REPORT ON THE SCIENTIFIC RESULTS OF THE "MICHAEL SARS" NORTH ATLANT. DEEP-SEA EXPED. 1910
CARRIED OUT UNDER THE AUSPICES OF THE NORWEGIAN GOVERNMENT AND THE SUPERINTENDENCE OF
SIR JOHN MURRAY, K. C. B. and DR. JOHAN HJORT

CRUSTACEA DECAPODA

(THE PENAEIDEA AND STENOPODIDEA EXCEPTED)

BY

E. SIVERTSEN

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INTRODUCTION

The study of all of the Decapod Crustacea collected during the 1910 «Michael Sars» Expedition originally was entrusted to the Norwegian carcinologist OSCAR SUND. SUND (1920a) published a report on the Penaeids and Stenopodids of this collection, but did not finish his study on the rest of the material. A large part of the latter had already been identified by SUND when in January 1916 a fire in his office destroyed almost all of his notes concerning these specimens. After this catastrophe SUND at several occasions took up again the study of the material, but because of the pressure of his work on fishery investigations, he could not find the opportunity to finish his «Michael Sars» studies. At the time of his death in 1943 he only left a few notes and several figures of his material. The larger part of this material, however, was provided with his identification labels, so that, when the present authors were invited by the «Michael Sars» Committee to finish SUND's work on this collection, they found already a large part of the fundamental work done by their predecessor.

Some of the results of SUND's study of the Decapoda of the 1910 «Michael Sars» Expedition, which never have been published by SUND himself, have been incorporated by MURRAY & HJORT (1912) in their book «The Depths of the Ocean».

All of the extant material dealt with in the present paper has been examined by us; we checked all of SUND's identifications, so that we are responsible for the names used in this report. However, some of the material listed in SUND's notes got lost before we took over the job; where this seemed useful we have mentioned such material in the present report, always indicating that it was not examined by us.

Due to the long time that has elapsed since SUND started his study, many of the species which he considered to be new to science, in the mean time have been described by other authors. Only one of these species proved still to be undescribed and we therefore take a great pleasure in naming it for OSCAR SUND, who did so much work on the present collection without having had the satisfaction of ever seeing a report on it finished.

The larval stages of Decapod Crustacea collected by the «Michael Sars» Expedition (with the exception of those of *Polybius*) are not dealt with in the present paper.

The abbreviation cl. has been used for carapace length. Where this abbreviation is not employed, the length indicated is the total length.

The material is kept in the Zoological Museum, Bergen, duplicates are in the Rijksmuseum van Natuurlijke Historie, Leiden.

To end this introduction we give here a short biographical sketch of OSCAR SUND.

OSCAR SUND

1884 — 1943

OSCAR SUND was born April 19th, 1884 in Gildeskål, Norway. For 35 years he worked in the service of the Norwegian Fishery Investigations (Fiskeridirektoratet). The fisheries formed a field in which SUND was thoroughly interested, not in the least since it gave him the opportunity of living close to the sea and to study the richness of the animal life along the very extensive Norwegian coast. SUND was a highly gifted personality with a versatility of interests, which is clearly reflected in his scientific work. It is self-evident that his main activity falls within the field of fishery investigations. In many ways he was a pioneer there, introducing new methods for the determination of the phosphate and nitrate contents of sea-water, and finding new ways for studying the recruitment of the stock of cod. Furthermore he directed the attention to the echo-sounder as an efficient instrument to locate shoals of fish, and introduced its use for the important cod fisheries in the region of the Lofoten Islands.

SUND's list of publications consists of 64 items,

most of which are shorter papers and reports. Among his more voluminous publications on fisheries we may mention his (1938) «Die Norwegische Seefischerei» in «Handbuch der Seefischerei Nordeuropas» (vol. 8 pt. 1A, pp. 1—181) and his (1942) «Skårungen» (pp. 1—249), a very compact and instructive fisheries handbook intended for the use by Norwegian fishermen.

In the earlier years of his scientific career SUND published four papers on Decapod Crustacea. The first of these appeared in 1913 and contains a revision of the genus *Pasiphaea* from the North Atlantic; during a long period this paper has been accepted as fundamental for the systematics of that group. In 1915 a short paper on the relation between the genera *Polycheles* and *Eryoneicus* was published by SUND; in it he clearly showed that *Eryoneicus* is nothing but the larval stage of *Polycheles*. His «ingenious argument on the Eryonicus-Polycheles question», as Rev. THOMAS R. R. STEBBING called it in a letter to SUND, soon convinced other carcinologists, and at present SUND's opinion is shared by all workers in the field. In 1920 SUND made public the results of his reexamination of the Eryonidea of the «Challenger» Expedition, a collection which was badly in need of a revision. In the same year SUND published the first part of the report on the «Michael Sars» Decapod Crustaceans, dealing with the Penaeidea and Stenopodidea (named Peneides and Stenopides by SUND), an important paper which is a valuable contribution to our knowledge of the North Atlantic representatives of these two groups.

OSCAR SUND died as a victim of the second World War. In October 1943, when he returned from fishery investigations in northern Norway, the ship on which he made his home voyage was sunk.

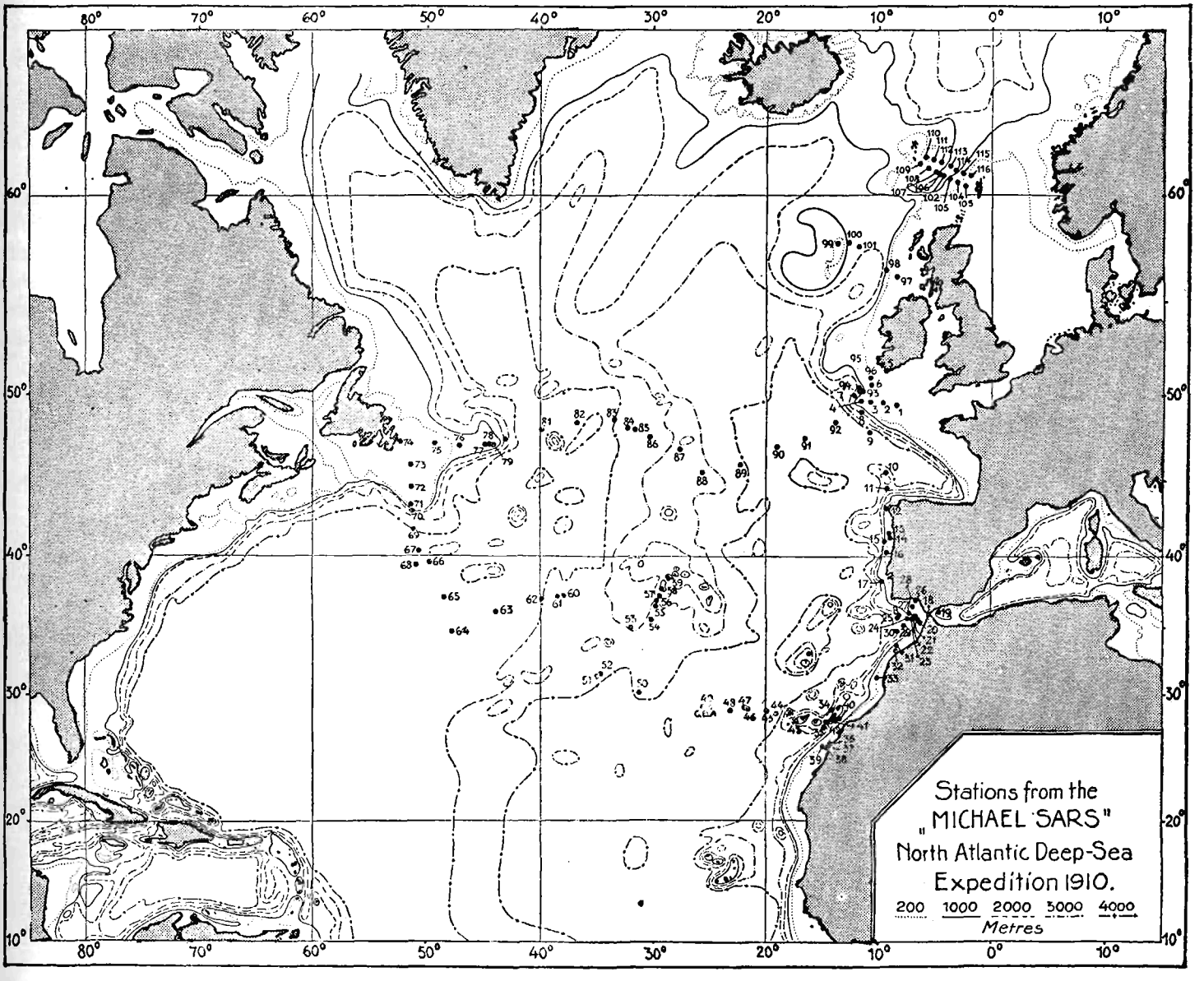

Fig. 1. Stations from the «Michael Sars» North Atlantic Deep-Sea Expedition 1910.

DECAPODA MACRURA

Oplophoridae

Acanthephyra brevirostris SMITH

Acanthephyra brevirostris SMITH, 1885, Proc. U. S. Nat. Mus., vol. 7, p. 504.

Station 63, west of the Azores, 36° 5′ N, 43° 58′ W, depth 1500—4500 m, June 22, 1910. 1 specimen, cl. 11 mm.

The specimen is somewhat damaged, but agrees well with the descriptions and figures given in literature, so that we do not entertain any doubt as to its identity.

Distribution. The species has been reported from several localities off the Atlantic coast of the U.S.A. between 37° and 39.5° N, from Bermuda, the Bahamas, from off Portugal, West Africa, the S.W. Indian Ocean and from off Ecuador. It has been found in depths between 1200 and 5300 m.

Acanthephyra stylorostratis (BATE)

Bentheocaris stylorostratis BATE, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 726, pl. 123 fig. 4.

Station 45, west of the Canary Islands, 28° 42′ N, 20° 0′ W, depth 1000 m, May 28 and 29, 1910. 7 specimens (3 ovigerous females, cl. 14 to 15 mm), cl. 5 to 15 mm; the same, depth 1500 m. 8 specimens, cl. 7 to 16 mm.

Station 49, west of the Canary Islands, 29° 8′ N, 25° 16′ W, depth 1000 m, June 1, 1910. 7 specimens (1 ovigerous female, cl. 14 mm), cl. 3 to 14 mm.

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 1000 m, June 5 and 6, 1910. 13 specimens, cl. 5 to 13 mm; the same, depth 2000 m. 1 specimen, cl. 13.5 mm (not seen).

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 1300 m, June 8 and 9, 1910. 2 specimens, cl. 5 and 12 mm.

The specimens agree excellently with CHACE's (1940, p. 144, fig. 22) description and figure of this species.

Distribution. *Acanthephyra stylorostratis* has a rather wide distribution. In the Atlantic Ocean it has been found off New Jersey (U.S.A.), near Bermuda, the Bahamas, Madeira, the Canary and the Cape Verde Islands. Furthermore it has been reported from S. Africa and probably occurs also near the Tuamotu Islands. It is known from depths varying between 1000 and 5000 m.

Acanthephyra microphthalma SMITH

Acanthephyra microphthalma SMITH, 1885, Proc. U.S. Nat. Mus., vol. 7, p. 502.

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 2000 m, June 5 and 6, 1910. 2 specimens, cl. 5 and 9 mm.

The two specimens, though in a poor condition, leave not the least doubt as to their identity; they agree perfectly with the descriptions and figures given in the literature.

ALCOCK (1902, p. 155) mentions a species with the name *Acanthephyra microps*. Since we could find no other reference to such a species, it seems most probable that the name *microps* is a lapsus for *microphthalma*.

Distribution. The species has been reported from the east coast of the U.S.A. between 36° and 37.5° N, from off Portugal, from the Bay of Bengal, the Celebes Sea and from the southern Pacific Ocean. It has been found at depths between 2000 and 4700 m.

Acanthephyra eximia SMITH

Acanthephyra eximia SMITH, 1884, Rep. U. S. Fish Comm., vol. 10, p. 377 (*eximea* on p. 376).

Acanthephyra brachytelsonis BATE, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 753, pl. 126 fig. 7.

Station 24, west of Gibraltar, 35° 34′ N, 7° 35′ W, depth 1615 m, May 6 and 7, 1910. 2 specimens (1 ovigerous female, cl. 40 mm), cl. 30 and 40 mm.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1500 m, June 24, 1910. 1 juvenile, cl. 9 mm.

The rostrum of the smaller specimen from Station 24, a male, is somewhat more curved upwards than that of the holotype figures by CHACE (1940, p. 148). There are five teeth on the upper margin and two on the lower. In the ovigerous female the rostrum is comparatively much shorter, it does not possess the slender curved anterior part that is typical for the males. Even so the number of rostral teeth is larger in the female than in the male, being six

on the upper, three on the lower margin. Our ovigerous female thereby shows a strong resemblance, as far as the shape of the rostrum is concerned, to the specimen of *A. eximia brachytelsonis* figured by BALSS (1925, p. 258, fig. 28). As CHACE (1940) pointed out the variety *brachytelsonis* cannot be kept separate from the typical *A. eximia.*

The juvenile specimen collected by the «Michael Sars» Expedition has the rostrum very much like that of the holotype, with seven dorsal and four ventral teeth.

Distribution. The species has been recorded from the Western Atlantic (off North Carolina, Bermuda, Bahamas, off Brazil, N. of the Falkland Islands) and from throughout the Indo-West Pacific region (from the Arabian Sea and S. Africa to Japan, Polynesia and the Kermadec Islands). It has been found at depths between 360 and 3700 m.

Acanthephyra gracilipes CHACE

Acanthephyra gracilipes CHACE, 1940, Zoologica, New York, vol. 25, p. 149, figs. 26, 27.

Station 45, west of the Canary Islands, 28° 42′ N, 20° 0′ W, depth 1500 m, May 28 and 29, 1910. 3 specimens, cl. 8 to 13 mm.

Station 49, west of the Canary Islands, 29° 8′ N, 25° 16′ W, depth 1000 m, June 1, 1910. 2 specimens, cl. 4.5 to 5 mm; the same, depth 1500 m. 2 specimens, cl. 13 and 14 mm.

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 1500 m, June 5 and 6, 1910. 1 specimen, cl. 12 mm; the same, depth 2000 m. 3 specimens, cl. 9 to 14 mm.

CHACE (1940) states that the tip of the telson is missing in the type specimen. The same is true for all our specimens but the largest from Station 45. In this specimen the tip of the telson reaches about to the end of the exopod of the uropods; it is sulcate dorsally, armed with three pairs of small lateral spines and terminates in a central point which at each side is flanked by two spines. The outermost of the latter spines being the larger.

In the specimens at hand the rostral formula was found to be 7/1, 7/0, 6/0 (three times), 5/1, 5/0 (twice), and 4/0 respectively. In CHACE's type this formula is 6/0. The formula of the species thus becomes 7—4/1—0.

The specimens from stations 49 (1500 m depth) and 51 are in a very poor condition, having been dried out. Nevertheless their identity could be made out with reasonable certainty.

Distribution. The only previous record of this species is that by CHACE (1940) who reported it from near Bermuda, at about 32°12′ N, 64°36′W, from a depth of 1800 m.

Acanthephyra purpurea A. MILNE EDWARDS (figs. 2—6)

Acanthephyra purpurea A. MILNE EDWARDS, 1881, C. R. Acad. Sci. Paris, vol. 43, p. 933.

Acanthephyra purpurea MURRAY & HJORT, 1912, Depths of the Ocean, pp. 585, 622, 668, 720, pl. 3 fig. 2, textfig. 475.

Station 10, Bay of Biscay, 45° 26′ N, 9° 20′ W, depth 785, m April 19 to 21, 1910. 2 specimens, cl. 18 and 20.5 mm.

Station 15, off Portugal, 40° 56′ N, 9° 28′ W, depth 300 m, April 22 and 23, 1910. 1 specimen, cl. 11 mm.

Station 23, west of Gibraltar, 35° 32′ N, 7° 7′ W, depth 100 m, May 5 and 6, 1910. 6 specimens, cl. 8 to 12 mm; the same, depth 200 m. 93 specimens (18 ovigerous females, cl. 11.5 to 18 mm), cl. 4 to 18 mm; the same, depth 0—500 m. 3 specimens (2 ovigerous females, cl. 12 and 15 mm), cl. 9 to 15 mm; the same, depth 1215 m. 10 specimens (2 ovigerous females, cl. 13 and 14.5 mm), cl. 10 to 18 mm.

Station 25, west of Gibraltar, 35° 36′ N, 8° 25′ W, depth 1300 m, May 7, 1910. 1 specimen, cl. 17.5 mm.

Station 29, west of Gibraltar, 35° 10′ N, 7° 55′ W, depth 200 m, May 9 and 10, 1910. 4 specimens, cl. 7 to 11 mm; the same, depth 1000 m. 2 specimens, cl. 6 and 12 mm.

Station 34, near the Canary Islands, 28° 52′ N, 14° 16′ W, depth 200 m, May 13 and 14, 1910. 18 specimens (10 ovigerous females, cl. 13 to 17 mm), cl. 5.5 to 17 mm (not seen); the same, depth 300 m. 2 specimens, cl. 3 and 5 mm; the same, depth 500 m. 3 specimens, cl. 3.5 mm.

Station 35, near the Canary Islands, 27° 27′ N, 14° 52′ W, depth 0—2900 m, May 18 and 19, 1910. 1 specimen, cl. 10 mm; the same, depth 2100 m. 1 specimen, cl. 6 mm.

Station 42, near the Canary Islands, 28° 2′ N, 14° 17′ W, depth 250 m, May 23 and 24, 1910. 3 specimens, cl. 5.5 to 15 mm; the same, depth 450 m. 10 specimens (1 ovigerous female, cl. 17 mm), cl. 3 to 18 mm.

Station 45, west of the Canary Islands, 28° 42′ N, 20° 0′ W, depth 500 m, May 28 and 29, 1910. 3 specimens, cl. 3 to 15 mm; the same, depth 1000 m. 9 specimens (1 ovigerous female, cl. 13 mm), cl. 2.5 to 14.5 mm; the same, depth 1500 m. 9 specimens, cl. 9 to 16 mm.

Station 47, west of the Canary Islands, 29° 2′ N, 22° 53′ W, depth 3400 m, May 30, 1910. 1 specimen, cl. 4 mm.

Station 49 B, west of the Canary Islands, 29° 8′ N, 25° 16′ W, depth 1000 m, June 1, 1910. 9 specimens, cl. 2.5 to 15 mm; the same, depth 1500 m. 4 specimens, cl. 10 to 17 mm.

Station 49 C, west of the Canary Islands, 29° 7′ N, 25° 32′ W, depth 0—1000 m, June 1 and 2, 1910. 4 specimens (1 ovigerous female, cl. 14 mm), cl. 12.5 to 19 mm.

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 150 m, June 5 and 6, 1910. 5 specimens, cl. 9 to 13 mm; the same, depth 350 m. 3 specimens, cl. 5 to 10 mm; the same, depth 1000 m. 5 specimens, cl. 4.5 to 14.5 mm; the same, depth 1500 m. 3 specimens, cl. 10 to 13.5 mm; the same, depth 2000 m. 8 specimens (1 ovigerous female, cl. 12.5 mm), cl. 9 to 15 mm.

Station 52, S.W. of the Azores, 31° 24′ N, 34° 47′ W, depth 300 m, June 6 and 7, 1910. 2 ovigerous females, cl. 15.5 and 19.5 mm; the same, depth 600 m. 89 specimens (2 ovigerous females, cl. 13 and 14 mm), cl. 9 to 18 mm.

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 50 m, June 8 and 9, 1910. 8 specimens, cl. 2 to 3 mm (not seen); the same, depth 100 m. 3 specimens (1 ovigerous female, cl. 15 mm), cl. 8 to 15 mm; the same, depth 150 m. 14 specimens (3 ovigerous females, cl. 14 to 15 mm), cl. 8 to 15 mm; the same, depth 300 m. 22 specimens (4 ovigerous females, cl. 14 to 17 mm), cl. 3 to 17 mm; the same, depth 800 m. 8 specimens, cl. 2.5 to 4.5 mm; the same, depth 1300 m. 12 specimens (1 ovigerous female, cl. 13.5 mm), cl. 4 to 15 mm.

Station 56, near the Azores, 36° 53′ N, 29° 47′ W, depth 100 m, June 10 and 11, 1910. 5 specimens, cl. 7 to 12 mm; the same,

depth 150 m. 11 specimens, cl. 5 to 12 mm; the same, depth 375 m. 2 specimens, cl. 3 and 5 mm; the same, depth 500 m. 9 specimens, cl. 2.5 to 17.5 mm; the same, depth 1000 m. 2 specimens, cl. 7 and 19 mm; the same, depth 1500 m. 8 specimens (2 ovigerous females, cl. 14 and 14.5 mm), cl. 4 to 17 mm.

Station 58, near the Azores, 37° 11′ N—37° 42′ N, 29° 18′ W —29° 31′ W, depth 150 m, June 11 to 13,1910. 2 specimens, cl. 12 and 13.5 mm; the same, depth 300 m. 9 specimens (4 ovigerous females, cl. 14 to 17.5 mm), cl. 12 to 17.5 mm.

Station 62, west of the Azores, 36° 52′ N, 39° 55′ W, depth 150 m, June 20 and 21, 1910. 2 specimens (1 ovigerous female, cl. 12 mm), cl. 9 and 12 mm; the same, depth 300 m. 6 specimens, cl. 8 to 15 mm; the same, depth 500 m. 16 specimens (1 ovigerous female, cl. 15 mm), cl. 1.5 to 19 mm; the same, depth 1000 m. 7 specimens (1 ovigerous female, cl. 16.5 mm), cl. 7 to 17.5 mm; the same, depth 1250 m. 1 ovigerous female, cl. 16 mm; the same depth 1500 m. 5 specimens (2 ovigerous females, cl. 13 and 14.5 mm), cl. 8 to 19.5 mm.

Station 63, west of the Azores, 36° 5′ N, 43° 58′ W, depth 450 —1350 m, June 22, 1910. 34 specimens (2 ovigerous females, cl. 15 and 16 mm), cl. 6 to 17 mm.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1000 m, June 24, 1910. 42 specimens (6 ovigerous females, cl. 12 to 18 mm), cl. 3.5 to 18 mm; the same, depth 1250 m. 3 specimens, cl. 3 to 4 mm; the same, depth 1500 m. 6 specimens, cl. 8 to 16.5 mm.

Station 67, S.E. of Newfoundland, 40° 17′ N, 50° 39′ W, depth 600 m, June 27, 1910. 44 specimens, cl. 1.5 to 12 mm.

Station 69, S.E. of Newfoundland, 41° 39′ N, 51° 4′ W, depth 150 m, June 29, 1910. 1 specimen.

Station 70, S.E. of Newfoundland, 42° 59′ N, 51° 15′ W, depth 850 m, June 30, 1910. 2 specimens (not seen).

Station 81, east of Newfoundland, 48° 2′ N, 39° 55′ W, depth 500 m, July 12, 1910. 1 specimen, cl. 14 mm (not seen); the same, depth 1250 m. 1 specimen, cl. 12 mm (not seen); the same, depth 1500 m. 1 specimen, cl. 9 mm (not seen).

Station 82, N.W. of the Azores, 48° 24′ N, 36° 53′ W, depth 500 m, July 13, 1910. 16 specimens (1 ovigerous female, cl. 17 mm), cl. 5 to 18 mm; the same, depth 1000 m. 1 ovigerous female, cl. 16 mm.

Station 84, north of the Azores, 48° 4′ N, 32° 25′ W, depth 500 m, July 15, 1910. 7 specimens, cl. 6 to 17 mm (not seen); the same, depth 750 m. 2 specimens (1 ovigerous female, cl. 16 mm), cl. 8.5 and 16 mm; the same, depth 1500 m. 2 specimens, cl. 16 and 18 mm.

Station 87, north of the Azores, 46° 48′ N, 27° 46′ W, depth 750 m, July 17, 1910. 1 specimen.

Station 88, north of the Azores, 45° 26′ N, 25° 45′ W, depth 100 m, July 18, 1910. 1 specimen, cl. 9 mm; the same, depth 500 m. 10 specimens (1 ovigerous female, cl. 18 mm), cl. 18 to 21 mm.

Station 90, N.E. of the Azores, 46° 58′ N, 19° 6′ W, depth 500 m, July 21, 1910. 16 specimens (2 ovigerous females, cl. 17 and 18 mm), cl. 13 to 22 mm.

Station 98, off the Hebrides, 56° 33′ N, 9° 30′ W, depth 500 m, August 5, 1910. 1 specimen, cl. 17 mm.

Station 101, off the Hebrides, 57° 41′ N, 11° 48′ W, depth 1000 m, August 6 and 7, 1910. 1 specimen, cl. 19 mm.

Small specimens of this species are hard to distinguish from small specimens of the next. The identity of juveniles with a carapace length of less than 5 mm, therefore, is not certain. In such specimens the dorsal spines of the telson generally are not yet developed.

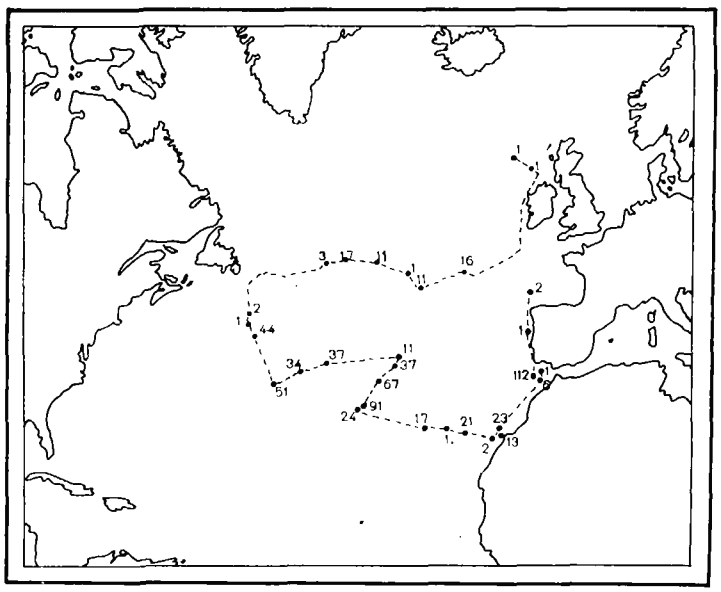

Fig. 2. Geographical distribution of *Acanthephyra purpurea* A. MILNE EDWARDS collected by the 1910 «Michael Sars» Expedition. The figures indicate the number of specimens caught at the various stations.

In a few specimens the fourth abdominal segment is provided with a median posterior spine. One specimen possessed only three dorsal pairs of spines on the telson.

Until recently most authors did not distinguish between the present and the next species. KEMP (1939, p. 576) finally showed convincingly that we have to do here with two valid and distinct species. A discussion of various aspects of the biology of the present form is given in the text dealing with *A. pelagica*.

Distribution. *Acanthephyra purpurea* is known to inhabit the North Atlantic, roughly between 20° and 53° N. latitude, it does not occur in the Mediterranean.

Acanthephyra pelagica (RISSO) (figs. 3—7)

Alpheus Pelagicus RISSO, 1816, Hist. nat. Crust. Nice, p. 91, pl. 2 fig. 7.

Pandalus pelagicus RISSO, 1826, Hist. nat. Europ. mérid., vol. 5 p. 79, pl. 2 fig. 5.

Ephyra pelagica ROUX, 1831, Mém. Class. Crust. Salic., p. 24.

Ephyra Haeckelii VON MARTENS, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 51, pl. 1 fig. 7.

Miersia pelagica KINGSLEY, 1880, Proc. Acad. nat. Sci. Phila., 1879, p. 416.

Acanthephyra sica BATE, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 739, pl. 125 fig. 7.

Acanthephyra Agassizii mediterranea RIGGIO, 1900, Monit. zool. Ital., vol. 11 suppl., p. 20.

Acanthephyra rectirostris RIGGIO, 1900, Monit. zool. Ital., vol. 11 suppl., p. 20.

Acanthephyra purpurea multispina COUTIÈRE, 1905, Bull. Mus. océanogr. Monaco, no. 48, p. 10.

Acanthephyra parva multidens COUTIÈRE, 1905, Bull. Mus. océanogr. Monaco, no. 48, p. 16, fig. 5 no. 1, 2.
Acanthephyra multispina MURRAY & HJORT, 1912, Depths of the Ocean, pp. 585, 622, 668, 720, pl. 3 fig. 1, textfig. 475.
Acanthephyra haeckeli KEMP, 1939, Ann. Mag. nat. Hist., ser. 11 vol. 4, p. 575.
Acanthephyra pelagica HOLTHUIS, 1947, Zool. Meded. Leiden, vol. 27, p. 315.

Station 10, Bay of Biscay, 45° 26′ N, 9° 20′ W, depth 150 m, April 19—21, 1910. 1 specimen, cl. 11 mm; the same, depth 785 m. 17 specimens (1 ovigerous female, cl. 17 mm), cl. 5 to 19 mm.

Station 23, west of Gibraltar, 35° 32′ N, 7° 7′ W, depth 1215 m, May 5 and 6, 1910. 1 specimen, cl. 7 mm.

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 800 m, June 8 and 9, 1910. 4 specimens, cl. 3 to 9 mm; the same, depth 1300 m. 4 specimens, cl. 6 to 14 mm.

Station 56, near the Azores, 36° 53′ N, 29° 47′ W, depth 500 m, June 10 and 11, 1910. 1 specimen, cl. 10 mm; the same, depth 1000 m. 3 specimens, cl. 7 to 19 mm; the same, depth 1500 m. 7 specimens, cl. 6 to 13 mm.

Station 62, west of the Azores, 36° 52′ N, 39° 55′ W, depth 1000 m, June 20 and 21, 1910. 5 specimens, cl. 6.5 to 19 mm; the same, depth 1500 m. 4 specimens, cl. 20 to 26 mm.

Station 63, west of the Azores, 36° 5′ N, 43° 58′ W, depth 450—1350 m, June 22, 1910. 3 specimens, cl. 15 to 24 mm; the same, depth 1500—4500 m. 5 specimens, cl. 15 to 23 mm.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1000 m, June 24, 1910. 4 specimens, cl. 6 to 9 mm; the same, depth 1250 m. 1 specimen, cl. 6 mm; the same, depth 1500 m. 21 specimens, cl. 19 to 27 mm.

Station 66, S.E. of Newfoundland, 39° 30′ N, 49° 42′ W, depth 750 m, June 26, 1910. 5 specimens, cl. 6.5 to 23 mm.

Station 67, S.E. of Newfoundland, 40° 17′ N, 50° 39′ W, depth 600 m, June 27, 1910. 2 specimens, cl. 2.5 and 3 mm; the same, depth 1100 m. 11 specimens, cl. 11 to 24 mm.

Station 70, S.E. of Newfoundland, 42° 59′ N, 51° 15′ W, depth 850 m, June 30, 1910. 2 specimens, cl. 5 and 12 mm.

Station 80, east of Newfoundland, 47° 34′ N, 43° 11′ W, depth 1000, 1250, and 1500 m, July 11, 1910. 51 specimens, (4 ovigerous females, cl. 19 to 23 mm), cl. 7 to 24 mm.

Station 81, east of Newfoundland, 48° 2′ N, 39° 55′ W, depth 500 m, July 12, 1910. 1 specimen, cl. 14 mm; the same, depth 750 m. 1 specimen, cl. 22 mm; the same, depth 1000 m. 1 specimen, cl. 23 mm; the same, depth 1250 m. 1 specimen, cl. 12 mm; the same, depth 1500 m. 16 specimens, cl. 9 to 25 mm.

Station 82, N.W. of the Azores, 48° 24′ N, 36° 53′ W, depth 1000 m, July 13, 1910. 8 specimens, cl. 6 to 26 mm; the same, depth 1250 m. 1 specimen, cl. 7.5 mm; the same, depth 1500 m. 19 specimens, cl. 22 to 25 mm.

Station 84, north of the Azores, 48° 4′ N, 32° 25′ W, depth 1000 m, July 15, 1910. 6 specimens, cl. 11 to 22 mm; the same, depth 1250 m. 2 specimens, cl. 21 and 22 mm; the same, depth 1500 m. 3 specimens, cl. 10 to 21 mm.

Station 87, north of the Azores, 46° 48′ N, 27° 46′ W, depth 750 m, July 17, 1910. 1 specimen, cl. 6 mm; the same, depth 1000 m. 5 specimens, cl. 8 to 20 mm.

Station 88, north of the Azores, 45° 26′ N, 25° 45′ W, depth 500 m, July 18, 1910. 3 specimens, cl. 13 mm; the same, depth 750 m. 6 specimens, cl. 3 to 7 mm; the same, depth 1000 m. 13 specimens, cl. 5 to 23 mm.

Station 90, N.E. of the Azores, 46° 58′ N, 19° 6′ W, depth 500 m, July 21, 1910. 3 specimens, cl. 6 to 14 mm; the same, depth 750 m. 3 specimens cl. 3 to 6.5 mm; the same, depth 1000 m. 4 specimens, cl. 8 to 22 mm.

Station 92, S.W. of Ireland, 48° 29′ N, 13° 55′ W, depth 150 m, July 23 and 24, 1910. 2 specimens, cl. 6 and 8 mm; the same, depth 500 m. 8 specimens, cl. 6.5 to 15 mm; the same, depth 750 m. 6 specimens, cl. 6 to 8 mm; the same, depth 1000 m. 6 specimens, cl. 6.5 to 23 mm; the same, depth 1500 m. 7 specimens, cl. 8 to 23 mm.

Station 94, S.W. of Ireland, 50° 13′ N, 11° 23′ W, depth 1000 m, July 26, 1910. 1 specimen, cl. 22 mm.

Station 98, off the Hebrides, 56° 33′ N, 9° 30′ W, depth 500 m, August 5, 1910. 1 specimen, cl. 16 mm; the same, depth 750 m. 4 specimens, cl. 6 to 15 mm.

Station 101, off the Hebrides, 57° 41′ N, 11° 48′ W, depth 750 m, August 6 and 7, 1910. 2 specimens, cl. 6.5 and 8.5 mm; the same, depth 1000 m. 29 specimens, cl. 7 to 23 mm; the same, depth 1250 m. 15 specimens, cl. 7 to 22 mm.

Until 1905 *Acanthephyra purpurea* and *A. pelagica* were not recognized as two distinct species. It was COUTIÈRE (1905, p. 10), who first noted some differences between the two forms which induced him to describe the latter as a new variety *multispina* of the former. SUND, when studying the extensive material of the two species collected by the «Michael Sars» Expedition, came to the conclusion that the differences between the two forms are of a specific nature and he elevated COUTIÈRE's variety to the rank of a full species, *Acanthephyra multispina*. The result of SUND's investigations was first published in MURRAY & HJORT's (1912) «The Depths of the Ocean», a book which for a large part was based on the, often unpublished, results of the study of many of the specialists working on the «Michael Sars» collections.

In MURRAY & HJORT's book mention was made of the two species, but no reasons for their separation were given. That SUND's opinion is not the result of a rash conclusion, is shown by the notes left by him which contain a vast multitude of measurements that were made to indicate differences in dimensions and proportions of the two species in question. It is to be regretted that this part of SUND's work has never been published, as it would at once have proved the correctness of his conclusions, and would have made unnecessary the long period in which carcinologists did not agree about the taxonomic status of *Acanthephyra multispina*. Some of these authors, like STEPHENSEN (1923, p. 44) accepted SUND's point of view, but others like CHACE (1936, p. 27) did not consider the two forms to be specifically distinct. It was KEMP (1939) who, in his masterly revision of the «purpurea» group of the genus *Acanthephyra*, finally decided this question and showed that SUND's opinion is correct.

SUND used the specific name *multispina* COUTIÈRE for the species, KEMP (1939) showed that the name *haeckeli* VON MARTENS has priority over COUTIÈRE's name, while finally HOLTHUIS (1947) proved that the specific name

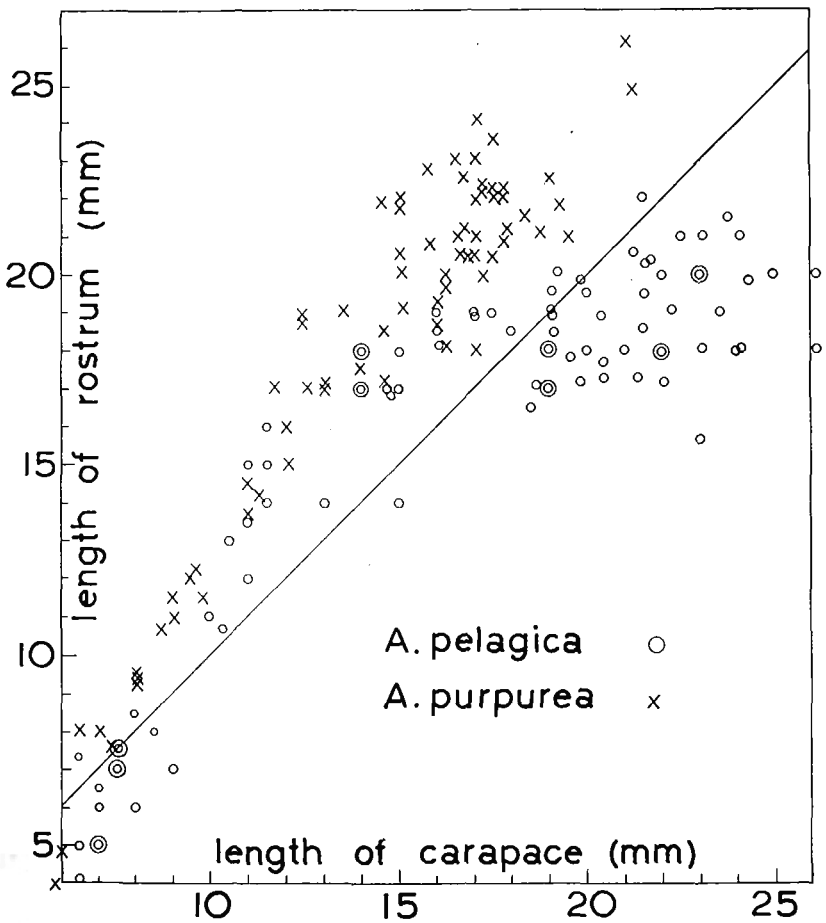

Fig. 3. Ratio between the carapace length and the length of the rostrum in *Acanthephyra purpurea* A. MILNE EDWARDS (Sta. 34 and 63) and *A. pelagica* (RISSO) (Sta. 64 and 101). The oblique line indicates the ratio equilibrium.

pelagica RISSO, being the oldest of all synonyms for this species, has to be used. The synonymy of the species is given above.

Among SUND's notes we found a graph showing the relation between the length of the rostrum and that of the carapace in both *A. purpurea* and *A. pelagica*, which distinctly shows that in the former species the rostrum is relatively longer than in the latter (fig. 3), a result also found by STEPHENSEN (1923) for his Atlantic material of the two species.

The vertical distribution of the «Michael Sars» material of *A. purpurea* and *A. pelagica* is shown in another graph compiled by SUND (fig. 4)[1]. As shown by this graph. *A. pelagica*, as far as specimens with a carapace length of 5 mm or more are concerned, is restricted to depths below 350 m. Further it is shown that the larger the specimens are the deeper they occur. At depths between 350 and 600 m only young specimens (cl. less than 17 mm) are met with, in the second layer (depth between 700 and 1300 m) there are about equal numbers of smaller (cl. less than 17 mm) and larger specimens (cl. 17 mm or more), while in the deepest hauls, from 1500 m down, the larger specimens are strongly dominating (119 large against 13 small specimens). In accordance with this vertical size-distribution of the species we find that females with eggs and males with spermatophores are restricted to depths below 700 m, and are most frequently found in the deeper parts, at about 1500 m.

In *A. purpurea* the picture of the vertical distribution is quite different. Here specimens are found in all depths, from near the surface down to more than 1500 m. Smaller and larger specimens, including females with eggs, occur at all depths, apparently being most common between 200 and 600 m.

It is interesting to compare the vertical distribution of *Acanthephyra purpurea* and *A. pelagica* collected by the «Michael Sars» with the data given by CHACE (1940, pp. 134—143) for the same two species in the waters near Bermuda. CHACE, who had the opportunity of studying a very large material of *A. purpurea* (4572 specimens), shows that in the Bermuda region the center of abundance of this species is at a depth of 900 to 1500 m. Most of the «Michael Sars» specimens, however, were found above 900 m, with a center of abundance at about 600 m. This discrepancy may partly be due to different physical conditions of the areas compared, or may be caused by diurnal migrations of the animals (see WELSH, CHACE & NUNNEMACHER, 1937, p. 190). According to CHACE all the Bermuda specimens were taken in the daytime, while more then half the number of specimens of the «Michael Sars» Expedition (242 out of 437) were caught at night. However, even in the daytime-hauls of the «Michael Sars» Expedition the bulk of the specimens (140 out of 195) were taken at depths of 500 m or less (MURRAY & HJORT, 1912, p. 668).

Turning to *A. pelagica* we find a corresponding difference in the vertical distribution. Around Bermuda the center of the adult population, according to CHACE (1940, pp. 142, 143), is found at about 1650 m, that of younger specimens between 1300 and 1650 m. In the «Michael Sars» material, however, the center of abundance of both populations is somewhat closer to the surface, lying at 1250 m for the adults and at 900 m for the young specimens (the calculations for these average depths are based upon 222 adult and 96 young specimens).

[1] In the original drawing SUND had included the small forms with a carapace length of less than 5 mm, which have also been mentioned in MURRAY & HJORT's (1912) fig. 575. Since we found it impossible to identify these small forms with certainty, we have excluded them from the present graph.

When discussing the vertical distribution of the two species in the «Michael Sars» collection, the actual number of specimens caught at various depths has been referred to. As during the cruise of the «Michael Sars» many different gears were used (young fish trawls, large nets and silk nets of various sizes and of varying degree of fishing power), the objection may be raised that, because of this difference in the fishing power of the gear used, the numbers of specimens collected at different depths might not give a correct picture of the actual abundance of the species at those depths. SUND, however, worked out a table for the fishing power of the gear used during the entire expedition at various depths. This table gives the values referred below for the fishing power of the gear used at the depth-intervals mentioned in figure 4.

As may be seen from the table, the gear used in the depth-interval 700—1300 m, where the center of abundance of *A. pelagica* was found, has a somewhat higher fishing power than that used in the deeper layers, but this difference is not large enough to actually change the picture of the vertical distribution that was obtained without taking the fishing power into account. On the other hand, at the two depth-intervals 175—300 m, and 350—600 m, where *A. purpurea* was most commonly met with, the gear had a considerably lower fishing power than at both the higher and lower depth-intervals. Therefore the abundance of *A. purpurea* at the depth-intervals 175—300 m and 350—600 m is even greater than is indicated by the number of specimens caught at these depths.

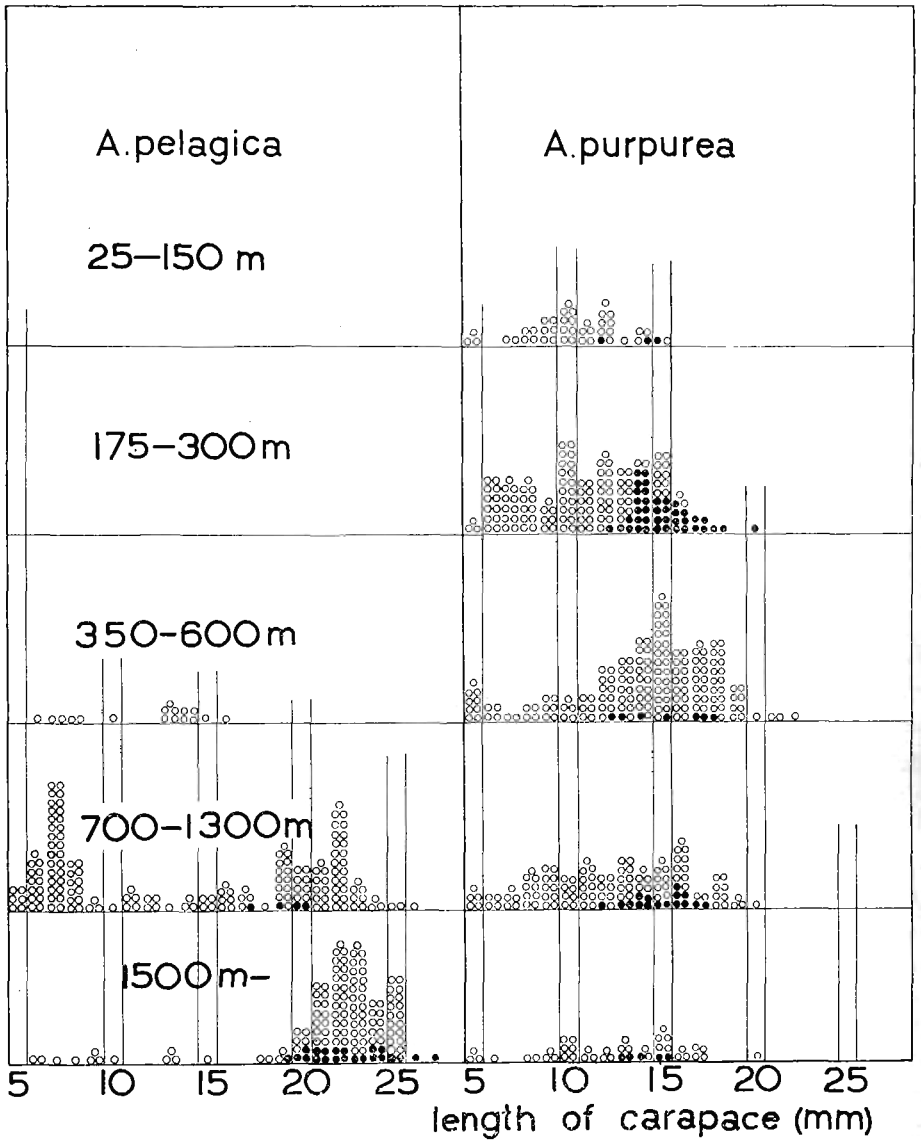

Fig. 4. Vertical distribution of *Acanthephyra purpurea* A. MILNE EDWARDS and *A. pelagica* (RISSO) collected by the 1910 «Michael Sars» Expedition. Each circle represents one specimen, a filled circle stands for an ovigerous female or a male with spermatophores.

Length of wire out	Calculated depth	Fishing power (= product of the size of the opening of the gear used and the length of the time of towing)
50—300 m	25—150 m	781
350—600 m	175—300 m	265
700—1200 m	350—600 m	327
1400—2600 m	700—1300 m	615
3000 m and more	1500 m and more	594

From the graph shown in fig. 5 it may be concluded that *A. purpurea* attains sexual maturity at a distinctly smaller size than *A. pelagica*. In our material we find ovigerous females of *A. purpurea* with the carapace as short as 12 mm, while the smallest of our ovigerous females of *A. pelagica* has a carapace length of not less than 17 mm. The average length of the carapace of the ovigerous females in *A. purpurea* is 14.1 mm, in *A. pelagica* 20.2 mm. Judging by the few observations at hand, both sexes in *A. pelagica* seem to grow to about the same size.

Figure 6 represents a fourth graph worked out by SUND, it shows certain differences in the life cycle of the two *Acanthephyra* species. As in fig. 4 (see footnote on p. 9) we have left out of account the specimens with a carapace

of less than 5 mm long, since a certain identification of these animals is not well possible. It is certain, however, that if these specimens were included, a distinct top would have been visible in both the curves before the 5 mm point. We now find that in *A. pelagica* the curve shows three maxima, namely at 7 mm, 13 mm, and 22 mm respectively. If we suppose these maxima to indicate age groups, then this would mean that *A. pelagica* attains sexual maturity in the third year of its life. In the case of *A. purpurea* the identification of true maxima is more complicated. There might, apart from the larval forms, be only one, or perhaps two maxima (at 10 mm and 15 mm respectively). The indistinctly marked maxima in the curve of this species might be due to the lack of any definite breeding period, which would check well with CHACE's (1940, p. 137) observations on specimens from the Bermuda region. However, our material is too small and moreover not sufficiently homogeneous to permit of any definite conclusion. It is hoped that other workers may be able to bring more light in this question. Our (or better SUND's) observations, however, may be regarded as a working hypothesis.

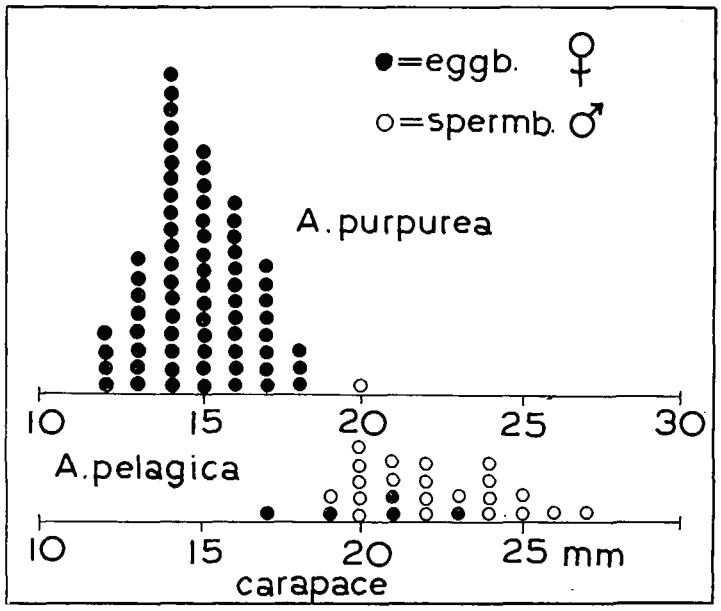

Fig. 5. Relation between size and sexual maturity in *Acanthephyra purpurea* A. MILNE EDWARDS and *A. pelagica* (RISSO) collected by the 1910 «Michael Sars» Expedition.

The age indications mentioned seem to be in accordance with the general rule that specimens from warmer waters show a more rapid growth and an earlier maturation than those from colder waters. In this connection it may be mentioned that the deep sea prawn, *Pandalus borealis* KRØYER at Spitsbergen needs 5 years to reach a size and degree of maturity, which it attains in two years in the warmer water of the Oslofjord (RASMUSSEN, 1942, p. 34). Furthermore EINARSSON (1945, p. 167) showed that *Thysanoessa inermis* (KRØYER) and *T. raschi* (M. SARS) mature in one year in the southern part of their range, but need two years for maturing in the northern part.

As far as the geographical distribution of the two *Acanthephyra* species is concerned, in the North Atlantic *A. purpurea* is regarded as a more southern form as it has never been recorded north of 53° N. latitude, while *A. pelagica* has been caught as far north as Davis Strait (about 64° N). This view is fully confirmed by the data gathered by the «Michael Sars» Expedition. The maps giving the distribution of the material of the two species collected by the «Michael Sars» Expedition (figs. 2, 7) at once show the large difference in the number of specimens caught in the southern and the northern sections respectively. In the table below a compilation of these data is given. The last column of this table shows the maximum, mean, and minimum temperatures and salinities of the stations where the two species were collected by the «Michael Sars» Expedition; these data have been taken from HELLAND HANSEN (1930).

Species	Southern section stations 15—69			Northern section stations 10, 70 – 101				Salinity ‰	Temp. C°
	Number of specimens			Number of specimens					
	Total	Percent	Per 100 fishing units	Total	Percent	Per 100 fishing units			
A. purpurea	595	86	35	62	21	7	max. mean min.	36.45 35.36 34.90	17 6 11.5 3.6
A. pelagica	99	14	6	230	79	29	max. mean min.	35.65 35.14 34.88	11.8 6.3 3.3

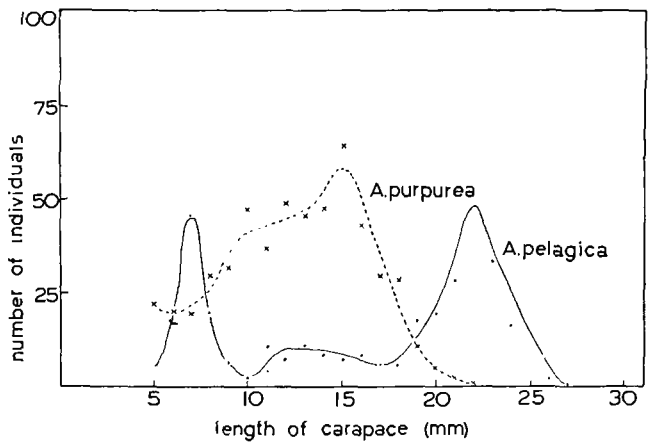

Fig. 6. Size groups in *Acanthephyra purpurea* A. MILNE EDWARDS and *A. pelagica* (RISSO) collected by the 1910 «Michael Sars» Expedition.

This table clearly shows that *A. purpurea* is the dominating species in the hauls from the southern section (86 % of *A. purpurea* against 14 % of *A. pelagica*), while in those from the northern section it is *A. pelagica* that is dominating (*A. pelagica* 79 %, *A. purpurea* 21 %). Furthermore the table shows that corresponding differences are found if the values for fishing power (number of specimens per fishing unit) are taken into consideration. In the southern section nearly 6 specimens of *A. purpurea* are caught for each single specimen of *A. pelagica*, while in the northern section more than 4 specimens of *A. pelagica* were collected against one of *A. purpurea*. The data in the last column of the above table fully support the view that *A. purpurea* is a warm water form (mean temperature 11.5° C) compared with *A. pelagica* (mean temperature 6.3° C). This fact might explain why *A. pelagica* is lacking in all the hauls from stations 24 to 52 in the south-eastern area (see fig. 7). The hydrographical data from these stations concerning the depths where *A. pelagica* might be supposed to occur (900—1700 m), reveal salinities varying from about 35.20 to 36.40 ‰ and temperatures of about 5° to 11° C, which possibly are not too favourable for the species.

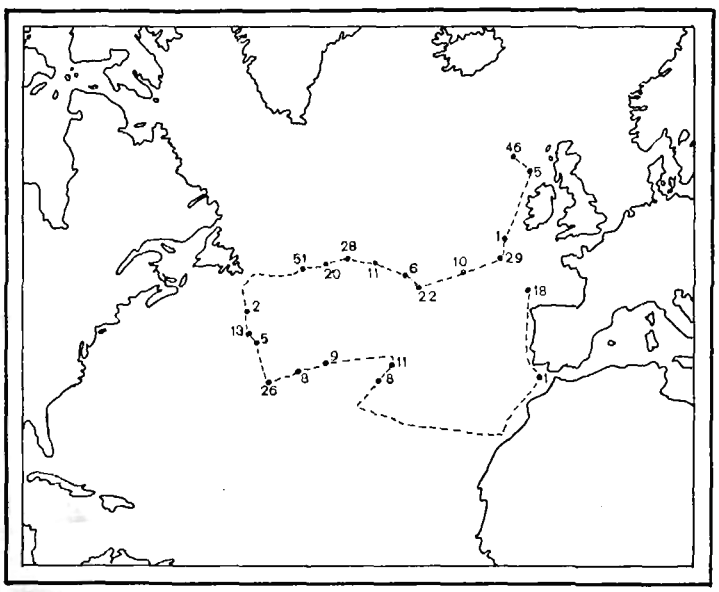

Fig. 7. Geographical distribution of *Acanthephyra pelagica* (RISSO) collected by the 1910 «Michael Sars» Expedition. The figures indicate the number of specimens caught at the various stations.

Very little is known about the food of deep sea prawns. Therefore we like to call the attention to the examination carried out by SUND on the food of the prawns collected by the 1910 «Michael Sars» Expedition (see MURRAY & HJORT, 1912, p. 720): «In the stomachs of large prawns, *Acanthephyra purpurea* and *A. multispina* taken below 500 metres, SUND found the remains of copepoda, sagittidae, and fragments of minute fishes (*Cyclothone*)». These finds agree well with CHACE's (1940, p. 205) observations that the stomachs of *Acanthephyra purpurea* and *Systellaspis debilis* from the Bermuda region contained copepods, shrimp-like forms, pteropods, worms, radiolarians and blackish fish.

Distribution. *Acanthephyra pelagica* occurs in the northern Atlantic from the Davis Strait and Iceland southwards to about 13° S, including the Mediterranean. Furthermore it is found in the South Atlantic south of 24° S and in the southern part of the Indian and Pacific Oceans south of 32° S and north of 57° S.

Meningodora mollis SMITH

Meningodora mollis SMITH, 1882, Bull. Mus. comp. Zoöl. Harvard, vol. 10, p. 74, pl. 11 figs. 8, 9, pl. 12 figs. 5—9.

Station 81, east of Newfoundland, 48° 2′ N, 39° 55′ W, depth 1500 m, July 12, 1910. 1 specimen, cl. 19.5 mm.

The genus *Notostomus* of most modern authors can be divided into two natural groups. The most primitive of these groups is characterized by the lack of denticles on the posterior part of the dorsal carina of the carapace, by the carapace which shows only one longitudinal carina on the lateral surface and by the first abdominal segment which shows no dorsal carina. Moreover the species of this group are more slender than those of the second group. In our opinion these two groups are sufficiently distinct to be elevated to the rank of a full genus. The type species of the genus *Notostomus* A. MILNE EDWARDS, 1881, *N. gibbosus* A. MILNE EDWARDS, belongs to the second group, while the first group contains *Meningodora mollis* SMITH, the type species of the genus *Meningodora* SMITH, 1882. The genus *Notostomus* therefore should be restricted to the second group, while the first group acquires the generic name *Meningodora*.

Distribution. The species is known from the North Atlantic (off the east coast of the U.S.A. between 34°

and 40° N, near Bermuda, the Bahamas, off Brazil, the Bay of Biscay, off Portugal), from the Indian Ocean, from N. of the Philipines and from off the west coast of Central America near the Cocos Islands. It has been reported from depths between 900 and 3000 m.

Meningodora vesca (SMITH)

Notostomus vescus SMITH, 1886, Rep. U. S. Fish. Comm., vol. 13, p. 677.

Station 29, west of Gibraltar, 35° 10′ N, 7° 55′ W, depth 1000 m, May 9 and 10, 1910. 1 specimen, cl. 14 mm.

Station 49, west of the Canary Islands, 29° 8′ N, 25° 16′ W, depth 1500 m, June 1, 1910. (not seen).

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1000 m, June 24, 1910. 2 specimens (1 ovigerous female, cl. 16 mm), cl. 11 and 16 mm; the same, depth 1500 m (not seen).

Station 67, S.E. of Newfoundland, 40° 17′ N, 50° 39′ W, depth 1100 m, June 27, 1910. 1 specimen, cl. 17 mm.

Station 84, north of the Azores, 48° 4′ N, 32° 25′ W, depth 1500 m, July 15, 1910. 1 specimen, cl. 7 mm.

Station 87, north of the Azores, 46° 48′ N, 27° 46′ W, depth 750 m, July 17, 1910. 1 specimen (not seen); the same, depth 1000 m. 1 specimen cl. 15 mm.

Station 90, N.E. of the Azores, 46° 58′ N, 19° 6′ W, depth 1000 m; July 21, 1910. 1 specimen, cl. 14 mm.

The specimens agree well with the description given by CHACE (1940, pp. 153, 154), except for the branchiostegal spine, which in our specimens is supported by a short ridge, resembling thereby more or less *Meningodora compsa* (CHACE). The number of rostral teeth is variable, in our material there are 8 to 11 dorsal and 0 to 2 ventral teeth. The diameter of the eggs of the ovigerous female from Station 64 is 0.6 to 0.8 mm.

Distribution. The species is known from the North Atlantic (S. of Iceland, off the eastcoast of the U.S.A., near Bermuda, the Bahamas, off Portugal), from West Africa, the Bay of Bengal and the Philippine Islands. It has been reported from depths between 750 and 5300 m.

Notostomus robustus SMITH

Notostomus robustus SMITH, 1884, Rep. U. S. Fish Comm., vol. 10, p. 377, pl. 7 fig. 2.

Station 56, near the Azores, 36° 53′ N, 29° 47′ W, depth 1500 m, June 10 and 11, 1910. 1 specimen, cl. 51 mm.

Station 62, west of the Azores, 36° 52′ N, 39° 55′ W, depth 1500 m, June 20 and 21, 1910. 1 specimen, cl. 14 mm.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1000 m, June 24, 1910. 1 specimen, cl. 13 mm.

Station 80, east of Newfoundland, 47° 34′ N, 43° 11′ W, depth 1500 m, July 11, 1910. 1 specimen, cl. 17 mm.

The specimens agree well with the descriptions and figures given in the literature (see also the remarks under *N. distirus*).

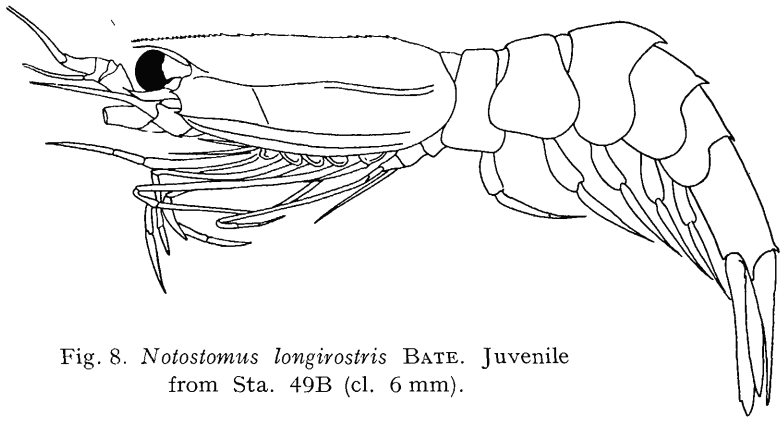

Fig. 8. *Notostomus longirostris* BATE. Juvenile from Sta. 49B (cl. 6 mm).

Distribution. Until now the species has only been reported from the western part of the North Atlantic (off the east coast of the U.S.A. between 37° and 42° N, near Bermuda, the Bahamas). It is known from depths between 850 and 3000 m.

Notostomus distirus CHACE

Notostomus distirus CHACE, 1940, Zoologica, New York, vol. 25, p. 166, figs. 39, 40.

Station 49, west of the Canary Islands, 28° 8′ N, 25° 16′ W, depth 1000 m, June 1, 1910. 1 specimen, cl. 20 mm.

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 1000 m, June 5 and 6, 1910. 1 specimen, cl. 13 mm; the same, depth 2000 m. 2 specimens, cl. 18 and 21 mm.

It is with somewhat doubt that we refer the above specimens to *Notostomus distirus*. All are fairly small and most are in a poor condition, having the integument soft and wrinkled, which makes it difficult to trace the lateral carinae of the carapace. In one of the specimens, namely that from Station 49, however, it can be observed that the post-antennal carina disappears at about the middle of the posterior branchial region. In the young specimens referred above to *N. robustus*, the post-antennal carina is more prominent and reaches backwards to the lower posterior margin of the carapace. Moreover the specimens referred to *N. robustus* have the dorsal margin of the carapace minutely and evenly dentate for its entire length, while in the specimens referred here to *N. distirus* this dentition is more irregular and the teeth are more widely separated.

The species is only known from the original specimens which were collected near Bermuda, at about 32°12′ N, 64°36′ W at a depth of 1800 m.

Notostomus longirostris BATE (fig. 8)

Notostomus longirostris BATE, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 833, pl. 135 fig. 4.

Notostomus spec. MURRAY & HJORT, 1912, Depths of the Ocean, p. 585, fig. 425.

Station 34, near the Canary Islands, 28° 52′ N, 14° 16′ W, depth 500 m, May 13 and 14, 1910. 1 specimen, cl. 7 mm.

Station 42, near the Canary Islands, 28° 2′ N, 14° 17′ W, depth 450 m, May 23 and 24, 1910. 1 specimen, cl. 8 mm.

Station 45, west of the Canary Islands, 28° 42′ N, 20° 0′ W, depth 1500 m, May 28 and 29, 1910. 2 specimens, cl. 40 and 53 mm.

Station 49 B, west of the Canary Islands, 29° 8′ N, 25° 16′ W, depth 1500 m, June 1, 1910. 1 specimen, cl. 6 mm.

Station 49 C, west of the Canary Islands, 29° 7′ N, 25° 32′ W, depth 0—1000 m, June 1 and 2, 1910. 1 specimen, cl. 18 mm.

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 1300 m, June 8 and 9, 1910. 1 specimen, cl. 22 mm.

The small specimens from Stations 34 and 42 are damaged, but certainly belong to this species. The smallest specimen of the present material, namely that from Station 49B, differs from the rest by lacking the median lateral carina at the base of the rostrum, and by having the dorsal carina of the first abdominal segment only faintly indicated (fig. 8); these differences may be due to the fact that the specimen is still very young.

As CHACE (1947, p. 28) has pointed out, the relative size of the rostrum changes during the growth of the animals, being relatively shortest in the smallest specimens, longest in the intermediate forms (up to a carapace length of about 20 mm), while it becomes smaller again in the larger specimens. CHACE's observations agree very well with what we find in our material:

Number of specimens	Length of carapace (mm)	Length of rostrum (mm)	Length of rostrum / Length of carapace
1	53	31	0.57
1	40	26	0.65
1	22	25	1.14
1	18	20	1.11
1	8	7	0.88
1	7.5	5.3	0.71

During the growth the general appearance of the carapace and the rostrum also changes, as has been pointed out by CHACE (1947, p. 26) and as is well shown by our material.

The larger specimens of *N. longirostris* strongly resemble *N. patentissimus* BATE, but may be distinguished by the longer and less rapidly narrowing rostrum.

Examination of the type specimen of *Notostomus longirostris* BATE, which is preserved in the British Museum, showed the presence of a median lateral carina at the base of the rostrum in this specimen. BATE (1888) in his description of the species does not mention this carina, nor is it shown in BATE's figure. In the specimens at hand the carina is distinctly visible, except in the smallest specimen (cl. 6 mm) where it cannot be found.

As pointed out by HOLTHUIS (1951, p. 30) there is no valid reason to consider *N. longirostris* and *N. atlanticus* LENZ & STRUNCK as different species.

The largest specimen of the present material, a male from station 45, has been figured by MURRAY & HJORT (1912, p. 586, textfig. 425) under the name «*Notostomus*, n. sp.»

Distribution. The species has a wide distribution. It has been found in the Atlantic (Bermuda, Bahamas, S.W. of Spain, off West Africa), in the Indian Ocean (near New Amsterdam) and in the Malay Archipelago. It has been recorded from depths between 600 and 3500 m.

Ephyrina bifida STEPHENSEN (fig. 9)

Ephyrina bifida STEPHENSEN, 1923, Rep. Danish oceanogr. Exped. Medit., vol. 2 pt. D3, p. 58, fig. 18.

Station 53, S. of the Azores, 34° 59′ N, 33° 1′ W, depth 1300 m, June 8 and 9, 1910. 1 specimen, cl. 5 mm.

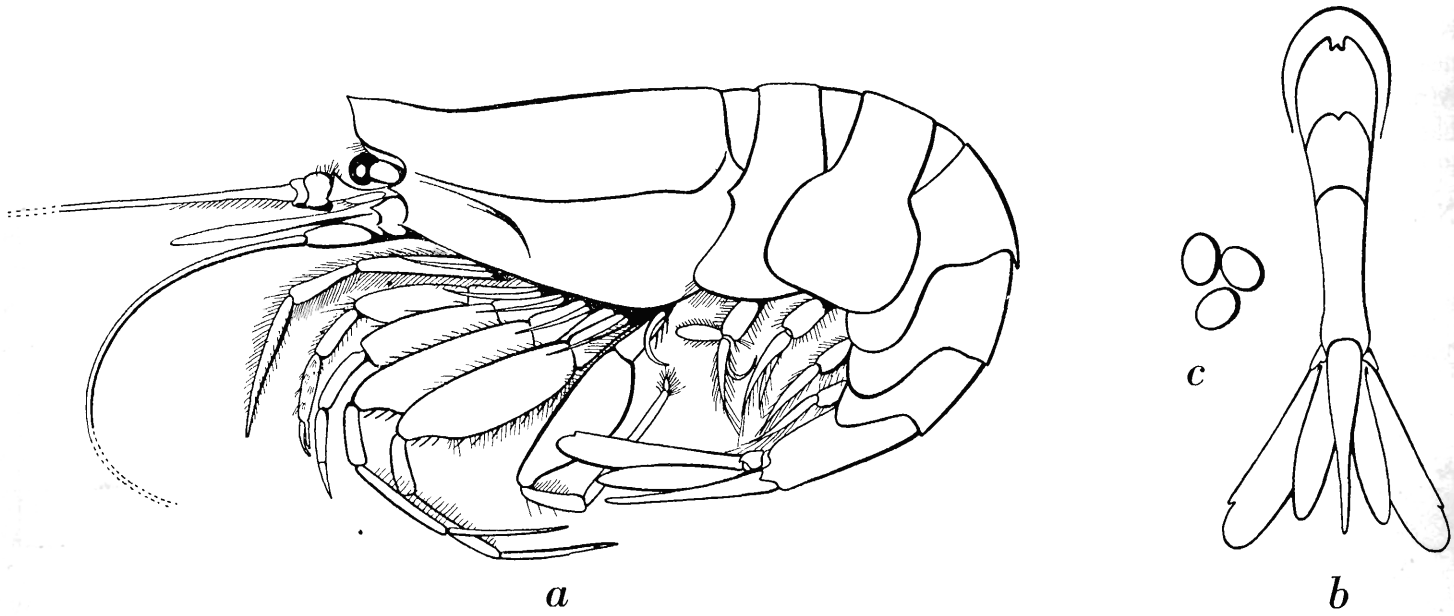

Fig. 9. *Ephyrina bifida* STEPHENSEN. × 1.4. a. Lateral view. b. Dorsal view of abdomen. c. Eggs.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1500 m, June 24, 1910. 3 specimens, cl. 12 to 37.5 mm.

Station 82, N.W. of the Azores, 48° 24′ N, 36° 53′ W, depth 1000 m, July 13, 1910. 1 specimen, cl. 19 mm; the same, depth 1250 m. 1 specimen, cl. 10.5 mm.

Station 84, north of the Azores, 48° 4′ N, 32° 25′ W, depth 750 m, July 15, 1910. (not seen); the same, depth 1000 m. 1 specimen, cl. 5 mm; the same, depth 1500 m. 1 specimen, cl. 11 mm.

Station 90, N.E. of the Azores, 46° 58′ N, 19° 6′ W, depth 1000 m, July 21, 1910. 1 juvenile, damaged.

Station 92, S.W. of Ireland, 48° 29′ N, 13° 55′ W, depth 1000 m, July 23 and 24, 1910. 1 specimen, cl. 6 mm; the same, depth 1500 m. 3 specimens (1 ovigerous female, cl. 33 mm), cl. 15 to 33 mm.

The specimens at hand agree well with the descriptions and figures given of the present species in the literature. Until now no ovigerous females have been recorded. The ovigerous female of the present collection has a carapace length of 33 mm and a total length of 116 mm. The eggs are rather few and large, their longer and shorter diameters are 4.2 and 3.0 mm respectively.

Distribution. The species is known from the Atlantic only (Bermuda, Bahamas, Bay of Biscay and Gulf of Guinea), it has been reported from depths between 720 and 4000 m.

Ephyrina benedicti Smith (fig 10)

Ephyrina Benedicti Smith, 1885, Proc. U. S. Nat. Mus., vol. 7, p. 506.

Station 49, west of the Canary Islands, 29° 6′ — 29° 8′ N, 25° 2′ — 25° 32′ W, depth unknown, June 1 and 2. 1910. At least one specimen (not seen).

No material of this species was found in the collection studied by us, but among Sund's papers relating to the 1910 «Michael Sars» Decapods we found a drawing (reproduced here as fig. 10) showing the present species, with the indication that the specimen was collected at Station 49. The figure leaves not the least doubt as to the identity of the specimen.

Distribution. *Ephyrina benedicti* is known from the North Atlantic (off the east coast of the U.S.A. at 40° 26′ 40″ N, 67°5′15″ W, from off S.W. Ireland, and from off Portugal), and from near the Bonin Islands. It has been found in depths ranging from 1400 to 4400 m.

Hymenodora glacialis (Buchholz) (figs. 11, 12)

Pasiphaë glacialis Buchholz, 1874, Zweite Deutsche Nordpolarfahrt, vol. 2, p. 279, pl. 1 fig. 2.

Station 44, near the Canary Islands, 28° 37′ N, 19° 8′ W, depth 0—4000 m, May 28, 1910. 1 specimen, cl. 19 mm.

Station 45, west of the Canary Islands, 28° 42′ N, 20° 0′ W, depth 1500 m, May 28 and 29, 1910. 1 specimen, cl. 11 mm.

Station 48, west of the Canary Islands, 28° 54′ N, 24° 14′ W, depth 3900 m, May 31, 1910. 1 specimen, cl. 10 mm.

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 1500 m, June 5 and 6, 1910. 4 specimens, cl. 7 to 11 mm; the same, depth 2000 m. 4 specimens, cl. 9 to 12 mm.

Station 56, south of the Azores, 36° 53′ N, 29° 47′ W, depth 1500 m, June 10 and 11, 1910. 6 specimens, cl. 5 to 11 mm.

Station 62, west of the Azores, 36° 52′ N, 39° 55′ W, depth 1500 m, June 20 and 21, 1910. 2 specimens, cl. 11 and 16 mm.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1000 m, June 24, 1910. 4 specimens, cl. 4 to 7 mm.

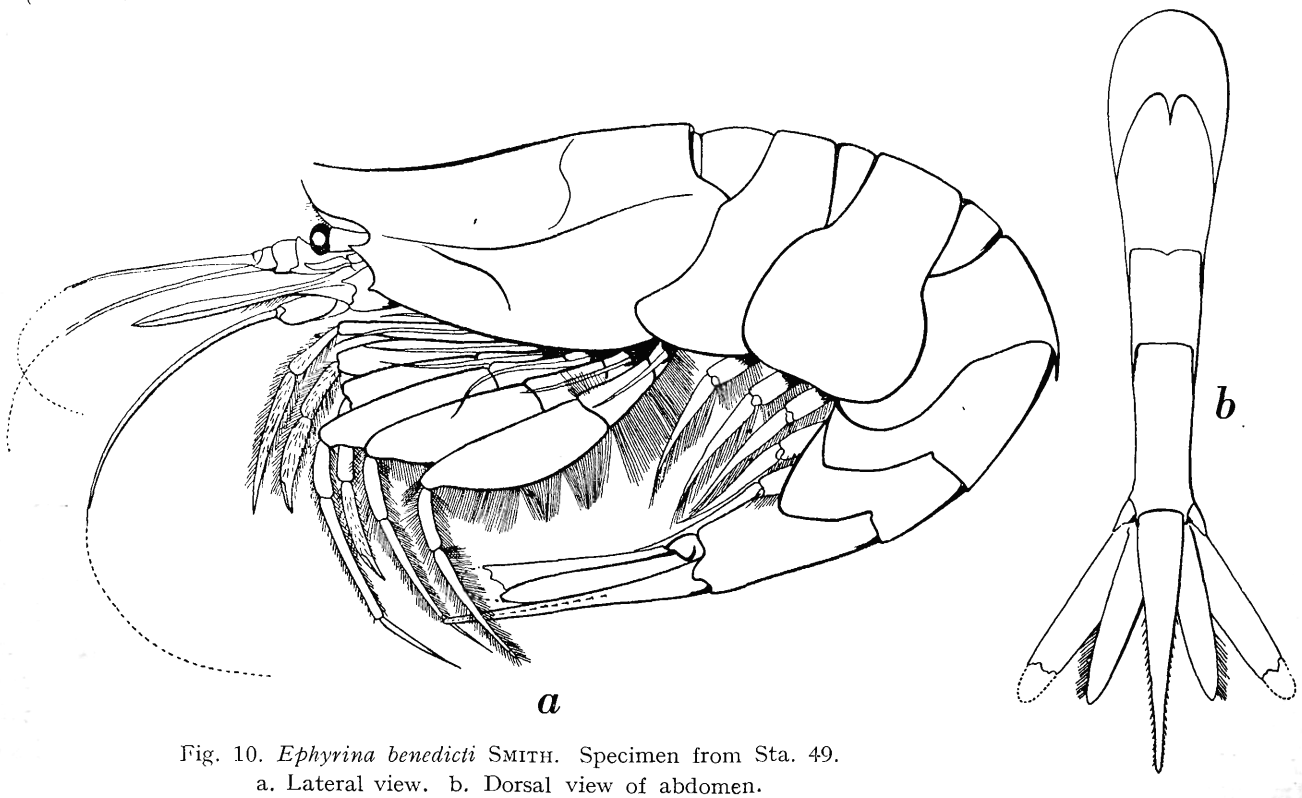

Fig. 10. *Ephyrina benedicti* Smith. Specimen from Sta. 49.
a. Lateral view. b. Dorsal view of abdomen.

Fig. 11. *Hymenodora glacialis* (BUCHHOLZ). Anterior part of body in lateral view. a. specimen from Sta. 44; b. specimen from Sta. 51 (2000 m depth). × 6.

A discussion of the differences that exist between this species and *H. gracilis* SMITH is given in the text dealing with the latter species (see p. 17).

Hymenodora glacialis was mentioned for the first time in the literature by SCORESBY (1820, vol. 1, p. 542, vol. 2, pl. 16 fig. 13), who described and figured it under the name *Cancer boreas* PHIPPS. SCORESBY's figure shows clearly that his specimen is not *Sclerocrangon boreas* (PHIPPS) but actually belongs to *Hymenodora glacialis*.

Distribution. The present species occurs in the Arctic region and goes down the Atlantic Ocean as far south as 30° N, furthermore it is known from the Gulf of Panama. There are many more records of this species in the literature, but since *H. glacialis* and *H. gracilis* for a long time have not been considered distinct species, most of the older references to *H. glacialis* cannot be fully trusted. The species has been found in superficial water layers and in depths up to 3900 m.

Hymenodora gracilis SMITH (figs. 12, 13)

Hymenodora gracilis SMITH, 1886, Rep. U. S. Fish. Comm., vol. 13, p. 681, pl. 12 fig. 6.

Hymenodora gracilis MURRAY & HJORT, 1912, Depths of the Ocean, p. 668.

Station 49, west of the Canary Islands, 29° 8′ N, 25° 16′ W, depth 1000 m, June 1, 1910. 3 specimens, cl. 5 to 6 mm; the same, depth 1500 m. 2 specimens, cl. 10 mm.

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 1000 m, June 5 and 6, 1910. 6 specimens (1 ovigerous female, cl. 8 mm), cl. 3 to 8 mm; the same, depth 1500 m. 2 specimens, cl. 6 and 7 mm.

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 1300 m, June 8 and 9, 1910. 16 specimens (1 ovigerous female, cl. 11 mm), cl. 4 to 12 mm.

Station 56, near the Azores, 36° 53′ N, 29° 47′ W, depth 1000 m, June 10 and 11, 1910. 1 specimen, cl. 3.5 mm; the same, depth 1500 m. 3 specimens, cl. 8 to 10 mm.

Station 62, west of the Azores, 36° 52′ N, 39° 55′ W, depth 1500 m, June 20 and 21, 1910. 7 specimens, cl. 6 to 11 mm.

Station 63, west of the Azores, 36° 5′ N, 43° 58′ W, depth 450—1350 m, June 22, 1910. 1 specimen, cl. 6 mm.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1250 m, June 24, 1910. 10 specimens, cl. 5 to 8 mm; the same, depth 1500 m. 52 specimens (4 ovigerous females, cl. 10 to 11 mm), cl. 5 to 12 mm.

Station 66, S.E. of Newfoundland, 39° 30′ N, 49° 42′ W, depth 750 m, June 26, 1910. 1 specimen, cl. 3 mm.

Station 80, east of Newfoundland. 47° 34′ N, 43° 11′ W, depth 1000 m, July 11, 1910. 5 specimens, cl. 3 to 7 mm; the same, depth 1250 m. 8 specimens, cl. 3 to 7 mm; the same, depth 1500 m. 22 specimens, cl. 6 to 12 mm.

Station 81, east of Newfoundland, 48° 2′ N, 39° 55′ W, depth 1000 m, July 12, 1910. 4 specimens, cl. 3 to 6 mm; the same, depth 1250 m. 1 specimen, cl. 4 mm; the same, depth 1500 m. 18 specimens, cl. 6 to 11 mm.

Station 82, N.W. of the Azores, 48° 24′ N, 36° 53′ W, depth 750 m, July 13, 1910. 4 specimens, cl. 3 to 5 mm; the same, depth 1000 m. 10 specimens (1 ovigerous female, cl. 11 mm), cl. 3 to 11 mm; the same, depth 1500 m. 6 specimens, cl. 11 to 15 mm.

Station 84, north of the Azores, 48° 4′ N, 32° 25′ W, depth 750 m, July 15, 1910. 2 specimens, cl. 2.5 and 3 mm; the same, depth 1000 m. 9 specimens (1 ovigerous female, cl. 9 mm), cl. 3 to 9 mm; the same, depth 1250 m. 1 specimen, cl. 7 mm; the same, depth 1500 m. 10 specimens, cl. 3 to 12 mm.

Station 86, north of the Azores, 47° 29′ N, 30° 20′ W, depth 1000 m, July 16, 1910. 2 specimens, cl. about 9 and 10 mm.

Station 87, north of the Azores, 46° 48′ N, 27° 46′ W, depth 1000 m, July 17, 1910. 5 specimens, cl. 4 to 5 mm.

Station 88, north of the Azores, 45° 26′ N, 25° 45′ W, depth 1000 m, July 18, 1910. 15 specimens.

Station 90, N.E. of the Azores, 46° 58′ N, 19° 6′ W, depth 1000 m, July 21, 1910. 7 specimens, cl. 4 to 8 mm.

Station 92, S.W. of Ireland, 48° 29′ N, 13° 55′ W, depth 750 m, July 23 and 24, 1910. 2 specimens, cl. 3 mm; the same, depth 1000 m. 4 specimens, cl. 4 to 7 mm; the same, depth 1500 m. 8 specimens, cl. 7 to 14 mm.

Station 94, S.W. of Ireland, 50° 13′ N, 11° 23′ W, depth 1000 m, July 26, 1910. 2 specimens, cl. 6 and 7 mm.

Station 101, off the Hebrides, 57° 41′ N, 11° 48′ W, depth 1000 m, August 6 and 7, 1910. 3 specimens, cl. 3 to 3.5 mm; the same, depth 1250 m. 2 specimens, cl. 7 and 8 mm.

Hymenodora gracilis and *H. glacialis* are very closely related and have been considered by several authors to be one species. Around 1939 Dr. STANLEY W. KEMP studied the present genus and came to the conclusion that the two species actually are distinct. Though Dr. KEMP in correspondance and in conversation communicated his views on this subject to other carcinologists (see CALMAN, 1939, p. 195, and CHACE, 1940, p. 176) his finds have never been published. During the Plymouth bombardment in 1941 all of Dr. KEMP's notes were destroyed, and when this eminent carcinologist passed away in 1945, no paper setting out the differences between the two species of *Hymenodora* had yet been published.

The awkward situation existing at this date is that though carcinologists know that the two species *H. glacialis* and *H. gracilis* are distinct (Dr. KEMP's authority on this subject is a sufficient guarantee) most of them are not acquainted with the exact differences found by Dr. KEMP. Dr. FENNER A. CHACE, curator of the division of marine invertebrates, U.S. National Museum, Washington, D.C., U.S.A., who had corresponded extensively with Dr. KEMP on this problem, provided us with the observations communicated to him by Dr. KEMP in a letter dated May 3, 1939. With his usual kindness Dr. CHACE permitted us to cite here Dr. KEMP's statement.

«Some time ago I looked into the *Hymenodora* question and came to the conclusion that *glacialis* and *gracilis* are indeed distinct as Stephensen maintains. The best character, which however can only be seen in reasonable good specimens, is that a groove (as shown in the enclosed sketch) is present in *glacialis* but absent in *gracilis*. I have fairly good *gracilis* in the Discovery collection which were carefully hardened in formalin as soon as caught and I feel tolerably confident that this distinction is valid. I am, however, in a bit of a muddle over the distribution because the Challenger got undoubted *glacialis* in mid-Atlantic and in the far south, and apparently no *gracilis*. In the Discovery work we have only *gracilis* and no *glacialis*. Very curious but it may be only a coincidence. If you dry the surface moisture from the carapace, I think you will see the groove in *glacialis*». The sketch referred to by Dr. KEMP is reproduced here as fig. 12. In our material we found the character mentioned by Dr. KEMP extremely useful and quite constant. The character mentioned by SMITH (1886) in the original description of the present species, namely the presence of a podobranch on the second maxilliped in specimens of *H. gracilis* and its absence in *H. glacialis*, holds good in all the specimens we checked on this point. The rostrum in *H. glacialis* as a rule is higher and shorter than in *H. gracilis*, its lower margin is more strongly convex. The upper lateral surfaces of the rostrum in *H. glacialis* are slightly swollen, while in *H. gracilis* they are more or less concave. In both species the anterior

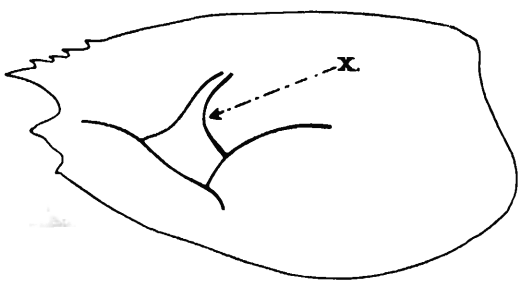

Fig. 12. Sketch made by Dr. S. W. KEMP to indicate the differences between *Hymenodora glacialis* (BUCHHOLZ) and *H. gracilis* SMITH. Groove «x» is present in *H. glacialis*, absent in *H. gracilis*

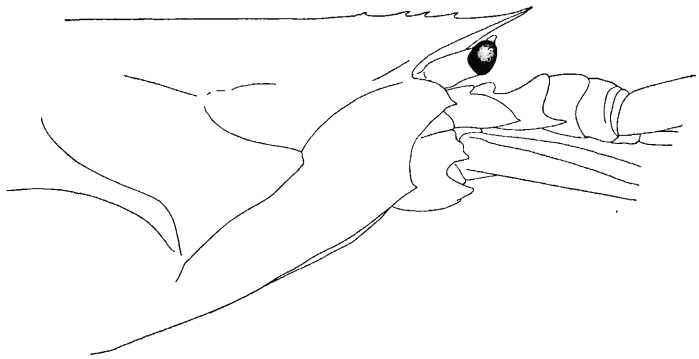

Fig. 13. *Hymenodora gracilis* SMITH. Anterior part of body in lateral view. Specimen from Sta. 82 (1500 m depth). × 4.8.

margin of the second segment of the antennal peduncle forms a lobe over the outer basal part of the scaphocerite; in *H. glacialis* this lobe is broadly and evenly rounded throughout, while in *H. gracilis* it is produced to a blunt point in its outer part. These differences are illustrated in the accompanying figures (figs. 11 and 13). Figure 11 b shows that sometimes the rostrum in *H. glacialis* is produced to a rather sharp point, though it generally is blunt as in fig. 11a.

Through the kindness of Dr. ISABELLA GORDON of the British Museum, we were able to examine the «Thor» specimen identified by KEMP (1910, p. 74) as *Hymenodora glacialis* and found that it actually belongs to *H. gracilis*.

Distribution. The species is known with certainty from the North Atlantic (off S.W. Greenland, off the eastcoast of the U.S.A. between 35° and 41° N, near Bermuda, the Bahamas, W. and S.W. of Ireland, the Bay of Biscay), furthermore it has been found off S. Africa, in the Arabian Sea and in the Indian Ocean near the Antarctic continent. It is known from depths between 500 and 5300 m. As already mentioned by KEMP several puzzling questions exist regarding the distribution of the two species of *Hymenodora*. A thorough revision of the genus may solve these problems.

Systellaspis debilis (A. MILNE EDWARDS) (fig. 14)

Acanthephyra debilis A. MILNE EDWARDS, 1881a, Ann. Sci. nat. Zool., ser. 6 vol. 11 pt. 4, p. 13.

Systellaspis debilis MURRAY & HJORT, 1912, Depths of the Ocean, p. 668, pl. 3 fig. 3.

Station 10, Bay of Biscay, 45° 26′ N, 9° 20′ W, depth unknown, April 19 to 21, 1910. 4 specimens, cl. 2.5 to 4 mm; the same, depth 100 m. 1 specimen, cl. 5 mm; the same, depth 150 m. 2 specimens (1 ovigerous female, cl. 13.5 mm), cl. 13 and 13.5 mm; the same, depth 415 m. 1 specimen, cl. 4 mm.

Station 15, off Portugal, 40° 56′ N, 9° 28′ W, depth 300 m, April 22 and 23, 1910. 6 specimens, cl. 3 to 6 mm.

Station 23, west of Gibraltar, 35° 32′ N, 7° 7′ W, depth 100 m, May 5 and 6, 1910. 15 specimens (2 ovigerous females, cl. 12 and 13 mm), cl. 3 to 13 mm; the same, depth 200 m. 3 specimens, cl. 3 to 7 mm; the same, depth 1215 m. 1 ovigerous female, cl. 15 mm.

Station 29, west of Gibraltar, 35° 10′ N, 7° 55′ W, depth 200 m, May 9 and 10, 1910. 9 specimens, cl. 4 to 6 mm (not seen); the same, depth 550 m. 1 specimen, cl. 7 mm; the same, depth 1000 m. 2 specimens, cl. 4 and 6 mm.

Station 34, near the Canary Islands, 28° 52′ N, 14° 16′ W, depth 200 m, May 13 and 14, 1910. 1 specimen, cl. 12 mm.

Station 42, near the Canary Islands, 28° 2′ N′, 14° 17′ W, depth 150 m, May 23 and 24, 1910. 2 specimens (1 ovigerous female, cl. 14 mm), cl. 5.5 and 14 mm; the same, depth 450 m. 2 specimens, cl. 2.5 mm.

Station 45, west of the Canary Islands, 28° 42′ N, 20° 0′ W, depth 100 m, May 28 and 29, 1910. 1 specimen, cl. 5 mm; the same, depth 150 m. 32 specimens (5 ovigerous females, cl. 12 to 13.5 mm), cl. 3 to 13.5 mm; the same, depth 1500 m. 3 specimens (2 ovigerous females, cl. 13 and 14 mm), cl. 13 to 14 mm.

Station 49B, west of the Canary Islands, 29° 8′ N, 25° 16′ W, depth 500 m, June 1, 1910. 2 specimens, cl. 2.5 and 5 mm; the same, depth 1500 m. 4 specimens (1 ovigerous female, cl. 14.5 mm), cl. 6.5 to 14.5 mm.

Station 49C, west of the Canary Islands, 29° 7′ N, 25° 32′ W, depth 0—1000 m, June 1 and 2, 1910. 1 specimen, cl. 13 mm.

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 100 m, June 5 and 6, 1910. 33 specimens (2 ovigerous females, cl. 11 and 12 mm), cl. 6 to 14 mm; the same, depth, 150 m. 20 specimens (7 ovigerous females, cl. 13 to 14 mm), cl. 3 to 14 mm; the same, depth 1500 m. 1 specimen, cl. 6 mm; the same, depth 2000 m. 3 specimens, cl. 5 to 12.5 mm.

Station 52, S. W. of the Azores, 31° 24′ N, 34° 47′ W, depth 600 m, June 6 and 7, 1910. 2 specimens, cl. 7 and 11 mm.

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 50 m, June 8 and 9, 1910. 5 specimens, cl. 5 to 12.5 mm; the same, depth 100 m. 4 specimens (1 ovigerous female, cl. 14 mm), cl. 8 to 14 mm; the same, depth 150 m. 3 specimens, cl. 3 to 3.5 mm; the same, depth 1300 m. 2 specimens (1 ovigerous female, cl. 13.5 mm), cl. 5 and 13.5 mm.

Station 56, near the Azores, 36° 53′ N, 29° 47′ W, depth 100 m, June 10 and 11, 1910. 1 specimen, cl. 7 mm; the same, depth 500 m. 1 specimen, cl. 3.5 mm; the same, depth 1500 m. 2 specimens, cl. 12 mm.

Station 58, near the Azores, 37° 11′ N — 37° 42′ N, 29° 18′ W — 29° 31′ W, depth 50 m, June 11 to 13, 1910. 1 specimen, cl. 6 mm; the same, depth 100 m. 1 specimen, cl. 10 mm; the same, depth 150 m. 2 specimens, cl. 4 and 4.5 mm; the same, depth 300 m. 3 specimens, cl. 11 to 12 mm.

Station 62, west of the Azores, 36° 52′ N, 39° 55′ W, depth 100 m, June 20 and 21, 1910. 2 specimens, cl. 6 and 7 mm; the same, depth 150 m. 8 specimens (1 ovigerous female, cl. 12.5 mm), cl. 4 to 12.5 mm; the same, depth 500 m. 2 specimens, cl. 2.5 and 5 mm; the same, depth 1000 m. 2 specimens, cl. 7 and 9 mm; the same, depth 1500 m. 3 specimens, cl. 6 to 12 mm.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 500 m, June 24, 1910. 2 specimens, cl. 3.5 and 4.5 mm; the same, depth 1000 m. 3 specimens, cl. 3.5 to 6 mm; the same, depth 1250 m. 1 specimen, cl. 10 mm; the same, depth 1500 m. 3 specimens (2 ovigerous females, cl. 13 and 15 mm), cl. 13 to 15 mm.

Station 67, S.E. of Newfoundland, 40° 17′ N, 50° 39′ W, depth 600 m, June 27, 1910. 2 specimens, cl. 3.5 and 9 mm.

Station 87, north of the Azores, 46° 48′ N, 27° 46′ W, depth 500 m, July 17, 1910. 6 specimens, cl. 4.5 to 9 mm; the same, depth 1000 m. 1 specimen, cl. 7.5 mm.

Station 88, north of the Azores, 45° 26′ N, 25° 45′ W, depth 50 m, July 18, 1910. 2 specimens, cl. 4 and 5 mm; the same, depth 100 m. 1 specimen, cl. 7 mm; the same, depth 150 m. 1 specimen, cl. 10 mm; the same, depth 300 m. 2 specimens, cl. 3.5 and 4.5 mm; the same, depth 500 m. 3 specimens, cl. 5 to 12 mm.

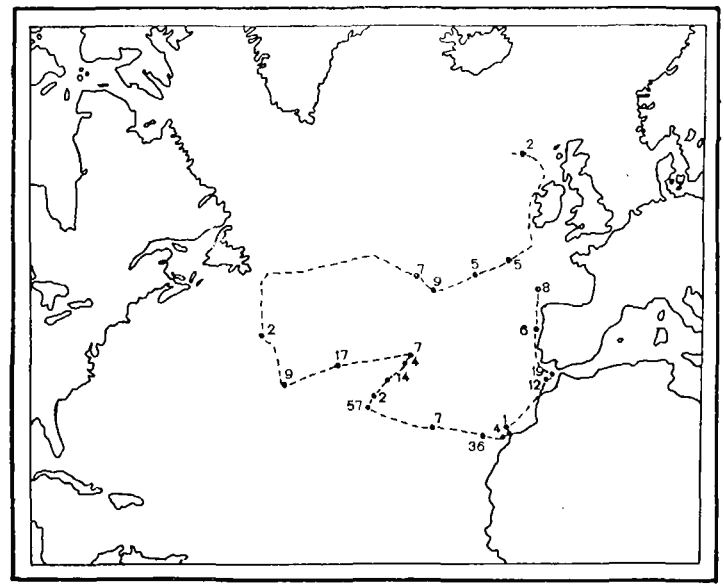

Fig. 14. Geographical distribution of *Systellaspis debilis* (A. MILNE EDWARDS) collected by the 1910 «Michael Sars» Expedition. The figures indicate the number of specimens caught at the various stations.

Station 90, N. E. of the Azores, 46° 58′ N, 19° 6′ W, depth 300 m, July 21, 1910. 4 specimens, cl. 2.2 to 5.5 mm; the same, depth 500 m. 1 specimen, cl. 4 mm.

Station 92, S.W. of Ireland, 48° 29′ N, 13° 55′ W, depth 50 m, July 23 and 24, 1910. 1 specimen, cl. 4 mm; the same, depth 150 m. 3 specimens, cl. 3.5 to 5 mm; the same, depth 1000 m. 1 specimen, cl. 5 mm.

Station 101, off the Hebrides, 57° 41′ N, 11° 48′ W, depth 300 m, August 6 and 7, 1910. 1 specimen, cl. 10 mm; the same, depth 500 m. 1 specimen, cl. 10 mm.

In young specimens with a carapace length of less than 5 mm, the carina and the median posterior tooth of the third abdominal segment are distinctly higher than in larger specimens; in these juveniles, moreover, the denticles on the hind margin of the fourth and fifth abdominal segments are not yet visible, while the sixth segment may be more than twice as long as the fifth.

The total length of the ovigerous females of the present material varies from 70 to 85 mm, the carapace length from 12 to 15 mm. The diameter of the eggs lies between 3.0 and 1.9 mm. The largest male of the present collection has a total length of 79 mm and a carapace length of 14 mm.

As may be seen from the map showing the geographical distribution of the material of the present species collected by the «Michael Sars» Expedition (fig. 14), the largest number of specimens (170) were found in the S.E. area at Stations 15 to 58, very few specimens were collected in the S.W. and the N.E. areas (28 at Stations 62—67, and

36 at Stations 10 and 87—101), and none in the N.W.-area. This distribution reminds somewhat of that of *Acanthephyra purpurea* (fig. 2), and the two species probably should be regarded as more thermophile than *A. pelagica*.

The «Michael Sars» material of *Systellaspis debilis* shows that this species is most abundant in relatively shallow water. Of the 234 specimens examined 141 (60 %) were found at depths between 25 and 150 m, the others were scattered over various depths down to 2000 m (see also MURRAY & HJORT, 1912, p. 668). In the Bermuda region CHACE (1940, pp. 183, 184) found the center of abundance of *S. debilis* at a considerably larger depth, namely between 700 and 1100 m. However, CHACE (1940, p. 184) points out that certain observations indicate that specimens of *S. debilis* «are present in the upper levels, but that they may be able to avoid the nets in this better lighted zone». The relative large numbers of specimens caught by the «Michael Sars» Expedition in the upper layers support CHACE's assumption, and indicate at the same time that the gear used by the expedition (nets and trawls) have been working quite efficiently in catching the specimens.

Distribution. The species has been recorded from the Atlantic (from S. of Iceland and the Faeroes south to the Bahamas, the Azores and the Cape Verde Islands), from West-, South-, and East Africa, from the Indian Ocean, the Malay Archipelago and Hawaii. It occurs at depths between 25 and 3000 m.

Systellaspis braueri (BALSS)

Acanthephyra braueri BALSS, 1914, Zool. Anz., vol. 44, p. 594.

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 1300 m, June 8 and 9, 1910. 1 specimen, cl. 8 mm.

Station 69, S.E. of Newfoundland, 41° 39′ N, 51° 4′ W, depth 150 m, June 29, 1910. 1 juvenile.

Station 81, east of Newfoundland, 48° 2′ N, 39° 55′ W, depth 1500 m, July 12, 1910. 1 specimen, cl. 15 mm.

Station 82, N.W. of the Azores, 48° 24′ N, 36° 53′ W, depth 1500 m, July 13, 1910. 1 specimen, cl. 11 mm.

Station 92, S.W. of Ireland, 48° 29′ N, 13° 55′ W, depth 1500 m, July 23 and 24, 1910. 3 specimens, cl. 11.5 to 16 mm, and 2 juveniles.

The three juveniles from Stations 69 and 92 have a total length of between 10 and 15 mm, they are in a rather poor condition and therefore could not be identified with complete certainty. The other specimens check very well with the published accounts of the species. The rostrum in these larger specimens bears 10 to 13 dorsal and 2 or 3 ventral teeth.

Distribution. The species is rather rare and has been collected at widely scattered localities (Bermuda, Bay of Biscay, Gulf of Guinea, Bay of Bengal, and off California), it has been reported from depths between 1300 and 4000 m.

Oplophorus spinosus (BRULLÉ) (textfig. 15, pl. III. figs. 1, 2)

Palaemon spinosus BRULLÉ, 1839, Webb & Berthelot's Hist. nat. Iles Canaries, vol. 2 pt. 2 Entomologie, p. 18, fig. on p. 3.

Station 45, west of the Canary Islands, 28° 42′ N, 20° 0′ W, depth 150 m, May 28 and 29, 1910. 1 specimen, cl. 13 mm.

Station 49, west of the Canary Islands, 29° 8′ N, 25° 16′ W, depth 1000 m, June 1, 1910. 1 specimen, cl. 3 mm (not seen).

Station 51, S.W. of the Azores, 31° 20′ N, 35° 7′ W, depth 100 m, June 5 and 6, 1910. 1 specimen, cl. 13 mm; the same, depth 150 m. 3 specimens (1 ovigerous female, cl. 14 mm), cl. 14 to 17 mm; the same, depth 1000 m. 1 specimen, cl. 9 mm; the same, depth 2000 m. 1 ovigerous female, cl. 13 mm.

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 50 m, June 8 and 9, 1910. 1 juvenile, cl. 2.0 mm; the same, depth 1300 m. 1 specimen, cl. 13 mm.

Station 62, west of the Azores, 36° 52′ N, 39° 55′ W, depth 50 m, June 20 and 21, 1910. 1 specimen, cl. 13 mm.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, depth 1250 m, June 24, 1910. 1 juvenile, cl. 2.5 mm.

All the larger specimens at hand are easily recognized as belonging to this species by the distinct barb on the inner margin of the scaphocerite. In the juveniles (cl. 2 to 2.5 mm) this barb is only slightly indicated.

Among the notes left by SUND we found a number of drawings of *Oplophorus spinosus*. The sketches show various stages of this species, from the very juvenile specimen up to the ovigerous female (fig. 15). Furthermore SUND's figure of a specimen in dorsal view and a detail of the scaphocerite also are reproduced here (pl. III, figs. 1, 2).

The synonymy of this species, which is better known as *Oplophorus* (or *Hoplophorus*) *grimaldii* COUTIÈRE, has been dealt with by HOLTHUIS (1949, p. 229).

Distribution. The species is known from the North Atlantic (off the east coast of the U.S.A., near Bermuda, the Bahamas, west of Madeira, off the Canary Islands), from N. of Tristan da Cunha, from the eastern Indian Ocean, from S. of Japan, and from near Easter Island. It was found in depths ranging between 0 and 1800 m.

Nematocarcinidae

Nematocarcinus ensifer (SMITH) (fig. 16)

Eumiersia ensifera SMITH, 1882, Bull. Mus. comp. Zoöl. Harvard, vol. 10, p. 77, pl. 13 figs. 1—9.

Stochasmus exilis BATE, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 823, pl. 132 fig. 14.

Station 35, near the Canary Islands, 27° 27′ N, 14° 52′ W, depth 2603 m, May 18 and 19, 1910. 1 specimen, cl. 28 mm.

Station 53, south of the Azores, 34° 59′ N, 33° 1′ W, depth 1300 m, June 8 and 9, 1910. 1 specimen, cl. 7 mm.

Station 92, S.W. of Ireland, 48° 29′ N, 13° 55′ W, depth 1000 m, July 23 and 24, 1910. 1 specimen, cl. 7.3 mm.

The specimen from Station 92 has the rostrum unarmed below, while its upper margin bears 22 teeth, 8 of which are placed behind the orbit. The dorsal teeth would have

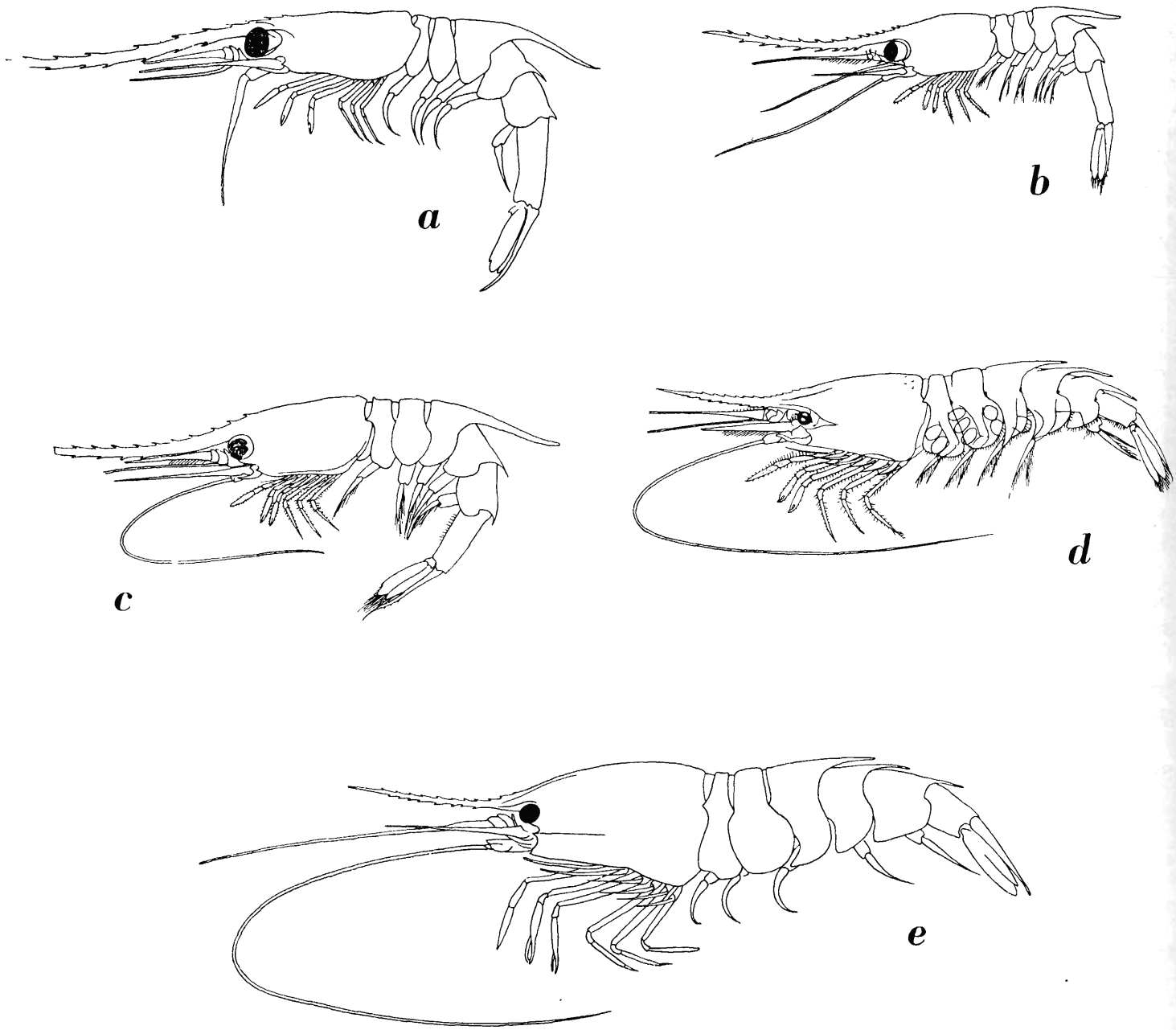

Fig. 15. *Oplophorus spinosus* (BRULLÉ). a, specimen from Sta. 53 (cl. 2.0 mm); b, specimen from Sta. 64 (cl. 2.5 mm); c, specimen from Sta. 49 (cl. 3.0 mm); d, ovigerous female from Sta. 51 (cl. 14.0 mm); e, specimen from Sta. 53 (cl. 13.0 mm).

been evenly distributed over the rostrum, were it not that the interspaces between the top of the rostrum and the first tooth, and that between the second and third teeth are somewhat larger than the intervals between the other teeth. The rostrum in this specimen does not reach the end of the antennular peduncle. The third abdominal segment is only slightly produced in the middle of the posterior margin. The specimen from Station 53 is similar to that from Station 92, but is in a poor condition. The large specimen from Station 35 has the rostrum long, though the tip is broken it still reaches considerably beyond the end of the antennular peduncle. It has at least 24 dorsal teeth, 8 of which are placed behind the orbit; no ventral teeth are visible. The distal dorsal teeth are placed slightly wider apart than the proximals. The third abdominal segment of this specimen is strongly produced in the postero-median region.

It is interesting to note that our large specimen was found in a sample taken from the sea-bottom, while the two smaller animals were collected from mid-water.

The taxonomic status of many of the species belonging to the genus *Nematocarcinus* still is more or less uncertain as the variability of the characters that are used to separate these species is not yet fully known. From the Atlantic Ocean four species of *Nematocarcinus* have been reported: *N. cursor* A. MILNE EDWARDS, *N. ensifer* (SMITH), *N. exilis* (BATE), and *N. gracilipes* FILHOL. *Nematocarcinus cursor* is a rather characteristic species, the identification of which causes not too many difficulties, but considerable confusion exists regarding the three other species. Some authors consider *N. ensifer* and *N. exilis* as two distinct species, others treat *N. exilis* as a variety of *N. ensifer*, while a third group of authors unites the two to one single species. The differences generally attributed to the two forms are the following (see HANSEN, 1908, p. 75, and KEMP, 1910, p. 79):

1. In *N. exilis* the rostrum is shorter than in *N. ensifer*. According to KEMP (1910) the rostrum in the former species measures 1/3 to 3/5 of the length of the carapace, while in «typical specimens of *N. ensifer* the rostrum is frequently as long as the carapace».

2. The eyes are larger in *N. exilis* than in *N. ensifer*.

3. The posterior corner of the pleura of the fifth abdominal segment is more distinctly drawn out in *N. ensifer* than in *N. exilis*.

4. The third abdominal segment in the postero-median region is less strongly produced in *N. exilis* than it is in *N. ensifer*.

5. The pereiopods in *N. exilis* are slightly longer than in *N. ensifer*, in the former species the first pair of legs reaches beyond the tip of the scaphocerite by the length of the chela and sometimes by one quarter of the carpus as well, while in the latter the first legs reach only to the tips of the scaphocerite.

6. *N. exilis* is a form from the eastern Atlantic, while *N. ensifer* inhabits the western part of that ocean.

According to most of these characters our material belongs to two different species. The large specimen from Station 35 shows most resemblance to *N. ensifer*, while the two small specimens should have to be placed in *N. exilis*.

Concerning the length of the rostrum SMITH (1882, p. 77) remarked that «the rostrum in the smaller specimens is often not more than half as long as the carapax proper, but in the larger specimens much longer and in one specimen nearly as long as the carapax». Two years later SMITH (1884, p. 369) replaced the last part of the just cited sentence by «but in the larger specimens much longer, frequently fully as long as the rest of the carapax». After reading the above statements and after examination of our material it seemed worth while to study the relative length of the rostrum in specimens of different sizes from both sides of the Atlantic Ocean. In the accompanying graph

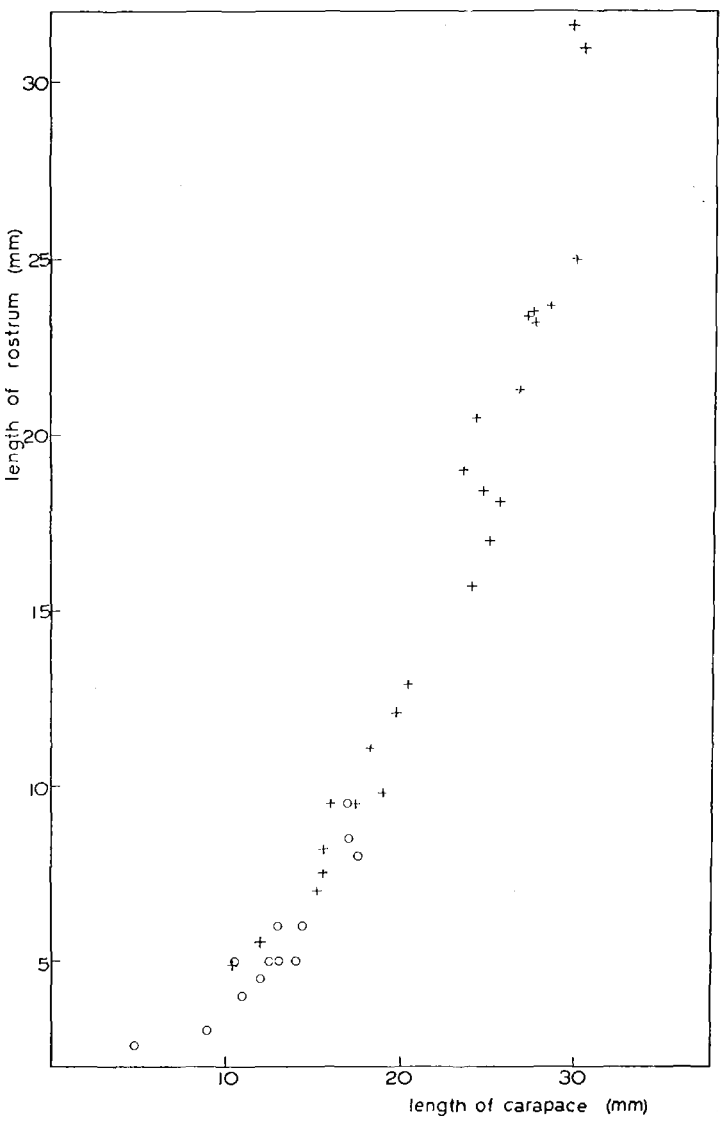

Fig. 16. *Nematocarcinus ensifer* (SMITH). Graph showing the relation between the length of the rostrum and that of the carapace in specimens from the eastern Atlantic (circles, o) and from the western Atlantic (crosses, +).

(fig. 16) we have set out the length of the rostrum against that of the carapace of specimens of both *N. ensifer* and *N. exilis*. This graph in the first place is based upon data published by European and American authors, while also the measurements taken from the «Michael Sars» material are used; unfortunately, the broken rostrum of the large «Michael Sars» specimen made it impossible to take accurate measurements from it. In going over the literature we found that hardly any measurements have been published for small specimens from the western Atlantic. To fill this gap in our knowledge, we measured a number of such small specimens (cl. 12.0 to 24.0 mm) from the «Albatross» Station 2116 (off the east coast of the U.S.A.), which were identified by SMITH (1884) as *N. ensiferus*. These specimens

for this purpose were kindly placed at our disposal by the U.S. National Museum, Washington, D.C., through the good offices of Dr. FENNER A. CHACE. As will be seen from fig. 16 the so-called differences in the length of the rostrum of *N. exilis* and *N. ensifer* do not actually exist, but are mainly due to the fact that until now no large specimens of *N. exilis* have been collected in the eastern Atlantic, while the measurements published for the western Atlantic form were largely taken from larger specimens. The published records for the total length of eastern Atlantic specimens vary between 36 and 83 mm, while SMITH (1882, 1884) reports upon western Atlantic specimens with sizes between 44 and 145 mm. The animal from the 1910 «Michael Sars» Station 35 proves that large specimens do occur in the eastern Atlantic. The first of the above mentioned characters differentiating between *N. exilis* and *N. ensifer* thus proves to be without taxonomic value.

The second of these characters concerns the difference in the size of the eyes. In BATE's (1888, pl. 132 fig. 14) original figure of *N. exilis* the eye indeed is shown distinctly broader than in SMITH's (1884, pl. 7 fig. 1, and 1886, pl. 17 fig. 2) figures of *N. ensifer*. However, SMITH's (1882, pl. 13 fig. 1) original figure of *N. ensifer* shows the eye distinctly broader than in his 1884 and 1886 figures, while KEMP's (1910, pl. 9 fig. 1) figure of *N. exilis* shows the eye much smaller than in BATE's (1888) figure of the type specimen of that species. Since the eye is somewhat flattened in one direction, totally different impressions of its width are obtained if it is observed from different angles. This may explain the large variation in the width of the eye in the published figures of both *N. exilis* and *N. ensifer*. It does not seem very probable that this character is of any importance for the distinction of the two forms. It is possible that KEMP (1910) reached this same conclusion since he did not mention the size of the eye as a character to separate the two species.

The third and the fourth characters, like the first, are subject to change with the age of the animals. In juvenile specimens the pleura of the fifth abdominal segment is short and broad, and the third segment is only slightly produced posteriorly; in the large specimens, however, the pleura of the fifth segment is longer and somewhat drawn out, while the third abdominal segment forms a more or less tooth-like process in its postero-median part. Both our large specimen and the *exilis* specimen figured by KEMP (1910, pl. 9 fig. 1) in these repects do not differ essentially from *N. ensifer* as figured by SMITH (1884).

The fifth of the above mentioned characters for the separation of *N. exilis* and *N. ensifer* does not hold good either. Though KEMP (1910, p. 79) states that in *N. ensifer* the first legs reach «only to the tips of the antennal scales», SMITH (1882, p. 79), in the original description of the species remarks that the «legs of the first pair .... reach to or a little by the tips of the antennal scales.» In the 6 specimens of *N. ensifer* from the western Atlantic that we examined and that still had the first legs attached (cl. 14.5 to 26 mm), we found that the first leg reaches beyond the scaphocerite with at least the fingers and sometimes even with more than the entire chela.

Summarizing, we arrive at the conclusion that the evidence before us does not support the validity of the characters that have been given in the literature to distinguish *N. exilis* and *N. ensifer*. These supposed differences between the two forms are mainly due to differences in age of the specimens examined. It is therefore impossible for us to regard *N. ensifer* and *N. exilis* as different species or even subspecies, and consequently *N. exilis* is treated here as a junior synonym of *N. ensifer*.

A different problem is offered by *Nematocarcinus gracilipes* FILHOL. As has been pointed out by HOLTHUIS (1951, pp. 34, 35) this species has never been adequately described and is only known from a figure which very often has been used (and misused) in popular books dealing with the deep sea. During a very short stay in Paris in 1950, HOLTHUIS briefly examined the type specimens of *Nematocarcinus gracilipes*, which still are preserved in the Muséum National d'Histoire Naturelle. HOLTHUIS's (1951, pp. 34, 35) opinion that DE MAN (1920, p. 75) erroneously gave the Cape Verde Islands as the type locality of *N. gracilipes*, proved to be unfounded. The label of the type specimen of this species, namely, reads:

«Iles du Cap Vert. Talisman. 4742—86. 30 Juillet 1883. n. 112. 495—618 m». The depth 495—618 m given on the label does not check with that given in the literature (Anonymus, 1884, p. 532; FILHOL, 1885, pp. 140, 143), where it is said that the species was captured at a depth of 850 m. However, the station data of this «Talisman» Expedition seem to be in a state of great confusion. As far as we could check, no list of the stations has ever been published in the series of the Travailleur and Talisman reports, in fact we know of no place in French literature where such a list can be found. However, SANDERSON SMITH (1888, pp. 981—985), published the data from the dredging stations made by the «Talisman» in 1883. The data given by SMITH for Station 112 of this expedition do not check with those found on the label of the types of *N. gracilipes;* the latter data agree far better with those given by SMITH for Station 120, which again check very well with those given by A. MILNE EDWARDS & BOUVIER (1900, p. 362) for Station 113 of the same expedition. To make the situation still more complicate, A. MILNE EDWARDS & BOUVIER (1900), on p. 66 give data for Station 113 which do not check at all with the data given for the same station by the same authors on p. 362 of their publication, but which agree

well with the data listed by SMITH (1888) for Station 119. A. MILNE EDWARDS & BOUVIER's (1900, p. 13) Station 112 is identical with one of the stations that SMITH (1888) gave the number 118, while Station 112 mentioned by A. MILNE EDWARDS & BOUVIER (1900) on p. 122 of their paper proves to be identical with the second of SMITH's stations 118, these two stations 118 mentioned by SMITH having different positions and depths. Anyhow, whatever the exact position is of the station where the types of *N. gracilipes* were collected, it certainly is close to the Cape Verde Islands.

The type specimens of *N. gracilipes* resemble *N. ensifer*, but differ somewhat in the shape of the rostrum. The larger of the two specimens is an ovigerous female of 80 mm total length, the other measures 62 mm. The rostrum is about 2/3 of the length of the carapace, it bears 23 to 25 teeth on the upper margin, 10 or 11 of which are placed behind the orbit. The ultimate half of the upper margin of the rostrum is unarmed. The lower margin bears 2 to 4 teeth which are placed below the unarmed dorsal part. The third abdominal segment has the posterior margin somewhat produced in its median part, but it is not pointed there. The first leg reaches with part of the carpus beyond the scaphocerite. These two type specimens show a remarkable resemblance to the specimen mentioned by LENZ & STRUNCK (1914, p. 330) under the name *Nematocarcinus ensifer* var. *exilis* from the South Atlantic Ocean near Ascension. In LENZ & STRUNCK's specimen the rostrum bears 26 dorsal teeth, 10 of which are placed behind the orbit; the anterior 1/4 to 1/5 of the rostrum is without teeth dorsally, but bears two teeth ventrally. It seems to be possible that LENZ & STRUNCK's specimen is conspecific with *N. gracilipes* FILHOL, which species may be different from *N. ensifer* (SMITH). A direct comparison of FILHOL's types, LENZ & STRUNCK's specimen and North Atlantic material might solve this problem.

SMITH (1882, p. 77) in the original description of the present species gave it the name *Eumiersia ensifera*. When subsequently the species was placed in the genus *Nematocarcinus*, the gender of the specific name changed from feminine to masculine. Some authors, including SMITH himself, then used the spelling *ensiferus*, which, however, is incorrect as the masculine form of *ensifera* is *ensifer*. The correctly spelled name for the species thus is *Nematocarcinus ensifer*, a spelling adopted by most modern authors.

Distribution. The species has been reported from the North Atlantic (S. of Iceland, off the east coast of the U.S.A. between 31° and 42° N, off S.W. Ireland, the Bay of Biscay, the Mediterranean, the Canary Islands), from the Indian Ocean (Arabian Sea, Bay of Bengal), and from the Pacific (off Japan, off New Guinea, off the west coast of Central America between 1° S and 28° N). It has been collected at depths between 535 and 3650 m, while larvae have been taken at about 33 m depth.

Pasiphaeidae

Pasiphaea tarda KRØYER (figs. 17, 18)

Pasiphae tarda KRØYER, 1845, Naturhist. Tidsskr., n. ser. vol. 1, p. 453.

Pasiphaë princeps SMITH, 1884, Rep. U. S. Fish Comm., vol 10, p. 381, pl. 5 fig. 2.

Pasiphaea principalis SUND, 1913, Bergens Mus. Aarb., 1912 pt. 6, p. 6, figs. 5—7, 9 a—f.

Station 4, off S. W. Ireland, 49° 38′ N, 11° 35′ W, depth 923 m, April 10, 1910. 2 mutilated specimens, cl. about 30 and 50 mm.

Station 101, off the Hebrides, 57° 41′ N, 11° 48′ W, depth 1853 m, August 6, 1910. 2 specimens, cl. 4.5 and 22 mm.

The systematic status of this species has been a subject of many controversies and of much confusion. Some authors, like SUND (1913), considered *Pasiphaea tarda*, *P. princeps*, *P. principalis* and *P. multidentata* as four distinct and valid species. Others, like KEMP (1910, pp. 39, 42) and the present authors, believe *P. tarda*, *P. princeps* and *P. principalis* to be synonyms for one species, which, however, is distinct from *P. multidentata* (the latter species is dealt with here on pp. 26—29). The other extreme of the three opinions, namely that all four names are synonymous, was held by authors like STEPHENSEN (1912, p. 65).

SUND's opinion, which he published in a preliminary paper in 1913, was partly based on material collected by the 1910 «Michael Sars» Expedition. It was to be expected that SUND would have elaborately dealt with this question in his «Michael Sars» report, had he been given the opportunity of finishing the latter. For this reason the present authors feel it their duty to study this problem in somewhat more detail than they otherwise would have done in this paper; they have tried now to come to a definite conclusion with regard to the systematic status of the above mentioned species. In order to attain this end they asked for and received on loan all the North Atlantic material of *Pasiphaea* of the Museums of Tromsø, Trondheim, Bergen, Oslo, and Copenhagen, the larger part of which served SUND as a basis for his *Pasiphaea* study. Furthermore material from the American east coast, identified by S. I. SMITH as *Pasiphaë tarda* and *P. princeps* was received on loan from the U.S. National Museum in Washington, D.C., U.S.A. The authors wish to express here their deep felt gratitude to the above named institutions for entrusting them with this valuable material.

We regret that after a thorough examination of all this material we are unable to share SUND's opinion that *P. tarda*, *P. princeps* and *P. principalis* represent three distinct species.

As far as *Pasiphaea tarda* and *P. principalis* are concerned, SUND (1913, p. 15) states that the «chief distinctions depend upon the form of the rostrum and upon the relative size of the abdomen». Considering first the character afforded by the abdomen we see that SUND expressed the relative size of the abdomen in his material in the ratio

$$\frac{\text{carapace length}}{\text{length of abdomen}}$$

and that he found this ratio to be different in the two species. As SUND himself (1913, p. 6) already pointed out this »ratio .... is very difficult to determine with certainty, as it is impossible to stretch the abdomen of specimens preserved in alcohol quite straight». In our opinion too this character is hardly trustworthy, but in order to check SUND's statement that it can be used to distinguish the two species, we measured as accurately as possible all the material seen by us. The result of this investigation shows that the above mentioned ratio as a specific character is of no value at all and that it is impossible to distinguish the two species with it.

A very careful comparison of the specimens brought by SUND to *P. tarda* and *P. principalis* respectively, failed to show any difference that might be used to separate the two, except for the shape of the rostrum. This latter feature has been used by SUND as the most important character to distinguish *P. principalis* from *P. tarda*, and good figures of the shape of the rostrum of typical *principalis* and typical *P. tarda* specimens may be found in SUND's paper. (1913, figs. 9 a, g, h).

As already stated by SUND (1913, p. 17) the shape of the rostrum «is very different in large individuals. . . ., but there is less difference in young animals». SUND furthermore remarks that the juveniles «were determined as either *P. principalis* or *P. tarda* by means of the form of the scaphocerite and the armament of the 2nd pereiopod». This statement is not very clear since on p. 16 the same author declared that the «two forms agree in the shape of the scaphocerite, though the apical spine is as a rule more developed in *P. tarda;* they also agree in the armament of the 2nd pereiopod». Actually SUND's (1913, p. 17) statement «I suppose each set [of juveniles] belongs to the respective species merely because the specimens were caught in areas where only one of the two forms is known to occur», shows that he, like we, was unable to distinguish between specimens of *P. principalis* and *P. tarda*, that have the carapace less than 20 mm long. In these juveniles, as is shown by SUND's figures 9 d-f, m, and n, the rostrum is short and erect, its shape resembling more that of an adult specimen of *P. principalis*, than that of an adult *P. tarda*. In the material examined by us hardly any recognizable «tarda»-shaped rostrum was found in specimens of less than 30 mm carapace length, while the typical «tarda» rostra were only observed in specimens of more than 40 mm carapace length.

Our problem now is whether or not the difference in the shape of the rostrum shown by large specimens brought by SUND to *Pasiphaea tarda* and *P. principalis* actually is of specific value. Of *Pasiphaea principalis* we examined 7 specimens with a carapace length of 35 mm or more, all seven being types of the species (fig. 17 g-m). The lengths of their carapaces were respectively 35, 36, 36, 39, 40, 40, and 43 mm[1]. Of these seven specimens not less than five (fig. 17, h, i, j, l, m) are parasitized by Protozoan parasites belonging to the genus *Amallocystis* of the family Ellobiopsidae. These parasites are visible as bushy masses protruding from the base of the rostrum at each side of the carapace; their position is well shown in SUND's (1913) fig. 9b. Similar parasites also occur in *Pasiphaea multidentata* ESMARK (fig. 20a, b). The presence of the parasites causes a deformation in the anterodorsal part of the carapace and in the rostrum of the host. Firstly the upper margin of the carapace shows a distinct hump over the region where the parasites are attached, and secondly the rostrum usually degenerates, becoming short, high, and blunt, with a rather irregular outline. A specimen of 30 mm carapace length from the «Tjalfe» Expedition (fig. 17f) identified by SUND as *P. tarda* and mentioned by him (1913, p. 16) as forming the fourth lot in the enumeration of his material of that species, also showed Ellobiopsid parasites. In this specimen the parasites evidently were still very young since they do not yet form the large bushy masses, but are visible only as small bud-shaped objects. The host had the dorsal margin of the carapace with a distinct hump, but the rostrum still is pointed and rather long, being not as much degenerated as in the larger specimens. Except for this 30 mm «Tjalfe» specimen, all parasitized specimens were placed by SUND in *P. principalis*. As we know now that the presence of Ellobiopsid parasites causes a deformation of the rostrum (the same phenomenon also is observed in *Pasiphaea multidentata*, see figs. 20 a, b), we might be inclined to believe that the characters in which the rostrum of *P. principalis* differs from that of *P. tarda* are caused only by the Ellobiopsidae. But then we still have

[1] The measurements given here represent the actual dorso-median length of the carapace, measured from the dorso-median point of the anterior margin to the tip of the median emargination of the posterior margin. Our measurements in several cases differ more or less distinctly from those given by Sund for the same specimens. These differences partly are accounted for by that Sund took his measurements in a different way, and partly by that the material in the course of time may have changed somewhat. Some of the differences, however, cannot be explained that way, so for instance the ovigerous female said by SUND to have the carapace 52 mm long, was found by us to have a carapace length of about only 40 mm. In the present discussion therefore we only use the measurements taken by ourselves.

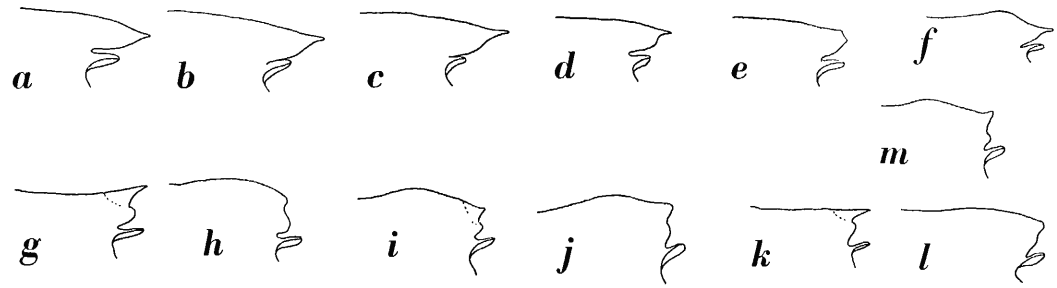

Fig. 17. *Pasiphaea tarda* KRØYER. Outlines of rostra. a—f, specimens, with cl. 48, 48, 43, 41, 39, and 30 mm respectively, identified by SUND as *P. tarda;* f, specimen with young Ellobiopsidae; g—m, type specimens of *P. principalis* SUND, cl. 43, 40, 40, 39, 36, 36, and 35 mm respectively. h, i, j, l, m, specimens heavily infested by Ellobiopsidae.

to explain why the two large non-parasitized type specimens of *P. principalis* (cl. 36 and 43 mm) (fig. 17 g, k) do not have a rostrum of the «tarda» type. The rostrum of the larger of these specimens has been figured by SUND as fig. 9a, that of the smaller specimen is very similar. A careful examination of these two specimens shows that the rostrum in both has the tip separated from the basal part by a rather sharp line, along which the tip is slightly movable. The whole situation gives the impression that the rostrum has met with some accident and that the tip is regenerating. Taking furthermore into account that the shape of the basal part of the rostrum of these *P. principalis* specimens in no way differs from that of *P. tarda* specimens, we have come to the conclusion that these two specimens probably are nothing but *P. tarda* with the rostrum broken and regenerating. Also the specimen of 30 mm carapace length figured by SUND as fig. 9c has such a regenerating rostrum; in fact this feature is seen in many specimens of the same lot. This lot, being collected at Station 79b of the 1902 «Michael Sars» Expedition, contains, apart from 4 of the 5 large parasitized specimens mentioned above, a large number of specimens with the rostrum regenerating (all the specimens figured by SUND as figs. 9a—c belong to this lot). It seems probable that this particular lot has been heavily infected with Ellobiopsid parasites, part of the specimens (4 in number) still showing the parasites and having the rostrum deformed, part of them recovering from the attack and with the rostrum regenerating. Also it is possible that the infection by Ellobiopsidae, which evidently always is localized in the region of the rostrum, makes the rostrum brittle and easy to break. It is noteworthy that all but one of the large type specimens of *P. principalis* belong to the lot from «Michael Sars» 1902 Sta. 79b; the only exception is the specimen with a carapace length of 36 mm from Sognefjord («Michael Sars» 1911, Sta. 4) (fig. 17 l) which is listed by SUND (1913, p. 13) in his one but last lot. This specimen also is heavily infested with Ellobiopsidae, showing a large cluster of these at each side of the strongly deformed rostrum. The specimen from SUND's second lot said to have the carapace 37 mm long, actually has it only 32 mm.

Summarizing we find that the short and high «principalis» type of rostrum is primarily a juvenile character, always present in specimens with the carapace less than about 20 mm long. In material with a carapace length between about 20 and about 35 mm we find the rostrum rather variable, showing all transitions from a high and short to a more low and elongate shape. In large specimens the shape of the rostrum normally is of the «tarda» type, but through the action of Ellobiopsid parasites it may become deformed and obtain a high and short outline, resembling more or less that of juvenile specimens. The shape of the rostrum therefore cannot be used as a character to distinguish *P. tarda* and *P. principalis*. The absence of other characters separating these two species necessitates the fusion of the two. The name *principalis* thus disappears in the synonymy of *Pasiphaea tarda*, the latter being the older of the two.

Our next problem is whether or not *Pasiphaea princeps* SMITH and *P. tarda* KRØYER are different species. SUND (1913, p. 11) considers *P. princeps* to be a species distinct from *P. principalis* and *P. tarda*, he lists the following differences between the first two:

1. «The eggs of Smith's species are very large, measuring 4 by 5 mm, while the eggs of the European species measure only 2 by 3 mm». SUND is mistaken in the size of the eggs of SMITH's specimen, as SMITH (1884, pp. 382, 383) himself states: «The eggs, which are just beginning to show the pigment of the developing eyes, are slightly elliptical in outline and about 3 by 4 mm in shorter and longer diameter», while the same author later (SMITH, 1886, p. 630) gives the diameter of the eggs of *P. princeps* as 3.5 mm. GURNEY (1942, p 55) states that the eggs of *P. tarda* are 3.4—3.9 by 3 mm in diameter, so that there actually is no difference in the size of the eggs in *P. tarda* and *P. princeps*. GURNEY's statement that the eggs of *P. princeps* are 4 by 5 mm in diameter in all probability is based on SUND's erroneous remark. Unfortunately all of the ovigerous females seen by us had lost their eggs so that we could not take any measurements ourselves.
2. «The base of the 2nd pereiopod carries no spines in the American species according to Smith's description, while all the specimens of the present species longer than about 60 mm which I have seen carry at least 2

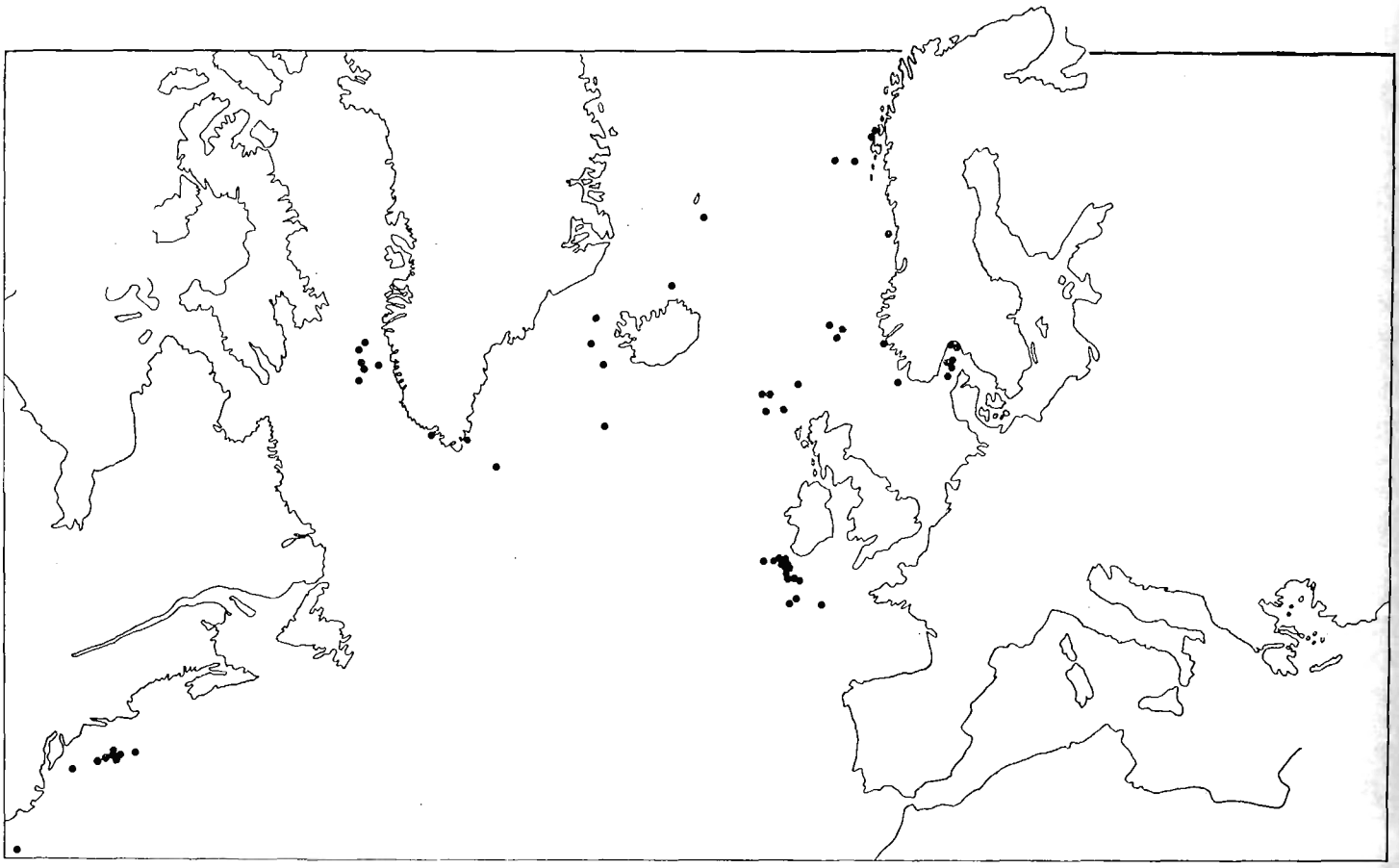

Fig. 18. Geographical distribution of *Pasiphaea tarda* KRØYER in the North Atlantic.

and sometimes as many as 5 spines». Though SMITH in his description does not directly state that no spines are present on the basis of the second pereiopod, it might be concluded from his description that he meant to say so; also no such spines are shown in SMITH's figure. The absence of these spines may be a senile character, since SMITH's type (which has not been seen by us) is a specimen with a carapace length of 75 mm, being thereby 1.5 times as large as the largest specimen in SUND's and our material. Furthermore the East American specimens seen by us, which were identified by S. I. SMITH as *Pasipaea princeps* had the basis of the second pereiopod with one to three spines. These specimens, six in number, showed carapace lengths of 25 to 49 mm.

3. «The comparative lengths of the joints of the 4th and 5th pereiopod in Smith's species do not correspond with those found in the present species». Such a difference was not found by us when directly comparing our European specimens of *P. tarda* with East American specimens of about equal size identified by SMITH as *P. princeps*.

We do not find any differences of taxonomic importance between the East American and European specimens examined by us and are fully convinced that they constitute but one species, which has to bear the name *Pasiphaea tarda*. The few differences that our American material shows with the original description of *P. princeps* probably are caused by the unusual size of the latter, and we follow SMITH in considering them to belong to the same species. Thereby *Pasiphaea princeps* falls as a synonym of *P. tarda*.

Apart from the specimens collected during the 1910 «Michael Sars» Expedition the following material has been examined by us: All of SUND's types of *Pasiphaea principalis* listed by him on p. 13 of his 1913 paper, and the specimens enumerated by him (1913, p. 16) in the list of material of *P. tarda*, with the exception of the type of *P. tarda* and the first five lots of specimens collected by the «Thor» in the Skagerak. Part of the latter perhaps form a lot of 7 specimens in the Bergen Museum, which was identified by SUND as *P. tarda* and which only bears the label «Skagerak». We examined also the specimen from «Albatross» Station 2171 reported upon by SMITH (1886, p. 683) as *Pasiphaë princeps* and those from «Albatross» Stations 2546 and 2626 mentioned by RATHBUN (1904, p. 23) under the same specific name. Furthermore we saw all the spe-

cimens of the present species collected by the «Ingolf» Expedition reported upon by HANSEN (1908, p. 78), those collected by the «Rink» Expedition reported upon by STEPHENSEN (1916, p. 270), those collected by the «Thor» Expedition reported upon by STEPHENSEN (1923, p. 31), the specimens enumerated by GRIEG (1927, p. 8), that of the «Godthaab» Expedition dealt with by STEPHENSEN (1935, p. 33), and the Lindenowfjord specimen mentioned by HEEGAARD (1941, p. 57). Furthermore we examined materirial from several Norwegian localities (Torsken, Tysfjord, Ranøkalven and Hvaler).

D i s t r i b u t i o n. The species inhabits the northern Atlantic Ocean (see fig. 18); along the European coast it occurs as far south as the Bay of Biscay while along the American coast it has been reported from off S. Carolina and localities more to the north. RATHBUN (1904, p. 23) mentions the species from Unalaska and the state of Washington on the Pacific coast of America, while FAXON (1895 p. 175) recorded a specimen from off Ecuador. The species has been reported from depths between 250 and 2400 m.

Pasiphaea multidentata ESMARK (figs. 19—21)

Pasiphaea multidentata ESMARK, 1866, Forh. Vidensk. Selsk. Christiania, 1865, pp. 259, 314, 315, 316.

Pasiphaë norvegica M. SARS, 1866, Forh. Vidensk. Selsk. Christiania, 1865, pp. 260, 314, 315, 316.

Pasiphaë (Phye) sicula RIGGIO, 1896, Natural. Sicil., vol. 15, p. 41 (pl. 1 figs 2 a, b, belonging to this description, was published without explanation in vol. 14 (1895)).

Pasiphaea multidentata sicula ZARIQUIEY ALVAREZ, 1946, Publ. Biol. Medit. Inst. Esp. Est. Medit., vol. 2, p. 59, figs. 59, 61.

We did not find any representative of this species in the material collected by the 1910 «Michael Sars» Expedition examined by us. In SUND'S notes there is an indication that this species actually has been collected by the expedition, but the indication is too vague to be used.

The scientific life of this species starts with a rather unpleasant dispute between the Norwegian professors L. ESMARK and M. SARS. In the meeting of October 27 1865 of the Videnskabs Selskab in Christiania (the present Oslo), ESMARK (1866, p. 259) described the present form as a new species under the name *Pasiphaea multidentata*. At the end of ESMARK's lecture MICHAEL SARS stated that he had in his possession specimens of a new species of *Pasiphaea* (spelled *Pasiphaë* by him) which he had named *P. norvegica*. He remarked that a careful comparison with ESMARK's *P. multidentata* was necessary in order to ascertain whether or not the two forms are distinct. SARS' remark was published on p. 260 of the Forh. Vidensk. Selsk. Christiania, 1865, and this is the first time that the name *Pasiphaë norvegica* appeared in print; since SARS did not give any details of his species there, the name is a nomen nudum. At the next meeting of the Selskab (December 1, 1865) M. SARS made a few remarks on Crustacea and Mollusks collected by him in Christianiafjord. Among the Crustacea he mentioned *Pasiphaë norvegica*. In Forh. Vidensk. Selsk. Christiania, 1865, p. 314 an extract of SARS' lecture is published; in this extract the names of the species mentioned by SARS are listed, but no description is given. The name *Pasiphaë norvegica* thus figures here for the second time as a nomen nudum. In the discussion following SARS' lecture ESMARK expressed the opinion that SARS' *P. norvegica* and his own *P. multidentata* are identical species, and that the latter name has to be used. SARS in his reply does not deny the identity of the two forms, but he does not positively accept it either. SARS' reproach that ESMARK published the description of his *P. multidentata* only after having seen SARS' specimens of *P. norvegica*, might be considered as showing that SARS too was of the opinion that the two species are identical. SARS furthermore stated that ESMARK's description is insufficient for a certain identification of *P. multidentata* and therefore he rejects the latter name. ESMARK did not give in and claimed that the name proposed by him is perfectly valid and has to be given preference over *P. norvegica*. This discussion is published on pp. 314—316 of the above mentioned Forhandlinger. During the discussion SARS, to show the variability of a character used by ESMARK, described the spinulation of the merus of the first and second pereiopods of his *P. norvegica* specimens (p. 315) and it is thus here that the name *P. norvegica* for the first time is made available nomenclatorially. As far as we can find out, the volume of Forh. Vidensk. Selsk. Christiania, 1865, has not been published in parts, but as a whole. The names *Pasiphaë norvegica* and *Pasiphaea multidentata* thus have been published at the same time and for nomenclatorial purposes rank from the same date. To find out which of these two names according to the International Rules of Zoological Nomenclature has to be employed for the present species, we have to apply the Principle of the First Reviser.[1] In the present case the first reviser is the author who, after citing the two names, clearly indicates by whatever method, that he is of the opinion that the two nominal species represent the same taxon and that he is selecting one of the names to the exclusion of the other name to be the name to be used for that taxon (see HEMMING, 1953, p. 67). This first reviser thus evidently is ESMARK himself (1866, pp. 314—316),

[1] The Principle of Page Precedence installed during the XIIIth International Congress of Zoology at Paris, 1948 (see HEMMING, 1950, p. 330), has been abandoned again during the XIVth International Congress of Zoology at Copenhagen, 1953, where the Principle of the First Reviser was reinstalled (see HEMMING, 1953, p. 66).

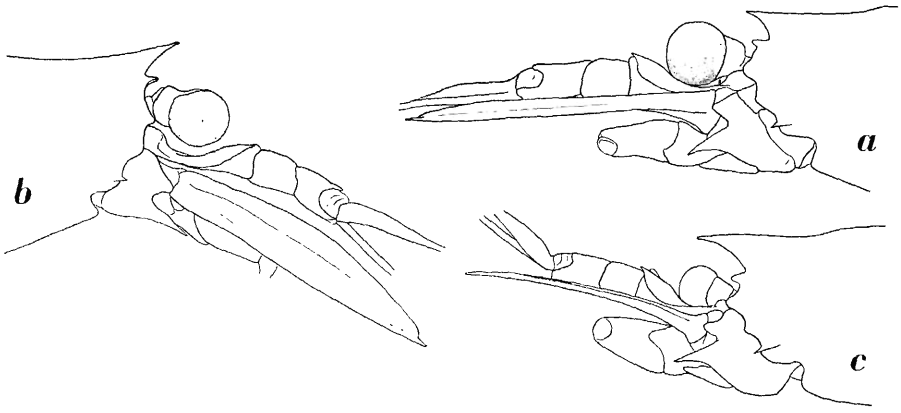

Fig. 19. *Pasiphaea multidentata* ESMARK. Anterior part of the body in lateral view. a, b, ovigerous females (cl. 36.5 and 33 mm respectively) from Salhus, Bergensfjord, Norway; c, ovigerous female (cl. 34.3 mm) from the Catalonian coast of Spain.

who emphatically stated that he considered *P. multidentata* and *P. norvegica* to be identical species and furthermore said that the species should be known under the name *multidentata*, while he rejected the name *norvegica:* «den [the species] skulde beholde det af ham [ESMARK] først givne Navn P. multidentata og ikke Sars's senere norvegica». Consequently, as far as the name of the present species is concerned, we reach here the same conclusion as SUND (1913), namely that the correct name is *Pasiphaea multidentata* ESMARK. SUND arrived at this same conclusion because he was of the opinion that *P. norvegica* dated from 1868, the year in which M. SARS published an elaborate description and good figures of that species; SUND therefore considered *P. multidentata* as a senior synonym of *P. norvegica*.

Before the publication of SUND's (1913) paper neither the name *P. multidentata* nor *P. norvegica* had been accepted but by their own authors. Most European carcinologists of that period considered the species to be not different from *Pasiphaea tarda* KRØYER. In America, SMITH (1884, p. 381) had already discovered that these two species are distinct, but unfortunately he gave the new name *princeps* to the actual *P. tarda*, applying the name *tarda* to the other (i.e. the present) species. KEMP (1910, pp. 42, 43) was the first European author who recognised the differences between the two species, but he unfortunately followed SMITH in using the incorrect names. SUND (1913) made an end to this nomenclatorial confusion and gave the present species the correct name *P. multidentata*, which name at present is generally accepted.

The present species has been well described by M. SARS (1868, p. 282) and KEMP (1910), who both also gave good figures of it. The differences between this species and *P. tarda* have been dealt with by KEMP (1910) and SUND (1913).

The specimens of *Pasiphaea multidentata* from the Mediterranean are considered by ZARIQUIEY ALVAREZ (1946, pp. 59, 60) to form a distinct subspecies, which he named *Pasiphaea multidentata sicula* RIGGIO (1896). Dr. ZARIQUIEY was so kind to provide us with his large material of this Mediterranean form and with his as yet unpublished notes on Mediterranean species of *Pasiphaea*. A comparison of our extensive North Atlantic material with the specimens from the Mediterranean fully confirmed Dr. ZARIQUIEY's opinion that the two forms are so closely related that it is impossible to consider them to be specifically distinct. Whether the differences that exist are of a sufficient importance to justify the separation of the Mediterranean form as a distinct subspecies remains to be considered. The only differences that we found between the two forms are:

1. The rostrum in *P. multidentata sicula* (fig. 19c) usually is longer, higher and directed more forwards than in *P. m multidentata* (fig. 19a, b). It generally reaches considerably beyond the anterior margin of the carapace, has the upper margin less convex than in the typical form and has the tip more produced and slender. The shape of the rostrum is more variable in the Atlantic specimens than in those from the Mediterranean, and though we did not find any large *sicula* specimens with a *multidentata* type of rostrum, among material from the Skagerak some large specimens were encountered that had the rostrum exactly like in the Mediterranean form.
2. A second difference is the one found by us in the size of the eyes, which on the whole are larger in the typical form than in the subspecies *sicula*. Also this character is variable, and moreover it is hard to use for diagnostic purposes.

As we could find no other differences between the two forms, and as the two characters mentioned above prove to be variable, at least in the Atlantic material, it is hard to decide whether or not the Mediterranean form should be considered as a distinct subspecies. In order to find a satisfactory solution to this problem it is necessary to examine a large material of adult specimens from more localities than we at present have at our disposal.

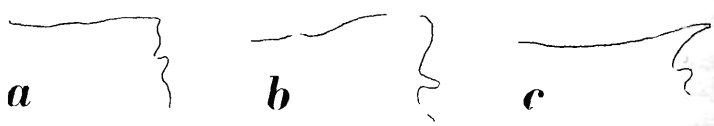

Fig. 20. *Pasiphaea multidentata* ESMARK. Outlines of rostra of specimens from Drøbak, Norway. a, b, specimens parasitized by Ellobiopsidae (cl. 21 and 31 mm respectively); c, specimen without parasites (cl. 27 mm).

Some of the specimens that were examined by us were infested with Ellobiopsid parasites, which, like in *P. tarda* caused a deformation of the rostrum (fig. 20a, b).

The type specimen of *Pasiphaea multidentata* ESMARK is preserved in the Oslo Museum and could be examined by us. As already stated by ESMARK and SUND (1913) it is in a poor condition, nevertheless its identity could be ascertained without the least doubt. The Oslo Museum furthermore possesses a specimen of the present species (cl. 35 mm) from Station 33 of the Norwegian North Atlantic Expedition, which was identified by G. O. SARS (1886, p. 11) as *P. tarda*.

Examination of 17 specimens from various localities within the Gulf of Maine, U.S.A., kindly lent to us by the U.S. National Museum, showed that SUND (1913) was right in his supposition that the American and European forms belong to one species. Part of this American material was dealt with by SMITH (1879, p. 89) under the name *Pasihaë tarda*, and part of it by BIGELOW (1926, p. 131) under the correct name *Pasiphaea multidentata*.

Distribution. Like the previous species *Pasiphaea multidentata* inhabits the northern Atlantic (see fig. 21). It occurs all along the westcoast of Europe and it is found in the Mediterranean. It also is reported from Iceland, Greenland and the American eastcoast from Cape Breton Island (Canada) south to Massachusetts (U.S.A.). It has been reported from depths between 10 and 2000 m.

Pasiphaea sivado (RISSO)

Alpheus Sivado RISSO, 1816, Hist. nat. Crust. Nice, p. 93, pl. 3 fig. 4.

Station 29, W. of Gibraltar, 35° 10′ N, 7°55′ W, depth 100 m, May 9, 1910. 1 specimen, cl. 14 mm.

In the collections of the Tromsø, Trondheim, Bergen, Oslo and Copenhagen Museums material of this species is present from the following localities: Norway (Ingdalen, Stadsbygd, S. Trøndelag; Mangerfjord; Hjeltefjord; Salhus in Bergensfjord; Abbedisen near Bergen; Kopervik; Langesundsfjord; Drøbak; Oslofjord), Skagerak, Sweden (Kosterfjord off Strömstad), Mediterranean (Barcelona, Sicily). No difference between the Mediterranean and the N. Atlantic forms could be found.

Distribution. The species is known from the west coast of Europe from western Norway southwards into the Mediterranean; it also has been reported from the Indo-West Pacific region (Red Sea, India, Japan). It is known from depths ranging between 0 and 500 m.

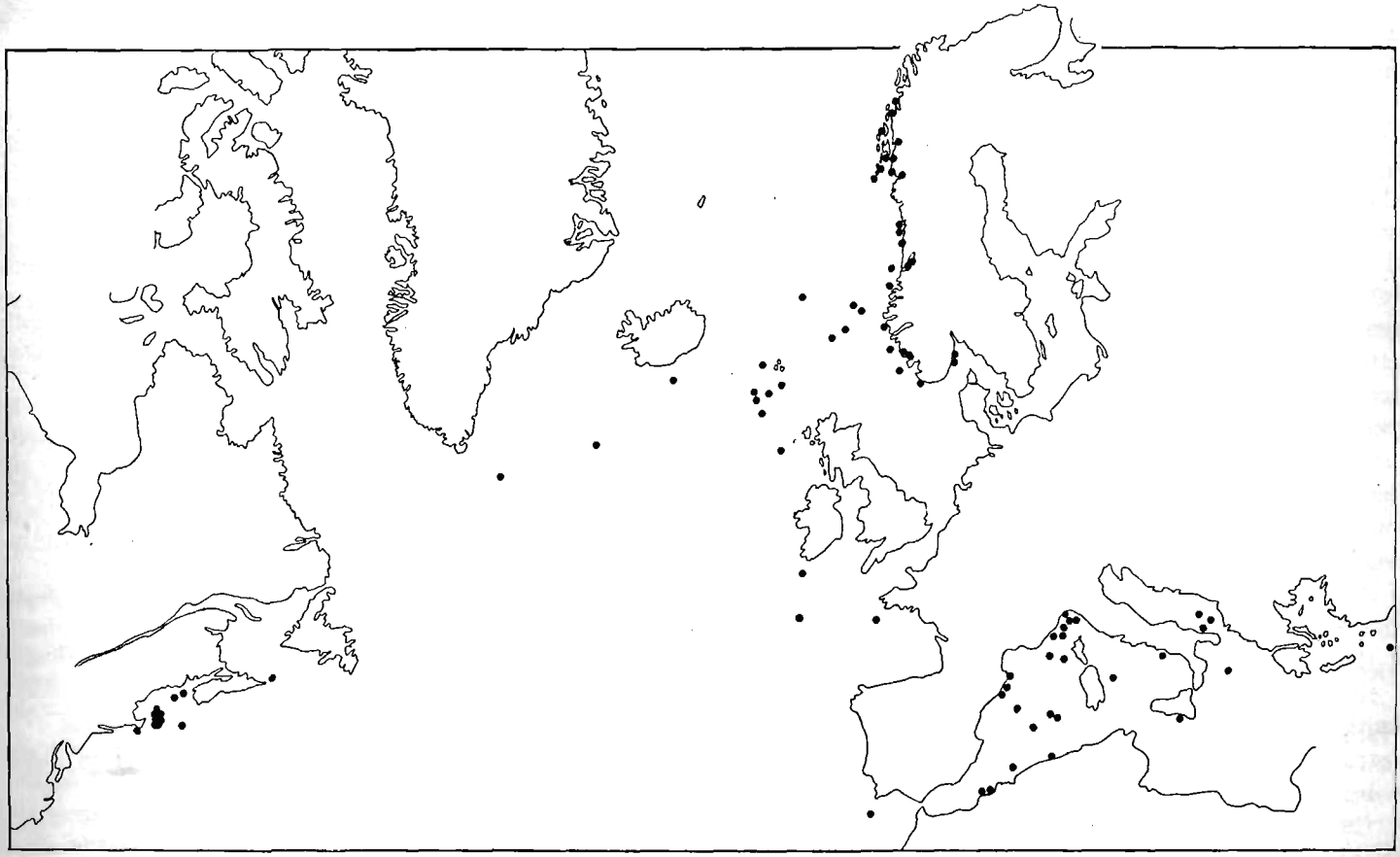

Fig. 21. Geographical distribution of *Pasiphaea multidentata* ESMARK.

Pasiphaea liocerca CHACE

Pasiphaea liocerca CHACE, 1940, Zoologica, New York, vol. 25 p. 122, figs. 2, 3.

Station 53, south of the Azores, 34° 59′ N, 33°1′ W, depth 1300 m, June 8 and 9, 1910. 3 specimens (1 ovigerous female, cl. 13 mm), cl. 10—14 mm.

Station 84, north of the Azores, 48°4′ N, 32° 25′ W, depth 1250 m, July 15, 1910. 1 specimen, cl. 13 mm.

The specimens agree fully with CHACE's description and figures of this species.

The only previous record of the species is that by CHACE (1940) who reports it from near Bermuda at about 32°12′ N, 64°36′ W, from a depth of about 1400 m.

Parapasiphaë cristata SMITH

Parapasiphaë cristata SMITH, 1884, Rep. U. S. Fish Comm., vol. 10, p. 388, pl. 5 fig. 3.

Parapasiphaë macrodactyla CHACE, 1939, Mem. Soc. Cubana Hist. nat., vol. 13, p. 33.

Station 53, south of the Azores, 34°59′ N, 33°1′W, depth 1300 m, June 8 and 9, 1910. 1 specimen, cl. 11 mm.

Station 64, between the Azores and Bermuda, 34°44′ N, 47° 52′ W, depth 1500 m, June 24, 1910. 1 specimen, cl. 8 mm.

Station 82, N.W. of the Azores, 48°24′ N, 36°53′ W, depth 1500 m, July 13, 1910. 2 specimens, cl. 15 and 21 mm.

Station 84, north of the Azores, 48°4′ N, 32°25′ W, depth 1000 m, July 15, 1910. 3 juveniles (small and defect): the same, depth 1250 m. 1 specimen, cl. 14 mm.

Station 92, S.W. of Ireland, 48°29′ N, 13°55′ W, depth 1500 m, July 23 and 24, 1910. 1 specimen, cl. 18.7 mm.

Station 101, off the Hebrides, 57°41′ N, 11°48′ W, depth 1250 m, August 6 and 7, 1910. 1 specimen, cl. 10 mm.

The 1910 «Michael Sars» collection contains 7 specimens which evidently belong to the present species. In these specimens the length of the carapace varies between 8 and 21 mm, the total length varying between 29 and 68 mm. Furthermore there are three smaller specimens (from Station 84) with a carapace length of less than 6 mm; these latter specimens probably also belong to the present species, but owing to the defective state of this material its specific identity cannot be made certain.

The specimens at hand were identified by SUND as *Parapasiphaë cristata* SMITH and indeed agree well with SMITH's original description of that species, which, however, is rather short. In our material the dorsal carina of the rostrum bears one or two teeth; in one of the specimens, however, such teeth are lacking entirely. The shape of the rostrum shows some slight variation, it generally is sharply pointed, but it may be slightly more blunt. Smith does not say anything about the dentition of the rostrum of the type specimen, but no teeth are discernable in his figure.

CHACE (1939, p. 33) described a new species, *Parapasiphaë macrodactyla* from off S.E. Cuba. Later, the same author (CHACE, 1940, p. 128) recorded it also from near Bermuda. This species without any doubt is identical with our material, the latter agreeing perfectly with the characters described and figured by CHACE for his specimens. In CHACE's material the dorsal carina of the rostrum is armed with one or two teeth above the orbit. According to CHACE one of the most distinctive characters of his species is the fact that the fingers of the second chelae are distinctly longer than the palm. This character is well shown by the «Michael Sars» material where the ratio between the length of the fingers and that of the palm varies between 1.15 and 1.22. According to the measurements given by SMITH for the type specimen of *Parapasiphaë cristata*, this ratio is 1.22 in that species.

From the available data it seems most probable that *Parapasiphaë cristata* and *P. macrodactyla* are identical. However, as SMITH's description is very short, a closer examination of the type specimen of *P. cristata* might disclose differences of specific value with *P. macrodactyla*.

Distribution. The type and only specimen of *Parapasiphaë cristata* recorded thus far originates from off the American eastcoast at 39°22′ N, 68°34′30″ W, depth 2900 m. *P. macrodactyla* has been reported from near Bermuda at about 32°12′ N, 64°36′ W, depth 1800 m for adults and 1000 to 1800 m for juveniles, and from S.S.E. of Bahia de Guantanamo, Oriente Province, Cuba, 19° 40′ N, 75°3′ W, depth 3500 m.

Parapasiphaë sulcatifrons SMITH

Parapasiphaë sulcatifrons SMITH, 1884, Rep. U. S. Fish Comm., vol. 10, p. 384, pl. 5 fig. 4, pl. 6 figs. 1—7.

Parapasiphaea sulcatifrons MURRAY & HJORT, 1912, Depths of the Ocean, p. 668.

Station 53, south of the Azores, 34°59′ N, 33°1′ W, depth 1300 m, June 8 and 9, 1910. 2 specimens, cl. 8 and 21 mm.

Station 62, west of the Azores, 36°52′ N, 39°55′ W, depth 1250 m, June 20 and 21, 1910. 1 specimen, cl. 6 mm; the same, depth 1500 m. 1 ovigerous female, cl. 24 mm.

Station 63, west of the Azores, 36°5′ N, 43°58′ W, depth 450 to 1350 m, June 22, 1910. 2 juveniles, cl. 6 and 7 mm.

Station 64, between the Azores and Bermuda, 34°44′ N, 47° 52′ W, depth 500 m, June 24, 1910. 2 specimens, cl. 19 and 22 mm (not seen); the same, depth 1000 m. 6 specimens, cl. 5.5 to 12 mm; the same, depth 1250 m. 2 juveniles; the same, depth 1500 m. 2 specimens, cl. 19 and 22 mm.

Station 66, S.E. of Newfoundland, 39°30′ N, 49°42′ W, depth 500 m, June 26, 1910. 1 specimen, cl. 6 mm; the same, depth 750 m. 6 specimens, cl. 5 to 15 mm.

Station 67, S.E. of Newfoundland, 40°17′ N, 50°39′ W, depth 1100 m, June 27, 1910. 5 specimens (including 1 ovigerous female, cl. 25 mm), cl. 20 to 25 mm.

Station 70, S.E. of Newfoundland, 42°59′ N, 51° 15′ W, depth 850 m, June 30, 1910. 3 specimens, cl. 18 to 22 mm.

Station 80, east of Newfoundland, 47°43′ N, 43°11′ W, depth 750 m, July 11, 1910. 2 specimens, cl. 8 and 10 mm; the same, depth 1000 m. 2 specimens, cl. 12 and 18 mm; the same, depth 1250 m. 1 specimen, cl. 7 mm, and 1 juvenile; the same, depth 1500

m. 12 specimens (including 3 ovigerous females, cl. 25 to 28 mm), cl. 17 to 28 mm.

Station 81, east of Newfoundland, 48°2′ N, 39°55′ W, depth 750 m, July 12, 1910. 1 specimen, cl. 16 mm (not seen); the same, depth 1000 m. 1 specimen, cl. 14 mm (not seen); the same, depth 1250 m. 3 juveniles; the same, depth 1500 m. 10 specimens (including 2 ovigerous females, cl. 24 and 27 mm), cl. 12 to 27 mm.

Station 82, east of Newfoundland, 48°24′ N, 36°53′ W, depth 500 m, July 13, 1910. 12 specimens, cl. 5 to 7 mm (not seen); the same, depth 750 m. 2 juveniles (not seen); the same, depth 1000 m. 2 specimens, cl. 6 and 29 mm; the same, depth 1250 m. 1 specimen, cl. 6 mm, and 1 juvenile; the same, depth 1500 m. 2 specimens, cl. 14 and 19 mm.

Station 84, north of the Azores, 48°4′ N, 32°25′ W, depth 1000 m, July 15, 1910. 1 juvenile (not seen); the same, depth 1500 m. 1 specimen, cl. 6 mm.

Station 87, north of the Azores, 46°48′ N, 27°46′ W, depth 750 m, July 17, 1910. 2 specimens, cl. 5 and 6 mm; the same, depth 1000 m. 7 specimens, cl. 5 to 14 mm, and 5 juveniles.

Station 88, north of the Azores, 45°26′ N, 25°45′ W, depth 750 m, July 18, 1910. 1 specimen, cl. 4 mm; the same, depth 1000 m. 2 specimens (1 ovigerous female, cl. 25 mm), cl. 15 and 25 mm, and 6 juveniles.

Station 92, off S.W. Ireland, 48°29′ N, 13°55′ W, depth 500 m, July 23 and 24, 1910. 8 specimens, cl. 5 to 13 mm; the same, depth 750 m. 1 specimen, cl. 9 mm, and 4 juveniles; the same, depth 1500 m. 4 specimens (1 ovigerous female, cl. 22 mm), cl. 7.5 to 22 mm.

Station 94, off S.W. Ireland, 50°13′ N, 11°23′ W, depth 1000 m, July 26, 1910. 3 specimens, cl. 6 to 11 mm.

Station 95, off S.W. Ireland, 50°22′ N, 11°44′ W, depth 1797 m, July 26 and 27, 1910. 1 ovigerous female, cl. 23 mm.

Station 98, off the Hebrides, 56°33′ N, 9°30′ W, depth 750 m, August 5, 1910. 7 specimens, cl. 5 to 7 mm.

Station 101, off the Hebrides, 57°41′ N, 11°48′ W, depth 1000 m, August 6, 1910. 5 specimens, cl. 4 to 12 mm; the same, depth 1250 m. 7 specimens (1 ovigerous female, cl. 24.5 mm), cl. 12 to 24.5 mm.

The specimens marked here as juveniles are too small to make a certain specific identification possible.

Distribution. The species is most abundant in the North Atlantic from Greenland and Iceland southwards to about 35° S. It has also been reported from off the French Congo, S. Africa and the southern Indian Ocean. The depths in which the species has been found range from 500 to 5400 m.

Palaemonidae

Leander tenuicornis (SAY) (pl. I fig. 3)

Palaemon tenuicornis SAY, 1818, Journ. Acad. nat. Sci. Phila., vol. 1, p. 249.

Palaemon natator MURRAY & HJORT, 1912, Depths of the Ocean, p. 671.

Station 64, between the Azores and Bermuda, 34° 44′ N, 47° 52′ W, surface, from floating gulfweed (*Sargassum* spec.), June 24, 1910. — 9 specimens (3 ovigerous females, cl. 14 to 15 mm), cl. 13 to 15 mm.

Station 64 — 66, Sargasso Sea, 34°44′ — 39°30′ N, 47° 52′ — 49°42′ W, surface, from floating gulfweed (*Sargassum* spec.), June 24 to 26, 1910. 13 specimens (4 ovigerous females, cl. 13 to 15 mm), cl. 5 to 16 mm.

Station 67, S.E. of Newfoundland, 40°17′ N, 50°39′ W, surface, June 27, 1910. 1 specimen, cl. 2 mm.

Leander tenuicornis is one of the three species of prawns that are characteristic inhabitants of the floating gulfweed, *Sargassum*. The other two species are *Hippolyte coerulescens* (FABR.) and *Latreutes fucorum* (FABR.), that will be dealt with below.

No coloured figure of the present species has ever been published before, therefore the one given here will be very welcome. It shows that in its coloration the species is very well adapted to its life in the gulfweed.

Distribution. The species is practically circumtropic, it only has not been reported from the west coast of the American continent. Though it is a typical inhabitant of the floating gulfweed, it has also been found in the litoral zone among algae.

Hippolytidae

Hippolyte coerulescens (FABRICIUS)

Astacus coerulescens FABRICIUS, 1775, Syst. Ent., p. 414.

Station 64, between the Azores and Bermuda, 34°44′ N, 47° 52′ W, surface, from floating gulfweed (*Sargassum* spec.), June 24, 1910. 1 ovigerous female, cl. 9 mm.

Station 64 — 66, Sargasso Sea, 34°44′ — 39° 30′ N, 47°52′ — 49°42′ W, surface, from floating gulfweed (*Sargassum* spec.), June 24 to 26, 1910. 8 specimens (4 ovigerous females, cl. 8 mm), cl. 5 to 8 mm.

Station 67, S.E. of Newfoundland, 40°17′ N, 50°39′ W, surface, June 27, 1910. 1 specimen, cl. 3 mm.

Distribution. Like the previous species *Hippolyte coerulescens* is a characteristic inhabitant of the floating *Sargassum* weeds. It has been reported from the Central Atlantic Ocean (Bermuda, the East American coast from N. Carolina to Florida, the Azores, the Canary and Cape Verde Islands), from the Gulf of Guinea and S. Angola, while there is furthermore a doubtful record of the species from the Cape Horn region.

Latreutes fucorum (FABRICIUS) (pl. I figs. 1, 2)

Palaemon fucorum FABRICIUS, 1798, Suppl. Ent. syst., p. 404.

Latreutes ensiferus MURRAY & HJORT, 1912, Depths of the Ocean, p. 671.

Station 64, between the Azores and Bermuda, 34°44′ N, 47° 52′ W, depth 100 m, June 24, 1910. 1 specimen, cl. about 4 mm (poor condition); the same, depth 150 m. 1 specimen, cl. 4.5 mm.

Station 64 — 66, Sargasso Sea, 34°44′ — 39°30′ N, 47°52′ — 49° 42′ W, surface, from floating gulfweed (*Sargassum* spec.), June 24 to 26, 1910. 27 specimens (18 ovigerous females, cl. 7 to 9 mm), cl. 2 to 9 mm.

Station 67, S.E. of Newfoundland, 40°17′ N, 50°39′ W, surface, June 27, 1910. 1 ovigerous female, cl. 4 mm.

Station 69, S.E. of Newfoundland, 41°39′ N, 51°4′ W, surface, from floating gulfweed (*Sargassum* spec.), June 29, 1910. 2 specimens, cl. 3 and 4 mm.

Latreutes fucorum is a typical member of the gulfweed community and has seldom, if ever, been found outside this habitat. The two above specimens from Station 64 therefore probably have gotten accidentally into the samples from 100 and 150 m depth.

The two coloured figures (pl. I figs. 1 and 2) reproduced here are the first ever published of this species. Like in *Leander tenuicornis* the colour of the present species is admirably adapted for its life among the gulfweed.

Distribution. *Latreutes fucorum* has been found in the Atlantic Ocean from Newfoundland south to the West Indies, the Azores and the Cape Verde Islands.

Bythocaris gracilis SMITH (fig. 22)

Bythocaris gracilis SMITH, 1885, Proc. U.S. Nat. Mus., vol. 7, p. 497.

Station 70, S.E. of Newfoundland, 42°59′ N, 51°15′ W, depth 550 m, June 30, 1910. 2 specimens, cl. 5 and 7.5 mm.

The above specimens are typical representatives of SMITH's species. In both the tooth on the mid-dorsal line of the carapace is very distinct, all abdominal pleurae are rounded, those of the fourth and fifth segments are rather narrow, but have the tips rounded and not spiniform as in *B. simplicirostris* SARS and *B. leucopis* SARS. In *Bythocaris payeri* the present species finds its closest relative, and the two species actually are hard to distinguish from one another. Most of the differentiating characters that until now have been used for their distinction seem to vary strongly. The following differences have been mentioned in literature:

1. In *Bythocaris payeri* the eyes are considerably smaller than in *B. gracilis* (see SMITH, 1885, p. 497; HANSEN, 1908. p. 68; KEMP, 1910, p. 118).

2, In *B. payeri* the antennal scale is rather shorter and considerably broader than in *B. gracilis* (see SMITH, 1885; HANSEN, 1908; KEMP, 1910).

3. The lateral teeth of the rostrum are more prominent in *B. gracilis* than in *B. payeri* (see SMITH, 1885; KEMP, 1910).

4. A small tooth is present on the median carina of the carapace in *B. gracilis*, but lacks in *B. payeri* (see SMITH, 1885; HANSEN, 1908; KEMP, 1910).

In the following lines a discussion of each of these 4 characters is given:

1. HANSEN (1908) remarked that in his material of *B. gracilis* the eyes are but little larger than in *B. payeri*, but KEMP (1910) considers the character mentioned here under (1) to be most reliable for the separation of the two species. In our material the eyes of *B. gracilis* (from Station 70) are distinctly larger than those of specimens of *B. payeri* from the Faeroes (Station 102) and the Barents Sea, but showed little difference from the eyes of *B. payeri* from the same station (Sta. 70). (see figures 22, 23).

2. HANSEN (1908) found «that the antennal scale is somewhat narrower and a little longer in *B. gracilis*, but the difference is much smaller than is given in Smith's descriptions, and in *B. Payeri* the scale becomes relatively a little broader with age». In our material there is no striking difference in the shape of the antennal scale of the two forms. As HANSEN already pointed out the shape of the scaphocerite changes with age.

3. In our specimens of *B. gracilis* the lateral rostral teeth indeed are more erect and prominent than in *B. payeri*. On the whole the rostrum is narrower in *B. gracilis* than in *B. payeri*, while the lateral rostral teeth reach far less far forwards in the former species than in the latter, where the lateral teeth almost reach the tip of the rostrum. This difference is well shown in Smith's figures, but we find exactly the opposite in KEMP's drawings.

4. HANSEN (1908) remarked that though in all his specimens of *B. gracilis* the tooth on the median carina of the rostrum is present, it was not absent in all his *B.*

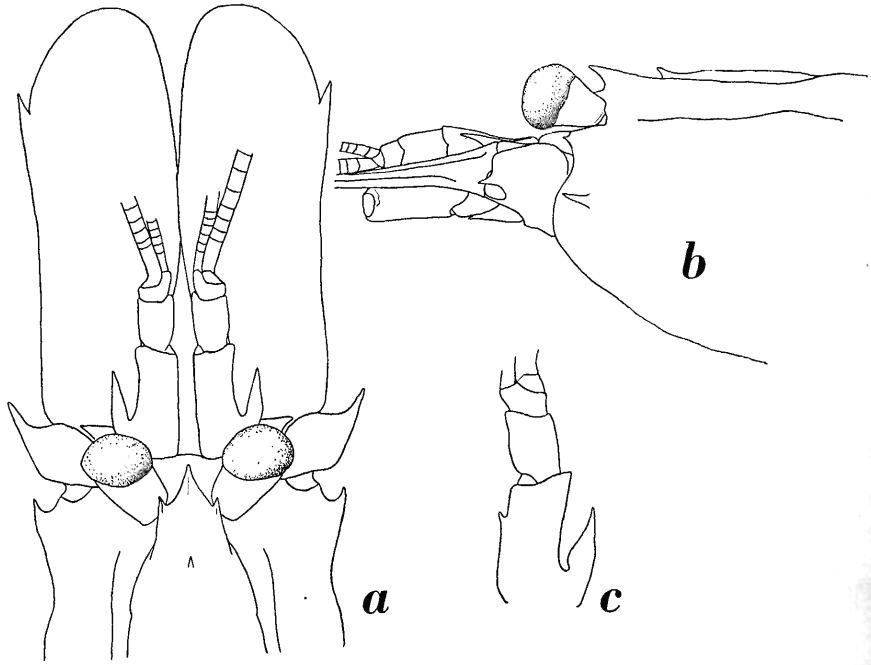

Fig. 22. *Bythocar isgracilis* SMITH. Specimen from Sta. 70 (Newfoundland). a, anterior part of body in dorsal view; b, anterior part of body in lateral view; c, antennular peduncle. a, b, x 7; c, x 10.

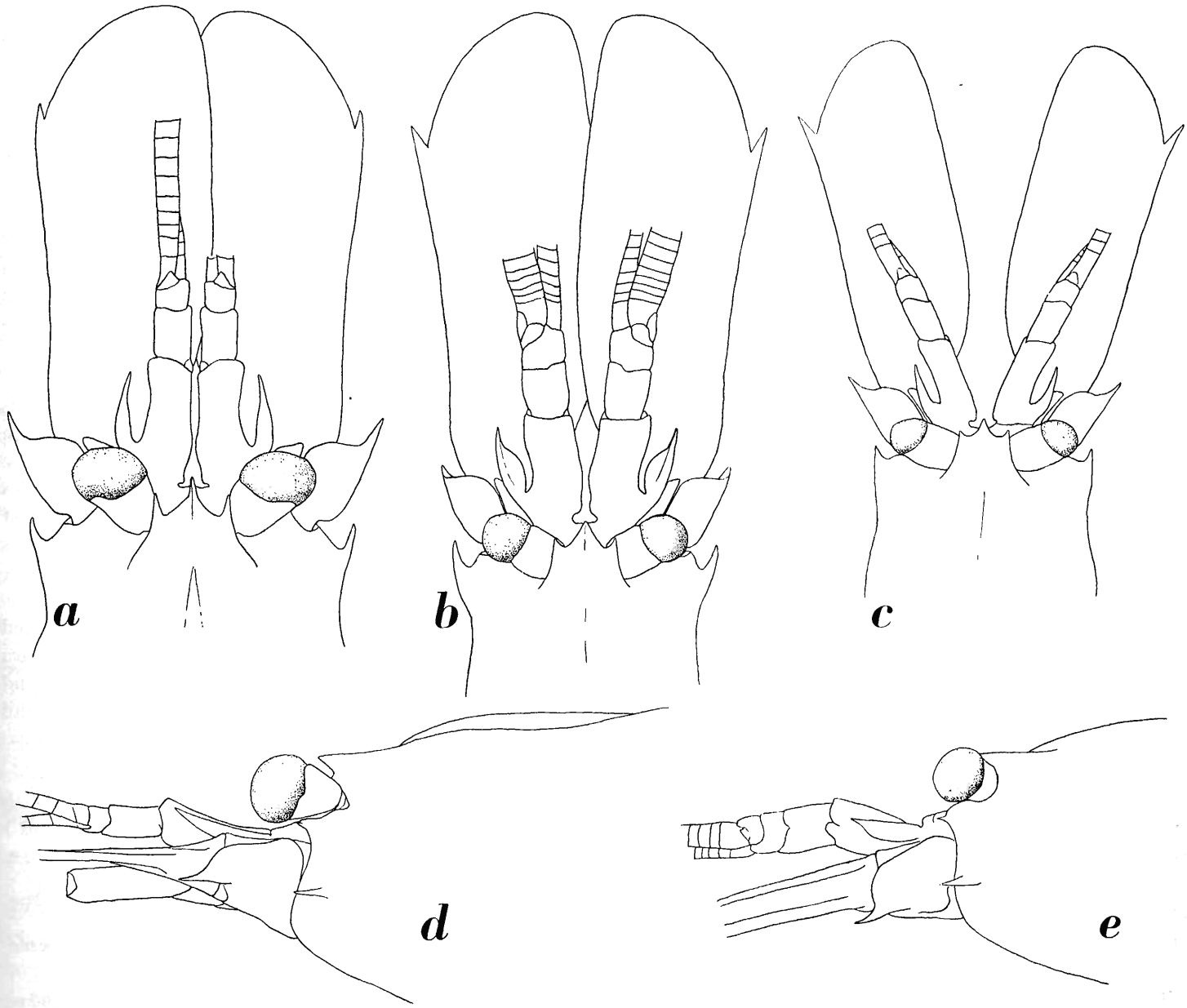

Fig. 23. *Bythocaris payeri* (HELLER). a—c, anterior part of body in dorsal view; d, e, anterior part of body in lateral view; a, d, specimen from Sta. 70 (Newfoundland); b, e, specimen from Sta. 102 (Faroes); c, specimen from Barents Sea. a—e, x 8.5.

payeri specimens. In our two specimens of *B. gracilis* the tooth is very distinct, while it lacks in all our *B. payeri* material except for a single specimen from Station 102, where such a tooth is visible.

Other differences shown by our material of the two species are the following:

a. In *B. gracilis* a distinct groove runs from the orbit backwards over the larger part of the carapace. This groove is almost parallel to the ridge which runs backwards from the supra-orbital spine. In *B. payeri* this groove is absent.

b. In *B. gracilis* the ridges on the dorsal surface of the carapace are more pronounced than in *B. payeri*. In the latter species the ridge behind the supra-orbital spine is only distinct in the extreme anterior part, while in *B. gracilis* it extends over a considerable part of the carapace.

c. The stylocerite in *B. payeri* generally is longer than in *B. gracilis*, it reaches almost the end of the basal segment of the antennular peduncle and ends in a very slender tip which is directed straight forward or even somewhat inward. In *B. gracilis* the stylocerite is somewhat shorter, tapers regularly to a sharp and narrow, but not needle-shaped top and is directed outwards. In the material of *B. payeri* from the Barents Sea, however, the stylocerite shows a rather large resemblance to that of our *B. gracilis*.

A revision of the present genus based on a large material

from numerous different localities is urgently needed. Without such a material the task of ascertaining the size and status of the various species seems to be hopeless.

Distribution. The species has been reported from off W. Greenland, off the east coast of the United States between 35° and 40° N, and from off S.W. Ireland. It was found in depths between 550 and 1900 m.

Bythocaris payeri (HELLER) (figs. 23, 24)

Hippolyte Payeri HELLER, 1875, Denkschr. Akad. Wiss. Wien, vol. 35, p. 26, pl. 1 figs. 1—4.

Station 70, S.E. of Newfoundland, 42°59′ N, 51°15′ W, depth 550 m, June 30, 1910. 2 specimens (1 ovigerous female, cl. 8.5 mm), cl. 6.5 and 8.5 mm.

Station 102, between the Faeroes and the Shetland Islands, 60°57′ N, 4°38′ W, depth 750 m, August 9 and 10, 1910. 14 specimens (3 ovigerous females, cl. 11 to 11.5 mm), cl. 6 to 11.5 mm.

The differences between this material and the two specimens of *B. gracilis* from Station 70 have been dealt with under the latter species. For comparison we examined two specimens of the present species from the Barents Sea, which have been reported upon by HOEK (1882, p. 19, pl. 1 figs. 8, 9) and which are preserved in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden.

Examination of all the available specimens of *B. payeri* showed that this species is variable in a large number of characters, and that it is not certain at all that our present conception of the systematic status of this species is correct.

The variability of the material has already partly been dealt with under *B. gracilis*. The material at hand is too small to allow us to make any definite conclusions, but it is highly interesting to note that the three lots show differences in characters which are practically constant within each lot. In the American specimens the eyes have the cornea about as large as those of *B. gracilis*, in the Faeroes specimens it is considerably smaller, while the Barents Sea specimens have it even still smaller. The eyestalk in the American specimens tapers strongly towards the base, as in *B. gracilis*, in the other material the eyestalk is about as broad at the base as at the top. In the Faeroes specimens the antennular peduncle is short and broad, in the Barents Sea specimens it is more slender, but in the American specimens it is most slender of all. The Faeroes specimens have the stylocerite more broadened than in the other specimens, while both the American and the Faeroes specimens have the top of the stylocerite more produced than in the Barents Sea specimen. Figures of the various specimens are given here for comparison. The antennular peduncles have been figured separately to show the exact shape of the stylocerite, which is drawn somewhat foreshortened in the other figures.

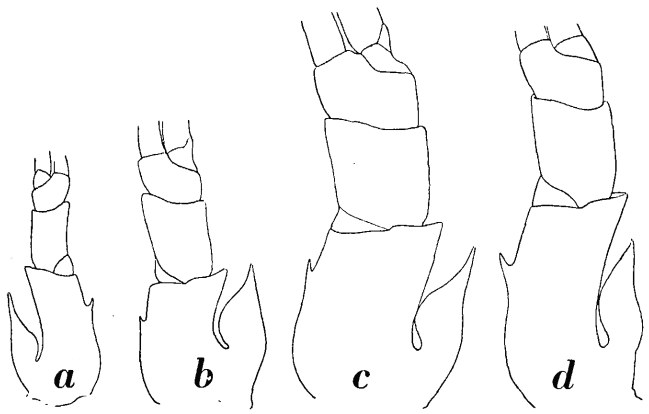

Fig. 24. *Bythocaris payeri* (HELLER). Antennular peduncle. a, specimen from Sta. 70; b, c, specimens from Sta. 102; d, specimen from Barents Sea. a, b, x 8, c, d, x 16.

It will be interesting to study a large material of this species from various localities throughout its range in order to ascertain the variability of several of its characters.

RETOWSKY (1946, p. 298, fig. 1) described a new species of this genus, *Bythocaris irene* from the Arctic Ocean east of the New Siberian Islands. This species in many respects shows a great resemblance to our specimens of *B. payeri* from the Barents Sea.

Distribution. The species has been reported from the Arctic Ocean, from Greenland east to the Kara Sea and south to Iceland, the Faeroes and the Shetland Islands. It has been found in depths between 180 and 1000 m.

Pandalidae

Parapandalus richardi (COUTIÈRE) (fig. 25)

Pandalus (*Stylopandalus*) *Richardi* COUTIÈRE, 1905, Bull. Mus. Océanogr. Monaco, no. 48, p. 18, fig. 6.

Plesionika nana MURRAY & HJORT, 1912, Depths of the Ocean, pp. 585, 668.

Station 23, west of Gibraltar, 35°32′ N, 7°7′ W, depth 100 m, May 5 and 6, 1910. 5 specimens (1 ovigerous female, cl. 7 mm), cl. 4 to 7 mm; the same, depth 200 m. 1 specimen, cl. 7 mm.

Station 29, west of Gibraltar, 35°10′ N, 7°55′ W, depth 1000 m, May 9 and 10, 1910. 1 specimen, cl. 7 mm.

Station 34, near the Canary Islands, 28°52′ N, 14°16′ W, depth 200 m, May 13 and 14, 1910. 1 specimen, cl. 7.5 mm.

Station 35, near the Canary Islands, 27°27′ N, 14°52′ W, depth 0—2400 m, May 18 and 19, 1910. 1 specimen, cl. 8 mm.

Station 42, near the Canary Islands, 28°2′ N, 14°17′ W, depth 150 m, May 23 and 24, 1910. 2 specimens, cl. 7 and 8 mm.

Station 45, west of the Canary Islands, 28°42′ N, 20°0′ W, depth 100 m, May 28 and 29, 1910. 6 specimens, cl. 3.5 to 7 mm; the same, depth 150 m. 10 specimens (4 ovigerous females, cl. 7.5 to 9 mm), cl. 4 to 9 mm; the same, depth 1000 m. 1 specimen, cl. 5.5 mm.

Station 49, west of the Canary Islands, 29°8′ N, 25°16′ W, depth 500 m, June 1, 1910. 1 specimen, cl. 7 mm; the same, depth 1500 m. 6 specimens (1 ovigerous female, cl. 6.5 mm), cl. 5 to 6.5 mm.

Station 51, S.W. of the Azores, 31°20′ N, 35°7′ W, depth 100 m, June 5 and 6, 1910. 5 specimens (2 ovigerous females, cl. 6.5 and 7 mm), cl. 6 to 7 mm; the same, depth 150 m. 3 specimens, cl. 4.5 to 6.5 mm; the same, depth 350 m. 1 specimen, cl. 3 mm; the same, depth 1500 m. 1 specimen, cl. 6.5 mm.

Station 53, south of the Azores, 34°59′ N, 33°1′ W, depth 50 m, June 8 and 9, 1910. 1 specimen, cl. 5.5 mm; the same, depth 100 m. 1 ovigerous female, cl. 7.5 mm; the same, depth 150 m. 2 specimens, cl. 4.5 and 6 mm.

Station 56, near the Azores, 36°53′ N, 29°47′ W, depth 150 m, June 10 and 11, 1910. 1 ovigerous female, cl. 8.5 mm.

Station 62, west of the Azores, 36°52′ N, 39°55′ W, depth 100 m, June 20 and 21, 1910. 2 specimens, cl. 7 and 7.5 mm; the same, depth 150 m. 2 specimens (1 ovigerous female, cl. 7.5 mm), cl. 6.5 and 7.5 mm; the same, depth 1250 m. 1 specimen, cl. 6.5 mm.

Station 64, between the Azores and Bermuda, 34°44′ N, 47°52′ W, depth 500 m, June 24, 1910. 1 specimen, cl. 5.5 mm (damaged); the same, depth 1000 m. 2 specimens (1 ovigerous female, cl. 7.5 mm), cl. 7 and 7.5 mm; the same, depth 1500 m. 1 ovigerous female, cl. 7.5 mm.

Station 81, east of Newfoundland, 48°2′ N, 39°55′ W, depth 500 m, July 12, 1910. 1 specimen, cl. 7.5 mm.

The specimens examined agree well with the figures and descriptions given of this species by COUTIÈRE (1905) and CHACE (1940, p. 192).

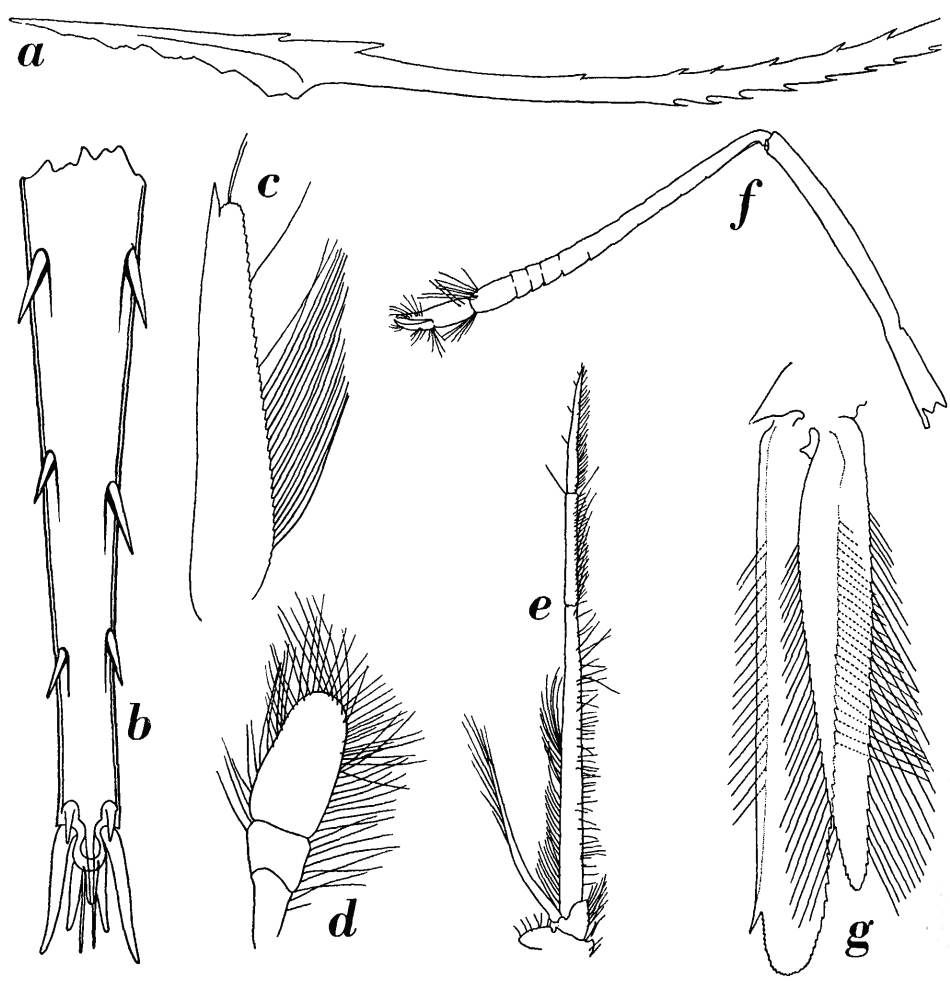

Fig. 25. *Parapandalus richardi* (COUTIÈRE). Lectotype of *Plesionika nana* MURRAY & HJORT. a, rostrum; b, distal part of telson; c, scaphcerite; d, mandibular palp; e, third maxilliped; f. second pereiopod; g, uropod.

In their book «The Depths of the Ocean» MURRAY & HJORT (1912, pp. 585, 668) twice make mention of a species under the name «*Plesionika nana* n.sp.». On p. 585 it is referred to as a «truly pelagic Pandalid» that «was taken at most of the stations [of the 1910 «Michael Sars» Expedition] from Spain to Newfoundland», on p. 668 the colour of the body and of the eyes is described, and the ratio between the size of the carapace and that of the eye is given as well; the vertical distribution is stated too. By giving these details of the species MURRAY & HJORT made *Plesionika nana* a nomenclatorially available name, which cannot be regarded as a nomen nudum. Evidently MURRAY & HJORT had not the least intention of describing a new *Plesionika*, but received the name and the data from OSCAR SUND, who provided them for their book with many more unpublished results of his study on the Decapoda of the 1910 «Michael Sars» Expedition. From the data published in «The Depths of the Ocean» the identity of *Plesionika nana* MURRAY & HJORT cannot be established, but in the «Michael Sars» material studied by us, we found the types of that species. Around 1912 SUND had identified all the material of *Parapandalus richardi* enumerated above, as *Plesionika nana* which he considered to be a new species. As the actual type of this species SUND indicated the male specimen (cl. 7 mm) from Station 23 (depth 200 m). As SUND's selection has never been published, we indicate that specimen here as the lectotype of *Plesionika nana* MURRAY & HJORT. The latter name thus falls as a junior synonym of *Parapandalus richardi* (COUTIÈRE, 1905). It becomes clear from SUND's notes that he later recognized the identity of his species with that of COUTIÈRE's. SUND's figures of the species are reproduced here (fig. 25).

Distribution. *Parapandalus richardi* has been reported from the Bay of Cadiz, Spain (STEPHENSEN, 1923, p. 80), from near the Canary Islands (COUTIÈRE, 1905), from west of Madeira (COUTIÈRE, 1905) and from near Bermuda (CHACE, 1940). The present material nicely fills the gap that existed between the eastern and the western Atlantic localities. CHACE (1940) probably is right when

he supposes this species to be a warm water form; except for the specimen from Station 81, the species has not been found by the «Michael Sars» Expedition north of 37° N. It perhaps is the influence of the Gulf Stream which makes it possible for the species to exist as far north as Station 81 (east of Newfoundland). *Parapandalus richardi* is known from depths between 12.5 and 1800 m, it shows a distincs diurnal migration. STEPHENSEN (1923) found the speciet in night-hauls from depths between 12.5 and 150 m, the «Michael Sars» collected the species at night at depths between 50 and 1500 m. The day-time catches of the species are from the following depths: 600 to 800 m (STEPHENSEN. 1923), 540 to 1800 m (CHACE, 1940), 500 to 1500 m («Michael Sars», see MURRAY & HJORT, 1912, p. 668).

Plesionika martia (A. MILNE EDWARDS)

Pandalus martius A. MILNE EDWARDS, 1883, Rec. Fig. Crust. nouv. peu conn., pl. 21.

Station 4, off S.W. Ireland, 49°38′ N, 11°35′ W, depth 923 m, April 10 and 11, 1910. 1 ovigerous female, cl. 26 mm.

Station 21, west of Gibraltar, 35°31′ N, 6°35′ W, depth 535 m, May 5, 1910. 4 specimens (3 ovigerous females, cl. 17 to 19 mm), cl. 17 to 19 mm.

Station 23, west of Gibraltar, 35°32′ N, 7°7′ W, depth 1215 m, May 5 and 6, 1910. 2 specimens, cl. 10 and 12 mm.

The specimens from Station 4 and Station 21 agree very well with the published descriptions and figures. The specimens from Station 23 have been identified by SUND with this species; at present they are in too poor a condition to make their certain identification possible, there is, however, no indication that SUND's identification should be incorrect.

Distribution. The species has been reported from the North Atlantic (near Bermuda, off S.W. Ireland, the Bay of Biscay, the Mediterranean), from off West- and South-Africa, and from the entire Indo-West Pacific region (from Aden and East Africa to Japan and Hawaii). It has been found in depths between 165 and 2100 m.

Plesionika heterocarpus (COSTA)

Pandalus heterocarpus COSTA, 1871, Annu. Mus. zool. Univ. Napoli, vol. 6, p. 89, pl. 2 fig. 3.

Station 39 B, south of the Canary Islands, 26°3′ N, 15°0′ W, depth 292 m, May 21, 1910. 7 specimens, cl. 3.5 to 6 mm.

The specimens, though young and for a large part in not too good a condition, could be identified with certainty as belonging to the typical form of *Plesionika heterocarpus*. The right second pereiopod reaches distinctly beyond the scaphocerite with its mero-carpal articulation, though it reaches less far forwards than in adult specimens. The left second pereiopod overreaches the scaphocerite with practically the entire chela. The dactyli of the last three pereiopods are long and slender, measuring slightly less than half the length of the propodus.

Distribution. The species has been reported from the entire Mediterranean and from the eastern Atlantic (from Portugal to Angola). It has been found in depths between 92 and 680 m.

Pandalina brevirostris (RATHKE)

Pandalus brevirostris RATHKE, 1843, Nova Acta Acad. Leop. Carol. vol. 20 pt. 1, p. 17.

Station 96, off S.W. Ireland, 50°57′ N, 11°46′ W, depth 100 m, July 27, 1910. 1 specimen, cl. 3 mm.

The specimen is a typical representative of *Pandalina brevirostris*.

Distribution. The species is known from not too deep waters from W. Norway to the Mediterranean.

Pandalus propinquus G. O. SARS

Pandalus propingvus G. O. SARS, 1869, Vid. Selsk. Forh. Christiania, 1869, p. 148.

Station 94, S.W. of Ireland, 50°13′ N, 11°23′ W, depth 1000 m, July 26, 1910. 1 specimen, cl. 4.5 mm.

Station 96, S.W. of Ireland, 50°57′ N, 11°46′ W, depth 100 m, July 27, 1910. 1 specimen, cl. 5 mm.

Station 98, off the Hebrides, 56°33′ N, 9°30′ W, depth 750 m, August 5, 1910. 1 specimen, cl. 5 mm.

In these specimens, all of which are juveniles, the pterygostomian angle is more distinctly and sharply pointed than in the specimens figured by KEMP (1910, pl. 11); furthermore this angle is more distinctly pointed in the specimen from Station 94 than in that from Station 98. In the specimens from both Station 94 and 98 rudiments of exopods are visible on the third maxilliped and the first three legs. Owing to the rather poor condition of the third specimen, the presence or absence of such rudiments is difficult to establish there.

Distribution. The species is known from W. Greenland, S. of Iceland and N. Norway south to off New York and the Bay of Biscay. It was found in depths between 65 and about 2000 m.

Heterocarpus grimaldii A. MILNE EDWARDS & BOUVIER (figs. 26, 27)

Heterocarpus Grimaldii A. MILNE EDWARDS & BOUVIER, 1900 a, Bull. Soc. zool. France, vol. 25, p. 58.

Station 41, near the Canary Islands, 28°8′ N, 13°35′ W, depth 1365 m, May 23, 1910. 54 specimens (21 ovigerous females, cl. 31.5 to 35.6 mm), cl. 20 to 35.6 mm.

The rostrum is long and slender, it reaches with about 1/2 to 1/3 of its length beyond the scaphocerite. It is about as long as the carapace, and is directed upwards. The mid-dorsal carina of the carapace bears five (seldom six or four) strong teeth, the first of which is placed at about 2/5 of the length of the carapace from the posterior margin. The anterior tooth (seldom the two anterior teeth) are placed in the basal part of the dorsal margin of the rostrum. The larger part of the upper margin of the rost-