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THE ATLANTIC SHRIMPS OF THE DEEP-SEA GENUS *GLYPHOCRANGON* A. MILNE EDWARDS, 1881[1]

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ABSTRACT

An enumeration is given of the 12 known Atlantic species of the genus *Glyphocrangon* (Crustacea, Decapoda, Caridea), with a key for their identification. Two species are described as new, while of others additional details are provided. The geographic distribution of each species is discussed.

INTRODUCTION

During the cruises of the research vessels GERDA and JOHN ELLIOTT PILLSBURY of the University of Miami, important collections of deep-sea decapod Crustacea have been brought together. The GERDA collections originate largely from the Straits of Florida and adjacent waters, while R/V PILLSBURY explored West African waters (1964, 1965) and the Atlantic offshore waters of Yucatan (1968), Honduras (1967, 1968), Panama (1966), Colombia (1966, 1968), Venezuela (1968), the Guianas (1968), the West Indian islands from Trinidad to Puerto Rico (1969), and from Puerto Rico to Jamaica (1970), and also made a collecting trip to Bermuda (1964). The material of the deep-sea genus *Glyphocrangon* obtained during these cruises proved to be so extensive and so important that it could well serve as the basis for a revision of the Atlantic representatives of the genus. As a participant in seven of the PILLSBURY cruises and one of the GERDA, I was able to make colour notes and colour sketches of fresh material of a number of species, which helped me considerably towards a better understanding of their true taxonomic status. The material of these cruises is preserved in the collections of the museum of the Rosenstiel School of Marine and Atmospheric Sciences of the University of Miami (UMML), and the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands (RMNH); some duplicates are in the U. S. National Museum, Washington, D. C., and the Allan Hancock Foundation, University of Southern California, Los Angeles, California.

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In the present paper an enumeration is given of all the species and subspecies known from the Atlantic, and a key for their identification is provided, as well as descriptions and figures where needed. As no uniformity existed in the indication of the various ridges, grooves, and other structures of the carapace, which are of great systematic importance, a terminology is now proposed in order to facilitate a reference to them.

I am greatly indebted to Drs. Gilbert L. Voss and Frederick M. Bayer for permitting me to take part in various PILLSBURY and GERDA cruises and for placing the facilities of the Rosenstiel School of Marine and Atmospheric Sciences at my disposal, thus enabling me to finish the present study. The University of Miami made it financially possible for me to partake in the expeditions and to stay for several periods at the School of Marine and Atmospheric Sciences.

Type-specimens and other Atlantic material of *Glyphocrangon* have been kindly placed at my disposal by the U. S. National Museum, Washington, D. C. (USNM); the Museum of Comparative Zoology of Harvard University, Cambridge, Massachusetts (MCZ); the British Museum (Natural History), London (BM); the Muséum National d'Histoire Naturelle, Paris (MP); the Universitetets Zoologiske Museum, Copenhagen (MC); and the Centre Océanologique de Bretagne at Plouzané, France (COB). This additional material greatly helped to arrive at conclusions concerning the status of several species and often also considerably extended our knowledge of the range of the species. I wish to tender my very best thanks to Drs. Fenner A. Chace, Jr., and Raymond B. Manning of the U. S. National Museum; Drs. William A. Newman and Herbert Levi of the Museum of Comparative Zoology; Drs. Isabella Gordon, Anthony L. Rice, and R. W. Ingle of the British Museum; Dr. J. Forest of the Paris Museum; Dr. Torben Wolff of the Copenhagen Museum; and M. M. l'Herroux of the Centre Océanologique for their most cordial help.

The greater part of the drawings illustrating this paper were made by Mrs. Constance Stolen McSweeny, staff artist of the Rosenstiel School of Marine and Atmospheric Sciences. Through the kindness of Dr. Raymond B. Manning, it is possible to reproduce here the original drawings of *Glyphocrangon* species first published by S. I. Smith in 1882 and 1886. These drawings, made by J. H. Emerton, are now preserved in the Division of Crustacea, U. S. National Museum, Washington, D. C. They are of such high quality that it was thought worthwhile to republish them here, the more so as their reproduction in Smith's paper (1886) leaves much to be desired.

The abbreviation cl. denotes the carapace length (inclusive of the rostrum). The above-mentioned institutions are usually indicated with the abbreviations given in parentheses after their names.

Glyphocrangon A. Milne Edwards, 1881

Thalascaris Bate, 1878: Ann. Mag. nat. Hist., (5) *2:* 282. A genus originally described without included nominal species. Type-species, by present designation: *Glyphocrangon rimapes* Bate, 1888, Rep. Voy. Challenger, Zool., *24:* 523. Gender: feminine.

Glyphocrangon A. Milne Edwards, 1881: Annls Sci. nat., Zool., (6) *11* (4): 3. Type-species, by original designation: *Glyphocrangon spinicauda* A. Milne Edwards, 1881, Annls Sci. nat. Zool., (6) *11* (4): 3. Gender: feminine.

Rhachocaris S. I. Smith, 1882, Bull. Mus. comp. Zool. Harv., *10:* 41. Type-species, selected by Fowler (1912, Ann. Rep. New Jersey State Mus., 1911: 556): *Rhachocaris agassizii* S. I. Smith, 1882, Bull. Mus. comp. Zool. Harv., *10:* 43. Gender: feminine.

Glyptocrangon Norman, 1886, Mus. Normanianum, (Ed. 1), *3:* 8. Erroneous spelling for *Glyphocrangon* A. Milne Edwards, 1881.

Plastocrangon Alcock, 1901, Descr. Cat. Indian Deep Sea Crust. Macr. Anom.: 125, 133. Type-species, selected by Fowler (1912, Ann. Rep. New Jersey State Mus., 1911: 556): *Glyphocrangon caecescens* Wood-Mason & Alcock, 1891, Ann. Mag. nat. Hist., (6) *8:* 357. Gender: feminine.

The genus *Glyphocrangon* is represented in the Atlantic by 12 known species. Material of all the Atlantic species was available for study.

Description.—The integument of the body is very firm. The rostrum is well developed, dorsoventrally depressed, and somewhat hollowed in the basal part. The lateral margin of the rostrum bears two or three teeth in the species dealt with here (this number is higher in some species from the Indo–West Pacific and East Pacific regions). A dorsomedian carina as a rule is present on the rostrum. The carapace shows a complicated array of grooves, ridges, spines, and tubercles. In order to facilitate a comparison of these features in the various species, the following names are now proposed for them (see also Figure 1).

GROOVES:

a. Cervical groove. A transverse groove in the median part of the posterior third of the carapace. It ends at about the antennal ridge (No. 3, see below); a side branch connects it with groove b.

b. Lateral groove. This groove runs from below the rostrum posteriorly and ventrally to the posterior part of the lateral margin of the carapace, where it usually stops short against the submarginal ridge (No. 6). It traverses practically the full length and breadth of the lateral surface of the carapace.

c. Anterior groove. This groove cuts across the base of the rostrum, curves backward laterally and stops against the anterior intermediate ridge (No. 2a).

d. Posteromarginal groove. This groove runs along the posterior margin of the carapace, from one posterolateral angle to the other.

e. Lateromarginal groove. This groove runs to the inside of the anterior half of the marginal ridge (No. 7). It starts at the base of the branchiostegal spine and follows the marginal ridge (No. 7) to the point where the marginal and submarginal (No. 6) ridges fuse.

RIDGES: Most ridges of the carapace are bisected by either the cervical or the lateral grooves. The two components of each bisected ridge are indicated here as anterior and posterior and are indicated with the letters a and b, respectively. Sometimes the homology of the two components is not very clear, and mistakes may have been made here.

1. Submedian carina (1a, anterior; 1b, posterior). This runs along either side of the dorsomedian line of the carapace, extending from the rostral base to the posterior margin of the carapace. It is divided in two by the cervical groove (a).

2. Intermediate carina (2a, anterior; 2b, posterior). This extends below and to the outside of the submedian carina (No. 1), and runs parallel to it. It reaches from just below the anterior groove (c) to the posteromarginal groove (d), and is divided into two parts by the cervical groove (a).

3. Antennal carina (3a, anterior; 3b, posterior). This carina extends from the antennal spine on the anterior margin of the carapace to the posteromarginal groove (d), being more or less parallel to the intermediate carina (No. 2). It is bisected by the lateral groove (b). Sometimes the anterior antennal carina (No. 3a) is reduced to a mere line of tubercles, or is entirely absent; only in *G. neglecta* is it present as a distinct ridge.

4. Lateral carinae (4a, anterior; 4b, posterior). This ridge lies below the antennal carina (No. 3) and is about parallel to it. It starts either at the branchiostegal spine (in *G. neglecta*), or above it and closer to the antennal spine, and continues backward as far as the posteromarginal groove (d). The anterior lateral carina (No. 4a) is always present and often shows one or two large, winglike, widened teeth. It is bisected by the lateral groove (b).

5. Sublateral carina (5a, anterior; 5b, posterior). This rather short carina lies below the lateral carina (No. 4) and is about parallel with it. It starts at some distance behind the anterior part of the lateromarginal groove (e) and somewhat below and behind the branchiostegal spine. As a rule, it does not reach the posteromarginal groove. It is bisected by the lateral groove (b). The posterior sublateral carina (No. 5b) is rather irregular in shape. The anterior sublateral carina is low, but is always present.

6. Submarginal carina. This ridge starts in the anterior part of the

carapace in front of the lateral groove (b) and extends backward to slightly beyond the posterolateral angle of the carapace. Sometimes it is partly coalesced with the marginal carina (No. 7), and sometimes it is broken up.

7. Marginal carina. A narrow and sharp ridge just above the lateral margin of the carapace. It extends from the branchiostegal spine along the lateral and posterior margins of the carapace.

SPINES, TEETH, AND OTHER FEATURES: The following spines and teeth can be recognized:

α. Lateral rostral teeth (α1, anterior; α2, posterior). The teeth on the lateral margin of the rostrum. As a rule, they are placed in the basal half and are two in number on either side; only in one Atlantic species, *G. rimapes*, are there three pairs.

β. Antennal spine. A spine placed on the anterior margin of the carapace at the lower orbital angle.

γ. Branchiostegal spine. A spine placed on the anterior margin of the carapace at some distance below the antennal spine.

Spines and tubercles may also be found on the various ridges. The posterolateral angle of the carapace (p.a.) is a spot in the posterior part of the marginal carina where this carina is bluntly triangularly produced. The lateral margin of the carapace in its posterior part lies very close to the marginal carina (No. 7), being separated by a short distance from it in the anterior part. The margin closely hugs the bases of the pereiopods; both before the third maxilliped and before the first pereiopod a process extends from the lateral margin inward and fits behind a process directed up from the anterior part of the base of either appendage. This peculiar formation was already observed and discussed by Smith (1882).

The abdominal somites are provided with numerous longitudinal ridges and spines or tubercles. A median carina is found on all or part of the somites. This carina on the first somite ends in a strong anteriorly directed spine, and in somites 2 to 6 it is bisected transversally. In somites 2 and 3, the tubercles forming the carina usually are so low and inconspicuous that the carina is hardly, if at all, noticeable there, and only becomes distinct in the middle of the fourth somite. The first somite also shows in each half a strong, anteriorly directed tooth, which forms a continuation of the intermediate carina of the carapace. The pleura of the second to sixth somites end in one or more strong teeth. The telson is elongate triangular and gradually tapers to a long and slender sharp point. The articulations between the abdominal somites 1 and 2, 2 and 3, and 3 and 4 are of the normal type. Those between somites 4 and 5, 5 and 6, and 6 and the telson are aberrant, insofar as each of the two articulating points between two consecutive somites possesses a locking mechanism. The posterior margin of the somite in front of each articulating point forms a

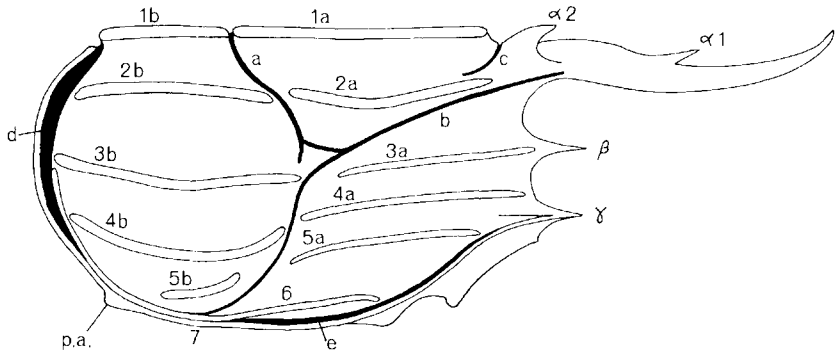

FIGURE 1. Schematic drawing, in lateral view, of the carapace of *Glyphocrangon*, showing ridges, grooves, teeth, and spines, with the nomenclature used here for these. 1a, 1b, anterior and posterior submedian carinae; 2a, 2b, anterior and posterior intermediate carinae; 3a, 3b, anterior and posterior antennal carinae; 4a, 4b, anterior and posterior lateral carinae; 5a, 5b, anterior and posterior sublateral carinae; 6, submarginal carina; 7, marginal carina; a, cervical groove; b, lateral groove; c, anterior groove; d, posteromarginal groove; e, lateromarginal groove; p.a., posterolateral angle; α 1, α 2, lateral rostral teeth; β, antennal spine; γ, branchiostegal spine.

process just below the articulation, which process curves up and around the center of the articulating point. This process moves in a semicircular groove, the anterior margin of which is formed by the tubercle of the articulating point, and the posterior margin of which is a sharp ridge on the somite behind the articulation. This latter ridge lies immediately against the posterior margin of the process. The exact nature of the locking mechanism is unknown to me, but it makes it possible for the last three abdominal somites and the telson to form a fixed, rigid unit. The three pairs of locking devices work independently from one another. The locking is such that the posterior somite of two consecutive somites forming the mechanism can move upward relative to the anterior member of the pair, but not downward; when the posterior member of the pair reaches its highest upward-directed position, the locking is complete. When all three pairs of locking devices are completely locked, the posterior end of the abdomen is strongly curved upward. A. Milne Edwards (1881), in the original description of the genus, remarked that the sixth abdominal somite and the telson are fused. He was probably led to this conclusion because, in his material, the locking device between the sixth somite and the telson made any movement between these somites impossible. As Smith (1882) perfectly correctly understood the condition, and also pointed to the locking mechanisms in the last abdominal somites, he thought that his material might possibly represent a genus different from A. Milne Edwards's *Glypho-*

crangon, and used the name *Rhachocaris* for it. After Milne Edwards, in 1883, published a figure of his *Glyphocrangon* species to supplement his rather meagre descriptions, Smith (1884) recognized the synonymy of *Glyphocrangon* and *Rhachocaris* and dropped the latter name.

The eyes are either large and well developed (subgenus *Glyphocrangon*) or reduced (subgenus *Plastocrangon*).

The antennulae have two flagella, the inner of which is slender; the outer has the larger proximal part thickened.

The scaphocerite is well developed and oval. A tooth may be visible on the outer margin.

The mandible possesses no incisor process and no palp. The molar process is slender, curved, and widened at the end, where it bears several blunt teeth. The maxillula has the palp well developed; the lower lacinia is slender and oval; the upper lacinia is distally widened and bears a row of spinules on the distal margin. The maxilla has the inner lacinia strongly reduced; the palp is well developed and ends in some spiniferous hairs; the scaphognathite is large. All maxillipeds are provided with exopods that end in articulate flagella. The upper endite of the first maxilliped is distinct, the lower is practically nonexistent; the palp is well developed; the exopod has a distinct caridean lobe; the epipod is large and bilobed. The last segment of the second maxilliped is narrow and applied to the penultimate segment with its longer side. The third maxilliped is a large appendage, the ultimate two segments of which form an oval blade that bears strong spines along its margin and on the inner surface.

The branchial formula runs as follows:

	Maxillipeds			Pereiopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	–	–	–	1	1	1	1	1
Arthrobranchs	–	–	2	1	1	1	1	–
Podobranchs	–	–	–	–	–	–	–	–
Epipods	1	1	–	–	–	–	–	–
Exopods	1	1	1	–	–	–	–	–

The subgenus *Plastocrangon* (see discussion, p. 294) should differ from *Glyphocrangon* s.s. in the absence of arthrobranchs at the first pereiopods. Whether or not this is a reliable character still has to be ascertained. In the Atlantic species *Glyphocrangon atlantica* Chace, which originally was placed in the subgenus *Plastocrangon*, the branchial formula in the specimens examined by me proved to be of the normal *Glyphocrangon* type. On the other hand, Kemp (1910: 170) reported in a juvenile specimen of *G. longirostris* the absence of arthrobranchs from the first two pereiopods, while in material of the same species examined by me these arthrobranchs

were present (see p. 341). The value of this character still needs an extensive study.

The first pereiopod is strong and subchelate. The ischium bears a strong anteroventral tooth. The second leg is also subchelate; it is very slender and has the carpus subdivided in numerous articles. The left and right second legs usually are slightly unequal, the right is then longer and more slender with a higher number of articles in the carpus. The following three pairs of pereiopods are simple and strongly resemble each other. The dactylus of the third leg is shorter and more conical than those of the fourth and fifth legs, which are more flattened. In females of *G. sculpta* and *G. rimapes*, the dactylus of the fifth leg is bifid. The propodus of the fourth and fifth legs bears a large terminal tuft of hairs surrounding the base of the dactylus; this tuft is absent in the third leg.

The first pleopod of the female has the endopod short and narrow, without any appendix; in the male it is short and broad, with a distinct *appendix interna*. The second to fifth pleopods of the female and the third to fifth of the male have the endopod well developed, with a slender *appendix interna*. The endopod of the second pleopod of the male bears, in addition to the *appendix interna*, an *appendix masculina*. The uropods are of the usual shape. The endopod is oval; the exopod bears a tooth on the external margin at the diaeresis, which is not very distinct, and which extends as far as the median carina of the exopod.

Distribution.—The genus *Glyphocrangon* is benthic and inhabits the deep sea of the Atlantic, Pacific, and Indian Ocean areas. The Atlantic species have been found at depths between roughly 135 and 3480 fathoms (= 250 and 6370 m). The depth range of the various species is more restricted; the data found so far are as follows:

	Total range (m)	Range of optimal occurrence (m)
G. longleyi	300– 837	300– 638
G. haematonotus	247– 966	329– 749
G. neglecta	365–1050	365– 730
G. aurantiaca	410– 733	410– 733
G. spinicauda	256– 692	458– 660
G. alispina	548–1865	548– 914
G. aculeata	707–1760	1100–1280
G. nobilis	410–2150	1280–1460
G. longirostris	1280–2500	1920–2290
G. sculpta	1645–3219	2200–2400
G. rimapes	2510	2510
G. atlantica	3885–6364	3885–6364

As to the horizontal distribution of the Atlantic species, eight (*G. spinicauda*, *G. aurantiaca*, *G. longleyi*, *G. haematonotus*, *G. neglecta*, *G. aculeata*, *G. nobilis*, and *G. alispina*) are known only from the western Atlantic, and three (*G. sculpta*, *G. atlantica*, and *G. longirostris*) have been found in both the western and eastern Atlantic, while the twelfth (*G. rimapes*) inhabits the Pacific (Japan and Juan Fernandez) and is known from a single specimen taken in the South Atlantic near Tristan da Cunha. No species is restricted to the eastern Atlantic. It is interesting to note that exactly the four species that inhabit the greatest depths (i.e., those that have not been found in depths of less than 1200 m) have the widest geographical distribution; these species occur either at both sides of the Atlantic Ocean or are found in both the Atlantic and the Pacific oceans. Two of the three amphi-Atlantic species have also the most extensive north-south distribution of all Atlantic species of *Glyphocrangon*: *G. sculpta* ranges from Iceland to the West Indies and South Africa, and *G. longirostris* from New England to the West Indies and from Ireland to South Africa. None of the other species goes this far north or south (only *G. rimapes* is found at about the same southernmost latitude). The third amphi-Atlantic species, *G. atlantica*, is known from only three specimens, so that little can be said about its actual range.

Of the eight species that seem to be confined to the western Atlantic, six (*G. spinicauda*, *G. longleyi*, *G. haematonotus*, *G. aculeata*, *G. nobilis*, and *G. alispina*) have a known range which extends from the southeast coast of the United States (North Carolina, South Carolina, or Florida) to the West Indies (the first three of these species), or to the north coast of South America (the last three). The two remaining species seem to have a more restricted area of distribution: *G. neglecta* has been found in the southern Caribbean and along the north coast of South America, while *G. aurantiaca* is known only from a small area covering Tobago and the north coast of the Guianas.

These general remarks have, of course, to be considered with much reserve, as a very great part of the deep and very deep waters of the Atlantic Ocean remain to be explored. Actually, the only area that has been consistently and intensively investigated for a period extending over many years is the Straits of Florida, which has been thoroughly covered by R/V GERDA. R/V PILLSBURY has systematically explored a great part of the West Indian region and continues this work. Also the BLAKE, ALBATROSS, and OREGON did valuable work in the West Indian region, but outside that area, large parts of the Atlantic Ocean are still terra incognita. Any definite conclusions can therefore not be drawn from the data at hand.

A comparison of the western Atlantic species of *Glyphocrangon* with the five species of the genus that are known from the East Pacific area (*Glyphocrangon alata* Faxon, 1893; *G. loricata* Faxon, 1895; *G. sicaria* Faxon,

1893; *G. spinulosa* Faxon, 1893; *G. vicaria* Faxon, 1896) shows no striking similarities. Except for *G. vicaria*, none of the East Pacific species can be considered as having a counterpart in the Atlantic Ocean. *Glyphocrangon vicaria* at first was identified by Faxon with *G. nobilis*, and later was elevated to the rank of a distinct species. According to Faxon (1896: 159, footnote), although it resembles *G. nobilis*, it is "even more closely related to *G. longirostris* Smith, which it represents on the Pacific side of the American continent."

Remarks.—A. Milne Edwards (1881) was incorrect in assigning the neuter gender to the generic name *Glyphocrangon*; the gender of the Greek word κραγγων, krangon, is feminine. Therefore, instead of *G. aculeatum* and *G. nobile* one should write *G. aculeata* and *G. nobilis*.

Bate (1878: 282), in a preliminary paper dealing with material of *Willemoesia* collected by the CHALLENGER, remarked: "That the depauperized state of the organs of vision is not due to the loss of light from the great depth at which *Willemoesia* is taken is evident from the fact that *Thalascaris*, n.g. (Crangonidae), is taken at depths equally great, and is remarkable for the large size of its eyes." As far as I know, the generic name *Thalascaris* since that time has not been mentioned again, either by Bate (1888) in the CHALLENGER report, or by any other author. It is very likely that Bate intended to propose the name *Thalascaris* for *Glyphocrangon*, which in 1878 was still undescribed. The only species of Crangonidae mentioned in Bate's CHALLENGER report from the depth range from which he reported *Willemoesia* in 1878 (1375 and 1900 fm) are *Pontophilus gracilis* Bate (1100-2150 fm) and *P. profundus* Bate (2600 fm). Of *P. gracilis*, Bate (1888: 489) remarked: "The ophthalmopoda are not large, being well hidden within the orbital cavity," while in *P. profundus* "The ophthalmi are ovate and tolerably large and prominent" (Bate, 1888: 490). It is not likely that Bate based his *Thalascaris* on either of these species. Of *Glyphocrangon*, however, Bate (1888: 505) remarked in the generic description: "The ophthalmopoda are short and support large and globular ophthalmi." Furthermore, the specimens of *Glyphocrangon* obtained by the CHALLENGER were found at depths between 200 and 1875 fathoms. The final, and most important, indication that Bate's early use of *Thalascaris* refers to *Glyphocrangon* is found by comparing his above-quoted remark of 1878 with what he said in 1888 (p. 525) about *Glyphocrangon rimapes* Bate: "The type of this species was brought up by the trawl in the same locality in the South Atlantic (Station 133) at which *Willemoesia leptodactyla* was obtained, and it is worthy of remark that while in this last-named genus the organs of vision are reduced to a rudimentary condition, those of *Glyphocrangon* are unusually large." *Glyphocrangon rimapes* Bate, 1888, thus should be considered the type-species of the genus *Thalascaris* Bate, 1878.

The International Commission on Zoological Nomenclature has been asked to suppress the generic name *Thalascaris* Bate, 1878, for the following reasons:

1. The genus was proposed in a most haphazard way, and its identity can be made clear only by the use of circumstantial evidence.

2. The generic name *Thalascaris*, as far as I have been able to find out, has never been used or cited after its original publication. Even its own author ignored it, and it is not found in Neaves's *Nomenclator Zoologicus*.

3. Although the genus is rather rare and the literature concerning it is very limited, the name *Glyphocrangon* has been consistently used for it for the last 80 years.

4. The generic name *Glyphocrangon* has been placed on the Official List of Generic Names by the International Commission on Zoological Nomenclature in their Opinion 470 (1957, Opin. Decl. Int. Comm. Zool. Nomencl., *16* [9]: 136) as name No. 1120.

5. The generic name *Thalascaris* is so similar to *Thalassocaris* (also for a genus of Caridean shrimps) that it would be good not to have to use these names side by side.

Pending the decision by the Commission, the name *Glyphocrangon* is provisionally adopted here for the genus.

The 12 Atlantic species of *Glyphocrangon* can be distinguished according to the following key.

KEY TO THE ATLANTIC SPECIES OF *Glyphocrangon*

1. Anterior lateral carina of the carapace with two distinct teeth behind the branchiostegal spine 2
1. Anterior lateral carina of the carapace with one tooth or without teeth behind the branchiostegal spine 8

2. Pleuron of fifth abdominal somite ending in three distinct teeth ..... *G. sculpta* p. 279
2. Pleuron of fifth abdominal somite ending in two distinct teeth 3

3. Rostrum with three lateral teeth on each side. Dactylus of the fifth pereiopod, at least in the female, broad and bifid ..... *G. rimapes* p. 287
3. Rostrum with two lateral teeth on each side. Dactylus of fifth pereiopod oval, not bifid 4

4. Anterior antennal carina formed of a row of tubercles. First abdominal somite with two transverse rows of tubercles between the intermediate carinae 5

4. Anterior antennal carina absent. First abdominal somite usually with only a single transverse row of tubercles, viz., along the posterior margin 6

5. Eyes with the cornea white. Body naked or with a very inconspicuous pubescence. The margins of the rostrum and the basal part of the carinae on the telson are serrated or crenulated. Posterior antennal carina distinctly serrated, between it and the posterior lateral carina many tubercles. Basal part of outer margin of scaphocerite without a fringe of setae proximally of the outer tooth ..... *G. atlantica*

5. Eyes with the cornea pigmented. Body with a short, but dense pubescence. The margins of the rostrum (apart from the 2 pairs of rostral teeth) not serrated, straight. Posterior antennal carina (apart from 2 blunt posterior teeth) straight, not serrated; between it and the posterior lateral carina the surface of the carapace is smooth. Outer margin of scaphocerite ciliated for its entire length ..... *G. spinicauda*

6. Posterior antennal carina usually rounded anteriorly, not ending in a spine. Antennal spine directed strongly outward, far more strongly diverging than the branchiostegal spine ..... *G. aurantiaca*

6. Posterior antennal carina usually ending anteriorly in a spine or sharp angle. Antennal spine not more strongly diverging than the branchiostegal 7

7. Anterior intermediate carina not ending in a spine. Posterior antennal and posterior lateral carinae bearing several blunt tubercles or teeth. Anterior of the two teeth on the anterior lateral carina behind the pterygostomian spine reaching to or beyond the orbital margin ..... *G. longleyi*

7. Anterior intermediate carina ending in a sharp spine. Posterior antennal and posterior lateral carinae straight, without tubercles or teeth. Anterior tooth of anterior lateral carina not reaching the level of the posterior margin of the orbit ..... *G. haematonotus*

8. Anterior antennal carina strong, forming with the antennal spine a single sharply pointed winglike expansion. Anterior lateral carina ending in the branchiostegal spine ..... *G. neglecta*

8. Anterior antennal carina absent or at most indicated by a few small tubercles. Antennal spine isolated on anterior margin of carapace, not winglike expanded posteriorly. Lateral ridge ending between antennal and branchiostegal spines 9

9. Posterior antennal carina ending anteriorly in a large winglike expanded spine. Tooth at anterior end of anterior lateral carina large and winglike, much wider than antennal spine ..... *G. aculeata* p. 323

9. Posterior antennal carina anteriorly blunt or ending in a small spinule, which is not at all winglike. Tooth at anterior end of anterior lateral carina, although distinct, much shorter and less wide than antennal spine 10

10. Upper surface of rostrum corrugated at either side of the median carina ..... *G. longirostris* p. 330

10. Upper surface of rostrum at either side of the median carina smooth 11

11. Antennal spine hardly more divergent than the branchiostegal. Posterior antennal carina ending anteriorly in a low right angle ..... *G. nobilis* p. 341

11. Antennal spine usually far more strongly diverging than the branchiostegal. Posterior antennal carina ending in a distinct spine ..... *G. alispina* p. 347

The best account of *Glyphocrangon* is undoubtedly that by Sidney I. Smith (1882: 41-53), who gave an excellent description of the genus and three of its species, and provided very accurate illustrations. Smith proposed the new name *Rhachocaris* for the genus, although he realized that there was a possibility that it might be identical with *Glyphocrangon* A. Milne Edwards, proposed a year earlier; A. Milne Edwards's preliminary description was insufficient to make this fully certain. Later the identity of the two genera was definitely established. In 1901, Alcock erected a new subgenus for species with reduced eyes collected in Indian waters; this subgenus *Plastocrangon*, which later was reported also from Atlantic waters, is of very doubtful standing (see p. 294).

Glyphocrangon sculpta (S. I. Smith, 1882)
Figs. 2, 3

Rhachocaris sculpta Smith, 1882, Bull. Mus. comp. Zool. Harv., *10:* 49, pl. 5, fig. 3; pl. 6, fig. 3-3d.

Glyphocrangon sculptus Smith, 1884, Rep. U. S. Commnr Fish, *10:* 365 (p.p.). —Verrill, 1885, Rep. U. S. Commnr Fish, *11:* 555, pl. 35, fig. 154.—Smith, 1886, Rep. U. S. Commnr Fish, *13:* 608, 655, pl. 8, fig. 3; pl. 9, figs. 1, 2.—Hansen, 1908, Dan. Ingolf-Exped., *3* (2): 55.—Stebbing, 1908, Ann. S. Afr. Mus., *6:* 37; 1910, Ann. S. Afr. Mus., *6:* 387.—Fowler, 1912, Ann. Rep. New Jersey State Mus., 1911: 557.—Stephensen, 1913, Meddr Grønland, *22:* 21.—De Man, 1920, Siboga Exped. Mon., *39*(a3): 215, 218.—Nierstrasz & Brender à Brandis, 1923, Siboga Exped. Mon., *32*f: 86.—Heegaard, 1941, Meddr Grønland, *126*(6): 34, fig. 13.—Barnard, 1950,

Ann. S. Afr. Mus., *38:* 719, fig. 134a-d.—Marshall, 1954, Aspects Deep Sea Biol.: 329.—Kensley, 1968, Ann. S. Afr. Mus., *50*(12): 318.

Glyptocrangon sculptus Norman, 1886, Mus. Normanianum, (Ed. 1) Pt. 3: 8; 1905, Mus. Normanianum, (Ed. 2) Pt. 3: 9.—Williamson, 1915, Nord. Plankt., *6:* 392.

Material Examined.—WESTERN ATLANTIC: E of New Jersey, U. S. A.: ALBATROSS sta. 2035, 1 female (USNM), 1 ovigerous female (A. M. Norman coll., BM); sta. 2095, 2 males (USNM); sta. 2102, 1 male (USNM); sta. 2196, 1 female (USNM); sta. 2534, 1 female (USNM); sta. 2571, 1 male (USNM).—Off Delaware, U. S. A.: BLAKE sta. 339, 1 ovigerous female holotype (MCZ).—E of Virginia, U. S. A.: ALBATROSS sta. 2105, 1 male (USNM).—E of North Carolina, U. S. A.: ALBATROSS sta. 2725, 2 specimens (USNM).—Mouth of Exuma Sound, Bahama Islands: ALBATROSS sta. 2629, 1 ovigerous female (USNM).—St. Croix Basin, Virgin Islands: PILLSBURY sta. 1304, 4 specimens.—NE of Tobago: PILLSBURY sta. 844, 2 ovigerous females.

EASTERN ATLANTIC: Bay of Biscay off Santander, Spain: Centre Océanologique de Bretagne, Sta. CHO4-BO15-Put 109, 1 male (COB).—SE of Lagos, Nigeria, West Africa: PILLSBURY sta. 314, 2 specimens.

Description.—The carapace is glabrous and slightly pitted; there is no pubescence or a widely scattered one of short, inconspicuous hairs. The rostrum reaches with ⅛ or ¼ of its length beyond the scaphocerite. The distance between the two pairs of lateral rostral teeth is somewhat shorter than, to almost half as long as, the distance between the anterior pair and the apex of the rostrum, which is again somewhat shorter than the distance dorsally between the anterior and the cervical grooves. The median rostral carina reaches to the base of the rostrum; sometimes is shows some tubercles or denticles in its basal part. The upper surface of the rostrum is concave, except for the distal fourth. A rounded carina connects the anterior and posterior lateral teeth.

The antennal spine is placed on the lower angle of the orbit; it is rather strong and directed somewhat upward and outward. The branchiostegal spine is stronger and is directed more downward. From the upper surface of the branchiostegal spine a carina extends to the anterior end of the anterior lateral carina; a shorter, similar carina is placed just below it.

The anterior submedian carinae of the carapace carry six to nine spiniform tubercles; between the two carinae there are scattered spinules; laterally of each carina there is an irregular row of about eight spinules. The carina ends anteriorly in a distinct spine. The posterior submedian carinae

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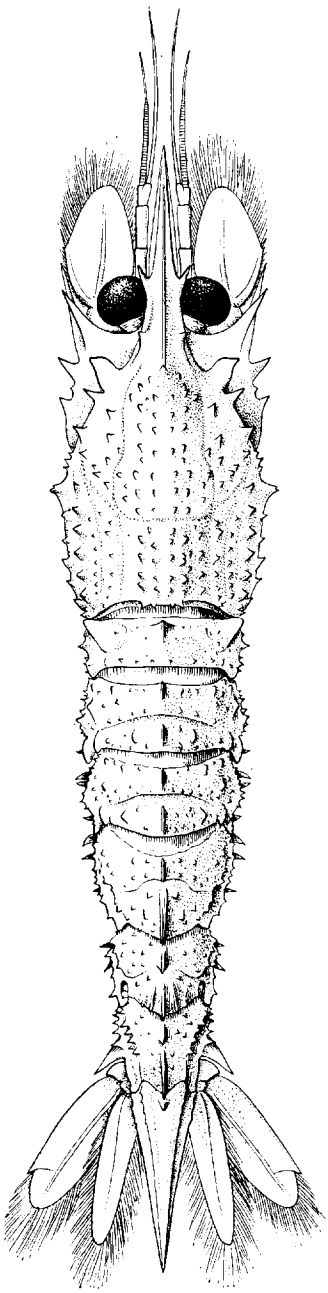
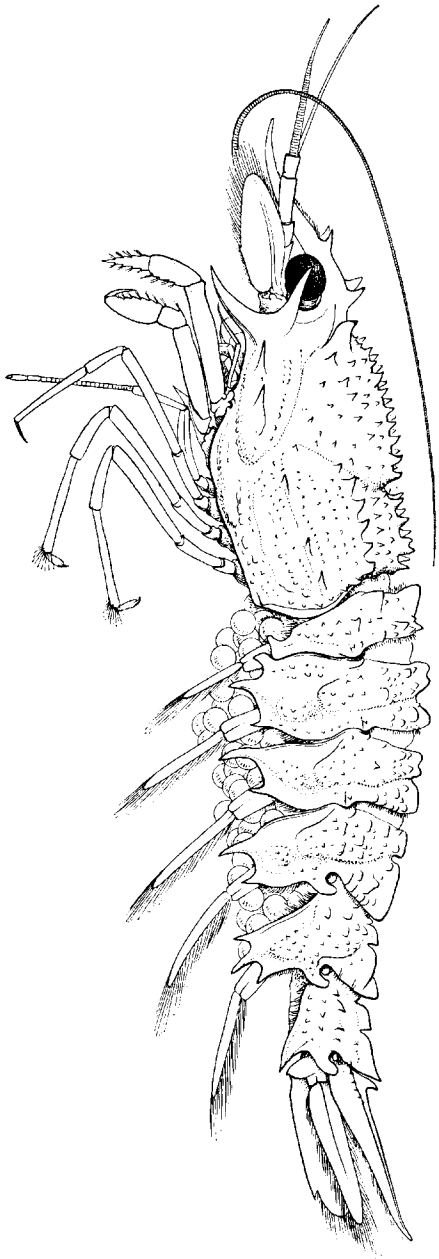
FIGURE 2. *Glyphocrangon sculpta* (Smith), holotype female from BLAKE sta. 339, in dorsal and lateral views, × 1.4. (After Smith, 1882.)





bear four or five sharp toothlike spines; a few spinules are found both to the outside and to the inside of the carinae. A row of about seven toothlike spines and a few scattered spinules are placed between the posterior submedian and the posterior intermediate carinae. The anterior intermediate carina has five spines, the anterior of which is largest; it is larger than the posterior rostrolateral teeth and is immediately followed by a much smaller spine; the distance between the first and second spines is much smaller than that between the second and third. To the inner side of the anterior intermediate carina there is a row of about five smaller teeth; a few spinules are placed to the outside of it. The posterior intermediate carina bears six or seven large toothlike spines; some spinules are placed to the outside of the carina. The posterior antennal carina is smooth, but irregular, and often has indications of several teeth, e.g., one in the middle and one in the basal part; the carina ends in a usually distinct, but blunt, triangular tooth. Between the anterior end of this ridge and that of the anterior intermediate there is a row of three or four spines placed along the posterior margin of the lateral groove; behind these three or four spines there are many spiniform tubercles more or less clearly arranged in longitudinal rows. The anterior antennal carina is indicated by a row of five to seven sharp spines, below and above which there may be small tubercles. The posterior lateral carina is rather irregularly toothed; the teeth are low and not very conspicuous. Between the posterior antennal and posterior lateral carinae there is a longitudinal row of about six to nine spinules, often with several tubercles above and below it; more to the rear, along the posteromarginal groove, there are two oblique rows of, respectively, one or two and three or four spinules. The anterior lateral carina bears two large, triangular, outwardly directed pointed teeth, in addition to which there is a third, much smaller, often inconspicuous, tooth either behind the first or the second of the larger teeth. The anterior and posterior sublateral carinae are distinct and without teeth. Between the posterior ends of the anterior lateral and sublateral carinae, there may be a very short additional carina just before the lateral groove. Behind the lateral groove, at about the same level there is an indication of a blunt tubercle followed by some others. The anterior submarginal carina is distinct and is sometimes connected with the posterior, which is short and not fused with the marginal carina. The lateromarginal groove merges uninterruptedly with the posteromarginal. The marginal carina is somewhat widened at the posterolateral angle. A sharp, or blunt, rather large tooth is placed at the posterolateral angle to the inner side of the marginal groove, this perhaps is to be considered a remnant of the posterior part of the submarginal carina. Sometimes one or two spines are placed before it.

The abdomen has the tubercles rather spiny. The three large dorsal teeth on the first somite are triangular and sharp. The tubercles are conical

and pointed, and very numerous. The median carinae on the second to sixth somites are widely interrupted in the middle (somites 2 and 3), or before the middle (somites 4 to 6). In the fifth somite, the two components of the median carina are rather short and sharply pointed; the submedian carinae are long and reach almost to the end of the somite, sloping down in the posterior third. The two components of the median carina of the sixth somite both end in an acute tooth. The pleuron of the first somite ends in an obliquely anteriorly directed blunt tooth; the anterior margin is somewhat concave, the posterior strongly convex. The pleuron of the second somite ends in three teeth of which the middle one is the longest. The pleura of the third and fourth somites end in two teeth, the anterior of which is longer than the posterior. The pleuron of the fifth abdominal somite ends in three sharp teeth, the middle one being longest. The lateral surface of the sixth somite has a longitudinal row of four or five sharply pointed teeth over the middle, with three to five smaller spines above it and about three below it. A longitudinal row of about six to eight small and rather closely placed spinules extends over the base of the pleuron. The basal tooth of the telson is large and triangular. The proximal part of the dorsal submedian carina is serrate.

The eyes are large, the cornea is globular; a small tubercle is placed in the distal part of the inner margin of the peduncle.

The scaphocerite is about ⅖ as wide as long. The antennal peduncle reaches to the end of the scaphocerite. Even in the adult specimen, an indication of a tooth is present slightly below the middle of the outer margin.

The third maxilliped reaches to the end of the scaphocerite. The distal two segments are of the same length and bordered by slender spines, which also are found on the inner surface. The first pereiopod reaches with the end of the propodus about to the end of the first segment of the antennular peduncle. The second legs are slightly unequal. The right is the longer and the more slender; it fails to reach the end of the scaphocerite, or just reaches beyond it. The carpus contains 20 to 23 segments. The left leg is shorter and wider. Its carpus is divided into 17 segments. The third leg reaches with the dactylus or a small part of the propodus beyond the scaphocerite. The dactylus measures about ⅛ of the length of the propodus. It is oval and pointed, with a longitudinal groove in the distal part of the dorsal surface. There is no brush of hair at the end of the propodus. The carpus is half, or less than half, as long as the propodus. The merus measures slightly less than the combined length of carpus and propodus. The fourth leg reaches with almost the entire dactylus beyond the scaphocerite. The dactylus measures ⅖ of the length of the propodus; it is oval in shape, but in the female it ends in two points, the outer of which is smaller than the inner; the upper surface shows a short distal groove between the two

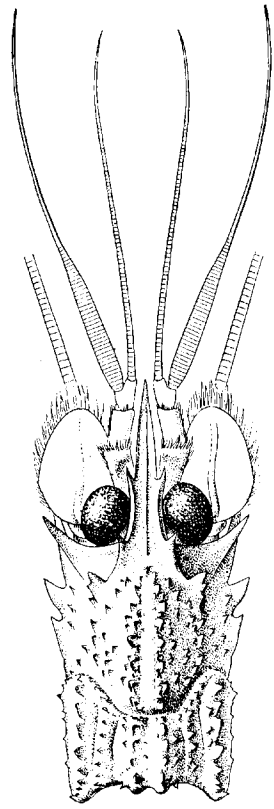


FIGURE 3. *Glyphocrangon sculpta* (Smith), male from ALBATROSS sta. 2051, anterior part of body in dorsal view, × 1.4. (After Smith, 1886.)

teeth. In the male it ends in a single point with at most a slight swelling on one side. The carpus measures ⅗ of the length of the propodus. The propodus bears distally a large tuft of hairs, which is slightly less than half as long as the dactylus. The merus is about twice as long as the carpus. The fifth leg distinctly fails to reach the end of the scaphocerite. It has about the same shape as the fourth; here, too, the sexual difference in the shape of the dactylus is noticeable.

The present species can easily be recognized and distinguished from the other Atlantic species of the genus by the fact that the pleura of the fifth abdominal somite end in three, instead of two, sharp teeth and by the two-pointed dactyli at the fourth and fifth pereiopods in the females.

Size.—The holotype specimen, a female, has cl. 44 mm. The examined female from the ALBATROSS Expedition has cl. 45 mm. The male from northern Spain has cl. 34 mm. The two ovigerous females collected by the PILLSBURY in 1969 have cl. 31 and 32 mm, and the two West African specimens 28 and 40 mm. The smaller and larger diameter of the eggs are, respectively, 2.0 to 2.6 mm and 3.0 to 3.4 mm. The total lengths of South African specimens, recorded by Stebbing (1908), were between 75 and 88 mm. Kensley (1968) reported for his South African material carapace lengths of 15.6 to 22.8 for the males and 19.3 to 26.0 mm for the females; in ovigerous females the carapace lengths ranged from 24.0 to 26.0 mm. Evidently Kensley did not include the rostrum in his carapace length.

Colour.—The description is based on recently preserved material from PILLSBURY sta. 844 and fresh material from PILLSBURY sta. 1304. The rostrum is red. Also red is the anterior part of the carapace before the anterior and cervical grooves, inclusive of the antennal and branchiostegal spines. The red colour also extends onto the anterior part of the anterior submedian carinae and the anterior tooth of the anterior intermediate carinae. A few tubercles of the anterior and posterior intermediate and lateral carinae may be pinkish, as also the anterior tooth of the posterior antennal carina. The rest of the carapace is uncoloured.

The abdomen is entirely uncoloured, but for the three large teeth of the first somite, the lateral teeth of the pleura, and the tip of the telson, all of which are pale orange, or reddish.

The antennulae and antennae are entirely orange red, except for an uncoloured spot in the basal part of the scaphocerite.

The mouthparts and the first three pereiopods are red. The fourth and fifth legs have the ischium red and the rest uncoloured or very pale orange; sometimes the articulations of the legs are reddish.

The pleopods are uncoloured.

Parasites.—Stebbing (1908) mentioned the presence of the bopyrid isopod *Bathygyge grandis* Hansen in the right branchial chamber of one of the South African specimens. This species was originally described from *Glyphocrangon spinulosa* Faxon from off the west coast of Mexico.

Horizontal Distribution.—The species has an extensive distribution in the Atlantic Ocean, reaching from Iceland to the West Indies, the Gulf of Guinea and South Africa. The records in the literature are: Between Iceland and Greenland: 64°34′N, 31°12′W (1300 fm = 2380 m) (Hansen, 1908; Stephensen, 1913; Heegaard, 1941). Off the east coast of the United States between Massachusetts and Delaware: 39°41′00″N, 69°20′20″W (1106 fm), 39°40′05″N, 69°21′25″W (1098 fm), 39°29′00″N, 70°58′40″W (1342 fm), 39°26′16″N, 70°02′37″W (1362 fm), 38°44′00″N, 72°38′00″W

(1209 fm), 37°50′00″N, 73°03′50″W (1395 fm) (Smith, 1884). Off New Jersey: 39°35′N, 69°44′W (1230 fm) (Smith, 1886). Off Delaware: 38°16′45″N, 73°10′30″W (1186 fm) (type-locality; Smith, 1882). Cape Point NE by E ¼ E, 40 miles and Cape Point N 70°E, 40 miles, South Africa (1463-1645 m) (Stebbing, 1908, 1910; Barnard, 1950). W of Cape of Good Hope, South Africa: 33°26′S, 16°33′E (2268 m), 33°45.5′S, 16°23.5′E (2707 m), 33°49′S, 16°30′E (2743 m), 33°52′S, 16°51′E (2835 m), 34°05′S, 16°58′E (2707 m), 34°36′S, 17°00′E (3219 m) (Kensley, 1968). The present material extends the known distribution of the species in the eastern Atlantic from South Africa north to West Africa and the Bay of Biscay, and in the western Atlantic from the east coast of the United States south to the West Indies. *G. sculpta* was, compared to the other species of the genus, very poorly represented in the PILLSBURY catches.

Vertical Distribution.—The depths from which *Glyphocrangon sculpta* is reported range from 900 to 1760 fathoms (= 1645 to 3219 m). It was found on bottoms described as: gray ooze (ALBATROSS sta. 2534), *Globigerina* ooze (ALBATROSS stas. 2035, 2052, 2095, 2102, 2105; BLAKE sta. 339), gray *Globigerina* ooze (ALBATROSS sta. 2571), gray ooze and Foraminifera (ALBATROSS sta. 2725), blue mud and *Globigerina* ooze (ALBATROSS sta. 2051), green mud (ALBATROSS sta. 2196), and coral sand (ALBATROSS sta. 2629).

Type-Material.—The holotype, an ovigerous female, originates from off Delaware, 38°16′45″N, 73°10′30″W. It is preserved in the collection of the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts, U. S. A. (No. 3236).

Remarks.—In the original description, Smith described the dactyli of the third and fourth pereiopods as bifid. It was Barnard (1950: 721, fig. 134b) who pointed out correctly that this feature is only shown by the females, while in the males the dactyli are of the usual oval shape, at most with a slight additional hump in the distal part of one lateral margin.

The specimen from ALBATROSS sta. 3825, referred to by Smith (1884) as belonging to the present species, is preserved in the Museum of Comparative Zoology in Cambridge, Mass., and upon examination proved to belong to *G. longirostris*. The sample contained the original identification by Smith and a label in another handwriting giving the correct identity. The material from ALBATROSS stations 2035, 2095, 2102, and 2105 reported upon by Smith (1884) as *G. sculptus* were also examined and proved to be correctly identified. Smith's (1884) material from ALBATROSS stations 2051 and 2052 was not available for examination.

Glyphocrangon rimapes Bate, 1888
Fig. 4

Thalascaris Bate, 1878, Ann. Mag. nat. Hist., (5), *2:* 282.

Glyphocrangon rimapes Bate, 1888, Rep. Voy. Challenger, Zool., *24:* 523, pl. 94, fig. 4.—Murray, 1896, Trans. R. Soc. Edinburgh, *38:* 387, 394, 400, 453.—Thompson, 1899, Proc. R. Soc. Edinburgh, *22:* 328.—De Man, 1920, Siboga Exped. Mon., 39 (a3): 215, 218.—Holthuis, 1952, Lunds Univ. Årsskr., N. Ser. (2) *47* (10): 77.—Anon., 1954, Illustr. Encycl. Fauna Japan, (Rev. Ed.): 764, fig. 2203.—Bahamonde, 1963, Noticiario mens. Mus. Nac. Hist. nat., Santiago Chile, 7 (81): [4].—Zarenkov, 1964, Faun. zoogeogr. notes decapod Crustacea Antarctic: 8.—Kubo, 1965, New Illustr. Encycl. Fauna Japan, *2:* 624, fig. 1011.

The status of this species is somewhat uncertain. Bate (1888) based it on four specimens, one from Japan, two from near Juan Fernandez, and one from the South Atlantic. Since that time no additional specimens have been found, and it is not even quite certain that all of Bate's specimens belong to a single species. For completeness' sake, it is included in the present list.

Glyphocrangon rimapes differs from all other Atlantic species of the genus in that the rostrum has three, instead of two, lateral teeth on either side. It agrees with *G. sculpta*, but differs from the other species, in that the dactylus of the fifth leg in the female is distinctly bifid. As no males of *G. rimapes* are known, we do not know whether there is any sexual difference here.

Size.—The specimen from the South Atlantic, an ovigerous female, was reported by Bate to have a total length of 87 mm.

Horizontal Distribution.—The four types, which so far are the only known specimens, were taken in Japan (near Yokohama, 34°37′N, 140°32′E), near Juan Fernandez (33°42′S, 78°18′W), and between Buenos Aires and Tristan da Cunha (37°47′S, 30°20′W).

Vertical Distribution.—The four known specimens were taken in 1375 fm (Juan Fernandez), 1715 fm (South Atlantic), and 1875 fm (Japan), on bottoms of *Globigerina* ooze (Juan Fernandez and South Atlantic) and blue mud (Japan).

Type-Material.—Bate (1888: 525) indicated the specimen from "the South Atlantic (Station 133)" as "the type of this species," and therefore this specimen from near Tristan da Cunha has to be considered the holotype. The figures of *G. rimapes* given by Bate (1888: pl. 94, fig. 4; reproduced in the present paper as Fig. 4) and also the greater part of his description are based on the larger of the two specimens from Station 300 (near Juan Fernandez; see Bate, 1888: 524).

Glyphocrangon atlantica Chace, 1939
Fig. 5

Glyphocrangon (*Plastocrangon*) *caecescens atlantica* Chace, 1939, Mems Soc. cub. Hist. nat., *13:* 40.

Material Examined.—WESTERN ATLANTIC: NW of Swan Island, N of Honduras: PILLSBURY sta. 575, 1 ovigerous female (UMML).—South of Santa Clara Province, Cuba: ATLANTIS sta. 2966, 1 female holotype (MCZ, No. 10242).

EASTERN ATLANTIC: Bay of Biscay, France: Centre Océanologique de Bretagne, sta. CHO4-BO17-Put 115, 1 female (COB).

Description.—The body is naked, without any obvious pubescence. The rostrum reaches with about ⅛ of its length beyond the scaphocerite. The distance between the two pairs of rostral teeth is slightly less than half the distance between the anterior pair and the apex. The rostral teeth are small compared to those of the other species; the anterior pair is directed more outwards than the posterior. The lateral margin of the rostrum in the PILLSBURY specimen shows three or four inconspicuous elevations between the lateral teeth, and one of these elevations in this specimen is enlarged to a minute tooth; before the anterior teeth a few faint irregularities may also be observed on the rostral carinae. In the French specimen and in the type these elevations are absent. Behind the posterior rostral tooth, the rostral carina is somewhat serrated or crenulated in all three specimens. The tip of the rostrum (i.e., the part distally of the anterior rostral teeth) is slightly longer than the distance between the anterior and cervical grooves measured dorsally. The median carina extends over the full length of the rostrum, it is nowhere very high, and it ends in the median tooth at the base of the rostrum. This median tooth is very distinct in the West Indian specimens, inconspicuous in the French. Between the anterior rostral teeth the rostrum is rather flat; farther backwards it becomes more concave. There is no distinct swollen ridge between the two pairs of teeth.

The antennal spine is placed on the lower angle of the orbit; it is much smaller than the branchiostegal spine and directed somewhat upward and forward. In the PILLSBURY specimen the carina behind the antennal spine is angularly produced, in the French specimen and in the type it is practically smooth. The branchiostegal spine is directed obliquely forward.

The anterior submedian carinae of the carapace are built of seven or eight small but distinct tubercles, which are conical with a blunt top. At the inner side of the carina there are about seven to nine smaller tubercles, arranged in an irregular longitudinal row; to the outside, a row of about eight similar irregularly arranged tubercles can be seen. The posterior submedian carina consists of four or five tubercles, with a few smaller ones on both the inner and outer sides. Apart from the small median tubercle at

the base of the rostrum just before the anterior groove, there is a larger median tubercle just behind the groove.

The anterior intermediate carina bears a row of four pairs of fairly large tubercles; the tubercles of each pair are placed one laterally of the other. Apart from these eight tubercles, each intermediate carina shows several smaller tubercles, above and below the larger ones; sometimes they are placed in longitudinal rows, sometimes there is no clear pattern. The posterior intermediate carina consists of an interrupted ridge formed by seven or eight teeth. Between it and the posterior submedian carina about three longitudinal rows of five to eight small tubercles are present.

The anterior antennal carina consists of a row of four or five tubercles, the anterior of which is ridgelike; one or two very small tubercles may be seen either above or below the antennal carina. The posterior antennal carina is irregularly serrated. It ends in a rather low tooth at some distance behind the cervical groove, and one or two small tubercles stand between it and the cervical groove. Between the posterior antennal carina and the posterior intermediate carina there are about three longitudinal rows of eight to twelve small tubercles each.

The anterior lateral carina has two large, but not very high, teeth with blunt tops. The carina itself is in places irregular, so that one or two faint serrations may be visible between or behind the teeth. The anterior tooth does not attain the posterior limit of the orbit. The carina ends at the base of the branchiostegal spine. The posterior lateral carina is low but distinct; it is bluntly serrated. These serrations are most distinct and placed closest together in the posterior half. Anteriorly the carina ends bluntly. Between the posterior lateral and posterior antennal carinae there are two or three longitudinal rows of four to ten very small tubercles.

In the West Indian specimens the anterior sublateral carina is rather distinct, although it is rather irregular; above it, and sometimes also below, is a row of four irregular tubercles. The carina and tubercles are hardly noticeable at all in the French specimen. The posterior sublateral carina consists of a row of ten to fourteen tubercles below the posterior lateral carina. The submarginal carina is indistinct and consists of an area of reticulated grooves. The lateral groove is interrupted there. The marginal carina forms a distinct rounded tooth at the posterolateral angle.

In the French specimen, the sculpture of the carapace is far less distinct than in the PILLSBURY specimen, on which the above description is based for the larger part.

The tubercles on the abdomen are small and blunt, but quite distinct. There is no, or hardly any, pubescence. The first abdominal somite carries the usual three large, pointed, triangular teeth. Between these teeth there is a row of distinct tubercles along the anterior margin, in addition to the row that extends along the posterior margin of the tergum. All somites

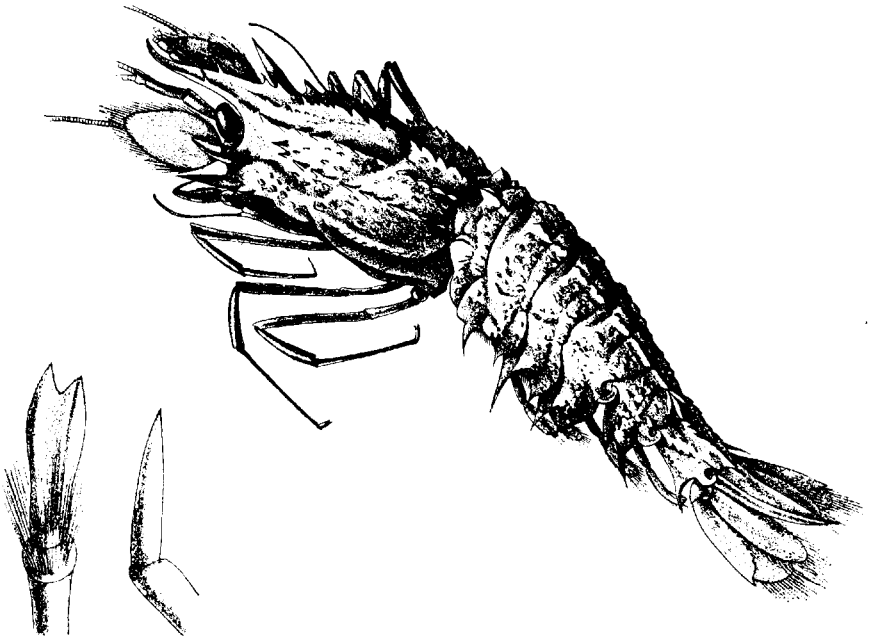


FIGURE 4. *Glyphocrangon rimapes* Bate, paratype female from CHALLENGER sta. 300: Top, dorsolateral view; bottom, left, dactyl of fifth pereiopod; bottom, right, dactyl of third pereiopod; × 1.8. (After Bate, 1888.)

have a median longitudinal carina. That of the first is formed by the above-mentioned large, median, triangular tooth and a short ridge behind it. Those of the second and third are low and interrupted by the transverse grooves of each somite. That of the fourth shows a slight notch in the middle. The fifth somite shows only the carina in the anterior half and in the extreme distal posterior part; in the posterior half of the somite there are two posteriorly diverging submedian carinae, which are rather high and do not reach the posterior margin of the somite. The median carina of the sixth somite is high, shows a notch just before the middle, and ends in a triangular tooth. The rest of the terga and pleura of the somites are provided, both before and behind the transverse grooves, with various tubercles which are arranged in longitudinal rows or placed irregularly. The tip of the pleuron of abdominal somite 1 is truncate laterally, with the antero-lateral angle produced forward. The pleuron of the second somite is almost circular, with a distinct, sharp tooth at the apex and an indistinct, low, rounded tooth on the margin before and behind the apex. The third, fourth, and fifth somites end in two teeth each; in the third and fourth, the anterior

of these teeth is by far the larger and is directed distally, while the posterior is very small. In the fifth, the posterior tooth is markedly larger than the anterior. The pleuron of the sixth somite is formed by a large and sharp triangular tooth, the apex of which is directed posteriorly. The lateral surface of the sixth somite bears a longitudinal row of about four or five ridgelike tubercles over its middle, extending from the articulation with the fifth somite to that with the telson. One to four blunt tubercles are placed below this row. Two very short ridges are placed at the posterior margin, one just over and one just below the articulation with the telson. Above the upper of these a small tubercle is visible. Along the anterior half of the lower margin of the sixth somite and over the base of the pleuron there is a row of about five tubercles. The marginal as well as the submedian carinae of the telson are denticulated in their proximal half; this is especially distinct in the basal part of the marginal ridge. The basal median dorsal tooth of the telson is ridgelike and high.

The eyes are large; the cornea is globular and far wider than the eyestalk. However, no pigment is present. The cornea is milky white, both in the living and the preserved animal. A small, pointed tubercle is placed on the inner margin of the eyestalk near the base of the cornea.

The scaphocerite is elongate oval; it is slightly more than twice as long as broad. A distinct, although blunt, tooth is placed in the middle of the outer margin. The inner margin of the scaphocerite shows a shallow notch or dent in the distal part. The antennal peduncle reaches as far as the end of the scaphocerite.

The third maxilliped reaches with the dactylus to the end of the scaphocerite, or somewhat beyond.

The first pereiopod reaches somewhat beyond the middle of the scaphocerite. The second legs are definitely unequal. The right is the longer; it reaches to the end of the scaphocerite in the larger specimen, less far in the smaller. The fixed finger of the chela is so strongly reduced that the latter has practically become a subchela. The carpus consists of 19 and 20 segments in the larger specimens, 16 in the smaller; the last segment is the longest, being about as long as the subchela. The merus is less than half as long as the carpus and slightly shorter than the ischium. The left second leg fails to reach the end of the scaphocerite. The carpus consists of 15 segments in the larger specimens, and of 13 in the specimen from France. The merus is about half as long as the carpus. The third leg reaches with half the propodus beyond the scaphocerite in the larger specimen, overreaching it with the dactylus in the smaller. The dactylus is only slightly flattened and measures almost ⅓ of the length of the propodus. It ends in a single slender point and has a longitudinal groove on the upper (= anterior) surface. The propodus does not bear a distal tuft of hairs. The

carpus is more than half as long as the propodus and less than half as long as the merus. The fourth leg reaches about to the tip of the rostrum in the larger specimens, to the end of the scaphocerite in the smaller. The dactylus is somewhat less than ⅓ of the length of the propodus; it ends in a slender, simple point. The propodus bears a distal tuft of long hairs, which hides the basal part of the dactylus from view. The fifth leg is almost as long as the fourth. Its dactylus is shorter, being about ¼ of the length of the propodus. Otherwise, the two legs resemble each other very much. The sternum is smooth.

The uropodal protopod ends dorsally in two rounded lobes over the bases of the exopod and endopod. The outer margin of the exopod is somewhat curved and ends in a distinct tooth. The diaeresis is very obscure; it can be seen only very close to the outer tooth.

Size.—The type-specimen has cl. 43.4 mm; the other specimens, the second and third known, have cl. 37 and 47 mm; all are females. The eggs have a diameter of 3 × 4 mm.

Colour.—The colour of the living specimen from the PILLSBURY Expedition was noted to be "pale orange with yellow eggs." The cornea was white. Also in the French specimen, which was examined 6 months after capture, the cornea was entirely white.

Horizontal Distribution.—Until now, the species was known only from the type-specimen, from south of Santa Clara Province, Cuba, 20°47'N, 80° 24'W (2125 fathoms = 3885 m) (Chace, 1939). The largest specimen reported upon in the present paper was taken not too far from the type-locality; the smaller, however, originates from the eastern Atlantic, having been collected off the Atlantic coast of France.

Vertical Distribution.—The type was taken at 3885 m depth, the other specimens at 6364 to 6373 m and 4665 m. Compared to the other Atlantic species, *G. atlantica* is one of those occurring deepest. The bottom at PILLSBURY Sta. 575 was noted to consist of clay.

Type-Material.—The holotype, a female with cl. 43.4 mm, was collected south of Santa Clara Province, Cuba, 20°47'N, 80°24'W at 2125 fathoms, at ATLANTIS sta. 2966. It is now preserved in the Museum of Comparative Zoology, Harvard University, Cambridge, Mass., under reg. no. 10243.

Remarks.—Chace (1939) considered this form to be the Atlantic subspecies of *Glyphocrangon caecescens* Wood-Mason from the Bay of Bengal.

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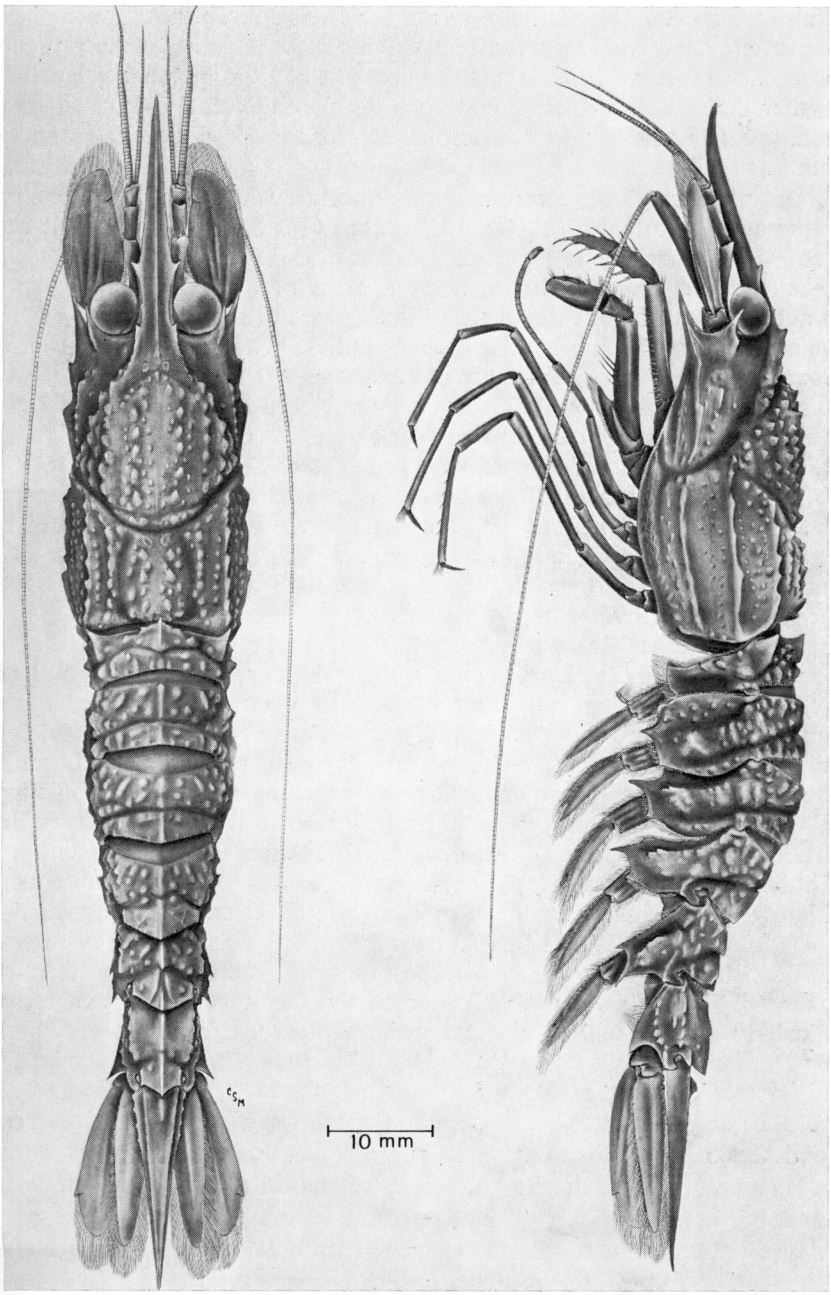
FIGURE 5. *Glyphocrangon atlantica* Chace, female from PILLSBURY sta. 575, in dorsal and lateral views.


10 mm

In my opinion the differences between the two forms, part of which have been enumerated by Chace, are of a specific nature, e.g., (1) the presence or absence of the tubercles that define the anterior antennal ridge, (2) whether the fifth abdominal somite has the pleura ending in two or three teeth, and (3) whether the rostrum has two or three well-developed lateral teeth.

The subgenus *Plastocrangon* is of doubtful validity. The differences enumerated by Alcock (1901: 133) are: (1) the eyes are small and opaque yellow-ochre, (2) the submedian and intermediate carinae are broken up into lines of tubercles, and (3) the first and second pereiopod do not have arthrobranchs. In their Illustrations of the Zoology of the Investigator, Wood-Mason & Alcock (1894, pl. 7, fig. 1) showed the eyes of *G. caeca* as quite small, but those of *G. caecescens* (pl. 7, fig. 2) are distinctly larger, as are those of *G. cerea* (see Alcock & Anderson, 1895: pl. 9, fig. 6). The eyes of the present species are not much, if at all, smaller than those of normal species of *Glyphocrangon*. As to the colour of the eye, this seems to be variable, at least in preserved specimens of some species. Thus, in *G. longirostris* the eyes (in preserved specimens) can be almost white, but specimens with dark eyes and intermediates are also found. Pale eyes are especially found in juvenile specimens. It is possible, of course, that in living specimens the colour of the eye is more constant. The submedian and intermediate carinae are broken up into tubercles in so many species of *Glyphocrangon* s. s. that this character is of very little, if any, value for the characterization of *Plastocrangon*. The third character seems to be of great importance, viz., the difference in the branchial formula. In *Plastocrangon*, namely, the arthrobranchs of the first and second pereiopods, which are present in *Glyphocrangon* s. s., should be missing. This important character, which, if constant, might even be of generic importance, has been curiously ignored by most authors. Alcock mentioned it in the original description of the subgenus *Plastocrangon*, but subsequent authors dealing with species of *Plastocrangon* neither confirmed nor denied it. De Man (1920: 241-247), who described two species of *Plastocrangon*, one of them new, did not mention the branchial formula, and neither did Chace (1939). This is probably due to the fact that the branchiae are difficult to observe without damaging the carapace. In the present specimens, arthrobranchs are present on both the first and second pereiopods and for that reason the species certainly belongs to *Glyphocrangon* s.s. It would be interesting to examine the typical *Glyphocrangon caecescens* Wood-Mason, as this is the type-species of the subgenus *Plastocrangon*.

The specimen from the Bay of Biscay resembles the one from off Swan Island, but has the sculpture decidedly less accentuated. Many of the sharp and distinct tubercles of the latter specimen are blunt or very inconspicuous in the former. Also the legs of the French specimen are relatively shorter.

But in all important characters there is a close resemblance, and I do not hesitate to assign both to the same species. Some of the differences may be due to the fact that the specimen from the eastern Atlantic is younger than the others.

Glyphocrangon spinicauda A. Milne Edwards, 1881
Figs. 6, 7

Glyphocrangon spinicauda A. Milne Edwards, 1881, Annls Sci. nat. Zool., (6) *11* (4): 3; 1883, Rec. Fig. Crust. nouv. peu conn.: pl. [40], fig. 1, 1a.—Faxon, 1896, Bull. Mus. comp. Zool. Harv., *30:* 158.—Young, 1900, Stalk-eyed Crust. Brit. Guiana: 458.—De Man, 1920, Siboga Exped. Mon., 39 (a3): 215, 219.—Glassell, 1934, Trans. S. Diego Soc. nat. Hist., *7:* 454. —Holthuis, 1955a, Zool. Verhand. Leiden, *26:* 130; 1955b, Bull. zool. Nom., *11:* 211.—Hemming, 1957, Opin. Decl. Int. Comm. zool. Nomencl., *16:* 136.—Anderson & Bullis, 1970, Sea Frontiers, *16* (2): 116.

Glyphocrangon aculeata Boone, 1927, Bull. Bingham oceanogr. Coll., *1* (2): 121, fig. 27; (p. p.) 1930, Bull. Vanderbilt mar. Mus., *3:* 179, pl. 66 (not pl. 67).—Glassell, 1934, Trans. S. Diego Soc. nat. Hist., *7:* 454 (not *Glyphocrangon aculeata* A. Milne Edwards, 1881).

Glyphocrangon cf. *spinicauda* Burkenroad, 1942, Am. Nat., *76:* 421.

Glyphocrangon (*Glyphocrangon*) *spinicauda* Springer & Bullis, 1956, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 196: 13.—Bullis & Thompson, 1965, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8 (p.p.).

Glyphocrangon spinicauda "Form A" Dobkin, 1965, Bull. Mar. Sci., 15: 872, 874, figs. la, b, d, e, 2-5.

Material Examined.—Straits of Florida, U. S. A.: GERDA sta. 142, 1 ovigerous female; sta. 154, 11 males, 7 females (3 ovigerous); sta. 158, 8 males, 11 females (2 ovigerous); sta. 161, 2 males; sta. 169, 1 male; sta. 170, 1 juvenile; sta. 175, 1 female; sta. 179, 15 females (8 ovigerous); sta. 180, 1 male; sta. 247, 1 ovigerous female; sta. 299, 36 males, 4 females, 1 juvenile; sta. 300, 4 males; sta. 301, 20 specimens; sta. 302, 9 juveniles; sta. 386, 1 specimen; sta. 646, 2 specimens; sta. 666, 2 ovigerous females; sta. 671, 1 specimen; sta. 715, 23 specimens (18 ovigerous); sta. 716, 2 specimens (1 ovigerous); sta. 806, 5 specimens (1 ovigerous); COMBAT sta. 447, 1 ovigerous female (USNM); sta. 450, 8 specimens (1 ovigerous) (USNM); PELICAN sta. 17, 1 specimen (USNM); SILVER BAY sta. 441, 18 specimens (6 ovigerous) (USNM).—Santaren Channel, N of Cuba: GERDA sta. 815, 3 specimens; sta. 816, 1 specimen; sta. 817, 1 specimen; sta. 818, 7 ovigerous females; sta. 1012, 1 specimen; sta. 1016, 7 males, 4 females (2 ovigerous); sta. 1017, 1 specimen; sta. 1018, 1 specimen; PILLSBURY sta. 1171, 49 specimens (20 ovigerous).—N of Cuba: OREGON sta. 1342, 1 male, 1 ovigerous female (USNM).—W of Key West, Florida, U. S. A.: OREGON sta. 1321, 1 male, 7 ovigerous females (USNM).—NW of Cuba: PILLSBURY sta. 584, 1 specimen.—Off Yucatan, Mexico: ALBATROSS sta. 2358, 35 specimens (18 ovigerous) (USNM); sta. 2359, 19

specimens (7 ovigerous) (USNM); PILLSBURY sta. 600, 4 specimens; sta. 601, 1 specimen; sta. 602, 11 specimens.—S of Jamaica: PILLSBURY sta. 1225, 13 specimens.—Between Jamaica and Honduras: OREGON sta. 1885, 7 specimens (2 ovigerous) (USNM).—Off Nicaragua: OREGON sta. 1916, 1 ovigerous female (USNM); sta. 1919, 1 specimen (USNM); sta. 1921, 3 specimens (1 ovigerous) (USNM); sta. 1933, 2 specimens (1 ovigerous) (USNM).—N of Hispaniola: PILLSBURY sta. 1160, 2 specimens.— Off St. Kitts (= St. Christopher): BLAKE sta. 147, 1 male holotype (MCZ); sta. 148, 2 specimens (MCZ).—Off Guadeloupe: PILLSBURY sta. 918, 1 specimen; sta. 923, 2 specimens; sta. 936, 41 specimens (5 ovigerous).—Off Dominica: PILLSBURY sta. 929, 4 specimens.—Off St. Lucia: PILLSBURY sta. 889, 1 ovigerous female.—Off Barbados: BLAKE sta. 274, 12 specimens (MCZ); sta. 275, 5 specimens (2 ovigerous) (MCZ); sta. 281, 7 specimens (MCZ).— Off the mouth of the Amazon River: OREGON sta. 2081, 4 ovigerous females (USNM).

Description.—The dorsal surface of the body is covered with a very short pubescence between the carinae and tubercles. The rostrum is rather slender, with the tip curved upward. In the adults the tip (i.e., the part before the anterior lateral rostral teeth) is about as long as the basal part (i.e., the part between the anterior pair of rostral teeth and the anterior groove of the carapace), and somewhat shorter than the distance between the anterior and cervical grooves. In juveniles, the tip is distinctly longer than either the basal part or the distance between the two grooves. There are two pairs of lateral rostral teeth; the posterior pair is situated in the basal sixth of the rostrum. The upper surface of the rostrum is rather deeply hollowed in the basal half and flattened distally; it is not, or hardly, channeled between the anterior teeth. The lateral margin between the two pairs of lateral teeth is not widened. The distal part carries a longitudinal median carina which extends backward about halfway the distance between the two pairs of lateral teeth. A transverse row of setae is placed across the base of the rostrum.

The anterior submedian carinae of the carapace are distinct, with six or seven blunt teeth. At the inner side of each of these ridges there is a row of nine to fifteen smaller tubercles. On the outer side one of five to nine tubercles. In some specimens these additional tubercles are about as large as those of the submedian carinae proper; in very small specimens they are often very inconspicuous. The posterior submedian carinae consist of four or five blunt teeth, the last of which protrudes posteriorly over the posterior groove. At their inner side there is a row of three to five small tubercles; on the outer side, between it and the posterior intermediate carina, there are several smaller and larger tubercles scattered: generally a row of two to four small tubercles along the submedian carina, a row of three to five larger tubercles in the middle and a row of two to seven along

the inner side of the posterior intermediate carina. The rows are often not distinct, or are double, so that the impression of scattered tubercles is obtained. The anterior intermediate row consists of three or four blunt teeth flanked by an upper and a lower additional row each of three to five tubercles. The posterior intermediate carina bears six or seven blunt tubercles. A lower additional row consists of two to nine small tubercles. The posterior antennal carina is smooth and anteriorly rounded without a trace of a spine; in its posterior half it shows some indistinct concavities. Anteriorly, the carina is continued obliquely upward by a row of about three tubercles along the posterior margin of the lateral groove. The anterior antennal carina is represented by a longitudinal row of about five to eight distinct tubercles extending behind the antennal spine. One or two pearly tubercles are present dorsally of the base of this row. The posterior lateral carina is straight and ends in a small, almost rectangular tooth. The anterior lateral carina lies in one line with the posterior lateral carina; it ends in the branchiostegal spine. The anterior of these teeth fails to reach the level of the posterior margin of the orbit; it is somewhat appressed and is much less conspicuous than the one in *G. longleyi*. The posterior (= lateral) margins of the two teeth lie approximately in one line. The anterior and posterior sublateral carinae are distinct. The anterior part of the submarginal carina ends near the end of the lateral groove. However, there is a distinct high and sharp, though rather short, carina between the posterolateral angle of the carapace and the posterior end of the posterior lateral carina; this short carina is distinctly removed from the marginal carina and evidently represents the posterior part of the submarginal carina; it is continued to the posterior end of the posterior antennal carina as a row of three or four separate tubercles. The posteromarginal and lateral grooves are in contact with each other.

The antennal and branchiostegal spines are strong and much resemble those of *Glyphocrangon haematonotus*.

The abdomen is more tubercular than that of *Glyphocrangon haematonotus*. Between the median and intermediate carinae of the first somite there are two transverse rows of three or four distinct tubercles each, one along the anterior and one along the posterior margin. In *G. haematonotus*, the anterior row is absent. The shape and the size of the pleural spines is about the same in the two species. The dorsal submedian ridges of the fifth abdominal somite resemble those of *G. haematonotus*, in that they are continued almost up to the posterior margin of the segment as narrow sharp ridges; in *G. haematonotus*, however, they reach farther backward than in *G. spinicauda*. As in *G. haematonotus*, the median carina of the sixth somite is deeply incised in the basal part. On the sixth abdominal somite, instead of the two longer longitudinal carinae on the middle of the lateral surface as found in *G. haematonotus*, there are three to five much shorter

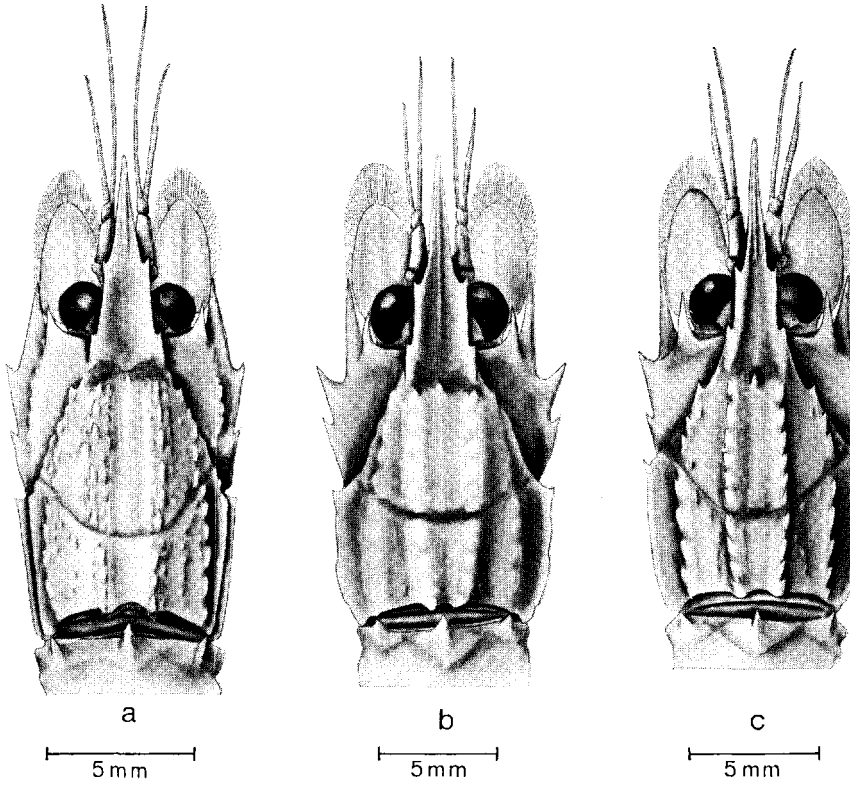


FIGURE 6. Dorsal view of anterior part of body: a, *Glyphocrangon spinicauda* A. Milne Edwards, from GERDA sta. 247; b, *Glyphocrangon longleyi* Schmitt, from GERDA sta. 197; c, *Glyphocrangon haematonotus*, new species, from GERDA sta. 222.

carinae. Also, the carina ending in the posterolateral tooth of the somite is broken up in small parts.

The tailfan resembles that of *G. haematonotus*, but is perhaps slightly less slender.

The eyes are large, but smaller than in *Glyphocrangon longleyi*, and about the size of those in *G. haematonotus*. The cornea is large, swollen, and provided with dark pigment. A small, but distinct, tubercle is placed on the inner margin of the ocular peduncle near the base of the cornea.

The scaphocerite is rather narrow, as in *G. haematonotus*, and much less broad than in *G. longleyi*. It is slightly more triangular and less oval than in *G. haematonotus*. The antennal peduncle reaches almost to the end of the scaphocerite.

No differences could be found between this species and *G. haematonotus*, as far as the oral and thoracic appendages are concerned.

No spine is found on the fifth thoracic sternum of either males or females, but in juveniles a median tubercle may be present there.

The spine on the outer margin of the scaphocerite, which in *G. haematonotus* is visible only in the younger specimens and is entirely absent in ovigerous females, in the present species is still present in females carrying eggs and in males with carapace lengths of up to 31 mm.

Size.—The smallest specimen examined is a juvenile with a carapace length of 13 mm. Males had the carapace length up to 44 mm and females up to 43 mm. The ovigerous females examined had the carapace length between 30 and 43 mm. The diameter of the eggs is 2 to 2.5 mm.

Colour.—The general colour impression is that of a red-backed shrimp with a red spot below the eye and with pale legs. The rostrum is whitish. The distal part (from the distal lateral teeth forward) is pink; the extreme tip in some specimens is white, in others it is red. The lateral margins of the distal part of the rostrum are somewhat darker red than the rest. The basal lateral rostral teeth are red, and the distal teeth are either pink (like the rest of the rostrum there) or red. The tubercles of the submedian and intermediate carinae (especially of the anterior carinae) are red. The additional tubercles between these carinae and below the intermediate are either red or pink. The posterior submedian and posterior intermediate carinae usually are lighter than the anterior, sometimes being whitish; usually the last tubercles of the posterior submedian carinae are red. Red chromatophores are scattered between the carinae in an area behind the anterior and upper lateral grooves and above the posterior antennal carina. The outline of this area is often quite distinct. Below it, the carapace and the carinae are uncoloured. The extreme anterior part of the posterior antennal carina may carry a red spot. The antennal spine and the area just behind the anterior margin of the carapace above the spine are dark red, as is also the basal part of the branchiostegal spine, and sometimes also the tip of the anterior tooth of the anterior lateral carina and the tubercles of the anterior antennal carina.

All the tubercles and carinae of the tergum and the upper part of the pleura of the abdomen are red. The distal part of the pleura is uncoloured, except for the tip of that of the sixth somite, which is red. The area between the red tubercles of the abdomen bears scattered red chromatophores. The tailfan is pink or whitish, with red carinae and tubercles.

The antennula, both peduncle and flagellum, is pink; the basal segment is not darker than the rest, but of the various segments the distal end may be somewhat darker than the proximal part. The antenna is pink with a

red band over the base of the scaphocerite and the adjoining area; sometimes also the extreme distal part of the peduncle is red.

The mouthparts, pereiopods, and pleopods are uncoloured, in striking contrast to most other species of the genus.

The eggs are blue, with a slightly greenish tinge, or pale greenish.

Horizontal Distribution.—The species is known from the western Atlantic from the east coast of Florida south to Barbados and into the Caribbean area as far west as Yucatan, Honduras, and Nicaragua. The records in the literature are: Off the east coast of Florida: off Daytona Beach (Anderson & Bullis, 1970). Straits of Florida: 27°41′N, 79°11′W to 27°51′N, 79°14′W (300-310 fm), 25°45′N, 80°00′W (140 fm) (Dobkin, 1965); 25°07′N, 79°15′W (300 fm), 23°59′N, 79°43′W (350 fm) (Bullis & Thompson, 1965); off Miami, 1100 fm (Boone, 1930). N of Cuba: 23°10′N, 79°33′W (280 fm) (Springer & Bullis, 1956). Gulf of Mexico, W of Dry Tortugas: 24°49′N, 84°06′W (170-200 fm) (Springer & Bullis, 1956). Off St. Kitts (= St. Christopher), West Indies: 17°19′27″N, 62°50′30″W (250 fm) (type-locality: A. Milne Edwards, 1881, 1883; Young, 1900), 17°17′12″N, 62°46′43″W (208 fm) (Faxon, 1896). Off Barbados, West Indies: 13°00′50″N, 59°36′20″W (209 fm), 12°58′33″N 59°36′45″W (218 fm), and 12°54′48″N, 59°36′30″W (288 fm) (Faxon, 1896). Off British Honduras: N of Glover Reef (366, 484, and 486 fm) (Boone, 1927). Off Honduras: 16°54′N, 81°18′W (250 fm) (Bullis & Thompson, 1965). Off Nicaragua: 13°30′N, 82°00′W (275-300 fm), 13°18′N, 82°12′W (350 fm) (Bullis & Thompson, 1965).

The present new records of the species from the east coast of Florida, the Straits of Florida, the Santaren Channel, northwest of Cuba, off Yucatan Peninsula, south of Jamaica, north of Hispaniola, off Guadeloupe, off Dominica, off St. Lucia, and off the mouth of the Amazon fit well into the range shown by the records from the literature, and extend the known range to the southeast.

Vertical Distribution.—The species has been collected between 140 and 378 fathoms (= 256 and 692 m); most of the specimens have come from between 250 and 360 fm (= 458 and 660 m). Boone (1927) reported her material from 366, 484, and 486 fm; it is not certain, however, whether all of it belongs to the present species. The same author (Boone, 1930) reported upon material collected off Miami in 1100 fm, which record seems very unlikely (see Remarks). The bottom on which the animals were caught is indicated as: gray mud (PELICAN sta. 17); fine gray sand, ooze (BLAKE sta. 147); fine gray sand, black specks (BLAKE sta. 148); fine sand (BLAKE sta. 274); fine brown sand (BLAKE sta. 275); broken shell (BLAKE sta. 281); coral (OREGON stas. 1885, 1916); coral sand (COMBAT sta. 447; SILVER BAY sta. 441); fine white coral (ALBATROSS sta. 2358); white

coral (ALBATROSS sta. 2359); fine mud, broken shell, dead coral, broken sea-urchin tests (PILLSBURY sta. 1171); very clean bottom with pumice stone rubble (PILLSBURY sta. 929); rock (OREGON sta. 2081). The species evidently prefers a sandy or rather coarse bottom over a pure muddy one.

Habits.—So far as I know, only once a species of *Glyphocrangon* has been observed in its natural surroundings, viz., by Anderson & Bullis (1970: 116), who describe the present species, which they watched from an Aluminaut submarine at a depth of about 250 fm off Daytona Beach, Florida: "The shrimp were almost always in a strange position, with head and tailfan touching, or dug into the bottom with the middle of the body arched. These shrimp jumped and swam more often than other shrimp species as the lighted area of the submarine approached. The swimming actions were relatively weak—one tailflip moved the animal about 1 inch, and the forward movements were very slow."

Larval Development.—Burkenroad (1942) reported upon a late embryo of a species of *Glyphocrangon* which he thought to be probably this species. Dobkin (1965) dealt extensively with the development of the present species, which he indicated as *Glyphocrangon spinicauda* "Form A."

Type-Material.—The holotype is a male specimen (cl. 44 mm) from St. Kitts (17°19′27″N, 62°50′30″W, 250 fm, fine gray sand and ooze), collected by the BLAKE at sta. 147 (14 January 1879), and now preserved in the collection of the Museum of Comparative Zoology, Cambridge, Mass., where I have been able to examine it, and to establish its identity with the present form.

Remarks.—This species, *G. longleyi*, and *G. haematonotus* resemble each other very closely, and have been confused in the literature. The differences, both in morphological and in colour characters, are so constant, however, that there can be little doubt that the three forms are distinct species.

The original description of *Glyphocrangon spinicauda* is insufficient for a positive identification of the species. A. Milne Edwards's (1883) figure of the holotype, however, makes its identity with the present species clear; furthermore, this was confirmed by the examination of the holotype.

Boone (1927) described and figured what she thought to be *Glyphocrangon aculeata* from north of Glover Reef, where it was taken at depths of 366, 484, and 486 fathoms. The specimen figured by Boone is definitely not *G. aculeata*, but *G. spinicauda* instead. It is not certain, however, whether all of Boone's material actually belongs to *G. spinicauda*. She commented, namely, on the great variation within her material, and described old specimens which were "much more heavily tuberculated and

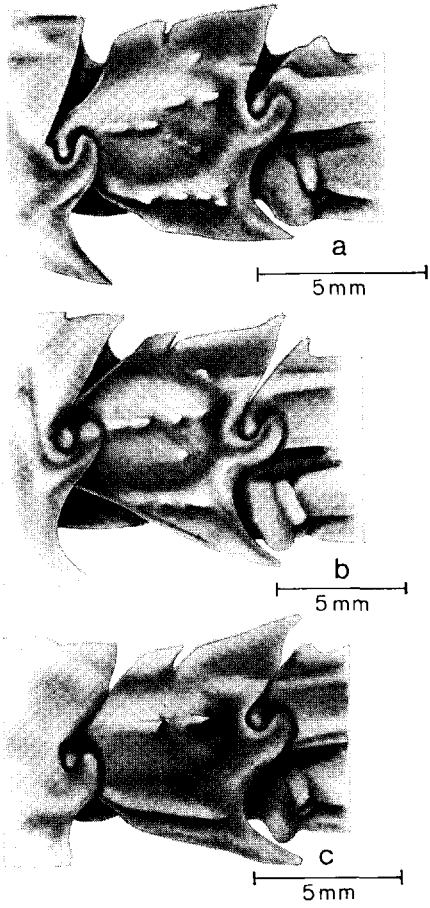


FIGURE 7. Sixth abdominal somite in lateral view: a, *Glyphocrangon spinicauda* A. Milne Edwards, from GERDA sta. 247; b, *Glyphocrangon longleyi* Schmitt, from GERDA sta. 197; c, *Glyphocrangon haematonotus*, new species, from GERDA sta. 222.

rugose," while others (equally large adults) had "weak tubercles" or were "nearly smooth." Without examination of Boone's material, no certain identification is possible. Glassell (1934) has already referred Boone's material to the present species. In her 1930 paper, Boone again reported upon *Glyphocrangon aculeata*; her illustrations show that she had (at least) two species confused under that name. Boone herself distinguished two forms in her material. One of these, represented by three specimens and

figured on her Pl. 67, is clearly true *G. aculeata.* The other form, to which she brought ten specimens, one of which is figured on Pl. 66, is *G. spinicauda*, judging by this figure. All 13 specimens were reported by Boone to be "dredged in 1100 fathoms, off Miami, Florida." This record must be erroneous, as no such great depths are found anywhere near Miami.

Part of the material brought by Bullis & Thompson (1965) to the present species is now preserved in the collection of the U. S. National Museum, and could be examined there. The specimens from OREGON stas. 1324, 1908, 1915, part of 1916, part of 1919, and 1923, from COMBAT sta. 120, and from PELICAN sta. 54 proved to belong to *Glyphocrangon longleyi*; those from COMBAT sta. 445 belong to *G. haematonotus*; while those from OREGON stas. 1885, 1916 (*partim*), and 1919 (*partim*), as well as those from COMBAT stas. 447 and 450, proved to be true *G. spinicauda.*

Glyphocrangon aurantiaca, new species
Fig. 8

Material Examined.—Off Tobago: PILLSBURY sta. 847, 1 male holotype (USNM No. 134647), 2 female paratypes.—Off Surinam: OREGON sta. 2007, 1 ovigerous female paratype (USNM); sta. 2009, 1 male, 1 ovigerous female paratype (USNM); sta. 4300, 1 ovigerous female paratype.—Off French Guiana: OREGON sta. 4293, 1 female paratype; sta. 4294, 1 female paratype.

Description.—The body is covered with a dense short pubescence, through which the carinae and tubercles protrude. The rostrum reaches with more than ⅓ of its length beyond the scaphocerite in the holotype, and in the smallest specimen with almost half its length. The distance between the two pairs of lateral rostral teeth is less than half the distance between the distal pair and the rostral apex, and about half the distance between the anterior and cervical grooves measured dorsally. The median rostral carina extends from the tip of the rostrum backward to the anterior pair of rostral teeth and becomes indistinct soon after. In its anterior part the carina is high and sharp. The upper surface of the rostrum between the anterior rostral teeth is rather flat, becoming concave more posteriorly; it is entirely covered with a tomentum of short and soft hairs. The anterior rostral teeth are slightly larger than the posterior and point obliquely sideways and forward. The posterior spines are more erect and point forward and upward. There is no distinct ridge between the teeth.

The submedian carinae of the carapace are broad and flattened. The anterior bear six or seven wide, low, blunt teeth which show a reticulate pattern of ridges dorsally. A few small tubercles stand to the inside of the carina. The posterior submedian carinae have four or five such broad teeth. A distinct, pointed, median tubercle is placed in the anterior groove

at the base of the rostrum. The anterior intermediate carina is replaced by a row of three or four very wide, low tubercles similar to, but larger than, those of the submedian carinae. These tubercles are flanked at each side by one to three small ones. The posterior intermediate carina is formed by a row of about six tubercles similar to, but smaller than, those of the submedian carinae. A row of about six small tubercles extends along the inner side of the posterior intermediate carina, while an additional tubercle is placed between the posterior intermediate and submedian carinae just behind the cervical groove, and two tubercles in the posterior half of the space between these carinae. The posterior antennal carina shows no teeth or tubercles, but has the reticulate pattern throughout; the anterior end of the carina is bluntly rounded. Obliquely above the end of the carina, a blunt tubercle is placed behind the anterior groove. There is no anterior antennal carina, although a small tubercle is found some distance above the anterior lateral carina. The posterior lateral carina, like the posterior antennal, is straight with a reticulate pattern of ridges; like all the other ridges, it does not end in a spine. There are a few tubercles in the posterior part of the space between the posterior antennal and lateral carinae. The anterior lateral carina bears two rather small teeth. The anterior is somewhat larger than the posterior, and both are directed obliquely forward and outward. The distance between the anterior tooth and the antennal spine is about as long as the tooth itself. The carina ends about between the antennal and branchiostegal spines. The antennal spine is very strong and long, being almost as long as the scaphocerite; it is directed strongly outward, making an angle of more than 60° with the branchiostegal spine, which is also very strong, although less so than the antennal spine. The anterior and posterior sublateral carinae are distinct and reticulate; they bear no spines. The submarginal is distinct and not connected with any other carina. The lateral groove merges uninterruptedly with the posterior groove. The marginal carina is not, or hardly at all, widened at the posterolateral angle. Between the tubercles and ridges, the carapace is covered with a very short and soft pubescence.

The tubercles on the abdomen, like those of the carapace, are low, wide, and blunt, but are without a reticular pattern of ridges; between them, the integument carries a very short and soft pubescence. The first abdominal somite carries the usual three large, pointed, anteriorly directed dorsal teeth; there is a transverse row of distinct tubercles along the posterior, but not along the anterior, margin of the somite. The second and third somites do not show a median carina. The fourth somite shows one in the pos-

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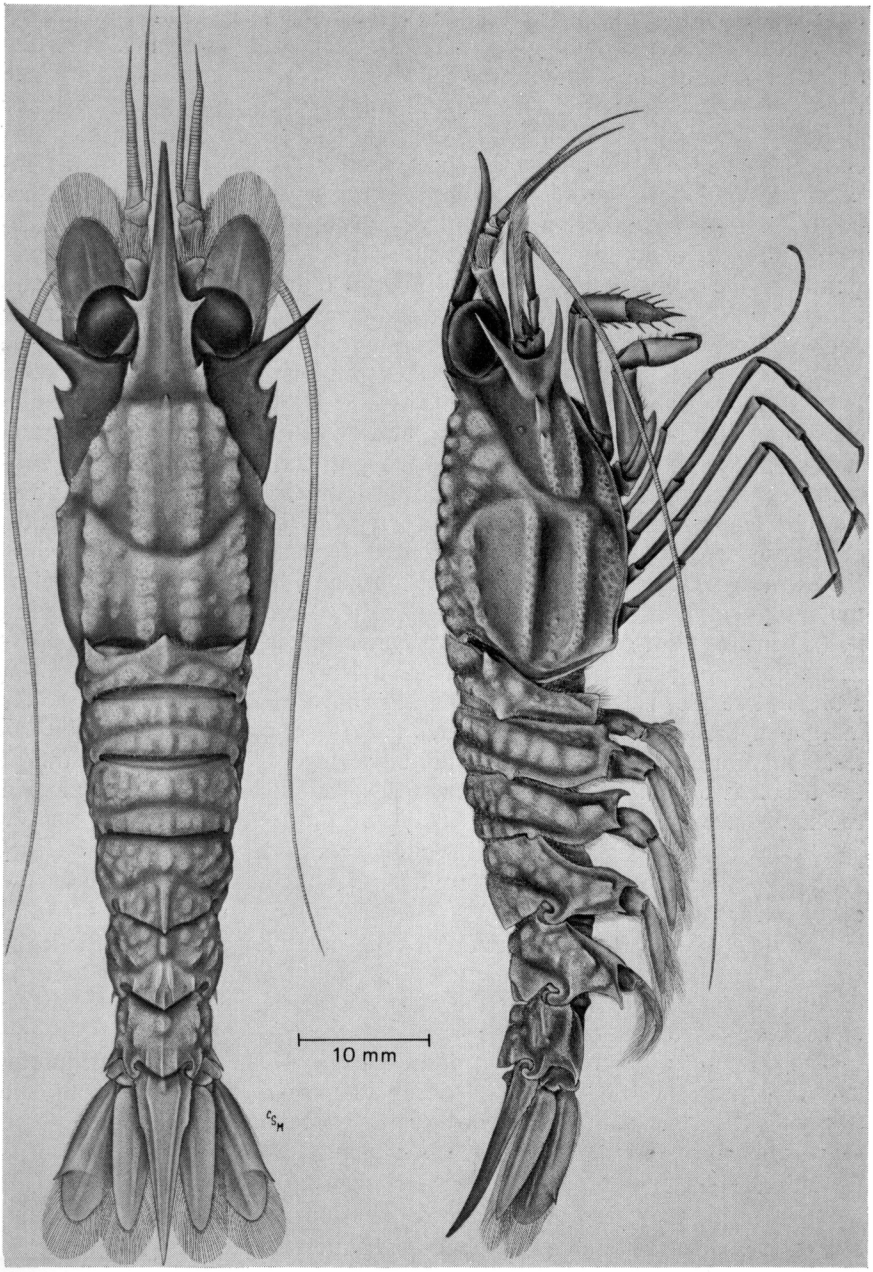
FIGURE 8. *Glyphocrangon aurantiaca*, new species, male holotype from PILLSBURY sta. 847, in dorsal and lateral views.


10 mm

terior half. The fifth somite has a very short median carina in the anteriormost part, and an equally very short one in the posteriormost part; the posterior half of the somite shows two rather long, submedian carinae which diverge slightly, posteriorly, and reach practically to the posterior margin. The sixth somite has a median carina over its full length, which ends in a slightly upward-directed sharp tooth. The carina is narrowly incised slightly before the middle. The pleuron of the first somite is rather narrow, its top is somewhat forward produced; it is rounded in the holotype, and more acute in the smallest specimen. The pleuron of the second somite in the holotype has the distal margin bluntly angular in front and behind, with a distinct tooth in the middle; in the juvenile, the posterior angle is more acute and toothlike. The pleura of the third to fifth somites end in two teeth, the anterior being longer than the posterior in somites three and four, shorter in somite five. The lateral margin of the sixth somite ends in a strong and sharply pointed, posteriorly directed tooth. The lateral surface of the sixth somite bears the following carinae: (a) a short, submedian carina in the extreme posterior part, which is preceded by a tubercle, (b) a short, longitudinal carina of irregular shape in about the center of the surface, (c) just below this central carina, a longitudinal, slightly sinuous ridge extends from the anterior margin of the somite to the level of the anterior part of the central carina, and a tubercle is found just behind it, (d) in line with carina c and the tubercle, a carina is found in the extreme posterior part of the somite, reaching the posterior margin, and (e) a broad, irregular ridge extends somewhat above, and parallel to, the lower margin of the somite. A short groove is furthermore found near the anterior margin of the somite somewhat above ridge (c). The basal tooth of the telson is distinct and triangular, with a rounded top. The submedian carinae of the telson are smooth.

The eyes are large; the cornea is globular and far wider than the eyestalk. The latter carries a very prominent, though small, tubercle in the distal part of the inner margin.

The scaphocerite is broadly oval. It does not carry a tooth in the holotype, but in the smallest specimens (cl. 20 and 26 mm) such a tooth is distinct in the proximal part of the outer margin. The antennal peduncle reaches almost to the end of the scaphocerite.

The third maxilliped reaches beyond the end of the antennal peduncle. The distal segment is triangular, ending in a sharp spiniform tooth; the upper margin bears four, the lower three, long movable spines, while about seven such spines are placed in two oblique rows on the inner surface. The penultimate segment bears two movable spines in the distal part of the upper margin, and three on the lower. The inner surface bears one movable spine somewhat behind the middle of the anterior margin. A dense field of hairs is present in the upper half of the inner surface. The antepen-

ultimate segment is almost as long as the two distal combined; its lower margin bears two small spines in the distal part.

The first pereiopod reaches beyond the end of the eyes; it is similar in shape to those of the other species of the genus. The second legs are unequal. The right is longer and more slender than the left; when stretched forward it reaches beyond the end of the scaphocerite. The chela is small, with the dactylus rather high and the fixed finger triangular, being about half as long as the palm. The carpus consists of about 30 articulations, of which the first and the last are longer than the others. The left leg is shorter and more robust than the right; its carpus consists of 20 to 25 articulations. The third leg reaches beyond the end of the scaphocerite. The dactylus is only slightly flattened and measures about ⅓ of the length of the propodus; it ends in a single slender point. The propodus does not have a terminal brush of setae. The carpus is somewhat longer than half the propodus, and slightly shorter than half the merus. The fourth leg reaches with part of the dactylus beyond the scaphocerite. The dactylus is more than half as long as the propodus; it is distinctly flattened and even slightly concave dorsally; it ends in a single slender point. The carpus is a little more than half as long as the propodus and a little less than half as long as the merus. The fifth leg reaches as far forwards as the fourth, and is similar in structure, the only difference being found in the shorter dactylus, which measures about ½ the length of the propodus. In the juvenile (cl. 20 mm), the dactylus of the last pereiopod is relatively somewhat longer. The thoracic sternum in the holotype is smooth, but for the fifth sternite, which shows a small, but distinct, median spinule. This spinule is absent in the large female, but present, be it small, in the juvenile.

The first pleopod of the holotype has a well-developed *appendix interna* on the endopod. The second pleopod has the *appendix masculina* longer than the *appendix interna* and for more than the distal half beset with long, rather stiff setae. In the females, the endopod of the first pleopod is oval without an appendix; on the other pleopods, only the *appendix interna* is present.

The uropodal protopodite has a rounded lobe over the base of the endo- and of the exopodite. The exopodite has the outer margin straight, or slightly sinuous, and ending in a distinct tooth. The diaeresis starts inwards from this tooth, but stops at the dorsal median longitudinal carina of the exopod. A second carina is visible to the outside of the median; it stops before reaching the diaeresis. The endopod is elongately oval and has a single, longitudinal median carina.

Size.—The carapace length of the male holotype is 36 mm, those of the female paratypes range from 20 to 41 mm; in the ovigerous female it is 40 mm. The eggs are about spherical, with a diameter of about 2.4 mm.

Colour.—The following colour description was made from the holotype immediately after capture. The general impression is that of an orange animal that has the carapace somewhat lighter than the abdomen, and white spots on the scaphocerite. The rostrum and the antennal and branchiostegal spines are uniformly orange. The tubercles of the submedian and intermediate carinae of the carapace are orange; the branchial area of the carapace is light orange. The abdomen is orange, with the tubercles and carinae of the tergum darker than the rest. Each somite shows a band of darker orange along the posterior margin, but this is not very striking. The tips of the pleura also are darker orange than the rest. The telson and the uropods are plain orange, only the carinae on the telson being darker. The antennular peduncle and flagella are orange, with a white spot dorsally on the last peduncular segment. The antenna is entirely reddish orange, with a white spot near the basis of the scaphocerite and on the middle and the basis of the scaphocerite itself. The mouthparts and the legs are uniformly red to reddish orange, the legs being orange, the mouthparts more red. The pleopods are uniformly orange. In the juvenile specimen the legs and uropods show more white.

Horizontal Distribution.—So far the species has been found only in a restricted area off the north coast of South America between Tobago and French Guiana.

Vertical Distribution.—*Glyphocrangon aurantiaca* has been found in depths ranging from 225 to at least 403 fathoms (= 410 to 733 m); the deepest station (PILLSBURY sta. 847) was between 403 and 700 fm (= 733 and 1280 m), so that it is likely that the depth range of the species exceeds 403 fm. In only two instances (OREGON stas. 2007 and 2009) the nature of the bottom was noted; in both cases it was blue mud.

Type-Material.—Holotype is the male specimen from PILLSBURY sta. 847, off Tobago, 11°37.3′N, 60°59.4′W to 11°41′N, 61°01.3′W, 400-700 fm, 2 July 1969. It is preserved in the U. S. National Museum under catalog number 134647. The paratypes are in the Museum of the Rosenstiel School of Marine and Atmospheric Sciences, Miami, Florida; the U. S. National Museum; and the Rijksmuseum van Natuurlijke Historie, Leiden.

Remarks.—The new species belongs to the group of *Glyphocrangon spinicauda*, *G. longleyi*, and *G. haematonotus*, characterized by having two distinct teeth on the anterior lateral carina, and two teeth at the end of the pleuron of the fifth abdominal somite. It differs from all three species in the long and widely divergent antennal spines, in the small teeth on the anterior lateral carina, in the lack of a sharp tooth at the end of any of the other carinae of the carapace, in the arrangement of the carinae on the sixth abdominal somite, and in the colour pattern. The species differs

furthermore from *G. spinicauda* in the absence of the anterior antennal carina, the absence of the anterior row of tubercles on the first abdominal somite, and in the low and blunt tubercles of carapace and abdomen; from *G. longleyi*, it differs in that the posterior lateral carina is straight, and in that the abdomen shows no median carina on the second and third somites; finally, it differs from *G. haematonotus* in the blunt tubercles on carapace and abdomen.

Glyphocrangon longleyi Schmitt
Figs. 6, 7

Glyphocrangon longleyi Schmitt, 1931, Yb. Carnegie Instn, Wash., *30:* 393. —Bullis, 1956, Comml Fish. Rev., *18*(12): 10.

Glyphocrangon (*Glyphocrangon*) *longleyi* Springer & Bullis, 1956, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 196: 13.—Bullis & Thompson, 1965, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8 (p.p.).

Glyphocrangon spinicauda "Form B" Dobkin, 1965, Bull. Mar. Sci. *15:* 874, 881, fig. 1c.

Glyphocrangon (*Glyphocrangon*) *spinicauda* Bullis & Thompson, 1965, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8 (p.p.).

Material Examined.—Off east coast of Florida, U. S. A.: PILLSBURY sta. 89, 1 ovigerous female; COMBAT sta. 84, 1 ovigerous female (USNM); sta. 120, 1 ovigerous female (USNM); sta. 186, 1 male, 2 ovigerous females; sta. 193, 6 females (5 ovigerous) (USNM); sta. 329, 1 ovigerous female (USNM); PELICAN sta. 13, 1 ovigerous female (USNM); sta. 20, 2 ovigerous females; sta. 27, 1 ovigerous female; sta. 31, 2 females (USNM); sta. 46, 1 ovigerous female (USNM); sta. 54, 2 ovigerous females (USNM). —Straits of Florida, U. S. A.: GERDA sta. 15, 1 female; sta. 62, 4 males, 1 female; sta. 66, 2 females; sta. 67, 1 male, 9 females (4 ovigerous); sta. 76, 1 male, 2 females (1 ovigerous); sta. 77, 1 male, 3 females (1 ovigerous); sta. 164, 1 male; sta. 171, 1 female; sta. 197, 1 female; sta. 228, 1 female; sta. 230, 9 specimens; sta. 288, 130 specimens (42 ovigerous); sta. 289, 20 specimens (8 ovigerous); sta. 362, 1 juvenile; sta. 439, 2 females (1 ovigerous); sta. 440, 10 specimens (1 ovigerous); sta. 465, 16 specimens (13 ovigerous); sta. 467, 6 specimens (4 ovigerous); sta. 469, 4 ovigerous females; sta. 472, 4 specimens; sta. 474, 2 specimens; sta. 475, 1 ovigerous female; sta. 483, 18 specimens; sta. 766, 17 specimens (15 ovigerous); sta. 834, 3 females (2 ovigerous); sta. 845, 2 females (1 ovigerous); sta. 861, 5 specimens (1 ovigerous); sta. 967, 6 males, 15 females (2 ovigerous); sta. 968, 7 females (5 ovigerous); sta. 969, 1 specimen; sta. 970, 29 specimens; sta. 1018, 1 juvenile; sta. 1098, 11 specimens; OREGON sta. 1351, 2 ovigerous females (USNM); sta. 1354, 2 males; PELICAN sta. 17, 1 ovigerous female (USNM); sta. 18, 20 females (13 ovigerous) (USNM); Pourtales Plateau, 1956, G. L. Voss, 1 ovigerous female (USNM).—North-

west Providence Channel, Bahama Islands: GERDA sta. 190, 5 specimens; sta. 679, 2 specimens; sta. 917, 2 specimens.—N of Cuba: OREGON sta. 1324, 7 females (6 ovigerous) (USNM).—Off Dry Tortugas, Florida, U. S. A.: 180-220 fms, R/V ANTON DOHRN, trawled, 31 July 1930, W. L. Schmitt, 1 ovigerous female holotype (USNM, Cat. No. 65948), 5 specimens (3 ovigerous) (USNM); 253-293 fm, 8 July 1931, W. L. Schmitt #22-31, 1 juvenile (USNM); 20 miles S of No. 2 Red Buoy, 290 fm, boat dredge, R/V ANTON DOHRN sta. 19, 3 July 1931, W. L. Schmitt, 1 male, 1 ovigerous female (USNM); 20 miles S of No. 2 Red Buoy, 295-315 fm, 19 July 1932, W. L. Schmitt #54, 2 specimens (USNM); Dohan dredge, 5-7 June 1939, A. A. Boyden, 4 specimens (2 ovigerous) (USNM); 200 fm, R/V ANTON DOHRN, W. C. Schroeder, rec'd August 1940, 1 ovigerous female (MCZ); OREGON sta. 1015, 6 specimens (USNM); sta. 1334, 1 specimen (USNM); sta. 1539, 1 specimen (USNM); COMBAT sta. 281, 1 ovigerous female.—Eastern Gulf of Mexico: OREGON sta. 489, 2 males, 12 females (3 ovigerous) (USNM).—Off Louisiana, U. S. A.: OREGON sta. 1407, 12 females (5 ovigerous) (USNM).—Western Gulf of Mexico: OREGON sta. 532, 2 ovigerous females (USNM); sta. 542, 1 ovigerous female (USNM); sta. 549, 1 specimen (USNM).—Off Yucatan, Mexico: PILLSBURY sta. 585, 1 juvenile; sta. 600, 2 juveniles; sta. 602, 6 specimens (2 ovigerous).—Off Atlantic coast of Nicaragua: OREGON sta. 1906, 7 specimens (USNM); sta. 1908, 2 specimens (USNM); sta. 1915, 1 specimen (USNM); sta. 1916, 2 specimens (USNM); sta. 1919, 1 ovigerous female (USNM); sta. 1923, 1 specimen (USNM); sta. 1929, 3 ovigerous females (USNM); sta. 1931, 1 specimen (USNM); sta. 1933, 18 specimens (1 ovigerous) (USNM).—Off Atlantic coast of Colombia: PILLSBURY sta. 374, 144 specimens (54 ovigerous); sta. 381, 28 specimens.—NW of Anguilla: PILLSBURY sta. 989, 1 male, 4 females (2 ovigerous).—Off Guadeloupe: PILLSBURY sta. 923, 2 males, 5 females (2 ovigerous).—Off Santa Lucia: PILLSBURY sta. 904, 4 specimens.

Description.—The body is covered between the carinae and tubercles with a dense, short pubescence. The rostrum is wide and rather flat, compared to those of *Glyphocrangon spinicauda* and *G. haematonotus*. The distance between the teeth of the anterior pair is 0.7 to 0.8 times the distance between the two pairs of rostral teeth (0.7 in juveniles, 0.8 in the largest specimens). Between the anterior teeth the rostrum is flat, hardly at all hollowed, and the teeth are directed obliquely upward and forward. There is no noticeable fringe of long hairs across the base of the rostrum. In adult specimens, the tip of the rostrum is somewhat longer than the basal part (i.e., the part proximal to the anterior lateral rostral teeth) and shorter than the distance between the anterior and cervical grooves measured in the median line. In very young specimens, the tip is 1.5 times as long as the distance between the grooves.

The six tubercles of the anterior submedian carinae of the carapace are very wide and blunt, and show a reticulate pattern of ridges. To the inside of these carinae there are up to ten very small smooth tubercles, which are largely obscured by the pubescence. To the outside of the carinae there are about two to five tubercles, which often are fused with the tubercles of the carina itself. The posterior submedian carinae have three or four tubercles similar to those of the anterior carinae, to the outside of which there may be some smaller, inconspicuous tubercles. The anterior intermediate carina is indistinct and consists of an irregular row of some four blunt and low tubercles; the anterior of these does not form a spine. The posterior intermediate carina is formed of four or five irregular, blunt and broad tubercles, with a row of two to six small, inconspicuous tubercles along its inner side. There is no anterior antennal carina. The posterior antennal carina ends in a distinct anterior tooth, which in very large specimens may be reduced to a rectangle. The carina itself is not straight, but is uneven in outline, as if with remnants of tubercles. The anterior lateral carina ends slightly above, almost in, the branchiostegal spine. It bears two distinct, winglike, expanded teeth, the anterior of which is distinctly larger than the posterior and reaches slightly beyond the posterior orbital margin; these teeth lie in one line; they are wider, and also reach farther sideways, than in either *G. spinicauda* or *G. haematonotus*. The posterior lateral carina ends anteriorly in a small sharp tooth or rectangle; it is uneven, as if with the remnants of two or three tubercles. The anterior sublateral carina is distinct; the posterior is irregular and may have a spiniform process. The anterior submarginal carina is distinct; it is widely separated from the posterior, which is reduced to a very short ridge at the posterolateral angle of the carapace, where it is fused with the marginal carina. Beyond the posterolateral angle, the carina is continued along the inside of the posteromarginal groove, as a row of some four tubercles. The posteromarginal and lateral grooves are not continuous with one another, but interrupted at the posterolateral angle of the carapace by the fusion of the posterior submarginal and marginal carinae. The antennal spine is directed obliquely upward and is curved somewhat inward, but does not noticeably extend sideward, so that in dorsal view the antennal spines do not reach sideways beyond the branchiostegal. The branchiostegal spines are longer and higher than the antennal. Two very inconspicuous ridges extend inward from the branchiostegal spine; one reaches the anterior lateral carina a short distance behind its anterior end, the other lies slightly more ventrally.

The ridges on the abdomen consist of low, wide, and very blunt tubercles, although their arrangement is much like that in *G. haematonotus*. The spines on the pleura usually are longer in the present species than in *G. haematonotus*, but the difference is not always very clear, especially not

in the juveniles. The dorsal submedian ridges of the fifth abdominal somite reach far less close to the posterior margin than in *G. haematonotus*. The sixth abdominal somite resembles that of *G. spinicauda*, in that the dorsomedian carina is deeply incised in its basal part, and in that the two central lateral ridges are broken up, each consisting of two short ridges or tubercles; these four ridges lie approximately in one line. Also, the lower ridge is divided into shorter ridges. A tubercle is placed some distance above the posterior part of the upper median carina, and one is placed between the posterior parts of the median and lower carinae.

The eyes are somewhat larger than those of *G. haematonotus*, but otherwise are very similar.

The scaphocerite is broader and more oval than in *G. haematonotus*. Juveniles always have a distinct tooth in the lower part of the external margin, but in adults it is usually missing.

The right second leg is more slender than the left; its carpus has about 30 against 20 articles. The dactyli of the last three pereiopods are oval, and simply pointed. That of the third is shorter (⅔ of the length of the propodus) and somewhat higher than those of the fourth and fifth legs. All have a distal groove dorsally, carrying some hairs.

The thoracic sternum shows no spines, in either males or females.

The uropods are more slender than in *G. haematonotus*.

Size.—The carapace length of the examined specimens varies between 13 and 56 mm. The largest male measured has a carapace length of 45 mm. Ovigerous females with carapace lengths between 43 and 56 mm were found. The holotype, an ovigerous female, has cl. 52 mm. The eggs have a diameter of 2 to 3.5 mm.

Colour.—The rostrum is pale orange, pink, or whitish. The tip is darker orange red in most specimens, but in some it is hardly at all darker than the rest of the rostrum. The basal, and sometimes also the distal, lateral rostral teeth are red, while also the basal part of the rostrum is a darker reddish colour than the distal part—this is especially true of the lateral margins. The anterior submedian and intermediate carinae of the carapace are dark orange red. The posterior submedian and intermediate ridges are white. The contrast in colour between the orange red anterior and white posterior submedian carinae is most striking and forms a constant character, which greatly helps in identifying the species in the field. The orange red colour of the intermediate ridges is less constant; sometimes it covers only the anterior part of the anterior ridge, leaving a small posterior part white, and sometimes it extends onto the extreme anterior part of the posterior ridge. The other carinae of the carapace are uncoloured. The antennal and branchiostegal spines are dark orange red, and sometimes also the tip of the anterior tooth of the anterior lateral carina has that colour.

The abdomen is pale orange or whitish. All the tubercles and carinae of the dorsal part of the tergum are orange red; those on the pleura and the extreme lateral part of the tergum are uncoloured. In some specimens, the tips of the pleura of the fifth and sixth somites are orange red. The tail fan is pale or somewhat darker orange red, becoming darker posteriorly. The carinae on the telson are orange red.

The antennula is pink or whitish, with the larger part of the first segment red. Of the antenna, the basal segments and the outer proximal part of the scaphocerite are red, the rest is pink, pale orange, or whitish.

The mouthparts, including the third maxilliped, are dark orange red. The first pereiopods are of the same colour, but may be paler in their basal parts. The second pereiopod is uncoloured, or has the chela and the extreme distal part of the carpus very pale orange. The last three pereiopods are also uncoloured, except for the dactylus and the distal part of the propodus, which are pale orange.

The pleopods are uncoloured. In an abnormal ovigerous female the stylamblys was coloured orange in the fifth somite.

The eggs are pale greenish or bluish green.

In the young, the body is white with three red areas: (1) an anterior dorsal spot covering the base of the rostrum and the anterior submedian carinae, (2) an anterior lateroventral spot covering the antennal and branchiostegal spines, the base of the antennulae and antennae, and the mouthparts, and (3) a posterior dorsal spot covering the first five abdominal somites (including the pleura). This colour pattern actually is a simplified version of that of the adults. Here, also, the sharp contrast between the anterior and posterior submedian carinae of the carapace is most striking.

Parasites and Commensals.—Several specimens carried Lepadidae on the body; they were found on the rostrum, scaphocerite, the eyestalk, the third maxilliped, the pereiopods, the abdominal pleura, the pleopods, and the uropods. In four instances an unknown organism, possibly a parasite, was found on the rostrum and the anterior part of the carapace of ovigerous females (from GERDA stas. 67 and 288, and PILLSBURY stas. 374 and 923). These organisms are vermiform and as if glued to the carapace and rostrum, where they may form distinct coiled masses. The nature of these organisms has not yet been ascertained. A similar, but smaller, organism was found on the ventral surface of the abdomen of a specimen of *G. longirostris* (see p. 339).

Horizontal Distribution.—The species is known from the east coast of Florida, the Bahamas, and the entire Gulf of Mexico south to Santa Lucia (W.I.), Yucatan and Colombia. The records in the literature are: Off the east coast of Florida: 29°57′N, 80°10′W (200-205 fm), 29°56′N, 80°10′W (190 fm), 29°47′N, 80°11′W (155-172 fm), 29°47′N, 80°12′W (185-190

fm), 29°44′N, 80°13′W (180 fm), 29°44′N, 80°09′W (220 fm), 29°15′N, 80°05′W (210 fm) (Bullis & Thompson, 1965). Straits of Florida: 26°31′ N, 79°46′W (235 fm), 26°18′N, 79°51′W (144-200 fm), 25°16′N, 80°00′ W (185 fm), 25°11′N, 79°55′W (300 fm), 24°05′N, 79°46′W (350 fm) (Bullis & Thompson, 1965); 25°30′N, 79°58′W to 25°45′N, 79°51.5′W (180 fm), 25°12.5′N, 80°02′W (250-300 fm), 25°04′N, 80°03′W to 25°08′ N, 79°59′W (175 fm) (Dobkin, 1965).

North of Cuba: 23°10′N, 79°33′W (280 fm) (Bullis & Thompson, 1965). Gulf of Mexico: "throughout the Gulf" (Bullis, 1965); 27°44′N, 85°09′W (254 fm), 27°41′N, 94°59′W (250-300 fm), 27°34.3′N, 93°10.2′W (220-300 fm), 26°58.5′N, 96°06.7′W (300-400 fm) (Springer & Bullis, 1956). Near Dry Tortugas, Florida: South of Dry Tortugas (type-locality; Schmitt, 1931), 24°29′N, 83°35′W (220 fm), 24°29′N, 83°27′W (220 fm), 24°28′N, 83°30′W (220 fm), 24°13′N, 82°35′W (300-305 fm) (Bullis & Thompson, 1965); 24°23′N, 83°22′W (200 fm), 24°20′N, 83°20′W (150-350 fm) (Springer & Bullis, 1956). Off Nicaragua: 13°30′N, 82°00′W (275-300 fm), 13°18′N, 82°12′W (350 fm), 13°13′N, 82°13′W (350 fm), 12°33′N, 82°20′W (350 fm) (Bullis & Thompson, 1965).

The present material extends the known range of the species considerably to the south and southeast.

Vertical Distribution.—The species was collected between 165 and 459 fathoms (= 300 and 837 m), with the highest frequency of occurrence between 165 and 350 fm (= 300 and 638 m). There is one exceptional record from 43 to 47 fm (GERDA sta. 834); the occurrence of the species at this depth, however, needs confirmation. The nature of the bottom at which the species was taken is given as: mud (PILLSBURY sta. 381; OREGON sta. 1407), gray mud (OREGON sta. 542; COMBAT sta. 193; PELICAN stas. 17, 27, 31, 46, 54), light gray mud (OREGON sta. 1539), gray mud and shells (OREGON sta. 549), green mud (COMBAT stas. 120, 186, 329), blue mud (OREGON sta. 489, PELICAN stas. 13, 20), yellow mud (OREGON sta. 1915), mud and sand (OREGON sta. 532), coral and mud (OREGON sta. 1015), gray sand (PELICAN sta. 18), coral (OREGON sta. 1916), rock (OREGON sta. 1351). The species clearly seems to prefer a muddy bottom and in this respect differs from the closely related *Glyphocrangon spinicauda*, which is usually found on a coarser bottom of sand, shells, etc.

Larval Development.—Dobkin (1965) described and figured larvae of the present species under the name *Glyphocrangon spinicauda* "Form B."

Type-Material.—The holotype, an ovigerous female (cl. 52 mm) from South of Dry Tortugas, Florida (depth 180-220 fm, R/V ANTON DOHRN; trawled, 31 July 1930, leg. W. L. Schmitt) is preserved in the U. S. National Museum under catalogue number 65948.

Remarks.—With *Glyphocrangon spinicauda* and *G. haematonotus*, the present form forms a group of species which are very close and have been confused with one another. *G. longleyi* is the most robust of the three, with the tubercles and sculpture blunter and wider. The differences between the three species have already been given above.

All but one of the specimens from PELICAN sta. 17 referred by Bullis & Thompson (1965) to the present species proved, upon examination, to belong to *G. haematonotus* (see pp. 315, 317); the remaining specimen, an ovigerous female, indeed was *G. longleyi*. On the other hand, the specimens from OREGON stas. 1324, 1908, 1915, and 1923, and part of those from stas. 1916 and 1919, those from COMBAT sta. 120 and PELICAN sta. 54, reported upon by the same authors as *G. spinicauda*, proved to be *G. longleyi*.

Glyphocrangon haematonotus, new species
Figs. 6, 7

Glyphocrangon longleyi Bullis & Thompson, 1965, Spec. Scient, Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8 (p.p.).

Glyphocrangon spinicauda Bullis & Thompson, 1965, Spec. Scient Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8 (p.p.).

Material Examined.—Off South Carolina, U. S. A.: ALBATROSS sta. 2628, 1 juvenile paratype (USNM); sta. 2676, 1 paratype (USNM).—Off Georgia, U. S. A.: ALBATROSS sta. 2668, 1 paratype (USNM).—Off the east coast of Florida, U. S. A.: ALBATROSS sta. 2664, 11 paratypes (USNM); PILLSBURY sta. 89, 11 paratypes; PELICAN sta. 11, 5 paratypes (USNM); sta. 27, 3 paratypes (USNM).—Straits of Florida, U. S. A.: GERDA sta. 61, 3 ovigerous paratypes; sta. 62, 1 ovigerous paratype; sta. 66, 2 ovigerous paratypes; sta. 67, 6 female paratypes (4 ovigerous); sta. 76, 2 female paratypes (1 ovigerous); sta. 77, 2 ovigerous paratypes; sta. 93, 1 female paratype; sta. 131, 1 juvenile paratype; sta. 144, 1 juvenile paratype; sta. 160, 4 male paratypes; sta. 161, 60 paratypes (27 ovigerous); sta. 164, 35 paratypes (3 ovigerous); sta. 170, 2 paratypes; sta. 171, 4 paratypes; sta. 175, 62 paratypes; sta. 197, 1 female paratype; sta. 221, 2 male paratypes; sta. 222, 1 ovigerous paratype; sta. 228, 1 female paratype; sta. 299, 4 ovigerous paratypes; sta. 300, 1 ovigerous paratype; sta. 302, 2 ovigerous paratypes; sta. 382, 24 paratypes (3 ovigerous); sta. 483, 6 paratypes (4 ovigerous); sta. 649, 1 ovigerous female holotype (USNM Cat. No. 128950), 11 paratypes (1 ovigerous); sta. 652, 8 paratypes; sta. 654, 2 paratypes; sta. 658, 6 paratypes; sta. 659, 4 paratypes; sta. 855, 1 ovigerous paratype; sta. 998, 46 paratypes (2 ovigerous); sta. 999, 21 paratypes; OREGON sta. 1354, 2 ovigerous paratypes; COMBAT sta. 445, 3 paratypes (USNM); PELICAN sta. 17, 20 paratypes (14 ovigerous) (USNM).—N of the Bahama Islands: GERDA sta. 181, 1 juvenile paratype; sta. 182,

1 juvenile paratype; sta. 403, 1 paratype; sta. 406, 24 paratypes.—SW of Dry Tortugas, Florida, U. S. A.: 200 fm, F. Chase, 1 female paratype.—Off Atlantic coast of Colombia: PILLSBURY sta. 374, 100 paratypes (39 ovigerous).—Off Anguilla: PILLSBURY sta. 989, 1 ovigerous paratype.—Off St. Vincent: PILLSBURY sta. 881, 4 male paratypes.

Description.—Between the ridges and the tubercles, the body is covered with a dense and very short pubescence. The rostrum is narrow and rather deeply channeled. The distance between the teeth of the anterior pair is 0.5 to 0.6 times the distance between the anterior and posterior pairs of rostral teeth. Between the anterior teeth the rostrum is distinctly concave, the teeth being hardly directed outward. There is a short, but noticeable, hairy fringe across the base of the rostrum. In adult specimens the tip of the rostrum is decidedly longer than the basal part, and as long as the distance between the anterior and cervical grooves measured dorsally. In young specimens the tip of the rostrum is relatively longer.

The six tubercles of the anterior submedian carina are sharply pointed, with a distinct dorsal crest, and without a reticulate pattern. Along the inner side there are no tubercles, or only a few inconspicuous tubercles. Along the outside there are sometimes also one or two inconspicuous tubercles, all obscured by the pubescence of the carapace. The posterior submedian carinae have toothlike tubercles similar to those of the anterior carina. The anterior intermediate carina consists of three or four sharply pointed tubercles placed in a single row. Between, and slightly above, the first and second there is a small, sometimes blunt, sometimes sharp, tubercle, while a second such tubercle is placed slightly behind and above the last of the larger tubercles. One to three small blunt tubercles are placed below the carina. The posterior intermediate carina consists of five tubercles, of which the anterior two end in a sharp point. The anterior antennal carina is absent and is not represented by tubercles. The posterior antennal carina is straight and usually ends in a distinct sharp tooth; sometimes this tooth is rectangular, rarely it is indistinct. The anterior lateral carina begins slightly above the anterior end of the posterior and ends practically at the base of the branchiostegal spine. It carries two distinct, winglike expanded teeth, the anterior of which is larger, but fails to attain the level of the posterior margin of the orbit. The posterior lateral carina is straight, but for two tubercular indentations in its extreme proximal part. It ends in a sharp, or in a rectangular, tooth. The anterior sublateral carina is distinct; the posterior is short and is posteriorly continued in a few tubercles. The anterior and posterior submarginal carinae are separated by the lateromarginal groove. The posterior submarginal carina practically touches the marginal carina at the posterolateral angle, and is continued posteriorly as a short row of tubercles. The lateromarginal and postero-

marginal carinae are in contact through a very narrow space at the posterolateral angle. The antennal spine is directed forward and for its full length stays to the inside of the branchiostegal spine; it is much shorter and narrower than the latter. Two inconspicuous ridges extend from the branchiostegal spine backward. The lower of these connects with the anterior lateral ridge, while the other runs close to and parallel with it.

The tubercles on the abdomen are sharper and higher than in *G. longleyi*; they are often carinate. The three large teeth on the first abdominal somite, as well as the anteromedian of the second and third, are large, laterally compressed, carinate dorsally, and end in a sharp anterior point. Between the median and intermediate teeth of the first somite, there is a single transverse row of tubercles, which extends along the posterior margin of the segment. The median tubercles of the somites are dorsally ridged and together form a median carina over the abdomen, which carina is interrupted at the margins and in the middle of each somite (including the sixth). The median carinae of the third to sixth somites are posteriorly produced; in somites 3 and 4 they are only slightly so, forming rounded processes; in somites 5 and 6 these processes are sharply angular; in the sixth somite it is even strongly produced as a large sharp tooth. The fifth somite shows two submedian carinae in the posterior half; these carinae diverge at first slightly, then more strongly, and reach to the posterior margin of the somite. The anterior part of the dorsal carina of the sixth somite, like the posterior, ends in a sharp tooth. The pleuron of the first somite is rather narrow and ends in a rounded, anteriorly directed top. That of the second somite is wide and ends in three teeth, of which the anterior is rectangularly rounded, the other two are pointed. The pleura of the third, fourth, and fifth somites end in two sharp spines; in the third and fourth somites the anterior spine is longest, in the fifth the posterior. The lateral margin of the sixth somite ends in a single sharp spine. The arrangement and the shape of the ridges on the lateral surface of the sixth abdominal somite differs considerably from that in the previous two species. The two central lateral ridges are undivided; they lie in one line, or the posterior is slightly higher. Also, the lower ridge is entire. No additional tubercles are noted. The basal tooth of the telson is distinct, with a narrowly rounded top. The carinae on the telson are sharp and smooth, without tubercles or serrations.

The eyes are somewhat smaller than those of *G. longleyi*. The peduncle bears a small tubercle on the inner margin, near the base of the cornea.

The scaphocerite is oval; it is somewhat more slender than in *G. longleyi*. In adult specimens the tooth, present in the lower part of the outer margin in young specimens, disappears entirely. The antennal peduncle reaches almost to the end of the scaphocerite.

The third maxilliped reaches slightly beyond the end of the scaphocerite. It is quite similar in shape to that of *G. aurantiaca*.

The first leg is quite typical. The right second leg reaches with part of the carpus beyond the scaphocerite. The carpus has about 30 articles. The left second leg is shorter and more robust than the right; its carpus has only about 20 articles. The third leg reaches about to the end of the scaphocerite. The dactylus is less than ⅓ as long as the propodus, and is only slightly flattened. The propodus does not carry a tuft of hairs distally. The carpus is about ⅔ as long as the propodus, and about half as long as the merus. In the fourth leg, which reaches about as far forward as the third, the dactylus is somewhat more flattened; it measures about ⅓ of the length of the propodus. It is ovate in dorsal view and ends in a simple point. Its upper surface bears a longitudinal median groove in the distal half; this groove carries a row of soft hairs and ends in a small tuft of short hairs. The propodus ends in a long tuft of hairs, which are only slightly shorter than the dactylus. The carpus is far more than half as long as the propodus and about half as long as the merus. The fifth leg resembles the fourth. A median tubercle is placed on the fifth thoracic sternum in the males. It is absent in the females.

The pleopods and uropods are similar to those of *G. aurantiaca.*

Size.—The smallest specimen examined is a juvenile with cl. 9 mm. The largest measured male has a carapace 41 mm long. Ovigerous females had the carapace length varying from 35 to 55 mm (mostly from 40 to 45 mm). The eggs have a diameter of 2.5 to 3.5 mm.

Colour.—The rostrum is whitish with a red apex; the basal lateral spines, and sometimes also the distal, are also red. The lateral margin of the rostrum is reddish in its basal part. On the carapace, the tubercles of both the anterior and posterior submedian and intermediate carinae, as well as the additional tubercles between them, are red or orange red. All the other carinae are uncoloured. The antennal and branchiostegal spines are red, being darkest at the apex. The tubercles and carinae of the abdominal tergum are orange red. The posterior margins of the terga, especially in the posterior somites, are a darker red. The pleura are whitish or pink; in some specimens, the margins and spines are darker. In very dark specimens, the pleura of the fifth and sixth somites are dark red. In these same specimens, the entire tail fan, which usually is whitish or greyish with red carinae, is entirely red.

The first two segments of the antennular peduncle are pink (the first sometimes is red), the third is white. The antennular and antennal flagella are pink, or (in dark specimens) red. The antennal peduncle is pink, with the distal part sometimes red. The scaphocerite shows a red band along the outer margin and the basal part of the inner margin.

The mouthparts are red or pink. The first pereiopod is likewise red. The second pereiopod is pale red in the basal part as far as the merus; the

carpus and chela are white. Also the third to fifth pereiopods are red or pink at the base, with merus, carpus, and the larger part of the propodus white or very light pink, while the distal part of the propodus and the dactylus are orange.

The pleopods are pink or whitish. The eggs are blue or greenish.

There is some variation in the extent and intensity of the red colour in this species. In one very dark specimen, the rostrum is almost entirely red, and all the legs are reddish or red; also, the antennular peduncle in this specimen is reddish. But the teeth on the anterior lateral carinae, and all carinae below the intermediate remain uncoloured, as also the base of the antenna and part of the scaphocerite.

The species differs from *G. longleyi* in that the posterior submedian carina is always entirely red.

Horizontal Distribution.—The species is only known from the present material enumerated above; its known range extends from the east coast of South Carolina and the Bahama Islands to the Caribbean coast of Colombia and St. Vincent.

Vertical Distribution.—So far, *Glyphocrangon haematonotus* has been taken at depths between 135 and 528 fm (= 247 and 966 m); the shallowest tow in which it was taken was from 113 to 135 fm (= 206 to 247 m). The species was most frequently found between 180 and 410 fm (= 329 and 749 m). The bottom at the stations where the species was taken consisted, as far as is known, of gray mud (PELICAN stas. 17, 27), white mud (PELICAN sta. 11), coral and mud (COMBAT sta. 445), yellow mud (ALBATROSS sta. 2628), green ooze and gray sand (ALBATROSS sta. 2676), gray sand and dead coral (ALBATROSS sta. 2668), coral sand (ALBATROSS sta. 2664).

Type-Material.—The holotype is an ovigerous female (cl. 44 mm) from GERDA sta. 649, Straits of Florida, 26°34'N, 79°43'W, 270 fm, 15 July 1965. It is now preserved in the collection of the U. S. National Museum under the catalog number 128950. The other specimens enumerated here are paratypes.

Remarks.—Some of the present material has been listed by Bullis & Thompson (1965) as *Glyphocrangon longleyi* (viz., part of specimens of PELICAN sta. 17), and as *G. spinicauda* (the material of COMBAT sta. 445).

Glyphocrangon neglecta Faxon, 1896
Fig. 9

Glyphocrangon neglecta Faxon, 1896, Bull. Mus. comp. Zool. Harv., *30:* 159, pl. 1, figs. 5, 6.—De Man, 1920, Siboga Exped. Mon., 39 (a3): 215, 219.—Bullis & Thompson, 1965, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8.

Material Examined.— S of Jamaica: PILLSBURY sta. 1256, 2 specimens (1 ovigerous).—Off Atlantic coast of Panama: PILLSBURY sta. 447, 53 specimens.—Off Atlantic coast of Colombia: PILLSBURY sta. 374, 76 specimens (35 ovigerous); sta. 381, 19 specimens; sta. 394, 1 specimen; sta. 776, 47 specimens (18 ovigerous); sta. 781, 19 specimens (2 ovigerous); sta. 784, 8 specimens (1 ovigerous).—Off Venezuela: PILLSBURY sta. 753, 7 specimens (2 ovigerous). OREGON sta. 1982, 8 specimens (USNM); sta. 2353, 39 specimens (USNM).—Off Grenada: BLAKE sta. 261, 1 holotype in poor condition (MCZ); sta. 265, 1 juvenile (MCZ).—Off Surinam: OREGON sta. 2007, 4 specimens (3 ovigerous); sta. 4301, 1 female; SNELLIUS sta. B24, 2 specimens (1 ovigerous) (RMNH).

Description.—This species is so distinctive that it can hardly be confused with any other member of the genus. Faxon's (1896) description and figure are adequate for its recognition.

The integument of the body is finely pitted between the carinae and tubercles; no pubescence is present. The rostrum is long and slender. The tip in the largest specimens is almost twice as long as the basal part. The distal part of the upper surface of the tip shows a median carina, the proximal part of the tip has a reticulate pattern of ridges. The basal part of the rostrum, between the two pairs of teeth, has the lateral margin broadly elevated, so as to form two wide marginal carinae. Both submedian carinae of the carapace have blunt and low tubercles. Also, the anterior intermediate carina consists of blunt tubercles. The posterior intermediate carina is straight, with a reticulate pattern and a blunt anterior end. The anterior antennal carina is well developed and ends in the antennal spine, a feature distinguishing this species from all other Atlantic species of *Glyphocrangon*. The antennal spine is much larger than the branchiostegal; it is directed more strongly outwards and reaches laterally beyond the latter. The posterior antennal and lateral ridges are straight; they are blunt anteriorly. The anterior lateral carina ends in the branchiostegal spine; it is straight and carries no teeth. The anterior sublateral carina runs very close to the lateral and fuses with it anteriorly. The posterior sublateral, and the anterior and posterior submarginal carinae are not very distinct. The lateral groove of the carapace does not reach the lateromarginal, which also is separated from the posteromarginal.

The first abdominal somite has the usual three dorsal teeth, the middle of which is sharp, the others blunt. Otherwise, there are hardly any tubercles on the first somite. Also, the second to fourth somites are practically smooth, with low and wide elevations instead of tubercles. The pleura of

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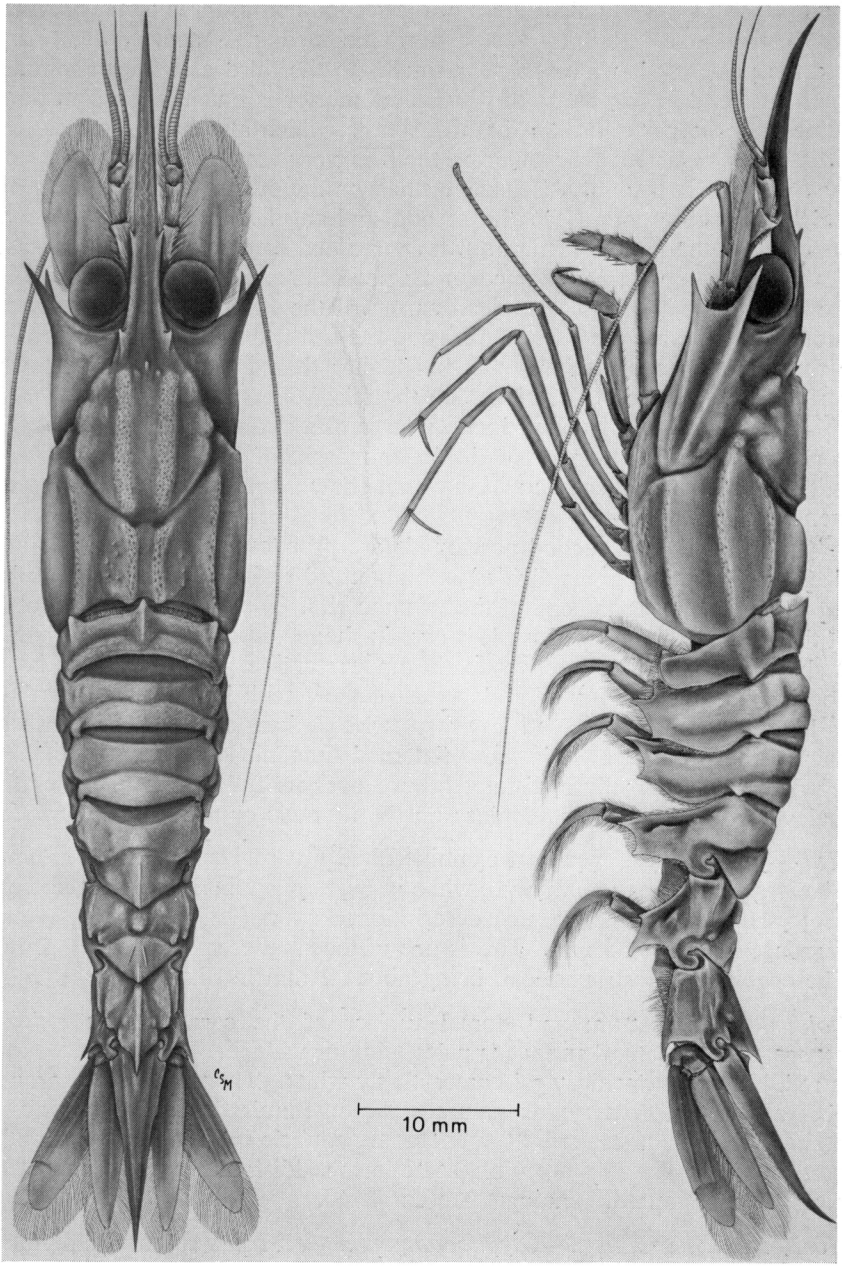
FIGURE 9. *Glyphocrangon neglecta* Faxon, female from PILLSBURY sta. 374, in dorsal and lateral views.


CSM
10 mm

the first somite are rounded; those of the second end in three teeth, of which the anterior one is bluntly rectangular, the median is acutely dentiform, and the posterior is wide and very small. In the third and fourth somites, the pleura end in two teeth, of which the anterior is much larger and more acute than the posterior. In the fifth somite, which also has two teeth, the situation is reversed: the anterior tooth is very small. The sculpture on the fifth and sixth somites is stronger than on the others. A median carina, which is lacking entirely in the second and third somites, makes its appearance in the middle of the fourth somite and extends over the fifth and sixth. The two posterior submedian carinae of the fifth somite do not reach the posterior margin. The median carina of the sixth somite is not interrupted at its base. The lateral surface of the sixth somite shows two central carinae, with the posterior somewhat higher than the anterior; the lower carina is not distinct. The ridges on the telson are smooth.

The eyes are well developed with a large black cornea. A small tubercle is present in the distal part of the inner margin of the peduncle.

The scaphocerite is ovate and does not show a tooth in any of my specimens.

The left and right second pereiopods are practically equal in shape and size, and have the carpus divided into about 20 to 26 segments. The third leg reaches about to the end of the scaphocerite. The dactylus has about ⅛ of the length of the propodus. It is oval in shape and ends in a single point; it shows a short distal groove on the upper surface. The propodus bears no distal brush of hairs. The dactylus of the fourth leg is more than half as long as the propodus and less than twice as long as the distal brush of hair of the propodus. It is more flattened than the dactylus of the third leg and shows dorsally a distinct groove over its full length. Neither the males nor the females have spines on the thoracic or abdominal sterna.

Size.—The smallest specimen examined had a carapace length of 11 mm. The largest male had cl. 35 mm, while in ovigerous females cl. ranged from 30 to 41 mm. In the original description, Faxon (1896: 160) gave the carapace length as 35 mm. This is one of the smaller species of the genus. The eggs are almost spherical, being about 2 mm in diameter.

Colour.—The rostrum and dorsal surface of the carapace are reddish orange, and the lateral surface is paler, pink or whitish. The antennal spine is reddish, the branchiostegal contrastingly white. The abdomen is orange pink above, with paler pink pleura. The antennular peduncle is pink or orange, the flagella are red. The antennal peduncle is whitish. The mouthparts are red. The legs are pink, sometimes reddish at the tips. The pleopods are uncoloured. The eggs are coral red.

Horizontal Distribution.—Glyphocrangon neglecta has so far been found only in the southern Caribbean (south of 17°30'N) and along the north

coast of South America (from Panama to Surinam). The present material was collected at numerous localities off the Caribbean coasts of Panama, Colombia, and Venezuela, from South of Jamaica, and off Surinam. The records in the literature are: Caribbean Sea between Honduras and Jamaica, 16°54'N, 81°18'W (250 fm) (Bullis & Thompson, 1965); off Montserrat, 16°43'45"N, 62°16'12"W (303 fm) (Faxon, 1896); off Grenada, 12°03'30"N, 61°47'10"W (291 fm) (Faxon, 1896); off Venezuela, 11°35'N, 62°41'W (212-250 fm) (Bullis & Thompson, 1965).

Vertical Distribution.—So far the species has been found between 200 and 576 fm (= 365 and 1050 m), most frequently between 200 and 400 fm (= 365 and 730 m). There is one record (SNELLIUS sta. B24) from a depth of 65 to 66 m (= 36 fm); it differs so widely from the other depth records for the species, that confirmation is needed before it can definitely be accepted. The various types of bottom from which the species was collected were noted to consist of: mud (PILLSBURY sta. 381; OREGON sta. 2353); mud with pteropod shells (PILLSBURY sta. 781); blue mud (OREGON sta. 2007); gray ooze (BLAKE sta. 265); sand and ooze (BLAKE sta. 260); sandy mud with clay and many shell fragments (OREGON sta. 4301); sand and broken shell, black specks (BLAKE sta. 153); coral (OREGON sta. 1885); shell and coral rubble (PILLSBURY sta. 753).

Type-Material.—The holotype is an ovigerous female collected from BLAKE sta. 261, off Grenada, 340 fm, and is preserved in the collection of the Museum of Comparative Zoology, Harvard College, Cambridge, Massachusetts, U. S. A., under Reg. No. 4434. The paratypes are a male from off Montserrat and a young specimen from off Grenada.

Glyphocrangon aculeata A. Milne Edwards, 1881
Fig. 10

Glyphocrangon aculeatum A. Milne Edwards, 1881, Annls Sci. nat., Zool., (6) *11* (4): 5; 1883, Rec. Fig. Crust. nouv. peu conn., pl. [39].—Holthuis, 1955a, Zool. Verhand. Leiden, *26:* 131.

Rhachocaris Agassizii Smith, 1882, Bull. Mus. comp. Zool. Harv., *10:* 43, pl. 5, fig. 2, pl. 6, fig. 2; 1884, Rep. U. S. Commnr Fish, *10:* 365.

Glyphocrangon aculeata Bate, 1888, Rep. Voy. Challenger, Zool., *24:* 521, pl. 94, fig. 1.—Faxon, 1896, Bull. Mus. comp. Zool. Harv., *30:* 158.—Young, 1900, Stalk-eyed Crust. British Guiana: 460.—Moreira, 1901, Archos Mus. nac., Rio de J., *11:* 15.—De Man, 1920, Siboga Exped. Mon., 39 (a3): 214, 216.—(p.p.) Boone, 1930, Bull. Vanderbilt mar. Mus., *3:* 179, pl. 67 (not pl. 66).—Dawson, 1965, Mus. Rep., Gulf Res. Lab., Ocean Springs, 1963-1964: 14.—Bullis & Thompson, 1965, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8.

Glyphocrangon aculeatus Agassiz, 1888, Bull. Mus. comp. Zool. Harv., *15:* 45, fig. 242.

not *Glyphocrangon agassizii* Fowler, 1912, Ann. Rep. New Jersey State Mus.,

1911: 556 (error for *Ceraphilus agassizii* = *Sclerocrangon jacqueti* [A. Milne Edwards]).

Glyphocrangon (*Glyphocrangon*) *aculeata* Springer & Bullis, 1956, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 196: 13.

not *Glyphocrangon aculeata* Boone, 1927, Bull. Bingham oceanogr. Coll., *1* (2): 121, fig. 27 (= *G. spinicauda*; see also Glassell, 1934, Trans S. Diego Soc. nat. Hist., *7:* 454).

Material Examined.—Off South Carolina, U. S. A.: ALBATROSS sta. 2677, 15 specimens (USNM).—N of the Bahama Islands: ALBATROSS sta. 2654, 1 juvenile (USNM); sta. 2656, 3 specimens (USNM); GERDA sta. 182, 1 female.—Straits of Florida, U. S. A.: GERDA sta. 121, 1 male, 3 juveniles; sta. 122, 3 females (2 ovigerous); sta. 126, 1 female; sta. 128, 2 males, 1 female; sta. 129, 1 male, 2 females; sta. 131, 4 males, 10 females (7 ovigerous); sta. 144, 1 female; sta. 223, 1 female; sta. 366, 1 ovigerous female; sta. 368, 1 male; sta. 370, 2 males, 1 female; sta. 374, 5 males, 4 females; sta. 375, 6 specimens; sta. 442, 2 females (1 ovigerous); sta. 443, 5 females (4 ovigerous); sta. 448, 1 juvenile; sta. 449, 4 males, 5 females, 3 juveniles; sta. 859, 3 specimens; sta. 867, 2 specimens (1 ovigerous); sta. 870, 4 ovigerous females; sta. 963, 3 specimens; sta. 1101, 1 female; sta. 1106, 1 ovigerous female; sta. 1107, 3 specimens (1 ovigerous); PILLSBURY sta. 634, 1 specimen.—W of Dry Tortugas, Florida, U. S. A.: BLAKE sta. 29, 1 specimen (MCZ).—Eastern Gulf of Mexico: OREGON sta. 1426, 2 specimens (USNM).—Western Gulf of Mexico: OREGON sta. 534, 5 specimens (USNM).—W of Jamaica: PILLSBURY sta. 1238, 1 specimen.—S of Jamaica: ALBATROSS sta. 2140, 2 specimens (USNM); BLAKE sta. VII, 1 specimen (MCZ); PILLSBURY sta. 1197, 4 specimens (2 ovigerous); sta. 1224, 2 specimens; sta. 1235, 1 specimen; sta. 1262, 2 specimens.—W of Haiti: PILLSBURY sta. 1178, 2 specimens; sta. 1187, 1 ovigerous female.—Off St. Croix, Virgin Islands: PILLSBURY sta. 1304, 1 specimen.—Off St. Kitts (= St. Christopher): PILLSBURY sta. 954, 1 male, 6 females (4 ovigerous); ALBATROSS sta. 2751, 1 specimen (USNM).—Off Aves Island: ALBATROSS sta. 2117, 1 specimen (USNM).—Off Guadeloupe: BLAKE sta. 163, 2 specimens (MCZ); sta. 174, 1 specimen (MCZ).—Off Martinique: BLAKE sta. 195, 1 specimen (MCZ); PILLSBURY sta. 892, 1 male, 1 juvenile.—Off St. Vincent: BLAKE sta. 227, 10 syntypes (MCZ).—Off Grenada: BLAKE sta. 265, 2 specimens (1 ovigerous) (MCZ); PILLSBURY sta. 847, 5 specimens.—Off Tobago: PILLSBURY sta. 844, 19 females (3 ovigerous).—Off Atlantic coast of Panama: PILLSBURY sta. 325, 1 specimen; sta. 448, 2 specimens (1 ovigerous).—Off Atlantic coast of Colombia: PILLSBURY sta. 388, 25 specimens (10 ovigerous); sta. 391, 24 specimens; sta. 407, 13 specimens (1 ovigerous); sta. 413, 12 specimens (2 ovigerous).—Off Venezuela: PILLSBURY sta. 741, 7 specimens (2 ovigerous); sta. 747, 1 female; sta. 754, 2 specimens.—Off British Guiana: PILLSBURY sta. 689, 7 specimens (4 ovigerous).— Off Surinam: PILLSBURY sta. 672, 1

ovigerous female, 2 juveniles; sta. 675, 25 specimens (10 ovigerous); sta. 682, 6 specimens (1 ovigerous).—Off Recife (= Pernambuco), Brazil: CHALLENGER sta. 120, 1 female (BM).

Description.—An excellent description and figures of this species were given by S. I. Smith (1882), who employed the name *Rhachocaris Agassizii* for it.

The dorsal surface of the body is glabrous, without any pubescence; it is extremely finely pitted. The tip of the rostrum in adults is slightly longer than the basal part, and slightly shorter than the distance between the anterior and cervical grooves measured dorsally. A median carina extends from the tip to the level of the basal pair of teeth. The margin of the rostrum is raised, and between the two pairs of teeth it forms a broad rounded carina. The basal part of the rostrum is distinctly concave, and the spines project upward and forward.

The tubercles of the submedian carinae of the carapace (six or seven anterior, three posterior) are laterally compressed and end in forward-directed sharp, or rather blunt, points. Also the anterior and posterior intermediate carinae have the tubercles (four and five, respectively) more or less dentiform; those of the anterior carina are, especially the anterior ones, sharply pointed. A few small tubercles are found between the carinae. The anterior antennal carina is totally absent, without any trace. The posterior antennal carina is straight, showing only two blunt serrations in its extreme posterior portion; it ends in a strong, somewhat winged, large, sharply pointed tooth. The anterior lateral carina is directed obliquely upward; it is large, winglike expanded, especially anteriorly, where it forms a single large tooth that ends in an extremely slender, sharp point. This tooth is about as long as, but far wider than the antennal spine, near the base of which it is situated. The posterior lateral carina shows two or three teeth in its basal part, but otherwise is straight; it ends in a rectangular point, which lies distinctly below the base of the anterior lateral carina and is practically level with that of the anterior sublateral carina. Between the posterior antennal and posterior lateral carinae there is a longitudinal row of small tubercles. The branchiostegal spine is longer, flatter, and higher than the antennal and diverges slightly more; it bears no carinae at all on its upper surface. The anterior sublateral carina is distinct. The posterior sublateral is short and continued posteriorly as two or three tubercles. The anterior submarginal carina is rather wide and quite distinct. The posterior submarginal is reduced to a row of about four tubercles along the posteromarginal groove. The lateral, lateromarginal, and posteromarginal grooves are in contact with another, except in one of the specimens where the anterior submarginal and posterior sublateral carinae are fused, blocking the lateral groove.

The teeth and tubercles on the abdomen are high and compressed. Apart

from the three large, sharply pointed teeth on the first somite, the tubercles and spines are blunt. The tubercles and spines in the median line of the abdomen form an effective median carina, which is interrupted at the ends and in the middle of the somites (also in the sixth somite). The central longitudinal carina on the lateral surface of the sixth somite is broken up into four to six short carinae or tubercles; a few small tubercles are placed above it. The lower carina is not broken up, but has an irregular upper margin. The pleuron of the second somite ends in the usual three teeth; the anterior of these, however, is low, rounded, and rather inconspicuous, the other two are sharply pointed. The pleuron of the fifth somite ends in two teeth.

The eyes are well developed, with large black corneas. A small tubercle is placed in the distal part of the inner margin of the eyestalk.

The scaphocerite is ovate and, even in the large specimens, shows a distinct tooth in the proximal third of the outer margin.

The left and right second pereiopods are about equally slender, but the right is the longer, often reaching beyond the scaphocerite with a good part of the carpus. The carpus has 25 to 29 articles. The left leg is shorter and has the carpus consisting of 19 to 22 articles. The dactylus of the third leg is about ⅓ as long as the propodus, is oval in outline, and ends in a single point; the upper surface shows a longitudinal groove in the distal half. The dactylus of the fourth leg is about half as long as the propodus. It is oval, like that of the third, but is flatter and distinctly concave dorsally. The fifth thoracic sternite of the males shows a median tubercle bearing a few long hairs; in the females this tubercle is absent, but the tuft of hairs is there.

Size.—The smallest specimen examined had cl. 14 mm. The largest male had cl. 38 mm. Ovigerous females had cl. 36 to 49 mm. The diameter of the eggs is 2 to 3 mm.

Colour.—The rostrum is pink or pale orange, with the teeth, and sometimes also the top, red; the marginal carinae connecting the lateral teeth are also red. In dark specimens the entire rostrum, distally of a curved line that connects the bases of the proximal lateral teeth, is dark red. The tubercles and spines of the submedian and intermediate ridges of the carapace are orange red, or red. The posterior antennal carina is pink or (partly or entirely) orange red. The tooth of the anterior lateral carina has an orange tip; sometimes the entire carina is orange. All the other carinae are un-

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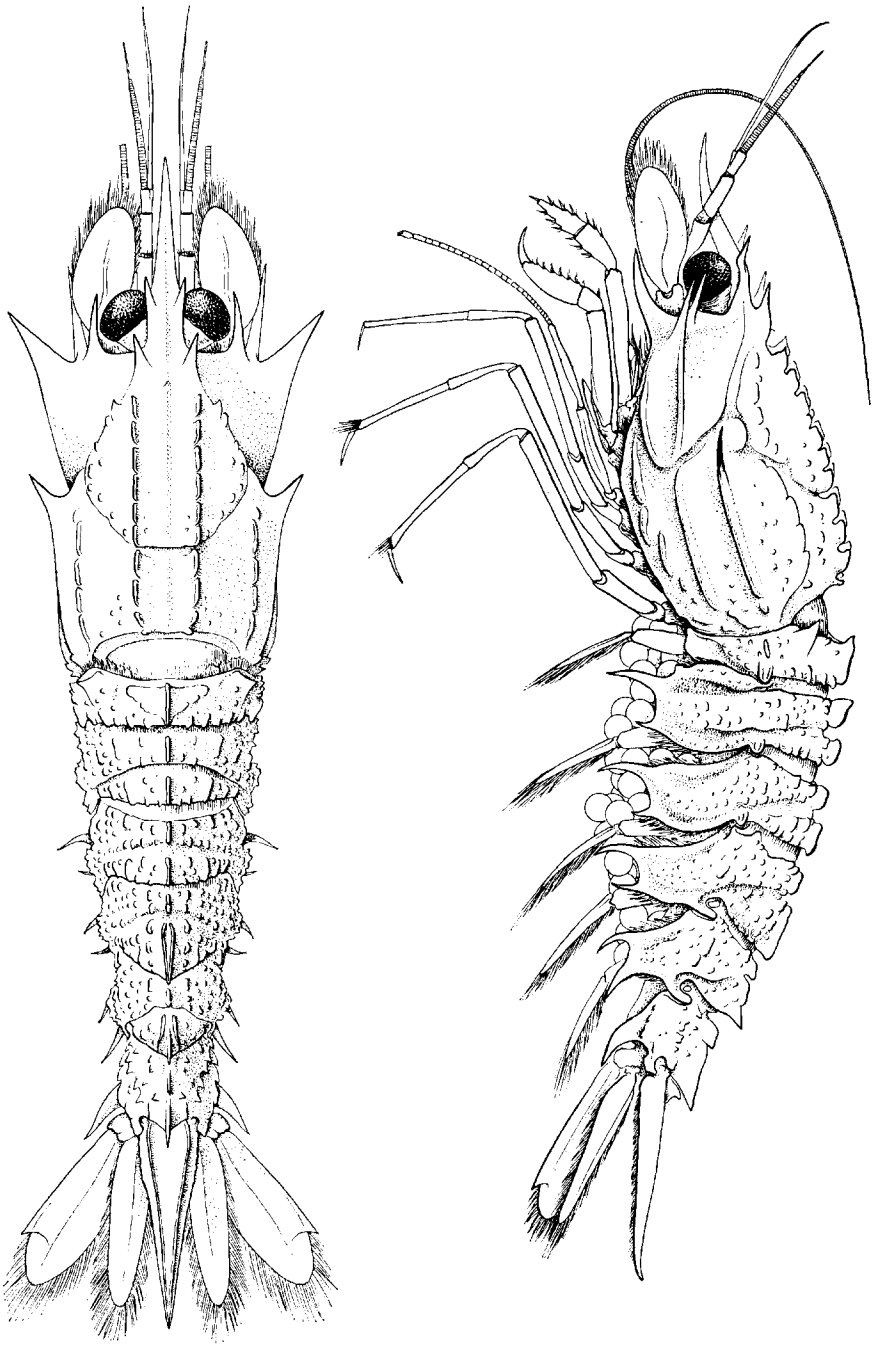
FIGURE 10. *Glyphocrangon aculeata* A. Milne Edwards, ovigerous female holotype of *Rhachocaris agassizii* Smith, from BLAKE sta. 326, in dorsal and lateral views, × 1.4. (After Smith, 1886.)



coloured. The antennal and branchiostegal spines, as well as the entire area along the anterior margin of the carapace below the orbit, are dark red.

All tubercles of the abdomen are orange or orange red, with those on the dorsal part being darker than the more ventrally situated ones. The spines of the pleura are also orange red or orange. The posteromedian parts of the fourth, fifth, and sixth somites show a large central or two submedian red spots. Usually the sixth somite shows a somewhat darker red colour than the other somites, and the entire tail fan is about the same colour, often becoming darker distally.

The eyes in the adults are large and well pigmented. In juveniles, they are often whitish.

The antennulae and antennae are red, sometimes lighter distally. The flagella are red. There is a white spot on the base of the antennular peduncle. The scaphocerite is white, with a red band along the outer margin, which in some specimens is reduced to a red spot; in others, the entire scaphocerite is red, but for a white spot in the basal part.

The oral parts are dark red. The first pereiopod has the chela and carpus dark red, and the merus and ischium a lighter colour. The second pereiopod is white, with the carpus and chela pink or pale orange. The basal part of each of the following pereiopods, as far as the ischium, is pink or reddish. The dactylus and the distal part of the propodus are pale orange.

The pleopods may have the protopod, or only its inner margin, pink; sometimes the entire pleopod is pink or red.

The eggs are greyish green or green.

Commensals.—Some specimens carry lepadids on the rostrum or carapace.

Horizontal Distribution.—The species is known from off Cape Hatteras (North Carolina, U. S. A.) to off Recife (northeastern Brazil), and from the entire Gulf of Mexico and Caribbean. The type-locality is off St. Vincent, West Indies. The records in the literature are: North Carolina, U. S. A.: south of Cape Hatteras, 33°42′15″N, 76°00′50″W (464 fm) (Smith, 1882). East coast of Florida, U. S. A.: off Miami (1100 fm) (Boone, 1930; either the locality or the depth is erroneous). Gulf of Mexico: west of Tortugas, 24°36′N, 84°05′W (955 fm) (Faxon, 1896); off Texas, 27°32′N, 93°01.6′W (400-450 fm) (Springer & Bullis, 1956; Bullis & Thompson, 1965). West Indies: south of Jamaica, 17°28′30″N, 77°30′00″W (610 fm) (Faxon, 1896); off Guadeloupe (878 fm) and 16°03′10″N, 61°52′20″W (769 fm) (Faxon, 1896); off Dominica, 15°18′12″N, 61°26′32″W (542 fm) (Faxon, 1896); off Martinique, 14°42′35″N, 61°13′15″W (501.5 fm) (Faxon, 1896); 14°31′55″N, 61°07′28″W (472 fm) (A. Milne Edwards, 1883); off St. Vincent (572 fm) (type-locality; A. Milne Edwards, 1881; Young, 1900); off Grenada,

12°03′55″N, 61°49′40″W (576 fm) (Faxon, 1896). Brazil: off Recife (= Pernambuco), 8°37′S, 34°29′W (675 fm) (Bate, 1888; Moreira, 1901).

Vertical Distribution.—The species has been caught at depths between 387 and 966 fathoms (= 707 and 1760 m); the shallowest station was at 371-387 fm. Most of the catches were made between 600 and 700 fm (= 1100 and 1280 m). A. Milne Edwards (1881) reported the types from 593 fm, but this evidently is an error for 572 fm, the depth of BLAKE sta. 227, at which the syntypes were taken (none of the early BLAKE stations gives a depth of 593 fm). Boone's (1930) record of the species from 1100 fm is doubtful, as no such depths are found "off Miami" whence she reported her material. The various bottoms on which the species has been taken have been described as: gray ooze (BLAKE sta. 265); *Globigerina* ooze (BLAKE sta. 326); blue *Globigerina* ooze (ALBATROSS sta. 2751); yellow ooze and black specks (ALBATROSS sta. 2654); ooze and sand (BLAKE sta. 163); sand and ooze (BLAKE sta. 227); fine sand, ooze, and black specks (BLAKE sta. 195); mud (OREGON sta. 1426); gray mud (OREGON sta. 534); clayey gray mud, with much debris (PILLSBURY sta. 413); green mud (ALBATROSS sta. 2677; PILLSBURY sta. 407); yellow mud and fine sand (ALBATROSS sta. 2117); yellow clayey mud, with much log debris (PILLSBURY sta. 1178); red mud (CHALLENGER sta. 120); slippery brown mud, with numerous very old and broken dead bivalve shells (PILLSBURY sta. 391); hard brown mud covered with siliceous sponges and branching Madreporaria (PILLSBURY sta. 689); heavy brownish clay (PILLSBURY sta. 388); sand (ALBATROSS sta. 2140; BLAKE sta. 200); fine dark sand and black specks (BLAKE sta. 190); coral sand (BLAKE sta. VII); Foraminifera (ALBATROSS sta. 2656); bottom with much *Thalassia* debris, as well as terrestrial plant remains (PILLSBURY sta. 1238).

Type-Material.—The type-material of this species consists of 10 syntypes (nine of which have cl. 20 to 34 mm; in the tenth, the rostrum is broken) from BLAKE sta. 227, off St. Vincent, 13°10′10″N, 61°18′15″W, 572 fm, sand and ooze, 19 February 1879. The specimens are preserved in the Museum of Comparative Zoology, Harvard University, Cambridge, Mass., under Reg. Nos. 4049 and 4424.

Remarks.—The species was first described in 1881 by A. Milne Edwards. The description was short and left much to be desired. This was the reason that S. I. Smith, although he had consulted A. Milne Edwards's paper, did not recognize the species from the description, and described it again as a new species, *Rhachocaris Agassizii*. Smith's description and figures are excellent, and so far have not been surpassed. When A. Milne Edwards (1883) published the figures of his *Glyphocrangon aculeatum*, its identity

with *Rhachocaris agassizii* was recognized by Smith (1884: 365), who then gave up both his generic and specific names.

Fowler (1912: 556) listed under the genus *Glyphocrangon* several species, among which was *Glyphocrangon agassizii* (S. I. Smith). That Fowler was somewhat confused, here, is shown by the fact that his references pertain not to *Rhachocaris agassizii* Smith, but to *Ceraphilus agassizii* Smith, 1882 (= *Sclerocrangon jacqueti* [A. Milne Edwards, 1881]).

Boone's (1927: 121, fig 27) material assigned to *Glyphocrangon aculeata* is *G. spinicauda*, as shown above (p. 301). The material that the same author later (Boone, 1930: 179) brought to the same species actually belongs to two species; her Plate 66 shows *G. spinicauda*, and Plate 67 *G. aculeata.* From her description, it is clear that, in her lot of 13 specimens from off Miami, ten belong to the former species and three to the latter.

Glyphocrangon longirostris (Smith, 1882)
Figs. 11, 12, 13

Rhachocaris longirostris Smith, 1882, Bull. Mus. comp. Zool. Harv., *10:* 51 (p.p.), pl. 5, fig. 1, pl. 6, fig. 1

Glyphocrangon longirostris Smith, 1884, Rep. U. S. Commnr Fish, *10:* 365; 1886, Rep. U. S. Commnr Fish, *13:* 608, 655, pl. 8, figs. 1, 2, pl. 9, figs. 3-5.—Stebbing, 1908, Ann. S. Afr. Mus., *6:* 38.—Kemp, 1910, Sci. Invest. Fish. Br. Ireland, 1908(1): 170.—Stebbing, 1910, Ann. S. Afr. Mus., *6:* 388.—Fowler, 1912, Ann. Rep. New Jersey State Mus., 1911: 557.—De Man, 1920, Siboga Exped. Mon., *39*(a3): 214, 217.—Balss, 1925, Wiss. Ergebn. dt. Tiefsee-Exped. 'Valdivia', *20:* 295.—Barnard, 1950, Ann. S. Afr. Mus., *38:* 721, fig. 134 e-g.—Marshall, 1954, Aspects Deep-Sea Biol.: 329.—? Bullis & Thompson, 1965, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8.

Glyphocrangon sculptus Smith, 1884, Rep., U. S. Commnr Fish., *10:* 365 (p.p.).

Glyptocrangon longirostris Williamson, 1915, Nordisches Plankton, *6:* 392.

Glyphocrangon nobilis? Stephensen, 1923, Rep. Dan. oceanogr. Exped. Mediterr., 2(D3): 80.

?*Glyphocrangon* sp. Bourdon, 1967, Bull. Mus. Nat. Hist. nat. Paris, Ser. 2, *38:* 857.

not *Glyphocrangon longirostris* (?) McGilchrist, 1905, Ann. Mag. nat. Hist., Ser. 7, *15:* 238 (= *G. assimilis* De Man).

Material Examined.—WESTERN ATLANTIC: E of Massachusetts, U. S. A.: ALBATROSS sta. 2077, 1 male (MCZ); sta. 2706, 1 juvenile (USNM).—E of New York, U. S. A.: ALBATROSS sta. 2530, 1 specimen (USNM).—E of New Jersey, U. S. A.: ALBATROSS sta. 2205, 1 ovigerous female (USNM); sta. 2206, 1 male (USNM); sta. 2550, 2 specimens (USNM).—Off Cape Hatteras, North Carolina, U. S. A.: BLAKE sta. 330, 1 lectotype female

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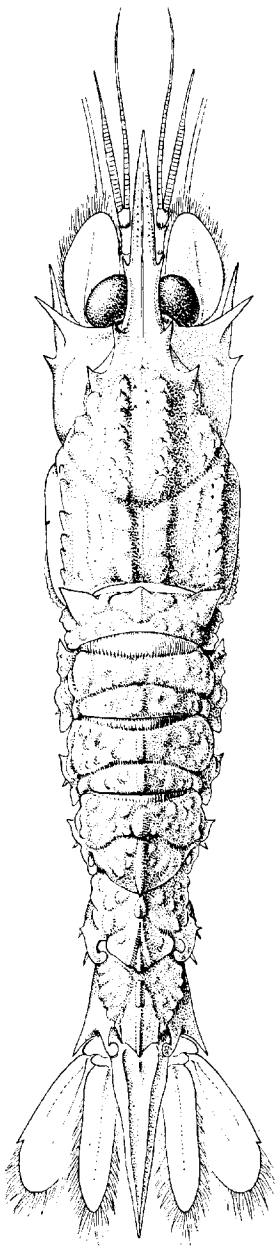
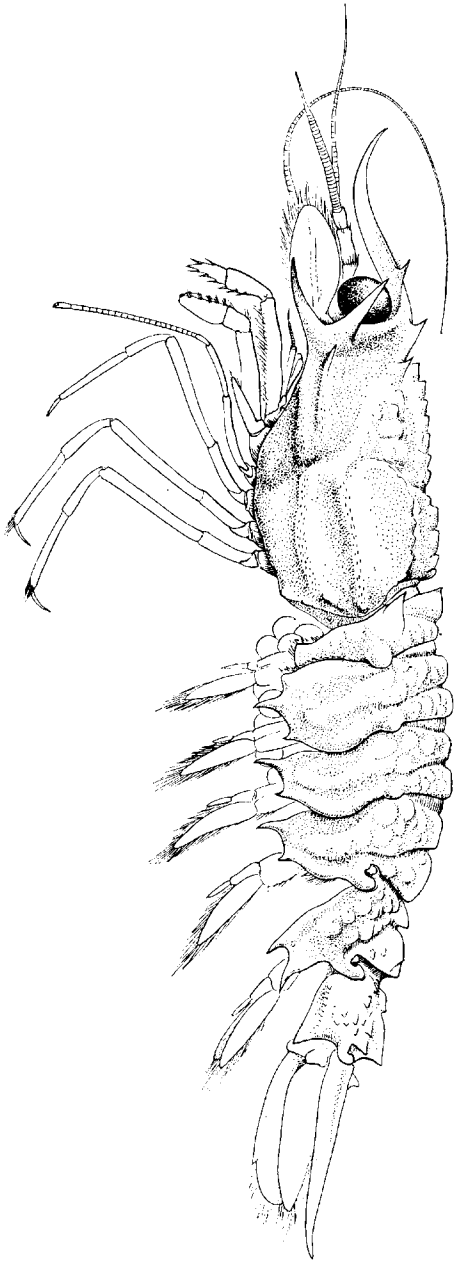
FIGURE 11. *Glyphocrangon longirostris* (Smith), adult female from ALBATROSS sta. 2205, in dorsal and lateral views, × 1.4. (After Smith, 1886.)





(MCZ).—Eastern Gulf of Mexico: ALBATROSS sta. 2381, 1 specimen (USNM); sta. 2383, 1 specimen (USNM).—St. Croix Basin, Virgin Islands: PILLSBURY sta. 1304, 3 specimens.

EASTERN ATLANTIC: W of Brittany, France: 48°04′N, 12°40′W, 4000 m, "Yngeltrawl," 1800 m.w., THOR Exped., 2 September 1906, 5 males, 3 females (2 ovigerous).—Off Brittany, France: Centre Océanologique de Bretagne, sta. CHO4-BO19-Put 124, 1 female (COB).—W of Strait of Gibraltar: 35°43′N, 8°16′W, 2156-2360 m, SKAGERAK Exped., 28 May 1946, 1 female (MC).—Off Southern Liberia, West Africa: PILLSBURY sta. 76, 2 males.—Off Nigeria, West Africa: PILLSBURY sta. 233, 4 specimens; sta. 309, 46 specimens (22 ovigerous); sta. 314, 1 specimen.

Description.—The rostrum is long and reaches with one fourth to almost half of its length beyond the scaphocerite. It is slender, with the tip curved upwards. The tip is 1.5 times to almost twice as long as the basal part, and 0.8 to 1.5 times as long as the distance between the cervical and anterior grooves. There are two pairs of lateral rostral teeth. Behind the anterior lateral teeth the lateral margin is raised, whereby the upper surface becomes concave. The distal part is flat, or even slopes down from the raised median carina. This carina extends from the tip of the rostrum to slightly in front of the posterior lateral rostral teeth. The dorsal surface of the distal part of the rostrum shows many depressions and elevated parts, giving it a corrugated appearance. These corrugations are quite typical for the species.

The anterior submedian ridges are distinct, with six or seven conical, pointed or blunt tubercles. At the inner side of each of these ridges there is a row of about six small, often very inconspicuous, tubercles; some additional small tubercles may be present in the median area. A distinct median tubercle is placed just behind the anterior groove. To the outside of the submedian ridges, there is a row of seven or eight small, often inconspicuous, tubercles. The posterior submedian ridges each consist of four or five pointed or blunt conical tubercles; the last of these slightly overhangs the posterior groove. At the inner side of the ridges, there is a row of three or four blunt, often inconspicuous, tubercles. On the outside, there are three or four indistinct tubercles. A row of about five small, blunt tubercles stands in the space between the posterior submedian and posterior intermediate carinae, while some other similar tubercles are placed closer to the intermediate carina.

The anterior intermediate carina bears three or four sharp, spinous tubercles. The anterior of these is largest and quite sharp. These four tubercles are placed in a curved line that is convex externally. To the inner side of the carina, there is a row of about three small tubercles. To its outside, there are a few scattered tubercles. The posterior intermediate carina bears

five or six strong, conical, pointed tubercles. To the outside, there may be a few small scattered tubercles. Two of the three largest of these tubercles are placed just behind the cervical groove, the third just before the posterior groove; sometimes these tubercles are very inconspicuous.

The posterior antennal carina is pitted, but shows no teeth or tubercles, and ends bluntly anteriorly. A row of two, often inconspicuous, blunt tubercles extends upward from the anterior end of this carina along the posterior margin of the cervical groove. The anterior antennal carina is indicated by a few inconspicuous tubercles.

The posterior lateral carina is without tubercles, but its surface is pitted. Anteriorly, it slopes down gradually towards the cervical groove, without a trace of a tooth or tubercle. The anterior lateral carina ends in a distinct sharp tooth at the base of the branchiostegal spine and at the level of the anterior groove.

The branchiostegal spine is large, slender, and sharply pointed. It is distinctly longer than the antennal spine and directed more forward, less outward. From the tip of the branchiostegal spine, two narrow and low, but rather distinct, carinae lead backward; the upper of these ends in the anterior lateral, the lower in the anterior sublateral carina.

The anterior sublateral carina is distinct and longer than the anterior marginal, which is about as distinct as the posterior sublateral. The posterior lateral and anterior sublateral carinae are almost in one line. The posterior submarginal and the posterior sublateral merge and form a forked carina, which stops at the posterolateral angle of the carapace. Between this angle and the base of the posterior lateral carina, a few tubercles are placed along the anterior margin of the posterior groove.

The first abdominal somite bears three large dorsal teeth—one median and two lateral. The teeth are somewhat laterally compressed, sharply pointed, and directed forwards. The lateral teeth are placed in one line with the posterior intermediate carinae. Blunt tubercles are present between, behind, and to the outside of the teeth. The pleura are straight anteriorly, rounded posteriorly and distally. They show a short carina close to, and parallel with, the lateral margin. The anterior half of the following somites is smooth, and this half disappears under the preceding somite in the fully stretched animal. The posterior part of the second to fourth somites is divided in two by a transverse groove. Before and behind this groove there are some tubercles. Those in the median line are short and ridgelike in the second and third and the anterior part of the fourth somite; in the posterior part of the fourth somite, they form a long, distinct carina, which posteriorly ends in a distinct angle. The tuberculation of the anterior part of the somites continues onto the pleuron, but stops short before reaching the distal margin. The end of this tuberculated area in the second somite is formed by a large rounded tubercle, before which the pleuron is

rather deeply hollowed. In the third and fourth somites, the end of the tuberculated area on the pleuron forms a wide, ridgelike, transverse tooth, against which the posterior margin of the preceding pleuron rests when the abdomen is most strongly curved. The pleuron of the second somite ends in a sharp, slender tooth, which at either side is flanked by a shorter and blunter, more triangular tooth or blunt angle. In the third and fourth somites, the pleuron ends in two sharply pointed teeth, the anterior of which is longer and sharper than the posterior. The fifth somite has the posterior median ridge short and sharp, ending in a rather blunt point; the anterior part is also sharp and ends bluntly posteriorly. Both are short and separated by a considerable distance. The dorsal submedian carinae start right behind the anterior median carina and continue almost to the posterior margin of the somite; they are high anteriorly, becoming gradually lower posteriorly. The lateral part of the upper surface bears several tubercles. In the upper part of the pleuron, there is an oblique ridge similar to the ridgelike teeth of the third and fourth pleura. The fifth pleuron ends in two slender, sharp teeth, of which the posterior is the longer; in some specimens there is a rudiment of a third tooth on the posterior margin. The sixth somite has the median carina well developed and ending posteriorly in a sharp triangular tooth, which reaches far over the base of the telson. The ridge is deeply notched in the basal third. The longitudinal ridge over the middle of the lateral surface of the sixth somite bears four or five large tubercles; the one in the middle may be placed just outside of the row. Two more tubercles are below and to the outside of the row, and some small scattered ones between it and the median ridge. Two short, longitudinal ridges are placed at the posterior margin of the somite, one just above, the other below, the articulation with the telson. A longitudinal ridge is visible in the anterior part of the base of the pleuron; it is rather irregular or tubercular. The pleuron ends in a sharp, slender, posteriorly directed tooth, from which an indistinct carina runs upward towards the base of the pleuron. The telson is slender. The two dorsal carinae are slightly serrate proximally. A distinct median basal tooth is present.

The eyes are very large. The cornea is large and swollen, being far longer and wider than the stalk. There is a small tubercle on the inside of the ocular peduncle, near the base of the cornea. In some specimens the colour of the cornea is dark, in others it is much lighter, but it never is as light as in *G. atlantica.*

The second segment of the antennular peduncle in the female is twice as long as the third. In the male, it is much shorter and more thickset.

The scaphocerite is oval, being slightly less than twice as long as broad. It reaches as far as the end of the antennular peduncle in the female, less far in the male. The antennal peduncle is slender and fails to reach the end of the scaphocerite, or reaches as far as its end.

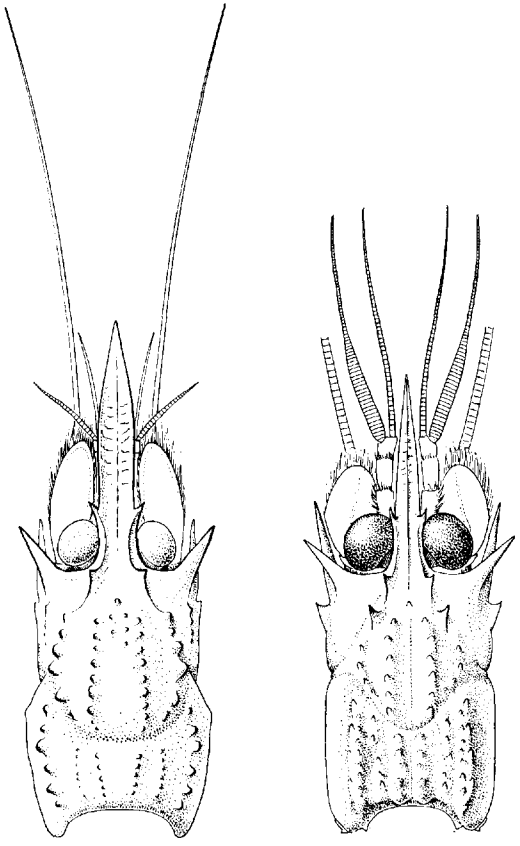


FIGURE 12. *Glyphocrangon longirostris* (Smith), dorsal view of anterior part of body: left, juvenile female lectotype from BLAKE sta. 330; right, male from ALBATROSS sta. 2206; × 1.4. (Left, after Smith, 1882; right, after Smith, 1886.)

The third maxilliped reaches slightly beyond the antennal peduncle. The last two segments show large curved spines on the lateral margins and on the posterior surface. The first pereiopods are subchelate; the propodus reaches about to the base of the last segment of the third maxilliped. The right second leg reaches slightly beyond the scaphocerite. The fingers of the chela are short; the chela itself is less than twice as long as high. The carpus consists of about 18 to 25 articles. The left leg is somewhat shorter and more heavy, and fails to reach the end of the scaphocerite; the carpus has 15 to 22 articles. The third legs reach with part of the propodus beyond the scaphocerite. The dactylus is simple, elongate ovate, and ends in

a blunt point; it measures ⅛ to ¼ of the length of the propodus. The propodus does not end in a bundle of hairs. The carpus is about 0.7 times as long as the propodus, and ⅔ as long as the merus. The fourth leg has the dactylus ⅔ as long as the propodus. The latter ends in a bundle of hairs, which is somewhat less than half as long as the dactylus. The carpus is 0.6 to 0.7 times as long as the propodus and somewhat less than half as long as the merus.

The uropods have the endo- and exopod elongate ovate. The outer margin of the exopod shows a rectangular tooth just behind the diaeresis.

Size.—The carapace length of the examined specimens varied between 22 and 46 mm. In ovigerous females it was 37 to 42 mm. The two specimens with branchial bopyrids had cl. 29 and 33 mm. The lectotype has cl. 23 mm and evidently is juvenile. The total length of the animals given in the literature varies between 25 and 110 mm. The eggs are large and few; in my material they measured 2.7 mm by 2.7-3.2 mm, although one, probably an underdeveloped one, measured 2 by 2 mm. Smith (1885) gave the size of the eggs as 2.8 by 3.1 mm, and counted 86 eggs in one female.

Colour.—Various authors have commented on the colour of the eyes. Smith, in the original description, described the cornea of the young lectotype (cl. 23.0 mm) as: "In the alcoholic specimen . . . perfectly white." Later the same author (Smith, 1885), having larger specimens at his disposal, found the cornea there "dark purplish brown" and commented about the "dark-colored eyes as in the other species." Stebbing (1908) described the eyes as "long retaining a purplish hue." Kemp (1910) found the colour of the cornea of a freshly caught young specimen (total length 40 mm) to be "pale orange without a trace of black pigment." Stephensen (1923) stated that his "largest specimen has, (in spirits) brownish eyes; in the others the eyes are colourless." Barnard (1950) gave the colour of the eyes as "dull orange-brown after many years in formalin." It seems very likely that in young specimens the colour of the eyes is very pale, and that it becomes darker with age. This is also borne out quite well by the material examined by me. Kemp (1910) described the rest of the colour of his freshly caught juvenile as follows: "The animal was ivory-white in colour with a suffusion of pink on the rostrum, the anterior part of the carapace, the oral appendages and the first pair of pereiopods." In Stephensen's (1923) decolorized specimens it was "plainly evident that the oral parts and the tips of many of the spines were originally red." Balss (1925) cited for the colour the following field notes: "Rücken graulichweiss, Extremitäten, Mundteile, Rostrum, Telson und Dornen des Panzers ziegelrot."

The specimens from PILLSBURY sta. 233 (off Nigeria) when just caught were noted to be coloured as follows: "Rostrum and anterior part of cara-

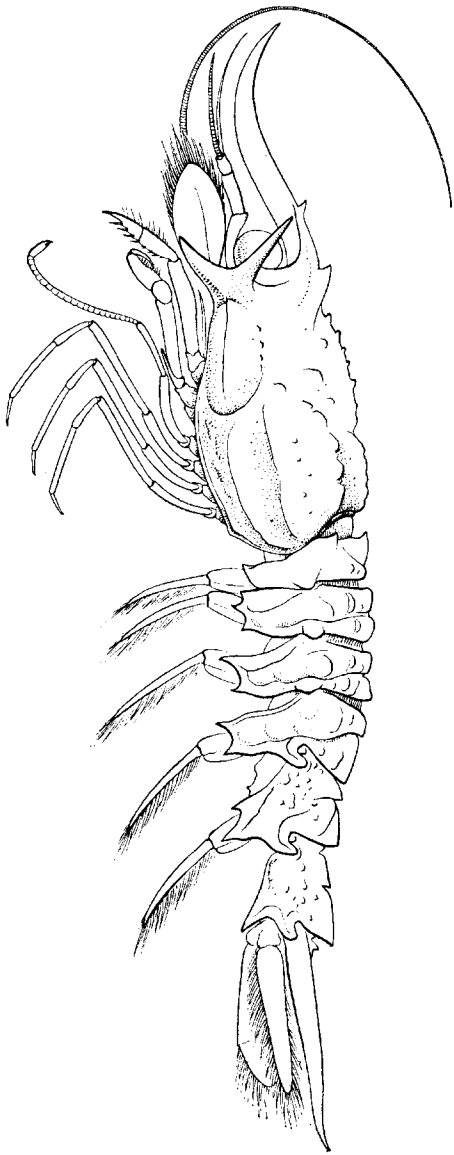


FIGURE 13. *Glyphocrangon longirostris* (Smith), juvenile female lectotype from BLAKE sta. 330, in lateral view, × 1.4. (After Smith, 1882.)

pace bright orange. Cornea bright yellow with the eye peduncle orange. All appendages from the antennulae to the fifth pereiopods orange, the mouthparts and the first pereiopods more reddish than the rest. The center of the basal half of the scaphocerite pale. Posterior part of carapace transparent, the often greenish intestines shining through. An orange band extends over the branchial region. The abdomen is pale orange. The pleura are darker than the tergum. Posteriorly the colour of the abdomen becomes darker, the tailfan and sixth abdominal somite being orange. Of the pleopods the exo- and endopod are orange, the protopod is lighter." The specimens from PILLSBURY sta. 309 (off Nigeria) were described as follows: "The dorsomedian part of carapace and abdominal somites greenish. Rostrum, antennal and branchiostegal spines as well as spines on the carapace pale orange. Posterolateral part of carapace and abdominal pleura pale orange. Eyestalks pink. Antennulae, antennae, mouthparts and legs orange." The colour of the specimens from the St. Croix basin were, immediately upon capture, noted to be as follows: "Rostrum and anterior part of the carapace (including the anterior end of the anterior submedian carinae, and the antennal and branchiostegal spines) reddish orange. Some small pale orange spots on the intermediate carinae, a small orange spot just before the cervical groove above the base of the anterior lateral carina, and a larger pale orange spot behind the cervical groove, covering both the posterior antennal and lateral carinae. Abdomen white with some faint pink colour on the three large teeth of the first somite, along the posterior margins of the second to fifth somites and on some of the dorsal tubercles; the general impression of the abdomen is that it is uncoloured dorsally. The pleura are faintly pink distally, except for that of the fifth somite which is red along the margins and lighter on the rest of its surface. The tailfan is uncoloured, only the carinae of the telson are faintly pink. The eyes have the cornea dark with a golden sheen. The antennula is orange red; the broader flagellum shows a longitudinal white band. The antenna, inclusive of the flagellum, is orange red, but for a white spot in the basal part of the scaphocerite. The mouth parts and the first pereiopod are red. The second pereiopod is more orange red, the following legs being orange. The pleopods are orange pink, being darker distally than proximally. In the juvenile the basal part of the rostrum and the anterior part of the carapace are pale pink, while there is also a pale pink spot in the posterolateral area of the carapace. The antennular and antennal peduncles are pale pink; the flagella are white and a white spot is visible in the basal part of the scaphocerite. The mouthparts and the first pereiopod are red." All these descriptions, although differing in details, give the same general colour pattern.

In preserved material, the eyes usually are paler than those of most other species.

Parasites and Commensals.—Two of the specimens from PILLSBURY sta. 309 (off Nigeria) carried bopyrid parasites in the branchial cavity. So far, no bopyrids had been reported from this species, but Bourdon (1967) described a new species of *Cabirops*, *C. serratus*, found parasitic on a species of *Bathygyge*, which itself was a parasite on a *Glyphocrangon* taken near the Canary Islands at 27°31'N, 16°27'W at 1918 m depth by the 1883 TALISMAN Expedition. Dr. Bourdon kindly informed me (*in litt.*, 1970) that the bopyrid *Bathygyge* examined by him was no longer attached to its glyphocrangonid host, and that the latter seems to be lost. Since the present species and *Glyphocrangon sculpta* seem to be the most common glyphocrangonids of the eastern Atlantic, and since bopyrids are found on both, it is possible that the specimen of *Glyphocrangon* taken by the TALISMAN was either *G. longirostris* or *G. sculpta.*

A heavily coiled, vermiform organism is present on the underside of the abdomen of a female with cl. 41 mm from PILLSBURY sta. 309 (off Nigeria); it is attached to the sternite of the second somite. This organism is similar to, but smaller and thinner than, the ones found on the rostrum and anterior part of the carapace of some specimens of *Glyphocrangon longleyi* (see p. 313). Its nature is unknown to me.

Horizontal Distribution.—The species has an extensive north-south distribution in the Atlantic Ocean, occurring from 50°47.5'N to about 34°S. The records in the literature are: Southwest of Ireland, 50°47.5'N, 11°43' W (900 fm) (Kemp, 1910); west of Brittany, France, 48°04'N, 12°40'W (Stephensen, 1923); east of Massachusetts, U. S. A., 41°09'40"N, 66°02'20" W (1255 fm) (Smith, 1884); east of New Jersey, U. S. A., 39°44'30"N, 70°30'45"W (1081 fm), 39°35'00"N, 71°24'30"W (1043 fm), 39°35'00"N, 71°18'45"W (1073 fm) (Smith, 1886); off Cape Hatteras, North Carolina, U. S. A., 35°41'03"N, 74°31'00"W (1047 fm) (type-locality; Smith, 1882; Smith gave the position of this station erroneously as 31°41'N, 74°35'W); ? off Nicaragua, 12°33'N, 82°20'W (350 fm) (Bullis & Thompson, 1965); ? off Surinam, 7°44'N, 54°40'W (350 fm) (Bullis & Thompson, 1965); ? near the Canary Islands, 27°31'N, 16°27'W (1918 fm) (Bourdon, 1967); between the Canary and Cape Verde Islands, West Africa, 24°35'N, 17°4' W (2500 m) (Balss, 1925); South Africa: Cape Point NE by E ¾ E 38½ miles (750-800 fm), Cape Point N 77° E (660-700 fm), Cape Point NE ¾ E 40 miles (720-800 fm) (Stebbing, 1908, 1910; Barnard, 1950); Cape Point N 58° E 49 miles (1646 m) (Stebbing, 1910; Barnard, 1950). Coutière (1911: 156; 1938: 265) reported *Glyphocrangon* from off the coast of Spain and Portugal, without giving any clue to the specific identity of his material; therefore, it is impossible to say whether the present or a different species was meant by him.

Vertical Distribution.—The species lives at great depth: all specimens known are taken from depths between 700 and 1371 fm (= 1280 and 2500 m). The shallowest tow in which the species was taken was at a depth of 660 to 700 fm. The material from 350 fm deep from off Nicaragua and Surinam brought to the present species by Bullis & Thompson (1965) is of uncertain identity (see below). Stephensen (1923) gave the depth at the station in which his specimens were taken as 4000 m, but indicated at the same time that the net had only 1800 m of wire. This would mean that his (adult) specimens were taken in midwater, which seems very unlikely. The bottom at the stations where the present species was taken is characterized as follows: gray ooze (ALBATROSS stas. 2205, 2530), gray ooze and Foraminifera (ALBATROSS sta. 2706), *Globigerina* ooze and clay (BLAKE sta. 330), blue mud (ALBATROSS sta. 2077), green mud (ALBATROSS sta. 2206; Stebbing, 1908), brown and green mud (ALBATROSS sta. 2383), brown mud (ALBATROSS sta. 2550), light brown mud (ALBATROSS sta. 2381).

Type-Material.—The type-material consists of two specimens, a larger (cl. 23 mm) juvenile female from BLAKE sta. 330 (off Cape Hatteras, North Carolina, U. S. A., 35°41′03″N, 74°31′00″W, 1047 fm, *Globigerina* ooze and clay) and a juvenile (total length 25 mm) from BLAKE sta. 315. The former is preserved in the Museum of Comparative Zoology, Harvard University, Cambridge, Mass., where I examined it in 1970. This specimen is now made the lectotype of *Rhachocaris longirostris* Smith, as Smith's original description and his figures are practically exclusively based on this specimen. The smaller specimen is preserved in the U. S. National Museum, and upon examination proved to belong to a different species, viz., *Glyphocrangon nobilis.*

Remarks.—Smith (1882) based the original description on the lectotype, which is a juvenile. Later the same author (Smith, 1886) gave additional details of the species based on adult specimens. As usual, his descriptions and figures are excellent.

One of the lots referred by Smith (1884) to *Glyphocrangon sculptus* (viz., the male specimen from ALBATROSS sta. 2077) proves actually to belong to *G. longirostris.* The specimen, which is in the Museum of Comparative Zoology, Harvard University, bears Smith's original label with the incorrect name, and a later label with the correct identification in a different handwriting (Faxon's ?). Smith's (1884) lots from ALBATROSS stas. 2035, 2095, 2102, and 2105, identified as *G. sculptus*, could also be examined and proved correctly named. His lots from ALBATROSS stas. 2051 and 2052, I have not seen (see also p. 286).

McGilchrist (1905) reported the species with some doubt from the Bay of Bengal, but De Man (1920) later showed that McGilchrist's specimens probably must be assigned to *Glyphocrangon assimilis* De Man.

Kemp (1910: 70) reported that in his juvenile, "arthrobranchs appear to be absent from the bases of the first two pairs of pereiopods, in accordance with Alcock's definition of the subgenus *Plastocrangon* though not with McGilchrist's account of *G. longirostris* (?) from the Indian Ocean." Actually, McGilchrist also remarked that in his specimen the number of branchiae was reduced, but he evidently accidentally switched the terms pleurobranchs and arthrobranchs. In the three specimens of the present material, also the small ones, that I examined on this point, arthrobranchs were present at the bases of the first and second pereiopods. It is difficult to find out whether these arthrobranchs are variable, or whether Kemp's specimen was abnormal.

The specimens from west of Brittany, which Stephensen (1923) brought with some doubt to *Glyphocrangon nobilis*, are preserved in the collection of the Copenhagen Museum and were kindly placed at my disposal by Dr. Torben Wolff. The collection of that museum contains another specimen, also identified by K. Stephensen as "*Glyphocrangon nobilis* (?)"; this specimen, obtained from the Göteborg Museum, was collected west of the Strait of Gibraltar by the Swedish SKAGERAK Expedition. All of Stephensen's material proves to belong to *G. longirostris* and not to *G. nobilis*. So far, *G. nobilis* has not been found in the eastern Atlantic.

Bullis & Thompson (1965) reported the present species from three stations made by the OREGON, viz., Nos. 1302, 1908, and 2010. The material of the first of these stations is in the U. S. National Museum and proved to be *Glyphocrangon nobilis*. The two other lots were not available, but as both came from depths far shallower (350 fm) than those usually producing *G. longirostris*, there is good reason to doubt the correctness of these identifications also.

Glyphocrangon nobilis A. Milne Edwards, 1881
Fig. 14

Glyphocrangon nobile A. Milne Edwards, 1881, Annls Sci. nat., Zool., Ser. 6 *11*(4): 5; A. Milne Edwards, 1883, Rec. Fig. Crust. nouv. peu conn., pl. [40], fig. 2.

Rhachocaris longirostris Smith, 1882, Bull. Mus. comp. Zool. Harv., *10:* 51 (p.p.), not pl. 5, fig. 1, not pl. 6, fig. 1.

Glyphocrangon nobilis Faxon, 1896, Bull. Mus. comp. Zool. Harv., *30:* 159 (p.p.).—Young, 1900, Stalk-eyed Crust. British Guiana: 459.—De Man, 1920, Siboga Exped. Mon., 39 (a3): 215, 217.—Schmitt, 1935, Scient. Surv. P. Rico, *15:* 170 (p.p.), fig. 33.

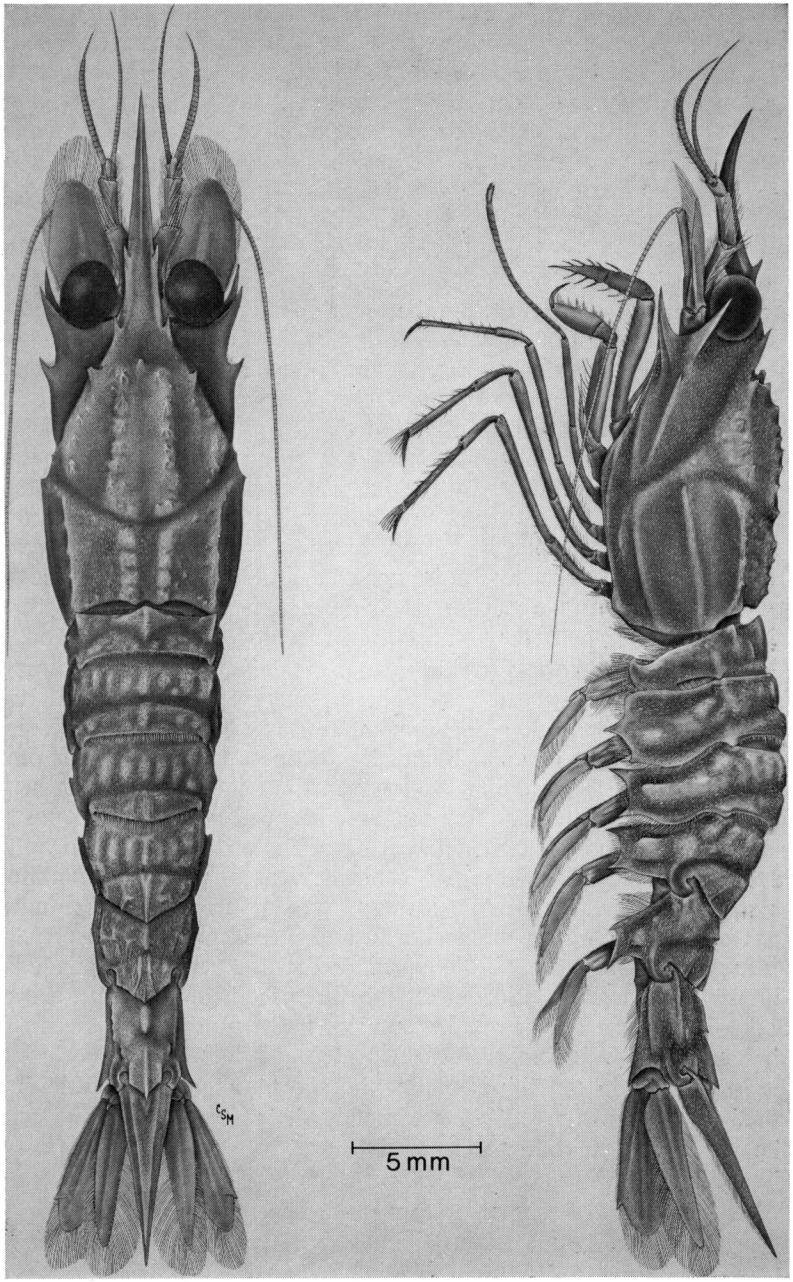
not ?*Glyphocrangon nobilis* Faxon, 1895, Mem. Mus. comp. Zool. Harv., *18:* 142 (= *G. vicaria* Faxon, 1896).—Stephensen, 1923, Rep. Dan. oceanogr. Exped. Mediterr., 2 (D3): 80 (= *G. longirostris* [Smith, 1882]).

Glyphocrangon longirostris Bullis & Thompson, 1965, Spec. Scient. Rep. U. S. Fish Wildl. Serv., Fisheries, 510: 8 (at least p.p.).

Material Examined.—E of South Carolina, U. S. A.: BLAKE sta. 315, 1 juvenile paralectotype of *Rhachocaris longirostris* Smith (USNM).—Bahama Islands: GERDA sta. 923, 1 ovigerous female.—Straits of Florida, U. S. A.: GERDA sta. 128, 2 males, 3 ovigerous females; sta. 365, 1 specimen; sta. 370, 1 female; sta. 374, 5 specimens (2 ovigerous); sta. 375, 1 male; sta. 449, 5 specimens (1 ovigerous); sta. 859, 1 ovigerous female; sta. 960, 3 specimens; sta. 963, 8 specimens; sta. 964, 3 specimens; sta. 965, 7 specimens; PILLSBURY sta. 634, 21 specimens (4 ovigerous).—NW of Cuba: BLAKE sta. 41, 1 ovigerous female (MCZ).—Gulf of Mexico off the Mississippi Delta: ALBATROSS sta. 2383, 1 specimen (USNM); sta. 2384, 4 specimens (1 ovigerous) (USNM); sta. 2385, 2 specimens (USNM); sta. 2392, 2 ovigerous females (USNM); OREGON sta. 1302, 1 specimen (USNM); sta. 1426, 3 specimens (1 ovigerous) (USNM).—S and SE of Jamaica: ALBATROSS sta. 2140, 2 juveniles (USNM); PILLSBURY sta. 1197, 34 specimens (10 ovigerous); sta. 1235, 21 specimens (6 ovigerous).—Gonave Bay, Haiti: PILLSBURY sta. 1178, 2 specimens (1 ovigerous).—Off St. Croix, Virgin Islands: BLAKE sta. 130, 1 specimen (MCZ); PILLSBURY sta. 1304, 3 specimens (2 ovigerous).—Off St. Kitts (= St. Christopher): ALBATROSS sta. 2751, 2 juveniles (USNM).—Off Guadeloupe: BLAKE sta. 162, 2 specimens (MCZ); sta. 174, 4 specimens (1 ovigerous) (MCZ).—Off Dominica: BLAKE sta. 176, 1 juvenile (MCZ); sta. 179, 1 specimen (MCZ); sta. 185, 2 juveniles (MP).—Off Martinique: BLAKE sta. 211, 1 juvenile (MCZ).—Off St. Lucia: BLAKE sta. 222, 2 juveniles (MCZ); PILLSBURY sta. 892, 25 specimens (11 ovigerous).—Off St. Vincent: BLAKE sta. 227, 1 specimen (MCZ).—Off Tobago: PILLSBURY sta. 844, 45 specimens (16 ovigerous); sta. 847, 5 ovigerous females.—Off Atlantic coast of Colombia: PILLSBURY sta. 770, 3 specimens (1 ovigerous).—Off Venezuela: PILLSBURY sta. 748, 168 specimens (38 ovigerous).—Off Surinam: PILLSBURY sta. 672, 8 specimens; sta. 673, 3 ovigerous females; sta. 675, 189 specimens (28 ovigerous); sta. 682, 6 specimens (1 ovigerous).

Description.—The body is covered with a short, dense pubescence, which leaves only the carinae and tubercles free. The tip of the rostrum is longer than the basal part, and about as long as the dorsal distance between the anterior and cervical grooves. The upper surface of the rostrum is smooth, and there is a median carina which extends from the top to somewhat beyond the anterior teeth. The upper surface of the basal part is not very concave; a curved carina connects each anterior with the corresponding posterior lateral tooth.

FIGURE 14. *Glyphocrangon nobilis* A. Milne Edwards, ovigerous female from PILLSBURY sta. 844, in dorsal and lateral views.


5 mm

The submedian ridges of the carapace bear wide, low, blunt tubercles, seven on the anterior, and four or five on the posterior carina. These tubercles usually are broken up into several smaller ones. The tubercles of the anterior intermediate carina are blunt and low, apart from the first, which ends in a distinct sharp tooth. The posterior intermediate carina has obscure indications of tubercles. There is no trace of the anterior antennal carina; the posterior one is straight and ends bluntly. The anterior lateral carina ends in a single, distinct, small tooth, which is placed at a level between the antennal and branchiostegal spines and rather far behind these. The posterior lateral ridge is smooth and curves strongly upward anteriorly; it lies on a much lower level than the anterior lateral carina, and almost in one line with the anterior sublateral carina, which is long and distinct. The posterior sublateral carina is short. The anterior submarginal is distinct and continues into the posterior submarginal, which is narrow and extends closely along the marginal carina until slightly beyond the posterolateral angle of the carapace. The lateromarginal groove is not in contact with the lateral, being blocked off by the fused posterior and anterior submarginal grooves, but it has a very narrow connection with the posteromarginal groove. The antennal spine is strong, reaching forward and slightly sideward; it is about parallel to the branchiostegal spine and about the same size. The upper surface of the branchiostegal spine bears two distinct carinae in its outer half; they stop before reaching the lateral carina.

The three teeth on the first abdominal somite are relatively short and low, the median being the lowest. There is a row of tubercles along the posterior margin, but not along the anterior one. The tubercles on the other somites are very low and blunt. No distinct median carina is present on the second and third somites; it starts in the middle of the fourth. The submedian ridges of the fifth somite are continued as far as the posterior margin of the somite. The median carina of the sixth somite is deeply incised in the basal half. Of the two central ridges on the lateral surface of the sixth abdominal somite, the lower is the longer; it is rather uneven, but not broken; the upper one is shorter and placed more posteriorly. The lower carina is also entire. The pleuron of the first somite is rounded, being bluntly produced anteriorly. Of the three teeth of the pleuron of the second somite, the anterior one is rounded, the two others are sharp. The third, fourth, and fifth somites have two pleural spines. The anterior spine is the larger one in the third somite, the shorter one in the fifth; in the fourth the two spines are of approximately the same length. The carinae of the telson are smooth.

The eye has a well-developed, black cornea. The stalk bears a spinule in the distal part of the inner margin.

The scaphocerite is ovate. In juveniles, it has a tooth in the lower half of the outer margin.

The second pereiopods are slightly unequal. The right is somewhat longer, reaching with part of the carpus beyond the scaphocerite. The right carpus has 24 to 30 segments, and the left one has 20 to 24 segments. The third leg reaches to the end of the scaphocerite. Its dactylus is oval, ending in a single point; it is about ⅓ of the length of the propodus, and shows a groove in the distal part of the upper surface. The dactylus of the fourth leg is about half as long as the propodus, or longer. It is oval, with a single point like that in the third leg, but it is more flattened, with the upper surface hollowed out.

The sternite of the fifth thoracic somite of the male shows a median tubercle.

Size.—The smallest specimen examined had a carapace length of 14 mm. The largest male had cl. 27 mm. Ovigerous females had cl. 25 to 34 mm. The eggs are 2.5 × 3 mm.

Colour.—The rostrum and the anterior part of the carapace (before the anterior groove and above the lateral carinae) are red; there may be a paler spot behind and above the antennal spine. Furthermore, the anterior parts of the intermediate and submedian carinae may be red. The posterior branchial region is pink or pale orange brown, or may be whitish, and a small, dark red spot may be present on the posterolateral margin. The rest of the carapace, including the submedian carinae, is not coloured.

The abdomen is uncoloured, except for a pink tinge on the first somite, and on the posterior parts of the second to fifth somites. The teeth of the first somite may be red, but as a whole the abdominal tergum is whitish or at least a very pale colour. The pleura are red entirely, or in their distal parts only. The telson is pink or pale orange, with darker carinae and a darker tip. The eyes of adult specimens have the cornea very dark, with a golden sheen; in the juveniles the eyes are pale, almost white. The antennulae, antennae, mouthparts, pereiopods, and pleopods are dark red. The uropods may be pink or red, but are usually paler than the pleopods; however, sometimes the fifth pleopods also may be pink or red. Eggs are blue or yellow. The general impression is of a shrimp which is white dorsally, but deep red anteriorly and ventrally.

Commensals.—A specimen from PILLSBURY sta. 675 carried hydroids on the carapace.

Horizontal Distribution.—The species is known from South Carolina (U. S. A.) and the Bahama Islands south to Surinam, including the greater part of the West Indian area. The records in the literature are: East of South Carolina, U. S. A., 32°18′20″N, 78°43′00″W (225 fm) (Smith, 1882); northwest of Cuba, 23°42′N, 83°13′W (860 fm) (Faxon, 1896); off the Mississippi Delta, Gulf of Mexico, 28°53′N, 87°58′W (890 fm) (Bullis &

Thompson, 1965); off Frederiksted, St. Croix, Virgin Islands, 17°43′N, 64°55′10″W (541 fm) (Faxon, 1896; Schmitt, 1935); off Guadeloupe, 16°02′40″N, 61°50′28″W (734 fm, 878 fm) (Faxon, 1896); off Dominica, 15°26′36″N, 61°36′45″W (1131 fm) (type-locality; A. Milne Edwards, 1881; A. Milne Edwards, 1883; Young, 1900); off Dominica, 15°32′18″N, 61′30°55″W (391 fm), 15°30′50″N, 61°32′55″W (824 fm; neotype locality), 15°24′55″N, 61°27′10″W (333 fm); off Martinique, 14°28′40″N, 61°06′08″ W (357 fm); off St. Lucia, 13°58′37″N, 61°04′45″W (422 fm); off St. Vincent, 13°10′10″N, 61°18′15″W (572 fm) (Faxon, 1896).

Vertical Distribution.—The species has been reported from depths between 225 and 1181 fm (= 410 and 2150 m). Most specimens were found between 700 and 800 fm (= 1280 and 1460 m). In the shallower hauls (less than 500 fm) the far larger percentage of the specimens were juveniles. Ovigerous females were found in depths between 585 and 975 fm. The bottom of the stations at which the species was collected consisted of: gray ooze (BLAKE sta. 130), blue *Globigerina* ooze (ALBATROSS sta. 2751), sand and ooze (BLAKE stas. 222, 227), dark brown ooze and sand (BLAKE sta. 176), sand and brown ooze (BLAKE stas. 179, 182), mud (OREGON sta. 1426), gray mud (ALBATROSS sta. 2385; OREGON sta. 1302), brown and gray mud (ALBATROSS stas. 2384, 2392), brown and green mud (ALBATROSS sta. 2383), yellow clayey mud with much log debris (PILLSBURY sta. 1178), fine sand and mud (BLAKE sta. 185), sand (ALBATROSS sta. 2140), fine sand (BLAKE sta. 211), lava sand (BLAKE sta. 162), green sand, black specks, and broken shell (BLAKE sta. 315).

Type-Material.—The holotype of the present species (from BLAKE sta. 182, off Dominica, 15°26′36″N, 61°36′45″W, 1131 fm, sand and brown ooze, 26 January 1879) could not be located, either in the Museum of Comparative Zoology, Harvard University, Cambridge, Mass., or in the Museum d'Histoire Naturelle in Paris. It has to be considered lost. As the original description of the species by A. Milne Edwards is insufficient for a certain recognition, and the figure that he provided later (A. Milne Edwards, 1883) is rather poor, it seems best to select a neotype, in order to settle definitely the identity of the species. As such is now chosen a specimen with a carapace length of 21 mm from BLAKE sta. 179 (off Dominica, 15°30′50″N, 61°32′55″W, 824 fm, sand and brown ooze, 25 January 1879), preserved in the collection of the Museum of Comparative Zoology, Harvard University, Cambridge, Mass., under Reg. No. 4061. It is quite well possible that this specimen was examined by A. Milne Edwards at the time that he described the species.

Remarks.—The material of the present species collected by the BLAKE at its station 41, as well as that of *G. alispina* collected by the same expedi-

tion at sta. 130, and now preserved in the Museum of Comparative Zoology, carries a label with the manuscript name "Glyphocrangon Batei A. Milne Edwards." So far as I know this name has never been published by A. Milne Edwards or any other author, and can best be ignored.

The smaller of the two specimens assigned by Smith (1882) to *Rhachocaris longirostris* in his original description of that species, on examination proved to be *G. nobilis*. As the larger of the two syntypes served Smith practically exclusively for his description and figures, it is selected here to be the lectotype of *R. longirostris*. In this way the name *longirostris* can continue to be used in the generally accepted sense.

One of the two specimens from BLAKE sta. 130 brought by Faxon (1896) to the present species, upon examination in the Museum of Comparative Zoology proved to belong to *G. alispina*; the other specimen is a true *G. nobilis*. Faxon's material from BLAKE stas. 41, 162, 174, 176, 179, 221, and 222 could also be reexamined. It proved to be correctly identified; only the identity of the very young specimens could not be made out with full certainty.

Bullis & Thompson (1965) reported three lots of *Glyphocrangon* (viz., from OREGON stas. 1302, 1908, and 2010) to *G. longirostris*. The material from sta. 1302 could be examined and proved to be *G. nobilis*. As the material from the other two stations was not available, nothing definite can be said about its identity; in view of the small depth at which it was collected, its identity with *G. longirostris* does not seem likely.

Glyphocrangon alispina Chace, 1939
Fig. 15

Glyphocrangon nobilis Faxon, 1896, Bull. Mus. comp. Zool. Harv., *30:* 159 (p.p.).—Schmitt, 1935, Sci. Surv. P. Rico, *15:* 170 (p.p.), not fig. 33.

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Glyphocrangon (*Glyphocrangon*) *alispina* Springer & Bullis, 1956, Spec. Scient Rep. U. S. Fish Wildl. Serv., Fisheries, 196: 13.

Material Examined.—Straits of Florida, U. S. A.: GERDA sta. 112, 33 specimens (17 ovigerous); sta. 122, 106 specimens (13 ovigerous); sta. 125, 15 specimens (1 ovigerous); sta. 131, 143 specimens (5 ovigerous); sta. 136, 48 specimens; sta. 142, 1 male; sta. 144, 1 male; sta. 146, 3 males, 1 female; sta. 221, 9 specimens (1 ovigerous); sta. 289, 45 specimens (36 ovigerous); sta. 362, 3 males, 27 females (26 ovigerous); sta. 365, 1 male; sta. 366, 4 specimens (1 ovigerous); sta. 439, 23 ovigerous females; sta. 440, 10 females (9 ovigerous); sta. 442, 362 specimens (37 ovigerous); sta. 443, 7 specimens; sta. 475, 2 ovigerous females; sta. 860, 156 specimens (53 ovigerous); sta. 861, 2 ovigerous females; sta. 867, 2 specimens;

sta. 870, 2 males, 2 females, 1 juvenile; sta. 966, 8 ovigerous females; sta. 1101, 64 specimens (28 ovigerous); ATLANTIS sta. 2995, 1 ovigerous female holotype (MCZ).—Eastern Gulf of Mexico: ALBATROSS sta. 2394, 3 specimens (2 ovigerous) (USNM); sta. 2395, 4 specimens (1 ovigerous) (USNM).—Off Yucatan, Mexico: PILLSBURY sta. 605, 1 male, 1 ovigerous female; sta. 607, 3 specimens (1 ovigerous).—S of Jamaica: PILLSBURY sta. 1224, 26 specimens (15 ovigerous); sta. 1235, 1 specimen; sta. 1255, 1 specimen; sta. 1261, 1 specimen; sta. 1262, 1 specimen.—Off Frederiksted, Saint Croix, Virgin Islands: BLAKE sta. 130, 1 ovigerous female (MCZ).—Off Nevis: PILLSBURY sta. 954, 60 specimens (25 ovigerous).—Off Guadeloupe: PILLSBURY sta. 919, 1 male, 1 female; sta. 946, 21 specimens (10 ovigerous).—Off St. Vincent: PILLSBURY sta. 881, 1 male.—Off Tobago: PILLSBURY sta. 846, 6 specimens; sta. 847, 13 specimens (3 ovigerous).—Off Atlantic coast of Panama: PILLSBURY sta. 325, 2 specimens; sta. 337, 2 specimens; sta. 407, 41 specimens (19 ovigerous); sta. 447, 3 specimens (1 ovigerous); sta. 448, 12 specimens (4 ovigerous).—Off Atlantic coast of Colombia: PILLSBURY sta. 381, 14 specimens (8 ovigerous); sta. 388, 26 specimens (15 ovigerous); sta. 391, 6 specimens (3 ovigerous); sta. 413, 22 specimens (15 ovigerous).—Off British Guiana: PILLSBURY sta. 689, 4 females (2 ovigerous).

Description.—The species is very close to *Glyphocrangon nobilis* and can easily be confused with it. It differs in the following points:

The rostrum is shorter and less slender. In ovigerous females it reaches with less than ¼ to ⅓ of its length beyond the scaphocerite (in *G. nobilis* with slightly less than ½).

The tubercles on the submedian carinae are not broken up into smaller ones, are far narrower, and the anterior two tubercles of the anterior carinae end in distinct teeth. The anterior tubercle of the anterior intermediate carina is transformed to a distinct spine, about as sharp and as large as the basal rostral tooth. The posterior antennal carina ends in a distinct, sharp, anterior tooth; this is one of the most important features separating *G. alispina* from *G. nobilis*, in which this carina ends bluntly or rectangularly. The tooth of the anterior lateral carina is shorter than that of *G. nobilis*.

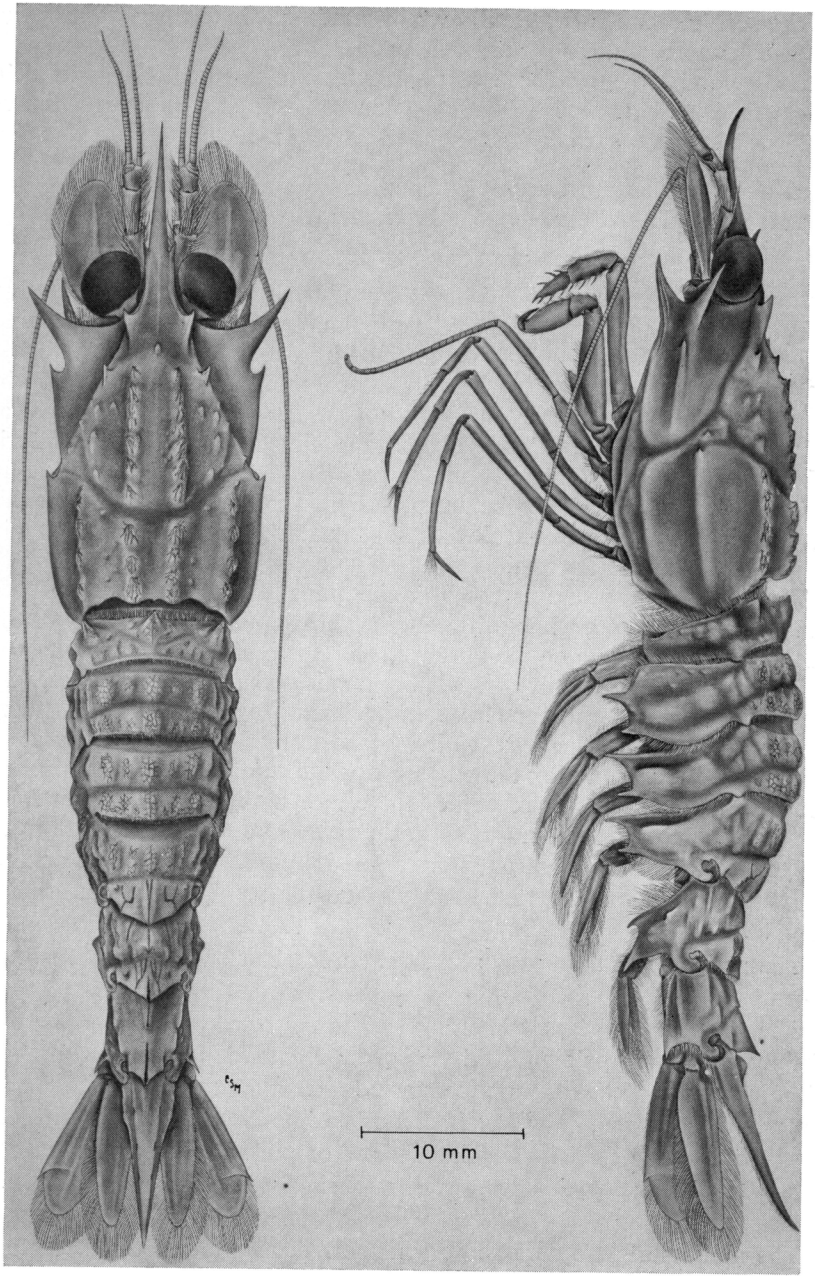
The antennal spine usually, but not always, is directed more sideways than the branchiostegal and overreaches it laterally.

The three teeth (especially the median) on the first somite of the abdomen in *G. alispina* are higher and sharper than in *G. nobilis*.

The central carinae on the lateral surface of the sixth somite are smooth and uninterrupted; they are straight and not irregular as in *G. nobilis*.

→

FIGURE 15. *Glyphocrangon alispina* Chace, ovigerous female from GERDA sta. 1101, in dorsal and lateral views.


10 mm

The scaphocerite is oval and, even in adult specimens, shows a distinct tooth below the middle of the outer margin.

The second legs, like those of *G. nobilis*, are unequal, the right being longer than the left. The right carpus consists of 24 to 26 articles, the left of 21 or 22 (in very young specimens slightly less, 22 and 19 respectively).

Size.—The smallest specimen examined had a carapace length of 10 mm. The largest male had cl. 31 mm. Ovigerous females ranged in cl. from 23 to 35 mm. The eggs measured 2 to 2½ mm by 2½ to 3 mm.

Colour.— The rostrum is whitish. In some specimens it has no red colour at all, in others the teeth (either the proximal only, or both the proximal and distal) may be red and even connected by a red marginal carina. Also, the tip may be red. On the whole, however, the rostrum gives a pale impression. On the carapace, the submedian and intermediate carinae are red or orange red. Also here is some variation, as part of the posterior submedian carinae (sometimes unilaterally) and part of the anterior and posterior intermediate may be uncoloured. The antennal and branchiostegal spines are usually uncoloured, but in dark specimens may be pink or red, just like the tip of the posterior antennal carina.

The dorsal parts of the first to fifth abdominal tergites have the tubercles and ridges orange red, while furthermore every somite shows a very distinct transverse red band along the posterior margin. This band is widest in the middle, narrowing laterally towards both ends. The pleura are white, with the tips of the teeth white or (in dark specimens) orange. The sixth somite is whitish in the anterior part, with a broad transverse band of orange red along the posterior margin; the pleuron is white, usually with a red tip. The tailfan is white or pink, sometimes there is a pink or orange spot in the basal part of the telson. In this spot, the ridges are darker than the rest of the telson. The uropods usually are white or pink, sometimes the exopod has a red band along the outer margin, and the basal half of the endopod may be reddish.

The peduncle of the eye is pink, the cornea black with a golden brown sheen.

The antennular peduncle is orange red in the basal part, becoming paler distally, being very pale orange in the distal segment. The flagella are whitish, pink or red. The antennal peduncle has the last two segments, or only the penultimate, red. The scaphocerite is white, with a red spot or band on the outer margin. The flagellum is red or pink. The red of the antennular and antennal peduncles together forms a transverse red band before the carapace.

The mouthparts are dark red or orange red, as are also the first pereiopods. The second pereiopod is colourless or red. The following pereiopods

are uncoloured, for their far larger part. Their bases may be pink and the dactyli and distal parts of the propodi pale orange brown.

The pleopods are uncoloured or show some pink spots.

The eggs are greyish or bluish green, or orange yellowish.

The general impression is that of a pale animal, with longitudinal red stripes over the full length of the dorsum of the carapace and transverse red bands on the abdomen. The front and ventral parts are very pale or white, with the exception of the red anterior band formed by the bases of the antennulae, antennae, and the mouthparts. It is almost the opposite of the coloration of *G. nobilis*.

Horizontal Distribution.—The species is known from the entire Caribbean area, including the Gulf of Mexico, from the Florida Straits to British Guiana. The records in the literature are: Gulf of Mexico, off Texas, U. S. A., 27°38.2'N, 94°59.4'W (350-400 fm) and 26°58.5'N, 96°06.7'W (300-400 fm) (Springer & Bullis, 1956); Gulf of Mexico, off the mouth of the Mississippi River, 29°12.2'N, 87°49'W (370-450 fm) and 29°01'N, 88°24'W (355-475 fm) (Springer & Bullis, 1956), 29°11'N, 87°47'W (455 fm) (Bullis & Thompson, 1965); off northwestern Cuba, 24°16'N, 83°22'W (375 fm) (Springer & Bullis, 1956); north of Matanzas Province, Cuba, 23°24'N, 81°00.5'W (370-605 fm) (type-locality; Chace, 1939); north of Santa Clara Province, Cuba, 23°16'N, 80°11'W (415 fm) (Chace, 1939); off Frederiksted, St. Croix, Virgin Islands, 17°43'N, 64°55'10"W (541 fm) (Faxon, 1896; Schmitt, 1935); off Nicaragua, 12°44'N, 82°14'W (350 fm) and 12°35'N, 82°19'W (350 fm) (Bullis & Thompson, 1965). The present material extends the known range to the east and southeast.

Vertical Distribution.—The species has been taken at depths between 300 and 1020 fathoms (= 548 to 1865 m), the majority of specimens, however, were found between 300 and 500 fathoms (= 548 to 914 m). The bottom at the stations at which the present species was collected consisted of: gray ooze (BLAKE sta. 130), grey mud (ALBATROSS sta. 2395), green mud (ALBATROSS sta. 2394), very fine sticky mud with debris consisting of rotten wood (PILLSBURY sta. 337), slippery brown mud with numerous very old and broken dead bivalve shells (PILLSBURY sta. 391), clayey grey mud with bottom debris formed by terrestrial plant remains (PILLSBURY sta. 413), hard brown mud covered with siliceous sponges and branching Madreporaria (PILLSBURY sta. 689), very heavy brownish clay (PILLSBURY sta. 388), and hard clay (PILLSBURY sta. 919).

Type-Material.—The holotype is an ovigerous female with cl. 30 mm from ATLANTIS sta. 2995, off Bahia Cardenas, Matanzas Province, Cuba, 23°24' N, 81°00'30"W, in 370-605 fm, on 16 March 1938. It forms part of the collection of the Museum of Comparative Zoology, Harvard University,

Cambridge, Mass., under Reg. No. 10242. There is one paratype, likewise an ovigerous female, from ATLANTIS sta. 2990-A.

Remarks.—The material reported upon by Faxon (1896) as *G. nobilis* is preserved in the Museum of Comparative Zoology, Harvard University, Cambridge, Mass., where I could examine it. In most instances (material from BLAKE stas. 41, 162, 174, 179, and 227) Faxon's identifications are correct; in three instances (stas. 176, 211, and 222) the material is too young, and moreover in too poor a condition, to make a certain identification possible. Of the two specimens reported by Faxon from BLAKE sta. 130, however, one (the ovigerous female) proved to belong to *G. alispina*, and the other specimen is a true *G. nobilis*.

SUMARIO

CAMARONES DEL ATLÁNTICO PERTENECIENTES AL GÉNERO DE AGUAS PROFUNDAS *Glyphocrangon* A. MILNE EDWARDS, 1881

Se enumeran las 12 especies conocidas del Atlántico pertenecientes al género *Glyphocrangon* (Crustacea, Decapoda, Caridea), con una clave para su identificación. Se describen dos especies como nuevas, a la vez que de otras se dan detalles adicionales. Se discute la distribución geográfica de cada especie.

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APPENDIX

The following list contains the data for the stations of the expeditions of the CHALLENGER, ALBATROSS, BLAKE, GERDA, PILLSBURY, ATLANTIS, OREGON, COMBAT, PELICAN, SILVER BAY, and SNELLIUS, and those of the Centre Océanologique de Bretagne (COB), mentioned in the present paper. As far as possible the number, position, depth, bottom, date, and the species of *Glyphocrangon* taken in it are mentioned for every station. The following abbreviations are used to indicate the bottom: bl., black; br., brown; brk., broken; bu., blue; cl., clay; co., coral; dd., dead; dk., dark; fne., fine; for., Foraminifera; frag., fragments; glob., *Globigerina*; gn., green; gy., gray; hrd., hard; lav., lava; lt., light; m., mud; oz., ooze; pter., pteropod; pum., pumice; r., rock; rd., red; s., sand; sh., shells; slp., slippery; sp., specks; st., stone; stk., sticky; wh., white; yl., yellow. In the column "Date" the day, month, and year are given in this order. In the last column, the species of *Glyphocrangon* represented in the samples are listed; they are indicated with the following abbreviations: ac., *Glyphocrangon aculeata*; al., *G. alispina*; at., *G. atlantica*; au., *G. aurantiaca*; h., *G. haematonotus*; lr., *G. longirostris*; ly., *G. longleyi*; ne., *G. neglecta*; no., *G. nobilis*; ri., *G. rimapes*; sc., *G. sculptus*; sp., *G. spinicauda.*

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	CHALLENGER				
	OFF RECIFE:				
120	08°37′00″S, 34°28′00″W	1235	rd. m.	9- 9-1873	ac.
	ALBATROSS				
	E OF NEW JERSEY:				
2035	39°26′16″N, 70°02′37″W	2491	glob. oz.	17- 7-1883	sc.
	E OF MASSACHUSETTS:				
2077	41°09′40″N, 66°02′20″W	2295	bu. m.	4- 9-1883	lr.
	E OF NEW JERSEY:				
2095	39°29′00″N, 70°58′40″W	2454	glob. oz.	30- 9-1883	sc.
2102	38°44′00″N, 72°38′00″W	2211	glob. oz.	5-11-1883	sc.
	E OF VIRGINIA:				
2105	37°50′00″N, 73°03′50″W	2551	glob. oz.	6-11-1883	sc.
	OFF AVES ISLAND:				
2117	15°24′40″N, 63°31′30″W	1249	yl. m. fne. s.	27- 1-1884	ac.
	S OF JAMAICA:				
2140	17°36′10″N, 76°46′05″W	1767	s.	11- 3-1884	ac., no.
	E OF NEW JERSEY:				
2196	39°35′00″N, 69°44′00″W	2250	gn. m.	6- 8-1884	sc.
2205	39°35′00″N, 71°18′45″W	1963	gy. oz.	20- 8-1884	lr.
2206	39°35′00″N, 71°24′30″W	1908	gn. m.	20- 8-1884	lr.
	OFF YUCATAN, MEXICO:				
2358	20°19′00″N, 87°03′30″W	406	fne. wh. co.	29- 1-1885	sp.
2359	20°19′10″N, 87°03′30″W	422	wh. co.	29- 1-1885	sp.
	EASTERN GULF OF MEXICO:				
2381	28°05′00″N, 87°56′15″W	2432	lt. br. m.	2- 3-1885	lr.
2383	28°32′00″N, 88°06′00″W	2160	br. gn. m.	3- 3-1885	lr., no.
2384	28°45′00″N, 88°15′30″W	1719	br. gy. m.	3- 3-1885	no.
2385	28°51′00″N, 88°18′00″W	1335	gy. m.	3- 3-1885	no.
2392	28°47′30″N, 87°27′00″W	1324	br. gy. m.	13- 3-1885	no.
2394	28°38′30″N, 87°02′00″W	768	gn. m.	13- 3-1885	al.
2395	28°36′15″N, 86°50′00″W	635	gy. m.	13- 3-1885	al.
	E OF NEW YORK:				
2530	40°53′30″N, 66°24′00″W	1748	gy. oz.	14- 7-1885	lr.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	E OF NEW JERSEY:				
2534	40°01′00″N, 67°29′15″W	2257	gy. oz.	15- 7-1885	sc.
2550	39°44′30″N, 70°30′45″W	1877	br. m.	9- 8-1885	lr.
2571	40°09′30″N, 67°09′00″W	2480	gy. glob. oz.	1- 9-1885	sc.
	OFF SOUTH CAROLINA:				
2628	32°24′00″N, 76°55′30″W	965	yl. m.	21-10-1885	h.
	BAHAMA ISLANDS:				
2629	23°48′40″N, 75°10′40″W	2138	co. s.	8- 3-1886	sc.
	N OF BAHAMA ISLANDS:				
2654	27°57′30″N, 77°27′30″W	1207	yl. oz. bk. sp.	2- 5-1886	ac.
2656	27°58′30″N, 78°24′00″W	1046	for.	3- 5-1886	ac.
	EAST COAST OF FLORIDA:				
2664	29°41′00″N, 79°55′00″W	682	co. s.	4- 5-1886	h.
	OFF GEORGIA:				
2668	30°58′30″N, 79°38′30″W	538	gy. s. dd. co.	5- 5-1886	h.
	OFF SOUTH CAROLINA:				
2676	32°39′00″N, 77°01′00″W	745	gn. oz. gy. s.	6- 5-1886	h.
2677	32°39′00″N, 76°50′30″W	874	gn. m.	6- 5-1886	ac.
	E OF MASSACHUSETTS:				
2706	41°28′30″N, 65°35′30″W	2173	gy. oz. for.	27- 8-1886	lr.
	E OF NORTH CAROLINA:				
2725	36°34′00″N, 73°48′00″W	2512	gy. oz. for.	24-10-1886	sc.
	OFF ST. KITTS:				
2751	16°54′00″N, 63°12′00″W	1257	bu. glob. oz.	28-11-1887	ac., no.
		BLAKE			
	W OF TORTUGAS:				
29	24°36′00″N, 84°05′00″W	1747			ac.
	NW OF CUBA:				
41	23°42′00″N, 83°13′00″W	1573			no.
	OFF ST. CROIX, VIRGIN IS.:				
130	17°43′00″N, 64°55′10″W	825	gy. oz.	4- 1-1879	no., al.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	OFF ST. KITTS:				
147	17°19′27″N, 62°50′30″W	457	fne. gy. s. oz.	14- 1-1879	sp.
148	17°17′12″N, 62°46′43″W	380	fne. gy. s. bk. sp.	14- 1-1879	sp.
	OFF GUADELOUPE:				
162	16°02′40″N, 61°50′28″W	1342	lav. s.	19- 1-1879	no.
163	16°03′10″N, 61°52′20″W–				
	16°04′10″N, 61°55′45″W	1406–1605	oz. s.	20- 1-1879	ac.
174		1605			ac., no.
	OFF DOMINICA:				
176	15°32′18″N, 61°30′55″W	715	dk. br. oz. s.	24- 1-1879	no.
179	15°30′50″N, 61°32′55″W	1507	s. br. oz.	25- 1-1879	no.
185	15°24′55″N, 61°27′10″W	609	fne. s. m.	27- 1-1879	no.
	OFF MARTINIQUE:				
195	14°42′35″N, 61°13′15″W	917	fne. s. oz. bk. sp.	5- 2-1879	ac.
211	14°28′40″N, 61°06′08″W	653	fne. s.	12- 2-1879	no.
	OFF ST. LUCIA:				
222	13°58′37″N, 61°04′45″W	772	s. oz.	16- 2-1879	no.
	OFF ST. VINCENT:				
227	13°10′10″N, 61°18′15″W	1046	s. oz.	19- 2-1879	no., ac.
	OFF GRENADA:				
261		622	s. oz.		ne.
265	12°03′55″N, 61°49′40″W	1053	gy. oz.	2- 3-1879	ne., ac.
	OFF BARBADOS:				
274	13°00′50″N, 59°36′20″W	382	fne. s.	5- 3-1879	sp.
275	12°58′33″N, 59°36′45″W	399	fne. br. s.	5- 3-1879	sp.
281	12°54′48″N, 59°36′30″W	527	brk. sh.	6- 3-1879	sp.
	E OF SOUTH CAROLINA:				
315	32°18′20″N, 78°43′00″W	412	gn. s. bk. sp. brk. sh.	12- 7-1880	no.
	OFF CAPE HATTERAS:				
330	35°41′03″N, 74°31′00″W	1915	glob. oz. co.	16- 7-1880	lr.
	OFF DELAWARE:				
339	38°16′45″N, 73°10′30″W	2171	glob. oz.	18- 7-1880	sc.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
		ATLANTIS			
	S OF SANTA CLARA PROVINCE:				
2966	20°47'30"N, 80°24'30"W	3886		26- 2-1938	at.
	STRAITS OF FLORIDA:				
2995	23°24'00"N, 81°00'30"W	677–1107		16- 3-1938	al.
		OREGON			
	EASTERN GULF OF MEXICO:				
489	27°44'N, 85°09'W	465	bu. m.	29- 9-1951	ly.
	WESTERN GULF OF MEXICO:				
532	27°34.3'N, 93°10.2'W	402–549	m. s.	11- 4-1952	ly.
534	27°32'N, 93°01.6'W	732–823	gy. m.	11- 4-1952	ac.
542	27°41'N, 94°59'W	457–549	gy. m.	16- 4-1952	ly.
549	26°58.5'N, 96°06.7'W	549–732	gy. m. sh.	18- 4-1952	ly.
	OFF DRY TORTUGAS:				
1015	24°20'N, 83°20'W	274–640	co. m.	16- 4-1954	ly.
	GULF OF MEXICO:				
1302	28°53'N, 87°58'W	1628	gy. m.	26- 5-1955	no.
	W OF KEY WEST, FLORIDA:				
1321	24°49'N, 84°06'W	311–366	—	7- 7-1955	sp.
	N OF CUBA:				
1324	24°23'N, 83°22'W	366	gy. m. s.	8- 7-1955	ly.
	OFF DRY TORTUGAS:				
1334	24°13'N, 82°35'W	549–558	—	10- 7-1955	ly.
	N OF CUBA:				
1342	23°10'N, 79°33'W	512	—	16- 7-1955	sp.
	STRAITS OF FLORIDA:				
1351	24°47'N, 80°10'W	457–476	r.	18- 7-1955	ly.
1354	25°20'N, 80°00'W	439	—	23- 7-1955	ly., h.
	OFF LOUISIANA:				
1407	28°07'N, 89°59'W	470	m.	20- 9-1955	ly.
	EASTERN GULF OF MEXICO:				
1426	29°07'N, 87°54'W	1097	m.	24- 9-1955	ac., no.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	OFF DRY TORTUGAS:				
1539	24°28′N, 83°30′W	402	lt. gy. m.	16- 6-1956	ly.
	BETWEEN JAMAICA AND HONDURAS:				
1885	16°54′N, 81°18′W	457	co.	23- 8-1957	sp.
	OFF NICARAGUA:				
1906	12°19′N, 82°27′W	594	—	11- 9-1957	ly.
1908	12°33′N, 82°20′W	640	—	11- 9-1957	ly.
1915	13°13′N, 82°13′W	640	yl. m.	12- 9-1957	ly.
1916	13°18′N, 82°12′W	640	co.	12- 9-1957	ly., sp.
1919	13°30′N, 82°00′W	503–549	—	12- 9-1957	sp., ly.
1921	13°33′N, 81°55′W	503	—	13- 9-1957	sp.
1923	13°39′N, 81°52′W	503	—	13- 9-1957	ly.
1929	13°22′N, 82°04′W	549	—	13- 9-1957	ly.
1931	13°56′N, 81°56′W	503	—	14- 9-1957	ly.
1933	14°08′N, 81°49′W	549	—	14- 9-1957	sp., ly.
	OFF VENEZULA:				
1982	10°00′N, 59°59′W	457	—	3-11-1957	ne.
	OFF SURINAM:				
2007	07°34′N, 54°49′W	412	bu. m.	7-11-1957	au., ne.
2009	07°40′N, 54°47′W	549	bu. m.	7-11-1957	au.
	OFF MOUTH OF AMAZON RIVER:				
2081	01°52′N, 46°54′W	320	r.	17-11-1957	sp.
	OFF VENEZUELA:				
2353	11°35′N, 62°41′W	388–457	m.	23- 9-1958	ne.
	OFF FRENCH GUIANA:				
4293	7°14′N, 52°55′W	732		21- 3-1963	au.
4294	7°21′N, 53°15′W	549		21- 3-1963	au.
	OFF SURINAM:				
4300	7°44′N, 54°19′W	549		23- 3-1963	au.
4301	7°34′N, 54°13′W	366	s. m. c. sh. frag.	24- 3-1963	ne.
	COMBAT				
	OFF EASTERN FLORIDA:				
84	29°56′N, 80°10′W	348	—	1- 9-1956	ly.
120	29°44′N, 80°13′W	329	gn. m.	17- 9-1956	ly.
186	29°44′N, 80°09′W	402	gn. m.	5-12-1956	ly.
193	29°47′N, 80°12′W	338–348	gy. m.	9- 1-1957	ly.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	OFF DRY TORTUGAS:				
281	24°17′N, 82°47′W	393	—	14- 3-1957	ly.
	OFF EASTERN FLORIDA:				
329	29°15′N, 80°05′W	384	gn. m.	31- 5-1957	ly.
	STRAITS OF FLORIDA:				
445	25°15′N, 79°13′W	366	co. m.	23- 7-1957	h.
447	25°07′N, 79°15′W	549	co. s.	23- 7-1957	sp.
450	23°59′N, 79°43′W	640	—	24- 7-1957	sp.
	PELICAN				
	OFF EAST COAST OF FLORIDA:				
11	27°52′N, 79°45′W	430	wh. m.	11- 3-1956	h.
13	28°22′N, 79°53′W	329	bu. m.	11- 3-1956	ly.
	STRAITS OF FLORIDA:				
17	26°18′N, 79°51′W	263–366	gy. m.	29- 3-1956	sp., ly., h.
18	26°31′N, 79°46′W	430	gy. s.	29- 3-1956	ly.
	OFF EAST COAST OF FLORIDA:				
20	28°17′N, 79°48′W	329	bu. m.	5- 4-1956	ly.
27	28°28′N, 79°49′W	366–388	gy. m.	9- 4-1956	ly., h.
31	29°36′N, 80°06′W	384–329	gy. m.	10- 4-1956	ly.
46	29°54′N, 80°10′W	316–329	gy. m.	2- 5-1956	ly.
54	29°47′N, 80°11′W	284–315	gy. m.	8- 6-1956	ly.
	SILVER BAY				
	STRAITS OF FLORIDA:				
441	27°39′N, 79°15′W	503–549	co. s.	9- 6-1958	sp.
	GERDA				
	STRAITS OF FLORIDA:				
15	25°45′N, 80°00′W	275–302		30- 5-1962	ly.
61	25°14′N, 80°02′W	256		29- 8-1962	h.
62	25°30.5′N, 80°00′W	403–384		29- 8-1962	h., ly.
66	25°25.5′N, 79°59′W–25°31′N, 79°57′W	366		26- 9-1962	h., ly.
67	25°31′N, 79°57′W–25°30′N, 79°56′W	351		26- 9-1962	h., ly.
76	25°28′N, 80°00′W–25°31′N, 79°57′W	344–348		28- 9-1962	h., ly.
77	25°29′N, 79°54.5′W–25°33′N, 80°02′W	329–339		28- 9-1962	h., ly.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
93	25°03′N, 79°45′W–25°08′N, 79°44′W	733		19- 4-1963	h.
112	24°14′N, 82°57′W–24°14′N, 82°56′W	686–641		18- 6-1963	al.
121	23°52′N, 82°05′W	1281		19- 6-1963	ac.
122	24°02.5′N, 82°03.5′W–24°11′N, 81°57′W	715–686		19- 6-1963	ac., al.
125	24°09′N, 81°47′W	695–677		19- 6-1963	al.
126	24°03′N, 81°49′W–24°06′N, 81°33′W	805–742		20- 6-1963	ac.
128	23°49′N, 81°37′W–23°50′N, 81°30′W	1464–1391		20- 6-1963	ac., no.
129	23°46′N, 81°15′W	1281		20- 6-1963	ac.
131	24°11′N, 80°57′W–24°16′N, 80°48′W	787–733		21- 6-1963	h., ac., al.
136	24°17′N, 80°42′W–24°21′N, 80°36′W	751–715		21/22-6-1963	al.
142	24°15′N, 80°05′W–24°16′N, 79°59′W	540–549		22- 6-1963	sp., al.
144	24°38′N, 80°15′W–24°37′N, 80°09′W	751		23- 6-1963	h., ac., al.
146	24°45′N, 80°09′W	659–686		23- 6-1963	al.
154	26°18′N, 79°22′W–26°29′N, 79°20′W	549		25- 6-1963	sp.
158	26°27′N, 79°21′W–26°36′N, 79°24′W	540–531		25- 6-1963	sp.
160	26°33′N, 79°42′W–26°37′N, 79°42′W	586		26- 6-1963	h.
161	26°37′N, 79°50′W–26°44′N, 79°45′W	412–421		26- 6-1963	sp., h.
164	26°53′N, 79°40′W–26°56.5′N, 79°40′W	531		26- 6-1963	h., ly.
169	27°01′N, 79°21.5′W–27°04′N, 79°21′W	567–522		29- 6-1963	sp.
170	27°06′N, 79°32′W–27°11′N, 79°30′W	677–659		29- 6-1963	h., sp.
171	27°12′N, 79°44′W–27°15′N, 79°43′W	439–448		29- 6-1963	h., ly.
	NW OF BAHAMA ISLANDS:				
175	27°19′N, 79°44′W–27°27′N, 79°43′W	430–421		30- 6-1963	h., sp.
179	27°41′N, 79°11′W–27°51′N, 79°14′W	549–567		1- 7-1963	sp.
180	27°51′N, 79°14′W–27°36.5′N, 79°13′W	613–631		1- 7-1963	sp.
181	27°57′N, 78°56′W–27°55′N, 78°59′W	779		2- 7-1963	h.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	N OF BAHAMA ISLANDS:				
182	27°55′N, 78°40′W–27°57′N, 78°40′W	860–897		2- 7-1963	h., ac.
	BAHAMA ISLANDS:				
190	25°57′N, 78°07′W	733–897		4- 7-1963	ly.
	STRAITS OF FLORIDA:				
197	25°30′N, 79°58′W–25°45′N, 79°51.5′W	329		10- 9-1963	h., ly.
221	24°21′N, 80°35′W–24°23′N, 80°30′W	604–586		22- 1-1964	h., al.
222	24°23′N, 80°28′W–24°29′N, 80°18′W	824		22- 1-1964	h.
223	24°18′N, 80°29′W–24°21′N, 80°23′W	897–915		23- 1-1964	ac.
228	25°04′N, 80°03′W–25°08′N, 79°59′W	320		24- 1-1964	h., ly.
230	25°12.5′N, 80°02′W	549–458		24- 1-1964	ly.
247	27°07′N, 79°21′W–27°10′N, 79°20′W	567		5- 2-1964	sp.
288	24°10′N, 81°42′W–24°13′N, 81°36′W	595–540		3- 4-1964	ly.
289	24°11′N, 81°36′W–24°15′N, 81°20′W	604–597		3- 4-1964	ly., al.
299	26°12′N, 79°31′W–26°16′N, 79°30′W	641		5- 4-1964	h., sp.
300	26°16′N, 79°30′W–26°28′N, 79°26′W	640		5- 4-1964	h., sp.
301	26°28′N, 79°26′W–26°38′N, 79°21′W	648–622		5- 4-1964	sp.
302	26°38.5′N, 79°21′W–26°49′N, 79°25′W	690		5- 4-1964	h., sp.
362	24°10′N, 81°42′W–24°11′N, 81°37′W	631		15- 9-1964	ly., al.
365	24°11′N, 81°37′W–24°12′N, 81°17′W	672		15- 9-1964	al., no.
366	24°12′N, 81°17′W–24°13′N, 81°08′W	679–709		15- 9-1964	ac., al.
368	24°03′N, 81°10′W–24°08′N, 80°59′W	961–1016		15- 9-1964	ac.
370	23°54′N, 81°19′W–23°53′N, 81°16′W	1281		16- 9-1964	ac., no.
374	23°50′N, 81°37′W–23°54′N, 81°27′W	1208–1241		17- 9-1964	ac., no.
375	23°54′N, 81°27′W–23°56′N, 81°04′W	1153–1190		17- 9-1964	ac., no.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
382	26°10′N, 79°37′W–26°24′N, 79°39′W	686–699		18- 9-1964	h.
386	27°09′N, 79°18′W	604		19- 9-1964	sp.
	NW OF BAHAMA ISLANDS:				
403	27°49′N, 78°50′W–27°48′N, 78°40′W	824		20- 9-1964	h.
406	27°39′N, 79°37′W–27°45′N, 79°38′W	467		21- 9-1964	h.
	STRAITS OF FLORIDA:				
439	24°14′N, 82°29′W–24°14′N, 82°23′W	584–566		29-11-1964	al., ly.
440	24°14′N, 82°21′W–24°13′N, 82°25′W	549–567		29-11-1964	al., ly.
442	24°05′N, 82°33′W–24°05′N, 82°25′W	742–753		29-11-1964	ac., al.
443	24°05′N, 82°21′W–24°03′N, 82°18′W	792–829		29-11-1964	ac., al.
448	23°54′N, 82°21′W–23°53′N, 82°17′W	1135–1184		1-12-1964	ac.
449	23°55′N, 82°05′W–23°55′N, 81°58′W	1373–1428		1-12-1964	ac., no.
465	24°18′N, 82°56′W–24°17′N, 82°51′W	403		25- 1-1965	ly.
467	24°18′N, 82°56′W–24°17′N, 82°48′W	370–348		25- 1-1965	ly.
469	24°17′N, 82°48′W–24°16′N, 82°44′W	384–357		25- 1-1965	ly.
472	24°17′N, 83°00′W–24°14′N, 82°56′W	549–567		25- 1-1965	ly.
474	24°14′N, 82°56′W–24°15′N, 82°52′W	576		25- 1-1965	ly.
475	24°14′N, 82°39′W–24°14′N, 82°35′W	550		26- 1-1965	ly., al.
483	24°30′N, 80°28′W–24°32′N, 80°24′W	443		27- 1-1965	h., ly.
646	25°49′N, 79°21′W–25°53′N, 79°22′W	439–531		1- 7-1965	sp.
649	26°34′N, 79°43′W	494		15- 7-1965	h.
652	27°07′N, 79°46′W–27°09′N, 79°45′W	403–393		16- 7-1965	h.
654	27°16′N, 79°49′W–27°20′N, 79°50′W	324		16- 7-1965	h.
658	27°15′N, 79°44′W–27°18′N, 79°44′W	320–310		16- 7-1965	h.
659	27°20′N, 79°40′W–27°25′N, 79°40′W	366		16- 7-1965	h.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	GULF STREAM OFF FLORIDA:				
666	27°48′N, 79°15′W–27°52′N, 79°15′W	522		17- 7-1965	sp.
671	27°52′N, 79°08′W–27°53′N, 79°08′W	662–702		18- 7-1965	sp.
	BAHAMA ISLANDS:				
679	25°56′N, 78°09′W–25°56′N, 78°05′W	595–711		20- 7-1965	ly.
	STRAITS OF FLORIDA:				
715	26°04′N, 79°24′W–26°05′N, 79°24′W	549–512		2- 8-1965	sp.
716	26°08′N, 79°24′W–26°11′N, 79°25′W	544		3- 8-1965	sp.
766	25°39′N, 80°00′W–25°41′N, 80°01′W	309–297		16- 9-1965	ly.
806	26°23′N, 79°23′W	549		13- 9-1966	sp.
	SANTAREN CHANNEL:				
815	24°08′N, 79°48′W	618		22- 6-1967	sp.
816	24°04′N, 79°42′W	558–540		22- 6-1967	sp.
817	23°50′N, 79°30′W	508		22- 6-1967	sp.
818	23°42′N, 79°09′W	530		22- 6-1967	sp.
834	25°15′N, 80°10′W	86–79		10- 7-1967	ly.
845	25°36′N, 80°01′W	296–318		12- 7-1967	ly.
855	25°21′N, 80°01′W–25°25′N, 80°02′W	207–247		25- 8-1967	h.
859	23°54′N, 81°57′W–24°01′N, 81°53′W	1161–1199		29- 8-1967	no., ac.
860	24°05′N, 81°46′W–24°06′N, 81°43′W	754–722		29- 8-1967	al.
861	24°08′N, 81°36′W	558–514		29- 8-1967	ly., al.
	STRAITS OF FLORIDA:				
867	24°05′N, 80°50′W	805–732		30- 8-1967	ac., al.
870	24°10′N, 81°07′W–24°17′N, 80°42′W	807–754		30- 8-1967	ac., al.
	NORTHWEST PROVIDENCE CHANNEL:				
917	25°59′N, 78°12′W	658–704		26- 9-1967	ly.
	BAHAMA ISLANDS:				
923	24°02′N, 77°34′W–24°30′N, 77°35′W	1554–1573		28- 9-1967	no.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	STRAITS OF FLORIDA:				
960	23°30′N, 82°26′W	1697–1692		31- 1-1968	no.
963	23°41′N, 82°16′W–23°47′N, 83°10′W	1454–1441		1- 2-1968	ac., no.
964	23°46′N, 81°51′W	1390–1440		1- 2-1968	no.
965	23°45′N, 81°49′W	1399–1394		1- 2-1968	no.
966	24°10′N, 82°22′W	553–558		2- 2-1968	al.
967	24°15′N, 82°26′W	499–503		2- 2-1968	ly.
968	24°17′N, 82°34′W	437–320		2- 2-1968	ly.
969	24°18′N, 82°33′W	402–269		2- 2-1968	ly.
970	24°24′N, 82°08′W	512		2- 2-1968	ly.
998	27°10′N, 79°43′W	366–375		21- 5-1968	h.
999	27°18′N, 79°39′W	530–551		21- 5-1968	h.
	SANTAREN CHANNEL:				
1012	23°35′N, 79°33′W–23°37′N, 79°32′W	508–530		14- 6-1968	sp.
1016	23°34′N, 79°12′W–23°51.2′N, 79°37′W	529–543		15- 6-1968	sp.
1017	23°58′N, 79°17′W–24°00′N, 79°20′W	555		15- 6-1968	sp.
	STRAITS OF FLORIDA:				
1018	24°07′N, 79°28′W–24°00′N, 79°26′W	556		15- 6-1968	sp., ly.
1098	24°15.5′N, 82°50′W	459–494		28- 4-1969	ly.
1101	24°10′N, 82°51.5′W	686–787		28- 4-1969	ac., al.
1106	24°02′N, 81°30′W	933–942		29- 4-1969	ac.
1107	24°05′N, 81°20′W	851–933		29- 4-1969	ac.
	PILLSBURY				
	OFF LIBERIA:				
76	04°32.0′N, 09°42.0′W–04°40.0′N, 09°49.0′W	1556–1464		4- 6-1964	lr.
	OFF EASTERN FLORIDA:				
89	28°25′N, 79°50′W	403		25- 7-1964	ly., h.
	OFF NIGERIA:				
233	05°19′N, 04°14′E–05°15′N, 04°02′E	2000–1500		12- 5-1965	lr.
309	04°15′N, 04°27′E–04°12′N, 04°28′E	1280–1320		26- 5-1965	lr.
314	04°58′N, 03°48′E–04°52′N, 03°48′E	2270–2334		27- 5-1965	lr., sc.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	OFF ATLANTIC COAST OF PANAMA:				
325	09°52′N, 79°35.5′W–09°52′N, 79°37′W	1774–1656		7- 7-1966	al., ac.
337	09°50.5′N, 78°39.3′W–09°52.2′N, 79°39.5′W	1846	very fne. stk. m., debris	8/9-7-1966	al.
	OFF ATLANTIC COAST OF COLOMBIA:				
374	09°57.0′N, 76°10.6′W	434–373		14- 7-1966	ly., h., ne.
381	10°17.0′N, 75°59.9′W–10°15.2′N, 75°59.9′W	724–597	m.	14- 7-1966	ly., ne., al.
388	10°16′N, 76°03′W–10°10.4′N, 76°08.8′W	814–1050	heavy br. cl.	15- 7-1966	ac., al.
391	10°03.0′N, 76°27.0′W–10°07.0′N, 76°29.0′W	1222–1748	slp. br. m., old brk. dd. bivalve sh.	16- 7-1966	ac., al.
394	09°28.6′N, 76°26.3′W–09°27.4′N, 76°29.0′W	416–634		16- 7-1966	ne.
407	09°00.2′N, 77°25.3′W–09°02.0′N, 77°28.8′W	1158–1225	gn. m.	18- 7-1966	ac., al.
413	09°01.5′N, 76°53′W–08°58.4′N, 76°56.3′W	1267–952	cl. gy. m., debris	18- 7-1966	ac., al.
	OFF ATLANTIC COAST OF PANAMA:				
447	09°07.4′N, 81°11.8′W–09°04.0′N, 81°13.8′W	657–673		21- 7-1966	ne., al.
448	09°10.1′N, 80°55.6′W–09°07.9′N, 80°56.0′W	952–869		21- 7-1966	ac., al.
	NW OF SWAN ISLAND:				
575	17°43′N, 84°20′W–17°48′N, 84°25′W	6373–6364	cl.	20/21-5-1967	at.
	NW OF CUBA:				
584	21°02′N, 86°24′W	353–347		23- 5-1967	sp.
	OFF YUCATAN, MEXICO:				
585	21°02′N, 86°29′W	567–570		23- 5-1967	ly.
600	20°29′N, 87°06′W	439–463		16- 3-1968	ly., sp.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
601	20°27′N, 87°06′W	457–466		16- 3-1968	sp.
602	20°22.5′N, 87°11.5′W	412–450		16- 3-1968	sp., ly.
605	18°50.1′N, 87°31.5′W	695–772		17- 3-1968	al.
607	18°30′N, 87°37′W	713–786		17/18-3-1968	al.
	STRAITS OF FLORIDA:				
634	23°33′N, 82°47′W–23°30.7′N, 82°32′W	1637–1756		25- 3-1968	ac., no.
	OFF SURINAM:				
672	07°37′N, 55°22′W–07°37′N, 55°27′W	1335–1220		11- 7-1968	ac., no.
673	07°56.5′N, 54°39′W–08°08′N, 54°36′W	1042–1070		11- 7-1968	no.
675	08°26′N, 54°17′W–08°41′N, 54°19′W	1234–1271		12- 7-1968	ac., no.
682	07°33.5′N, 56°25′W–07°38′N, 56°18′W	1317–1344		14- 7-1968	ac., no.
	OFF BRITISH GUIANA:				
689	08°14.0′N, 57°38′W	1372–1445	hrd. br. m. covered by siliceous sponges, branching Madreporaria	15- 7-1968	ac., al.
	OFF VENEZUELA:				
741	11°47.8′N, 66°06.8′W–11°52.4′N, 66°14.0′W	1051–1066		23- 7-1968	ac.
747	11°46′N, 67°05.7′W–11°54.7′N, 67°05′W	1174–1108		24- 7-1968	ac.
748	11°24.8′N, 67°10.1′W–11°36′N, 67°06′W	1866–1784		25- 7-1968	no.
753	11°18.8′N, 68°22.0′W–11°31.9′N, 68°25′W	384–607	sh., co. rubble	26- 7-1968	ne.
754	11°36.9′N, 68°42.0′W			26- 7-1968	ac.
	OFF ATLANTIC COAST OF COLOMBIA:				
770	12°55.0′N, 71°46.5′W–13°04′N, 71°42′W	1317–1298		28- 7-1968	no.
776	12°13.3′N, 72°50.0′W–12°18′N, 72°42.5′W	408–576		29- 7-1968	ne.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
781	11°30.1′N, 73°26.5′W–11°34.5′N, 73°20.0′W	567–530	m., pter. sh.	30- 7-1968	ne.
784	11°26.5′N, 74°10′W–11°26.7′N, 73°57.9′W	567–713		31- 7-1968	ne.
	OFF TOBAGO:				
844	11°30′N, 60°14.5′W–11°44′N, 60°11.2′W	1464–1848		1- 7-1969	sc.,ac.,no.
846	11°37.8′N, 60°37.4′W–11°38.8′N, 60°37.5′W	659–1126		2- 7-1969	al.
847	11°37.3′N, 60°59.4′W–11°41′N, 61°01.3′W	733–1281		2- 7-1969	au., no., al., ac.
	OFF ST. VINCENT:				
881	13°20.8′N, 61°02.5′W	576–842		6- 7-1969	al., h.
	OFF ST. LUCIA:				
889	14°04.4′N, 60°50.8′W–14°06.3′N, 60°51′W	371–403		7- 7-1969	sp.
	OFF MARTINIQUE:				
892	14°17′N, 60°45.2′W–14°19.7′N, 60°44.5′W	1116–1354		7- 7-1969	no., ac.
	OFF ST. LUCIA:				
904	13°45.5′N, 61°05.7′W	701–589		9- 7-1969	ly.
	OFF GUADELOUPE:				
918	16°04.1′N, 61°25.7′W–16°04.7′N, 61°25.5′W	399–497		11- 7-1969	sp.
919	16°05.3′N, 61°19.3′W–16°05.6′N, 61°19.0′W	683–733	hrd. cl.	12- 7-1969	al.
923	16°05′N, 61°24′W–16°06.2′N, 61°22.7′W	476–686		14- 7-1969	sp., ly.
929	15°29.5′N, 61°11.5′W–15°30.5′N, 61°11.6′W	458–503	very clean pum. st. rubble	15- 7-1969	sp.
936	16°02.5′N, 61°23.1′W–16°04.2′N, 61°22.6′W	430–641		16- 7-1969	sp.
946	16°43.5′N, 61°57.0′W–16°45.1′N, 61°56.5′W	733–833		17- 7-1969	al.
	OFF ST. KITTS AND NEVIS:				
954	16°55.0′N, 62°43.0′W–16°58.6′N, 62°46.5′W	686–1043		18- 7-1969	ac., al.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
	NW OF ANGUILLA:				
989	18°30′N, 63°23.7′W–18°34′N, 63°21.5′W	664–706		23- 7-1969	ly., h.
	N OF HISPANIOLA:				
1160	20°01′N, 68°59′W	201–842		17- 1-1970	sp.
	SANTAREN CHANNEL:				
1171	23°35′N, 79°24′W–23°34′N, 79°20′W	512–527	fne. m. brk. sh., dd. co., brk. sea-urchin tests	27- 6-1970	sp.
	GONAVE BAY, HAITI:				
1178	19°14′N, 73°14′W–19°25′N, 73°09′W	1765–1902	yl. cl. m., much log debris	30- 6-1970	ac., no.
	W OF HAITI:				
1187	18°17′N, 75°07′W	1033–1042		2- 7-1970	ac.
	S OF JAMAICA:				
1197	17°33.5′N, 76°08.5′W–17°35′N, 75°58′W	1481–1503		3- 7-1970	ac., no.
1124	17°31.2′N, 77°49.2′W–17°32.3′N, 77°47.4′W	878–907		6- 7-1970	ac., al.
1225	17°42.5′N, 77°58.0′W–17°47′N, 77°55.8′W	530–558		6- 7-1970	sp.
1235	17°54′N, 78°25.3′W–17°54′N, 78°15′W	1362–1586		7- 7-1970	ac., no., al.
	W OF JAMAICA:				
1238	18°16.0′N, 78°31.1′W	1591–1829	*Thalassia* debris, terrestrial plant remains	8- 7-1970	ac.
	S OF JAMAICA:				
1255	17°18′N, 78°32′W	722–820		14- 7-1970	al.
1256	17°27′N, 78°10′W	603–655		14- 7-1970	ne.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
1261	17°13′N, 77°50′W–17°18′N, 77°45′W	722–768		15- 7-1970	al.
1262	17°21.4′N, 77°34.8′W	914–1064		15- 7-1970	ac., al.
	ST. CROIX BASIN, VIRGIN IS.:				
1304	17°44.5′N, 64°59′W	3475–3969		23- 7-1970	sc., ac., lr., no.
	SNELLIUS				
	OFF SURINAM:				
B 24	07°04.4′N, 55°25.0′W	66	s. m. cl. many sh. frag.	27- 4-1966	ne.
	COB CHO4				
	BAY OF BISCAY, OFF SANTANDER:				
B015	Put 109 44°06.6′N, 04°06.9′W	1856		26-10-1969	sc.
	BAY OF BISCAY, FRANCE:				
B017	Put 115 45°13′N, 05°30′W	4665		29-10-1969	at.
	OFF BRITTANY, FRANCE:				
B019	Put 124 47°29.6′N, 08°22.6′W	2110		31-10-1969	lr.