

THE CRUSTACEA EUPHAUSIACEA OF THE UNITED STATES
NATIONAL MUSEUM.¹

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In 1911 I published a paper entitled: The Genera and Species of the order Euphausiacea, with Account of Remarkable Variation.² Every valid species hitherto established was enumerated, and preliminary descriptions were given of a number of new forms and of some little known species. At that time the order comprised 73 species. The previous year my treatise on the Euphausiacea gathered by the *Siboga* expedition had been published, and I had also at my service vast material from many sources, especially the collection in the Copenhagen Museum, together with the large collections procured, respectively, by the Prince of Monaco in the North Atlantic, by the Swedish Antarctic Expedition, by Dr. Alexander Agassiz during his cruise on the *Albatross* in the tropical east Pacific Ocean in 1904-1905, etc.; but the fauna of the north Pacific with Bering Sea was nearly unknown, and the material collected by the *Albatross*, the *Grampus*, etc., in the Atlantic off the United States had never been worked out. In order to fill such gaps in our knowledge of the world's fauna I applied to the authorities of the United States National Museum, who most kindly lent me for investigation its entire material. It contains several interesting Pacific forms, among which are a new genus, two new species unknown to me from any other collection, good material of two rare and hitherto imperfectly known species, etc. In the preliminary paper mentioned I established the new genus and species and added observations on some other forms. But the rich collection, which at present fills about 600 vials and bottles and comprises 46 species, deserves to be dealt with in a separate paper, containing descriptions with figures of sev-

¹ Since the author completed this paper and transmitted it to the United States National Museum there have been published three papers dealing with the Euphausiacea which add considerably to our knowledge of their distribution. They are as follows: W. M. TATTERSALL, The Schizopoda, Stomatopoda and nonantarctic Isopoda of the Scottish National Antarctic Expedition (Trans. Roy. Soc. Edinburgh, vol. 49, pt. 4, 1913. CARL ZIMMER, Die Schizopoden der Deutschen Südpolar Expedition, 1901-1903, (Deutsche Südpolar Expedition, 1901-1903, vol. 15, Zoologie, 7, 1914). CALVIN O. ESTERLY, The Schizopoda of the San Diego region (Univ. of California Publ., vol. 13, No. 1, April 14, 1914). The present author regrets that he has not been able to take these papers into consideration in his treatment of the topic "Distribution" under the various species here discussed.

² Bull. l'Inst. Océan. Monaco, No. 210.

eral forms, enumeration of the localities for every species, etc. In the present paper that task is attempted.

In most cases it has been deemed unnecessary to give a full account of the synonymy, because in papers published in 1908-1913 I have dealt with this topic for the major part of the species, but I always refer to one or two of the best descriptions and illustrations of the form in question. At each species all localities are enumerated, and generally they are arranged according to latitude, but localities in the Pacific are, of course, kept separately from those in the Atlantic. It may be added that I have also had for inspection the material worked out by Ortmann in 1894¹ and in 1905², and the localities for these animals are mentioned separately after the other stations from the Pacific under the species in question.

For some species which do not occur near the surface I have at each station added the depth of the sea, though the animals, at least generally, inhabit intermediate layers. For some species which frequently live at the surface I have noted the surface temperature at every locality, and when the animals have been caught at the surface I have generally noted not only the temperature but also the hour, etc.

As to the localities it may be said here that all marked "Sta." belong to the United States Bureau of Fisheries, and of these all numbers after Station 2000 are *Albatross* stations. The places marked "Hyd." or "Sur." are separate kinds of *Albatross* localities.

Genus BENTHEUPHAUSIA G. O. Sars.

Of this most interesting genus only a single species is known.

1. BENTHEUPHAUSIA AMBLYOPS G. O. Sars (1883).

1885. *Bentheuphausia amblyops* G. O. Sars, *Challenger* Rep., vol. 13, p. 109, pl. 19, text-fig. 4.

Occurrence.—This species has been taken at two stations in the northwestern Atlantic:

Sta. 2044. July 31, 1883. Lat. 40° 00' 30'' N.; long. 68° 37' 20'' W. 1,067 fathoms. 1 small specimen.

Sta. 2099. October 2, 1883. Lat. 37° 12' 30'' N.; long. 69° 39' W. 2,949 fathoms. 1 full-grown specimen.

Distribution.—The very wide distribution of this deep-sea form has been given in my Harvard paper.³

Genus THYSANOPODA Milne Edwards.

This genus comprises 11 species, 6 of which are represented in the collection. As to the grouping of the species I refer to my Harvard work.

¹ Bull. Mus. Comp. Zool., vol. 25, No. 8.

² Bull. U. S. Comm. Fish and Fisheries for 1903, pt. 3.

³ Mem. Mus. Comp. Zool., vol. 30, No. 4, 1912, p. 207.

2. THYSANOPODA MONACANTHA Ortmann (1893).

1910. *Thysanopoda agassizii* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 87, pl. 13, figs. 3a-3g (with synonymy).

1912. *Thysanopoda monacantha* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 212, pl. 4, figs. 3a-3c.

Occurrence.—Taken in the western Atlantic at three stations:

Sta. 2667. May 5, 1886. Lat. 30° 53' N.; long. 79° 42' 30'' W. 273 fathoms. 1 specimen.

Sta. 2665. May 4, 1886. Lat. 29° 47' N.; long. 80° 05' 45'' W. 263 fathoms. 1 specimen.

Sta. 2151. April 10, 1884. Caribbean Sea. Lat. 15° 28' 39'' N.; long. 80° 36' W. 653 fathoms. 1 specimen.

In 1894 Ortmann mentioned specimens from the two following stations in the Pacific and referred them to his *Thysanopoda agassizii*, new species, which is synonymous with *T. monacantha*:

Sta. 3414. April 8, 1891. Off Mexico. Lat. 10° 14' N.; long. 96° 28' W. 200-0 fathoms. 1 specimen.

Sta. 3382. March 7, 1891. Off Panama. Lat. 6° 21' N.; long. 80° 41' W. 200 fathoms; closed part of the Tanner net. 1 specimen.

In 1905 Ortmann recorded a specimen from the Hawaiian Islands at the following locality:

Sta. 3804. March 21, 1902. Lat. 24° 58' 42'' N.; long. 149° 11' W. 50-0 fathoms. 1 specimen.

The collection in hand contains a specimen from each of the two first-named stations: 3414 and 3382, but no specimen from Station 3804, and for the following reason some error must have crept in. The specimen marked "type" is from Station 3414 and measures 30 mm. from the tip of the rostrum to the end of the telson, while Ortmann gives the length of his type to be 19 mm. But in his paper on the Schizopoda from the Hawaiian Islands Ortmann says the specimen in question (from Station 3804) is 32 mm.; consequently I suppose that in one way or another this specimen has in America been put with the label indicating Station 3414, and that the much smaller specimen from this station has been lost. This is the only explanation I can give.

Distribution.—The wide distribution has been given in my Harvard paper quoted. Tattersall enumerated a number of stations in the Indian Ocean in 1912.¹

3. THYSANOPODA ÆQUALIS H. J. Hansen (1905).

1910. *Thysanopoda æqualis* H. J. HANSEN, *Siboga*-Exp., vol. 37, p. 84, pl. 12, figs. 4a-4c; pl. 13, fig. 1a.

Occurrence.—Taken in the northwestern Atlantic at a single station by the *Albatross*:

Sta. 2224. September 8, 1884. Lat. 36° 16' 30'' N.; long. 18° 21' W. 1 specimen.

¹ Trans. Linn. Soc. London, ser. 2, vol. 15, pt. 1, p. 129.

Furthermore, the collection contains a specimen from the South Pacific:

Lat. 33° S.; long. $120^{\circ} 57'$ W. U. S. S. *Wachusett*, July 24, 1888. Dr. W. H. Jones, United States Navy.

Finally, the *Albatross* has taken the species at the Hawaiian Islands: Sta. 3808. March 23, 1902. Lat. $22^{\circ} 10'$ N.; long. $155^{\circ} 35' 45''$ W. 50-0 fathoms. 9 specimens.

The tube, with these nine specimens, contains the original label of the *Albatross*, and, according to another label, Ortmann determined the animals as *T. obtusifrons* G. O. Sars; that they do not belong to the last-named species, but to *T. æqualis* H. J. Hansen, may easily be seen from the shape of the lobe on the first antennular joint; but in the paper on the Hawaiian Schizopods Ortmann wrote that he had seen five specimens of *T. obtusifrons* from station 3806 and 13 specimens from station 3888. The latitude and longitude given for the last-named station show that 3888 is a misprint for 3808; the animals from station 3806 are not in the collection.

Distribution.—This species is widely distributed in the Atlantic, the Indian, and the Pacific Oceans, as shown in my Harvard paper;¹ a goodly number of localities in the Indian Ocean are enumerated by Tattersall in 1912.²

4. THYSANOPODA PECTINATA Ortmann (1893).

1912. *Thysanopoda pectinata* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 218, pl. 5, figs. 1a-1m (with synonymy).

Occurrence.—The *Albatross* has taken a single specimen in the Gulf of Mexico:

Sta. 2393. March 13, 1885. Lat. $28^{\circ} 43'$ N.; long. $87^{\circ} 14' 30''$ W. 525 fathoms. 1 specimen.

The specimen is a fine male measuring 39 mm. in length.

Distribution.—It has been given in the Harvard work. According to Tattersall (in 1912), it has also been taken at two stations in the Indian Ocean.

5. THYSANOPODA ACUTIFRONS Holt and Tattersall (1905).

1906. *Thysanopoda acutifrons* HOLT and TATTERSALL, Fisheries, Ireland, Sci. Invest., 1904, vol. 5, p. 8, pl. 1.

1910. *Thysanopoda acutifrons* H. J. HANSEN, *Siboga-Exp.*, vol. 37, pp. 85-86, text-figure.

Occurrence.—This large species has been taken at no less than 24 stations in the northwestern Atlantic by the steamers *Fish Hawk* and *Albatross*:

Sta. 2428. June 23, 1885. Lat. $42^{\circ} 48'$ N.; long. $50^{\circ} 55' 30''$ W. 826 fathoms. 7 specimens (6 females, 1 male).

Sta. 2427. June 23, 1885. Lat. $42^{\circ} 46'$ N.; long. $51^{\circ} 00'$ W. 523 fathoms. 4 specimens (3 females, 1 male).

¹ Pp. 214-215.

² Trans. Linn. Soc. London, ser. 2, vol. 15, pt. 1, p. 128.

- Sta. 2076. September 4, 1883. Lat. $41^{\circ} 13' N.$; long. $66^{\circ} 00' 50'' W.$ 906 fathoms. 4 specimens (3 females, 1 male).
- Sta. 2083. September 5, 1883. Lat. $40^{\circ} 26' 40'' N.$; long. $67^{\circ} 05' 15'' W.$ 950 fathoms. 3 specimens (females).
- Sta. 2045. July 31, 1883. Lat. $40^{\circ} 04' 20'' N.$; long. $68^{\circ} 43' 50'' W.$ 373 fathoms. 1 specimen (female).
- Sta. 2047. July 31, 1883. Lat. $40^{\circ} 02' 30'' N.$; long. $68^{\circ} 49' 40'' W.$ 389 fathoms. 1 young specimen.
- Sta. 2044. July 31, 1883. Lat. $40^{\circ} 00' 30'' N.$; long. $68^{\circ} 37' 20'' W.$ 1,067 fathoms. 1 young specimen, with the eyes divided.
- Sta. 1096. August 11, 1881. Lat. $39^{\circ} 53' N.$; long. $69^{\circ} 47' W.$ 317 fathoms. 1 young specimen, with the eyes divided.
- Sta. 953. August 23, 1880. Lat. $39^{\circ} 52' 30'' N.$; long. $70^{\circ} 17' 30'' W.$ 724 fathoms. 2 specimens (male, female).
- Sta. 937. August 4, 1880. Lat. $39^{\circ} 49' 25'' N.$; long. $69^{\circ} 49' W.$ 606 fathoms. 1 specimen (female).
- Sta. 936. August 4, 1880. Lat. $39^{\circ} 46' 30'' N.$; long. $69^{\circ} 47' W.$ 716 fathoms. 1 specimen (female).
- Sta. 2094. September 21, 1883. Lat. $39^{\circ} 44' 30'' N.$; long. $71^{\circ} 04' W.$ 1,022 fathoms. 2 specimens (male, female).
- Sta. 2093. September 21, 1883. Lat. $39^{\circ} 42' 50'' N.$; long. $71^{\circ} 01' 20'' W.$ 1,000 fathoms. 1 specimen (female).
- Sta. 2095. September 30, 1883. Lat. $39^{\circ} 29' N.$; long. $70^{\circ} 58' 40'' W.$ 1,342 fathoms. 2 specimens (females).
- Sta. 2101. October 3, 1883. Lat. $39^{\circ} 18' 30'' N.$; long. $68^{\circ} 24' W.$ 1,686 fathoms. 1 specimen (female).
- Sta. 2235. September 13, 1884. Lat. $39^{\circ} 12' N.$; long. $72^{\circ} 03' 30'' W.$ 707 fathoms. 1 specimen (female).
- Sta. 2104. November 5, 1883. Lat. $38^{\circ} 49' N.$; long. $72^{\circ} 40' 30'' W.$ 991 fathoms. 1 specimen (female).
- Sta. 2715. September 18, 1886. Lat. $38^{\circ} 29' 30'' N.$; long. $70^{\circ} 54' 30'' W.$ 1,753 fathoms. 1 specimen (female).
- Sta. 2039. July 28, 1883. Lat. $38^{\circ} 19' 26'' N.$; long. $68^{\circ} 20' 20'' W.$ 2,369 fathoms. 1 specimen (female).
- Sta. 2565. August 28, 1885. Lat. $38^{\circ} 19' 20'' N.$; long. $60^{\circ} 02' 30'' W.$ 2,069 fathoms. 1 specimen (immature female).
- Sta. 2105. November 6, 1883. Lat. $37^{\circ} 50' N.$; long. $73^{\circ} 03' 50'' W.$ 1,395 fathoms. 1 specimen (female).
- Sta. 2223. September 7, 1884. Lat. $37^{\circ} 48' 30'' N.$; long. $69^{\circ} 43' 30'' W.$ 2,516 fathoms. 1 specimen (female).
- Sta. 2098. October 1, 1883. Lat. $37^{\circ} 40' 30'' N.$; long. $70^{\circ} 37' 30'' W.$ 2,221 fathoms. 2 specimens (females).
- Sta. 2099. October 2, 1883. Lat. $37^{\circ} 12' 30'' N.$; long. $69^{\circ} 39' W.$ 2,949 fathoms. 1 specimen (female).

Remarks.—In several among the full-grown specimens the eyes are darker than in those taken by the Prince of Monaco, the *Ingolf*, or the

Thor; but this darker color may perhaps be due to the preservation. In most of the males the distal curved part of the terminal process of the male copulatory organs is extremely acute and even a little longer, more slender, and more curved than in the specimen figured in the *Siboga* work.

Some of the specimens are uncommonly large. A female from Station 2094 measures 47 mm., a female from Station 2095, 48.5 mm., from the end of the rostrum to the tip of the telson. A male from Station 2094 is 30 mm. long, another, from Station 2427, is 38 mm., and a third male, from Station 2428, is 41 mm.

Distribution.—According to the statements in my *Ingolf* Malacostraca¹ (which also gives the synonymy) this species has a rather restricted distribution; quite recently K. Stephensen has added several stations from West Greenland. In Davis Strait it goes northward to lat. 63° 49' N. West of Iceland it has been taken northward to lat. 65° 20' N. Besides, it has been taken southwest and south of Iceland, southwest of the Faroes, west of the Hebrides, west and southwest of Ireland, finally west of France southward to lat. 46¼° N. It has never been caught near the surface; as to more detailed information I refer to the *Ingolf* paper. In the list of American stations I have in each case added the depth of the sea, though it may be taken for granted that the animals have always been taken by the instruments between the bottom and the surface.

6. THYSANOPODA ORIENTALIS H. J. Hansen (1910).

1910. *Thysanopoda orientalis* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 85, pl. 13, figs. 2a-2i.

1912. *Thysanopoda orientalis* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 222, pl. 5, figs. 2a-2i.

Occurrence.—Taken in the west Atlantic at three stations:

Sta. 994. September 8, 1881. Lat. 39° 40' N.; long. 71° 30' W. 368 fathoms. 1 specimen (scarcely full-grown female).

Sta. 2665. May 4, 1886. Lat. 29° 47' N.; long. 80° 05' 45'' W. 263 fathoms. 1 specimen (female).

Sta. 2382. March 3, 1885. Lat. 28° 19' 45'' N.; long. 88° 01' 30'' W. 1,255 fathoms. 1 specimen (female).

Furthermore, the *Albatross* has taken this species at two stations in the Eastern Chinese Sea, not far from southern Japan:

Sta. 4908. August 11, 1906. Lat. 31° 40' N.; long. 129° 20' 40'' E. 434 fathoms. 1 specimen (female).

Sta. 4905. August 11, 1906. Lat. 31° 39' N.; long. 129° 19' E. 369 fathoms. 1 specimen (male).

Remarks.—This species is closely allied to *T. acutifrons*; the differences have been pointed out in the two papers quoted above. The males of the two species are easily separated by the copulatory

organs, but females, especially not quite full-grown specimens, may sometimes be difficult to separate with certainty, though the shape of the lobe of the first antennular joint generally affords a good character. The single male has the processes of the copulatory organs agreeing with my figure in the Harvard work; this specimen measures about 33 mm. and is a little smaller than the female Chinese specimen, which is 35 mm. long. That the two Atlantic females secured, respectively, in the Gulf of Mexico (Station 2382) and off the northern part of Florida (Station 2665) belong to *T. orientalis* is quite certain, but according to the color of the eyes, the shape of the lobe of the first antennular joint and the fourth abdominal segment feebly produced at the dorsal line I must refer the sub-adult female from Station 994 to *T. orientalis*, though it has been taken so far northward in the area occupied by *T. acutifrons*.

Distribution.—This species had been captured in the tropical East Pacific south of the line, in the Indian Archipelago, and by the Prince of Monaco in the North Atlantic west of southern Spain. The distribution is thus very different from that of *T. acutifrons*.

7. THYSANOPODA CORNUTA Illig (1905).

Plate 1, fig. 1a.

1905, March 28. *Thysanopoda cornuta* ILLIG, Zool. Anz., vol. 28, p. 663 (with three text-figures).

1905, April 1. *Thysanopoda insignis* H. J. HANSEN, Bull. Mus. Océan. Monaco, No. 30, p. 19 (with three text-figures).

Occurrence.—The *Albatross* has captured this gigantic species at two stations, one in the Northwest Atlantic, the other in the Pacific at southern Japan.

Sta. 2717. September 18, 1886. Lat. 38° 24' N.; long. 71° 13' W. 1,615 fathoms. 1 specimen.

Sta. 4953. August 22, 1906. Lat. 31° 39' N.; long. 132° 54' 40'' E. 1,350 fathoms. 1 specimen.

Remarks.—Both specimens are females; the Atlantic specimen measures 60 mm., that from the west Pacific 79 mm. from the front margin of the carapace to the end of the telson. To the description in my paper quoted, a few remarks may be added.

The narrow longitudinal strip near most of the lower lateral margin of the carapace is thickened as a conspicuous ridge (fig. 1a); considerably above this ridge another ridge runs subparallel with the lower margin, but the last-named ridge is only half as long as the carapace, disappearing at some distance from the hind margin, and very far from the front margin of the carapace. This description conveys a more correct idea of the structure than my earlier mention of two longitudinal furrows, which seem to be found, one a little above the lower margin, consequently at the upper margin of the lower ridge, and the other just below the upper lateral ridge.

Figure 1a may, for the rest, convey a fair idea of the furrows and ridges of the carapace.

Distribution.—Three localities are mentioned in the literature. The species has been taken twice in the East Atlantic, that is, in its tropical area by the German Deep-Sea Expedition and in the subtropical northern part by the Prince of Monaco; finally it was secured by Dr. A. Agassiz in the tropical East Pacific.

(?) THYSANOPODA CORNUTA Illg. (Young).

Under this name I described and figured in the Harvard paper¹ an animal near the end of the larval life and measuring 14.5 mm. in length. The *Albatross* has gathered a specimen at the following station in the Pacific:

Sta. 4759. May 20, 1906. Lat. 53° 05' N.; long. 138° 31' W. 300-0 fathoms. 1 specimen.

This specimen, which also is 14.5 mm. long, differs from that figured in 1912 in having a fine, slender rostrum which is about one-third as long as the front margin of the frontal plate; furthermore, the median anterior keel on the carapace is feebly developed, the furrows and keels on the carapace and on the posterior abdominal segments are feeble or not discernible, the endopods are still distinctly shorter in proportion to the telson and their exopod considerably shorter than the endopod; finally, the thoracic legs are much less developed than in my former specimen. All these features show that the new specimen, though as long as that described in 1912 and agreeing with it as to the shape of the frontal plate, in general aspect, etc., is somewhat less developed, possessing decidedly more larval features. It may be added that its antennular flagella are similar in length, scarcely half as long as the carapace and somewhat shorter than the antennal flagella.

Genus MEGANYCTIPHANES Holt and Tattersall.

Only a single species is known.

8. MEGANYCTIPHANES NORVEGICA M. Sars (1856).

1886. *Nyctiphanes norvegica* KOELBEL, Die österr. Polarst. Jan Mayen, p. 48, pl. 3, figs. 7-10.

1905. *Meganyctiphanes norvegica* HOLT and TATTERSALL, Rep. Sea and Inland Fisheries of Ireland, 1902-1903, pt. 2, No. 4, pp. 105 and 135, pl. 16.

Other references to literature are found in K. Stephensen's Grønlands Krebsdyr og Pycnogonider.² It may be added that I pointed out in the *Siboga* Report (p. 90) that *Euphausia lanei* Holt and Tattersall (1905) had been established on a less than half-grown and besides somewhat damaged specimen of *M. norvegica*.

Occurrence.—It has been captured at a very large number of places in the northwestern area of the Atlantic:

¹ P. 224, pl. 6, figs. 1a-1e.

² Meddelelser om Grønland, vol. 22, 1913.

Grampus No. 638. August 1, 1894. Lat. $50^{\circ} 01' 15''$ N.; long. $65^{\circ} 33' 45''$ W. 1 specimen.

Grampus. July 29, 1894. About lat. $49\frac{1}{2}^{\circ}$ N.; long. $64\frac{1}{3}^{\circ}$ W. Dip net, from well. 10 specimens.

Grampus No. 666. August 5, 1894. Lat. $48^{\circ} 29'$ N.; long. $60^{\circ} 56' 15''$ W. Numerous specimens.

Grampus No. 608. July 28, 1894. Lat. $48^{\circ} 11'$ N.; long. $64^{\circ} 02' 30''$ W. 2 specimens.

Bay of Fundy (about lat. 45° N.), United States Fish Commission, 1872. Numerous specimens.

Eastport Harbor (about lat. $44^{\circ} 54'$ N.). Half pint of specimens.

July 25, 1893. Lubec, Maine (near Eastport), United States Fish Commission. Enormous number of specimens.

September 8, 1878. Banquereau (lat. 44° – 45° N.; about 58° long.). From stomach of Rudder Fish. Schooner *Marion*. 3 specimens.

Grampus No. 809. September 9, 1894. Lat. $44^{\circ} 13' 15''$ N.; long. $67^{\circ} 55' 15''$ W. 1 specimen.

Sta. 105. September 20, 1877. Off Nova Scotia (about lat. 44° N.; long. $63\frac{1}{3}^{\circ}$ W.). 1 specimen.

Grampus No. 759. August 24, 1894. Lat. $43^{\circ} 36' 30''$ N.; long. $69^{\circ} 03' 30''$ W. 11 specimens.

Sta. 191–2. August 31, 1878. About lat. $42^{\circ} 33\frac{1}{2}'$ N.; long. 70° W. 3 specimens.

Sta. 184. August 29, 1878. About lat. $42^{\circ} 30\frac{1}{2}'$ N.; long. $70\frac{3}{8}^{\circ}$ W. 3 specimens.

Sta. 234, 238. September 25, 26, 1878. Lat. $42^{\circ} 30\frac{1}{2}'$ N.; long. $70^{\circ} 38'$ W. 8 specimens.

Sta. 194. August 31, 1894. About lat. $42\frac{1}{2}^{\circ}$ N.; long. 70° W. 3 specimens.

Sta. 1078. August 2, 1882. Off Cape Cod (about lat. $42\frac{1}{3}^{\circ}$ N.). 5 specimens.

Sta. 1083. August 2, 1882. Off Cape Cod. 11 specimens.

Grampus No. 480. July 7, 1894. Lat. $42^{\circ} 13' 15''$ N.; long. $70^{\circ} 15' 30''$ W. Many specimens.

Grampus No. 503. July 9, 1894. Lat. $42^{\circ} 13'$ N.; long. $70^{\circ} 24'$ W. 8 specimens.

Grampus. July 9, 1894. Near lat. $42^{\circ} 13'$ N.; long. $70^{\circ} 24'$ W. Dip-net. Half pint.

Grampus. July 9, 1894. With dip-net in the well of the schooner. Numerous specimens.

Grampus No. 481. July 7, 1894. Lat. $42^{\circ} 12' 15''$ N.; long. $70^{\circ} 17' 15''$ W. Dip-net. Large number of specimens.

Grampus No. 482. July 7, 1894. Near the preceding place. Dip-net. Large number of specimens.

- Sta. 318. August 29, 1879. Lat. $42^{\circ} 01\frac{1}{2}'$ N.; long. $70^{\circ} 15'$ W.
3 specimens.
- Sta. 2528. July 13, 1885. Lat. $41^{\circ} 47'$ N.; long. $65^{\circ} 37' 30''$ W.
4 young specimens.
- Woods Hole region. About lat. $41^{\circ} 32'$ N. 4 specimens.
- Grampus* No. 75. May 25, 1891. Lat. $40^{\circ} 22'$ N.; long. $72^{\circ} 38'$ W. Immense number of older larvæ.
- Sta. 2045. July 31, 1883. Lat. $40^{\circ} 04' 20''$ N.; long. $68^{\circ} 43' 50''$ W. 1 specimen.
- Sta. 2046. July 31, 1883. Lat. $40^{\circ} 02' 49''$ N.; long. $68^{\circ} 49'$ W. 1 specimen.
- Sta. 2025. May 25, 1883. Lat. $40^{\circ} 02'$ N.; long. $70^{\circ} 27'$ W. 1 specimen.
- Sta. 2091. September 21, 1883. Lat. $40^{\circ} 01' 50''$ N.; long. $70^{\circ} 59'$ W. 1 specimen.
- Sta. 1092. August 11, 1882. Lat. $39^{\circ} 58'$ N.; long. $69^{\circ} 42'$ W. 4 specimens.
- Sta. 1029. September 14, 1881. Lat. $39^{\circ} 57' 06''$ N.; long. $68^{\circ} 16'$ W. 14 specimens.
- Sta. 1028. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 17'$ W. 7 specimens.
- Sta. 1031. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 19'$ W. 1 specimen.
- Sta. 1035. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 28'$ W. 6 specimens.
- Sta. 1094. August 11, 1882. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 47'$ W. 2 specimens.
- Sta. 1032. September 14, 1881. Lat. $39^{\circ} 56'$ N.; long. $69^{\circ} 22'$ W. 3 specimens.
- Sta. 1033. September 14, 1881. Lat. $39^{\circ} 56'$ N.; long. $69^{\circ} 24'$ W. 8 specimens.
- Sta. 1034. September 14, 1881. Lat. $39^{\circ} 56'$ N.; long. $69^{\circ} 26'$ W. 11 specimens.
- Sta. 946. August 9, 1881. Lat. $39^{\circ} 55\frac{1}{2}'$ N.; long. $71^{\circ} 14'$ W. 3 specimens.
- Sta. 2188. August 3, 1884. Lat. $39^{\circ} 54' 30''$ N.; long. $71^{\circ} 08'$ W. 3 specimens.
- Sta. 1096. August 11, 1882. Lat. $39^{\circ} 53'$ N.; long. $69^{\circ} 47'$ W. 1 specimen.
- Sta. 939. August 4, 1881. Lat. $39^{\circ} 53'$ N.; long. $69^{\circ} 50' 30''$ W. 2 specimens.
- Sta. 1026. September 8, 1881. Lat. $39^{\circ} 50' 30''$ N.; long. $71^{\circ} 23'$ W. 8 specimens.
- Grampus* No. 235. May 15, 1894. Lat. $39^{\circ} 50' 30''$ N.; long. $71^{\circ} 17' 45''$ W. 2 specimens.

- Sta. 2582. September 18, 1885. Lat. $39^{\circ} 50' 00''$ N.; long. $71^{\circ} 43'$ W. 1 specimen.
- Sta. 879. September 13, 1880. Lat. $39^{\circ} 49' 30''$ N.; long. $70^{\circ} 54'$ W. 1 specimen.
- Sta. 2215. August 22, 1884. Lat. $39^{\circ} 49' 15''$ N.; long. $70^{\circ} 31' 45''$ W. 2 specimens.
- Sta. 880. September 13, 1880. Lat. $39^{\circ} 48' 30''$ N.; long. $70^{\circ} 54'$ W. 5 specimens.
- Sta. 2192. August 5, 1884. Lat. $39^{\circ} 46' 30''$ N.; long. $70^{\circ} 14' 45''$ W. 1 specimen.
- Sta. 2029. May 25, 1883. Lat. $39^{\circ} 42'$ N.; long. $70^{\circ} 47'$ W. Surface. 1 young specimen.
- Sta. 1137. September 8, 1882. Lat. $39^{\circ} 40'$ N.; long. $71^{\circ} 52'$ W. 2 specimens.
- Sta. 2179. July 23, 1884. Lat. $39^{\circ} 30' 10''$ N.; long. $71^{\circ} 50'$ W. 2 specimens.
- Sta. 2180. July 23, 1884. Lat. $39^{\circ} 29' 50''$ N.; long. $71^{\circ} 49' 30''$ W. 2 specimens.
- Grampus* No. 232. May 14, 1894. Lat. $39^{\circ} 26' 15''$ N.; long. $71^{\circ} 31'$ W. 5 young specimens.
- Sta. 2236. September 13, 1884. Lat. $39^{\circ} 11'$ N.; long. $72^{\circ} 08' 30''$ W. 2 specimens.
- Sta. 1044. October 20, 1881. Lat. $38^{\circ} 37'$ N.; long. $73^{\circ} 12'$ W. 4 specimens.
- Grampus* No. 18. May 12, 1887. Lat. $38^{\circ} 30'$ N.; long. $74^{\circ} 02'$ W. 12 half-grown specimens.
- Sta. 2230. September 12, 1884. Lat. $38^{\circ} 27'$ N.; long. $73^{\circ} 02'$ W. 1 young specimen.
- Grampus* No. 29. April 27, 1887. Lat. $37^{\circ} 43'$ N.; long. $74^{\circ} 15'$ W. 1 young specimen.
- Sta. 897. November 16, 1880. Lat. $37^{\circ} 25'$ N.; long. $74^{\circ} 18'$ W. 2 specimens.

All gatherings undertaken by the *Grampus* in 1887, 1891, and 1894 are tow-net hauls, consequently the animals secured must have lived near the surface.

Remarks.—One of the largest females from lat. $42^{\circ} 13' 15''$ N. is 35 mm. long, while a very large male captured off Cape Cod (Station 1083) is even 39.5 mm. long.

Distribution.—The list above shows that in the west Atlantic off North America this species goes southward to lat. $37^{\circ} 25'$ N., off Delaware Bay and northward to the northern part of the Gulf of Lawrence, while it is unknown between the last-named locality and Davis Strait. Quite recently it has been captured at the entrance of Davis Strait, at lat. $60^{\circ} 07'$ N.; long. $48^{\circ} 26'$ W. (K. Stephensen). It has been taken west, east, and north of Iceland, near Jan

Mayen and at places near east Greenland, going northward to lat. $74^{\circ} 30' N.$ Its occurrence in the western Mediterranean, along the western coasts of Europe to Vadsö and in the Arctic Sea north of Europe and Asia has been dealt with in the *Ingolf* Malacostraca (vol. 1) which also contains more detailed information. Richters's statement, with a query, about its occurrence in Bering Sea is undoubtedly wrong.

Genus NYCTIPHANES G. O. Sars.

The genus comprises four species, but only a single form is represented in the collection.

9. NYCTIPHANES SIMPLEX H. J. Hansen (1911).

1912. *Nyctiphanes simplex* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, pp. 227, 288, pl. 6, figs. 2a-2i (adult and subadult); pl. 7, figs. 1a-1b (young); pl. 12, figs. 3a-3f (larval stages).

Occurrence.—Among the unnamed material, specimens from six stations in the east Pacific are at hand:

Sta. 4399. April 7, 1904. Lat. $32^{\circ} 44' 50'' N.$; long. $117^{\circ} 48' 45'' W.$ Surface. Surf. temp. 62° . 4.18 p. m. 4 specimens.

San Luis Gonzales Bay, Gulf of California (about lat. $30^{\circ} N.$; long. $114\frac{1}{2}^{\circ} W.$). March 27, 1889. *Albatross*. Enormous number of specimens.

Sta. 2834. May 3, 1888. Lat. $26^{\circ} 14' N.$; long. $113^{\circ} 13' W.$ From stomach of *Merlucius*. Many specimens.

Sur. 16. March 1, 1888. Lat. $4^{\circ} 21' N.$; long. $81^{\circ} 59' W.$ Moonlight. Surface. Surf. temp. 74° . 2 specimens.

Sur. 28. April 7, 1888. Off Hood Island, Galapagos Archipelago. Surface. Scoop net, electric light. Clear starlight. 8-9 p. m. Numerous specimens.

Narborough Id., Galapagos. From stomach of *Puffinus*. January 5, 1889. Stanford University. Numerous fine specimens.

Furthermore, the material from seven of the nine stations recorded in 1894 by Ortmann for *Nyctiphanes australis* G. O. Sars belongs to *N. simplex*: (The specimens from the two other stations belong to *Euphausia recurva* H. J. Hansen, and are recorded later on.)

Sur. 542. January 14, 1892. Lat. $35^{\circ} 31' N.$; long. $124^{\circ} 57' 30'' W.$ Surface. Surf. temp. 56° . 8 specimens.

Sur. 52. October 13 or 14, 1891. About lat. $35^{\circ} N.$; long. $129^{\circ} W.$ Surface. 1 specimen.

Sta. 3435. April 22, 1891. Lat. $26^{\circ} 48' N.$; long. $110^{\circ} 45' 20'' W.$ Surface. Surf. temp. 70° . 6 young specimens.

Hyd. 2619. March 11, 1891. Lat. $7^{\circ} 31' N.$; long. $78^{\circ} 42' 30'' W.$ 1,000-0 fathoms. 1 specimen.

Sta. 3388. March 9, 1891. Lat. $7^{\circ} 06' N.$; long. $79^{\circ} 48' W.$ 400-0 fathoms. 1 specimen.

March 7, 1891, thus near lat. $6^{\circ} 21' N.$; long. $80^{\circ} 41' W.$ 3 specimens.

Sta. 3409. April 3, 1891. Lat. $0^{\circ} 18' 40'' N.$; long. $90^{\circ} 34' W.$ Surface. Surf. temp. 82° . 2 specimens.

Remarks.—Some of the specimens are uncommonly large. A male taken March 7, 1891, measures 13.5 mm. in length; a female, from Narborough Island, is even 16 mm. long, and a male from the same locality, 14 mm.

Distribution.—The species is known only from the east Pacific, between lat. $35^{\circ} 31' N.$ and lat. $5^{\circ} 57\frac{1}{2}' S.$

Genus EUPHAUSIA Dana.

In the revision of the order (1911) I enumerated 27 species and divided them into four groups. Seventeen species are represented in the collection.

10. EUPHAUSIA KROHNII Brandt.

1851. *Thysanopoda krohnii* BRANDT, Krebse, in Middendorff's Sibirische Reise, vol. 2, pt. 1, p. 127.

1863. *Euphausia mülleri* CLAUS, Zeitschr. wiss. zool., vol. 13, p. 444, pls. 28-29, figs. 29-45.

1882. *Thysanopoda bidentata* G. O. SARS, Forh. Vidensk. Selsk. Christiania for 1882, No. 18, p. 50, pl. 1, figs. 11-14.

1911. *Euphausia krohnii* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, p. 22, with 2 text-figures.

Occurrence.—This North Atlantic species has been taken at the following places:

Sta. 69. September 1, 1877. Lat. $42^{\circ} 44' N.$; long. $62^{\circ} 43' W.$ Surf. temp. $65\frac{1}{2}^{\circ}$. 2 specimens.

Sta. 2528. July 13, 1885. Lat. $41^{\circ} 47' N.$; long. $65^{\circ} 37' 30'' W.$ Surf. temp. 69° . 6 specimens.

Sta. 2575. September 3, 1885. Lat. $41^{\circ} 07' N.$; long. $65^{\circ} 26' 30'' W.$ Surf. temp. 71° . 1 specimen.

Sta. 2045. July 31, 1883. Lat. $40^{\circ} 04' 20'' N.$; long. $68^{\circ} 43' 50'' W.$ Surf. temp. 72° . 2 specimens.

September 14, 1872. Georges Bank region (lat. 42° - $40^{\circ} N.$; long. 66° - $69^{\circ} W.$). 3 specimens.

Sta. 2047. July 31, 1883. Lat. $40^{\circ} 02' 30'' N.$; long. $68^{\circ} 49' 40'' W.$ Surf. temp. 72° . 2 specimens.

Sta. 1111. August 22, 1882. Lat. $40^{\circ} 01' 33'' N.$; long. $70^{\circ} 35' W.$ Surf. temp. 72° . Numerous specimens.

Sta. 2044. July 31, 1883. Lat. $40^{\circ} 00' 30'' N.$; long. $68^{\circ} 37' 20'' W.$ Surf. temp. 72° . 3 specimens.

Sta. 2213. August 22, 1884. Lat. $39^{\circ} 58' 30'' N.$; long. $70^{\circ} 30' W.$ Surf. temp. 71° . 11 specimens.

Sta. 1114. August 22, 1882. Lat. $39^{\circ} 58' N.$; long. $70^{\circ} 38' W.$ Surf. temp. 72° . 1 specimen.

- Sta. 2183. August 2, 1884. Lat. $39^{\circ} 57' 45''$ N.; long. $70^{\circ} 56' 30''$ W. Surf. temp. 68° . 11 specimens.
- Sta. 1031. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 19'$ W. Surf. temp. 65° . 5 specimens.
- Sta. 1034. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 26'$ W. Surf. temp. 62° . 8 specimens.
- Sta. 1035. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 28'$ W. Surf. temp. 62° . 1 specimen.
- Sta. 1093. August 11, 1882. Lat. $39^{\circ} 56'$ N.; long. $69^{\circ} 45'$ W. Surf. temp. 75° . 5 specimens.
- Sta. 952. August 23, 1881. Lat. $39^{\circ} 55'$ N.; long. $70^{\circ} 28'$ W. Surf. temp. 68° . 3 specimens.
- Sta. 2188. August 3, 1884. Lat. $39^{\circ} 54' 30''$ N.; long. $71^{\circ} 08'$ W. Surf. temp. 70° . 13 specimens.
- Sta. 1096. August 11, 1882. Lat. $39^{\circ} 53'$ N.; long. $69^{\circ} 47'$ W. Surf. temp. $75\frac{1}{2}^{\circ}$. Numerous specimens.
- Sta. 1026. September 8, 1881. Lat. $39^{\circ} 50' 30''$ N.; long. $71^{\circ} 23'$ W. Surf. temp. 69° . 7 specimens.
- Sta. 2187. August 3, 1884. Lat. $39^{\circ} 49' 30''$ N.; long. $71^{\circ} 10'$ W. Surf. temp. 68° . 16 specimens.
- Sta. 2215. August 22, 1884. Lat. $39^{\circ} 49' 15''$ N.; long. $70^{\circ} 31' 45''$ W. Surf. temp. 74° . Many specimens.
- Sta. 2192. August 5, 1884. Lat. $39^{\circ} 46' 30''$ N.; long. $70^{\circ} 14' 15''$ W. Surf. temp. 72° . 14 specimens.
- Sta. 2219. August 23, 1884. Lat. $39^{\circ} 46' 22''$ N.; long. $69^{\circ} 29'$ W. Surf. temp. 74° . 3 specimens.
- Sta. 2687. July 18, 1886. Lat. $39^{\circ} 46'$ N.; long. $71^{\circ} 19'$ W. 5 specimens.
- Sta. 2550. August 9, 1885. Lat. $39^{\circ} 44' 30''$ N.; long. $70^{\circ} 30' 45''$ W. Surf. temp. 76° . 7 specimens.
- Sta. 2195. August 5, 1884. Lat. $39^{\circ} 44'$ N.; long. $70^{\circ} 03'$ W. Surf. temp. 74° . 9 specimens.
- Sta. 998. September 8, 1881. Lat. $39^{\circ} 43'$ N.; long. $71^{\circ} 32'$ W. Surf. temp. 68° . 1 specimen.
- Sta. 997. September 8, 1881. Lat. $39^{\circ} 42'$ N.; long. $71^{\circ} 32'$ W. Surf. temp. 67.5° . 1 specimen.
- Sta. 2190. August 4, 1884. Lat. $39^{\circ} 40'$ N.; long. $70^{\circ} 20' 15''$ W. Surf. temp. 73° . Numerous specimens.
- Sta. 1137. September 8, 1882. Lat. $39^{\circ} 40'$ N.; long. $71^{\circ} 52'$ W. Surf. temp. 70° . Numerous specimens.
- Sta. 2201. August 19, 1884. Lat. $39^{\circ} 39' 45''$ N.; long. $71^{\circ} 35' 15''$ W. Surf. temp. 66° . 13 specimens.
- Sta. 2202. August 19, 1884. Lat. $39^{\circ} 38'$ N.; long. $71^{\circ} 39' 45''$ W. Surf. temp. 67° . 11 specimens.

- Sta. 1139. September 8, 1882. Lat. $39^{\circ} 37' N.$; long. $71^{\circ} 55' W.$
Surf. temp. 72° . 1 specimen.
- Sta. 2205. August 30, 1884. Lat. $39^{\circ} 35' N.$; long. $71^{\circ} 18' 45'' W.$
Surf. temp. 73° . 5 specimens.
- Sta. 2203. August 19, 1884. Lat. $39^{\circ} 34' 15'' N.$; long. $71^{\circ} 41' 15'' W.$ Surf. temp. 74° . 7 specimens.
- Sta. 2042. July 30, 1883. Lat. $39^{\circ} 33' N.$; long. $68^{\circ} 26' 45'' W.$
Surf. temp. 71° . 1 specimen.
- Sta. 2683. July 17, 1886. Lat. $39^{\circ} 33' N.$; long. $70^{\circ} 50' W.$ 17 specimens.
- Sta. 1142. September 8, 1882. Lat. $39^{\circ} 32' N.$; long. $72^{\circ} 00' W.$
Surf. temp. 74° . 1 specimen.
- Sta. 1144. September 8, 1882. Lat. $39^{\circ} 31' N.$; long. $72^{\circ} 06' W.$
Surf. temp. 74° . 1 specimen.
- Sta. 2179. July 23, 1884. Lat. $39^{\circ} 30' 10'' N.$; long. $71^{\circ} 50' W.$
Surf. temp. 67° . 3 specimens.
- Sta. 2180. July 23, 1884. Lat. $39^{\circ} 29' 50'' N.$; long. $71^{\circ} 49' 30'' W.$ Surf. temp. 68° . 24 specimens.
- Sta. 2095. September 30, 1883. Lat. $39^{\circ} 29' N.$; long. $70^{\circ} 58' 40'' W.$ Surface. Surf. temp. $69\frac{1}{2}^{\circ}$. 3 specimens.
- Sta. 2178. July 22, 1884. Lat. $39^{\circ} 29' N.$; long. $72^{\circ} 05' 15'' W.$
Surf. temp. 68° . 4 specimens.
- Grampus* No. 232. May 14, 1894. Lat. $39^{\circ} 26' 15'' N.$; long. $71^{\circ} 31' W.$ Tow-net. 6 specimens.
- Sta. 2235. September 13, 1884. Lat. $39^{\circ} 12' N.$; long. $72^{\circ} 03' 30'' W.$ Surf. temp. 72° . Many specimens.
- Sta. 2222. September 6, 1884. Lat. $39^{\circ} 03' 15'' N.$; long. $70^{\circ} 50' 45'' W.$ Surf. temp. 73° . 1 specimen.
- Sta. 2104. November 5, 1883. Lat. $38^{\circ} 48' N.$; long. $72^{\circ} 40' 30'' W.$ Surf. temp. 63° . 1 specimen.
- Sta. 2746. September 18, 1887. Lat. $38^{\circ} 46' N.$; long. $73^{\circ} 05' 45'' W.$ Surf. temp. 68° . 6 specimens.
- Sta. 2102. November 5, 1883. Lat. $38^{\circ} 44' N.$; long. $72^{\circ} 38' W.$ Surface. Surf. temp. $62\frac{1}{2}^{\circ}$. 1 specimen.
- Sta. 1044. October 10, 1881. Lat. $38^{\circ} 37' N.$; long. $73^{\circ} 12' W.$ Surf. temp. 66° . 4 specimens.
- Sta. 2230. September 12, 1884. Lat. $38^{\circ} 27' N.$; long. $73^{\circ} 02' W.$ Surf. temp. 75° . Many specimens.
- Sta. 2565. August 28, 1885. Lat. $38^{\circ} 19' 20'' N.$; long. $60^{\circ} 02' 30'' W.$ Surf. temp. 77° . 2 specimens.
- Grampus* No. 47. May 19, 1891. Lat. $38^{\circ} 09' N.$; long. $74^{\circ} 07' W.$ Immense number of young specimens.
- Sta. 2172. July 20, 1884. Lat. $38^{\circ} 01' 15'' N.$; long. $73^{\circ} 44' W.$ Surf. temp. 76° . 6 specimens.

Sta. 2173. July 21, 1884. Lat. $37^{\circ} 57' N.$; long. $72^{\circ} 34' W.$
Surf. temp. 71° . 4 specimens.

Sta. 2105. November 6, 1883. Lat. $37^{\circ} 50' N.$; long. $73^{\circ} 03' 50'' W.$
Surface. Surf. temp. 63° . 3 specimens.

Sta. 2742. September 17, 1887. Lat. $37^{\circ} 46' 30'' N.$; long. $73^{\circ} 56' 30'' W.$
Surf. temp. 69° . Many specimens.

Sta. 2098. October 1, 1883. Lat. $37^{\circ} 40' 30'' N.$; long. $70^{\circ} 37' 30'' W.$
Surf. temp. $72\frac{1}{2}^{\circ}$. 20 specimens.

Sta. 2229. September 11, 1884. Lat. $37^{\circ} 38' 40'' N.$; long. $73^{\circ} 16' 30'' W.$
Surf. temp. 75° . 8 specimens.

Sta. 2426. June 4, 1885. Lat. $36^{\circ} 01' 30'' N.$; long. $74^{\circ} 47' 30'' W.$
Surf. temp. 71° . 2 specimens.

This extremely long list shows that this species is very common in the West Atlantic off the United States between lat. 40° and $38^{\circ} N.$, going north to about lat. $42\frac{3}{4}^{\circ} N.$ and southward to near lat. $36^{\circ} N.$ Besides, the collection contains a specimen from the Gulf of Gasconne (Exped. *Caudan*) and determined as *Euphausia pellucida* Dana.

The temperature at the surface is noted at each station, because this species, according to my experience from other sources, frequently lives near the surface. It is larger than the following form, and its most important characters have been pointed out in the Monaco paper quoted.

Distribution.—*E. krohnii* is known from the western half of the Mediterranean and besides it is common in the east Atlantic, going southward at least to lat. $36^{\circ} 13' N.$ and northward to lat. $51^{\circ} N.$; a single specimen has been taken on the west coast of Norway.

11. EUPHAUSIA AMERICANA H. J. Hansen (1911).

1911. *Euphausia americana* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, p. 23, fig. 6.

Occurrence.—Taken by the *Albatross* at six stations in the West Atlantic:

Sta. 2195. August 5, 1884. Lat. $39^{\circ} 44' N.$; long. $70^{\circ} 03' W.$
Surf. temp. 74° . 1 specimen.

Sta. 2569. August 31, 1885. Lat. $39^{\circ} 26' N.$; long. $68^{\circ} 03' 30'' W.$
Surface. Surf. temp. 75° . Numerous specimens.

Sta. 2585. September 19, 1885. Lat. $39^{\circ} 08' 30'' N.$; long. $72^{\circ} 17' W.$
Surf. temp. 73° . 1 specimen.

Sta. 2174. July 21, 1884. Lat. $38^{\circ} 15' N.$; long. $72^{\circ} 03' W.$
Surf. temp. 76° . 15 specimens.

Hyd. 138. February 9, 1884. Caribbean Sea. Lat. $10^{\circ} 51' 30'' N.$; long. $67^{\circ} 01' 40'' W.$ Surface. 11 specimens.

Remarks.—While dealing with the large material of *Euphausia krohnii* in the collection of the United States National Museum I examined the male copulatory organs of specimens of various sizes

and was surprised to find that some smaller specimens which I had deemed to be casual or local varieties, had the two main processes of the copulatory organs quite different from those in large, typical specimens. The result was that the smaller but adult specimens proved to be a species hitherto overlooked, and I named it *E. americana*, because the first specimens observed had been taken off the United States and belong to the National Museum. In the above-quoted paper I pointed out the most important specific characters of the three species with the margin of the lobe of first antennular joint pectinate, viz, *E. krohnii* Brandt, *E. americana*, and *E. eximia* H. J. Hansen; in a future work on the Monaco collection a more detailed description with a number of figures of the two first-named species will be given.

Distribution.—The localities above show that in the Northwestern Atlantic this species goes northward to about lat. $39\frac{3}{4}^{\circ}$ N., that it was found together with *E. krohnii* between lat. $39\frac{3}{4}^{\circ}$ and $38\frac{1}{4}^{\circ}$ N., and that it has besides been taken in the Caribbean Sea. In the paper on the Schizopoda collected by the Swedish Antarctic Expedition (1913) I showed that this expedition had gathered *E. americana* at no less than 20 places in the line from lat. $33^{\circ} 23' N.$; long. $18^{\circ} 39' W.$ to lat. $32^{\circ} 15' S.$; long. $50^{\circ} 14' W.$, furthermore that the Copenhagen Museum possesses it from the middle of the North Atlantic, namely, lat. $33^{\circ} N.$; long. $47^{\circ} W.$

12. EUPHAUSIA EXIMIA H. J. Hansen (1911).

1912. *Euphausia eximia* H. J. Hansen, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 230, pl. 7, figs. 2a-2g.

Occurrence.—Of the material received in unnamed condition specimens from three *Albatross* stations in the Pacific are at hand:
 Sur. 26. April 3, 1888. Lat. $0^{\circ} 30' S.$; long. $88^{\circ} 37' 30'' W.$ Surface. Light clouds, 7.35 p. m. Surf. temp. 80° . Many specimens.

Sta. 2808. April 4, 1888. Lat. $0^{\circ} 36' 30'' S.$; long. $89^{\circ} 19' W.$ Surf. temp. 79° . 6 specimens.

Sur. 16. March 1, 1888. Lat. $4^{\circ} 21' S.$; long. $81^{\circ} 59' W.$ Surface. Moonlight. Surf. temp. 74° . 1 specimen.

Among the animals recorded by Ortmann in 1894 as *E. pellucida* Dana the following specimens belong to *E. eximia*:

Off Guaymas (about lat. $28^{\circ} N.$; long. $111^{\circ} W.$). 500 fathoms. 8 specimens.

Fifty miles south of Guaymas (about lat. $27\frac{1}{4}^{\circ} N.$; long. $111^{\circ} W.$). 700-0 fathoms. 1 specimen.

Sta. 3434. April 21, 1891. Lat. $25^{\circ} 29' 30'' N.$; long. $109^{\circ} 48' W.$ Surface. Surf. temp. 70° . 1 specimen.

Sta. 3416. April 11, 1891. Lat. $16^{\circ} 32' 30'' N.$; long. $99^{\circ} 42' 40'' W.$ 300-0 fathoms. 4 specimens.

Lat. 13° 33' 30'' N.; long. 97° 57' 30'' W. 8 p. m. Surface. Large number of immature specimens.

Sta. 3414. April 8, 1891. Lat. 10° 14' N.; long. 96° 28' W. 200-0 fathoms. Many specimens. 300-0 fathoms. 14 specimens.

Sta. 3388. March 9, 1891. Lat. 7° 06' N.; long. 79° 48' W. 400-0 fathoms. 1 specimen.

Sta. 3409. April 3, 1891. Lat. 0° 18' 40'' N.; long. 90° 34' W. Surface. Surf. temp. 82°. 1 specimen.

Hyd. 2628. March 26, 1891. Lat. 0° 13' S.; long. 84° 52' W. 200-0 fathoms. 1 specimen.

Distribution.—This species is known only from the East Pacific, and according to the list above and the long list in the Harvard paper it extends as far north as lat. 28° N. and south to about lat. 14½° S.

13. EUPHAUSIA DIOMEDEÆ Ortman (1894).

1910. *Euphausia diomedæ* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 91, pl. 13, figs. 4a-4c.

1912. *Euphausia diomedæ* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 235, pl. 7, fig. 4a.

Occurrence.—Among the unnamed material, specimens were found from two places in the tropical Pacific:

September 9, 1899, *Albatross*, consequently about lat. 2° 38' N.; long. 137° 22' W. Surface. 2 specimens.

Sur. 26. April 3, 1888. Lat. 0° 30' S.; long. 88° 37' 30'' W. Surface. Light clouds, 7.35 p. m. Surf. temp. 80°. 12 specimens.

Among the animals recorded by Ortman as *E. pellucida* the following specimens belong to *E. diomedæ*.

Sta. 3414. April 8, 1891. Lat. 10° 14' N.; long. 96° 28' W. 100-0 fathoms. 3 specimens. About 200 fathoms. 2 specimens.

March 7, 1891, consequently about lat. 6° 21' N.; long. 80° 41' W. Surface. 8.30 p. m. Many specimens.

Sta. 3412. April 4, 1891. Lat. 1° 23' N.; long. 91° 43' W. Surface. Surf. temp. 82°. Many specimens.

Sta. 3409. April 3, 1891. Lat. 0° 18' 40'' N.; long. 90° 34' W. Surface. Surf. temp. 82°. 9 specimens.

Remarks.—Ortman's two type-specimens of *E. diomedæ* were taken at Station 3909. As shown in my papers quoted the characters applied by Ortman for *E. diomedæ* are in reality founded only on a most remarkable and somewhat anomalous variation. His two specimens were taken together with 9 normal specimens of the same species, but these he referred to *E. pellucida*, which is a mixture of several species well separated by excellent differences in the antennulæ and the copulatory organs.

Distribution.—As pointed out in my Harvard paper (pp. 235-237) this species is known from the Red Sea and is widely distributed in

the tropical areas of both the Indian Ocean and the Pacific, in the East Pacific going northward to lat. $30^{\circ} 35' N$. It has never been taken in the Atlantic.

14. *EUPHAUSIA MUTICA* H. J. Hansen (1905).

1910. *Euphausia mutica* H. J. Hansen, *Siboga* Exp., vol. 37, p. 93, pl. 14, figs. 1a-1d.

Occurrence.—This species has been taken at a number of places in the northwest Atlantic:

Sta. 1111. August 22, 1882. Lat. $40^{\circ} 01' 33'' N$.; long. $70^{\circ} 35' W$. Surf. temp. 72° . 1 specimen.

Sta. 1137. September 8, 1882. Lat. $39^{\circ} 40' N$.; long. $71^{\circ} 52' W$. Surf. temp. 70° . 1 specimen.

Sta. 2569. August 31, 1885. Lat. $39^{\circ} 26' N$.; long. $68^{\circ} 03' 30'' W$. Surf. temp. 75° . 1 specimen.

Sta. 2585. September 19, 1885. Lat. $39^{\circ} 08' 30'' N$.; long. $72^{\circ} 17' W$. Surface. Surf. temp. 73° . 4 specimens.

Sta. 2742. September 17, 1887. Lat. $37^{\circ} 46' 30'' N$.; long. $73^{\circ} 56' 30'' W$. Surf. temp. 69° . 12 specimens.

Sta. 2098. October 1, 1883. Lat. $37^{\circ} 40' 30'' N$.; long. $70^{\circ} 37' 30'' W$. Surf. temp. $72\frac{1}{2}^{\circ}$. 1 specimen.

Sta. 2224. September 8, 1884. Lat. $36^{\circ} 16' 30'' N$.; long. $68^{\circ} 21' W$. Surf. temp. 79° . 1 specimen.

New Providence Island, Bahamas; *Albatross*. 1 specimen.

Hyd. 138. February 9, 1884. Caribbean Sea: Lat. $10^{\circ} 51' 30'' N$.; long. $67^{\circ} 01' 40'' W$. 8 specimens.

Also 2 specimens were taken by the *Grampus*, July 23, 1890, but the place is unknown.

Furthermore it has been taken in the southeast Pacific at a single place:

August 10, 1884. Lat. $29^{\circ} 33' S$.; long. $81^{\circ} 34' W$. U. S. S. *Wachusett*. Dr. W. H. Jones, U. S. Navy. 6 specimens.

Among the specimens from the Hawaiian Islands referred by Ortmann (1905) to "*E. bidentata* G. O. Sars," several specimens from the following localities belong to *E. mutica*:

Sta. 3829. April 1, 1902. Avalu Point, south coast of Molokai Island. Surface. 1 specimen.

Sta. 3867. April 10, 1902. Pailolo Channel. Surf. temp. 75° . 7 specimens.

Sta. 3901. April 19, 1902. Pailolo Channel. Surface. 7.41 p. m. Surf. temp. 74° . 8 specimens.

Sta. 3912. May 5, 1902. South coast of Oahu Island. Surface. 7.13 p. m. Surf. temp. 76° . 1 specimen.

Sta. 4009. June 17, 1902. Lat. $21^{\circ} 50' 30'' N$.; long. $159^{\circ} 15' W$. Surface. 6.48 p. m. Surf. temp. 76° . Many specimens.

Sta. 4011. June 18, 1902. Lat. $21^{\circ} 20' N.$; long. $158^{\circ} 21' W.$ Surface. 4.03–4.06 p. m. Surf. temp. 77° . 1 specimen.

Distribution.—*E. mutica* is widely distributed in the tropical and temperate areas of the Atlantic, in the Indian Ocean, and in large parts of the tropical and subtropical parts of the Pacific. More special information on this topic is found in my Harvard paper, and in 1912 Tattersall enumerated many places in the Indian Ocean.¹

15. *EUPHAUSIA RECURVA* H. J. Hansen (1905).

1912. *Euphausia recurva* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 233, pl. 7, figs. 3a–3n.

Occurrence.—Among the unnamed material this species was found only from a single locality in the southeast Pacific.

August 10, 1884. Lat. $29^{\circ} 33' S.$; long. $81^{\circ} 34' W.$ U. S. S. *Wachusett*. Dr. W. H. Jones, U. S. Navy. 3 specimens.

Among the specimens referred by Ortmann in 1894 to *Nyctiphanes australis* G. O. Sars those from the two last-named of the four localities mentioned below belong to *E. recurva*, and the same is the case with the specimens referred by him to *E. pellucida*, from the two other stations:

Sur. 543. January 14, 1892. Lat. $35^{\circ} 36' 30'' N.$; long. $124^{\circ} 45' 30'' W.$ Surface. 9.28 p. m. Surf. temp. 56° . 7 specimens.

Sur. 542. January 14, 1892. Lat. $35^{\circ} 31' N.$; long. $124^{\circ} 57' 30'' W.$ Surface. 7.19 p. m. Surf. temp. 56° . Many specimens.

Sur. 54. October 14, 1891. Lat. $35^{\circ} 03' 30'' N.$; long. $129^{\circ} 05' W.$ Surface. 3.33 p. m. Surf. temp. 65° . 1 specimen.

Sur. 74. October 16, 1891. Lat. $30^{\circ} 04' 30'' N.$; long. $133^{\circ} 56' 30'' W.$ 6.55 p. m. Surf. temp. 67° . 1 specimen.

Among the animals from the Hawaiian Islands recorded in 1905 by Ortmann as *E. bidentata* G. O. Sars, some specimens belong to *E. recurva*:

Sta. 3867. April 10, 1902. Pailolo Channel. Surf. temp. 75° . 1 specimen.

Sta. 3901. April 29, 1902. Pailolo Channel. Surface. 7.41 p. m. Surf. temp. 74° . 14 specimens.

Sta. 3926. May 10, 1902. Lat. $21^{\circ} 13' N.$; long. $158^{\circ} 43' W.$ Surface. 7.15 p. m. Surf. temp. 75° . 5 specimens.

Distribution.—A detailed account of the very wide distribution in the southern Atlantic, the Indian Ocean, Japan, and Lower California is found in my Harvard paper; two additional localities of the southern Atlantic have been noted in the Report on the Schizopoda from the Swedish Antarctic Expedition (1913).

¹ Trans. Linn. Soc. London, vol. 15, pt. 1, p. 130.

16. EUPHAUSIA BREVIS H. J. Hansen (1905).

1912. *Euphausia brevis* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 239, pl. 8, figs. 1a-1g.

Occurrence.—The unnamed material contained specimens from three places in the north Atlantic off the United States:

Sta. 2046. July 31, 1883. Lat. $40^{\circ} 02' 49''$ N.; long. $68^{\circ} 49'$ W. Surf. temp. 72° . 1 specimen.

Sta. 2569. August 31, 1885. Lat. $39^{\circ} 26'$ N.; long. $68^{\circ} 03' 30''$ W. Surf. temp. 75° . Many specimens. Surface. Many specimens.

Sta. 2585. September 19, 1885. Lat. $39^{\circ} 08' 30''$ N.; long. $72^{\circ} 17'$ W. Surf. temp. 73° . 1 specimen.

Furthermore the species has been gathered at a place in the south-east Pacific:

July 24, 25, 1888. Lat. 33° S.; long. $120^{\circ} 57'$ W. U. S. S. *Wachusett*. Dr. W. H. Jones, U. S. Navy. 10 specimens.

Among the specimens recorded by Ortmann in 1894 as *E. pellucida* Dana, the specimens from a single place belong to *E. brevis*:

Sur. 165. November 11, 1891. Lat. $30^{\circ} 23'$ N.; long. $140^{\circ} 36' 30''$ W. Surface. 6 p. m. Surf. temp. 69° . 4 specimens.

Among the animals from the Hawaiian Islands recorded in 1905 by Ortmann as *E. bidentata* G. O. Sars, a goodly number belong to *E. brevis*:

Sta. 3797. March 17, 1902. Lat. $31^{\circ} 55'$ N.; long. $136^{\circ} 00'$ W. Surface. 7.20 p. m. Surf. temp. 62° . 4 specimens. 25 feet below surface. 2 specimens.

Sta. 3867. April 10, 1902. Pailolo Channel. Surf. temp. 75° . 9 specimens.

Sta. 3901. April 29, 1902. Pailolo Channel. Surface. 7.41 p. m. Surf. temp. 74° . 2 specimens.

Distribution.—The extremely wide distribution of this small species has been recorded in my Harvard paper; a large number of localities in the tropical and temperate Atlantic, between lat. $37^{\circ} 58'$ N.; long. $16^{\circ} 21'$ W. and lat. $26^{\circ} 58'$ S.; long. $44^{\circ} 57'$ W., have been enumerated in my paper on the Schizopoda from the Swedish Antarctic Expedition (1913).

17. EUPHAUSIA SUPERBA Dana (1852).

1913. *Euphausia superba* H. J. HANSEN, Rep. Crust. Schizopoda coll. by the Swedish Antarctic Expedition, p. 27, pl. 4, figs. 2a-2g (with references to the papers of G. O. Sars and Tattersall).

Occurrence.—The collection contains a single specimen from the Antarctic Ocean presented by Prof. D'Arcy W. Thompson and determined as *E. murrayi* G. O. Sars, which is one of the synonyms of *E. superba*.

Distribution.—This species is antarctic and probably circumpolar. More detailed statements have been given or referred to in the paper quoted.

18. *EUPHAUSIA SIMILIS* G. O. Sars (1883).

1885. *Euphausia similis* G. O. Sars, *Challenger* Rep., vol. 13, p. 79, pl. 13, figs. 1-6.

1911. *Euphausia similis* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, p. 24 (with a text-figure).

1913. *Euphausia similis* H. J. HANSEN, Crust. Schiz. Swed. Antarctic Exp., p. 29, pl. 4, figs. 3a-3e.

Occurrence.—This species is at hand only from a couple of *Albatross* stations in the Pacific at Japan:

Sta. 3710. May 10, 1900. Entrance Port Heda, off Honshu Island, Japan. 800 fathoms. 1 specimen.

Sta. 4905. August 11, 1906. Lat. $31^{\circ} 39' N.$; long. $129^{\circ} 19' E.$; not far from Koshika Island, southern Japan. 369 fathoms. 1 specimen.

Remarks.—Both specimens are normal; that from Station 3710 is an adult male measuring 25.5 mm. in length.

Distribution.—This species is known from the South Atlantic, at lat. $37^{\circ} 17' S.$, and the adjacent parts of the subantarctic region (H. J. H., 1913¹), from the Indian Ocean (H. J. H., in 1910 and 1911, Tattersall, 1912), and from a place between New Zealand and Tasmania (H. J. H., 1911).

19. *EUPHAUSIA TENERA* H. J. Hansen (1905).

1885. *Euphausia gracilis* G. O. Sars, *Challenger* Rep., vol. 13, p. 89, pl. 15, figs. 12-23 (not *E. gracilis* Dana).

1910. *Euphausia tenera* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 95, pl. 14, figs. 3a-3e.

Occurrence.—Taken at five places in the Atlantic off the United States:

Sta. 2528. July 13, 1885. Lat. $41^{\circ} 47' N.$; long. $65^{\circ} 37' 30'' W.$ Surf. temp. 69° . 1 specimen.

Sta. 2091. September 21, 1883. Lat. $40^{\circ} 01' 50'' N.$; long. $70^{\circ} 50' W.$ Surf. temp. 69° . 2 specimens.

Sta. 2195. August 5, 1884. Lat. $39^{\circ} 44' N.$; long. $70^{\circ} 03' W.$ Surf. temp. 74° . 1 specimen.

Sta. 2569. August 31, 1885. Lat. $39^{\circ} 26' N.$; long. $68^{\circ} 03' 30'' W.$ Surf. temp. 75° . 6 specimens. Surface. Numerous specimens.

Grampus No. 5078. March 1, 1889. Lat. $25^{\circ} 34' 00'' N.$; long. $83^{\circ} 07' W.$ No. 5079. March 2, 1889. Lat. $25^{\circ} 34' 30'' N.$; long. $83^{\circ} 01' W.$ 3 specimens in all.

Besides, the species has been taken in the tropical East Pacific at a single station:

¹ In the enumeration of localities in my paper in question a misprint will be found. In the last line but one on p. 29 it should read, long. $36^{\circ} 21' W.$, instead of, long. $30^{\circ} 21' W.$

Sur. 26. April 3, 1888. Lat. $00^{\circ} 30' N.$; long. $88^{\circ} 37' 30'' W.$ Surface. 7.35 p. m. Surf. temp. 80° . Very large number of specimens.

Furthermore, Ortmann in 1894 has also recorded this species from three stations at the Galapagos: (He named the species *E. gracilis* Dana, but, as I pointed out in 1905, *E. gracilis* Dana is unrecognizable, and, besides, certainly not identical with *E. gracilis* G. O. Sars. I suppressed the name *gracilis*, naming the species described and figured by Sars, *E. tenera*.)

Sta. 3412. April 4, 1891. Lat. $1^{\circ} 23' N.$; long. $91^{\circ} 43' W.$ Surface. Surf. temp. 82° . 27 specimens.

Sta. 3419. April 3, 1891. Lat. $0^{\circ} 18' 40'' N.$; long. $90^{\circ} 34' W.$ Surface. Surf. temp. 82° . Numerous specimens.

Sta. 2628. March 26, 1891. Lat. $0^{\circ} 13' N.$; long. $84^{\circ} 52' W.$ 200-0 fathoms. 4 specimens.

Distribution.—The wide distribution of this fine and very slender species in the tropical Atlantic, the Indian Ocean, and some parts of the Pacific has been dealt with in the Harvard paper. Supplementary details on its distribution in the Indian Ocean and the Atlantic have been published, respectively, by Tattersall (1912) and myself (1913).

20. EUPHAUSIA PACIFICA H. J. Hansen (1911).

Plate 1, figs. 2a-2g.

1911. *Euphausia pacifica* H. J. Hansen, Bull. l'Inst. Océan. Monaco, No. 210, p. 28, figs. 10, A and B.

1912. *Euphausia pacifica* H. J. Hansen, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 241, pl. 7, figs. 5a-5b.

Occurrence.—This species is at hand from 24 localities (not including those of Ortmann for his *E. splendens* Dana—see below), all in the boreal or northern temperate Pacific; but as some of the localities are nearer to northeastern Asia, while the majority are found near America, from Alaska to near the southern end of California, I divide the localities into two groups, and as the line of separation between them the meridian of longitude $170^{\circ} W.$ is taken, because it runs through the middle of Bering Strait:

A. American localities.

Sta. 4753. October 1, 1905. Off Bushy Point, Alaska. Lat. $55^{\circ} 41' 30'' N.$; long. $131^{\circ} 46' 12'' W.$ 150-0 fathoms. 10 specimens.

Sta. 4760. May 21, 1906. Lat. $53^{\circ} 53' N.$; long. $144^{\circ} 53' W.$ 300-0 fathoms. 5 specimens.

Sta. 4759. May 20, 1906. Lat. $53^{\circ} 05' N.$; long. $138^{\circ} 31' W.$ 300-0 fathoms. 1 specimen.

Sta. 4758. May 19, 1906. Lat. $52^{\circ} 02' N.$; long. $132^{\circ} 53' W.$ 300-0 fathoms. 2 specimens.

Sta. 2861. May 31, 1888. Lat. $51^{\circ} 14' N.$; long. $129^{\circ} 50' W.$ 6 specimens.

Albatross, April 26, 1892. Off Vancouver Island. From floating kelp. 1 specimen.

Albatross, 1892. Off Cape Cook, Vancouver Island. 2 specimens.

Sta. 3449. August 28, 1891. Off Washington. Lat. $48^{\circ} 29' 40'' N.$; long $124^{\circ} 40' 10'' W.$ 135-0 fathoms. 1 specimen.

Sta. 3444. August 27, 1891. Lat. $48^{\circ} 16' 30'' N.$; long. $123^{\circ} 49' 40'' W.$ 41-0 fathoms. Numerous specimens.

Sta. 4756. November 16, 1905. Lat. $47^{\circ} 37' 48'' N.$; long. $122^{\circ} 26' 20'' W.$ 75-0 fathoms. 2 specimens.

Sta. 4757. May 4, 1906. Lat. $39^{\circ} 18' N.$; long. $123^{\circ} 58' W.$ Enormous quantity of specimens.

Sta. 4468. May 13, 1904. Off Santa Cruz Lighthouse, Monterey Bay, Cal. (about lat. $36\frac{3}{4}^{\circ} N.$). Numerous specimens.

Sta. 4471. May 14, 1904. Off Point Pinos Lighthouse, Monterey Bay, Cal. 3 specimens.

Sta. 4515. May 23, 1904. Off Point Pinos Lighthouse, Monterey Bay, Cal. 5 specimens.

Sta. 4528. May 27, 1904. Off Point Pinos Lighthouse, Monterey Bay, Cal. 2 specimens.

Sta. 4529. May 27, 1904. Off Point Pinos Lighthouse, Monterey Bay, Cal. 2 specimens.

Sta. 4533. May 28, 1904. Off Point Pinos Lighthouse, Monterey Bay, Cal. 1 specimen.

Sta. 4536. May 31, 1904. Off Point Pinos Lighthouse, Monterey Bay, Cal. 2 specimens.

Sta. 4537. May 31, 1904. Off Point Pinos Lighthouse, Monterey Bay, Cal. 2 specimens.

Sta. 4382. March 18, 1904. Off south point North Coronado Island, vicinity of San Diego, Cal. (about lat. $32\frac{3}{4}^{\circ} N.$). Surface. 1 immature specimen.

B. *Localities off Asia.*

Sta. 4793. June 16, 1906. Lat. $54^{\circ} 48' N.$; long. $165^{\circ} 54' E.$ Near Bering Island. 300-0 fathoms. 3 specimens.

Sta. 4785. June 12, 1906. Lat. $53^{\circ} 20' N.$; long. $170^{\circ} 33' E.$ 300-0 fathoms. 1 specimen.

Sta. 5030. Sept. 29, 1906. Lat. $46^{\circ} 29' 30'' N.$; long. $145^{\circ} 46' E.$ 300-0 fathoms. 15 specimens.

Sta. 4806. June 26, 1906. Lat. $42^{\circ} 13' N.$; long. $144^{\circ} 21' E.$ Near northern Japan. 200-0 fathoms. 18 specimens.

Furthermore, all specimens recorded by Ortmann in 1894 as *E. splendens* Dana belong to *E. pacifica*. The localities are situated between San Francisco and the Hawaiian Islands:

Sur. 543. January 14, 1892. Lat. $35^{\circ} 36' 30''$ N.; long. $124^{\circ} 45' 30''$ W. Surface. 9.28 p. m. Surf. temp. 56° . 9 specimens.

Sur. 542. January 14, 1892. Lat. $35^{\circ} 31' N.$; long. $124^{\circ} 57' 30''$ W. Surface. 7.19 p. m. Surf. temp. 56° . Many specimens.

Sur. 541. January 14, 1892. Lat. $35^{\circ} 25' 30''$ N.; long. $125^{\circ} 09' 30''$ W. 5.17 p. m. 300-0 fathoms. 4 specimens.

Sur. 540. January 14, 1892. Lat. $35^{\circ} 19' 30''$ N.; long. $125^{\circ} 21' 30''$ W. 1.58 p. m. 300-0 fathoms. 5 specimens.

Description.—The front margin of the carapace, seen from above (fig. 2a), in the main is transverse, yet having each half of the margin distinctly concave, as the median half is produced a little forward, forming a very short frontal plate, with the end rounded or angular, but without any rostral process. The gastric area without median keel; the lateral margin of the carapace with a well-developed denticle a little before the middle. The eyes very large.

Antennulæ (figs. 2a-2d), with the first joint at the upper, inner distal angle a little protruding and produced into a very small acute triangle (fig. 2b), longer than broad, and directed forward somewhat or slightly outward and much upward (figs. 2c-2d). Second and third joints distinctly more slender than in *E. lucens*; second joint above at the inner angle distally produced in a small or very small spine; second joint longer than the third, which is thicker in the male (fig. 2c) than in the female (fig. 2d). The dorsal carina, on third joint, is moderately developed, with its front margin very oblique and frequently a little concave beyond the upper angle.

The copulatory organs (figs. 2e-2g) afford excellent characters. The terminal process (p^2) is moderately short and somewhat thick, a little thicker than in *E. lucens* and *E. frigida*; the foot (f) is rather long and the heel (h) somewhat short, with the end angular; seen from behind (fig. 2f) the process has its most distal part a little broader than beyond the middle, with the end seemingly flatly rounded, but seen from the inner side (fig. 2g) the distal part of the process shows itself to be much larger, but bent nearly angularly forward, as a very oblong, distally obtuse, irregularly shaped plate. The proximal process (p^3) is somewhat longer than the terminal (fig. 2f), but far from reaching its end. It has no secondary branch on the outer side; its distal part is, seen from behind (fig. 2f), gradually much compressed; seen from the inner side (fig. 2g) this part shows itself to be a large, very oblong, distally rounded plate bent very strongly backward, thus forming a nearly right angle with the remainder of the process. On the distal margin of this plate, near its base, an incision is seen, and a comparison with the structure in *E. frigida* and *E. lucens* shows that the plate is the extremely elongate posterior (or right) wing of the terminal expansion found in these two species. The lateral process (p^4) is long, distally much

curved, without secondary tooth. The setiferous lobe (fig. 2e, *ls*) has, besides the six distal, strong and long setæ, three thinner setæ on the distal part of the inner margin and five fine setæ distributed along nearly the whole outer margin; the oblique triangular lobe constituting a kind of pouch is very large.

Length.—One of the largest females (from lat. 39° 18' N.) is 22 mm. long and a large male (from off Vancouver Island) is 21.5 mm. long.

Remarks.—This species is distinguished from *E. lucens* H. J. Hansen and *E. frigida* H. J. Hansen, especially by the shape of the processes of the copulatory organs; furthermore, by the very short frontal plate, the shape of the lobe of the first antennular joint, and other minor points in the antennulæ.

Distribution.—To the interesting distribution shown by the lists above it must be added that the Copenhagen Museum possesses specimens from seven localities situated at Formosa, and especially near Japan and Korea northward to lat. 39° N.; finally, that a number of immature specimens were taken between San Francisco and the Hawaiian Islands in lat. 33° 40' N. (Harvard paper).

21. EUPHAUSIA LUCENS H. J. Hansen (1905).

1885. *Euphausia splendens* G. O. Sars, *Challenger Rep.*, vol. 13, p. 80, pl. 13, figs. 7-17.

1911. *Euphausia lucens* H. J. Hansen, *Bull. l'Inst. Océan. Monaco*, No. 210, p. 26, fig. 8, A and B.

Occurrence.—Taken only at a single place in the South Atlantic: Sur. 12. January 15, 1888. Lat. 45° 22' S.; long. 64° 20' W. Surface. 12.10 p. m. Surf. temp. 58°. 2 specimens.

Distribution.—According to my paper quoted this species has been taken four times in the southeast Atlantic and at a place between New Zealand and Tasmania, while three of the places given by Sars remain doubtful. In 1913 Tattersall¹ enumerated three additional localities in the southeast Atlantic nearly west of the Cape of Good Hope.

22. EUPHAUSIA HEMIGIBBA H. J. Hansen (1910).

1910. *Euphausia hemigibba* H. J. Hansen, *Siboga-Exp.*, vol. 37, p. 100, pl. 14, figs. 5a-5f.

Occurrence.—Taken by the *Albatross* at three stations in the north-west Atlantic:

Sta. 2190. August 4, 1884. Lat. 39° 40' N.; long. 70° 20' 15'' W. Surf. temp. 73°. 3 specimens.

Sta. 2683. July 17, 1886. Lat. 39° 33' N.; long. 70° 50' W. 1 specimen.

Sta. 2569. August 31, 1885. Lat. 39° 26' N.; long. 68° 03' 30'' W. Surface. Surf. temp. 75°. 3 specimens.

¹Trans. Royal Soc. Edinburgh, vol. 49, pt. 4.

Furthermore, the specimens from the Hawaiian Islands referred by Ortmann in 1905 to *E. pseudogibba* Ortmann belong to *E. hemigibba* (compare my statements on the interpretation of the species in the above-quoted paper, p. 99):

Sta. 3799. March 18, 1902. Lat. 29° 22' N.; long. 139° 31' W. 100-0 fathoms. 1 specimen.

Sta. 3867. April 10, 1902. Pailolo Channel. Surf. temp. 75°. 1 specimen.

Distribution.—*E. hemigibba* is very common in the Atlantic from lat. 42° N. to southwest of the Cape of Good Hope, and in the Indian Ocean from Port Elizabeth to long. 129° E.

23. EUPHAUSIA GIBBA G. O. Sars (1883).

1885. *Euphausia gibba* G. O. Sars, *Challenger Rep.*, vol. 13, p. 91, pl. 16, figs. 1-8.

1912. *Euphausia gibba* H. J. Hansen, *Mem. Mus. Comp. Zool.*, vol. 35, No. 4, p. 244, pl. 8, figs. 2a-2b.

Occurrence.—Only a single specimen, from the southeast Pacific, is at hand:

August 10, 1884. Lat. 29° 33' S.; long. 87° 34' W. U. S. S. *Wachusett*, Dr. W. H. Jones, U. S. Navy. 1 specimen (male).

Distribution.—It is known only from the Pacific south of the line, going northward at least to lat. 16° 32' S.

24. EUPHAUSIA DISTINGUENDA H. J. Hansen (1911).

1912. *Euphausia distinguenda* H. J. Hansen, *Mem. Mus. Comp. Zool.*, vol. 35, No. 4, p. 248, pl. 8, figs. 3a-3f.

Occurrence.—Among the material received without determinations no specimen was found, but the majority of the specimens referred by Ortmann in 1894 to *E. mucronata* G. O. Sars belong to *E. distinguenda*:

Off Guaymas, Gulf of California (about lat. 28° N.). 500-0 fathoms. 1 specimen.

120 miles northwest of Acapulco (about lat. 17½° N.). 175-0 fathoms. 5 specimens.

Sta. 3416. April 11, 1891. Lat. 16° 32' 30'' N.; long. 99° 42' 40'' W. 300-0 fathoms. 1 specimen.

Lat. 13° 33' 30'' N.; long. 97° 57' 30'' W. Surface. 8 p. m. 12 specimens.

Sta. 3414. April 8, 1891. Lat. 10° 14' N.; long. 96° 28' W. 200-0 fathoms. 2 specimens. 300-0 fathoms. 2 specimens.

Hyd. 2619. March 11, 1891. Lat. 7° 31' N.; long. 78° 42' 35'' W. 300-0 fathoms. 6 specimens. 1,000-0 fathoms. 2 specimens.

Sta. 3382. March 7, 1891. Lat. 6° 21' N.; long. 80° 11' W. 200 fathoms. Closed part of Tanner net. 7 specimens.

Sta. 3412. April 4, 1891. Galapagos. Lat. 1° 23' N.; long. 91° 43' W. Surface. Surf. temp. 82°. Many specimens.

Distribution.—In the Harvard paper a long list of localities situated in the east Pacific between lat. $22\frac{3}{4}^{\circ}$ N. and lat. $12\frac{1}{2}^{\circ}$ S. has been published.

25. *EUPHAUSIA LAMELLIGERA* H. J. Hansen (1911).

1912. *Euphausia lamelligera* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 250, pl. 8, figs. 4a-4e; pl. 9, fig. 1a.

Occurrence.—Among the unnamed material specimens are at hand from only a single station in the tropical east Pacific:

Sur. 16. March 1, 1888. Lat. $4^{\circ} 21' S.$; long. $81^{\circ} 50' W.$ Surface. 4.31 a. m. Moonlight. Surf. temp. 74° . 4 specimens.

Besides, some of the specimens referred by Ortmann in 1894 to *E. mucronata* G. O. Sars belong to *E. lamelligera*:

Hyd. 2619. March 11, 1891. Lat. $7^{\circ} 31' N.$; long. $78^{\circ} 42' 30'' W.$ 300-0 fathoms. 6 specimens. 1,000-0 fathoms. 12 specimens.

Sta. 3388. March 9, 1891. Lat. $7^{\circ} 06' N.$; long. $79^{\circ} 48' W.$ 400-0 fathoms. 19 specimens.

March 7, 1891, thus near lat. $6^{\circ} 21' N.$; long. $80^{\circ} 41' W.$ Surface. 1 specimen.

Distribution.—This species is, as shown in the paper quoted, rather common in the tropical east Pacific between lat. $19^{\circ} 52' N.$ and lat. $10^{\circ} 17' S.$

26. *EUPHAUSIA GIBBOIDES* Ortmann (1893).

1912. *Euphausia gibboides* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 252, pl. 9, figs. 2a-2b.

Occurrence.—The unnamed material contains specimens from a station in the northwest Atlantic and from a place in the tropical east Pacific off Chile:

Sta. 2098. October 1, 1883. Northwest Atlantic. Lat. $37^{\circ} 40' 30'' N.$; long. $70^{\circ} 37' 30'' W.$ 1 specimen.

Sta. 2808. April 4, 1888. East Pacific. Lat. $0^{\circ} 36' 30'' N.$; long. $89^{\circ} 19' W.$ 1 specimen (male).

Furthermore, Ortmann in 1894 correctly referred specimens from three stations in the Pacific to this species:

Sur. 540. January 14, 1891. Lat. $35^{\circ} 19' 30'' N.$; long. $125^{\circ} 21' 30'' W.$ 300-0 fathoms. 3 specimens.

Hyd. 2627. March 25, 1891. Lat. $0^{\circ} 36' N.$; long. $82^{\circ} 45' W.$ 1,832-0 fathoms. 1 specimen (male).

Hyd. 2628. March 26, 1891. Lat. $0^{\circ} 13' S.$; long. $84^{\circ} 52' W.$ 200-0 fathoms. 1 specimen.

Finally I found a somewhat young specimen of this species among the specimens referred by Ortmann to *E. mucronata* G. O. Sars from the following locality:

Sta. 3414. April 8, 1891. Lat. $10^{\circ} 14' N.$; long. $96^{\circ} 28' W.$ 300-0 fathoms. 1 specimen.

Distribution.—The distribution in the Atlantic and in parts of the Pacific has been dealt with in the Harvard paper quoted. In 1913 Tattersall added a locality in the southeast Atlantic, west of the Cape of Good Hope.

Genus *THYSANOESSA* Brandt.

This difficult genus comprises nine species and has been dealt with to some extent in my preliminary account of the order (1911). The American collection comprises seven species, thus all forms excepting two exclusively Antarctic species.

27. *THYSANOESSA LONGIPES* Brandt.

Plate 1, figs. 3a-3d; plate 2, figs. 1a-1e.

1851. *Thysanoessa longipes* BRANDT, Krebse, in Middendorff's Sibirische Reise, vol. 2, pt. 1, p. 128, pl. 6, figs. 1-14.

1911. *Thysanoëssa longipes* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, pp. 38 and 40.

Occurrence.—Taken at no less than 14 places in the colder temperate north Pacific and Bering Sea:

A. *Localities mainly American.*

April 18, 1892. Off Cape St. Elias. About lat. 60° N.; long. 144° W. 1 specimen.

Sta. 4753. October 1, 1905. Lat. 55° 41' 30'' N.; long. 131° 46' 12'' W. 150-0 fathoms. 4 specimens.

Sta. 4763. May 28, 1906. Lat. 53° 57' N.; long. 168° 06' W. 300-0 fathoms. 1 specimen.

Sta. 3329. August 21, 1890. Lat. 53° 56' 50'' N.; long. 167° 08' 15'' W. 1 specimen.

Sta. 3307. August 3, 1890. Lat. 53° 55' N.; long. 170° 50' W. 5 specimens.

Sta. 4765. May 29, 1906. Lat. 53° 12' N.; long. 171° 37' W. 300-0 fathoms. 2 specimens.

Sta. 4766. May 31, 1906. Lat. 52° 38' N.; long. 174° 49' W. 300-0 fathoms. 17 specimens.

April 5, 1913. From stomach of salmon caught between Tacoma and Seattle, Washington. C. H. Gilbert. $\frac{1}{2}$ specimen.

B. *Localities mainly Asiatic.*

Sta. 4793. June 16, 1906. Near Bering Island. Lat. 54° 48' N.; long. 164° 54' E. 300-0 fathoms. 1 specimen.

Sta. 4767. June 3, 1906. Lat. 54° 12' N.; long. 179° 07' 30'' E. 300-0 fathoms. 3 specimens.

Sta. 4785. June 12, 1906. Lat. 53° 20' N.; long. 170° 33' E. 300-0 fathoms. 2 specimens.

Sta. 4800. June 22, 1906. Lat. 49° 06' N.; long. 153° 06' E. 300-0 fathoms. 4 specimens.

Sta. 4802. June 24, 1906. Lat. $46^{\circ} 44' N.$; long. $151^{\circ} 44' E.$ 1 specimen.

Sta. 5030. September 29, 1906. Lat. $46^{\circ} 29' 40'' N.$; long. $145^{\circ} 46' E.$ 300-0 fathoms. Large number of specimens.

Description.—Rostrum long, rather narrow, distally acuminate (fig. 1*b*), slightly more slender in the male than in the female. The most anterior part of the carapace both above and on each side conspicuously protruding and curved somewhat outward as a kind of collar, most protruding at the limit between the side and the upper surface, and its margin at that limit forming a rounded or subacute angle. The major anterior part of the gastric area (fig. 1*b*) has a well-developed median keel which also runs along the rostrum to near the apex; between this keel and each lateral margin the rostrum is hollowed longitudinally, and this excavation is continued backwards and outwards as a deep, straight impression, the anterior part of which constitutes the limit between the gastric area and the collar-like produced anterolateral portion of the carapace. The lateral margin of the carapace has a distinct denticle somewhat behind the middle.

Eyes large (figs. 1*a*-1*b*), with a conspicuous transverse constriction considerably above the middle, and the upper section is much narrower and lower than the inferior section. Antennulæ in the female (pl. 2, fig. 1*a*; pl. 1, fig. 3*a*) with the two distal peduncular joints long and slender, the third joint conspicuously more slender and a little longer than the second; in the male (pl. 1, fig. 3*b*) both joints are conspicuously shorter and thicker, the third joint scarcely or slightly longer and a little thinner than the second. Antennular flagella (fig. 1*a*) in both sexes thin with many joints and the upper flagellum slightly shorter than the lower; in the female the flagella are somewhat longer than the sum of the two distal peduncular joints; in the male they are proportionately a little longer than in the female. Antennal squama (pl. 2, fig. 1*b*) somewhat narrow, with a tooth on the outer distal angle; the squama reaches in the female to the middle, in the male beyond the middle, of the third antennular joint.

Maxillulæ nearly as in *T. gregaria* (compare Sars, 1885); maxillæ a little longer in proportion to breadth than in *T. gregaria*. Maxillipeds normal, in the main as in *T. gregaria*; the distal part with its setæ is shown in plate 1, fig. 3*c*.

First pair of thoracic legs (pl. 2, fig. 1*a*) very elongate, with the fourth joint reaching beyond the end of the antennular peduncles. These legs are strong, and especially the third joint and the proximal half of the fourth joint are very robust, much thickened; fifth joint somewhat arcuate with some few setæ along the distal part of both margins; sixth joint somewhat long, about two-fifths as long as the

fifth, with about nine somewhat spiniform setæ along its prehensile margin; seventh joint considerably deeper than long, with four spiniform setæ. The following pairs of legs with their setæ fine and the majority of them very finely plumose. Endopod of sixth pair in the female (pl. 1, fig. 3*d*) one-jointed, very small, much less than half as long as the exopod.

First to fifth abdominal segments (pl. 2, fig. 1*c*) each with the posterolateral angle of the side plates produced into an acute tooth. Third, fourth, and fifth segment each with a considerably raised, sharp median keel, which on the third segment is very high and posteriorly produced into a long, compressed, horizontal process; in the fourth and fifth segments the process is small, acute; the sixth segment has no real dorsal keel, but terminates above in a similar small spiniform process. Posterior margin of fourth and fifth segments armed above with a small, sharp tooth at some distance from the median process. First and second segments dorsally somewhat raised toward the hind margin, and second segment frequently with a more or less distinct, short and low keel. Sixth segment rather long, a little shorter than the sum of the two preceding segments; its lower distal spine is well developed but simple in both sexes. Telson with two pairs of small dorsal spines; it is about as long as the endopod of the uropods which is slightly longer than the exopod.

The copulatory organs of first pair of pleopods (pl. 2, figs. 1*d* and 1*e*) with most parts somewhat elongated. The spine-shaped process (p^1) somewhat long and much curved. The terminal process (p^2) somewhat slender and a little before the middle much curved, tapering at most slightly from the curvature to near the obtuse end. The proximal process (p^3), which is somewhat less curved and toward the base a little less thick than the terminal process, is a little longer than the latter, but does not fully reach its distal end; in other respects the shape is rather similar. The median lobe (lm) is long and rather narrow, with the end comparatively broad and obliquely emarginate; the lateral process (p^4), which originates somewhat before the middle of the lobe and considerably beyond the insertion of the proximal process, reaches to near the end of the lobe and is very long, feebly curved and regularly tapering to its acute end. The auxiliary lobe (lu) is well developed. The setiferous lobe (ls) is rather narrow, with plumose setæ along both margins to a short distance from their base.

Length.—The largest female (from Station 5030) is 30 mm., an adult male 24 mm. long.

Remarks.—As Prof. Brandt had but poor material of this large and fine species at his disposal, his description and representation are imperfect. But when some later zoologists referred *T. longipes* as a synonym to *T. inermis* Krøyer (*T. neglecta* Krøyer, *T. borealis*

G. O. Sars) they ought to have taken Brandt's description of the dorsal armature into consideration. The species is easily separated from all other forms of the genus excepting *T. spinifera* Holmes by having some abdominal segments dorsally carinate and armed with spiniform processes; from *T. spinifera* it is separated by several excellent differences (eyes, antennulæ in the males, prehensile legs, abdominal armature, etc.).

Distribution.—Brandt's specimens were from the Sea of Okhotsk. With this exception the list above comprises our total knowledge of the distribution of *T. longipes*.

28. *THYSANOESSA SPINIFERA* Holmes (1900).

Plate 3, figs. 1a-1k.

1900. *Thysanoessa spinifera* HOLMES, Occ. Papers Cal. Acad. Sciences, vol. 7, p. 229, pl. 4, fig. 81.

1911. *Thysanoëssa spinifera* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, pp. 38 and 41.

Occurrence.—Taken at places in Bering Sea and the North Pacific along America from Alaska to near the southern end of California.

Hyd. 3242. June 5, 1893. Lat. 57° 40' N.; long. 143° 18' W. Off Alaska. 1 specimen.

Sta. 4753. October 1, 1905. Lat. 55° 41' 30'' N.; long. 131° 46' 12'' W. 150-0 fathoms. 3 specimens.

Sta. 3263. June 24, 1893. Bering Sea. Lat. 55° 04' N.; long. 165° 04' W. 1 specimen.

Sta. 4767. June 3, 1906. Lat. 54° 12' N.; long. 179° 07' 30'' E. 300-0 fathoms. 1 specimen.

Sta. 4758. May 19, 1906. Lat. 52° 02' N.; long. 132° 53' W. 300-0 fathoms. 1 specimen (male).

Albatross, 1888. Barclay Sound, Vancouver Island. (About lat. 49° N.; long. 125° W.) Electric light. 4 specimens (male, female). Surface. 1 specimen.

Sta. 3444. August 27, 1891. Lat. 48° 16' 30'' N.; long. 123° 29' 40'' W. About 15 specimens.

April 5, 1913. From stomach of salmon caught between Tacoma and Seattle, Washington. C. H. Gilbert. 2 specimens.

Sta. 4757. May 4, 1906. Lat. 39° 18' N.; long. 123° 58' W. 2 young specimens.

Sta. 4426. April 14, 1904. Off Point San Pedro, Santa Cruz Island, California. (About 34° N.) 1 specimen.

Sta. 4367. March 16, 1904. Point Loma L. H., vicinity of San Diego, California. (About lat. 32½° N.) 1 specimen.

Description.—Rostrum (fig. 1b) very long, somewhat tapering, acuminate and very acute, equal in both sexes or in the male slightly narrower than in the female. The most anterior part of the carapace

somewhat outstanding, collarlike, and at the limit between the side and the upper surface produced as a triangular, flat, very acute process directed forward and outward. The gastric area with a conspicuous median keel to near its hind margin; this keel continues forward along the rostrum to considerably beyond its middle, while between this keel and the lateral margin the rostrum is hollowed longitudinally, and this canaliculation is continued backward and outward as a somewhat curved, deeply impressed line limiting the gastric area at the side. The lateral margin of the carapace has no denticle.

Eyes large, seen from the side (fig. 1*a*) subcircular, being slightly higher than broad, feebly narrowing upward, but without any transverse constriction. Antennulæ in the female (fig. 1*c*) with the two distal peduncular joints differing from those in *T. longipes*, being distinctly less slender than in that species, and the second joint is a little longer and distinctly thicker than the third. In the male (figs. 1*a* and 1*d*) the second joint is still longer in proportion to the third than in the female, both second and third joints are conspicuously thicker and the third somewhat thickened toward the end, while the second has the inner half of its distal upper end produced upward and forward as a broadly rounded lobe, which along its free terminal and upper margin is adorned with setæ closely arranged in longitudinal rows; these setæ constitute a compressed brush, and their ends are curved in a peculiar way; seen from the side the third joint seems to be inserted on the outer side of the second. The antennular flagella are well preserved in an adult male (fig. 1*a*); the lower flagellum is about as long as the peduncle and much longer than the upper flagellum, which is somewhat longer than the sum of the two distal peduncular joints. The antennal squama reaches in the female a little beyond, in the male scarcely to, the end of the second joint of the antennulæ; the denticle at the end of the outer margin is well developed. The squama is distally broader than in *T. longipes*, with the end cut more transversely.

Maxillulæ and maxillæ nearly as in the preceding species. Maxillipeds normal; fig. 1*e* exhibits the distal part with its setæ.

First pair of thoracic legs (figs. 1*a* and 1*f*) comparatively feebly elongate, being from a little to considerably longer but conspicuously thicker than the second pair; the fourth joint reaches to or at most a little beyond the end of the first antennular joint. Fifth joint with naked setæ along the major part of both margins; sixth joint not much shorter than the fifth, with 7 glabrous setæ along the prehensile margin, and these setæ are moderately strong and most of them very long; seventh joint longer than deep, with 5 stiff setæ and 3 among them nearly spiniform. Second pair of legs (fig. 1*f*) normal; the setæ along the lower (posterior) margin very long and distinctly plumose; seventh joint at least twice as long as that of the first pair.

Endopod of sixth pair in the female one-jointed, not half as long as the exopod.

The abdominal segments (fig. 1*g*) dorsally carinate, but the keel is feebly developed on the sixth segment and wanting on about the anterior half of the first segment and on a smaller anterior part of the second and third segments, while in the fourth and fifth segments the keel is high and besides on each produced in a good-sized, compressed, horizontal process, which generally is a little longer on the fourth than on the fifth segment; the sixth segment terminates above in a process about as large as that of the fifth segment; the lower distal spine on the sixth segment is simple in both sexes. Fourth and fifth segments with the upper sublateral teeth rudimentary (they are well developed in *T. longipes*), while the lateral plates of the segments are nearly as in the preceding species. Sixth segment much shorter than in *T. longipes* and only a little longer than the fifth. Telson as in *T. longipes*; uropods about as long as or a little shorter than the telson.

(In one immature specimen measuring 16.2 mm. in length the otherwise very acute angle at the outer end of the front upper margin of the carapace is rounded; the abdomen has no keel on the first and second segments, while the keel is very feeble on the third and sixth segments; furthermore the fourth segment has no posterior dorsal spine, while the spines on the fifth and sixth segments are well developed. Some of these reductions may be due to the young age of the specimen, others to variation.)

Male copulatory organs of first pleopods (figs. 1*h*–1*k*) differ from those in *T. longipes* in having the three large processes conspicuously shorter and thicker and the setiferous lobe a little broader. The spine-shaped process (p^1) is long and much curved. The terminal process (p^2) has a little less than the proximal half rather thick and then it is suddenly somewhat (fig. 1*i*) or considerably (fig. 1*k*) curved, with the distal half much narrower than the proximal part and the end acute and turned outward. The proximal process (p^3) has the proximal part considerably less thickened than in the terminal process; it is straight (fig. 1*i*) or a little curved just before the middle (fig. 1*k*) and its end shaped about as that of the terminal process. The median lobe (*lm*) not differing essentially from that in *T. longipes*, but its lateral process (p^4) is inserted nearer the base and slightly or scarcely beyond the base of the proximal process; the process, which is far from reaching the end of the lobe, is somewhat curved (fig. 1*i*) or straight (fig. 1*k*) with the end acute or subacute. Figs. 1*h* and 1*i* represent the organ of a male which perhaps is not quite adult, as the inner and the median lobes with their processes are uncommonly short in proportion to the setiferous lobe, the processes simple, solid at their acute ends and the auxiliary lobe

conspicuously more than two-thirds as long as the median lobe. Fig. 1*k* represents the process-bearing lobes of the left organ of a large male, and in this organ the inner and the median lobes and their large processes are somewhat longer in proportion to the setiferous lobe than in the organ shown in fig. 1*h*, in reality showing the same length in proportion to the setiferous lobe as in *T. longipes* (pl. 2, fig. 1*d*); furthermore, the two largest processes of this organ look as if their terminal part is hollowed on the outer side, and the end of all three large processes is less produced and more convex on the inner side; finally, the auxiliary lobe is slightly more than half as long as the median lobe.

Length.—The largest female (from station 4426) is 26 mm.; the largest male (from station 3444) is 25.5 mm. long.

Remarks.—This specimen was established by Holmes on a single specimen, and his description, together with a figure, is good. *T. spinifera* is easily distinguished from *T. longipes* by many characters, among which may be mentioned: The absence of a tooth on the lateral margin of the carapace; the subcircular, not constricted eyes; the third joint of the antennular peduncle shorter than the second; the protruding setiferous lobe at the end of the second antennular joint in the male; no dorsal spine on the third abdominal segment; and the spines on the following segments larger than in *T. longipes*.

Distribution.—The type was caught near Fort Bragg, California, near lat. 39½° N. The remarks on occurrence and the list of localities comprise our total knowledge of the distribution of *T. spinifera*.

29. *THYSANOESSA INERMIS* Krøyer (?1846).

Plate 2, figs. 2*a*–2*d*.

1882. *Euphausia inermis* G. O. Sars, Forh. Vid. Selsk. Christiania for 1882, No. 18, p. 51, pl. 1, fig. 15.

1882. *Thysanoëssa borealis* G. O. Sars, Forh. Vid. Selsk. Christiania for 1882, No. 18, p. 52, pl. 1, figs. 16–18.

1911. *Thysanoëssa inermis* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, pp. 8–13 and p. 38.

Occurrence.—As discussed in the last-named paper, *Rhoda (Boreophausia) inermis* Krøyer and *Thysanoëssa neglecta* Krøyer (*T. borealis* G. O. Sars) are varieties of the same species; they are frequently clearly distinguished from each other by the structure of the first pair of thoracic legs, but sometimes transitions between both forms are found. Frequently all animals captured at a locality belong to the same form or variety, but sometimes both have been taken in the same haul. In the following list of the localities in the Atlantic a word on this topic is added at most stations. The specimens from the Pacific are mentioned separately.

October 12, 13, 17, 1879. Eastport (about lat. 44° 54' N.). Surface. R. Rathbun. 5 specimens. (Var. *T. neglecta*.)

Sta. 2513. July 11, 1885. Lat. $43^{\circ} 34' N.$; long. $63^{\circ} 56' 30'' W.$
Off Nova Scotia. 1 specimen. (Var. *T. neglecta.*)

Grampus No. 240. May 24, 1893. Lat. $42^{\circ} 48' N.$; long. $65^{\circ} 40' W.$ 2 specimens. (Var. *Rhoda.*)

Sta. 191. August 31, 1878. About lat. $42^{\circ} 33\frac{1}{2}' N.$; long. $69^{\circ} 58' W.$ 1 specimen. (Var. *Rhoda.*)

Sta. 139. July 29, 1878. Off Thatchers Island, thus about lat. $42\frac{1}{2}^{\circ} N.$; long. $70\frac{1}{2}^{\circ} W.$ 1 young specimen. (Var. *T. neglecta.*)

Sta. 1080. August 2, 1881. Off Cape Cod (about lat. $42\frac{1}{3}^{\circ} N.$). 8 specimens. (Var. *T. neglecta.*)

Sta. 1081. August 2, 1881. Off Cape Cod. 8 specimens. (Var. *Rhoda.*)

Sta. 1083. August 2, 1881. Off Cape Cod. 12 specimens. (Both forms.)

Sta. 1087. August 3, 1881. Off Cape Cod. 2 specimens. (Var. *T. neglecta.*)

Sta. 1089. August 3, 1881. Off Cape Cod. 8 specimens. (Both forms.)

Sta. 1090. August 3, 1881. Off Cape Cod. 7 specimens. (Var. *Rhoda.*)

Woods Hole region, about lat. $41^{\circ} 32' N.$ Large number of specimens of both forms taken on several occasions.

Vineyard Sound. V. N. Edwards. 2 specimens, adult male. (Var. *Rhoda.*) January 12, 14, 1880. Surface. 1 half-grown specimen.

Sta. 917. July 16, 1881. Lat. $40^{\circ} 22' N.$; long. $70^{\circ} 42' W.$ Stomach of *Phycis tenuis*. Large number of immature specimens.

Grampus No. 82. April 27, 1894. Lat. $38^{\circ} 42' N.$; long. $74^{\circ} 02' W.$ Tow-net. 1 specimen. (Var. *Rhoda.*)

Grampus No. 34. April 23, 1894. Lat. $38^{\circ} 15' N.$; long. $74^{\circ} 18' W.$ Tow-net. Numerous specimens. (Var. *Rhoda.*)

From Bering Sea and the adjacent area of the North Pacific this species is at hand from eight localities. All specimens seem to be forma *Rhoda*, but their number is somewhat small (excepting from Iliuliuk) and many among them are rather poorly preserved:

July 5, 1890. St. Paul Island (about lat. $57\frac{1}{2}^{\circ} N.$; long. $170^{\circ} W.$). W. Palmer. 1 specimen.

Sta. 2847. July 31, 1888. Lat. $55^{\circ} 01' N.$; long. $160^{\circ} 12' E.$ 1 specimen.

Sta. 4793. June 14, 1906. Lat. $54^{\circ} 36' 15'' N.$; long. $166^{\circ} 58' 15'' E.$ Near Bering Island. 300-0 fathoms. 2 specimens.

Sta. 3310. August 15, 1890. Lat. $53^{\circ} 56' 51'' N.$; long. $166^{\circ} 28' 53'' W.$ $2\frac{1}{2}$ specimens.

Iliuliuk, Unalaska. About lat. $53^{\circ} 53' N.$; long. $166^{\circ} 32' W.$ W. H. Dall. Half pint of specimens.

Sta. 4762. May 24, 1906. Lat. $53^{\circ} 46' N.$; long. $164^{\circ} 29' W.$ 2 specimens.

Sta. 5030. September 29, 1906. Lat. $46^{\circ} 39' 30'' N.$; long $145^{\circ} 46' E.$ 300–0 fathoms. 15 specimens.

Sur. 32. Locality unknown. 3 specimens.

Remarks.—The dorsal spiniform process on the sixth abdominal segment is always well developed. In the majority of the specimens from the Pacific the fifth abdominal segment has also a dorsal spine which sometimes is proportionately long, sometimes rather short, sometimes nearly or completely rudimentary, and in rare cases wanting. In specimens from the Atlantic the fifth segment has generally no dorsal spine, but among the specimens caught at station 1081, off Cape Cod, this segment has in one specimen a very conspicuous, somewhat long, and strong spine, while in a second specimen the spine is rudimentary.

Of the very remarkable variation of this species a detailed account may be found in my above-named paper. Here (pl. 2) I add some figures, all drawn with the same degree of enlargement, of the anterior legs of specimens taken together in the Woods Hole region. Figure 2*a* shows the major part of the two anterior right thoracic legs of an adult male measuring 17 mm. It will be observed that the leg of the first pair has the joints figured even slightly shorter and not at all thicker than those of the second leg; but one small difference between the two legs is important: The seventh joint of the first leg is somewhat shorter, with considerably shorter and a little stronger setae than that of the second leg, while in specimens of forma *Rhoda* the seventh joint of the first leg is similar to that of the second leg. Figure 2*b* shows the same parts of the corresponding left legs of another adult male, 16.5 mm. long. In this specimen the first leg has the fourth joint conspicuously thicker than in the second leg. Furthermore, the fifth joint is slightly thickened, a little elongate, conspicuously curved, and with the naked proximal part longer than in the second leg; the sixth joint of the first leg is distinctly thicker than that of the second leg; the seventh joint of the first leg is considerably shorter and much broader than that of the second leg, only slightly longer than broad and with its setæ thicker, somewhat spine-shaped, and much shorter than on the second leg. Figure 2*c* represents the two distal joints of the first left leg of a large female, 22.5 mm. long. The seventh joint is intermediate between those in the two preceding figures. Figure 2*d* represents the first left leg of an adult female, 19 mm. long. This leg shows the full *Thysanoessa*-development. Its fourth joint reaches forward to a little before the end of the second antennular joint, and a comparison between figure 2*d* and figures 2*a*–2*b* shows the great differences in thickness, length, and equipment with setæ or spines among legs of the first pair in different degrees of *Thysanoessa*-development in adult specimens. Finally, it

must be added that in specimens with the first pair of legs enormously elongate and thickened the legs of the second pair are in all respects similar to those shown in figures 2*a* and 2*b*. Stages between those shown in figures 2*b* and 2*d* have been omitted as unnecessary.

Distribution.—In the *Ingolf* Malacostraca (vol. 1, 1908) I had put together our knowledge of the distribution of *Rhoda inermis* and *Thysanoessa neglecta*; in Grønlands Krebsdyr og Pycnogonider (1913) K. Stephensen has added several statements. A brief abstract may be given here. It is known from the Gulf of St. Lawrence and was taken in a line between southeastern Newfoundland and Cape Farewell. Along west Greenland it goes northward to lat. $70\frac{1}{3}^{\circ}$ N., at east Greenland northward to lat. $78^{\circ} 13\frac{1}{2}'$ N. Furthermore, it is known from Iceland, the Faroes, Scotland, the western end of the Channel, the North Sea, Skager Rak, and northern Kattegat. It is extremely common on the northern coast of Norway and has been caught at Spitzbergen, in the Kara Sea, and at Franz Joseph Land. The list of localities above gives our information on its occurrence in the North Pacific and Bering Sea.

30. THYSANOESSA RASCHII M. Sars (1863).

1882. *Euphausia raschii* G. O. Sars, Overs. Vid. Selsk. Forh. Christiania for 1882, No. 18, p. 51.

1909. *Rhoda raschii* ZIMMER, Nord. Plankton, Schizopoden, p. 11, figs. 13-14.

1911. *Thysanoëssa raschii* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, pp. 38 and 42.

Occurrence.—Of this species material is at hand from Davis Strait, from a goodly number of places in the northwest Atlantic, and from several places in Bering Sea and the North Pacific.

A. *Atlantic localities*.

Off west coast of Greenland, at lat. $66^{\circ} 40'$ N. Greely Relief Expedition. H. G. Dresel. 2 specimens.

Grampus No. 648. August 3, 1894. Lat. $50^{\circ} 04' 15''$ N.; long. $63^{\circ} 29' 30''$ W. Tow-net. 1 specimen.

Grampus No. 638. August 1, 1894. Lat. $50^{\circ} 01' 15''$ N.; long. $65^{\circ} 33' 45''$ W. Tow-net. 1 specimen.

Grampus Nos. 640-641. August 2, 1894. About 50° N.; long. $65^{\circ} 08'$ W. Dip-net. 1 specimen.

Grampus. August 16, 1887. Mingan Island, near the northern coast of Gulf of St. Lawrence (about lat. 50° N.). Enormous number of specimens.

Grampus 629. July 30, 1894. Lat. $49^{\circ} 49' 15''$ N.; long. $64^{\circ} 38'$ W. Tow-net. 3 specimens.

Grampus. July 30, 1894. About lat. $49^{\circ} 49'$ N.; long. $64^{\circ} 38'$ W. From the well of the schooner. Half pint of specimens.

Grampus No. 628. July 30, 1894. Lat. $49^{\circ} 46' 45''$ N.; long. $64^{\circ} 34'$ W. Tow-net. Large number of specimens.

Grampus No. 627. July 29, 1894. Lat. $49^{\circ} 45' 43''$ N.; long. $64^{\circ} 31' 30''$ W. Tow-net. 9 specimens.

Grampus No. 626. July 29, 1894. Lat. $49^{\circ} 43' 30''$ N.; long. $64^{\circ} 24' 00''$ W. Tow-net. Numerous specimens.

Grampus. July 7, 1887. 7 miles SSE. from Cape Pine, Newfoundland. 9 specimens.

Sta. 2468. July 3, 1885. Lat. $45^{\circ} 11' 30''$ N.; long. $55^{\circ} 51' 30''$ W. 1 specimen.

Sta. 2699. August 22, 1886. Lat. $45^{\circ} 04' 00''$ N.; long. $55^{\circ} 23' 00''$ W. 2 specimens.

Sta. 41. August 20, 1877. Lat. $42^{\circ} 49' 00''$ N.; long. $66^{\circ} 19' 00''$ W. 1 specimen.

Sta. 1087. August 3, 1881. Cape Cod Light, SSW. 7 miles. 3 small specimens.

B. *Localities in Bering Sea and North Pacific.*

Sta. 3237. June 7, 1890. Lat. $58^{\circ} 08' 00''$ N.; long. $158^{\circ} 19' 00''$ W. Many specimens.

Sta. 4254. July 16, 1903. Chilkoot Inlet, southeastern Alaska (about lat. 58° ; long. 135° W.). 1 specimen.

Sta. 4753. October 1, 1905. Lat. $55^{\circ} 41' 30''$ N.; long. $131^{\circ} 46' 12''$ W. 2 specimens.

Sta. 3444. August 27, 1891. Lat. $48^{\circ} 16' 30''$ N.; long. $123^{\circ} 29' 40''$ W. 1 specimen.

April 5, 1913. From stomach of salmon caught between Tacoma and Seattle, Washington. C. H. Gilbert. Many specimens.

Sta. 5030. September 29, 1906. Lat. $46^{\circ} 29' 30''$ N.; long. $145^{\circ} 46' 00''$ E. 300–0 fathoms. 3 specimens.

May 1, 1884. Lat. $39^{\circ} 25' 00''$ N.; long. $150^{\circ} 28' 00''$ W. Lieut. G. M. Stoney. 1 specimen.

Remarks.—It was impossible to find any difference between females from the Atlantic and the Pacific. Adult males from the Pacific are lacking.

Distribution.—This species is known from Christiania Fjord, Skager Rak, west coast of Norway, both sides of Scotland, Iceland, East Greenland at lat. $74\frac{1}{2}^{\circ}$ N. and along West Greenland northwards to lat. $70\frac{1}{2}^{\circ}$ N. It is interesting that it has not been taken south of Cape Cod.

31. *THYSANOESSA LONGICAUDATA* Krøyer (71846).

1882. *Thysanoëssa tenera* G. O. SARS, Fork. Vid. Selsk. Christiania for 1882, No. 18, p. 53, pl. 1, figs. 19–20.

1905. *Thysanoëssa longicaudata* HOLT and TATTERSALL, Rep. Fisheries of Ireland, 1902–1903, pt. 2, app. 2, pp. 107 and 138, pl. 15.

1911. *Thysanoëssa longicaudata* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, pp. 38 and 41, fig. 13.

Occurrence.—The material at hand is extremely large, coming from 54 localities in the northwest Atlantic off the United States:

- Sta. 2528. July 13, 1885. Lat. $41^{\circ} 47' N.$; long. $65^{\circ} 37' 30'' W.$
1 specimen.
Woods Hole region. Lat. $41^{\circ} 32' N.$ 3 specimens.
- Sta. 993. September 7, 1881. Lat. $40^{\circ} 28' N.$; long. $70^{\circ} 44' W.$
1 specimen.
- Sta. 2045. July 31, 1883. Lat. $40^{\circ} 04' 20'' N.$; long. $68^{\circ} 43' 50'' W.$ Large number of specimens.
- Sta. 2046. July 31, 1883. Lat. $40^{\circ} 02' 49'' N.$; long. $68^{\circ} 49' W.$
Numerous specimens.
- Sta. 2047. July 31, 1883. Lat. $40^{\circ} 02' 30'' N.$; long. $68^{\circ} 49' 40'' W.$ Numerous specimens.
- Sta. 1122. August 26, 1882. Lat. $40^{\circ} 02' N.$; long. $58^{\circ} 50' W.$ 4 specimens.
- Sta. 2091. September 21, 1883. Lat. $40^{\circ} 01' 50'' N.$; long. $70^{\circ} 59' W.$ 1 specimen.
- Sta. 2044. July 31, 1883. Lat. $40^{\circ} 00' 30'' N.$; long. $68^{\circ} 37' 20'' W.$ Many specimens.
- Sta. 1114. August 22, 1882. Lat. $39^{\circ} 58' N.$; long. $70^{\circ} 38' W.$
8 specimens.
- Sta. 1029. September 14, 1881. Lat. $39^{\circ} 57' 06'' N.$; long. $69^{\circ} 16' W.$ Numerous specimens.
- Sta. 1028. September 14, 1881. Lat. $39^{\circ} 57' N.$; long. $69^{\circ} 17' W.$ 5 specimens.
- Sta. 1031. September 14, 1881. Lat. $39^{\circ} 57' N.$; long. $69^{\circ} 19' W.$
Numerous specimens.
- Sta. 1035. September 14, 1881. Lat. $39^{\circ} 57' N.$; long. $69^{\circ} 28' W.$
Numerous specimens.
- Sta. 1034. September 14, 1881. Lat. $39^{\circ} 56' N.$; long. $69^{\circ} 26' W.$
4 specimens.
- Sta. 1093. August 11, 1882. Lat. $39^{\circ} 56' N.$; long. $69^{\circ} 45' W.$
Numerous specimens.
- Sta. 952. August 23, 1881. Lat. $39^{\circ} 55' N.$; long. $70^{\circ} 28' W.$ 1 specimen.
- Sta. 2188. August 3, 1884. Lat. $39^{\circ} 54' 30'' N.$; long. $71^{\circ} 08' W.$
15 specimens.
- Sta. 1096. August 11, 1882. Lat. $39^{\circ} 53' N.$; long. $69^{\circ} 47' W.$
Numerous specimens.
- Sta. 1026. September 8, 1881. Lat. $39^{\circ} 50' 30'' N.$; long. $71^{\circ} 23' W.$ 14 specimens.
- Sta. 2187. August 3, 1884. Lat. $39^{\circ} 49' 30'' N.$; long. $71^{\circ} 10' W.$
9 specimens.
- Sta. 2215. August 22, 1884. Lat. $39^{\circ} 49' 15'' N.$; long. $70^{\circ} 31' 45'' W.$ Many specimens.
- Sta. 2192. August 5, 1884. Lat. $39^{\circ} 46' 30'' N.$; long. $70^{\circ} 14' 45'' W.$ 1 specimen.

- Sta. 2687. July 18, 1886. Lat. $39^{\circ} 46' N.$; long. $71^{\circ} 19' W.$
Many specimens.
- Sta. 2195. August 5, 1884. Lat. $39^{\circ} 44' N.$; long. $70^{\circ} 03' W.$ 3
specimens.
- Sta. 998. September 8, 1881. Lat. $39^{\circ} 43' N.$; long. $71^{\circ} 32' W.$
4 specimens.
- Sta. 2093. September 21, 1883. Lat. $39^{\circ} 42' 50'' N.$; long.
 $71^{\circ} 01' 20'' W.$ 2 specimens.
- Sta. 2029. May 25, 1883. Lat. $39^{\circ} 42' N.$; long. $70^{\circ} 47' W.$ Sur-
face. Surf. temp. 53° . 1 specimen.
- Sta. 2689. July 18, 1886. Lat. $39^{\circ} 42' N.$; long. $71^{\circ} 15' 30'' W.$
Large number of specimens.
- Sta. 997. September 8, 1881. Lat. $39^{\circ} 42' N.$; long. $71^{\circ} 32' N.$
11 specimens.
- Sta. 2190. August 4, 1884. Lat. $39^{\circ} 40' N.$; long. $70^{\circ} 20' 15'' W.$
1 specimen.
- Sta. 994. September 8, 1881. Lat. $39^{\circ} 40' N.$; long. $71^{\circ} 30' W.$
8 specimens.
- Sta. 1137. September 8, 1882. Lat. $39^{\circ} 40' N.$; long. $71^{\circ} 52' W.$
Many specimens.
- Sta. 2201. August 19, 1884. Lat. $39^{\circ} 39' 45'' N.$; long. $71^{\circ} 35' 15''$
 $W.$ 15 specimens.
- Sta. 2690. July 18, 1886. Lat. $39^{\circ} 39' N.$; long. $71^{\circ} 11' W.$
Stomach of *Macrurus bairdii*. Many fragments.
- Sta. 2202. August 19, 1884. Lat. $39^{\circ} 38' N.$; long. $71^{\circ} 39' 45''$
 $W.$ Many specimens.
- Sta. 2205. August 20, 1884. Lat. $39^{\circ} 35' N.$; long. $71^{\circ} 18' 45''$
 $W.$ 3 specimens.
- Sta. 2203. August 19, 1884. Lat. $39^{\circ} 34' 15'' N.$; long. $71^{\circ} 41'$
 $15'' W.$ 5 specimens.
- Sta. 2683. July 17, 1886. Lat. $39^{\circ} 33' N.$; long. $70^{\circ} 50' W.$
Numerous specimens.
- Sta. 2179. July 23, 1884. Lat. $39^{\circ} 30' 10'' N.$; long. $71^{\circ} 50' W.$
12 specimens.
- Sta. 2180. July 23, 1884. Lat. $39^{\circ} 29' 50'' N.$; long. $71^{\circ} 49' 30''$
 $W.$ 6 specimens.
- Sta. 2095. September 30, 1883. Lat. $39^{\circ} 29' N.$; long. $70^{\circ} 58'$
 $40'' W.$ Surface. Surf. temp. $69\frac{1}{2}^{\circ}$. Numerous specimens.
- Sta. 2034. July 17, 1883. Lat. $39^{\circ} 27' 10'' N.$; long. $69^{\circ} 56' 20''$
 $W.$ 9 specimens.
- Sta. 2041. July 30, 1883. Lat. $39^{\circ} 22' 50'' N.$; long. $68^{\circ} 25' W.$
1 specimen.
- Sta. 2235. September 13, 1884. Lat. $39^{\circ} 12' N.$; long. $72^{\circ} 03'$
 $30'' W.$ 18 specimens.

Sta. 2222. September 6, 1884. Lat. $39^{\circ} 03' 15''$ N.; long. $70^{\circ} 50' 45''$ W. 10 specimens.

Sta. 2104. November 5, 1883. Lat. $38^{\circ} 48' N.$; long. $72^{\circ} 40' 30''$ W. Enormous quantity of specimens.

Sta. 2230. September 12, 1884. Lat. $38^{\circ} 27' N.$; long. $73^{\circ} 02' W.$ Many specimens.

Sta. 2565. August 28, 1885. Lat. $38^{\circ} 19' 20'' N.$; long. $60^{\circ} 02' 30'' W.$ Many specimens.

Sta. 2172. July 20, 1884. Lat. $38^{\circ} 01' 15'' N.$; long. $73^{\circ} 44' W.$ 7 specimens.

Sta. 2097. October 1, 1883. Lat. $37^{\circ} 56' 20'' N.$; long. $70^{\circ} 57' 30'' W.$ Surface. Surf. temp. $72\frac{1}{2}^{\circ}$. 1 specimen.

Sta. 2229. September 11, 1884. Lat. $37^{\circ} 48' 40'' N.$; long. $73^{\circ} 16' 30'' W.$ Many specimens.

Grampus No. 28. April 27, 1887. Lat. $37^{\circ} 45' N.$; long. $74^{\circ} 15' W.$ Tow-net. 1 specimen.

Sta. 2098. October, 1883. Lat. $37^{\circ} 40' 30'' N.$; long. $70^{\circ} 37' 30'' W.$ 12 specimens.

Distribution.—*T. longicaudata* Krøyer is known from the eastern North Atlantic southward to the west coast of Ireland and the Skager Rak, furthermore it is widely distributed in the subarctic and Arctic seas north of the Atlantic, Europe and Asia eastward to lat. $80^{\circ} N.$; long. $124^{\circ} E.$ More detailed information is given in the *Ingolf* Report, vol. 3, pt. 2, pp. 88–89 (1908); later Stephensen added a number of stations (1912).

32. THYSANOESSA PARVA H. J. Hansen (1905).

1905. *Thysanoëssa parva* H. J. HANSEN, Bull. Mus. Océan. Monaco, No. 30, p. 25, figs. 22–24.

1905. *Thysanoëssa parva* H. J. HANSEN, Bull. Mus. Océan. Monaco, No. 42, p. 27.

1911. *Thysanoëssa parva* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, pp. 39 and 43, fig. 14.

Occurrence.—The material is somewhat scanty, originating from only five places in the northwest Atlantic:

Sta. 2219. August 23, 1884. Lat. $39^{\circ} 46' 22'' N.$; long. $69^{\circ} 29' W.$ 16 specimens.

Sta. 2190. August 4, 1884. Lat. $39^{\circ} 40' N.$; long. $70^{\circ} 20' 15'' W.$ 10 specimens.

Sta. 2222. September 6, 1884. Lat. $39^{\circ} 03' 15'' N.$; long. $70^{\circ} 50' 45'' W.$ 8 specimens.

Sta. 2230. September 12, 1884. Lat. $38^{\circ} 27' N.$; long. $73^{\circ} 02' W.$ 1 specimen.

Sta. 2173. July 21, 1884. Lat. $37^{\circ} 57' N.$; long. $72^{\circ} 34' W.$ 8 specimens.

Distribution.—*T. parva* was hitherto known only from the east Atlantic between about lat. $37\frac{1}{2}^{\circ}$ to $27\frac{3}{4}^{\circ} N.$; all specimens were taken by the Prince of Monaco.

33. THYSANOESSA GREGARIA G. O. Sars (1883).

1885. *Thysanoëssa gregaria* G. O. Sars, *Challenger* Rep., vol. 13, p. 120, pi. 21, figs. 8-17; pl. 22.
1905. *Thysanoëssa gregaria* H. J. HANSEN, Bull. Mus. Océan. Monaco, No. 42, pp. 27 and 28.
1911. *Thysanoëssa gregaria* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, pp. 39 and 43, fig. 15.
1913. *Thysanoëssa gregaria* H. J. HANSEN, Rep. Crust. Schizopoda Swedish Antarctic Exp., p. 37, pl. 6, figs. 1a-1b.

Occurrence.—Material is at hand from four stations in the north-west Atlantic and from four places in the north Pacific:

A. *Atlantic stations*.—Sta. 2091. September 21, 1883. Lat. $40^{\circ} 01' 50''$ N.; long. $70^{\circ} 59'$ W. 4 specimens.

Sta. 2095. August 5, 1883. Lat. $39^{\circ} 44'$ N.; long. $70^{\circ} 03'$ W. 2 specimens.

Sta. 2104. November 5, 1883. Lat. $38^{\circ} 48'$ N.; long. $72^{\circ} 40' 30''$ W. 4 specimens.

Sta. 2098. October 1, 1883. Lat. $37^{\circ} 40' 30''$ N.; long. $70^{\circ} 37' 30''$ W. 4 specimens.

B. *Localities in the Pacific*.—Bering Island (about lat. 55° N.). Leonhard Stejneger, 1882-83. 1 specimen (female).

Sta. 4793. June 16, 1906. Lat. $54^{\circ} 48'$ N.; long. $164^{\circ} 54'$ E. Toperkoo Island, not far from Bering Island. 300-0 fathoms. 1 specimen (female).

May 1, 1884. Lat. $39^{\circ} 25'$ N.; long. $150^{\circ} 28'$ W. Lieut. G. M. Stoney, U. S. N. 1 specimen (adult male).

Sta. 4397. April 1, 1904. Lat. $33^{\circ} 10' 15''$ N.; long. $121^{\circ} 42' 15''$ W. 5 specimens (male).

Remarks.—As already stated by me in 1913,¹ this species varies considerably in several features, to which may be added that even the eyes seem to be somewhat variable in size. I have attempted, without success, to find differences in the shape of the processes of the copulatory organs of specimens from the North Pacific and the subantarctic ocean south of the Atlantic. The male taken by Lieutenant Stoney is 12 mm. long and has the eyes large.

Distribution.—This species is known from the temperate north Atlantic, the temperate south Atlantic, and southward in the subantarctic ocean to lat. $53^{\circ} 34'$ S.; furthermore, from the south Pacific and the temperate and boreal north Pacific, but it has never been taken in the tropical area and, so far as I can see, perhaps not in the subtropical belts of any ocean. Further details on this topic may be found in the papers quoted above.

¹ Rep. Crust. Schizopoda Swedish Antarctic Exp.

Genus **TESSARABRACHION** H. J. Hansen.

Description—Carapace with the frontal plate small, triangular, short and much broader than long (pl. 4, fig. 1*b*); a rostral process is wanting. Eyes very large, higher than broad, distinctly constricted not much above the middle (fig. 1*a*). Antennulæ (figs. 1*b*–1*d*) as in *Thysanoessa*; the first joint without distal lobe and very much broader than the two other peduncular joints, which are slender in the female (figs. 1*b* and 1*c*), while in the male the third joint especially is thicker; the upper flagellum depressed and shorter than the lower, which is compressed; both flagella broader in the male than in the female. Antennæ as in *Thysanoessa*; the peduncle of the endopod elongate (fig. 1*f*) with its proximal joint more than twice as long as the distal.

Maxillulæ (fig. 1*g*) with the pseudexopod and the palp moderately large. Maxilla (fig. 1*h*) very broad, both lacinia with the inner margin incised; fourth joint (4) short and somewhat small; exopod (*ex*) produced along the outer margin of fourth joint and terminating beyond its end. Endopod of the maxillipeds (figs. 1*a* and 1*i*) with the fourth joint extremely elongate, almost four times as long as the sum of the three distal joints, fifth and sixth joints being very short; the two distal joints are shown in figure 1*k*.

Thoracic legs (fig. 1*a*) about as in *Thysanoessa* excepting that both first and second pairs are very elongate, subsimilar; the structure of these legs is in the main like the first pair in a species of *Thysanoessa* where this pair is very elongate. The three following pairs with the full number of joints in the endopods; sixth pair with the exopod normally developed, while the endopod is in the female (fig. 1*l*) two-jointed, very slender, and slightly longer than the exopod, but wanting in the male. Seventh pair in both sexes without endopod, while the somewhat small exopod is one-jointed, styliform.

Abdomen as in *Thysanoessa*. All luminous organs are present.

Copulatory organs of first pleopods (fig. 1*m*) so reduced that I suppose that the males seen by me are not adult. The setiferous lobe and the auxiliary lobe with its hooks are well developed, while a median lobe is not marked off from the inner lobe, which has no processes but only two or three fine marginal spines.

Remarks.—This genus was established by me in 1911 on specimens of a single species found in the material of the United States National Museum. It differs from *Thysanoessa* in having no rostral process, while the two anterior pairs of thoracic legs are very elongate and subsimilar; furthermore, the structure of the maxillipeds differs much from that in *Thysanoessa* and all other genera.

34. *TESSARABRACHION OCULATUM* H. J. Hansen (1911).

Plate 4, figs. 1a-1m.

1911. *Tessarabrachion oculata* H. J. HANSEN, Bull. l'Inst. Océan. Monaco, No. 210, p. 47.

Occurrence.—It has been taken at three stations in the boreal Pacific:

Sta. 4793. June 16, 1906. Lat. $54^{\circ} 48' N.$; long. $164^{\circ} 54' E.$ Toperkoo Island, not far from Bering Island. 300-0 fathoms. 3 specimens (male, female).

Sta. 4759. May 20, 1906. Lat. $53^{\circ} 05' N.$; long. $138^{\circ} 31' W.$ 3 specimens.

Sta. 4806. June 26, 1906. Lat. $42^{\circ} 13' N.$; long. $144^{\circ} 21' E.$, off northern Japan. 200-0 fathoms. 9 specimens (male, female).

Description.—The small frontal plate (fig. 1*b*) has the apex subacute or a little rounded, and behind this end the plate is concave, which is due to the fact that the front marginal part of the carapace is above and thence downward below the middle of the sides, somewhat expanded, and bent respectively upward and outward as a kind of collar. The lateral margin of the carapace without any denticle.

The eyes are very large (figs. 1*a*-1*b*), considerably higher than broad, divided by a feeble constriction not much above the middle, and the upper section is nearly as broad as the lower.

Antennulæ in the female (figs. 1*b* and 1*c*) with the third peduncular joint slightly or scarcely longer but conspicuously more slender than the second; the lower flagellum is about as long as the sum of the two preceding joints, 17-jointed; the upper flagellum is about 15-jointed and slightly or considerably shorter. In the male (fig. 1*d*) the two distal peduncular joints are conspicuously thicker than in the female and the third at least as thick as the second; both flagella are somewhat longer than in the female, with about 17-18 joints in each flagellum. The antennal squama reaches in the female the middle of the third antennular joint; it is somewhat narrow (fig. 1*f*), with the outer margin concave and terminating in a denticle.

The two anterior pairs of legs are very elongate, the fourth joint reaching to or beyond the end of the antennular peduncle (fig. 1*a*), but this joint is comparatively feebly thickened and subcylindrical. The fifth joint is naked excepting two small spines on its distal portion, and it is more than two and a half times as long as the sum of the two distal joints. The sixth joint has about eight spiniform setæ along its prehensile margin and six or seven stiff setæ on the other margin. The seventh joint about as long as deep, with two somewhat long, curved spines and a few shorter spines; these spines are distinctly

longer on second than on first pair of legs. The setæ on third pair of legs not plumose.

The abdominal segments without dorsal denticles. Sixth segment about as long as the sum of the fourth and the fifth. The telson, which has two pairs of dorsal spinules, is nearly as long as the exopod of the uropods, and the exopod is somewhat shorter than the endopod.

Length.—The largest female is 24 mm., the largest male 20 mm. long.

Remarks.—In the description of the species I have not mentioned the copulatory organs; the reason is seen in the diagnosis of the genus, and the remarks to be found there, together with fig. 1*m*, may be sufficient.

Distribution.—Our entire knowledge of this topic is to be found above, under "Occurrence."

Genus NEMATOSCELIS G. O. Sars.

All six species hitherto established are represented in the collection.

35. NEMATOSCELIS MEGALOPS G. O. Sars (1883).

1885. *Nematoscelis megalops* G. O. Sars, *Challenger Rep.*, vol. 13, p. 127, pl. 23, figs. 5-10; pl. 24.

1911. *Nematoscelis megalops* H. J. Hansen, *Bull. l'Inst. Océan. Monaco*, No. 210, pp. 48-50, fig. 18A.

Occurrence.—This species is at hand from 47 places in the north-west Atlantic:

Sta. 69. September 1, 1877. Lat. 42° 44' N.; long. 62° 43' W.
1 specimen.

Sta. 1120. August 26, 1882. Lat. 40° 05' N.; long. 68° 48' W.
1 specimen.

Sta. 2045. July 31, 1883. Lat. 40° 04' 20'' N.; long. 68° 43' 50'' W. 9 specimens.

Sta. 2046. July 31, 1883. Lat. 40° 02' 49'' N.; long. 68° 49' W. 19 specimens.

Sta. 2047. July 31, 1883. Lat. 40° 02' 30'' N.; long. 68° 49' 40'' W. 4 specimens.

Sta. 1122. August 26, 1882. Lat. 40° 02' N.; long. 68° 50' W. 4 specimens.

Sta. 2044. July 31, 1883. Lat. 40° 00' 30'' N.; long. 68° 37' 20'' W. 3 specimens.

Sta. 2213. August 22, 1884. Lat. 39° 58' 30'' N.; long. 70° 30' W. 3 specimens.

Sta. 1114. August 22, 1882. Lat. 39° 58' N.; long. 30° 38' W. 1 specimen.

Sta. 2183. August 2, 1884. Lat. 39° 57' 45'' N.; long. 70° 56' 30'' W. 7 specimens.

- Sta. 1029. September 14, 1881. Lat. $39^{\circ} 57' 06''$ N.; long. $69^{\circ} 10'$ W. 10 specimens.
- Sta. 1028. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 17'$ W. 5 specimens.
- Sta. 1031. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 19'$ W. 16 specimens.
- Sta. 1035. September 14, 1881. Lat. $39^{\circ} 57'$ N.; long. $69^{\circ} 28'$ W. 1 specimen.
- Sta. 952. August 23, 1881. Lat. $39^{\circ} 55'$ N.; long. $70^{\circ} 28'$ W. 7 specimens.
- Sta. 2188. August 3, 1884. Lat. $39^{\circ} 54' 30''$ N.; long. $71^{\circ} 08'$ W. 1 specimen.
- Sta. 1096. August 11, 1882. Lat. $39^{\circ} 53'$ N.; long. $69^{\circ} 47'$ W. 1 specimen.
- Sta. 1026. September 8, 1881. Lat. $39^{\circ} 50' 30''$ N.; long. $71^{\circ} 23'$ W. 5 specimens.
- Sta. 2187. August 3, 1884. Lat. $39^{\circ} 49' 30''$ N.; long. $71^{\circ} 10'$ W. 6 specimens.
- Sta. 2215. August 22, 1884. Lat. $39^{\circ} 49' 15''$ N.; long. $70^{\circ} 31' 45''$ W. Many specimens.
- Sta. 2192. August 5, 1884. Lat. $39^{\circ} 46' 30''$ N.; long. $70^{\circ} 14' 45''$ W. 3 specimens.
- Sta. 2219. August 23, 1884. Lat. $39^{\circ} 46' 22''$ N.; long. $69^{\circ} 29'$ W. 7 specimens.
- Sta. 2195. August 5, 1884. Lat. $39^{\circ} 44'$ N.; long. $70^{\circ} 03'$ W. 1 specimen.
- Sta. 2689. July 18, 1886. Lat. $39^{\circ} 42'$ N.; long. $71^{\circ} 15' 30''$ W. 4 specimens.
- Sta. 997. September 8, 1881. Lat. $39^{\circ} 42'$ N.; long. $71^{\circ} 32'$ W. 1 specimen.
- Sta. 995. September 8, 1881. Lat. $39^{\circ} 40' 30''$ N.; long. $71^{\circ} 31'$ W. 1 specimen.
- Sta. 2190. August 4, 1884. Lat. $39^{\circ} 40'$ N.; long. $70^{\circ} 20' 15''$ W. 3 specimens.
- Sta. 994. September 8, 1881. Lat. $39^{\circ} 40'$ N.; long. $71^{\circ} 30'$ W. 6 specimens.
- Sta. 1137. September 8, 1882. Lat. $39^{\circ} 40'$ N.; long. $71^{\circ} 52'$ W. 17 specimens.
- Sta. 2201. August 19, 1884. Lat. $39^{\circ} 39' 45''$ N.; long. $71^{\circ} 35' 15''$ W. 10 specimens.
- Sta. 2202. Aug. 19, 1884. Lat. $39^{\circ} 38'$ N.; long. $71^{\circ} 39' 45''$ W. 3 specimens.
- Sta. 2203. August 19, 1884. Lat. $39^{\circ} 34' 15''$ N.; long. $71^{\circ} 41' 15''$ W. 9 specimens.
- Sta. 2042. July 30, 1883. Lat. $39^{\circ} 33'$ N.; long. $68^{\circ} 26' 45''$ W. 1 specimen.

- Sta. 2683. July 17, 1886. Lat. $39^{\circ} 33' N.$; long. $70^{\circ} 50' W.$ 8 specimens.
- Sta. 1144. September 8, 1882. Lat. $39^{\circ} 31' N.$; long. $72^{\circ} 06' W.$ 1 specimen.
- Sta. 2179. July 23, 1884. Lat. $39^{\circ} 30' 10'' N.$; long. $71^{\circ} 50' W.$ 1 specimen.
- Sta. 2095. September 30, 1883. Lat. $39^{\circ} 29' N.$; long. $70^{\circ} 58' 40'' W.$ Surface. Surf. temp. $69\frac{1}{2}^{\circ}$. 16 specimens.
- Sta. 2182. July 23, 1884. Lat. $39^{\circ} 25' 30'' N.$; long. $71^{\circ} 44' W.$ 1 specimen.
- Sta. 2235. September 13, 1884. Lat. $39^{\circ} 12' N.$; long. $72^{\circ} 03' 30'' W.$ 10 specimens.
- Sta. 2236. September 13, 1884. Lat. $39^{\circ} 11' N.$; long. $72^{\circ} 08' 30'' W.$ Numerous specimens.
- Sta. 2104. November 5, 1883. Lat. $38^{\circ} 48' N.$; long. $72^{\circ} 40' 30'' W.$ 6 specimens.
- Sta. 2203. September 12, 1884. Lat. $38^{\circ} 27' N.$; long. $73^{\circ} 02' W.$ 9 specimens.
- Sta. 2172. July 20, 1884. Lat. $38^{\circ} 01' 15'' N.$; long. $73^{\circ} 44' W.$ 2 specimens.
- Sta. 2105. November 6, 1883. Lat. $37^{\circ} 50' N.$; long. $73^{\circ} 03' 50'' W.$ Surface. Surf. temp. 63° . 1 specimen.
- Sta. 2098. October 1, 1883. Lat. $37^{\circ} 40' 30'' N.$; long. $70^{\circ} 37' 30'' W.$ 7 specimens.
- Sta. 2229. September 11, 1884. Lat. $37^{\circ} 38' 40'' N.$; long. $73^{\circ} 16' 30'' W.$ 12 specimens.
- Sta. 2728. October 25, 1886. Lat. $36^{\circ} 30' N.$; long. $71^{\circ} 33' W.$ Many specimens.

The animals from the Pacific recorded by Ortmann in 1894 as *N. megalops* G. O. Sars, I refer to the following species.

Remarks.—Sars has published a detailed description with numerous excellent figures of the female, but he had no male specimen. In the female the third peduncular joint of the antennulæ is a little longer and conspicuously thinner than the second joint, while in the adult male the third joint is a little shorter than, or at most about as long as, the second and much thicker than in the female, being as thick as the second joint, which also is a little shorter and distinctly thicker than in the other sex. In both sexes the frontal plate is a moderately small triangle conspicuously broader than long; in the female this plate terminates in a very long and very narrow, canaliculate and curved rostrum, which is totally wanting in the male. Yet in very rare cases the male with the copulatory organs seemingly well developed has a rostrum as the female, and I have seen a single female (from station 1137) without any rostrum from the tip of the frontal plate. The copulatory organs

have been dealt with in my above-quoted paper. Large females are 24–25 mm. long, males 18 mm.

Distribution.—The long list shows this species to be extremely common in the Atlantic off the United States between lat. 40° N. and 39½° N., that it has been taken once at about lat. 42¾° N., several times between lat. 39½° and 37½° N., and once at lat. 36½° N. In the *Ingolf* Malacostraca, vol. 1 (1908) I have dealt with the distribution of *N. megalops*. It has been taken as far north as South-west Iceland, in lat. 63° N., also east of Newfoundland, west of the Faroes and farther south in the eastern north Atlantic; it is unknown from the tropical and subtropical belts of the Atlantic, but found again at some places in the southern temperate Atlantic. I mentioned that the Copenhagen Museum possesses specimens from the southern part of the Indian Ocean, viz, at lat. 40° 8' S., long. 52° E.; at lat. 38° S., long. 62½° E.; and at lat. 40° 41' S., long. 85° 22' E., but as all specimens in question are females I am now unable to decide whether the specimens belong to *N. megalops* G. O. Sars or to the extremely similar *N. difficilis* H. J. Hansen, a species unknown to me in 1908.

36. NEMATOSCELIS DIFFICILIS H. J. Hansen (1911).

1911. *Nematoscelis difficilis* H. J. Hansen, Bull. l'Inst. Océan. Monaco, No. 210, p. 48, fig. 18 B.

Occurrence.—Among the unnamed material specimens from two stations in the Pacific are at hand:

Sta. 4757. May 4, 1906. Lat. 39° 18' N.; long. 123° 58' W. Off California. 8 specimens (1 male, 1 female, and 6 half-grown).

Sta. 4407. April 9, 1904. Off S. E. point of Santa Catalina Island, Gulf of California (about lat. 26° N.). 1 specimen (male).

Furthermore, the animals recorded by Ortmann in 1894 as *N. megalops* belong to this species:

Sur. 541. January 14, 1892. Lat. 35° 25' 30'' N.; long. 125° 09' 30'' W. 300–0 fathoms. 1 specimen (male).

Sur. 540. January 14, 1892. Lat. 35° 19' 30'' N.; long. 125° 21' 30'' W. 300–0 fathoms. 3 specimens (male and rudiments of 2 females).

Finally the specimens from two of the stations referred by Ortmann in 1894 with some doubt to *N. microps* belong to *N. difficilis*:

Off Guaymas, Gulf of California (about lat. 28° N.), 500–0 fathoms. 3 specimens (female).

Fifty miles south of Guaymas. 700–0 fathoms. 6 specimens (only 1 female adult).

Remarks.—The material is somewhat scarce and the majority of the specimens either poorly preserved or far from adult.

Nevertheless, I have had the good fortune to examine 4 adult and rather well-preserved males; I have inspected their copulatory

organs and found that they agree with one another and with my figure quoted. The differences pointed out between the copulatory organs of *N. megalops* from the North Atlantic and *N. difficilis* from the northeast Pacific are very easily seen and certainly so sharp, so important, and so constant that they are sufficient for separating *N. difficilis* from *N. megalops*. I have hitherto been unable to find any other character by which to distinguish the two species, and consequently I am unable to separate their females, but it may be possible that more detailed investigation of rich and well-preserved material will show small differences between the females.

The male from survey 541 has no rostrum and is 16.5 mm. long; the male from survey 540 has a long female rostrum and is 18 mm. The male from station 4407 has no rostrum and is about 19 mm.; the male from station 4757 has the rostrum rudimentary and is 19 mm. long. The largest female, from off Guaymas, is 22 mm. long.

Distribution.—Hitherto known only from the six stations recorded, all situated in the northeast Pacific, between lat. $39\frac{1}{2}^{\circ}$ N. and 26° N.

37. NEMATOSCELIS ATLANTICA H. J. Hansen (1910).

1910. *Nematoscelis atlantica* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 107.

Occurrence.—Material from only two places in the northwest Atlantic is at hand:

Sta. 2210. August 21, 1884. Lat. $39^{\circ} 37' 45''$ N.; long. $71^{\circ} 18' 45''$ W. 2 specimens.

Sta. 2565. August 28, 1885. Lat. $38^{\circ} 19' 20''$ N.; long. $60^{\circ} 02' 30''$ W. 3 specimens.

Remarks.—This species, established on material taken by the Prince of Monaco, will be described and figured in the report on that fine collection.

Distribution.—Previously known only from the warmer temperate area of the eastern North Atlantic.

38. NEMATOSCELIS MICROPS G. O. Sars (1883).

1910. *Nematoscelis microps* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 107, pl. 15, figs. 2a-2k.

1912. *Nematoscelis microps* H. J. HANSEN, *Mem. Mus. Comp. Zool.*, vol. 35, No. 4, p. 259, pl. 9, figs. 4a-4d; pl. 10, figs. 1a-1b.

Occurrence.—It has been taken at five places in the northwest Atlantic:

Sta. 2045. July 31, 1883. Lat. $40^{\circ} 04' 20''$ N.; long. $68^{\circ} 43' 50''$ W. 1 specimen (adult male).

Sta. 2195. August 5, 1884. Lat. $39^{\circ} 44'$ N.; long. $70^{\circ} 03'$ W. 1 specimen (adult male).

Sta. 2230. September 12, 1884. Lat. $38^{\circ} 27'$ N.; long. $73^{\circ} 02'$ W. 1 specimen.

Sta. 2172. July 20, 1884. Lat. $38^{\circ} 01' 15''$ N.; long. $73^{\circ} 44'$ W. 1 specimen.

Sta. 2151. April 10, 1884. Caribbean Sea. Lat. $15^{\circ} 28' 39''$ N.; long. $80^{\circ} 36'$ W. 1 specimen (immature male).

The animals recorded with some doubt by Ortmann in 1894 as *N. microps* G. O. Sars, do not belong to this species, but to *N. difficilis* H. J. Hansen (see above), *N. gracilis* H. J. Hansen, and *N. tenella* G. O. Sars.

Distribution.—I have seen specimens from the Atlantic, the Indian Ocean (*Siboga*), and the tropical east Pacific (the Harvard paper), but a more detailed general account must be postponed.

39. NEMATOSCELIS GRACILIS H. J. Hansen (1910).

1910. *Nematoscelis gracilis* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 109, pl. 15, figs. 3a-3g.

1912. *Nematoscelis gracilis* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 261, pl. 10, fig. 2a.

Occurrence.—No specimen was found among the unnamed material, but most of the specimens from the tropical east Pacific recorded in 1894 by Ortmann as *N. microps* G. O. Sars, belong to *N. gracilis*, and the same is the case with the specimens referred by him to *N. tenella* G. O. Sars:

Sta. 3416. April 11, 1891. Lat. $16^{\circ} 32' 30''$ N.; long. $90^{\circ} 42' 40''$ W. 300-0 fathoms. 1 specimen.

Lat. $12^{\circ} 34'$ N.; long. $97^{\circ} 21'$ W. 4 immature specimens. (Referred to *N. tenella* by Ortmann.)

Sta. 3414. April 8, 1891. Lat. $10^{\circ} 14'$ N.; long. $96^{\circ} 28'$ W. 200-0 fathoms. 1 specimen. 300-0 fathoms. 5 specimens.

Hyd. 2619. March 11, 1891. Lat. $7^{\circ} 31'$ N.; long. $78^{\circ} 42' 30''$ W. 1,000-0 fathoms. 1 specimen.

Sta. 3382. March 7, 1891. Lat. $6^{\circ} 21'$ N.; long. $80^{\circ} 41'$ W. 200 fathoms; closed part of Tanner net. Many specimens.

Hyd. 2627. March 25, 1891. Lat. $0^{\circ} 36'$ N.; long. $82^{\circ} 45'$ W. 1770-0 fathoms. 1 specimen.

Hyd. 2628. March 26, 1891. Lat. $0^{\circ} 13'$ S.; long. $84^{\circ} 52'$ W. 200-0 fathoms. 2 specimens.

Distribution.—This species was known from the Indian Archipelago (*Siboga*) and the tropical East Pacific (the Harvard paper); in 1912 Tattersall enumerated a number of places in the Indian Ocean.

40. NEMATOSCELIS TENELLA G. O. Sars (1883).

1910. *Nematoscelis tenella* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 110, pl. 15, figs. 4a-4m.

1912. *Nematoscelis tenella* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 263, pl. 10, figs. 3a-3c.

Occurrence.—Among the unnamed material is a single specimen from the northwest Atlantic:

Sta. 2565. August 28, 1885. Lat. $38^{\circ} 19' 20''$ N.; long. $60^{\circ} 02' 30''$ W. 1 specimen (male).

The following specimens from the tropical East Pacific referred by Ortmann in 1894 to *N. microps* belong to *N. tenella*:

Sta. 3414. April 8, 1891. Lat. $10^{\circ} 14' N.$; long. $96^{\circ} 28' W.$ 200–0 fathoms. 1 specimen.

Hyd. 2627. March 25, 1891. Lat. $0^{\circ} 36' N.$; long. $82^{\circ} 45' W.$ 1770–0 fathoms. 1 specimen.

Distribution.—The very wide distribution in the Atlantic, the Indian Ocean, and the Pacific has been dealt with in the Harvard paper; in 1912 Tattersall enumerated many localities in the Indian Ocean.

Genus NEMATOBRACHION Calman.

Only one of the three species known is represented in the collection.

41. NEMATOBRACHION FLEXIPES Ortmann (1893).

1912. *Nematobrachion flexipes* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 269, pl. 10, figs. 5a–5m.

Occurrence.—Only the specimens from the tropical East Pacific referred correctly by Ortmann in 1894 to his *Stylocheiron flexipes* are found in the collection.

Sta. 3382. March 7, 1891. Lat. $6^{\circ} 21' N.$; long. $80^{\circ} 41' W.$ 200 fathoms. Closed part of the Tanner net. 3 specimens.

Hyd. 2627. March 25, 1891. Lat. $0^{\circ} 36' N.$; long. $82^{\circ} 45' W.$ 1770–0 fathoms. 1 specimen.

Distribution.—*N. flexipes* is known from the Atlantic and the East Pacific; more details on this topic have been given in my paper quoted.

Genus STYLOCHEIRON G. O. Sars.

Nine species are known, and five are represented in the collection.

42. STYLOCHEIRON CARINATUM G. O. Sars (1883).

1885. *Stylocheiron carinatum* G. O. Sars, *Challenger* Rep., vol. 13, p. 137, pl. 26.

1910. *Stylocheiron carinatum* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 113, pl. 16, figs. 1a–1h.

Occurrence.—Among the unnamed material specimens are at hand from seven stations, four of which are in the northwest Atlantic and three in the North Pacific:

A. Atlantic Stations.

Sta. 2091. September 21, 1883. Lat. $40^{\circ} 01' 50'' N.$; long. $70^{\circ} 59' W.$ 1 specimen.

Sta. 1029. September 14, 1881. Lat. $39^{\circ} 57' 06'' N.$; long. $69^{\circ} 10' W.$ 1 specimen.

Sta. 2174. July 21, 1884. Lat. $38^{\circ} 15' N.$; long. $72^{\circ} 03' W.$ Surface. Surf. temp. 76° . 1 specimen.

Sta. 2224. September 18, 1884. Lat. $36^{\circ} 16' 30'' N.$; long. $68^{\circ} 21' W.$ 2 specimens.

B. *Stations in the North Pacific.*

Sur. 163. November 11, 1891. Lat. $30^{\circ} 31' 30''$ N.; long. $140^{\circ} 05' 30''$ W. 330–300 fathoms. Tanner net. 2 specimens.

Sur. 174. November 12, 1891. Lat. $29^{\circ} 38'$ N.; long. $142^{\circ} 17'$ W. 330–300 fathoms. Tanner net. 1 specimen.

Sur. 16. March 1, 1888. Lat. $4^{\circ} 21'$ N.; long. $81^{\circ} 59'$ W. Surface. Surf. temp. 74° . 4.45 a. m. Moonlight. 14 specimens.

Furthermore, the specimen from one of the stations enumerated in 1894 by Ortmann for *S. suhmi* G. O. Sars belongs to *S. carinatum*, viz.

Sta. 3388. March 9, 1891. Lat. $7^{\circ} 06'$ N.; long. $79^{\circ} 48'$ W. 400–0 fathoms. 1 specimen (adult male).

The two specimens from the Hawaiian Islands recorded by Ortmann in 1905 as *S. carinatum* have been correctly named and most of the other specimens from the same station belong to the same species:

Sta. 3801. March 19, 1902. Lat. $28^{\circ} 31'$ N.; long. $141^{\circ} 47'$ W. 120–100 fathoms. 17 specimens.

Finally the specimen recorded in 1905 by Ortmann as *S. suhmi* belongs in reality to *S. carinatum*, and the determination is easy because one of the prehensile legs is well preserved.

Sta. 3803. March 21, 1902. Lat. $25^{\circ} 39' 45''$ N.; long. $147^{\circ} 41' 45''$ W. 50 fathoms. 1 specimen.

Distribution.—*S. carinatum* is very widely distributed in the Atlantic, the Indian Ocean, and the Pacific. A detailed account is found in my Harvard paper (1912), and a large number of places in the Indian Ocean were recorded by Tattersall in 1912.

43. *STYLOCHEIRON AFFINE* H. J. Hansen (1910).

1910. *Stylocheiron affine* H. J. Hansen, *Siboga* Exp., vol. 37, p. 118, pl. 16, figs. 4a–4d.

Occurrence.—The animals from two of the stations enumerated by Ortmann in 1894 for *S. suhmi* G. O. Sars belong to *S. affine*:

Lat. $12^{\circ} 34'$ N.; long. $97^{\circ} 21'$ W. 8 specimens.

Hyd. 2628. March 26, 1891. Lat. $0^{\circ} 13'$ S.; long. $84^{\circ} 52'$ W. 200–0 fathoms. 2 specimens.

The two specimens from station 3414, referred by Ortmann to "*S. suhmi*," are so poor that they are unrecognizable. The specimen from station Hyd. 2619 does not belong to that species but to the *longicorne* group, being either *S. affine* or *S. longicorne*.

Distribution.—*S. affine* is known from the Indian Archipelago and the tropical east Pacific.¹

44. *STYLOCHEIRON ELONGATUM* G. O. Sars (1883)

1885. *Stylocheiron elongatum* G. O. Sars, *Challenger* Rep., vol. 13, p. 146, pl. 27, figs. 6–10.

Occurrence.—Only a single specimen is at hand.

Sta. 2224. September 8, 1884. Lat. $36^{\circ} 16' 30''$ N.; long. $68^{\circ} 21'$ W. 1 specimen.

¹ See my Harvard paper of 1912.

Distribution.—This species, which is known from the Atlantic, the Indian Ocean, and the Pacific, seems to be scarce in most areas. A more detailed account has been given in my Harvard paper. In 1912 Tattersall enumerated four stations in the Indian Ocean.

45. *STYLOCHEIRON ABBREVIATUM* G. O. Sars (1883).

1910. *Stylocheiron abbreviatum* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 122.

1912. *Stylocheiron abbreviatum* H. J. HANSEN, Mem. Mus. Comp. Zool., vol. 35, No. 4, p. 280, pl. 11, figs. 5a-5f.

Occurrence.—Among the unnamed material only some few specimens are at hand, all from the Pacific:

Sur. 163. November 11, 1891. Lat. $30^{\circ} 31' 30''$ N.; long. $140^{\circ} 05' 30''$ W. 330-300 fathoms. Tanner net. 3 specimens.

Sta. 3801. March 19, 1902. Lat. $28^{\circ} 31' N.$; long. $141^{\circ} 47' W.$ Hawaiian Islands. 120-100 fathoms. 3 specimens (among specimens of *S. carinatum*).

The specimen from Hyd. 2619, referred by Ortmann in 1894 to *S. abbreviatum*, belongs in reality to the *longicorne* group, but it is too mutilated for determination. The specimen from the Hawaiian Islands mentioned by Ortmann in 1905 was correctly determined:

Sta. 3803. March 21, 1902. Lat. $25^{\circ} 39' 45''$ N.; long. $147^{\circ} 41' 45''$ W. 50 fathoms. 1 specimen.

Distribution.—*S. abbreviatum* is known from the Atlantic, the Indian Ocean, and the Pacific. A detailed account may be looked for in my Harvard paper quoted, and in 1912 Tattersall added a locality in the Indian Ocean.

46. *STYLOCHEIRON MAXIMUM* H. J. Hansen (1908).

1908. *Stylocheiron maximum* H. J. HANSEN, The Danish *Ingolf* Exp., vol. 3, Crust. Malacost., I, p. 92.

1910. *Stylocheiron maximum* H. J. HANSEN, *Siboga* Exp., vol. 37, p. 121, pl. 16, figs. 6a-6d.

Occurrence.—This species is at hand from a single station in the northwest Atlantic and from two places in the tropical east Pacific:

Sta. 2667. May 5, 1886. Lat. $30^{\circ} 53' N.$; long. $79^{\circ} 42' 30'' W.$ 1 specimen.

Sta. 3414. April 8, 1891. Lat. $10^{\circ} 14' N.$; long. $96^{\circ} 28' W.$ 200-0 fathoms. 1 specimen.

Hyd. 2619. March 11, 1891. Lat. $7^{\circ} 31' N.$; long. $78^{\circ} 42' 30'' W.$ 2 specimens.

Distribution.—*S. maximum* is widely distributed in the Atlantic, going northward to lat. $61^{\circ} 49' N.$; long. $14^{\circ} 11' W.$ (*Ingolf* Exp.), and southward to the subantarctic area as far as lat. $49^{\circ} 56' S.$ (H. J. Hansen, 1913). Besides, it is known from the Indian Archipelago (*Siboga* Exp.) and the tropical east Pacific.

EXPLANATION OF PLATES.

PLATE 1.

Thysanopoda cornuta Illig.

Fig. 1a. Carapace (with the proximal part of left eye-stalk) of a large female, from the left side; $\times \frac{7}{8}$.

Euphausia pacifica H. J. Hansen.

Fig. 2a. Anterior part of an adult female (from station 4757), from above; $\times 9$.

2b. Distal part of first antennular joint and proximal part of second joint of the same female, from above; $\times 22$.

2c. Major part of left antennular peduncle of an adult male, from the left side; $\times 17$.

2d. Major part of left antennular peduncle of an adult female, from the left side; $\times 17$.

2e. Left copulatory organ of first pleopod of an adult male, unrolled and seen from behind; $\times 33$. *li*, inner lobe; *lm*, median lobe; *ls*, setiferous lobe; *lu*, auxiliary lobe.

2f. Inner and median (*lm*) lobes of the organ shown in fig. 2e, from behind; $\times 51$. *p*², terminal process; *f*, its foot; *h*, its heel; *p*³, proximal process; *p*⁴, lateral process.

2g. Inner and median lobes of left copulatory organ of another male, from the inner side; $\times 51$. The lettering as in fig. 2f.

Thysanoessa longipes Brandt.

Fig. 3a. Major part of left antennular peduncle of an adult female (from station 5030), from the outer side; $\times 12$.

3b. Major part of left antennular peduncle of an adult male (from station 5030), from the outer side; $\times 12$.

3c. Distal part of the endopod of left maxilliped of a female, from below; $\times 33$.

3d. Right sixth thoracic leg, branchia omitted, of a female, from behind; $\times 12$.

PLATE 2.

Thysanoessa longipes Brandt. (Continued.)

Fig. 1a. Anterior part of body with appendages of a scarcely adult female, from the left side; $\times \frac{1}{2}$.

1b. Anterior part of a female, from above; $\times 7$.

1c. The six abdominal segments—pleopods omitted—and the base of the caudal fan of a female from station 4793, from the left side; \times scarcely 6.

1d. Left copulatory organ of first pleopod of an adult male, unrolled and seen from behind; $\times 32$. *li*, inner lobe; *lm*, median lobe; *ls*, setiferous lobe; *lu*, auxiliary lobe.

1e. Inner and median lobes of the organ shown in fig. 1d, from behind; $\times 50$. *p*¹, spiniform process; *p*², terminal process; *p*³, proximal process; *p*⁴, lateral process.

Thysanoessa inermis Krøyer.

Fig. 2a. Major part of the two anterior right thoracic legs of an adult male, 17 mm. long (from Woods Hole region), from the outer side; $\times 16$.

2b. Major part of the two anterior left thoracic legs of an adult male, 16.5 mm. long (from Woods Hole region), from the outer side; $\times 16$.

2c. Sixth and seventh joints of left first thoracic leg of a large female, 22.5 mm. long (from Woods Hole region), from the outer side; $\times 16$.

2d. First left thoracic leg of an adult female, 19 mm. long (from Woods Hole region), from the outer side; $\times 16$.

PLATE 3.

Thysanoessa spinifera Holmes.

- Fig. 1a. Anterior part of the body with appendages of an adult male (from station 4758), from the left side; $\times 6$.
- 1b. Anterior part of the body of an adult female (from Barclay Sound), from above; $\times 1\frac{1}{2}$.
- 1c. Major part of left antennular peduncle of a female, from the outer side; $\times 12$.
- 1d. Major part of left antennular peduncle of the male shown in fig. 1a, from the outer side; $\times 12$.
- 1e. Distal part of the endopod of left maxilliped of a female, from below; $\times 33$.
- 1f. Major part of the two anterior left thoracic legs of the adult male shown in fig. 1a, from the outer side; $\times 11$. *trl*¹, first leg; *trl*², second leg.
- 1g. The six abdominal segments—pleopods omitted—and the base of the caudal fan of a female (from station 4367), from the left side; \times scarcely 6.
- 1h. Left copulatory organ of first pleopod of a perhaps not fully adult male, unrolled and seen from behind; $\times 36$.
- 1i. Inner and median (*lm*) lobes of the organ shown in fig. 1h, from behind; $\times 80$. *p*¹, spiniform process; *p*², terminal process; *p*³, proximal process; *p*⁴, lateral process.
- 1k. The more important part of left copulatory organ of a large and adult male, from behind; $\times 61$. *lm*, median lobe; *ls*, setiferous lobe; *lu*, auxiliary lobe; the other letters as in fig. 1i.

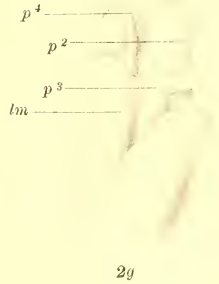
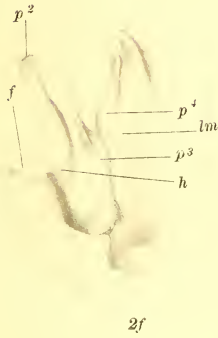
PLATE 4.

Tessarabrachion oculatum H. J. Hansen.

- Fig. 1a. Anterior part of the body with appendages of a male (from station 4793), from the left side; $\times 6$.
- 1b. Anterior part of a female (from station 4793), from above; $\times 7$.
- 1c. Left antennula, excepting the proximal part of first joint of a female, from the outer side; $\times 10$.
- 1d. Left antennula excepting the proximal part of first joint of a male, from the outer side; $\times 10$.
- 1e. Upper flagellum of left antennula of another male, from above; $\times 2\frac{1}{2}$.
- 1f. Right antenna, from below; $\times 7$.
- 1g. Left maxillula of a female, from below; $\times 30$.
- 1h. Left maxilla of the same female, from below; $\times 30$. 1, first joint; 2, second joint; 3, third joint; 4, fourth joint, "palp"; *ex*, exopod.
- 1i. Left maxilliped of a male, from below; $\times 9$.
- 1k. The terminal part of the maxilliped shown in fig. 1i, from below; $\times 33$.
- 1l. Right sixth thoracic leg, branchia omitted, of a female, from behind; $\times 14$.
- 1m. Left copulatory organ of first pleopod of a perhaps not adult male, unrolled and seen from behind; $\times 51$.

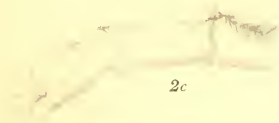


1a

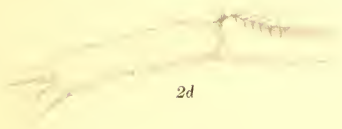


2g

2a

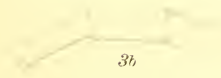


2b



3d

3e

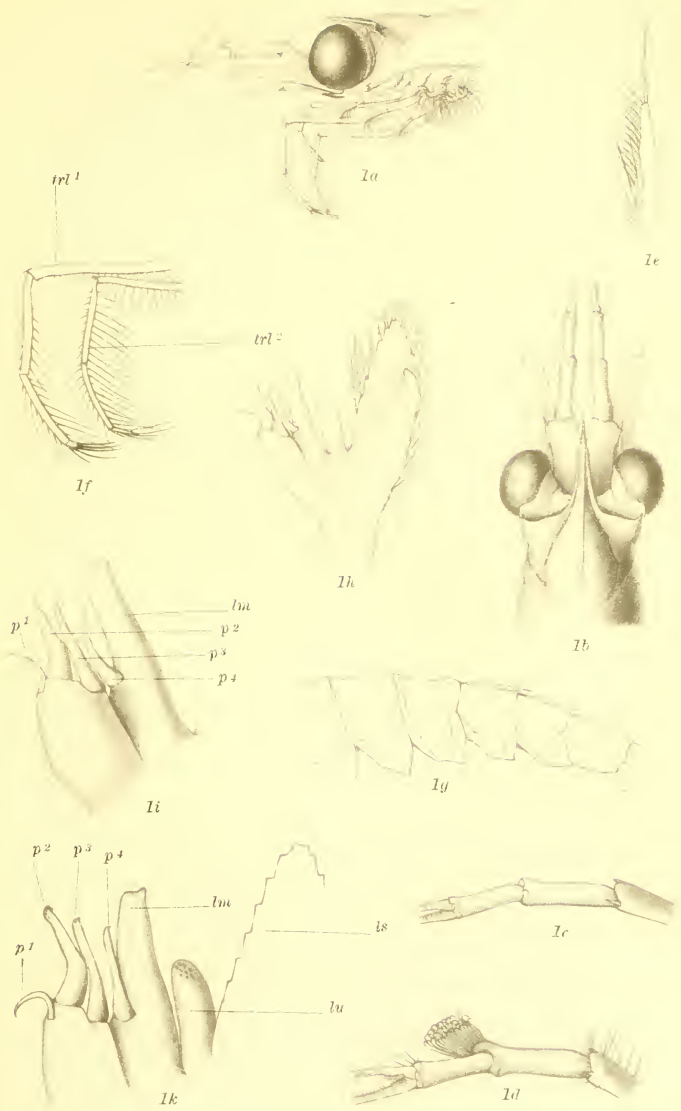


3a

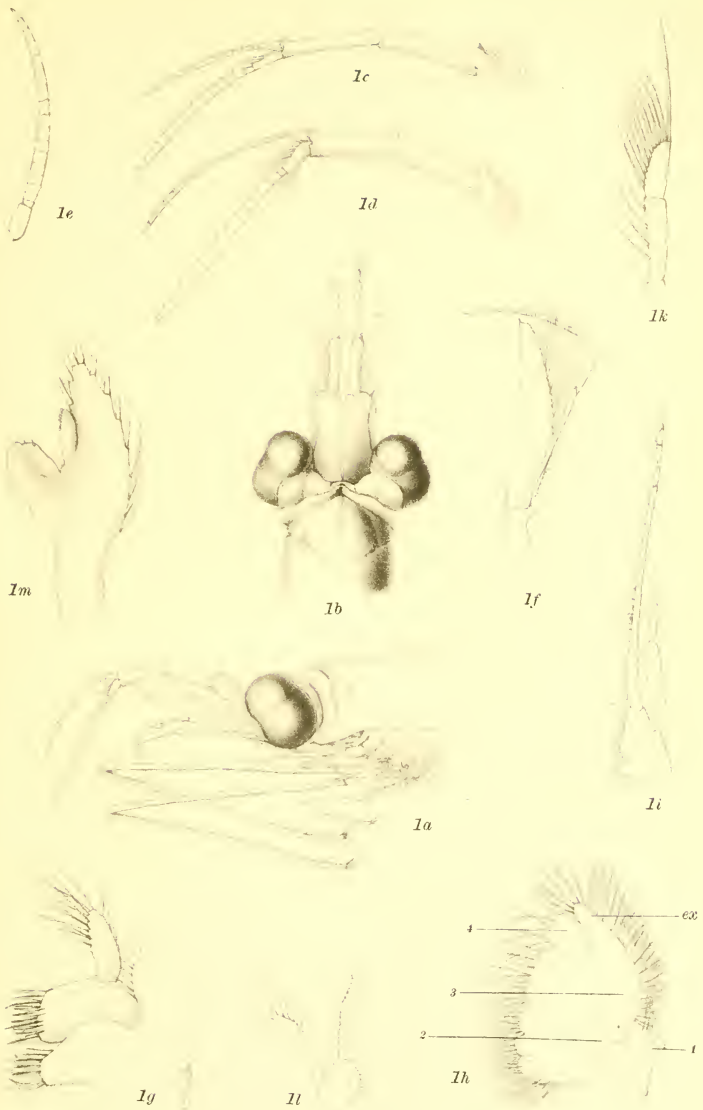
1. THYSANOPODA CORNUTA ILLIG 2. EUPHAUSIA PACIFICA H. J. HANSEN
3. THYSANOESSA LONGIPES BRANDT



1. THYSANOESSA LONGIPES BRANDT 2. T. INERMIS KRÖYER



1. THYSANDESSA SPINIFERA HOLMES



1. TESSARABRACHION OCLATUM H. J. HANSEN

