MADEIRAN DECAPOD CRUSTACEANS IN THE COLLECTION OF THE MUSEU MUNICIPAL DO FUNCHAL. I. ON SOME INTERESTING DEEP-SEA PRAWNS OF THE FAMILIES PASIPHAEIDAE, OPLOPHORIDAE AND PANDALIDAE

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INTRODUCTION

This is the first of a series of planned papers on the Madeiran Decapod Crustaceans preserved in the collection of the Museu Municipal do Funchal.

Originally, it was intended to include in this article all the species of the families Pasiphaeidae and Oplophoridae contained in our collection. However, one species of the Pasiphaeidae and the Oplophoridae *Acanthephyra purpurea* A. Milne Edwards, *A. pelagica* (Risso) and *Notostomus longirostris* Bate had to be put aside to be dealt with later, as the great bulk of material of these species to be examined would take up too much time to get the paper ready for publication in this Bulletin.

All the specimens reported upon here with exception of the single specimen of *Heterocarpus laevigatus* Bate and the specimen no. 12111 of *H. ensifer* A. Milne Edwards were found in stomachs of the bathypelagic fish *Aphanopus carbo* Lowe, which is being fished commercially in Madeira. Organized search for stomach contents, on the daily catches, has now been going on uninterruptedly for two and half years.

The fishery of *Aphanopus carbo* is carried out from small boats. The lines employed are 1.600 m. long, but how deep the small weight attached to their ends takes these lines is difficult to tell. Because of the currents it is certain that the lines have an oblique direction in the water and so we may suppose that the bulk of fishes is caught at a depth ranging from about 600 - 1.000 m.

The scarcity of some of the species dealt with here, as for instance *Systellaspis debilis*, is possibly due to the fact that they have a bathymetric distribution different from that of *A. carbo*.

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Siboga Expedition and preserved in the Amsterdam Museum.

Thanks are also due to Dr. Torben Wolff, Zoological Museum, Copenhagen, for the gift of a copy of Dr. Hansen's 1908 work "Crustacea Malacostraca of the Danish *Ingolf* Expedition".

Finally, it is a pleasure to thank Mr. G.E. Maul, Curator of the Museu Municipal do Funchal, for his encouragement and constant interest in the author's work.

SYSTEMATIC PART

Family PASIPHAEIDAE

Genus **Pasiphaea** Savigny, 1816

Pasiphaea hoplocerca Chace, 1940

Text-fig. 1C; Plate I, fig. 1.

Pasiphaea hoplocerca Chace, 1940, p.124, figs. 4 & 5.

Material seen:

One ovigerous female, with eyed eggs; Reg.No.4575; carapace length 23.1 mm.; 7.VIII.1954. Both the telson and the gastric spine have the tip broken off; otherwise the specimen is in good condition.

One specimen, sex not known; Reg.No.4599; carapace length abt.23mm.; 23.VIII.1954. Badly damaged.

One specimen, sex not known; Reg.No.5572; 29.IV.1955. Only fragment of abdomen.

One specimen, sex not known; Reg.No.5743; 13.VI.1955. Only fragment of abdomen.

One male; Reg.No.5892; carapace length 21.9mm; 19.VII.1955.

One ovigerous female; Reg.No.6022; carapace length abt.21 mm.; 6.VIII.1955. Damaged.

One male; Reg.No.6045; carapace length 22mm.; 10.VIII.1955.

One specimen, sex not known; Reg.No.6172; the carapace length cannot be determined; 23.VIII.1955 Badly damaged.

One male; Reg.No.6178; carapace length 22.8mm.; 24.VIII.1955.

One male; Reg.No.6272; carapace length abt.22.5mm.; 5.IX.1955. Damaged.

One male; Reg.No.8619; carapace length 21.2mm.; 9.VI.1956.

One ovigerous female; Reg.No.8637; carapace length 21.7mm.; 15.VI. 1956. Cut in two, otherwise in good condition.

One male; Reg.No.9136; carapace length 22.2mm.; 27.VIII.1956.

One specimen, sex not known; Reg.No.9140; 28.VIII.1956. Only fragment of abdomen.

One female; Reg.No.9840; carapace length 20mm.; 5.X.1956. Damaged.

One specimen, sex not known; Reg.No.9865; 11.X.1956. Only fragment.

One ovigerous female; Reg.No.9922; carapace length 20.9mm.; 24.X.1956.

One male; Reg.No.10278; carapace length abt. 20.6mm.; 21.XI.1956. Badly damaged.

One male; Reg.No.11106; carapace length abt. 20.3mm.; 21.II.1957. Damaged.

Colour: Red with a very slight brownish tinge; fingers of first and second pairs of pereiopods brownish red; cornea bluish grey; eggs purplish wine-red.

Our specimens agree in most characters with Chace's description and figures of the species. The only differences we have found are the following:

a) A more or less well developped carina along almost all the dorsal length of the carapace.

b) Almost all of our specimens have a blunt carina on the posterior part (more or less 2/3) of the dorsal margin of the 1st abdominal somite.

c) A more pronounced branchiostegal sinus.

d) Although the carapace is somewhat inflated in the orbital region, post-orbital ridges are absent in the Madeiran specimens.

e) The exterior side of the lower distal angle of the carpi of the first pair of pereiopods is armed with a sub-acute tooth, not mentioned in the original description of *P. hoplocerca*.

The differences pointed out in *a*) to *d*) can be explained by the greater size of the Madeiran specimens. With regard to *e*) Dr. Chace *(in litt.)* is of the opinion that the specimens from Bermuda had the carpi shaped as in the specimens from Madeira.

Pasiphaea hoplocerca was only known from Bermuda. The discovery of the species off Madeira considerably extends the area of its geographical distribution.

Pasiphaea multidentata Esmark, 1865

Text-fig. 1A & B; Plate I, fig. 2.

Pasiphaea multidentata Esmark, 1866, pp.259, 314, 315, 316 [original description not seen; only Sund's quotation on p.4 available]; Sivertsen & Holthuis, 1956, p.27, figs. 19-21 [history of the species].

Material seen:

One male; Reg.No.5742; carapace length abt.29mm.; 13.VI.1955. Damaged.

One ovigerous female, with eyed eggs; Reg.No.9135; carapace length 52.5mm.; 27.VIII.1956. Damaged.

One male; Reg.No.10277; carapace length 46.5mm.; 20.XI.1956.

The rostrum of our specimens resembles that of the Mediterranean form *sicula*.

In *P.multidentata* the number of spines on the ventral margin of the

meri of the lst and 2nd pairs of pereiopods increases with age. In two small specimens collected by the *Dana* in the Skagerak on 13.VI.1927 (carapace lengths 15.2mm. and 19.6mm.) the author found 4 and 2 spines on the meri of the first pair of pereiopods and 16 and 15 on the meri of the 2nd pair of pereiopods of the smaller specimen; in the larger one, there are 7 and 9

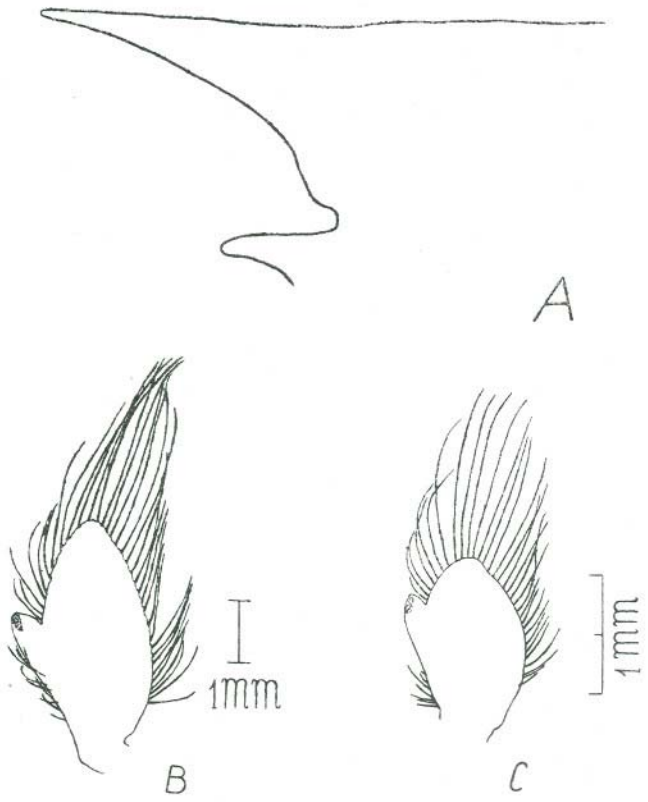

FIG. 1. — **A-B** *Pasiphaea multidentata:* **A** Gastric spine of specimen 10277. **B** Endopod of the first male pleopod. **C** *Pasiphaea hoplocerca;* Endopod of the first male pleopod.

spines on the meri of the lst pair and 21 on the merus of the left second pereiopod (the right one being damaged). Our specimen No.5742 (carapace length abt.29mm.) has 13 spines on the merus of the first right pereiopod (the only one existing). Specimen No.10277 has 28 and 30 spines on the meri of the first pereiopods and 42 on the meri of the second pair. Specimen No. 9135 has 29 spines on the meri of the first pair of pereiopods and 41 and 47 on the meri of the second pair.

The number of spines on the inferior margin of the basis of the 2nd pair of pereiopods increases also with age. In the smallest specimen at hand (carapace length 15.2mm.) the basis of the second pereiopod presents ventrally a single irregular row of spines, with only one or two additional spinules on the sides. In the largest *Dana* specimen (carapace length 19.6mm.) there are two rows of spines on the distal ventral margin of the basis. And on the three Madeiran specimens there is an elongated triangular patch of spines on the ventral side of the basis. The broadest part of this patch is on the distal part of the basis, and the point of the triangle formed by the spines of the patch is on the proximal part of the basis.

Pasiphaea multidentata is probably not as rare in Madeiran waters as the fact that only 3 specimens are mentioned here might suggest. From time to time we have found in stomachs of *A. carbo* fragments of a Pasiphaeid that almost certainly must be referred to that species. In the collection of the Museu Municipal about a dozen of such remains are preserved.

Pasiphaea multidentata is known from the North Atlantic and the Mediterranean (see Sivertsen & Holthuis, Fig.21). The present specimens apparently represent the most southern record of the species.

Family OPLOPHORIDAE

Genus **Acanthephyra** A. Milne Edwards, 1881

Acanthephyra eximia Smith, 1884

Acanthephyra eximea Smith, 1884, p.376 [*eximia* on p.377]; 1886, p.667, pl.14, fig.1; Rathbun, 1906, p.922; Chace 1936, p.27.

Acanthephyra eximea, var. *brachytelsonis*, de Man, 1920, p.55.

Acanthephyra eximia Wood-Mason & Alcock, 1892, p.361, fig.3; Alcock, 1901, p 76; Kemp, 1906, pp.20 & 23; Balss, 1925, p.258, fig.27; Calman, 1939, p.191; Chace, 1940, p.147, fig.24; 1947, p.20; Barnard, 1950, p 667, fig.124 e, f; Holthuis, 1955, p.277, fig.1; Sivertsen & Holthuis, 1956, p.5.

Acanthephyra eximia var. *brachytelsonis*, Alcock, 1901 p.78; Kemp, 1906, pp.21 & 23; Balss, 1914, p.21 [not seen, *fide* Stebbing 1915, p.98]; Stebbing, 1917, p.35, pl.94 [not seen, *fide* Balss, 1925, p.258]; Balss, 1925, p.258, fig.28.

Acanthephyra brachytelsonis Bate, 1888, p.753, pl.126, fig.7; Wood-Mason & Alcock, 1891, p.195; 1892, p.362, fig.4; "Illustrations of the *Investigator*", plate 3, fig.2; Alcock, 1901, p.76 [in key]; Stebbing, 1915, p.97.

Acanthephyra angusta Bate, 1888, p.737, pl.124, fig. 6.

Acanthephyra edwardsii Bate, 1888, p.747, pl.126, fig.1.

Acanthephyra pulchra A. Milne Edwards, 1890, p.165 [for the synonymy of *pulchra* see Holthuis, 1955].

Material seen:

One female; Reg.No.5289; carapace length abt. 34mm.; 24.III.1955 Damaged.

One ovigerous female; Reg. No. 5308; carapace length 29.3mm.; 30. III. 1955.

One female; Reg. No. 5874; carapace length 36.1mm.; 14V. II. 1955. Badly damaged. Two or three eyed eggs, attached to the pleopods, suggest that it is a female that has recently shed its eggs.

One ovigerous female; Reg. No. 6333; carapace length abt. 37mm.; 21. IX. 1955. Badly damaged.

One ovigerous female; Reg. No. 8502; large specimen, the carapace length cannot be determined; 29. V. 1956. Badly damaged.

One ovigerous female; Reg. No. 8813; carapace length abt. 27mm.; 17. VII. 1956. Badly damaged.

One female; Reg. No. 8814; carapace length abt. 23mm.; 17. VII. 1956. Badly damaged.

One female; Reg. No. 8840; large specimen, the carapace length cannot be determined; 28. VII. 1956. Badly damaged.

One adult specimen, sex not known; Reg. No. 8842; carapace length abt. 26mm.; 30. VII. 1956. Badly damaged.

One ovigerous female; Reg. No. 9456; carapace length abt. 33mm.; 6. IX. 1956. Badly damaged.

One ovigerous female; Reg. No. 9935; large specimen, the carapace length cannot be determined; 26. X. 1956 Badly damaged.

One male; Reg. No. 10255; carapace length 25.2mm.; 5. XI. 1956.

One female; Reg. No. 10272; carapace length abt. 31mm.; 12. XI. 1956. Badly damaged.

One female; Reg No. 10273; large specimen, the carapace length cannot be determined; 12. XI. 1956. Badly damaged

One male; Reg. No. 10798; carapace length abt. 36mm.; 24. I. 1957. Badly damaged.

The specimens Nos. 5289, 5308, 5874, 6333, 8813, 8842 and 9909 all have 6 spines on the dorsal margin of the rostrum, and the male No. 10255, 7 spines. Specimens Nos. 8813 and 9909 have 4 spines on the ventral margin of the rostrum and specimens Nos. 6333, 8842, and 10272 have 3 spines. The telson of the specimens Nos. 5308, 5874, 8840, 8842, 10272 and 10789 is armed with 4 pairs of lateral spinules, that of the specimens Nos. 8813, 8814 and 10255 is armed with 4 spinules on the right side and 5 on the left, and that of the specimen No. 9909 has only 3 pairs of lateral spinules. The remaining specimens are so badly damaged that no details can be given.

Acanthephyra eximia has a wide geographical distribution. In the North Atlantic the species is known from off the east coast of the United States, from Bermuda, from the Bahamas, from between the Azores and Bermuda, and from West of Gibraltar. Holthuis (1955, Pubbl. Staz. Zool. Napoli, vol. XXVII) has shown that *A. pulchra*, described from the Mediterranean by A. Milne Edwards, is identical with *A. eximia*. Furthermore the species is also

known from the South Atlantic (South of Pernambuco and North of the Falkland Islands), from the Indian Ocean (off the east coast of Africa, Gulf of Aden, Zanzibar), from the Arabian Sea, from the Andaman Sea, from the Bay of Bengal, from several localities of the Malay Archipelago and from the Pacific (Japan, Hawaii, South of the Philippines and Kermadec Islands).

Acanthephyra curtirostris Wood-Mason, 1891

Plate II, fig. 1.

Acanthephyra curtirostris Wood-Mason & Alcock, 1891, p.195; Balss 1925, p.261, fig.30 [synonymy]; Chace, 1936, p.26; 1937, p.111; Calman, 1939, p.194; Chace, 1940, p.143, fig. 21; 1947, p.17; Springer & Bullis, 1956, p.11.

Acanthephyra acutifrons Bate, 1888, p.749 (*partim*) [*fide* Kemp, 1906].

Material seen:

One female; Reg.No.8087; carapace length 17.8mm.; 22.III.1956. The specimen is slightly damaged (the right eye has disappeared and the pleura of the 3 first abdominal somites are damaged). Otherwise it is in good condition.

This specimen agrees with the descriptions of the species as given by previous authors, its rostrum is armed dorsally with 8 teeth and the telson with 11 pairs of lateral spines.

To the author's knowledge, this is the first record of *A.curtirostris* from the Eastern Atlantic. Records of the capture of the species in the Western Atlantic have been published by Chace successively in 1937, 1940 and 1947, and by Springer & Bullis in 1956.

A.curtirostris is also known from the Indian Ocean, Arabian Sea, Laccadive Sea, Bay of Bengal, Andaman Sea, Malay Archipelago (several localities), Japan, Hawaii, Philippines and from off the west coast of the American Continent (California, Panama and Peru).

Genus **Ephyrina** Smith, 1885

KEY TO THE KNOWN SPECIES OF THE GENUS *EPHYRINA*
(after Chace, 1940, modified)

1. A posterior tooth or spine on posterior dorsal margin of third abdominal somite; only one row of spinules on each side of telson 2

   No posterior tooth or spine on posterior dorsal margin of third abdominal somite; two irregular rows of spinules on each side of telson ..... *Ephyrina hoskynii*

2. Posterior tooth on third abdominal somite triangular; 20-25 spinules on each side of telson..... *E.benedicti*

   Posterior tooth on third abdominal somite broad and bifid at end; 5-8 spinules on each side of telson..... *E.bifida*

Ephyrina hoskynii Wood-Mason, 1891

Plate III, fig. 1.

Ephyrina hoskynii Wood-Mason & Alcock, 1891, p.194; Caullery, 1896, p.376; Alcock, 1901, p.84; "Illustrations of the *Investigator*", 1901, pl.52, fig.3; Kemp, 1910, p.68, pl.7, figs.1-6; Coutière, 1911, p.156; de Man, 1920, p.46; Chace, 1940, p.173, fig.44; 1947, p.29; Springer & Bullis, 1956, p.11.

Ephyrina benedicti Balss, 1925, p.269 (*partim*); Chace, 1936, p.29 (*partim*).

Material seen:

One specimen, sex not known; Reg.No.5505; carapace length abt.24mm.; 22.IV.1955. Badly damaged.

One female; Reg.No.5875; carapace length abt.24mm.; 14.VII.1955. Badly damaged.

One female; Reg.No.6391; carapace length 16.1mm.; 30.IX.1955.

One female; Reg.No.6671; 6.XI.1955. Large specimen, only the abdomen existing.

One specimen, sex not known; Reg.No.6692; 18.X.1955. Large specimen, only the abdomen existing.

One female; Reg.No.8500; the carapace length cannot be determined; 26.V.1956. Badly damaged.

One male; Reg.No.9592; carapace length abt.20.5mm.; 18.IX.1956. Badly damaged.

One female; Reg.No.9908; carapace length 14.7mm.; 16.X.1956.

One female; Reg.No.10254; carapace length abt.15mm.; 5.XI.1956.

One female; Reg.No.10259; 6.XI.1956. Large specimen, only the abdomen existing.

One specimen, sex not known; Reg.No.10284; 24.XI.1956. Large specimen, only the abdomen existing.

One specimen, sex not known; Reg.No.10467; 14.XII.1956. Large specimen, only the abdomen existing.

One male, Reg.No.10719; carapace length abt.21.2mm.; 19.I.1957.

One specimen, sex not known; Reg.No.10754-A; 22.II.1957. Large specimen, only the abdomen existing.

The genus *Ephyrina* was erected by Smith in 1885 for *Ephyrina benedicti*, a species captured by the "Albatross", in September 1883 at north lat.40° 26' 40" and west.long.67° 5' 15".

Some years later, in 1891, Wood-Mason described a new species of the genus, which he named *Ephyrina hoskynii*, and which differs from *E.benedicti* mainly by the absence of a process on the posterior margin of the third abdominal segment. The validity of *E.hoskynii* was accepted by subsequent authors (Caullery, 1896; Alcock, 1901; Kemp, 1910; Coutière, 1911; de Man,

1920; Stephensen, 1923). Kemp, however, though maintaining it distinct from *E. benedicti,* pointed out the close relationship between the two species. In 1925 Balss synonymized it with *E. benedicti.* However, the specimens identified by the latter as *E. benedicti,* belong, in reality (at least the big male described and figured by him) to *E. bifida,* a species described in 1923 by Stephensen. In 1936 Chace, in his key to the Oplophoridae, included both *E. hoskynii* and *E. bifida* in the synonymy of *E. benedicti,* but, four years later, he reconsidered his former view and recognized the three species as distinct, pointing out some of their distinguishing characters in a key and descriptions. This opinion he maintains in 1947.

The examination of the material of *E. hoskynii* from off Madeira shows a character that further substantiates the validity of the species. While trying to identify his specimens the present author was puzzled by the fact that his material, which, because of the absence of a process on the third abdominal segment, could only be referred to *E. hoskynii,* had *two irregular rows of spinules on each side of the telson, the upper with about 5-16 spinules and the lower with about 12-21 spinules,* a character which seems to have been overlooked by previous authors, including Kemp, who, on the other hand, has given a good description and figure of the species.

The following table shows the counts of the telson spinules of those of our specimens that have the telson intact:

	Lateral telson spinules (upper row)		Lateral telson spinules (lower row)	
Reg. No.	right side	left side	right side	left side
5875	11	11?	18	15
6391	15?	16?	21?	21?
6671	12?	9?	15	17?
6692	8	9	13	12
8500	16	15?	18	18?
9592	7	7	15	17?
10259	13	12	18	19
10284	5?	7?	14	14?
10719	11	10	17	16

Dr. Fenner A. Chace, Jr., to whom the present author communicated this fact, has also found the same double row of telson spinules on the U. S. National Museum specimens of *E. hoskynii.*

The reason for this oversight can probably be found in the fact that these shrimps quickly lose their pigment in alcohol, and become almost transparent, which makes it very difficult to see these spinules.

The author has no specimens of the other two known species of *Ephyrina* but Dr. Chace, who kindly examined for him the type of *E. benedicti* and also specimens of *E. bifida* preserved in the U. S. National Museum, has found only one row of spinules on each side of the telson of these two species.

There are few records of *E. hoskynii.* In the Atlantic it has been captured in the Bay of Biscay, off the southwest coast of Ireland, off the west coast of Spain or Portugal, off the Bermudas and off the Bahamas, and in the Gulf of Mexico. Outside the Atlantic it has been caught in the Arabian Sea in the vicinity of the Laccadive Islands, and in the Bay of Bengal off Ceylon. In the U. S. National Museum there are two more specimens captured by the "Albatross". One, an ovigerous female, was captured in a depth of 272 fms. (bottom), on the 20th of July 1908, in the China Sea, at north lat. 13° 39' 36" and east long. 120° 32' 55"; the other, a young specimen, was caught in a depth of 920 fms. (bottom), on the 4th of March 1909, in the Philippine Islands, at north lat. 12° 59' 15" and east long. 122.° 30' 40".

Genus **Systellaspis** Bate, 1888

Systellaspis debilis (A. Milne Edwards), 1881

Text-fig. 2.

Acanthephyra debilis A. Milne Edwards, 1881, p.13; Calman, 1925, p.13; Vilela, 1936, p.220.

Systellaspis debilis Balss, 1925, p.242 [synonymy]; Chace, 1936, p.29; 1940, p.181, fig. 51-53; 1947, p.35; Barnard, 1950, p.663, fig. 124, a; Holthuis, 1951, pg.32; 1952, p.28; Sivertsen & Holthuis, 1956, p. 17, fig.14; Springer & Bullis, 1956, p.12.

[*non*] *Systellaspis debilis* Boone, 1930, p.135, pl.46.

Acanthephyra multispina Zariquiey Alvarez [not Coutière, 1905], 1946, pg.60 [figure only].

[?] *Acanthephyra pellucida* A. Milne Edwards, *fide* Perrier, 1886, p.330.

Material seen:

One ovigerous female; Reg.No.5887; carapace length 13mm.; 16.VII. 1955.

One male; Reg.No.5943-A; carapace length abt.9mm.; 29.VII.1955. Badly damaged.

One male; Reg.No.6023; carapace length 11mm.; 6.VIII.1955.

One ovigerous female; Reg.No.6667; carapace length 12.7mm.; 3.X. 1955.

One male; Reg.No.7723; carapace length 12.5mm.; 14.I.1956.

One male; Reg.No.8837; carapace length 12.1mm.; 27.VII.1956.

One male; Reg.No.9104; carapace length abt.12.4mm.; 20.VIII.1956. Damaged.

One ovigerous female; Reg.No.9106; carapace length 14.5mm.; 21. VIII.1556.

One female; Reg.No.9585; large specimen, the carapace length cannot be determined, 10.IX.1956. Badly damaged.

One male; Reg.No.9839; carapace length 11.9mm.; 4.X.1956.

One female; Reg.No.9842; carapace length abt.11.5mm.; 8.X.1956. Badly damaged.

One ovigerous female; Reg.No.9843; carapace length 13.2mm.; 8.X. 1956.

One female; Reg.No.9907; carapace length 13.6mm.; 15.X.1956. Damaged.

One ovigerous female; Reg.No.9912; carapace length abt.12mm.; 17.X.1956. Damaged.

One male; Reg.No.9936; carapace length 11.7mm.; 29.X.1956.

One male; Reg.No.10800; carapace length 10.6mm.; 24.I.1957.

The sex of the badly damaged specimens Nos. 9842 and 9907 was determined by the examination of the triangular process on the ventral side, behind the 5th pair of pereiopods. This process, as pointed out by Stephensen (1923) is very elongate in the female of *S. debilis*.

The specimens Nos. 5887, 6667, 7723, 8837, 9104, 9585, 9839, 9843, 9907, 9936 and 10800 all have 4 spines on the rostral crest, and the specimens Nos. 6023, 9106, 9842 and 9912 have 3 spines. In the damaged specimen No. 5943-A the number of spines on the rostral crest cannot be determined. The position of the last spine on the rostral crest varies somewhat from specimen to specimen, so that in some specimens it is somewhat difficult to decide if it belongs to the rostral crest or to the rostrum proper.

The specimens Nos. 6023, 6667, 8837, 9104, 9106, 9585, 9839, 9843, 9907 and 10800 have only one spine on the dorsal margin of the rostrum between the proximal spine on the ventral margin of the rostrum and the last one of the rostral crest, the specimens Nos. 5887, 7723 and 9936 have 2 and the specimen No. 9912 has 3.

The specimens Nos. 6667, 7723, 9936 and 10800, the only ones that have the rostrum intact, have respectively the following rostral formula (including the spines on the rostral crest):

$$\frac{15}{8};\ \frac{15}{10};\ \frac{14}{9};\ \frac{15}{9}$$

The telson in the specimens Nos. 5887, 6023, 6667, 7723, 8837, 9104, 9842, 9907 and 10800 is armed with 4 pairs of lateral spines, omitting those of the terminal cluster. The specimen No.9106 has 4 spines on the right side of the telson and 5 on the left, the specimen No.9839 has 4 spines on the rigth side and 3 on the left, and the specimen No.9843 has 5 spines on the rigth side and 4 on the left.

The notch on the posterior margin of the pleura of the 5th abdominal segment, although generally present, is absent in one or two specimens, due possibly to injury.

In Madeira, *S. debilis* seems to be a scarce species in the depth in which *Aphanopus carbo* lives. However, as mentioned above, 6 specimens (2 males and 4 females, 2 of which were ovigerous) were obtained in October 1956.

The specimen figured in 1946, under the name *Acanthephyra multispina* Coutière, by Zariquiey Alvarez, in his useful book "Crustáceos Decápodos Mediterráneos" is undoubtedly a specimen of *S. debilis*. In *Acanthephyra pelagica* (Risso) (=*A. multispina* Coutière) the posterior margin of the terga of the 4th and 5th abdominal segments is not denticulate, as figured by the Spanish author, a character peculiar, on the other hand, to *S. debilis*. However, the diagnosis given by Zariquiey, although he does not mention the number of pairs of lateral spines on the telson, can be applied to *A. pelagica* and not to *S. debilis*, as he states that the 2nd to 6th abdominal segments are dorsally carinate, a character which is not found in the genus *Systellaspis*. It would be interesting to know if the specimen figured by Zariquiey was really captured in the Mediterranean. If so, it would be the first record of *S. debilis* from that sea.

Perrier, 1886, p.330, mentions and gives a very inadequate description of a mysterious *Acanthephyra pellucida* A. Milne Edwards. Chace, 1936, p.30,

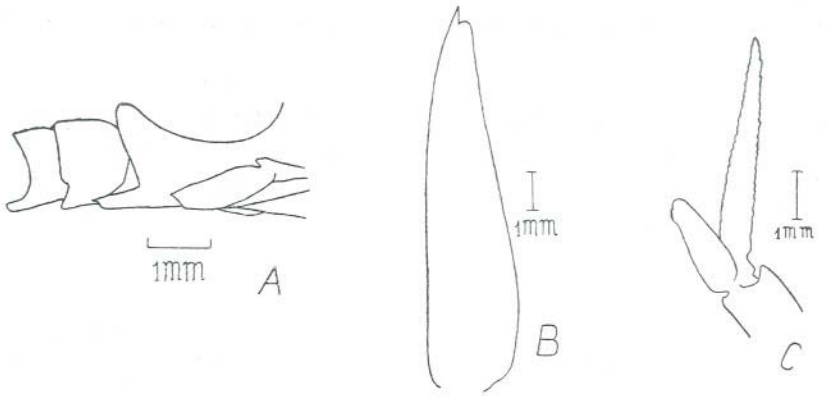

FIG. 2.—*Systellaspis debilis*: **A** Antennular peduncle, showing the stylocerite. **B** Antennal scale. **C** Endopod and exopod of the 1st female pleopod.

considers it to be a possible synonym of *Oplophorus grimaldii* Coutière [=*O. spinosus* (Brullé)]. However, Perrier mentions a character that makes it most unlikely that these two species are identical. The said character, a luminous line, anteriorly pointed, posteriorly continuous, parallel to the inferior border of the carapace, does not exist in *O. spinosus*, whereas such a line is found in *S. debilis*. Kemp, 1910, pp. 67-68, makes a comparison of the photophores of *A. pellucida* (as described by Perrier) with those of *S. debilis*. There is agreement in a number of them, though the French author mentions some that do not agree well with those found in *S. debilis*. Also, Perrier mentions two luminous organs that are not found in this species, at least not in specimens that have not been examined in an absolutely fresh state. In our opinion, due to the fact that Perrier's account

may contain errors, we cannot help feeling that *A. pellucida* is a synonym of *S. debilis*. This opinion is strengthened by Perrier's statement that *A. pellucida* was caugth "assez souvent". Although *S. cristata* and *S. affinis*, and possibly the other two known species of *Systellaspis*, have photophores, the only species of this genus that is caught quite commonly is *S. debilis*.

Most of the records of *S. debilis* are from the North Atlantic; apart from this, the species has been captured in the South Atlantic, off the west, south and east coasts of Africa, in the Indian Ocean, in the Malay Archipelago and in the Hawaiian Islands. There is one record of the species from near Madeira, at north lat. 33° 7' and west long. 15° 49'.

Systellaspis cristata (Faxon), 1893

Text-fig. 3; Plate II, fig. 2.

Acanthephyra cristata Faxon, 1893, p.206.
Systellaspis cristata Holthuis, 1951, p.33 [synonymy]; Springer & Bullis, 1956, p.12.

Material seen:

One female; Reg.No.8643; carapace length 14.1mm.; 19.VI.1956. Both the tip of the rostrum and the telson, as well as part of the antennular and antennal flagella, are broken off; otherwise the specimen is in fair condition.

One female, apparently ovigerous (between the pleopods there seem to be remains of macerated eggs); Reg.No.11590; carapace length 13.5mm.; 18.V.1957. Slightly damaged.

Our specimens agree in most characters with the descriptions of the species given by previous authors. However, the rostrum of the specimen No. 11590 is apparently somewhat longer than that of the specimens figured by Faxon and by Alcock & Anderson. Also the spine on the posterior border of the 3rd abdominal segment is more developped than in Faxon's figure, resembling the specimen figured in the "Plates of the *Investigator*" and the specimen dealt with by Holthuis in 1951.

In both the Madeiran specimens the rostral crest has 7 teeth. In specimen No.8643 (apart from those of the rostral crest) there are 5 teeth along the dorsal margin of the remaining part of the rostrum and 6 along the lower margin; in specimen No. 11590, the dorsal margin of the rostrum is armed with 5 teeth and the ventral margin with 4.

Specimen No.11590, although practically intact, arrived in a not very fresh condition. However, the following colour notes could be taken:

General colour of the body orange-red; cornea bluish grey, with golden reflexions; antennal scale with a yellowish-white elongate oblique spot in the proximal exterior region. On the anterior half of the carapace a number of violet photophores could be seen; there also was a row of these photophores running along and just above the inferior carina of the carapace.

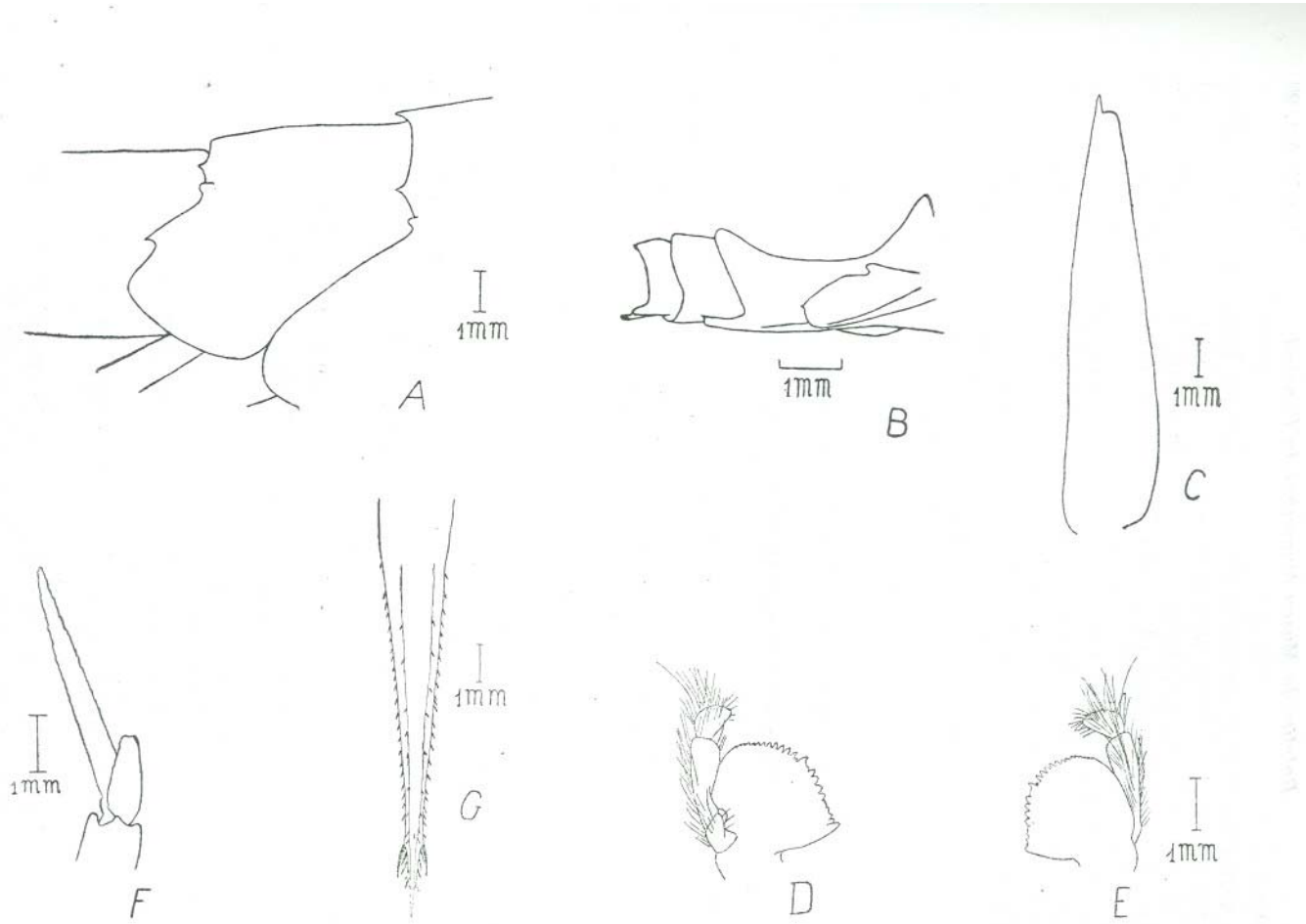

FIG. 5. – *Systellaspis cristata*: **A** Lateral view of the 4th and 5th abdominal somites. **B** Antennular peduncle, showing the stylocerite. **C** Antennal scale. **D-E** Mandible. **F** Endopod and exopod of the 1st female pleopod. **G** Dorsal view of the telson.

Medianly, along the dorsal surface of the telson, as far back as the pair of big spines on the distal part, there was another row of about 14 of these violet bodies. A violet spot was further to be seen on the anterior upper part of the carpi of the 3rd and 4th pairs of pereiopods, and another on the carpi and on the meri of the 5th pair of pereiopods.

The above mentioned bodies were slowly disappearing while the animal was being examined, so that it is possible that in an absolutely fresh state some more of these photophores could be seen.

Systellaspis cristata is apparently a rare species. The only two records of the species from the eastern Atlantic are those by Balss (1925, off Sierra Leone) and Holthuis (1951, off Liberia). Furthermore, the species is also known from the Gulf of Mexico, from the Arabian Sea, from near Ceylon and from the Gulf of Panama.

Genus **Oplophorus** H. Milne Edwards, 1837

Oplophorus spinosus (Brullé), 1839

Palaemon spinosus Brullé, 1839, p. 18, fig. on p. 3.

Oplophorus spinosus Holthuis, 1949, p. 229; Sivertsen & Holthuis, 1956, p. 19, fig. 15, pl. III, figs. 1 & 2.

Oplophorus grimaldii Coutière, 1905 a, p. 1114; Chace, 1936, p. 30; 1940, p. 187, fig. 55; 1947, p. 47, figs. 12-15.

Hoplophorus grimaldii Coutière, 1905 b, p. 1, fig. 1; Lenz & Strunck, 1914, p. 328, pl. 22, figs. 1-8; de Man, 1920, p. 42 & 48; Balss, 1925, p. 249, fig. 24.

Material seen:

One female; Reg. No. 5701; carapace length 10.5mm.; 30. V. 1955. Slightly damaged

One male; Reg. No. 5749; carapace length 16.4mm.; 14. VI. 1955. Broken in two, otherwise in good condition.

One ovigerous female; Reg. No. 5777; carapace length 13mm.; 18. VI. 1955.

One specimen, possibly female; Reg. No. 5812; carapace length abt. 12mm.; 30. VI. 1955. Badly damaged.

One female; Reg. No. 5843-A; carapace length abt. 11.3. mm.; 7. VII. 1955. Broken in two, otherwise in good condition.

One male; Reg. No. 5859; carapace length abt. 13.5mm.; 9. VII. 1955. Damaged.

One male; Reg. No. 5866; carapace length 15mm ; 11. VII. 1955. Slightly damaged.

One ovigerous female; Reg. No. 5890; carapace length 11.5mm.; 18. VII. 1955.

One male; Reg. No. 5904; carapace length 14mm.; 21. VII. 1955. Broken in two, otherwise in good condition.

One ovigerous female; Reg. No. 5919; carapace length 14mm.; 25.VII.1955. Tip of the rostrum broken off, otherwise in good condition.

One specimen, possibly male; Reg. No. 5978; carapace length 9mm.; 2.VIII.1955. Damaged.

One specimen, possibly female; Reg. No. 5994; carapace length 10.5mm.; 3.VIII.1955. Damaged.

One ovigerous female; Reg. No. 6250; carapace length abt. 11mm.; 30.VIII.1955. Damaged.

One male; Reg. No. 6255; carapace length 15.8mm.; 1.IX.1955,

One male; Reg. No. 6359; carapace length abt. 14.5mm.; 24.IX.1955. Slightly damaged.

One specimen, sex not known; Reg. No. 6882; carapace length abt. 14mm.; October 1955. Badly damaged.

One ovigerous female; Reg. No. 6883; carapace length 11.6mm.. October 1955. Broken in two, otherwise in good condition.

One ovigerous female; Reg. No. 6884; carapace length 12.7mm.; October 1955. Tip of the rostrum broken off, otherwise in good condition.

One female; Reg. No. 6885; carapace length 12.5mm.; October 1955.

One male; Reg. No. 7552; carapace length 15.4mm.; November 1955. Broken in two, otherwise in good condition.

One male; Reg. No. 7729; carapace length 15.3mm.; 21.I.1956.

One female; Reg. No. 8272; carapace length 13.7mm.; 30.IV.1956. Rostrum damaged, otherwise in good condition.

One male; Reg. No. 8641; carapace length abt. 17mm.; 18.VI.1956. Badly damaged.

One specimen, possibly female; Reg. No. 8644; carapace length about 11mm.; 19.VI.1956. Badly damaged.

One ovigerous female; Reg. No. 8650; the carapace length cannot be determined; 22.VI.1956. Only abdomen existing.

One specimen, possibly female; Reg. No. 8652; carapace length abt. 12mm.; 5.VI.1957. Badly damaged.

One male; Reg. No 8799; carapace length 13mm.; 11.VII.1956. Slightly damaged.

One male; Reg No. 8807; carapace length 13mm.; 13.VII.1956. Slightly damaged.

One specimen, sex not known; Reg. No. 8822; carapace length abt. 12mm.; 21.VII.1956. Badly damaged.

One ovigerous female; Reg. No. 8830; carapace length abt. 12mm.; 25 VII.1956. Broken in two, otherwise in good condition.

One ovigerous female; Reg. No. 8843; carapace length 11mm.; 30.VIII.1956. Slightly damaged.

One male; Reg. No. 9103; carapace length 9.5mm.; 20. VIII. 1956. Rostrum damaged, otherwise in good condition.

One ovigerous female; Reg. No. 9139; carapace length 12.8mm.; 28. VIII. 1956.

One female; Reg. No. 9143; carapace length abt. 12mm.; 29. VII. 1956. Badly damaged.

One male; Reg. No. 9598; carapace length 14.5mm.; 27. IX. 1956. Rostrum damaged, otherwise in good condition.

One ovigerous female; Reg. No. 9830; carapace length abt. 10.7mm.; 1. X. 1956. Damaged.

One specimen, possibly female; Reg. No. 9844; carapace length abt. 13mm.; 8. X. 1956. Badly damaged.

One specimen, possibly female; Reg. No. 9931; carapace length abt. 15mm.; 24. X. 1956. Damaged, the abdomen lacking.

One specimen, sex not known; Reg. No. 9938; carapace length more than 13mm.; 29. X. 1956. Badly damaged.

One ovigerous female; Reg. No. 10252; carapace length 12.3mm.; 2. XI. 1956. Broken in two, otherwise in good condition.

One specimen, sex not known; Reg. No. 10257; carapace length more than 12 mm.; 6. XI. 1956. Badly damaged.

One male; Reg. No. 10258; carapace length 14mm.; 6. XI. 1956. Damaged.

One male; Reg. No. 10265; carapace length 14mm.; 8. XI. 1956. Damaged.

One ovigerous female; Reg. No. 10266; the carapace length cannot be determined; 8. XI. 1956. Badly damaged.

One ovigerous female; Reg. No. 10274; carapace length 11mm.; 13. XI. 1956. Slightly damaged.

One ovigerous female; Reg. No. 10465; carapace length 12mm.; 13. XII. 1956. Damaged.

One ovigerous female; Reg. No. 10480; carapace length 12mm.; 29. XII. 1956.

One specimen. sex not known; Reg. No. 10705; carapace length abt. 13mm. Badly damaged, the abdomen lacking.

One female; Reg. No. 10717; carapace length 13mm.; 5. I. 1957. Damaged

One male; Reg. No. 10987; carapace length abt. 15mm.; 4. II. 1957. Damaged.

In adult *Oplophorus spinosus* the dorsal outline of the male carapace is apparently slightly more convex than that of the female. Furthermore, in the male, as figured by Chace (1947) the pleura of the first abdominal segment are notched in the inferior border. In the female, the pleura of that segment have the inferior border rounded.

In a fresh specimen, the ocular peduncle presents distally, on the inferior border, close to the cornea, two violet spots, one larger and one smaller. Below the orbit there is a large light-violet spot; more or less on

the anterior one fourth of the carapace, somewhat above the branchiostegal groove, there is a small photophore. Apart from this, there are 5 larger violet photophores, in a wide arch along the inferior part of the carapace, the most backward one on the triangular projection of the postero-lateral margin of the carapace and the most forward one close to the lower border of the carapace. The distance between the 1st and the 2nd is slightly smaller than the distance between the 3rd and the 5th. The 4th is midway between the 3rd and the 5th, and the distance between the 2nd and the 3rd is smaller than the distance between the 3rd and 4th or 4th and 5th. First maxilliped with a photophore on the inner margin of the exopodite. Third maxilliped with a narrow violet stripe along the ventral margin of the last segment. Exterior side of the carpi of the 3rd pereiopods almost entirely violet; exterior side of the carpi of the 4th pereiopods entirely violet; propodi of the 5th pereiopods exteriorly with a violet spot, interrupted on the proximal third. Proximal half of the carpi of the 5th pereiopods also with a violet spot exteriorly.

Behind the 5th pair of pereiopods, there is a vertical elongate violet stripe. Inferior margin of the pleura of the 1st-5th abdominal segments with a slight violet tinge. Basal segment of pleopods anteriorly with a violet rounded photophore; two more on each side of the ventral margin of the 6th abdominal segment, close to the base of the uropods. Finally, on the base of the endopod of the 2nd-6th pairs of pleopods, there seems to be a small photophore.

In the literature there are records of *O. spinosus* from the Canary Islands, from west of Madeira, from off the Azores, from between the Azores and Bermuda, from Bermuda, from off the east coast of the United States, from the Bahamas, from north of Tristan da Cunha, from the Indian Ocean, from off Easter Island (eastern Pacific) and from south of Japan.

Family PANDALIDAE

Genus **Heterocarpus** A. Milne Edwards, 1881

KEY TO THE SPECIES OF *HETEROCARPUS* KNOWN FROM THE EASTERN ATLANTIC

1. Carapace with two lateral carinae. Inferior margin of the orbit without an acute tooth-shaped process. Dorsal margin of the rostrum smooth along almost its whole length and toothed only on the proximal part...2

   Carapace with three lateral carinae, the upper one, on adult specimens, confined to the posterior region of the carapace. Inferior margin of the orbit with an acute tooth-shaped process. Dorsal margin of the rostrum armed along its whole length. 3rd and 4th abdominal segments strongly carinate dorsally, and posteriorly with strong spines. 1st and 2nd abdominal segments never strongly carinate..... *H. ensifer*

2. 3rd abdominal segment sharply carinate and posteriorly with a strong spine. 3rd maxilliped without an exopodite.....*H. grimaldii*
3rd abdominal segment, though bearing dorsally a longitudinal rounded carina, never sharply carinated; posterior dorsal border of the 3rd abdominal segment, never ending in an acute tooth. 3rd maxilliped with an exopodite .....*H. laevigatus*

Heterocarpus ensifer A. Milne Edwards, 1881

Text-fig. 4; Plate III, fig. 2.

Heterocarpus ensifer A. Milne Edwards, 1881, p.8; de Man, 1920, p.167 [synonymy]; Boone, 1927, p.119; Holthuis & Maurin, 1952, p.197; Holthuis, 1952, p.38, fig.10; Springer & Bullis, 1956, p.12.

Material seen:

One female; Reg.No.8180; carapace length 33mm.; 6.IV.1956. Both the rostrum and the spine on the posterior margin of the 3rd abdominal segment have the tip broken off; otherwise the specimen is in fair condition.

One ovigerous female; Reg.No.12111; carapace length 22.3mm.; 6.VIII.1957. Off Funchal Bay. Captured together with 2 *Thelxiope barbata* (Fabricius) and 7 *Parapandalus narval* (Fabricius), in shrimp pot resting for 5 hours, on bottom, at night, about 200m. depth. In very good state of preservation.

Besides the sharp dorsal carina on the 3rd and 4th abdominal segments, the dorsal surface of the 1st and 2nd abdominal segments of specimen

FIG. 4 — *Heterocarpus ensifer*: Orbital region, showing the acute process on the inferior margin of the orbit.

No.8180, and the dorsal surface of the 2nd abdominal segment of specimen No.12111, shows also a very obtuse and feeble carina.

The spines on the posterior margin on the 3rd and 4th abdominal

segments, in specimen No.12111 are, proportionally, much more developed than in specimen No.8180. In the smaller specimen, the dorsal carina, both of the 3rd and 4th abdominal segments, is a continuous one, but in the larger specimen that of the 3rd segment is interrupted on the posterior half. In this specimen, as pointed out above, the tip of the spine on the posterior border of the 3rd abdominal segment is broken off, but, judging from the shape of the existing part, it does not seem to have been much longer than the spine on the 4th segment. On the other hand, in the smaller specimen, the spine of the 3rd abdominal segment is much longer than the spine on the 4th segment, though slightly less than twice as long.

On each side of the first abdominal segment, on the anterior upper angle, there is a small rounded tubercle. On the orbit, above the antennal spine, there is an acute tooth-shaped process (see text-fig.4). This tooth-shaped process is neither found in *H. grimaldii* nor in *H. laevigatus*, (the other two species of *Heterocarpus* the author has at hand) though these two species show a blunt protuberance in the same region.

Upper margin of the rostrum armed with 19 teeth in the larger specimen, and with 20 in the smaller. In both specimens, 5 of these teeth are placed behind the posterior margin of the orbit. The most backward tooth is very small, and is placed, in both specimens, anterior to the middle of the carapace. Lower margin of the rostrum armed, in both specimens, with 10 teeth. Telson (ommitting those of the terminal cluster) armed with 4 pairs of lateral spines.

In the Atlantic, *H. ensifer* has been captured in several localities of the Caribbean Sea (Barbados, St.Kitts, Montserrat, Grenada and Glover Reef), in the Gulf of Mexico, off North Carolina (*H. carinatus* Smith), off the coast of Morocco and off Banana (Mouth of the river Congo). For the localities from which larvae are recorded, see Holthuis, 1952. Outside the Atlantic, the species is recorded from between the Philippine Islands and Borneo, from New Britain, from Hawaii and from Sagami Bay (Japan). Also in 1917, de Man, based on 5 specimens captured by the *Siboga* in the Malay Archipelago, created a variety *parvispina*, that differs from the typical specimens by the very small length of the spine on the 4th abdominal segment.

Heterocarpus laevigatus Bate, 1888

Text-figs. 5 & 6; Plate IV, fig. 1.

Heterocarpus laevigatus Bate, 1888, p.636, pl.CXII, fig.3; Alcock & Anderson, 1899, p.285; "Illustrations of the *Investigator*", pl.42, figs.1-1a; Alcock, 1901, p.105; Rathbun, 1906, p.918; Stebbing, 1914, p.40; de Man, 1920, p.159, pl.XIII, figs.37-37b; Barnard, 1950, p.684, fig.127b.

Material seen:

One male, Reg.No.4546; carapace length 33mm.; 14.IV.1954; Funchal fish market. The tip of the rostrum is broken off, all the pereiopods, except one, are separated from the body, and of the 3 last pairs, only two detached pereiopods remain; otherwise the specimen is in good condition. The fisherman who brought the specimen to the Museum stated that it was captured at the surface, together with small horse-mackerels [*Trachurus picturatus* (Bowdich)]. However, owing to its damaged state of preservation, it is more likely that it was extracted from the stomach of a fish, possibly from that of an *Aphanopus carbo*.

Dorsal carina of carapace with 6 teeth; of these, one is placed very slightly in front of the orbit, and another in the basal part of the dorsal margin of the rostrum. This has the extremity broken off; however we can still count 8 teeth on the inferior margin of the existing part. The type, *fide* Bate, has only 6 teeth on the ventral margin of the rostrum, but subsequent authors (Alcock & Anderson, Stebbing and de Man) have found between 10 and 13 teeth in their specimens. In a series of 6 specimens from the Hawaiian Islands, loaned by the U. S. National Museum, the present author has found that 4 of the specimens had 7 teeth on the dorsal carina of the carapace, and two had 6. On the lower margin of the rostrum, 4 of the specimens had 10 teeth, one had 6 and another had 5. Five of the specimens have the rostrum regularly curved upwards, but one (the one with only 5 teeth on the ventral margin of the rostrum), has an abnormal rostrum. The proximal 2/3 of the latter are curved upwards in the normal way, the remaing 1/3 being slightly curved downwards. In the dorsal carina of the carapace, slightly before the posterior margin, there is a blunt small tubercle. Pterygostomian spine stronger and longer than the antennal spine. On the lower posterior part of the carapace, a short distance above the inferior margin, there is a very small and feeble longitudinal carina.

First and second abdominal segments dorsally rounded and with a transversal groove in the posterior part of the dorsal surface. Third abdominal segment dorsally with a rounded and wide median carina, beginning slightly behind the anterior margin of the segment and disappearing slightly before the posterior margin. The latter shows a convexity in its median portion. The outline of the dorsal border of this third segment, in our specimen, is less rounded than in Bate's figure, but slightly more than in the figure in the "Plates of the *Investigator*"; this curvature, as shown by the Hawaiian specimens at hand, varies from specimen to specimen, though apparently it tends to become less pronounced with growth of the animal.

Fourth and fifth abdominal segments with a feeble, rounded median carina, that of the 4th segment being more conspicuous. The last abdominal segment, in our specimen, as well as in the Hawaiian specimens

at hand, is not "dorsally flattened", as stated by Bate in his description, but has its dorsal face slightly channeled.

Telson, in the Madeiran specimen, armed with 3 pairs of lateral spines, and with a dorsal groove extending along almost its whole length. Tip of the telson with 3 pairs of spines, those of the median pair being the longest. In 4 of the Hawaiian specimens examined, the telson is armed with 4 pairs of lateral spines, in one with 5 pairs, and the specimen with the abnormal rostrum has 6 spines on the right side of the telson, and 5 on the left.

Cornea well developed and broader than the ocular peduncle, which narrows towards the base. No ocellus is present.

Stylocerite very slightly concave exteriorly, practically reaching the distal part of the 3rd segment of the antennular peduncle. The latter reaches slightly beyond the middle of the scaphocerite. On the base of the stylocerite there is a forward-downward directed small process.

The length of the antennal scale is slightly more than half of the length of the carapace, and its width is very slightly less than 3.5 times in its length.

As the specimen is the only one in our collection, the mouth parts were not dissected.

Last segment of the 3rd maxilliped 1 1/2 times as long as the penultimate one. Antepenultimate segment about 1/6 times as long as the last segment. The 3rd maxilliped bears a very small exopodite and reaches the extremity of the antennal scale.

First pereiopods reaching more or less the distal 1/4 of the antennal scale. Carpus of the first pereiopods slightly more than 1 1/2 times the length of the propodus, and with more or less the same length as the merus.

Carpus of the second shorter pereiopod consisting of 6 joints; in 4 of the Hawaiian specimens examined the carpus is divided into 7 joints and in another into 6; in the smallest specimen this pereiopod is damaged. Carpus longer than the merus and also somewhat longer than the chela. Fingers somewhat shorter than the palm. This pereiopod is separated from the body, but measuring it with a compass, we can see that it would reach the middle of the antennal scale if it was in place.

Second longer pereiopod with the carpus divided into 19 joints and the merus into 7; in the Hawaiian specimens at hand, 3 have the carpus divided into 20 joints, and 3 into 21; the merus of 3 of the Hawaiian specimens is divided into 9 joints, of 2 into 8, and, finally, that of another possibly into 8. Propodus about 5 times as long as the carpus; carpus about 1.7 times as long as the merus.

As pointed out above, of the last 3 pairs of pereiopods, only two detached legs remain. Due to the fact that they have 2 spines on the posterior margin of the ischium, it is possible to know that they belong either to the 3rd or to the 4th pair (in *H. laevigatus*, as well as in *H. grimaldii*, the ischium of the 3rd pereiopod has no spines on the posterior margin). The outer row of spines on the meri of the two mentioned pereiopods have respectively 8 and 7 spines, and the inner row 5 and 4 spines. The dactyli are very short and the carpi somewhat shorter than the propodi.

For the endopod of the first pleopod of our specimen, see text-fig.6. The shape of this organ, as seen by the series of Hawaiian specimens at hand, varies with age. In the smallest specimen available (carapace length 22mm.) the endopod has the borders more or less parallel, and the anterior lobe very elongate, surpassing the posterior lobe. This specimen still lacks the *appendix masculina* on the 2nd pleopods. In two larger specimens (carapace length respectively 30.7 mm. and 30.8mm.), the shape af the endopod resembles that of the Madeiran specimen, however, the anterior lobe is still elongate and more or less the same size as the posterior lobe. In a specimen

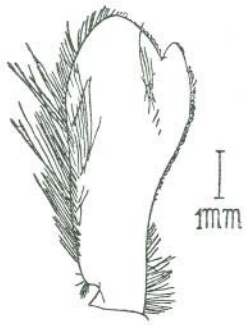

FIG. 6 — *Heterocarpus laevigatus*: Endopod of the 1st male pleopod of the Madeiran specimen.

with a carapace length of 37.5mm., the shape of the endopod resembles that of our specimen, but the distal part is slightly broader transversally. In the largest specimen at hand (carapace length 42.2mm.), the endopod is more elongate than in the Madeiran specimen, and has the anterior lobe slightly more developed.

Our specimen also shows, in the abdominal segments, the small sunken spots mentioned for *H. grimaldii* by Sirvertsen & Holthuis (1956). These spots have approximately the same distribution as described by the above mentioned authors for the latter species.

Through the kindness of Dr. L. B. Holthuis the author was able to compare his specimen with one of the specimens of the closely related species *H. grimaldii* A. Milne Edwards & Bouvier, captured by the *Michael Sars* in 1910 and dealt with by that author and Sivertsen in 1956.

Below, we are giving the most important differences we have found between the two species:

a) In *H. leavigatus* (see text-fig.5A) the third abdominal segment bears a longitudinal rounded carina beginning slightly behind the anterior border of the segment and desappearing before reaching the posterior border, which is not toothed and only shows a convexity. In *H. grimaldii* (see text-fig.5D) the third abdominal segment bears an acute carina on

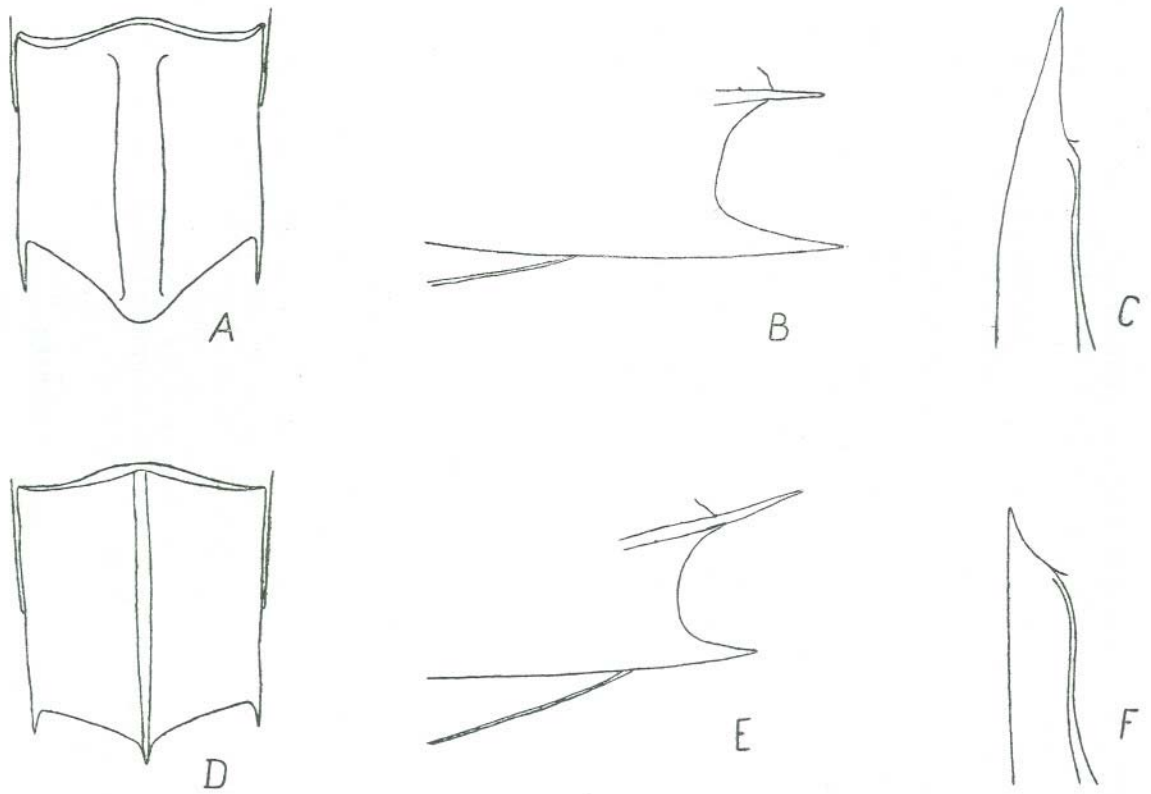

FIG. 5. – **A-C** *Heterocarpus laevigatus:* **A** Dorsal view of the 3rd abdominal somite. **B** Antennal and pterygostomian spines. **C** Ventral view of the pterygostomian spine. **D-F** *Heterocarpus grimaldii:* **D** Dorsal view of the 3rd abdominal somite. **E** Antennal and pterygostomian spines. **F** Ventral view of the pterygostomian spine.

its dorsal face and armed with an acute tooth in its posterior dorsal border.

b) In *H. laevigatus* (see text-fig. 5B) the antennal spine is shorter than the pterygostomian spine; in *H. grimaldii* (see text-fig. 5E) it is longer than the pterygostomian spine.

c) In *H. laevigatus* (see text-fig. 5C) the pterygostomian spine (as seen from below) is rather long; in *H. grimaldii* (see text-fig. 5F) it is much shorter.

d) In *H. laevigatus* the third maxilliped bears an exopodite; in *H. grimaldii*, the third maxilliped does not possess an exopodite.

e) The 3rd and 4th pairs of pereiopods of *H. laevigatus* have shorter dactyli than those of *H. grimaldii*. While the dactyli of those pereiopods of *H. grimaldii* are stated to be slightly more than 1/3 the length of the propodi, those of *H. laevigatus* (Dr. Chace, *in litt.*) vary from about 1/5 to about 1/8 of the length of the propodi.

f) In *H. laevigatus*, the dorsal face of the 6th abdominal segment is slightly furrowed. In *H. grimaldii* the 6th abdominal segment is dorsally flattened.

This is possibly the first time that *H. laevigatus* has been captured in the Atlantic. However, in 1911, Coutière, in a note on the Caridea collected in 1910 by the Prince of Monaco, stated that "*Heterocarpus laevigatus* Alcock est representé dans l'Atlantique par une forme si voisine que je l'ai distinguée seulement comme var. *occidentalis*". Sivertsen & Holthuis (1956), as well as the present author, think that *H. laevigatus occidentalis* Coutière (a *nomen nudum*) is identical with *H. grimaldii*, the sharp carina and the posterior spine on the third abdominal somite of the latter species being probably the character that led the French author to create his variety *occidentalis*. However, it would be interesting to re-examine the specimen or specimens seen by Coutière, in case they still exist, in order to find out definitely to which of the two species they should be referred.

H. laevigatus is recorded from East London (South Africa), from the Arabian Sea, from the Malay Archipelago and from the Hawaiian Islands.

In the collection of the Museu Municipal do Funchal the strongly digested remains of a specimen of *Heterocarpus*, found in the stomach of an *Aphanopus carbo*, are preserved. Inspite of its very bad state of preservation, so that several characters can no longer be seen, we cannot help feeling that it must be another *H. laevigatus*.

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CORRECTION

P.31, lines 17 and 18

instead of
Chace, 1936, p.29; 1940, p.181

read
Chace,1936, p.29; Calman, 1939, p.189; Chace, 1940, p.181

PLATE I

FIG. 1. — *Pasiphaea hoplocerca*. Female No. 9922. × 1.38.

FIG. 2. — *Pasiphaea multidentata*. Male No. 10277. × 0.59.

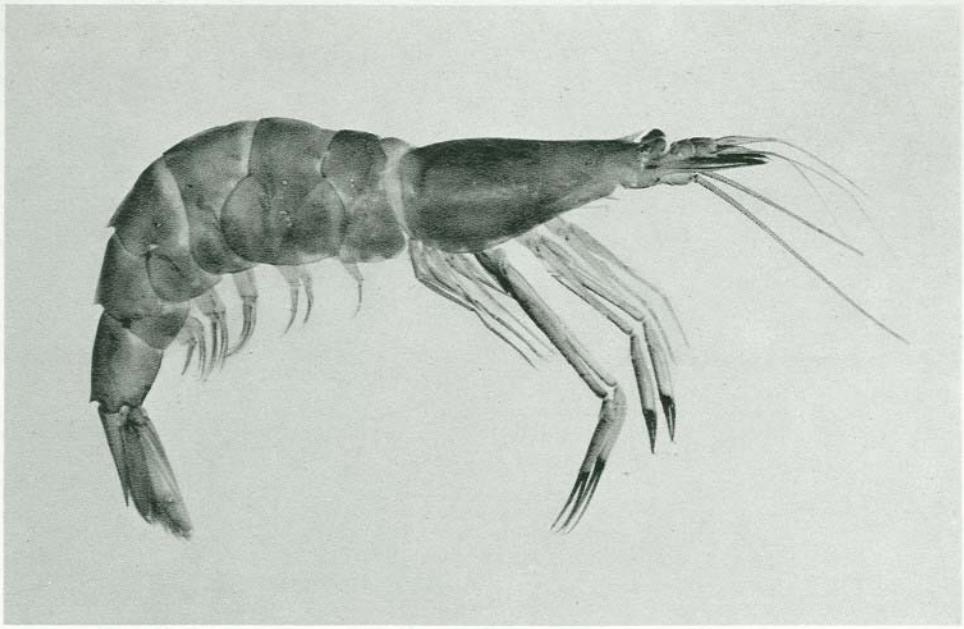

Fig. 1

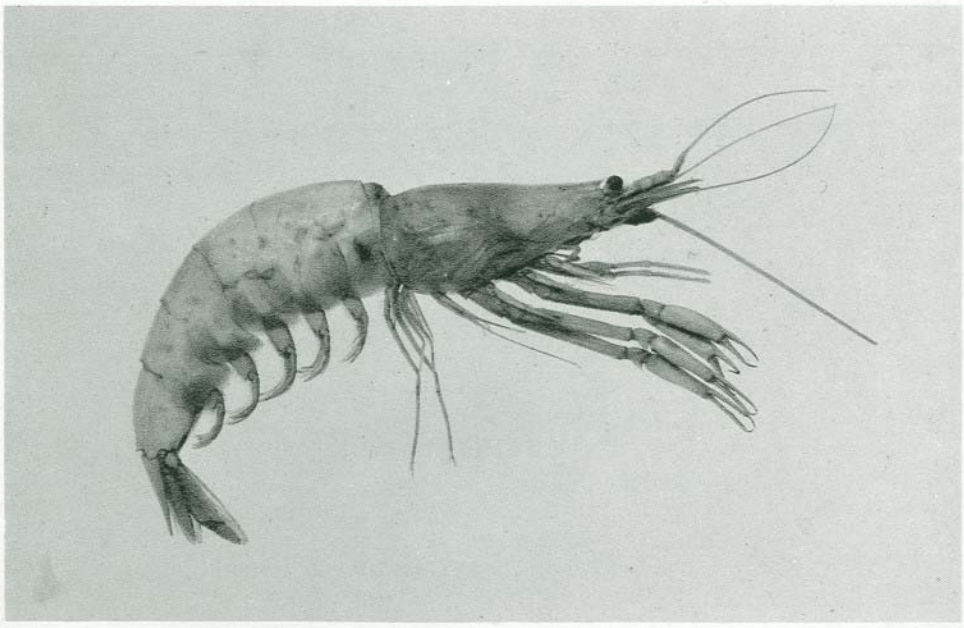

Fig. 2

PLATE II

FIG. 1. — *Acanthephyra curtirostris*. Female No. 8087. × 1.48.
FIG. 2. — *Systellaspis cristata*. Female No. 8643. × 2.07.

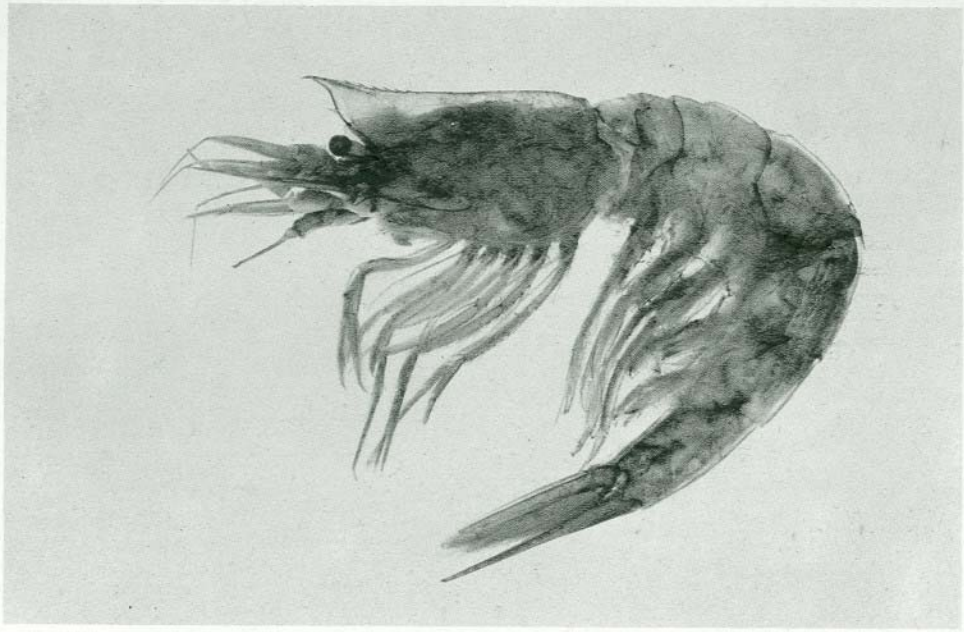

Fig: 1

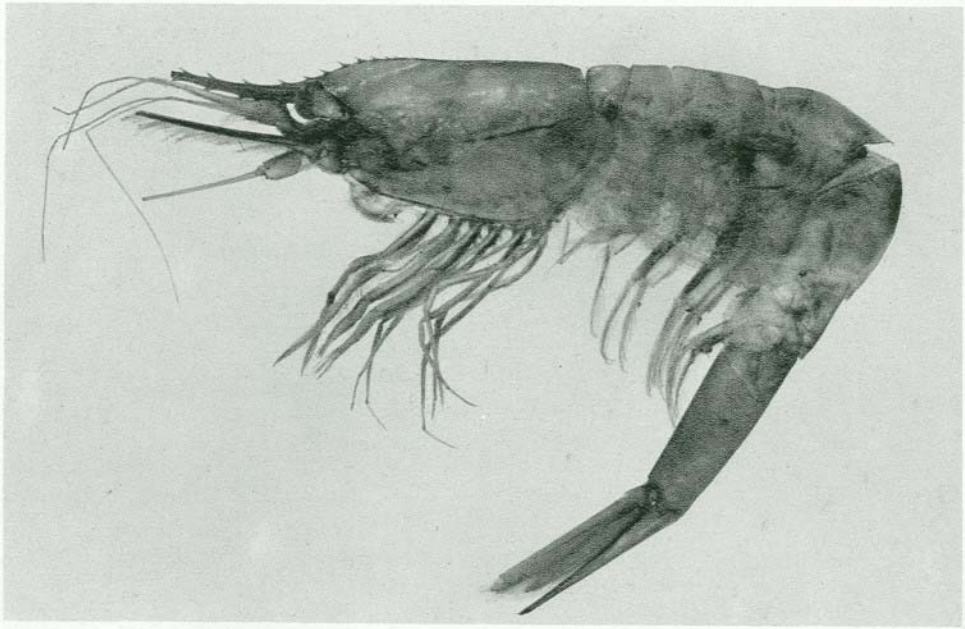

Fig. 2

PLATE III

FIG. 1. — *Ephyrina hoskynii*. Female No. 9908. × 1.44.

FIG. 2. — *Heterocarpus ensifer*. Ovigerous female No. 12111. × nearly 1.14.

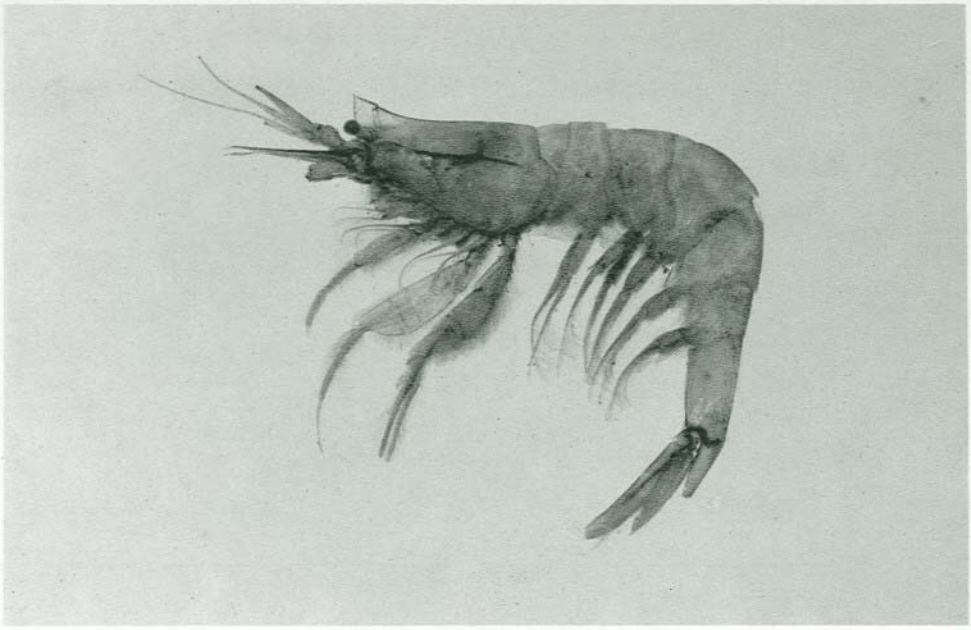

Fig. 1

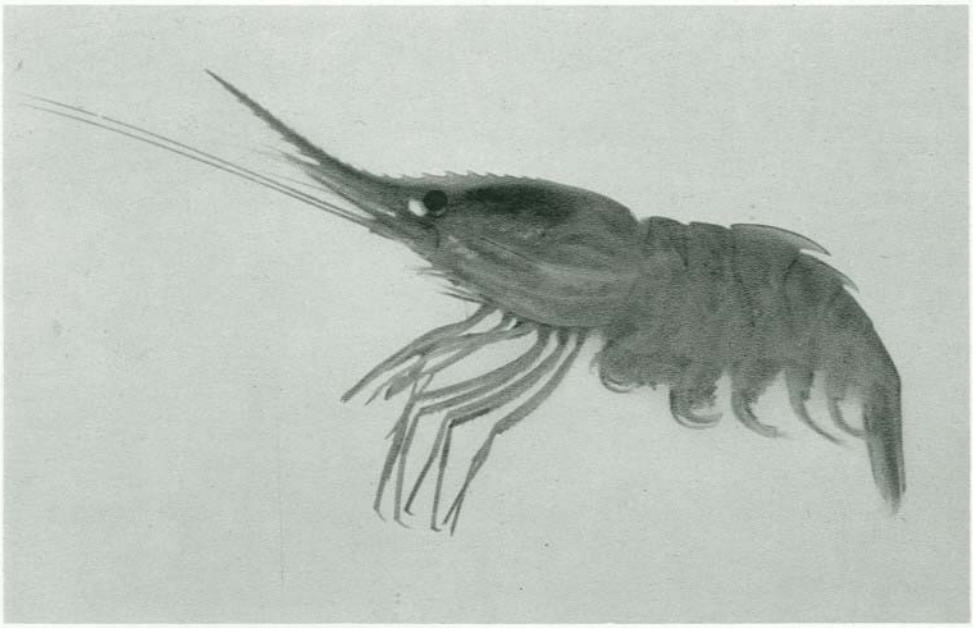

Fig. 2

PLATE IV

FIG. 1. — *Heterocarpus laevigatus*. Male No. 4546. Slightly enlarged.

FIG. 2. — *Heterocarpus grimaldii*. Ovigerous female. *Michael Sars* specimen examined by the author. Slightly reduced.

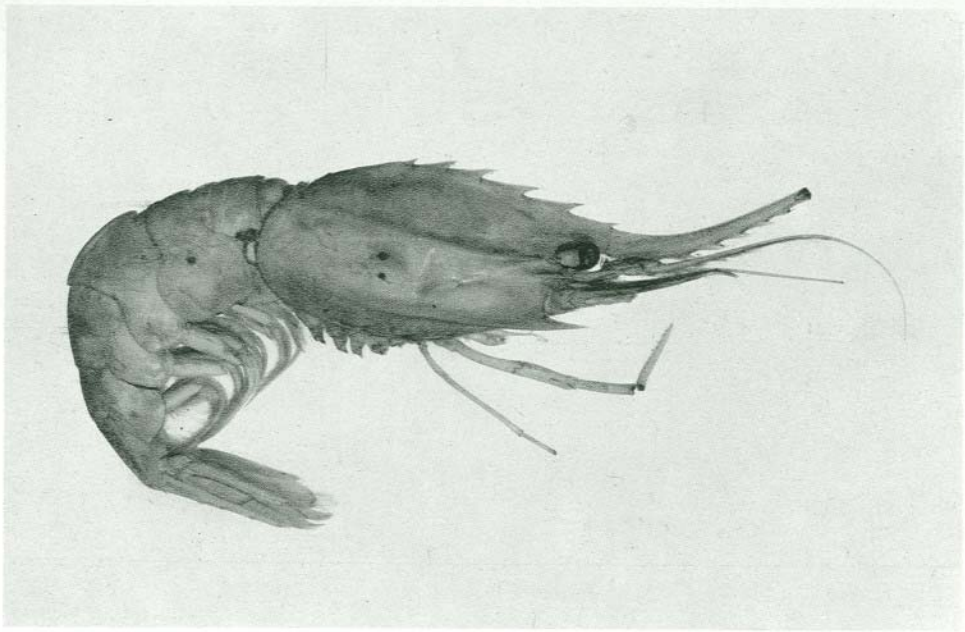

Fig. 1

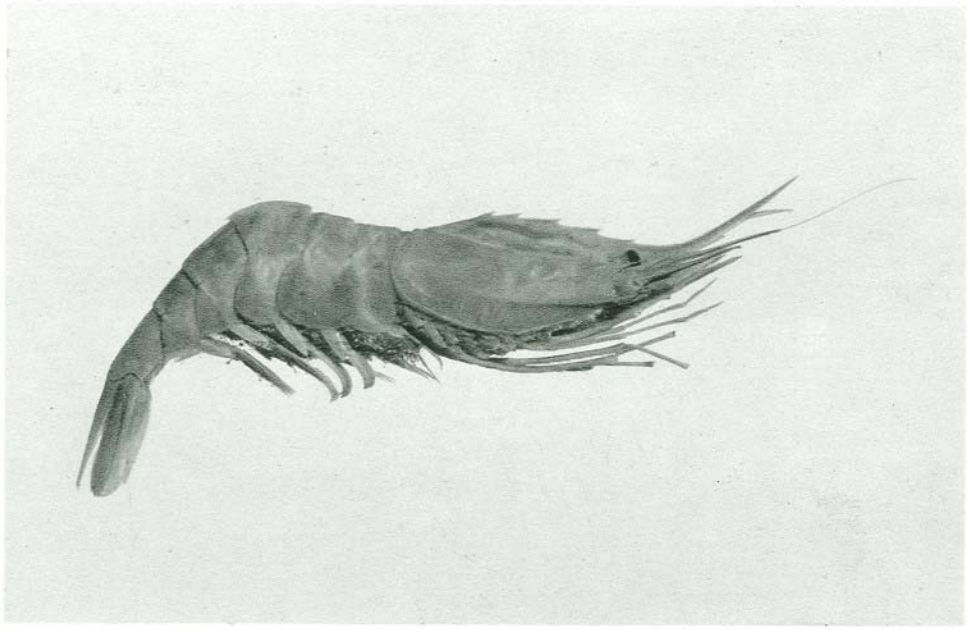

Fig. 2