, Gambia; triangular dredge (45 cm.), 18 m. depth, bottom very fine sand; April 24, 1946, $13h^{00}$. — 1 specimen 25 mm.

The specimens collected by the Atlantide Expedition agree very well with material of *Pontocaris cataphracta* from the Mediterranean, so that I have no doubt that they belong to the same species. The distinctness of the teeth, ridges and other sculpture is very variable, even in specimens, which belong to one lot. The strength of the sculpture does not seem to be dependent on age: strongly sculptured specimens are found among the juveniles as well as among the old specimens.

Distribution. *Pontocaris cataphracta* is a littoral species and seems to prefer a muddy or sandy bottom. It is known from the entire Mediterranean, from S. Portugal, from the West African coast, from S. Africa, S. Arabia and India. The West African records in literature are: Cape Blanco, Mauritania (Monod, 1933), Goree Island, Senegal (Miers, 1881).

Pontocaris lacazei (Gourret) 1887.

Restricted synonymy:

Crangon Lacazei Gourret 1887, p. 1033.

Material examined:

Station 120, off Rio Muni, 2°09′ N, 9°27′ E; otter trawl, 260–650 m. depth, bottom mud; March 1, 1946, $14h^{10}$—$15h^{40}$. — 3 ovigerous females 45—47 mm.

Comparison of the present material with specimens of this species from the Mediterranean showed their specific identity.

Distribution. The species occurs in much deeper water than *P. cataphracta*, it has been recorded from depths between 178 and 758 m. Like *Pontocaris cataphracta* the present species has a wide distribution. It is known from off S.W. Ireland, from the Bay of Biscay, from the western Mediterranean, from off S. Africa, from the Zanzibar area and New Zealand. It now is reported for the first time from West Africa.

Pontophilus challengeri Ortmann 1893.

Restricted synonymy:

Pontophilus challengeri Ortmann 1893, p. 49.

Distribution. A deep water species which has been recorded from depths between 2000 and 4980 m. It has been collected near the Cape Verde Islands, near Tristan da Cunha, in the Celebes Sea, near the Torres Strait, and off New Zealand. The only West African record is that by Ortmann (1893): northwest of the Cape Verde Islands.

Pontophilus bidens n. sp.

(Fig. 33).

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, $11h^{10}$—$14h^{00}$. — 1 ovigerous female 20 mm.

Description. The body is rather slender. The rostrum is narrow and elongate, it almost reaches to the end of the eyes. It widens slightly at the apex and the anterior margin is rather deeply emarginate. The anterior margin of the carapace bears at each half two large teeth, one of which forms the outer limit of the orbit, the other is placed near the base of the antenna. In addition, there is a much smaller tooth placed just below the outer large tooth. The carapace bears in its anterior half three spines, which are placed almost in one transverse row. The median of these spines is smallest, it lies slightly anteriorly of the two lateral spines. The lateral spines are placed slightly higher than the external teeth of the anterior margin of the carapace. No ridges and no other spines are visible on the carapace.

The abdomen shows no distinct sculpture. There are some shallow inconspicuous pits on most of the segments, while the sixth somite has the

upper margin provided with two indistinct longitudinal carinae. Some segments show some inconspicuous shallow transverse groove-like depressions (one such depression is visible on the first, third and fifth segment, two on the second). The pleurae of the first to fifth segments have the lateral margin posteriorly with a minute sharp tooth. The sixth segment is about 1.5 times as long as the fifth. Its lower surface projects distinctly beyond that of the fifth segment. The pleurae of the sixth segment are very small with the apex broadly rounded. The posterolateral angle is truncate with a very small spinule at the top. The telson is twice as long as the fifth abdominal segment. Its dorsal surface is sulcate and bears two pairs of almost invisible spines, which are placed in the posterior half of the telson. The posterior margin is very narrow and ends in a distinct median spine, it bears two pairs of slender spines, the outer one of which is the longer and stronger.

The eyes are well developed and of the usual shape.

The basal segment of the antennular peduncle reaches distinctly beyond the eyes. The stylocerite is broad and quadrangular. The anterior margin is about straight, the anterolateral angles are rounded. The last two segments of the peduncle are short.

The scaphocerite reaches with about half its length beyond the antennular peduncle. The outer margin is slightly concave, and bears in the proximal third of its length two very distinct teeth. The final tooth is strong and reaches with its full length beyond the lamella. The latter is rather broad in the basal part and gradually tapers towards the apex. The antennal peduncle reaches somewhat beyond the middle of the scaphocerite. This peduncle bears a small external spine near the base of the scaphocerite.

The mouth parts are of the usual Crangonid type. The mandible consists of the molar process only, which ends in some blunt teeth. The maxillula has the lower endite bluntly rounded, the upper one bears some distal spines; the palp is simple. The maxilla has only one reduced endite, the palp and the scaphognathite are well developed. All maxillipeds are provided with distinct exopods, each of which consisting of two parts: the peduncle and the flagellum. The articulations of the flagellum are only visible in the distal part. The first maxilliped possesses no endites, the palp is slender. The caridean lobe of the exopod is rather narrow, but the epipod is well developed. The second maxilliped has the last joint small and attached with its longer side to the end of the penultimate joint, an epipod is present. The third maxilliped reaches with half the ultimate joint beyond the scaphocerite. The last joint is slightly longer than the penultimate and about half as long as the antepenultimate joint. An epipod and a pleurobranch are present.

Pleurobranchs are present also at the bases of the pereiopods. No arthrobranchs, epipods or exopods are present there. The first leg reaches with a small part of the chela beyond the scaphocerite. The dactylus is slender, the subchelar spine is long, rather narrow and simple. The chela is about

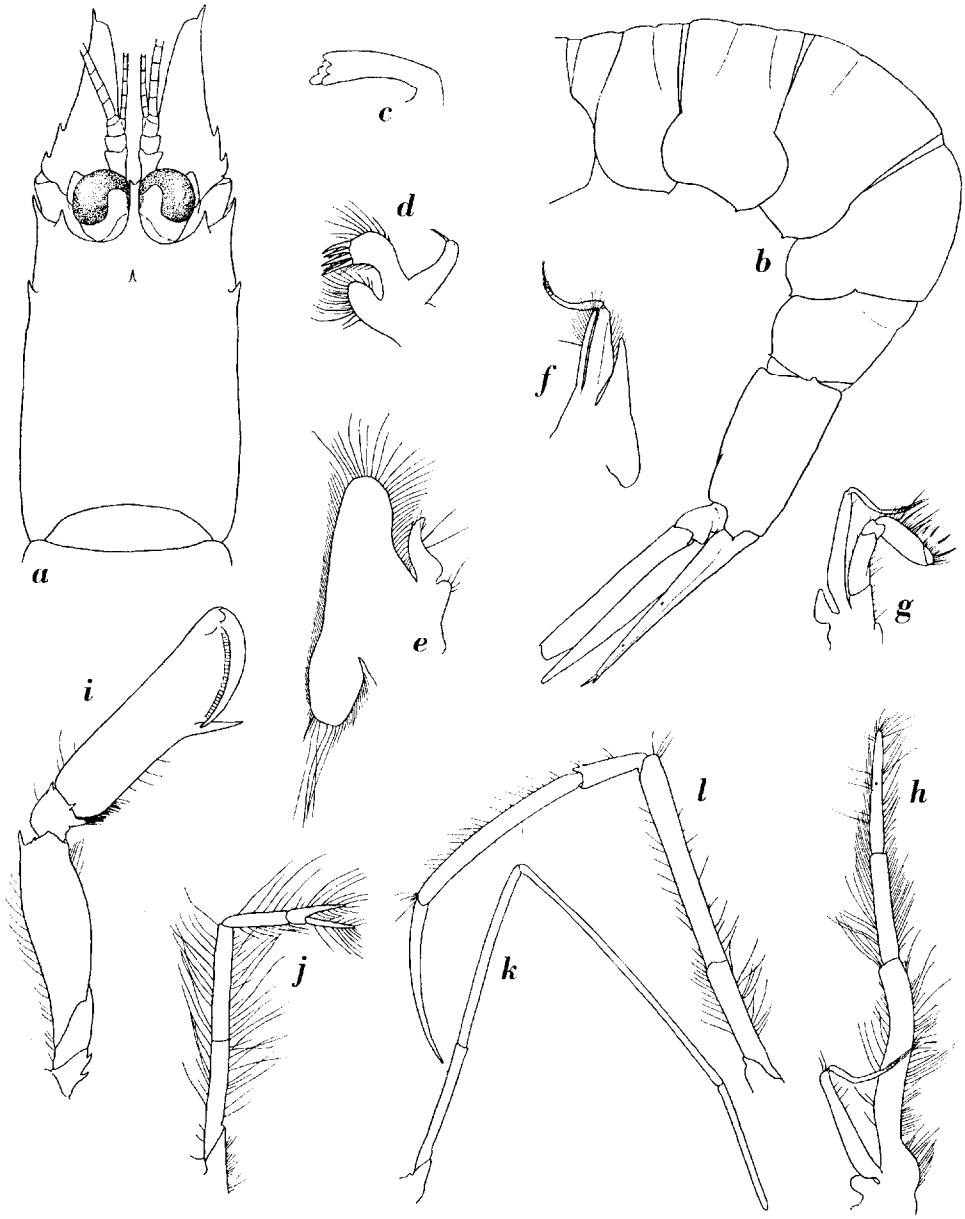

Fig. 33. *Pontophilus bidens* n. sp. a, anterior part of body in dorsal view; b, abdomen in lateral view; c, mandible; d, maxillula; e, maxilla; f, first maxilliped; g, second maxilliped; h, third maxilliped; i, first pereiopod; j, second pereiopod; k, third pereiopod; l, fourth pereiopod. a, b, i, ×9; c—h, j—l, ×13.

3.5 times as long as broad. The carpus is short, being about $^1/_5$ of the length of the chela. Its anterior margin bears a small spine in the upper part, one in the outer part and a rounded lobe in the lower part. The merus is almost as long as the chela, it bears a strong anterodorsal spine. Furthermore, the anterior margin of the merus bears a small spine in the outer part somewhat below the anterodorsal spine. The ischium and basis are short, the latter joint bears two teeth on the inner side. The second legs are short, they reach slightly beyond the base of the scaphocerite. The dactylus is somewhat longer than the fixed finger and is about three times as long as the palm. The carpus is about as long as the chela and has $^4/_7$ of the length of the merus. The latter joint is about as long as the ischium. Only one of the third legs is present in my specimen, and even that is not complete as it lacks the dactylus and part of the propodus. It is very slender and reaches with a small part of the carpus beyond the scaphocerite. The carpus is 1.5 times as long as the merus. The ischium measures $^2/_3$ of the length of the merus. The fourth and fifth legs are equal. The fourth reaches with the dactylus beyond the scaphocerite. The propodus is 1.2 times as long as the dactylus, it bears no spines. The carpus has $^1/_3$ of the length of the dactylus. The merus is slightly longer than the propodus and somewhat less than twice as long as the ischium.

The endopods of the pleopods are slender and undivided, that of the first pleopod is longest, that of the fifth shortest. Each of the second to fourth pleopods bears an appendix interna; these appendices diminish in size posteriorly. In the last pleopod no appendix is visible. The uropods are elongate. The exopod is about as long as the telson, but it is overreached by the endopod. The outer margin of the exopod ends in a small simple tooth.

The eggs are rather numerous and are 0.4 to 0.6 mm. in diameter.

The present new species differs from all known species of the present genus by having two teeth in the basal part of the outer margin of the scaphocerite. In *Pontophilus sculptus* (Bell) and allied froms (*P. incisus* Kemp, *P. vanderbilti* Boone, *P. angustirostris* De Man and *P. kempi* De Man) there is only one tooth there, in *P. japonicus* Doflein and *P. lowisi* Kemp there is a series of denticles on the outer margin, while in the other species of the genus the outer margin of the scaphocerite is entire. From the most closely related Atlantic form, *P. sculptus* (Bell) it may furthermore be immediately distinguished by the narrow rostrum, by the presence of only three spines on the carapace and by the absence of a distinct sculpture on the abdomen. The shape of the pleopods of the present specimen shows that in all probability it belongs to KEMP's (1916) group II.

The specimen has the propodi of the last two pairs of pereiopods covered with a reddish coloured film of mud, which is most distinct in the distal part of these joints.

Pontophilus sculptus (Bell) 1846—51.

Restricted synonymy:

Crangon sculptus Bell 1846—1851, p. 263, textfig.
Pontophilus sculptus Odhner 1923, p. 6.
Pontophilus sculptus Monod 1933, p 465.

Material examined:

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. — 2 specimens (including 1 ovigerous female, 9 mm.) 9 and 11 mm.

Station 49, off Sierra Leone, 7°29′ N, 13°38′ W; Sigsbee trawl, 74—78 m. depth, bottom muddy sand; December 30, 1945, $8h^{20}$. — 1 ovigerous female 12 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—10h. — 41 specimens (including 9 ovigerous females, 11—13 mm.) 8—13 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, $14h^{20}$. — 9 specimens (including 1 ovigerous female, about 11 mm.) 8—14 mm.

Station 147, off French Guinea, 9°28′ N, 14°58′ W; Sigsbee trawl, 45 m. depth, bottom shells and Foraminifera; April 14, 1946, $8h^{55}$—$9h^{35}$. — 6 specimens (including 2 ovigerous females, 12 and 13 mm.) 9—13 mm.

Station 148, off French Guinea, 9°57′ N, 15°22′ W; Sigsbee trawl, 25 m. depth, bottom shells and hydroids; April 14, 1946, $16h^{25}$—$16h^{55}$. — 15 specimens (including 3 ovigerous females, 10—13 mm.) 5—13 mm.

The present specimens agree fairly well with the descriptions and figures given in literature. Unfortunately, I had no European material at my disposal for comparison.

The teeth and ridges on the carapace in my material are generally much less distinct than shown in Kemp's (1910) figure. As in Odhner's (1923) material from Angola the anterior of the two smaller median teeth of the carapace often is very indistinct or even completely invisible. Also the posterior median teeth are often inconspicuous. The anterior of the two larger median teeth, however, is distinct and spiniform in most specimens. The long inner lateral row of 5 and the short intermediate lateral row of 4 teeth are much less distinct in most of my specimens than shown in Kemp's figure, in some specimens, however, they are almost as distinct as figured by Kemp. Between the median row of teeth and the inner lateral row there are 3 or 4 inconspicuous teeth or short ridges placed in a triangle or a quadrangle. These teeth are not shown in Kemp's figure,

but are present in all my specimens. Near the lateral margin of the carapace KEMP figures a long carina which bears two distinct teeth in the anterior part. In my specimens these teeth are present too, the anterior is spiniform, the posterior often blunt. They are not situated on one line which KEMP's figure seems to indicate, but the anterior one lies closer to the median line of the carapace than the posterior. Both teeth end posteriorly in a carina; the carina of the anterior tooth reaches slightly beyond the posterior tooth.

KEMP (1910) states that the merus of the first pair of legs bears no anterodorsal spine. At first I thought that this spine was also absent in my specimens, but on closer examination it proved to be present, though it is small and almost completely concealed by long hairs.

The shape of the pleopods is as described by KEMP (1916) for this species.

Distribution. *Pontophilus sculptus* is a littoral form. It is known from the British Isles southwards to the Western Mediterranean and the Adriatic; furthermore, it is known from West and South Africa. The West African records are: Cape Blanco, Mauritania (MONOD, 1933) and Porto Alexandre, Angola (ODHNER, 1923).

Pontophilus wolffi n. sp.

(Fig. 34).

Material examined:

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, $14h^{20}$. — 1 ovigerous female 14 mm.

Station 148, off French Guinea, 9°57′ N, 15°22′ W; Sigsbee trawl, 25 m. depth, bottom shells and hydroids; April 14, 1946, $16h^{25}$—$16h^{55}$. — 3 specimens (including 1 ovigerous female, 11 mm.) 6—11 mm., and 1 post-larval stage 4 mm.

Description. The body is small and robust. The rostrum is short and fairly broad, the anterior margin is truncate, the upper surface is distinctly hollowed. The rostrum does not by far reach the end of the eyes. The carapace is smooth and bears no spines. In the median dorsal line a small tubercle is visible. This tubercle is separated from the tip of the rostrum by about $^1/_4$ of the length of the carapace (rostrum included). A very inconspicuous elevation is placed slightly before and one slightly behind the tubercle. Furthermore a third slightly elevated point may be observed at $^1/_3$ of the length of the carapace from its posterior margin. The anterior margin of the carapace bears two teeth on each half: one is small and sharply pointed, it is placed at the lower angle of the orbit, the other is strong and stands near the base of the antenna. Below the strong spine the margin is entire.

The abdomen is smooth. The posterior part of the third and the whole

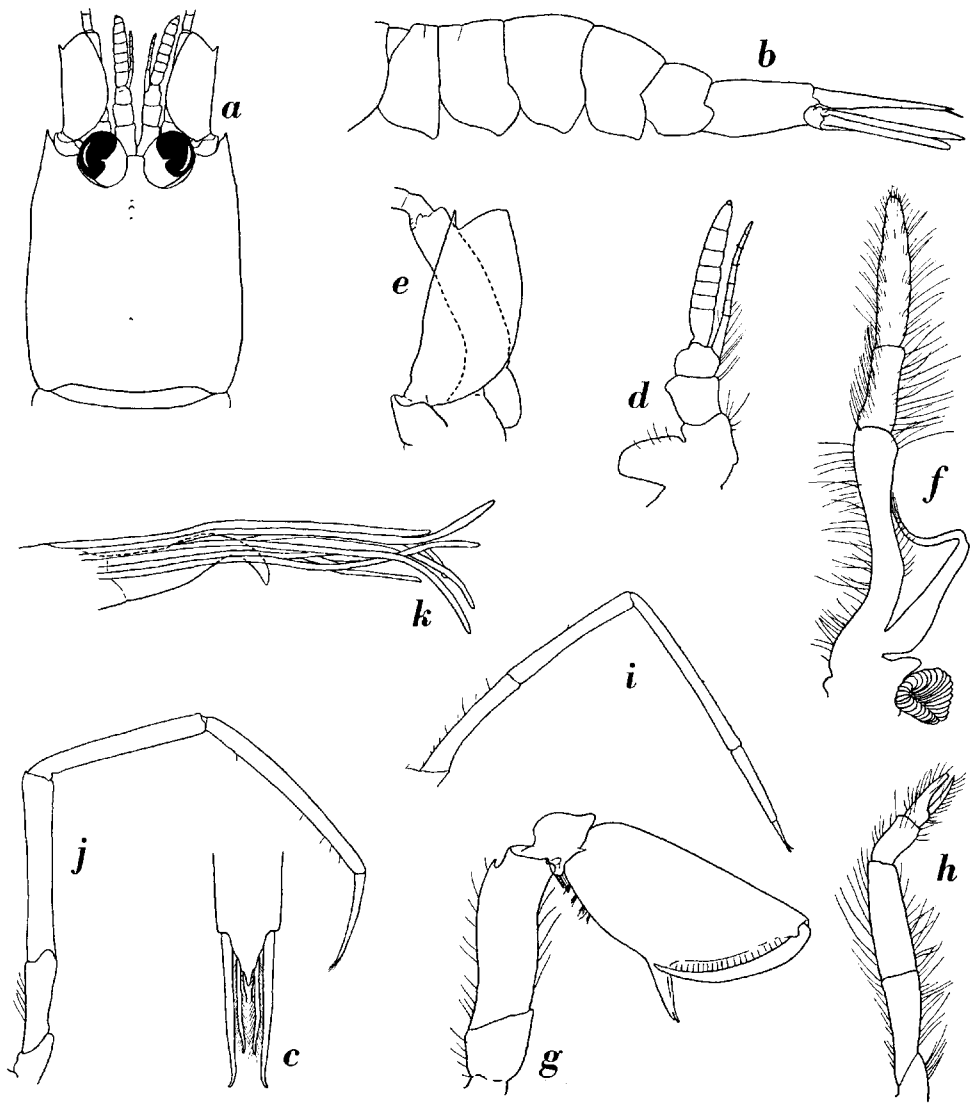

Fig. 34. *Pontophilus wolffi* n. sp. a, anterior part of body in dorsal view; b, abdomen in lateral view; c, tip of telson in dorsal view; d, antennula; e, antenna; f, third maxilliped; g, first pereiopod; h, second pereiopod; i, third pereiopod; j, fourth pereiopod; k, tip of dactylus of fourth pereiopod. a, b, ×7; c, ×48; d—j, ×15; k, ×300.

of the fourth and fifth segments show an indistinct median longitudinal carina. The sixth segment has a shallow elongate depression in the posterior part of its median dorsal line. The pleurae are rounded, though those of the first four segments have the posterior part of the lateral margin slightly and bluntly angular. The sixth segment has the pleurae small and pointed, the posterolateral angles are rounded. This segment is somewhat less than

twice as long as the fifth, while it measures $^3/_4$ of the length of the telson. The upper surface of the telson is sulcate. I have not observed any dorsal spinules in my material. The posterior margin bears a large median triangular plate, which ends in a sharp point and which bears a strong hair on each side of that point. There are two pairs of long and strong spines on the posterior margin of the telson. These spines are covered by the above mentioned triangular plate in their basal part. The inner spines are the shorter and bear small hairs.

The eyes are normal in shape and have the cornea darkly pigmented. They reach slightly beyond the end of the basal segment of the antennular peduncle.

The stylocerite is very broad, its anterior margin is rounded, the posterior is almost straight; there are no spinules on the stylocerite. The second segment of the antennular peduncle is somewhat longer and broader than the third. The two flagella are short, they reach only slightly beyond the scaphocerite, the outer is broad.

The scaphocerite is about twice as long as broad, it has the outer margin almost straight and without teeth. The final tooth is distinct, but it is somewhat overreached by the lamella, which is produced somewhat anteriorly. The antero-internal angle of the lamella is nearly rectangular with the apex rounded. The antennal peduncle reaches to the end of the scaphocerite. The peduncle bears no spine near the base of the scaphocerite.

The mandible, maxillula and maxilla are practically identical with those figured here for *Pontophilus bidens*. The first maxilliped differs from that of the latter species by having the epipod somewhat broader and pointed dorsally, in the second maxilliped the epipod is somewhat smaller than in *P. bidens*. The third maxilliped reaches slightly beyond the scaphocerite. The ultimate segment is almost twice as long as the penultimate. Together these two segments are as long as the antepenultimate. The exopod is of the usual shape, while an epipod and an arthrobranch are present.

Each of the pereiopods bears a pleurobranch, no epipods or exopods are present. The first leg reaches to the end of the scaphocerite. The chela is about twice as long as broad. The dactylus is slender, the subchelar spine is incised at the top and thus ends in two sharp points. The carpus is short, being about $^1/_4$ of the length of the chela. The anterior margin bears a small spinule in the outer region. Ventrally there is a rounded lobe, which bears some hairs. The merus is somewhat more than $^2/_3$ of the length of the chela. Its upper margin bears a distinct spine somewhat behind the anterior margin. The ischium is short. The second leg fails to reach the base of the scaphocerite. Its fingers are of nearly equal length, and are twice as long as the palm. The carpus is about as long as the chela and half as long as the merus. The latter is somewhat longer than the ischium. The third leg is very slender, it reaches about to the end of the scaphocerite. The dactylus bears a tuft of hairs at the apex, it is about $^1/_3$ of the length of the

propodus. The carpus is somewhat more than twice as long as the propodus and $^4/_3$ of the length of the merus. The ischium is slightly shorter than the merus. The fourth and fifth legs are subequal in shape. The fourth reaches with part of the propodus beyond the scaphocerite. The dactylus bears a tuft of hairs at the apex. The propodus is somewhat more than twice as long as the dactylus and slightly longer or slightly shorter than the carpus. The merus and the carpus are about equal in length.

The pleopods have the exopod articulated. In the female the endopod of the first pleopod is elongate and slender, in the other pleopods the endopod diminishes in size from the second to the fifth. No appendix interna is present on any of the pleopods. The situation in the males is unknown to me since no males are represented in the material examined. The uropods are elongate, the endopod is longer than the exopod. The outer margin of the exopod does not end in a final tooth.

The eggs are fairly numerous, they measure 0.3 to 0.6 mm. in diameter.

Type. Holotype is the specimen from Station 146.

The present new species is most closely related to *Pontophilus hendersoni* Kemp (1915) and *Pontophilus megalocheir* (Stebbing, 1915). The shape of the chela with the two-topped subchelar spine is present only in these three species and not known in any other species of *Pontophilus*. In the shape of the tip of the telson and that of the scaphocerite the present form shows most resemblance to *P. hendersoni* and differs in those respects from *P. megalocheir*. It furthermore differs from *P. megalocheir* in having the carpus of the second legs relatively much shorter and broader. From *P. hendersoni* it may be distinguished by the absence of the tubercle in the posterior median part of the third abdominal segment, by having the scaphocerite a little more produced antero-internally and by having the subchelar spine of the first pereiopod slender. Also the sculpture of the carapace is a feature by which *P. wolffi* may be distinguished at once from the other two species. In both *P. hendersoni* and *P. megalocheir*, there is a very distinct spine in the anterior third of the median dorsal line of the carapace. No other spines or tubercles seem to be present there. Unfortunately, I had no material either of *P. hendersoni* or *P. megalocheir* for comparison. *P. hendersoni* has been reported from India and S. Africa, *P. megalocheir* from S. Africa.

It is a pleasure to name this species after Mr. TORBEN WOLFF of the Zoological Museum at Copenhagen, one of the zoologists of the Atlantide-Expedition, who was always ready to assist me with information concerning the present Atlantide material.

Litterature.

(The papers marked with an asterisk * were not available to me).

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