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UDGIVNE AF
KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND
BD. 80 · Nr. 8

THE GODTHAAB EXPEDITION 1928

LEADER: EIGIL RIIS-CARSTENSEN

SIPHONOPHORA

BY

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WITH 5 FIGURES IN THE TEXT

KØBENHAVN
C. A. REITZELS FORLAG

BIANCO LUNOS BOGTRYKKERI A/S

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INTRODUCTION

The fauna of Siphonophores in the waters west of Greenland has been almost unknown up to now. *Galetta australis* (Quoy & Gaimard) (= *Galeolaria biloba* Sars) was recorded from Greenland, without further particulars, by GEGENBAUR (1860), but this species has not later been found in Greenland waters, and I am inclined to think that the specimens in question were taken elsewhere. Moss (1879) and FEWKES (1888) mention *Stephanomia cara* (A. Agassiz) from Robeson Channel and Lady Franklin Bay, but the identification is doubtful. *Dimophyes arctica* (Chun), which is generally distributed in Greenland waters, was recorded by VANHÖFFEN (1897) from one locality only. My list in "Conspectus Faunæ Groenlandicæ" (KRAMP 1914) contains no other records of siphonophores. JESPERSEN (1923) mentions *Dimophyes arctica* from two localities in Melville Bay. Finally, in a paper by MOSER (1920) *Stephanomia cara* is mentioned from one locality off the southern part of the west coast of Greenland.

The collections dealt with in the present paper contain 7 species, 5 of which are recorded from Greenland waters for the first time; one of them is described as a new species, *Stephanomia orthocanna* n. sp. The other species new to Greenland are: *Vogtia serrata* Moser, *Lensia conoidea* (Keferstein & Ehlers) (= *Galeolaria truncata* (Sars)), *Chuniophyes multidentata* Lens & Van Riemsdijk, and *Physophora hydrostatica* Forskål. The two species previously recorded, *Dimophyes arctica* and *Stephanomia cara*, were found in several localities.

The greater part of the material was collected by the "Godthaab" expedition in 1928. Moreover some specimens, belonging to four different species, were taken in a deep-sea haul in the southern part of Davis Strait by the "Dana" in 1925. Three samples, containing specimens of *Stephanomia cara*, were taken by the inspection vessel "Islands Falk" in 1926. Mr. PAUL M. HANSEN, M. Sc., who during several years carried out fishery investigations along the west coast of Greenland, found *Dimophyes arctica* in numerous localities and also some few nectophores of *Stephanomia cara*. One large colony of this species was also taken

near Kangamiut by Mr. N. L. NIELSEN. Finally, a few specimens of *Dimophyes arctica*, collected by the "Ingolf" expedition in 1895, are included in the following lists of localities.

The collections of the "Godthaab" expedition were carried out in the waters between the west coast of Greenland and the eastern coasts of the arctic Canadian islands and Labrador, from 55°00' to 78°15' N. The first station of the expedition (stat. 1) was however south-west of Iceland, and the specimens from that locality are also included in this paper.

As a rule the actual number of specimens found in the samples are given in the lists, but as not all specimens of *Dimophyes arctica* were picked out of the samples from the "Godthaab" expedition, the relative frequency of that species is expressed by means of the usual designations: *rr* = very few, *r* = few, + = neither rare nor common, *c* = common. These symbols are also used in a few other cases.

The material is in the Zoological Museum of Copenhagen.

I. SYSTEMATIC ACCOUNT OF THE SPECIES

Calycophoræ.

Vogtia serrata Moser.

Vogtia serrata Moser 1913 p. 149.

Hippopodius serratus Moser 1925 p. 420, Pl. 27 figs. 6—8, Pl. 28 figs. 4—9.

Not previously recorded from Greenland.

Material (see the map, fig. 1): "Dana" stat. 2401, 61°47' N. 52°55' W., 9.VII.1925, depth of the bottom 3000 m, ringtrawl 1900 m wire; 3 nectophores; in one of them the stem is well preserved. Only very slight indications of denticulation along the angles.

Geographical distribution: Widely distributed in the oceans, probably cosmopolitan, except in the Arctic. The species occurs in the subantarctic region, in the Tropical Indian Ocean, and in the Pacific as far north as the Sea of Okhotsk and the Bering Sea. It is not known with certainty from the Mediterranean, and in the Atlantic Ocean it is only recorded from the eastern parts and not farther north than the Bay of Biscay, 46°19' N. (BIGELOW and SEARS 1937). It mainly occurs in the deep and intermediate strata, but may occasionally ascend to the surface.

The present record of this species in deep water in the southern part of Davis Strait greatly augments the known area of distribution and confirms the supposition that it is generally distributed in the deeper parts of the oceans.

(Galetta australis (Quoy & Gaimard).

Galeolaria australis Quoy & Gaimard 1834 p. 43. Pl. 5 figs. 30—31.

Diphyes biloba M. Sars 1846 p. 45, Pl. 7 figs. 16—21.

Galeolaria biloba Haeckel 1888 pp. 151, 362.

Galeolaria australis Bigelow 1911 p. 238.

Galetta australis Bigelow 1931 p. 559, figs. 204—207.

Greenland records:

Diphyes sarsii Gegenbaur 1860 p. 372, Pl. 29 figs. 30—31.

(*Galeolaria biloba* Kramp 1914 p. 438).

The description of "*Diphyes sarsii*" was based upon some specimens which GEGENBAUR had received from the Zoological Museum of Copenhagen; they were said to have been collected off the Greenland coast. I have looked for these specimens in our collections, but have not found them. There are two small bottles labelled "Greenland" without further particulars. One of them contains two superior and two inferior nectophores, collected by HOLBØLL and marked "*Diphyes*", without specific name; these I have identified as *Galetta australis*. The other bottle contains two superior nectophores, identified as *Diphyes biloba* Sars; these might possibly be the type specimens of *Diphyes sarsii*, the name being changed, probably by LÜTKEN, when the identity of the two species was stated (in days gone by it was not an established rule to preserve the original label when a new one was written); but it is not very probable, because there are no inferior nectophores, and GEGENBAUR described both the superior and the inferior nectophores.

None of the expeditions of the last fifty years ("Ingolf", "Tjalfe", "Godthaab", etc.) have taken this species in Greenland waters in spite of their intensive collections with modern appliances. Other expeditions fishing with the same kinds of nets have taken it several times in the eastern parts of the North Atlantic. One is inclined to think, therefore, that it does not occur in Greenland waters at all. We cannot exclude the possibility that the labelling of the old specimens mentioned above, Grønland (in one of the two labels written "Grønland", in quotation marks) only means that the specimens were taken during a journey to and from Greenland, without saying anything of when and where they were found; they may have been taken anywhere between Scotland and Greenland. Until the occurrence of *Galetta australis* in Greenland waters has been confirmed by future collections I prefer to leave the question open, whether this species really belongs to the Greenland fauna.

Geographical distribution: Almost cosmopolitan; in the eastern Atlantic area the species occurs as far north as the coasts of Norway and Spitzbergen, but it is not recorded from Iceland. In the western Atlantic it is quite common in the tracts between the Bahama and Bermuda Islands and towards the southern coasts of New England, but it is not recorded north of 35°27' N., off Cape Hatteras. This makes it even less probable that it occurs in Greenland waters. Its occurrence in the North Atlantic seems to be restricted to the Gulf-Stream area, following the Gulf Stream to the waters between Scotland and Iceland and further along the Norwegian coast to Spitzbergen).

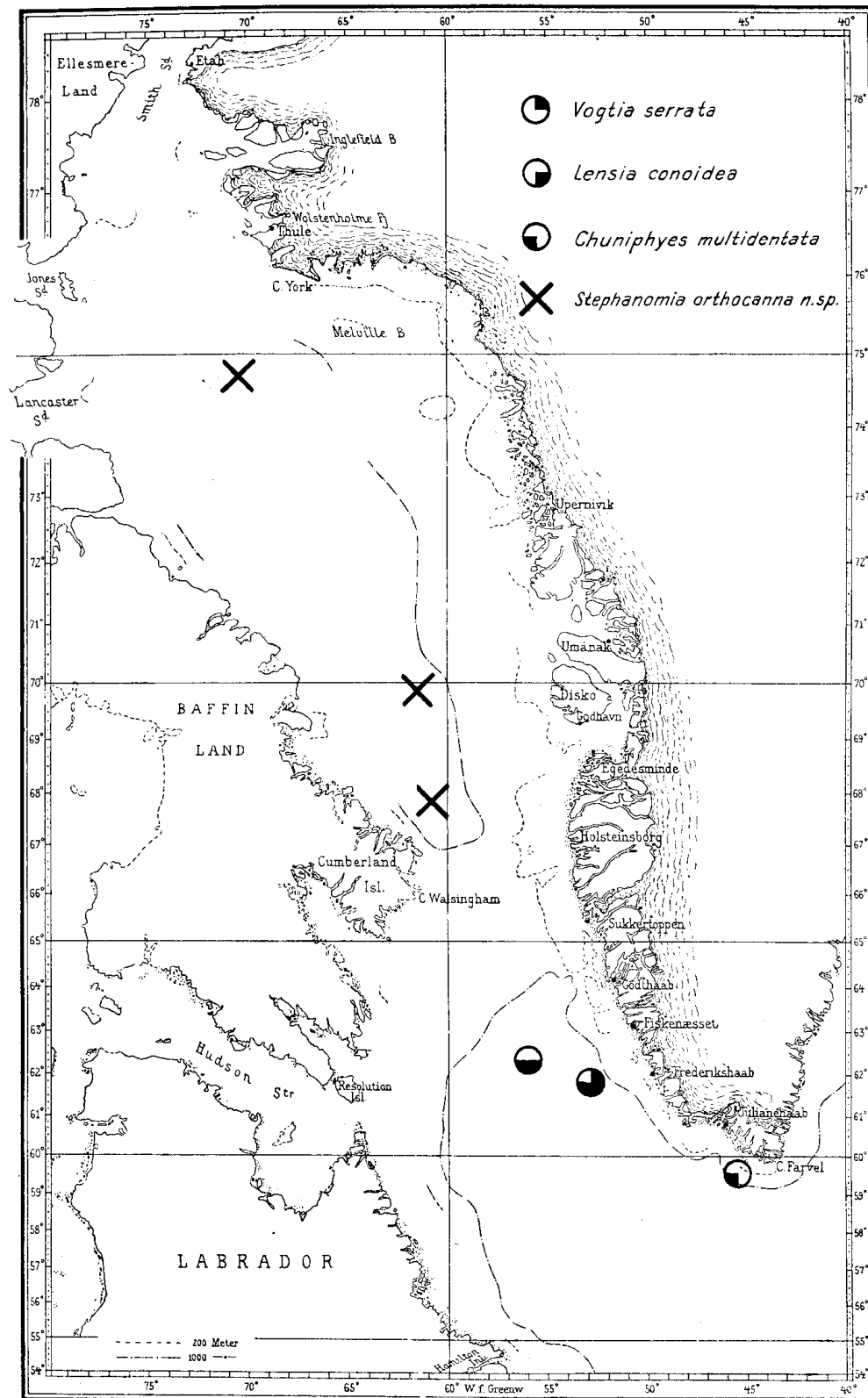


Fig. 1.

Lensia conoidea (Keferstein & Ehlers).

Diphyes truncata M. Sars 1846 p. 41, Pl. 7 figs. 1—15.

(name preoccupied by Quoy & Gaimard 1834).

Diphyes conoidea Keferstein & Ehlers 1860 p. 260; 1861 p. 16, Pl. 15 figs. 6—7.

Galeolaria truncata Haeckel 1888 p. 363.

Lensia truncata Totton 1932 p. 340.

Lensia conoidea Bigelow & Sears 1937 pp. 48, 112, figs. 27—35.

Not previously recorded from Greenland.

Material (see the map, fig. 1):

“Godthaab” 1928: Stat. 1, south-west of Iceland, 63°19' N. 26°50' W., 24.V., depth 1130 m, 1000 m wire; stat. 24, southern part of Davis Strait, 62°19' N. 56°00' W., 14.VI., depth 2550 m, 1000 and 2500 m wire.

“Dana” 1925: Stat. 2401, southern part of Davis Strait, 61°47' N. 52°55' W., 9.VII., depth 3000 m, 1900 m wire, 7 superior nectophores.

Representative samples from the “Godthaab” stations contain the following number of specimens:

stat. 1, 1000 m wire:	4 superior nectophores,	37 eudoxids.
— 24, 1000 - — 2 — —	25	—
— 24, 2500 - — 3 — —	2	—

Geographical distribution: Widely distributed in the oceans and with a very considerable vertical range, from the surface downwards. In the North Atlantic it mainly seems to occur in the Gulf-Stream area; it is recorded from the deep-sea areas south of Iceland, and it follows the Gulf Stream to the west coast of Norway, where it has been found as far north as 61°30' N., near Florö (SARS), and it also occurs in the Skagerrak. In the western Atlantic it is recorded from deep water off the Gulf of Maine and in the Gulf of Grand Manan, west of Nova Scotia, about 44° N. In the northern waters, north of the Gulf Stream, it seems to avoid the upper strata, but the finds of the “Godthaab” and the “Dana” show that in the deep and intermediate strata its northward distribution extends to the limits of the Atlantic deep-sea basin on both sides of Greenland.

Chuniphyes multidentata Lens & Van Riemsdijk.

Lens & Van Riemsdijk 1908 p. 13, Pl. 1 figs. 9—11, Pl. 2 figs. 12—15.

Bigelow 1911*a* p. 348.

Bigelow 1911*b* p. 262, Pl. 8 fig. 9, Pl. 10 fig. 7, Pl. 12 fig. 6.

Bigelow 1931 p. 566, figs. 208—209.

Bigelow & Sears 1937 pp. 60, 122, fig. 48.

Not previously recorded from Greenland.

Material (see the map, fig. 1):

“Godthaab” 1928: Stat. 1, southwest of Iceland, 63°19' N. 26°50' W.,

24.V., depth 1130 m, 1000 m wire (2 superior and 4 inferior nectophores); stat. 5, south-west of Kap Farvel, 59°30' N. 45°23' W., 29.V., depth 294 m, 100—300 m wire (1 superior and 1 inferior nectophore); stat. 24, southern part of Davis Strait, 62°19' N. 56°00' W., 14.VI., depth 2550 m, 1000 m wire (one superior nectophore).

"Dana" 1925: Stat. 2401, southern part of Davis Strait, 61°47' N. 52°55' W., 9.VII., depth 3000 m, 1900 m wire (13 superior nectophores).

In all the specimens the somatocyst is transversely prolonged into two horns, as in specimens from the Bay of Biscay described by BIGELOW (1911*a* p. 349 and 1911*b* p. 263).

Geographical distribution: Widely distributed in the oceans, recorded from tropical and temperate parts of the Pacific, and occurring on both sides of the Atlantic from South Georgia to the Bay of Biscay, but very rarely carried into the Mediterranean. It mainly occurs in deep and intermediate strata, but may occasionally ascend to the surface.

The occurrence of this large and easily recognisable siphonophore in the waters east and west of southern Greenland shows that it has a much more extensive distribution in the Atlantic Ocean than hitherto supposed.

Dimophyes arctica (Chun).

Diphyes arctica Chun 1897 p. 19, Pl. 1 figs. 1—10.

Greenland records:

Diphyes arctica Vanhöffen 1897 p. 274, Pl. 2 fig. 3.

(*Diphyes arctica* Kramp 1914 p. 439).

Diphyes arctica Jespersen 1923 p. 110.

Material (see the map, fig. 2):

"Ingolf" 1895: Stat. 24, 63°06' N. 56°00' W., 25.VI., depth 2258 m, vertical haul (1 nectophore and 8 eudoxids).

"Dana" 1925: Stat. 2401, 61°47' N. 52°55' W., 9.VII., depth 3000 m, ringtrawl, 1900 m wire (14 nectophores and 18 eudoxids).

"Godthaab" 1928: Stat. 1, south-west of Iceland, 63°19' N. 26°50' W., 24.V., depth 1130 m, 1000 m wire (rr); stat. 5, 59°30' N. 45°23' W., 29.V., 294 m, 100 m wire (rr), 300 m wire (rr); stat. 8, 58°35' N. 48°10' W., 30.V., 3500 m, 35—100 m wire (rr); stat. 18, 61°28' N. 63°44' W., 475 m, 400 m wire (rr); stat. 20, 61°39' N. 62°08' W., 12.VI., 620 m, 600 m wire (rr); stat. 24, 62°19' N. 56°00' W., 14.VI., 2550 m, 1000 m wire (rr); stat. 39, 66°51' N. 57°40' W., 3.VII., 680 m, 600 m wire (+); stat. 54, 69°50' N. 61°36' W., 14.VII., 1880 m, 1200 m wire (rr), 3000 m wire (r); stat. 77, 75°26' N. 62°26' W., 31.VII., 820 m, 800 m wire (+); stat. 117, 76°04'5 N. 80°56' W., 17.VIII., 690 m, 670 m wire (rr); stat. 132,

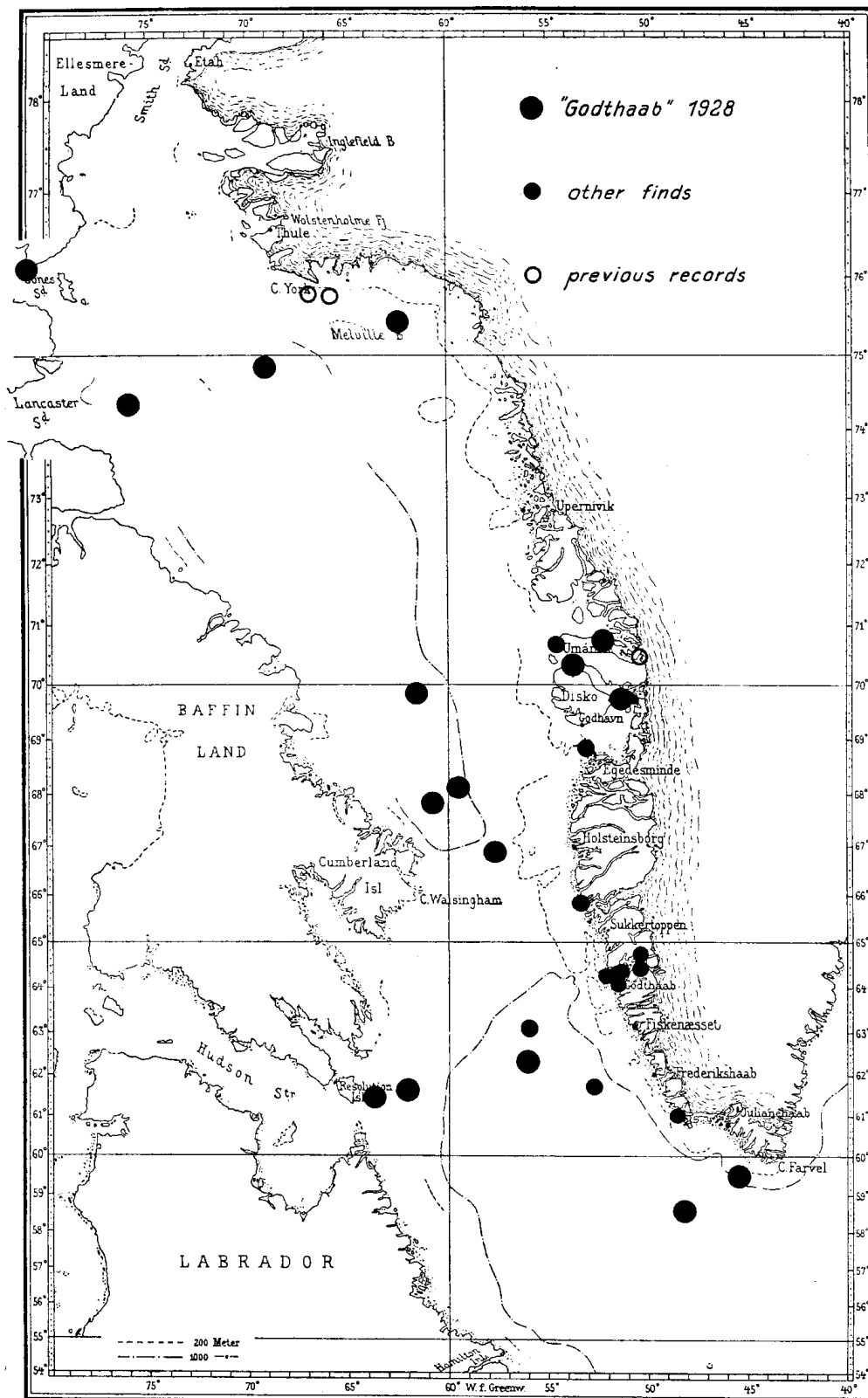
74°20' N. 75°56' W., 22.VIII., 685 m, 650 m wire (r); stat. 136, 74°50' N. 69°00' W., 23.VIII., 1500 m, 500 m wire (r), 1500 m wire (rr); stat. 146, 70°44' N. 52°16'5 W., 4.IX., 570 m, 250 m wire (rr); stat. 148, 70°20' N. 53°50' W., 6.IX., 575 m, 350 m wire (r); stat. 153, 69°44' N. 51°29'5 W., 7.IX., 480 m, 350 m wire (rr); stat. 161, 68°07' N. 59°27' W., 13.IX., 1250 m, 500 m wire (rr); stat. 162b, 67°42' N. 60°31' W., 14.IX., 1500 m, 1800 m wire (r).

PAUL M. HANSEN 1930—1939: Kapisigdlit, 64°27' N. 50°15' W., 16.X.30, 100 m wire (2 nectophores + 8 eudoxids); off Ameralikfjord, 64°03' N. 51°40' W., 23.V.33, 100 m wire (4 n. + 8 e.); mouth of Kangersuneq, 64°40' N. 50°10' W., 25.V.33, 100 m wire (6 n. + 24 e.); off Narssarmiut, 65°53' N. 53°15' W., 18.VI.34, 50 m wire (1 n. + 1 e.); Sârdloq, 64°22' N. 51°40' W., 9.VII.34, 50 m wire (2 n. + 10 e.); off Kangeq, 61°00' N. 48°30' W., VII.34, 50 m wire (1 e.); off Qârusuk, 64°20' N. 51°30' W., 6.VI.35, 100 m wire (2 n.); off Nûgssuaq, 70°40' N. 54°30' W., 5.IX.35, 100 m wire (1 e.); off Sârdloq, 64°22' N. 51°38' W., 8.VI.36, 50 m wire (4 n. + 9 e.); off Kangeq, 64°07' N. 52°05' W., 15.VI.37, 50 m wire (3 e.); off Qârusuk, 64°20' N. 51°30' W., 26.VI.37, 100 m wire (19 n. + 75 e.); off Ameralikfjord, 64°03' N. 51°40' W., 5.VII.37, 100 m wire (17 n. + 5 e.); off Hunde Eiland, 68°52' N. 53°00' W., 1.VI.38, 100 m wire (7 n.); off Kangeq, 64°07' N. 52°05' W., 2.VII.38, 100 m wire (8 n. + 8 e.); mouth of Godthaabsfjord, 64°10' N. 51°45' W., 5.VI.39, 100 m wire (2 e.).

Previously recorded from Little Qarajaqfjord, about 70°30' N. 50°40' W. (VANHÖFFEN 1897) and from two localities in Melville Bay, 75°46' N. 65°50' W. and 75°50' N. 66°50' W., in September 1916 (JESPERSEN 1923).

According to this list of localities and the map, fig. 2, *Dimophyes arctica* is evidently generally distributed in the waters west of Greenland, though it is usually not taken in any considerable number. The localities, where it was taken by the "Godthaab" expedition, are evenly scattered over the area investigated as far north as Jones Sound and Melville Bay; Mr. PAUL HANSEN mainly found it in several localities in the neighbourhood of Godthaab, and also in some other places as far north as Nûgssuaq.

The vertical distribution is likewise very extensive; in the coastal region the species was mainly found in hauls with 50—100 m wire out, i. e. about 25—50 m below the surface, but it was also taken in the few deeper hauls made in the fjords ("Godthaab" stat. 146, 148, and 153). In the open sea it was mainly taken in deep and intermediate strata, as far down as about 2000 m below the surface (stat. 54), while it was very rarely met with in the upper strata. The vertical distribution appears to be the same in the two deep-sea areas, north as well as south

Fig. 2. *Dimophyes arctica*.

of the submarine ridge between Greenland and Baffin Land, and is thus apparently independent of the hydrographic conditions, which are very different in these two areas.

The material available is too small for a reliable enumeration of the proportionate number of eudoxids at different seasons in different parts of the Greenland waters, but a few remarks may be made on this subject. The numbers of nectophores and eudoxids in Mr. PAUL HANSEN's collections are given in the list above; the numbers are very variable, but when all the observations are grouped according to the months when the collections were made, we find that in samples taken between 23rd May and the end of June the eudoxids make about 75 % of the total number of specimens, in samples from July about 50 %; also in the two samples taken in September (off Nûgssuaq) and October (Kapisigdlit) eudoxids were present. In representative samples from the "Godthaab" expedition the percentage numbers of eudoxids are as follows: Stat. 5, 18, and 20, southern part of Davis Strait, 29th May to 12th June, about 25 % of the total number of specimens; stat. 77, 117, 132, and 136, Baffin Bay and adjacent waters, 31st July to 23rd August, about 66 %; stat. 146, 148, and 153, Umanak Fjord and Vaigat, 4th to 7th September, about 50 %; stat. 161 and 162, Baffin Bay 13th to 14th September, about 16 %. These figures show that eudoxids are liberated throughout the period in which investigations have been carried out in Greenland waters, i. e. from May to October, and there is a slight indication of a maximum of propagation taking place in the Greenland coastal area in June, in the open sea somewhat later, in July or August. There are, however, so many accidental variations that these results may not be regarded as fully trustworthy. It should be added that eudoxids were found at all depths, from the surface water down to about 2000 m below the surface.

Geographical distribution: *Dimophyes arctica* has a cosmopolitan distribution, also comprising the high-arctic regions. In the Atlantic area it occurs from the Antarctic to Spitzbergen and the Kara Sea and to the waters east and west of Greenland, but it has never been found in the neighbourhood of Iceland, and it also seems to be lacking along the east coast of America. In warm and temperate regions it occurs in the deep strata, but in colder areas it may be found at all depths, as clearly seen from the collections in Greenland waters.

Physophoræ.*Physophora hydrostatica* Forskål.

Physophora borealis M. Sars 1877 p. 32, Pl. 5, Pl. 6 figs. 1—8.

Not previously recorded from Greenland.

Material (see the map, fig. 3):

"Godthaab" 1928: Stat. 1, south-west of Iceland, 63°19' N. 26°50' W., 24.V., depth 1130 m, 50 m wire (palpons and two young colonies); stat. 5, 59°30' N. 45°23' W., 29.V., 294 m, 35—200 m wire (2 colonies), 300 m wire (one young colony); stat. 27, 62°37' N. 51°40' W., 16.VI., 340 m, 100 m wire (3 colonies); stat. 177, 65°07'5 N. 53°29' W., 2.X., 78 m, 60 m wire (one colony and several nectophores and palpons); stat. 185, 61°11' N. 49°38'5 W., 9.X., 290 m, 50 m wire (4 colonies, several loose nectophores, palpons, and siphons).

All these localities, except stat. 1, are situated along the southern part of the west coast of Greenland between Kap Farvel and Sukkertoppen, at some distance from the shore (about 20—40 miles), at temperatures between about 3° and 4.7° C.

Geographical distribution: Almost cosmopolitan, though never recorded from true arctic regions. In the North Atlantic it is especially common in the Gulf-Stream area, and by the Gulf Stream it is regularly carried towards the west coast of Norway and further northwards at least as far as North Cape and occasionally further into the Barents Sea. It is also quite common off the southern and western coasts of Iceland in the water of the Irminger Current. The records from West Greenland mentioned above show that it follows that part of the Irminger Current which crosses Danmark Strait and accompanies the East-Greenland Polar Current round Kap Farvel and northwards along the southern part of the west coast of Greenland. It mainly occurs in the upper strata, but may occasionally be taken in rather deep water; it is mainly loose nectophores and palpons which sink into the deep strata.

Stephanomia cara (A. Agassiz).

Nanomia cara A. Agassiz 1863 p. 181.

Nanomia cara A. Agassiz 1865 p. 200, figs. 331—350.

Nanomia cara Fewkes 1888 p. 213, Pl. I, II, III.

Cupulita cara Haeckel 1888 p. 367.

Stephanomia cara Metschnikoff 1874 p. 62.

Greenland records:

?*Nanomia cara* Moss 1879 p. 123, 125.

?*Agalmopsis* (*Nanomia*) *cara* Fewkes 1888 p. 404.

(*Cupulita cara* Kramp 1914 p. 438).

Cupulita cara Moser 1920 p. 188.

Two species of Agalmidæ are known to occur in northern waters, *Stephanomia cara* (A. Agassiz) and *Agalma elegans* (M. Sars). They are difficult to distinguish from each other, when only the naked stem with the pneumatophore is present, and in such poor condition they are frequently found in the plankton samples. I believe, however, that the specimens mentioned below all belong to *Stephanomia cara*. The stems all have the same appearance, and several of them could be identified with certainty, because nectophores, palpons, tentilla, or bracts were found together with the stems, in some cases even attached to them. Moreover *Agalma* has a somewhat more southern distribution than *Stephanomia*; both occur in the Gulf-Stream area and may be carried into the North Sea to the southern parts of the Norwegian coast, but off the east coast of North America there is a marked difference in their distribution; *Agalma* does not occur north of Cape Cod, while *Stephanomia* is very common in the Gulf of Maine right up to Grand Manan.

Material (see the map, fig. 3):

Kangamiut, about 65°50' N. 53°15' W., 1916, collected by Mr. N. L. NIELSEN (one large colony, all kinds of individuals present, though detached from the stem).

"Islands Falk" 1926: Ameralikfjord, about 64°05' N. 51° W., 13.VII. (1 stem and 1 nectophore); Fylla Bank, 64°02' N. 52°25' W., 27.VII. (many nectophores and some palpons); 64°01' N. 52°40' W., 28.VII. (numerous nect.).

"Godthaab" 1928: South-west of Iceland: Stat. 1, 63°19' N. 26°50' W., 24.V., depth 1130 m, 50 m wire (numerous stems and nectophores, some palpons), 150 m wire (10 stems and some nect.), 1000 m wire (2 stems and a few nect.).—Off the west coast of Greenland: Stat. 5, 59°30' N. 45°23' W., 29.V., 294 m, 100 m wire (rr), 300 m wire (several stems and some nect.); stat. 20, 61°39' N. 62°08' W., 12.VI., 620 m, 600 m wire (1 stem); stat. 24, 62°19' N. 56°00' W., 14.VI., 2550 m, 35 m wire (rr), 100 m wire (3 stems); stat. 26, 62°33' N. 52°43' W., 15.VI., 2600 m, 35 m wire (2 stems), 100 m wire (5 stems); stat. 27, 62°37' N. 51°40' W., 16.VI., 340 m, 35 m wire (2 stems), 100 m wire (rr); stat. 31, 64°00' N. 52°41' W., 18.VI., 50 m, 35 m wire (4 stems); stat. 32, 63°57' N. 53°18' W., 19.VI., 680 m, 35 m wire (2 stems); stat. 185, 61°11' N. 49°38' W., 9.X., 290 m, 250 m wire (1 stem, with palpons) stat. 186, 61°17' N. 49°11' W., 9.X., 120 m, 100 m wire (1 stem).

PAUL M. HANSEN: Evighedsfjord, about 65°50' N. 53° W., 23.VI. 1926 (1 nectophore); Sârdloq, 60°32' N. 46°05' W., 8.IX.1937, 100 m wire (3 nectophores).

Previously recorded from a locality off Julianehaab, 60°07' N. 48°26' W., 3.V.1909, "Tjalfe" (MOSER 1920).



None of the recent expeditions have taken this species in Greenland waters north of about 66° N. It seems peculiar, therefore, that it was recorded from two localities in the far north by Moss (1879) and by FEWKES (1888). One can hardly suppress a doubt as to the correctness of these identifications; both of them were based upon notes and sketches made on board the ships, and not upon examination of the specimens. Moss writes as follows: p. 123: "While running the gauntlet through Robeson Channel on our return, several *Nanomia* were seen, like coral necklets, in the water, and one was captured and sketched for future identification." p. 125: "The *Nanomia* was probably *N. cara*, A. Agassiz. Identification, however, depends only on the sketch; for the specimen bottled by Captain FEILDEN has fallen to pieces." The specimen recorded by FEWKES was seen in the water on April 24th 1884, and FEWKES writes (p. 44): "The Physophore collected by the Lady Franklin Bay party is probably the same as the *Agalmopsis* (*Nanomia*) *cara* (A. Ag.), Fewkes, recorded from Robeson Channel by Dr. E. L. Moss." Though observed at the surface, the specimens from these northern localities may possibly have belonged to the new species from the deep parts of Baffin Bay, which I describe below.

In the waters west of Greenland *Stephanomia cara* has mainly been found in the neighbourhood of the Greenland coast, as far north as about 66° N., but it was also met with in the middle and western parts of Davis Strait ("Godthaab" stat. 20 and 24.) It evidently avoids the cold water of the Polar currents and only ascends into the surface layers when their temperature is somewhat above 0° . At stat. 20, off Resolution Island, it was taken below the water of the Labrador Current at a temperature of about 3.5° , and at the other stations of the "Godthaab" expedition the temperature at the depths where this species was found, varied between 1.2° and 6.0° , most of the observations being above 3° . Apart from the two finds at "Godthaab" stat. 20 and 24 the distribution of *Stephanomia cara* off the west coast of Greenland almost coincides with that of *Physophora hydrostatica*.

Geographical distribution: If it is true that *Stephanomia cara* is identical with *S. bijuga* (Delle Chiaje), the species has a very extensive distribution, comprising the tropical parts of the Pacific and Atlantic Oceans and the Mediterranean. The northern form, *S. cara*, occurs off the northern part of the east coast of North America and in the Gulf-Stream area, whence it is carried into the North Sea and the Skagerrak and to the southern and western coasts of Iceland, as also to the Davis Strait. It is mainly found in the upper and intermediate strata.

Stephanomia orthocanna n. sp.

Material (see the map, fig. 1):

"Godthaab" 1928: Stat. 54, 69°50' N. 61°36' W., 14.VII., depth 1880 m, 3000 m wire, about 2000 m below the surface, temperature $\div 0.4^{\circ}$ (several stems and nectophores); stat. 136, 74°50' N. 69°00' W., 23.VIII., depth 1500 m, 1500 m wire, about 1000 m below the surface, temp. 0.0° (several stems and nectophores); stat. 162 *b*, 67°42' N. 60°31' W., 14.IX., depth 1500 m, 1800 m wire, about 1200 m below the surface, temp. $\div 0.2^{\circ}$ (several stems, nectophores, siphons, and a single bract).

The colonies have all fallen to pieces, but as no other physophore siphonophores were present anywhere near these localities, it is admissible to presume that the fragments all belong to the same species. It is a large form, the nectophores especially being of considerable size. The species is mainly characterized by the straight course of the lateral canals in the nectophores; I therefore propose the specific name of *orthocanna* for this new species. Fragments from stat. 162 *b* are selected as representing the holotype.

Description: Stem. Nectosome short, siphosome very long, in the largest specimen more than 15 cm to the broken hind end, much and irregularly twisted in sharp curves and changing spirals. The diameter of the stem is about 3 mm in the upper portion, about 2 mm in the distal part. The pneumatophore (fig. 5 *a*) is comparatively small, 4.5—5 mm long, flask-shaped, greatest diameter about 2 mm.

Nectophores (fig. 4 *a—d*) very large, the largest of them 13 mm broad and 15 mm in length, height about half the length. The proximal half of the nectophore is cordiform, fairly evenly rounded, with only a slight indication of a blunt horn on each side, no sharp edges; in the cleft between the two lateral dilatations is a small median lappet, about as high as broad, with a slight central incurvation. The distal half of the nectophore is broadly cone-shaped. There is a deep longitudinal depression on the lower (ventral) side of the nectophore; in the distal portion the depression comprises the ventral wall of the nectosac which, accordingly, is horseshoe-shaped in cross-section (fig. 4 *d*). The nectosac is very large and spacious, trapezoid in outline, the two basal, lateral horns being very broad and blunt. The nectosac does not reach to the extreme end of the body, but the gelatinous substance surrounds the velar opening like a funnel. The somatocyst is deeply sunk in a narrow longitudinal furrow. The four radial canals are straight, also the lateral ones which, after they have turned round the extreme corners of the lateral horns of the nectosac, proceed directly to the ring-canal without the slightest indication of slings. At the distal end of the nectophore

the infolded, ventral edge has a median cleft and protrudes somewhat beyond the dorsal edge, which is evenly rounded.

Bract (fig. 4e). The only well-developed bract is found attached to the largest of the stems from stat. 162 *b*; its length is 5 mm, the

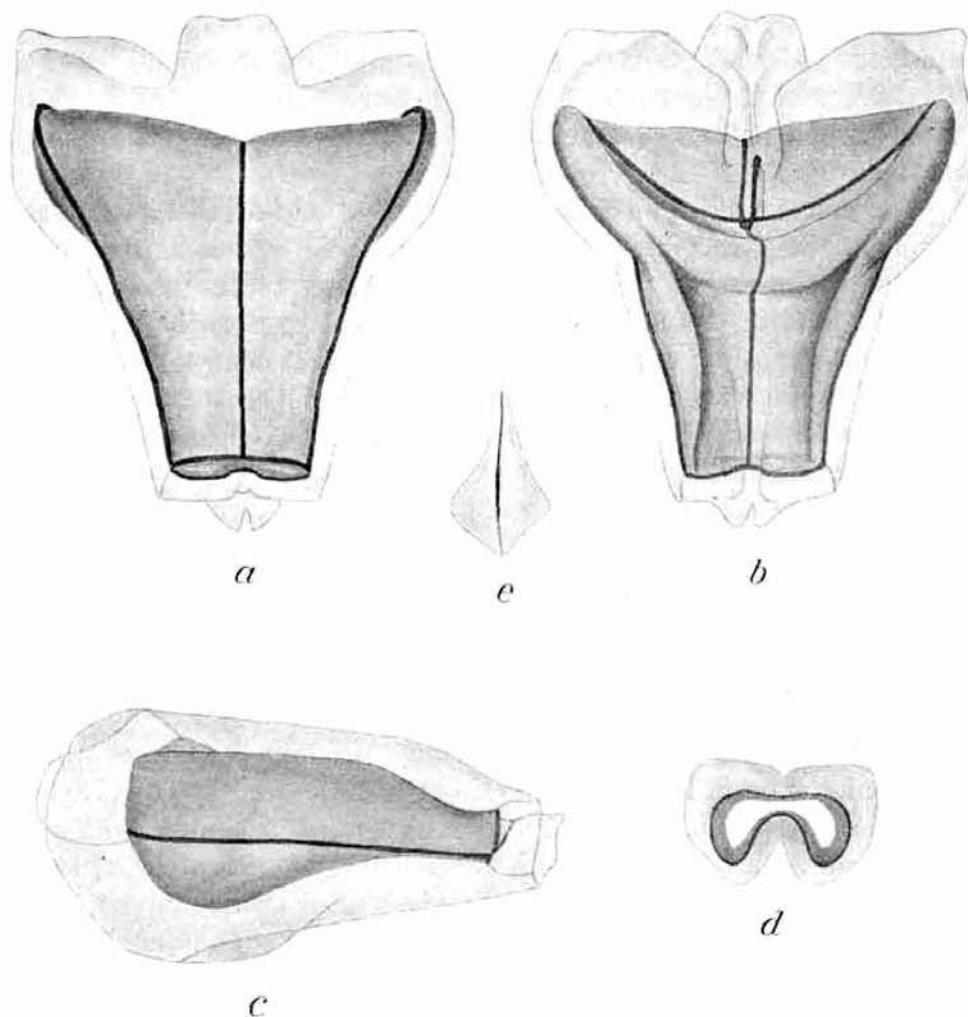


Fig. 4. *Stephanomia orthocanna* n. sp. — *a*—*d* nectophore: *a* dorsal view, *b* ventral view, *c* lateral view, *d* distal end; — *e* bract. — All figures $\times 4$.

greatest breadth 3 mm, thickness about 1 mm. The basal part is slender, the distal part about quadrangular, the distal and the lateral corners being almost rectangular, without protruding horns or points; no ridges on the surface. The central canal is in the median line of the body, slightly widened in the middle part.

Siphons (fig. 5 *b*): The largest siphons are 15 mm in length, spindle- or club-shaped; without a basal swelling, but with thickened, muscular

walls in the distal one-third; this gullet-like portion is frequently turned inside out; the mouth is of varying shape, frequently trumpet-shaped. The trunk of the siphon carries numerous elongated glands ("liver-cells") in longitudinal rows, fairly regularly placed in quincunx position. The tentacle, which issues from the base of the siphon, is irregularly twisted. In most cases the lateral branches are broken off; when present, they only occupy a short space rather near the base of the tentacle.

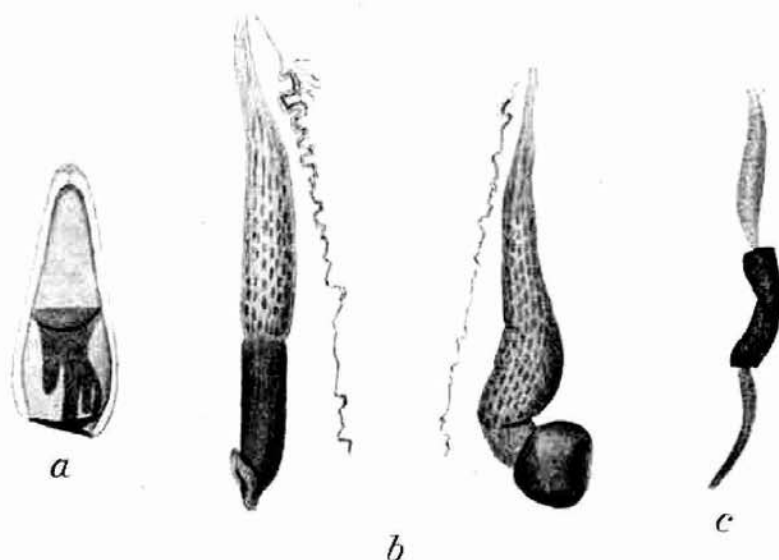


Fig. 5. *Stephanomia orthocanna* n. sp. — *a* pneumatophore, $\times 8$. — *b* siphons, $\times 4$. — *c* tentillum, $\times 50$.

Tentilla (fig. 5*c*). Very few tentilla have remained, and they are not in a condition to allow a proper description. They have only one terminal filament; the cnidoband is slightly coiled, and no involucre is observed.

Palpons and gonophores not observed.

Colour: The stem, when alive, has a bright scarlet colour (noted on board the ship).

Owing to the unicornuate tentilla this species must be referred to the genus *Stephanomia* as defined by BIGELOW (1911 *b* p. 274); it is distinguished from the other species of that genus by the characteristic shape of the nectophores and especially by the straight course of their lateral canals.

Occurrence. *Stephanomia orthocanna* was found in rather considerable numbers in all the three deep-water hauls taken by the "Godthaab" expedition in Baffin Bay, about 1000—2000 m below the surface, in the deep, cold strata with temperatures below 0° . Apparently, therefore, it is a high-arctic species. The only previous records of physophore

siphonophores in high-arctic waters are those by Moss (1879) and FEWKES (1888) of a species observed in the surface water in Robeson Channel and Lady Franklin Bay and by these authors, with some reservation, referred to *Stephanomia* (*Nanomia*) *cara*. As mentioned above, I doubt the correctness of this identification; it is possible, on the other hand, that the specimens in question, though occurring at the surface, belonged to the species just described by me. Most siphonophores have an extensive vertical distribution; if *Stephanomia orthocanna* really is a high-arctic species, it is likely to occur at all depths in Robeson Channel and Smith Sound as well as in the deep strata in Baffin Bay.

II. ZOOGEOGRAPHICAL REMARKS

The composition of the fauna of siphonophores in Greenland waters and the distribution of the 7 species found there, do not support the supposition put forth by MosER (1915 and 1925), that siphonophores are almost completely independent of the temperature of the water. MosER mentions 7 species which are absolutely eurytherm, and among them four of the species recorded above as occurring in Greenland waters: *Lensia conoidea*, *Dimophyes arctica*, *Stephanomia cara*, and *Physophora hydrostatica*. These species certainly have a very extensive geographical distribution, but only one of them, *Dimophyes arctica*, occurs under purely arctic conditions. The distribution of the three others in the North-Atlantic area is more or less correlated with the Gulf Stream and its various branches. *Physophora* and *Stephanomia* are true Gulf-Stream forms; in summer and autumn they are carried into the North Sea to the west coast of Norway, but they are not constant inhabitants of that region. They also occur in the water of the north-going branch of the Gulf Stream called the Irminger Current off the southern and western coasts of Iceland, but they are lacking in the colder areas off the north and west coasts. In the waters west of Greenland both species are fairly common off the southern part of the Greenland coast at temperatures between 1.2° and 6.0°, but they avoid the cold tracts of the Polar currents along the coasts of Greenland and Labrador, and their northward distribution in Davis Strait does not proceed beyond about 66° N. The records of *Stephanomia cara* in Robeson Channel and Lady Franklin Bay, in the far north, are probably due to a mistake.

Physophora and *Stephanomia cara* mainly belong to the upper strata, while *Lensia conoidea*, which has a similar horizontal distribution in northern waters, has a considerably wider vertical distribution; in the Gulf-Stream area it may occur in the upper strata, but in Danmark Strait and Davis Strait it has only been found in deep water, more than 650 m below the surface.

Vogtia serrata and *Chuniphyes multidentata* are widely distributed species which have their main occurrence in the deep and intermediate strata of the oceans, though sometimes ascending to the surface. Up

to now they were not known in the Atlantic north of the Bay of Biscay, and there also they may occur in the upper strata. *Vogtia* was found in deep water in Davis Strait together with *Chuniphyes*, which was also taken in deep water in Danmark Strait south-west of Iceland. West of Greenland *Chuniphyes* was also found at higher levels, about 50—200 m below the surface, but only in the body of Atlantic water (temperature 3.3° — 4.7°) below the water of the Polar current. It can hardly be doubted that it is the temperature of the water which prevents a further distribution of these species in Greenland waters.

The absolutely eurytherm character of *Dimophyes arctica* is emphasized by MOSER, and in the waters west of Greenland its occurrence really seems to be rather independent of the temperatures within the limits observed in that area, $\div 0.7^{\circ}$ — $+6.0^{\circ}$. 58 % of the catches of *Dimophyes* are however from temperatures below 1° , 21 % even from below 0° . BIGELOW & SEARS (1937 pp. 131—133) remark that even though *Dimophyes arctica* has a cosmopolitan distribution "as far as latitude is concerned", its vertical distribution in the different areas shows a marked dependence on temperature, the great majority of the specimens being found in strata where the temperature is lower than 12° . We may still be allowed, therefore, to regard *Dimophyes arctica* as a cold-water species penetrating more or less from the Polar regions into warmer seas.

MOSER also states that the Arctic has no siphonophore fauna of its own, as all the species occurring in the Arctic have a cosmopolitan distribution. This seems to be contradicted by the remarkable find of the species described above as *Stephanomia orthocanna* n. sp., which was found in three localities in the arctic deep-sea basin of Baffin Bay, at temperatures between 0.0° and $\div 0.4^{\circ}$, and nowhere else. It is possible that the specimens recorded by MOSS and FEWKES from the surface water in Robeson Channel and Lady Franklin Bay belong to the same species; but whether this be true or not, it is a remarkable fact that no siphonophore, except *Dimophyes arctica*, is found in Greenland waters between the true arctic basin of Baffin Bay and the considerably warmer tracts in the southern part of Davis Strait. *Stephanomia orthocanna* n. sp. seems to occur under high-arctic conditions only; *Dimophyes arctica* is a cosmopolitan cold-water species; *Physophora hydrostatica* and *Stephanomia cara* are epiplanktonic Gulf-Stream forms, rarely found in Greenland waters at temperatures lower than 3° and never below 1.2° ; *Vogtia serrata*, *Chuniphyes multidentata*, and *Lensia conoidea* occur east and west of the southern part of Greenland in areas which form direct continuations of the Atlantic deep-sea basin.

The Greenland fauna of siphonophores, though only comprising seven species, is thus composed of species which are very different in zoogeographical respect.

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