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KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND
Bd. 91 · Nr. 3

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BY

P. L. KRAMP

WITH 8 FIGURES IN THE TEXT

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C. A. REITZELS FORLAG
BIANCO LUNOS BOGTRYKKERI A S
1932

Pris: Kr. 1,50.

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A. CENRAA
STATSSKOLE

The numerous deep fjords on the west coast of Greenland, south of the Disko Bay, can be divided into two groups according to the depth at the entrance to the fjord. In the fjords of the so-called "Atlantic" type the entrance is deep enough to allow the comparatively warm water of Atlantic origin in the deeper parts of the Davis Strait to come into the fjord, in which the bottom water, therefore, has a fairly high temperature. In fjords of the "Arctic" type a threshold at the entrance prevents the Atlantic water from entering the fjord, in which the bottom water therefore is very cold. It was to be expected that the different hydrographical conditions in these two types of fjords would have an essential influence on the composition of the fauna, and the Committee for Geological and Geographical Investigations in Greenland therefore planned an investigation of a number of fjords belonging to both types.

As representative of the Arctic fjords was selected North Strömfjord, somewhat north of Holstensborg (see the map, fig. 8, p. 32). The mouth of the fjord is at Lat. 67°28′ N. The fjord is about 100 miles long, very narrow, and the inner part is divided into two branches. A small glacier debouches into the south-eastern branch. The greatest depth measured in the fjord is somewhat more than 500 m. The temperature of the surface water is dependent on the air-temperature; from 50 or 60 m downwards the temperature is said to be constantly negative, but I doubt whether this is quite correct (see below, p. 33). North Strömfjord was investigated in June-July 1911 by Dr. V. Nordmann.

In the summer of 1912 Mr. K. Stephensen examined some fjords of the Atlantic type: Kvanefjord near Frederikshaab, Lat. 61°55′ N., is about 25 miles long (see the map, fig. 7, p. 31). Three glaciers in the inner parts of the fjord produce a considerable quantity of icebergs; the salinity of the surface water is therefore very low, 26.6 ‰. The temperature of the water is negative from about 100 to 150 m, increasing downwards to about 3° in 500 m' depth; the greatest depth is more than 700 m; in the mouth of the fjord the depth is about 300—400 m. — The

mouth of Bredefjord, north of Julianehaab, is at Lat. 60°45′ N., and six miles further south is Skovfjord (see the map, fig. 6, p. 30). These fjords with their inner continuations Sermilik and Eriksfjord (Tunugdliarfik) are about 45 miles long, and also here there are several glaciers, so that the salinity of the surface water is only 24.9—27.0 ‰. There is a temperature minimum at about 100 m' depth, but during the investigations in 1912 negative temperatures were never observed in these fjords. The bottom temperature is almost 4° in the deepest parts of Bredefjord, 2°8 at 400 m in Skovfjord. In Bredefjord the greatest depth is more than 800 m, and the smallest depth measured midway out in the mouth is more than 550 m. In Skovfjord the depth does not seem to be more than about 400 m. For details, see STEPHENSEN 1916, pp. 233—234 and 362—365.

Numerous dredgings were carried out during the investigations in these fjords, and the Hydroids collected will now be treated. The material examined comprises 44 species, one of which is new to science, *Halecium læve* n. sp.

Some of the hydroids from these collections have already been mentioned in my list of the Greenland hydroids in "Conspectus Faunæ Groenlandicæ" (KRAMP 1914).

SYSTEMATIC ACCOUNT OF THE SPECIES

Athecata.

1. *Candelabrum phrygium* (Fabricius).

Myriothela phrygia autt.

Material: Skovfjord, stat. 145, 5.IX.12, 10—35 m, stones and Laminarians, temp. 2°1, one small specimen, on *Agarum*. The specimen is much contracted, measuring only 14 mm in length; it carries numerous male gonophores.

STECHOW (1923 p. 45) reintroduces the generic name of *Candelabrum* Blainville 1830 in favour of *Myriothela* M. Sars 1851, and I must agree with him in this respect. In May 1864, ALLMAN (1864 a, p. 358) adopted the name of *Candelabrum* for *Lucernaria phrygia* Fabricius and *Myriothela arctica* Sars which is the same species; but in July of the same year ALLMAN (1864 b, p. 63) gave reasons for adopting the name of *Myriothela:* "The laws of priority, if rigidly enforced, would certainly justify the suppression of Sars's name in favour of De Blainville's; but it is evident that De Blainville was utterly ignorant of the animal for which he proposes the generic name of *Candelabrum:* he asserts that it "certainement n'appartient pas au type des Actinozoaires", and he concludes his allusion to it by affirming its affinity with *Sipunculus*." — BEDOT likewise adopts the name of *Myriothela* saying (1905 p. 57) about *Candelabrum:* "Blainville a créé ce genre pour y placer la *Lucernaria phrygia* de Fabricius (1780). Mais il n'indique pas de nom spécifique pour cette espèce et ne donne aucune diagnose du genre." BLAINVILLE, however, expressly established the genus *Candelabrum* to comprise *Lucernaria phrygia* Fabricius ("Nous en formons un genre distinct, sous le nom de *Candelabrum*"), thus pointing out that species as the genotype. This seems to me a case, where the law of priority must be followed, so that *Candelabrum* Blainville becomes the proper name of the genus, with *Candelabrum phrygium* (Fabricius) as the genotype.

I also agree with STECHOW that two distinct genera must be established for *Arum cocksi* Vigurs and *Acandela mitra* (Bonnevie).

Occurrence in West-Greenland waters: This species was first described from Greenland by FABRICIUS (1780), who did not give any precise locality, only stating that the species was found "*in profundo maris, foliis ulvarum maximarum se affigens*". As the specimens were attached to algæ, the depth can hardly have been very great. Moreover there are in the Zoological Museum of Copenhagen two small, male specimens labelled Greenland, without further details; one is attached to a Polyzoan, the other to a Laminarian, so that also these specimens must have been taken in fairly shallow water. The find of the same species in shallow water in Skovfjord is, therefore, not very astonishing, though in most other localities the species has been found in very deep water. Direct comparison shows that some deep-sea specimens from the Norwegian Sea, identified by BROCH, belong to the same species as the West-Greenland specimens.

Geographical distribution: Arctic, mainly in the deep-sea; once recorded from shallow water, 12.8—14.6 m, West-Taimyr on the north coast of Siberia (JÄDERHOLM 1908).

2. *Tubularia regalis* Boeck.

Material: Kvanefjord, stat. 12, 26.VI.12, 290—400 m; one large colony with two well-preserved hydranths, one with young and one with fully developed gonophores.

Occurrence in West-Greenland waters: This is the only specimen of *Tubularia regalis* found at the west coast of Greenland.

Geographical distribution. East coast of Greenland abt. $73^1/_2°$ N.; Spitzbergen, west coast of Norway, south of the Faeroe Islands. — An arctic species, mainly found in the deeper parts of the littoral region, though in the northernmost localities it occurs in more shallow water.

3. *Rhizogeton nudus* Broch.

Material:

North Strömfjord, stat. 4 B, 27.VI.11, 46—48 m, temp. $-0°2$; numerous fertile colonies on *Halecium muricatum*.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. $2°3$; sterile colonies on *Abietinaria abietina* and *Sertularella polyzonias gigantea*.

Occurrence in West-Greenland waters: Previously recorded only from Godthaab Fjord, never found in the open sea.

Geographical distribution: Arctic, littoral.

4. *Perigonimus roseus* (M. Sars).

Material: Bredefjord, stat. 40, 17.VII.12, 170—180 m, temp. $2°5$—$3°$, sal. 34.0—34.3 $^0/_{00}$; on Polyzoans, a few gonophores present.

Occurrence in West-Greenland waters: abt. 60°—66°17′ N., mainly found on the off-shore banks.

Geographical distribution: Middle and deeper parts of the littoral region in boreal waters.

5. *Eudendrium annulatum* Norman.

Material: North Strömfjord, stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; several large colonies.

Occurrence in West-Greenland waters: Previously found near Sukkertoppen and on Fylla Bank.

Geographical distribution: Boreal, littoral.

6. *Eudendrium capillare* Alder.

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; fertile colonies on *Eudendrium annulatum.* — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; fertile colonies. — Stat. 9 B, 6.VII.11, 44—64 m, stony and rocky bottom, sal. 31.9 ‰; on *Lafoea fruticosa genuina.*

Bredefjord, stat. 40, 17.VII.12, 170—180 m, temp. 2°5—3°, sal. 34.0—34.3 ‰; fertile colonies.

The fertile colonies from North Strömfjord agree with the specimens from Great Hellefiske Bank, described by Broch (1916 p. 62), the gonophores being placed around hydranths which are somewhat reduced in size, but not completely atrophied as is the general rule in this species.

Occurrence in West-Greenland waters: Found in several localities along the coast as far north as off the west coast of Disko.

Geographical distribution: Almost cosmopolitan, littoral.

Thecaphora.

7. *Cuspidella grandis* Hincks.

Material: North Strömfjord, stat. 33, 27.VII.11, 150 m, temp. ÷ 1°1, sal. 34.3 ‰; fairly abundant on *Halecium curvicaule.*

Occurrence in West-Greenland waters: 64°—69°46′ N., 80—319 m.

Geographical distribution: Boreal, littoral.

8. *Cuspidella procumbens* Kramp.

Material: North Strömfjord, stat. 26, 24.VII.11, 33—50 m, stony bottom; one single hydrotheca was found on *Lafoea gracillima.*

Occurrence in West-Greenland waters: Found in only one other locality, near Cape Atholl, 76°25′ N.

Geographical distribution: Arctic, found in North-East Greenland.

9. *Lafoeina maxima* Levinsen.

Material:

North Strömfjord, stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2.

Bredefjord, stat. 88, 31.VII.12, 40—70 m; one colony.

Occurrence in West-Greenland waters: Common along the entire coast of Greenland from Cape Farewell to Smith Sound, 45—180 m.

Geographical distribution: Arctic, littoral.

10. *Stegopoma plicatile* (M. Sars).

Material:

North Strömfjord, stat. 33, 27.VII.11, 150 m, temp. ÷1°1, sal. 34.3 ‰; one small colony.

Kvanefjord: Stat. 5, 23.VI.12, 420 m, clay with a few stones, temp. 3°, sal. 34.1 ‰; one colony. — Stat. 11, 25.VI.12, 290—320 m, stony clay, sal. 34.0 ‰; one large colony which has been attached to a solid object. — Stat. 12, 26.VI.12, 290—400 m, stones with a little clay; small colonies on *Tubularia regalis*.

Occurrence in West-Greenland waters: Fairly common off the coast of Greenland from Kvanefjord to somewhat north of Upernivik and in Jones Sound, at depths between 103 and 850 m.

Geographical distribution: Arctic-boreal, deep-littoral and abyssal.

11. *Campanulina lacerata* (Johnston).

Material: North Strömfjord, stat. 36 B, near the mouth of the fjord, 31.VII.11, 21—24 m, stones and laminarians, temp. 2°; several colonies on *Agarum*.

The colonies all belong to the creeping form, consisting of dense growths of hydrothecæ and gonothecæ issuing directly from the stolons without forming erect stems. The numerous gonothecæ have a distal tubular elongation; I have observed gonothecæ of a similar shape in creeping colonies from Denmark.

Occurrence in West-Greenland waters: Colonies of the erect form of this species are found on *Ascophyllum* in the Færingerhavn between Fiskenæs and Godthaab.

Geographical distribution: Widely distributed, mainly boreal, in the upper part of the littoral region.

12. *Calicella syringa* (L.).

Material: North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp.0°2—0°3, sal. 31.9 ‰; on *Eudendrium annulatum* and *Sertularella polyzonias gigantea.* — Stat. 3 C, 200—240 m; on *Campanularia verticillata.*

Occurrence in West-Greenland waters: Generally distributed from Cape Farewell to Thule at depths between 25 and 470 m.

Geographical distribution: Cosmopolitan, in the littoral region.

13. *Tetrapoma quadridentatum* (Hincks).

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; abundant on *Eudendrium annulatum.* — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; fairly abundant on the stem of *Halecium muricatum.*

Eriksfjord, stat. 141, 2.IX.12, 35—70 m, stones with Balanidæ, temp. 0°6—1°2; on a Polyzoan.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3; on *Lafoea fruticosa grandis.*

Occurrence in West-Greenland waters: previously recorded from a few localities near the coast: Frederikshaab, Godthaab Fjord, and Egedesminde, at depths between abt. 50 and 393 m.

Geographical distribution: Purely arctic, in the middle part of the littoral region.

14. *Lafoea gracillima* (Alder).

Material: North Strömfjord: Stat. 7, 27.VI.11, 51—54 m, clayey sand, sal. 32.2 ‰; a few small colonies belonging to the forma *typica.* — Stat. 26, 24.VII.11, 33—50 m, stones; a few large colonies of forma *elegantula.*

Occurrence in West-Greenland waters: Generally distributed from Cape Farewell to Smith Sound, 47—470 m.

Geographical distribution: forma *typica* is cosmopolitan, forma *elegantula* is mainly found in arctic waters; both forms occur in the littoral and the upper part of the abyssal region.

15. *Lafoea fruticosa* M. Sars.

a. forma *genuina.*

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; several colonies with unusually densely set hydro-

thecæ. — Stat. 3 C, 200—240 m, temp. abt. 0°. — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; large colonies on barnacles. — Stat. 9 B, 6.VII.11, 44—64 m, stony and rocky bottom, sal. 31.9 ‰; some fairly large colonies. — Stat. 33, 27.VII.11, 150 m, temp. ÷ 1°1, sal. 34.3 ‰; three large colonies, one with several coppinias.

Bredefjord: Stat. 80, 30.VII.12, 365 m, fine clay with a few stones, temp. 3°7; one small colony. — Stat. 88, 31.VII.12, 40—70 m; some small colonies on barnacles and Polyzoans.

Eriksfjord, stat. 141, 2.IX.12, 35—70 m, stones with Balanidæ, temp. 0°6—1°2; two small colonies on a Polyzoan.

Skovfjord: Stat. 144, 3.IX.12, 250—300 m, stones with clay, temp. 2°1; fertile colonies. — Stat. 156, 15.IX.12, 70—140 m, temp. 2°3; two fairly large colonies.

b. forma *grandis*.

Material:

Bredefjord, stat. 80, 30.VII.12, 365 m, fine clay with a few stones, temp. 3°7; one small colony.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3; one colony.

Occurrence in West-Greenland waters: The two forms of *Lafoea fruticosa* have in all essentials the same distribution in the waters west of Greenland; both are common in the coastal region as well as on the off-shore banks from Cape Farewell northwards; f. *genuina* occurs even as far north as in Smith Sound, whereas f. *grandis* has not yet been found at the Greenland coast north of Disko; they both occur in Jones Sound. Depth 25—610 m.

Geographical distribution: forma *genuina* is equally common in arctic and boreal waters, whereas forma *grandis* is mainly found in the Arctic. They both have their principal occurrence in the middle and deeper parts of the littoral region.

16. *Toichopoma obliquum* (Hincks).

Material:

North Strömfjord, stat. 26, 24.VII.11, 33—50 m, stones, sal. 32.3 ‰; several large, slender colonies.

Bredefjord, stat. 88, 31.VII.12, 40—70 m; on a barnacle.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3; a few small colonies.

Occurrence in West-Greenland waters: Fairly common along the coast as far north as Ritenbenk in the Disko Bay, depth 25—190 m.

Geographical distribution: Arctic, littoral.

17. *Filellum serpens* (Hassall).

Material: Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3; on *Abietinaria abietina* and *Sertularella tricuspidata.*

Occurrence in West-Greenland waters: Fairly common from Cape Farewell to Disko, mainly on the off-shore banks; depth 56—450 m.

Geographical distribution: Cosmopolitan, mainly boreal, mid-littoral.

18. *Grammaria abietina* M. Sars.

Material:

Bredefjord, stat. 48, 19.VII.12, abt. 300—400 m; one colony.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3; one fairly large colony.

Occurrence in West-Greenland waters: Found in many localities, but nowhere common, along the entire west coast of Greenland from Cape Farewell to Smith Sound at depths between 60 and abt. 300 m.

Geographical distribution: Arctic-boreal, deep-littoral.

19. *Lictorella pinnata* (G. O. Sars).

Material: Kvanefjord, stat. 5, 23.VI.12, 420 m, temp. 3°, sal. 34.1 ‰; one large colony.

Occurrence in West-Greenland waters: Found in several localities as far north as Ritenbenk in the Disko Bay. In the waters north of Holstensborg the occurrence is restricted to depths, where the temperature of the water is positive, *viz.* about 400—520 m; off the southern part of the Greenland coast it has been found between 194 and 1200 m.

Geographical distribution: boreal, deep-littoral and abyssal.

20. *Sertularella tricuspidata* (Alder).

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰. — Stat. 3 C, 200—240 m, temp. abt. 0°. — Stat. 36 B, 31.VII.11, 21—24 m, stones and laminarians.

Bredefjord, stat. 88, 31.VII.12, 40—70 m.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3.

Occurrence in West-Greenland waters: Very common along the coast from Cape Farewell to Disko, especially on the off-shore banks, depth 50—400 m; also found in Jones Sound.

Geographical distribution: Arctic, in the littoral region.

21. *Sertularella polyzonias* (L.).

a. forma *typica*.

Material: Kvanefjord, stat. 12, 26.VI.12, 290—400 m, stones with a little clay; on *Tubularia regalis*.

b. forma *gigantea*.

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; a few colonies. — Stat. 3 C, 200—240 m, temp. abt. 0°; a small colony originating from a stolonized branch of another colony. — Stat. 4 B, 27.VI.11, 46—48 m, temp. ÷ 0°2, stony bottom; one small colony.

Eriksfjord, stat. 141, 2.IX.12, 35—70 m, stones with Balanidæ, temp. 0°6—1°2; a very small colony with only three hydrothecæ, on an Ascidian.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3; on *Abietinaria abietina*.

Occurrence in West-Greenland waters: Both forms of *Sertularella polyzonias* are fairly common along the coast from Cape Farewell to the south coast of Disko, especially on the off-shore banks; depth abt. 14—293 m. Forma *gigantea* is somewhat more abundant than f. *typica*.

Geographical distribution: forma *typica* is cosmopolitan, forma *gigantea* is a purely arctic variety. They both occur in the littoral region.

22. *Abietinaria abietina* (L.).

Material:

North Strömfjord: Stat. 3 C, 25.VI.11, 200—240 m, temp. abt. 0°; one colony with numerous gonothecæ containing fully developed gonophores. — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; several colonies.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3; several fairly large colonies, some of which are fertile.

Occurrence in West-Greenland waters: Fairly common from Cape Farewell to the west coast of Disko, 54—525 m.

Geographical distribution: Mainly boreal, but penetrating into the subarctic as well as into the lusitanian regions; littoral and abyssal.

23. *Sertularia tenera* G. O. Sars.

Material: North Strömfjord: Stat. 3 C, 25.VI.11, 200—240 m, temp. abt. 0°; two large, pinnate colonies, fertile. — Stat. 33, 27.VII.11,

150 m, temp. ÷ 1°1, sal. 34.3 ‰; several colonies. — Stat. 36 A, 31.VII.11, 170—200 m, shelly bottom, sal. 33.5 ‰; on a worm-tube.

Occurrence in West-Greenland waters: Distributed from Cape Farewell to Egedesminde, not very common; depth 25—319 m.

Geographical distribution: Arctic-boreal, littoral.

24. *Sertularia mirabilis* (Verrill).

Material: North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; one colony. — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; four colonies.

Occurrence in West-Greenland waters: Found in some localities between Fylla Bank and the Vaigat, 64°—69°50′ N., depth 35—50m.

Geographical distribution: Arctic, littoral.

25. *Sertularia fabricii* Levinsen.

Material: North Strömfjord, stat. 2, 23.VI.11, 375—380 m, clay with a few stones or rocks; temp. 0°2, sal. 33.3 ‰; a fragment of a colony, attached to a worm-tube; there are many gonothecæ, some of which have two unusually long spines.

Occurrence in West-Greenland waters: Fairly common from Cape Farewell to the north-west coast of Disko, depth 50—375 m.

Geographical distribution: Arctic and subarctic, littoral.

26. *Thuiaria thuja* (L.).

Material: North Strömfjord: Stat. 3 C, 25.VI.11, 200—240 m, temp. abt. 0°; five colonies, partly very large, with numerous gonothecæ. — Stat. 4 A, 27.VI.11, 400—410 m, mud and stones, temp. ÷ 0°7. — Stat. 4 B, 46—48 m, stony bottom, temp. ÷ 0°2; two fairly large colonies, one of which is fertile, and one young colony. — Stat. 6 (no records of depth etc.), one very large fertile and one smaller colony.

Occurrence in West-Greenland waters: Sparingly occurring from Cape Farewell to North Strömfjord, depth abt. 45—400 m.

Geographical distribution: Boreal, mid- and deep-littoral.

27. *Thuiaria alternitheca* Levinsen.

Material: North Strömfjord, stat. 3 C, 25.VI.11, 200—240 m, temp. abt. 0°; one large colony with numerous gonothecæ containing ripe gonophores.

Occurrence in West-Greenland waters: Found in some few localities between Cape Farewell and North Strömfjord at depths between 54 and 319 m.

Geographical distribution: Deficiently known; the species has only been found in the Davis Strait and in two localities on the west coast of Iceland.

28. *Diphasia pulchra* Nutting.

Material: North Strömfjord: Stat. 2, 23.VI.11, 375—380 m, clay with a few stones or rocks, temp. 0°2, sal. 33.3 ‰; one large, fertile colony. — Stat. 33, 27.VII.11, 150 m, temp. ÷ 1°1, sal. 34.3 ‰; four young colonies, two of which are fertile. — Stat. 35, 28.VII.11, 210—225 m, temp. ÷ 1°2, sal. 35.1 ‰; one small, fertile colony.

Two of the young colonies from stat. 33 are pinnate, whereas the stems of the two other colonies from the same station are a little twisted; in the large colony from stat. 2 the stem is strongly twisted, its lower half is naked (the branches have fallen off), and the distal half of the colony forms a dense tuft of branches directed to all sides. BROCH (1909 p. 182) unites this species with *Diphasia thuiarioides* (Clark), but LEVINSEN (1913 p. 311), who has examined the present specimens and compared them with cotypes of *D. thuiarioides* in the Zoological Museum of Copenhagen, has demonstrated that the two species must be kept apart, and I can fully confirm this statement. As far as I can see, the hydranths have no abcauline blind-sack; it is therefore not correct to refer this species to *Abietinaria* where LEVINSEN would place it. The trophosomes of the colonies from North Strömfjord agree perfectly with the descriptions as given by NUTTING (1904 p. 111, Pl. 31 figs. 1—3) and by JÄDERHOLM (1908 p. 17, Taf. III figs. 1—6). NUTTING's original specimens were sterile, but JÄDERHOLM has described the gonothecæ which, in his specimens, were provided with two distal spines of much varying length, being sometimes fairly long, sometimes only faintly indicated, but apparently the two spines were always of equal length.

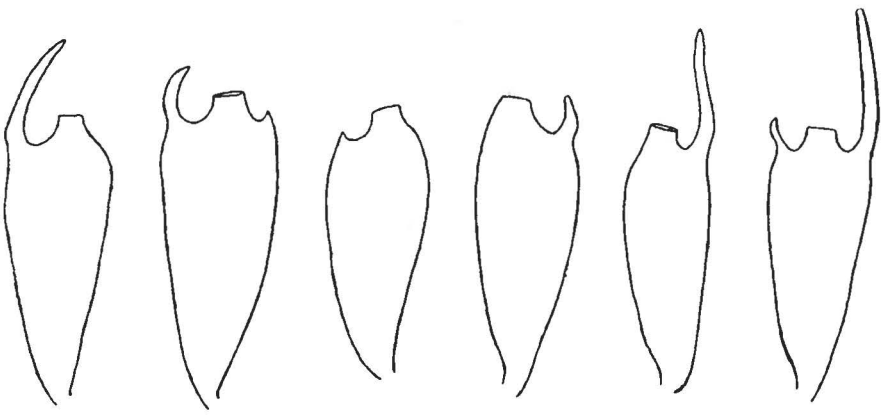

Fig. 1. Gonothecæ of *Diphasia pulchra* Nutting from North Strömfjord, stat. 2.

The colonies from North Strömfjord have numerous gonothecæ which, in their general shape, agree perfectly with those described by JÄDERHOLM, whereas the variation of the spines is still more pronounced. BROCH (1909) is probably right that the length of the spines is to some extent dependent on the stage of development of the gonotheca, young gonothecæ being destitute of spines. The present specimens, however, show that the growth of the spines proceeds very irregularly. In the small colony from stat. 35 the gonothecæ have no spines at all. In the two fertile colonies from stat. 33 some gonothecæ have no spines, whereas some others have two spines of about equal length. In the large colony from stat. 2 the majority of the gonothecæ have only one spine which may attain a much greater length than hitherto described in this species; when two spines are present, one is much longer than the other; the longest spine or, in the unicorn gonothecæ, the only spine is always on the side of the gonotheca which is turned away from the branch. Some examples of gonothecæ from the colony from stat. 2 are given in fig. 1.

Occurrence in West-Greenland waters: North Strömfjord is the only Greenland locality where *Diphasia pulchra* has been found up to now.

Geographical distribution: Arctic: Hudson Bay, Spitzbergen, Kara Sea, Siberian Polar Sea; Vancouver. In the littoral region.

29. *Halecium læve* n. sp.

Material: Bredefjord, stat. 80, 30.VII.12, 365 m, fine clay with a few stones, temp. 3°7.

Description: Several stems issue from a densely branched hydrorhiza; stems fascicled, consisting of a primary tube carrying the hydrothecæ and some accessory tubes (fig. 3); stems rather conspicuous, sparingly and irregularly branched. Main branches fairly regularly branched, approximately in one plane, usually with one side-branch on every third internodium (fig. 2), forming an acute angle with the mother branch. Internodia very long and slender, of equal width throughout, absolutely smooth, separated from each other by a single constriction, a little avry; the proximal internodium of each branch always longer than the others. The hydrothecæ are placed near the distal ends of the internodia; the hydrophores are smooth and cylindrical, and there is not the slightest trace of a constriction separating the hydrophore from the branch. The hydrotheca above the diaphragm is slightly funnel-shaped, with a somewhat everted margin, sometimes a little recurved on the adaxial side (figs. 4 and 5). Pseudohydrocauli consisting of about 3—5 hydrothecæ are developed from almost all primary hydrothecæ; the hydrothecæ within one and the same pseudo-

hydrocaulus are all of equal shape and width, their pedicels are cylindrical and smooth, with one sharp constriction near the base; the first hydrotheca above the primary one has usually a fairly long pedicel.

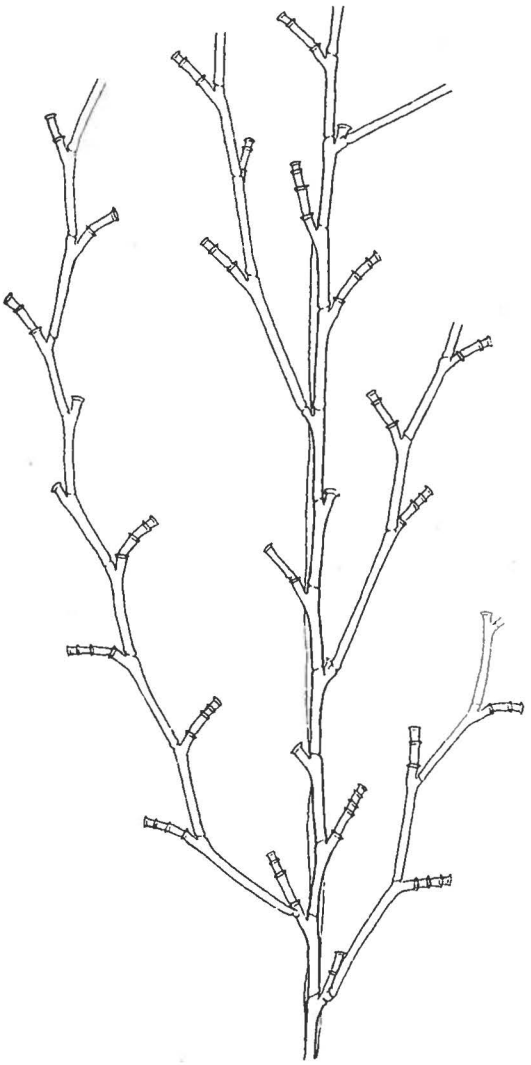

Fig. 2. *Halecium læve* n. sp. Branch of type-colony.

The female gonophores are broad and flattened (fig. 4); their distal edge forms a regular arch, the lateral sides are faintly S-shaped and form an almost right angle with each other. The gonotheca is mounted upon a short and smooth pedicel and placed on the basal part of a primary hydrotheca. Male gonothecæ unknown.

Colour: Stems and branches a light yellow.

Dimensions: Height of the colony about 7 cm. Average diameter of the hydrothecæ: at the diaphragm 0.13 mm, at the margin 0.17 mm; distance from diaphragm to margin about $^1/_3$ of width of diaphragm. Gonothecæ about 0.8 mm long (with the pedicel) and 0.7 mm broad.

The mode of branching and the long internodia give the colony of this species a slender and elongated appearance. The trophosome bears

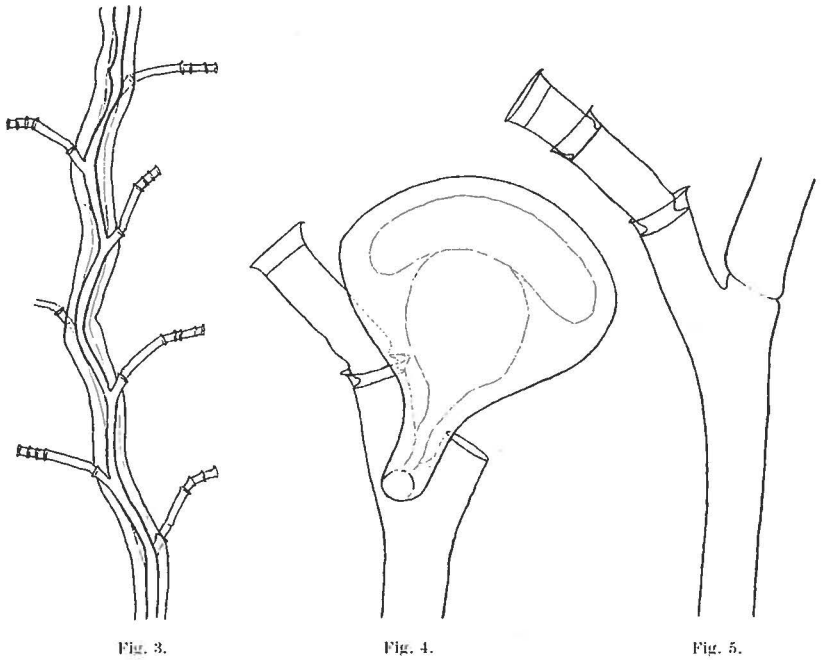

Fig. 3. Fig. 4. Fig. 5.

Figs. 3—5. *Halecium læve* n. sp. — Fig. 3, part of fascicled branch. — Fig. 4, gonotheca. — Fig. 5, pseudohydrocaulus with three hydrothecæ.

a great resemblance to *Halecium flexile* Allman, from which it is mainly distinguished by the shape of the gonothecæ; these latter are much like the gonothecæ of *Halecium antarcticum* Vanhöffen and *H. marsupiale* Bergh. A direct comparison with the type specimen of *H. marsupiale* has convinced me that the present form cannot be referred to that species.

30. *Halecium groenlandicum* Kramp.

Material:

North Strömfjord, stat. 26, 24.VII.11, 33—50 m, stones; one large colony with many solid "bridges" (see Kramp 1911 pp. 354 ff.).

Bredefjord, stat. 121, 25.VIII.12, 700 m, clay; one colony.

Occurrence in West-Greenland waters: sparingly occurring

along the coast as far north as off the west coast of Disko; the previous finds are from depths between 54 and abt. 200 m; it is interesting, therefore, that the species was found in Bredefjord in much deeper water, 700 m.

Geographical distribution: Arctic, mid- and deep-littoral.

31. *Halecium curvicaule* v. Lorenz.

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; on *Lafoea fruticosa genuina*, *Sertularella polyzonias typica*, and *Eudendrium annulatum*. — Stat. 3 C, 200—240 m, temp. abt. 0°; a very large colony with fascicled stems; the small branches and the hydrothecæ are typical, and some male gonothecæ are present. — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; on a barnacle. — Stat. 9 B, 6.VII.11, 44—64 m, stony and rocky bottom, sal. 31.9 ‰; colonies of forma *repens* on a worm-tube. — Stat. 33, 27.VII.11, 150 m, temp. ÷ 1°1, sal. 34.3 ‰; one erect, branched colony.

Kvanefjord, stat. 12, 26.VI.12, 290—400 m, stones with a little clay; some small and very slender colonies on *Tubularia regalis*.

Occurrence in West-Greenland waters: Fairly common from Julianehaab to the west coast of Disko, mainly found in the fjords or near the coast; depth abt. 25—570 m.

Geographical distribution: Arctic, mid- and deep-littoral.

32. *Halecium muricatum* (Ellis & Solander).

Material: North Strömfjord: Stat. 3 A, 25.VI.11, 325—330 m, temp. ÷ 0°1, sal. 33.3 ‰; several large colonies, fertile. — Stat. 3 B, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; one fertile colony. — Stat. 3 C, 200—240 m, temp. abt. 0°; three small colonies. — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; one fairly large colony.

Occurrence in West-Greenland waters: Very common along the entire west coast of Greenland, found as far north as Thule; occurs in the fjords as well as on the off-shore banks; depth abt. 25—470 m. It seems peculiar that this common hydroid was never found in any of the fjords examined in 1912.

Geographical distribution: Arctic-boreal, in the littoral region.

33. *Halecium labrosum* Alder.

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; some small colonies. — Stat. 3 C, 200—240 m, temp. abt. 0°; some small colonies.

Eriksfjord, stat. 141, 2.IX.12, 35—70 m, stones with Balanidæ, temp. 0°6—1°2; one colony on an Ascidian.

Occurrence in West-Greenland waters: Common from Cape Farewell to Ritenbenk in the Disko Bay at depths between abt. 25 and 470 m, and also found in Jones Sound.

Geographical distribution: Arctic-boreal, in the littoral region.

34. *Halecium tenellum* Hincks.

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; on hydroids. — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; abundant on *Lafoea fruticosa genuina*. — Stat. 33, 27.VII.11, 150 m, temp. ÷ 1°1, sal. 34.3 ‰; on *Lafoea fruticosa genuina*.

Kvanefjord, stat. 12, 26.VI.12, 290—400 m, stones with a little clay; on *Tubularia regalis*.

Bredefjord, stat. 40, 17.VII.12, 170—180 m, temp. 2°5—3°, sal. 34.0—34.3 ‰; on *Tubularia* sp.

Eriksfjord, stat. 141, 2.IX.12, 35—70 m, stones with Balanidæ, temp. 0°6—1°2; on an Ascidian.

Occurrence in West-Greenland waters: Sparingly occurring from Julianehaab to Egedesminde; depth in most cases unknown.

Geographical distribution: Cosmopolitan, in the littoral region.

35. *Halecium minutum* Broch.

Material: Kvanefjord, stat. 13, 26.VI.12, 34—40 m, stones with algæ, temp. 1°, sal. 32.1 ‰; common on *Boltenia ovifera*, fertile.

Most of the gonothecæ have only two distal teeth, the lateral edges presenting a wavy outline.

Occurrence in West-Greenland waters: Somewhat sparingly occurring from Frederikshaab to Egedesminde, 34—293 m.

Geographical distribution: Arctic, littoral.

36. *Nemertesia antennina* (L.).

Material: Skovfjord, stat. 155, 15.IX.12, 220—abt. 400 m, stones without clay, temp. 2°6—2°8; one fairly large colony, fertile.

Occurrence in West-Greenland waters: Besides in the above locality this species has been found on Julianehaab Bank, Fylla Bank, and Little Hellefiske Bank, 60°16′—65°27′ N., depth 120—194 m.

Geographical distribution: Widely distributed, mainly southern-boreal, mid- and deep-littoral and abyssal.

37. *Aglaophenopsis cornuta* (Verrill).

Material: Bredefjord: Stat. 55, 20.VII.12, 310—330 m, clay with a few small stones, temp. 2°—3°5, sal. 34.4—34.7 ‰; several large, fertile colonies. — Stat. 121, 25.VIII.12, 700 m, clay; three colonies.

Occurrence in West-Greenland waters: Found in several localities in the Davis Strait between 60°16′ and 65°30′ N., at depths from 135 to 1200 m, but mainly in water of more than 500 m' depth.

Geographical distribution: North-Atlantic, deep-littoral and abyssal.

38. *Cladocarpus formosus* Allman.

Material: Bredefjord, stat. 76, 25.VII.12, 260—320 m, stony clay, temp. 3°0—3°3; one large fertile colony.

Occurrence in West-Greenland waters: Found in some localities off the Greenland coast between 60°16′ and 65°34′ N., depth 104—1200 m.

Geographical distribution: Atlantic, deep-littoral and abyssal.

39. *Campanularia integra* MacGillivray.

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; on *Sertularella tricuspidata* and *Halecium muricatum*. — Stat. 3 C, 200—240 m, temp. abt. 0°; on *Sertularella tricuspidata*. — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2, on *Sertularia mirabilis* and *Abietinaria abietina*. — Stat. 9 B, 6.VII.11, 44—64 m, stones and rocks, sal. 31.9 ‰; on *Lafoea fruticosa genuina* and Polyzoans. — Stat. 36 B, 31.VII.11, 21—24 m, stones with Laminarians, temp. 2°; in great abundance on *Agarum*, fertile.

Kvanefjord, stat. 13, 22.VI.12, 34—40 m, stones with algæ, temp. 1°, sal. 32.1 ‰; abundant on *Boltenia ovifera*, fertile.

Bredefjord, stat. 88, 31.VII.12, 40—70 m; on *Lafoeina maxima* and Laminarians.

Eriksfjord, stat. 141, 2.IX.12, 35—70 m, stones with Balanidæ, temp. 0°6—1°2; on Ascidians and Polyzoans.

Skovfjord, stat. 156, 15.IX.12, 70—140 m, temp. 2°3; on *Lafoea fruticosa genuina*.

In the colonies from North Strömfjord stat. 36 B most of the hydrothecæ have thick walls (forma *caliculata*), but thin-walled hydrothecæ are found scattered between the others, a new proof of the identity between *Campanularia integra* and *caliculata* which, strangely enough, is still doubted by some authors. In the colony from Kvanefjord, stat. 13, most of the hydrothecæ are thin-walled.

Occurrence in West-Greenland waters: Generally distributed and very common from Cape Farewell to the Disko Bay and also found further north near Thule and Ellesmere Land and in Jones Sound; depth abt. 10—400 m.

Geographical distribution: Cosmopolitan, littoral.

40. *Campanularia volubilis* (L.).

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; on *Sertularella tricuspidata*, *Sertularella polyzonias gigantea*, and *Halecium muricatum*. — Stat. 4 B, 27.VI.11, 46—48 m, stony bottom, temp. ÷ 0°2; on *Sertularia mirabilis* and *Abietinaria abietina*. — Stat. 36 B, 31.VII.11, 21—24 m, stones and Laminarians, temp. 2°; one small colony on *Sertularella tricuspidata*.

Eriksfjord, stat. 141, 2.IX.12, 35—70 m, stones with Balanidæ, temp. 0°6—1°2; on a Polyzoan from an Ascidian.

Occurrence in West-Greenland waters: Common from Julianehaab to Pröven, 60°47′—72°23′ N., at depths between abt. 25 and 300 m, once recorded from 650 m.

Geographical distribution: Arctic-boreal, in the littoral region.

41. *Campanularia speciosa* Clark.

Material: North Strömfjord, stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; some scattered hydrothecæ of this beautiful hydroid were found on a colony of *Eudendrium annulatum*.

Occurrence in West-Greenland waters: Besides in the above mentioned locality this species has been found on Great Hellefiske Bank, 45 m.

Geographical distribution: Arctic, littoral.

42. *Campanularia verticillata* (L.).

Material: North Strömfjord: Stat. 3 C, 25.VI.11, 200—240 m, temp. abt. 0°; three fertile colonies, one of which is very large. — Stat. 33, 27.VII.11, 150 m, temp. ÷ 1°1, sal. 34.3 ‰; one colony.

Occurrence in West-Greenland waters: Fairly common on the off-shore banks from Cape Farewell to the north-west coast of Disko and also found in Smith Sound; depth 50—470 m.

Geographical distribution: northern-boreal, mid-littoral.

43. *Laomedea hyalina* (Hincks).

Material:

North Strömfjord: Stat. 3 B, 25.VI.11, 14—38 m, temp. 0°2—0°3, sal. 31.9 ‰; on shells and on *Sertularella tricuspidata* and *Hale-*

cium muricatum. — Stat. 3 C, 200—240 m, temp. abt. 0°. — Stat. 33, 27.VII.11, 150 m, temp. ÷ 1°1, sal. 34.3 ‰; one large colony.

Kvanefjord, stat. 12, 26.VI.12, 290—400 m, stones with a little clay; on *Tubularia regalis*, with many gonothecæ with extended gonophores.

Bredefjord, stat. 40, 17.VII.12, 170—180 m, temp. 2°5—3°, sal. 34.0—34.3 ‰; on *Tubularia* sp.

Occurrence in West-Greenland waters: Generally distributed and fairly common from Julianehaab to Pröven, abt. 61°—72½° N.; depth 25—520 m.

Geographical distribution: Arctic-boreal, mid-littoral.

44. *Laomedea longissima* (Pallas).

Material: Bredefjord, stat. 88, 31.VII.12, 40—70 m; several small sterile colonies on Laminarians and Polyzoans.

Occurrence in West-Greenland waters: Found in some few localities near the coast between Julianehaab and Pröven, 60°45′—72°23′ N.; depth 40—94 m.

Geographical distribution: Cosmopolitan, littoral.

LIST OF STATIONS

In the following list, the fjords are arranged from the South towards the North, and within each of the fjords the stations are arranged from the mouth inwards. The positions of the stations are seen on the maps, figs. 6—8.

Skovfjord and Eriksfjord.

Stat. 155, 15.IX.12, 220—abt. 400 m, temp. 2°6—2°8, stones without clay: southern-boreal species: *Nemertesia antennina.*

Stat. 156, 15.IX.12, 70—140 m, 2°3: arctic species: *Rhizogeton nudus, Tetrapoma quadridentatum, Lafoea fruticosa grandis, Toichopoma obliquum, Sertularella tricuspidata, Sertularella polyzonias gigantea;* arctic-boreal: *Lafoea fruticosa genuina, Grammaria abietina;* boreal: *Abietinaria abietina;* cosmopolitan: *Filellum serpens, Campanularia integra.*

Stat. 145, 5.IX.12, 10—35 m, 2°1, stones and Laminarians: arctic species: *Candelabrum phrygium.*

Stat. 144, 3.IX.12, 250—300 m, 2°1, stones with clay: arctic-boreal species: *Lafoea fruticosa genuina.*

Stat. 141 (Eriksfjord), 2.IX.12, 35—70 m, stones with Balanidæ: arctic species: *Tetrapoma quadridentatum, Sertularella polyzonias gigan-*

tea; arctic-boreal: *Lafoea fruticosa genuina*, *Halecium labrosum*, *Campanularia volubilis;* cosmopolitan: *Halecium tenellum*, *Campanularia integra.*

Bredefjord.

Stat. 121, 25.VIII.12, 700 m, clay: arctic species: *Halecium groenlandicum;* Atlantic-abyssal: *Aglaophenopsis cornuta.*

Stat. 40, 17.VII.12, 170—180 m, 3°—2°5, shell-fragments with stones: arctic-boreal species: *Laomedea hyalina;* boreal: *Perigonimus roseus;* cosmopolitan: *Eudendrium capillare*, *Halecium tenellum.*

Stat. 48, 19.VII.12, abt. 400 m: arctic-boreal species: *Grammaria abietina.*

Stat. 55, 20.VII.12, 310—330 m, 3°5—2°, sal. 34.7—34.4 ‰, clay with a few small stones: Atlantic-abyssal species: *Aglaophenopsis cornuta.*

Stat. 76, 25.VII.12, 260—320 m, 3°0—3°3, stony clay: Atlantic-abyssal species: *Cladocarpus formosus.*

Stat. 80, 30.VII.12, 365 m, 3°7, fine clay with a few stones: arctic species: *Lafoea fruticosa grandis;* arctic-boreal: *Lafoea fruticosa genuina;* distribution unknown: *Halecium læve* n. sp.

Stat. 88, 31.VII.12, 40—70 m: arctic species: *Lafoeina maxima*, *Toichopoma obliquum*, *Sertularella tricuspidata;* arctic-boreal: *Lafoea fruticosa genuina;* cosmopolitan: *Campanularia integra*, *Laomedea longissima.*

Kvanefjord.

Stat. 13, 26.VI.12, 34—40 m, 1°, 32.1 ‰; algæ with Hydroids: arctic species: *Halecium minutum;* cosmopolitan: *Campanularia integra.*

Stat. 12, 26.VI.12, 290—400 m, stones with a little clay: arctic species: *Tubularia regalis*, *Halecium curvicaule;* arctic-boreal: *Stegopoma plicatile*, *Laomedea hyalina;* cosmopolitan: *Sertularella polyzonias typica*, *Halecium tenellum.*

Stat. 11, 25.VI.12, 290—320 m, sal. 34.0 ‰, stony clay: arctic-boreal species: *Stegopoma plicatile.*

Stat. 5, 23.VI.12, 420 m, 3°, 34.1 ‰, clay with a few stones: arctic-boreal species: *Stegopoma plicatile;* boreal: *Lictorella pinnata.*

North Strömfjord.

Stat. 36 A, 31.VII.11, 170—200 m, 1°—2°, 33.5 ‰, shelly bottom: arctic-boreal species: *Sertularia tenera.*

Stat. 36 B, 31.VII.11, 21—24 m, 2°, stones and Laminarians: arctic species: *Sertularella tricuspidata;* arctic-boreal: *Campanularia volubilis;* cosmopolitan: *Campanulina lacerata*, *Campanularia integra.*

Stat. 2, 23.VI.11, 375—380 m, 0°2, 33.3 ‰, clay with a few stones or rocks: arctic species: *Sertularia fabricii*, *Diphasia pulchra.*

Stat. 7, 27.VI.11, 51—54 m, 32.2 ‰, clayey sand bottom: cosmopolitan species: *Lafoea gracillima typica.*

Stat. 3 B, 25.VI.11, 14—38 m, 0°3—0°2, 31.9 ‰: arctic species: *Tetrapoma quadridentatum, Sertularella tricuspidata, Sertularella polyzonias gigantea, Sertularia mirabilis, Halecium curvicaule, Campanularia speciosa;* arctic-boreal: *Lafoea fruticosa genuina, Halecium muricatum, Halecium labrosum, Campanularia volubilis, Laomedea hyalina;* boreal: *Eudendrium annulatum;* cosmopolitan: *Eudendrium capillare, Calicella syringa, Halecium tenellum, Campanularia integra.*

Stat. 3 C, 25.VI.11, 200—240 m: arctic species: *Sertularella tricuspidata, Sertularella polyzonias gigantea, Halecium curvicaule;* arctic-boreal: *Lafoea fruticosa genuina, Sertularia tenera, Halecium muricatum, Halecium labrosum, Laomedea hyalina;* boreal: *Abietinaria abietina, Thuiaria thuja, Campanularia verticillata;* cosmopolitan: *Calicella syringa, Campanularia integra;* distribution deficiently known: *Thuiaria alternitheca.*

Stat. 3 A, 25.VI.11, 325—330 m, ÷ 0°1, 33.3 ‰: arctic-boreal species: *Halecium muricatum.*

Stat. 6 (no details): boreal species: *Thuiaria thuja.*

Stat. 4 B, 27.VI.11, 46—48 m, ÷ 0°2, stony bottom: arctic species: *Rhizogeton nudus, Lafoeina maxima, Tetrapoma quadridentatum, Sertularella polyzonias gigantea, Sertularia mirabilis, Halecium curvicaule;* arctic-boreal: *Lafoea fruticosa genuina, Halecium muricatum, Campanularia volubilis;* boreal: *Abietinaria abietina, Thuiaria thuja;* cosmopolitan: *Eudendrium capillare, Halecium tenellum, Campanularia integra.*

Stat. 4 A, 27.VI.11, 400—410 m, ÷ 0°7, mud and stones: boreal species: *Thuiaria thuja.*

Stat. 9 B, 6.VII.11, 44—64 m, 31.9 ‰, stony and rocky bottom: arctic species: *Halecium curvicaule;* arctic-boreal: *Lafoea fruticosa genuina;* cosmopolitan: *Eudendrium capillare, Campanularia integra.*

Stat. 35, 28.VII.11, 210—225 m, ÷1°2, 35.1 ‰ arctic species: *Diphasia pulchra.*

Stat. 33, 27.VII.11, 150 m, ÷ 1°1, 34.3 ‰: arctic species: *Diphasia pulchra, Halecium curvicaule;* arctic-boreal: *Stegopoma plicatile, Lafoea fruticosa genuina, Sertularia tenera, Laomedea hyalina;* boreal: *Cuspidella grandis, Campanularia verticillata;* cosmopolitan: *Halecium tenellum.*

Stat. 26, 24.VII.11, 33—50 m, 32.3 ‰, stones: arctic species: *Cuspidella procumbens, Lafoea gracillima elegantula, Toichopoma obliquum, Halecium groenlandicum.*

DISTRIBUTION AND ZOOGEOGRAPHICAL CHARACTERS OF THE HYDROIDS IN THE FJORDS INVESTIGATED

As briefly mentioned in the Introduction the fjords in southern Greenland can be divided into two types which are very different from a hydrographical point of view and therefore supposed also to be faunistically different. Only very few groups of the animals collected during the investigations in the West-Greenland fjords in 1911 and 1912 have been worked up as yet, so that general results cannot be given. From what has been published (STEPHENSEN 1913 and 1916, HARTMEYER 1921)

Table I. Number of species of various groups of animals in the fjords investigated (from HARTMEYER 1921 p. 113, with addition of the Hydroids).

	Total no. of species	North Ström-fjord	Kvane-fjord	Brede-fjord	Sermi-lik	Skov-fjord	Eriks-fjord
Crustacea	89	53	27	81	3	29	19
Pycnogonida	10	3	2	7	1	2	1
Echinodermata	37	23	7	36	3	11	4
Ascidiacea	27	20	10	16	2	11	8
Hydroida	44	32	9	15	0	12	7

animals of different classes seem to react in different ways to the physical conditions of the two types of fjords. Table I shows the numbers of species of each group found in each of the fjords, and it will be seen that Bredefjord has a much larger number of Crustaceans, Pycnogonids, and Echinoderms than North Strömfjord, whereas the opposite is the case as far as Ascidians and Hydroids are concerned.

Sedentary animals like Ascidians and Hydroids are greatly dependent on the condition of the bottom. Almost all Hydroids require solid objects (stones, shells, algæ etc.) for attachment, though there are some few species, such as *Stegopoma plicatile* and *Nemertesia antennina*, which are able to develop a dense tuft of stolons by which the colony may be anchored to a bottom of clay or mud. The difference in number of Hydroids in the fjords here concerned cannot, however, be explained by the bottom conditions. In Kvanefjord, Sermilik, and Skovfjord stones were found in all localities investigated and at all depths; even where the bottom was mainly consisting of clay, some stones were always present, and in Bredefjord and Eriksfjord clay without stones was only

noted on very few stations. In North Strömfjord, on the other hand, fine clay without stones was found in almost half the stations, in shallow water as well as in the deeper parts of the fjord. Nevertheless the Hydroid fauna is much richer in North Strömfjord than in any of the southern fjords, a fact which is not easily explained as long as we have no precise knowledge of such other conditions as currents, pollution, amount of food in the water etc.

Table II shows the species which have been found in the different strata in each of the fjords investigated. We cannot be sure, on the other hand, of the reliability of the negative statements of this table; it is undoubtedly only due to accidental circumstances that *Halecium muricatum*, *Thuiaria thuja*, *Campanularia verticillata*, *Calicella syringa*, and *Lafoea gracillima typica* have not been found in the southern fjords,

Table II.

Species	Skovfjord (with Eriksfj.)				Brede-fjord				Kvane-fjord				"Atlantic"fjords together				North Ström-fjord			
	< 35 m	35—70 m	70—200 m	> 200 m	< 35 m	35—70 m	70—200 m	> 200 m	< 35 m	35—70 m	70—200 m	> 200 m	< 35 m	35—70 m	70—200 m	> 200 m	< 35 m	35—70 m	70—200 m	> 200 m
1. Candelabrum phrygium .	×	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..
2. Tubularia regalis	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	×	..	..	..	..
3. Rhizogeton nudus	..	..	×	..	..	..	..	..	..	..	..	..	..	..	×	..	..	×	..	..
8. Cuspidella procumbens . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..
9. Lafoeina maxima	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	×	..	..
13. Tetrapoma quadridentatum	..	×	×	..	..	..	..	..	..	..	..	..	..	×	×	..	×	×	..	..
14b. Lafoea gracillima elegantula	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..
15b. Lafoea fruticosa grandis .	..	..	×	..	..	..	..	×	..	..	..	..	..	..	×	×	..	..	..	..
16. Toichopoma obliquum . .	..	..	×	..	..	×	..	..	..	..	..	..	..	×	×	..	..	×	..	..
20. Sertularella tricuspidata .	..	..	×	..	..	×	..	..	..	..	..	..	..	×	×	..	×	..	..	×
21b. — polyzonias gigantea .	..	×	×	..	..	..	..	..	..	..	..	..	..	×	×	..	×	×	..	×
24. Sertularia mirabilis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	×	..	..
25. — fabricii	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×
28. Diphasia pulchra	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	×
30. Halecium groenlandicum	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	×	..	..
31. — curvicaule	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	×	×	×	×	×
35. — minutum	..	..	..	..	..	..	..	..	..	×	..	..	..	×	..	..	..	..	..	..
41. Campanularia speciosa . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..
Total of arctic species . .	*1*	*2*	*6*	*0*	*0*	*3*	*0*	*2*	*0*	*1*	*0*	*2*	*1*	*6*	*6*	*4*	*6*	*10*	*2*	*5*

(Continued next page)

Species	Skovfjord (with Eriksfj.)				Brede-fjord				Kvane-fjord				"Atlantic" fjords together				North Ström-fjord			
	< 35 m	35—70 m	70—200 m	> 200 m	< 35 m	35—70 m	70—200 m	> 200 m	< 35 m	35—70 m	70—200 m	> 200 m	< 35 m	35—70 m	70—200 m	> 200 m	< 35 m	35—70 m	70—200 m	> 200 m
10. Stegopoma plicatile	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	×	..	..	×	..
15a. Lafoea fruticosa genuina	..	×	×	×	..	×	..	×	..	..	..	..	..	×	×	×	×	×	×	×
18. Grammaria abietina	..	..	×	..	..	..	..	×	..	..	..	..	..	..	×	×	..	..	..	..
23. Sertularia tenera	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	×
32. Halecium muricatum	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	×	..	×
33. — labrosum	..	×	..	..	..	..	..	..	..	..	..	..	..	×	..	..	×	..	..	×
40. Campanularia volubilis	..	×	..	..	..	..	..	..	..	..	..	..	..	×	..	..	×	×	..	..
43. Laomedea hyalina	..	..	..	..	..	..	×	..	..	..	..	×	..	..	×	×	×	..	×	×
Total of arctic-boreal species	*0*	*3*	*2*	*1*	*0*	*1*	*1*	*2*	*0*	*0*	*0*	*2*	*0*	*3*	*3*	*4*	*5*	*3*	*4*	*5*
4. Perigonimus roseus	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	..	..
5. Eudendrium annulatum	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..
7. Cuspidella grandis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..
19. Lictorella pinnata	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	×	..	..	..	..
22. Abietinaria abietina	..	..	×	..	..	..	..	..	..	..	..	..	..	..	×	..	..	×	..	×
26. Thuiaria thuja	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	×
36. Nemertesia antennina	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..
42. Campanularia verticillata	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	×
Total of boreal species	*0*	*0*	*1*	*1*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*2*	*2*	*1*	*2*	*2*	*3*
37. Aglaophenopsis cornuta	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	..
38. Cladocarpus formosus	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	..
Total of Atlant. abyssal species	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	*0*	*0*	*0*	*0*
6. Eudendrium capillare	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	×	×	..	..
11. Campanulina lacerata	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..
12. Calicella syringa	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	×
14a. Lafoea gracillima typica	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..
17. Filellum serpens	..	..	×	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..
21a. Sertularella polyzonias typica	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	×	..	..	..	..
34. Halecium tenellum	..	×	..	..	..	..	×	..	..	..	..	×	..	×	×	×	×	×	×	..
39. Campanularia integra	..	×	×	..	..	×	..	..	..	×	..	..	..	×	×	..	×	×	..	×
44. Laomedea longissima	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	..	..	..
Total of cosmopolitan species	*0*	*2*	*2*	*0*	*0*	*2*	*2*	*0*	*0*	*1*	*0*	*2*	*0*	*3*	*4*	*2*	*5*	*4*	*1*	*2*
27. Thuiaria alternitheca	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×
29. Halecium læve	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	..
Species with unknown distrib.	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*1*
Grand Total	*1*	*7*	*11*	*2*	*0*	*6*	*4*	*7*	*0*	*2*	*0*	*7*	*1*	*12*	*15*	*15*	*17*	*19*	*9*	*16*

and also that *Lafoea fruticosa grandis*, *Halecium minutum*, *Grammaria abietina*, *Filellum serpens*, and *Sertularella polyzonias typica* were not found in North Strömfjord. All these species occur outside the coast of Greenland until far higher degrees of latitude. We may take it for granted, on the other hand, that *Aglaophenopsis cornuta*, *Cladocarpus formosus*, *Nemertesia antennina*, and *Lictorella pinnata* are really wanting in North Strömfjord. The two first mentioned species have been found in several localities between Julianehaab Bank and Little Hellefiske Bank, 60°16′—65°30′ N., at depths between abt. 100 and 1200 m, but not further north, *Nemertesia antennina* occurs within the same limits from south to north, but in less deep water, abt. 120—300 m. *Lictorella pinnata* has its main occurrence in the deeper parts of the boreal region; its distribution off the west coast of Greenland extends rather far to the north, entering the Disko Bay; but there is a characteristic difference in its bathymetrical distribution in various parts of the Greenland waters: south of the submarine ridge between Greenland and Baffin Land it occurs between abt. 200 and 1200 m, but north of the ridge it has not been found at depths of more than 520 m; it does not descend into the icy cold bottom water of the Baffin Bay, and in the Disko Bay it is only found between 400 and 470 m where the temperature is about 1°, whereas it avoids the intermediary depths with cold water. It seems beyond doubt that the low temperature in the deeper parts of North Strömfjord prevents these species from settling down there.

The great majority of the species which have been found in deep water in the fjords really belong to the littoral region, whence they are able to descend into greater depths. Among the species here mentioned only *Tubularia regalis* (arctic), *Stegopoma plicatile* (arctic-boreal), *Lictorella pinnata* and *Nemertesia antennina* (boreal), and *Aglaophenopsis cornuta* and *Cladocarpus formosus* (Atlantic-abyssal) have their principal occurrence in deep water, whence they ascend as far up as into the middle portion of the littoral region.

Almost all the species found in the fjords, which are dealt with in the present paper, also occur outside the open coast of Greenland; the only exceptions are the following: *Tubularia regalis* and *Diphasia pulchra* have not been found in any other Greenland localities than those here mentioned; *Rhizogeton nudus* is also known from Godthaab Fjord; the only previous record of *Candelabrum phrygium* as found in West-Greenland waters is from an unknown locality.

The number of species actually found in the fjords investigated is 44, but in Tables II—IV the arctic varieties of *Lafoea gracillima*, *Lafoea fruticosa*, and *Sertularella polyzonias* are reckoned as "species", the total number thus amounting to 47. In Table II the species are divided, according to their zoogeographical characters, into six groups:

1. Arctic species, mainly occurring within the arctic region, though some of them penetrate more or less into the boreal.

2. Arctic-boreal species, particularly common in arctic regions, but also more or less common in the boreal.

3. Boreal species, mainly occurring in the boreal region, never found under purely arctic conditions, but partly penetrating far to the south. (As only one "northern-boreal" species, *Campanularia verticillata*, has been found in these fjords, this species is reckoned among the boreal.)

4. Atlantic-abyssal species, mainly occurring in the deeper parts of the Atlantic Ocean.

5. Cosmopolitan or widely distributed species, able to live under very different conditions.

6. Species of which the further distribution is unknown or deficiently known.

Within each of these six groups the species are arranged in systematic order in Table II. The figures before the specific names in the table refer to the numbers under which the species are mentioned in the Systematic Part of this paper.

The results, as given in details in Table II, are summarized in Table III; in this table the depth of the water is divided into six bathymetrical zones. 35 m approximately indicates the lower limit of the Laminarian zone in all fjords. The fact that in the southern fjords only one species has been found within the Laminarian zone is simply due to

Table III. Zoogeographical composition of the Hydroid Fauna in West-Greenland fjords.

Depth m	Skovfjord (with Eriksfjord)					Bredefjord					Kvanefjord					"Atlantic" fjords together					North Strömfjord				
	arctic	arctic-boreal	boreal	atlantic-abyssal	cosmopolitan	arctic	arctic-boreal	boreal	atlantic-abyssal	cosmopolitan	arctic	arctic-boreal	boreal	atlantic-abyssal	cosmopolitan	arctic	arctic-boreal	boreal	atlantic-abyssal	cosmopolitan	arctic	arctic-boreal	boreal	atlantic-abyssal	cosmopolitan
< 35.....	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	6	5	1	..	5
35— 70.....	2	3	..	..	2	3	1	..	..	2	1	..	..	..	1	6	3	..	..	3	10	3	2	..	4
70—150.....	6	2	1	..	2	..	..	..	..	..	..	..	..	..	..	6	2	1	..	2	2	4	2	..	1
150—200.....	..	..	..	..	..	..	1	1	..	2	..	..	..	..	..	..	1	1	..	2	..	1	..	..	..
200—400.....	..	1	1	..	..	1	2	..	2	..	2	2	..	..	2	3	4	1	2	2	5	5	3	..	2
> 400.....	..	..	..	..	..	1	..	..	1	..	..	1	1	..	..	1	1	1	1	..	..	..	1	..	..
Total number of species.....	7	4	2	0	3	5	3	1	2	4	3	2	1	0	3	12	6	4	2	6	14	7	5	0	6

Table IV. Distribution of Hydroids in North Strömfjord.

Depth m	I, stat. 36 A & B					II, stat. 1—8					III, stat. 9-11					IV, stat. 23-35				
	temp. °C	arctic	arctic-boreal	boreal	cosmopolitan	temp. °C	arctic	arctic-boreal	boreal	cosmopolitan	temp. °C	arctic	arctic-boreal	boreal	cosmopolitan	temp. °C	arctic	arctic-boreal	boreal	cosmopolitan
< 35	2	1	1	..	2	0—4	6	5	1	4	5	..	..	..	..	0.2—1.5	..	..	..	..
35— 70	—	..	..	..	..	÷0.2	6	3	2	4	—	1	1	..	2	0.1—0.2	4	..	..	..
70—150	—	..	..	..	..	—	..	..	..	..	÷0.7—÷0.8	..	..	..	..	0—÷1.2	2	4	2	1
150—200	1—2	..	1	..	..	—	..	..	..	..	—	..	..	..	..	÷1—÷1.1	..	..	..	..
200—400	—	..	..	..	..	÷0.1—+0.2	5	5	3	2	÷1—÷1.5	..	..	..	..	÷1.2	1	..	..	..
> 400	—	..	..	..	..	÷0.7	..	..	1	..	÷0.1	..	..	..	..	—	..	..	..	..

deficiency of investigation. The limits between the other bathymetrical zones bear no relationship upon physical conditions; they are merely chosen for practical purposes with regard to the depths at which the dredgings were carried out in the various fjords (see the above list of stations).

Table III shows that each zoogeographical group of species has in all essentials the same bathymetrical distribution in both types of fjords; even the boreal Hydroids descend into the same depths in North Strömfjord as in the southern fjords. Of special interest are the total numbers of species of the various zoogeographical groups found in North Strömfjord as compared with the corresponding numbers in the southern ("Atlantic") fjords taken as a whole. The two Atlantic-abyssal species are wanting in North Strömfjord; but within all the other groups the numbers are very nearly the same in both types of fjords! This is a most remarkable result. According to STEPHENSEN, the fauna of Crustaceans, Pygnogonids, and Echinoderms in North Strömfjord consists entirely of arctic and arctic-boreal species, whereas several boreal and Atlantic forms occur in the southern fjords. HARTMEYER, on the other hand, found no essential difference between the Ascidian faunas of the two types of fjords, and now we also find that the zoogeographical composition of the Hydroid fauna is the same in both types of fjords, except that Atlantic-abyssal species are wanting in North Strömfjord.

The distribution of the Hydroids within each of the southern fjords does not give occasion for much discussion. The fjords are described and their hydrography accounted for in STEPHENSEN's paper (1916). In the southernmost fjords, near Julianehaab (Bredefjord and Skovfjord with their inner continuations Sermilik and Eriksfjord) the

surface water has varying temperatures and a low salinity owing to the melting of the many icebergs; the lowest temperature observed is 0° or a little more and is found at a depth of about 100 m, whence the temperature increases downwards; in Bredefjord the temperature is 3° at 250 m, 3°6—3°9 at depths of more than 450 m. In Skovfjord the bottom temperature is somewhat lower, 2°8 at 400 m. In Kvanefjord, near Frederikshaab, negative temperatures (0— ÷ 0°8) are observed in some stations between 100 and 150 m; at depths of more than 400 m the bottom temperature is usually 2°—3°.

The two Atlantic-abyssal Hydroids, *Aglaophenopsis cornuta* and

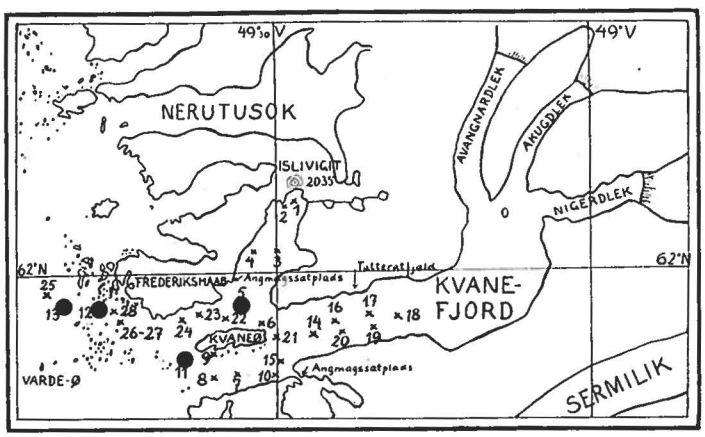

Fig. 7. Map of Kvanefjord. ● localities where Hydroids were collected.

Cladocarpus formosus, are only found in Bredefjord, partly near the mouth of the fjord (stat. 121 and 55), partly in the middle part (stat. 76, see the map, fig. 6). The arctic-boreal abyssal species *Stegopoma plicatile* was only found in Kvanefjord, in three localities, at depths between 290 and 420 m, and it was also here that the boreal abyssal species *Lictorella pinnata* was found. — According to STEPHENSEN, the fauna of these fjords is decreasing in richness from the mouth of the fjords inwards; this does only partly hold good as far as the Hydroids are concerned. In Kvanefjord, it is true, Hydroids were only found in the outer part of the fjord, in Bredefjord most species were found at stat. 88 in the inner part of the fjord, but inside that locality and in Sermilik no Hydroids were collected. In Skovfjord Hydroids were mainly found in two localities, stat. 156 near the mouth, and stat. 141 in Eriksfjord (Tunugdliarfik). Neither these examples nor a more detailed study of the occurrence of the species within these fjords give evidence of any pronounced correlation between the local distribution of the hydroids and the hydrographical features.

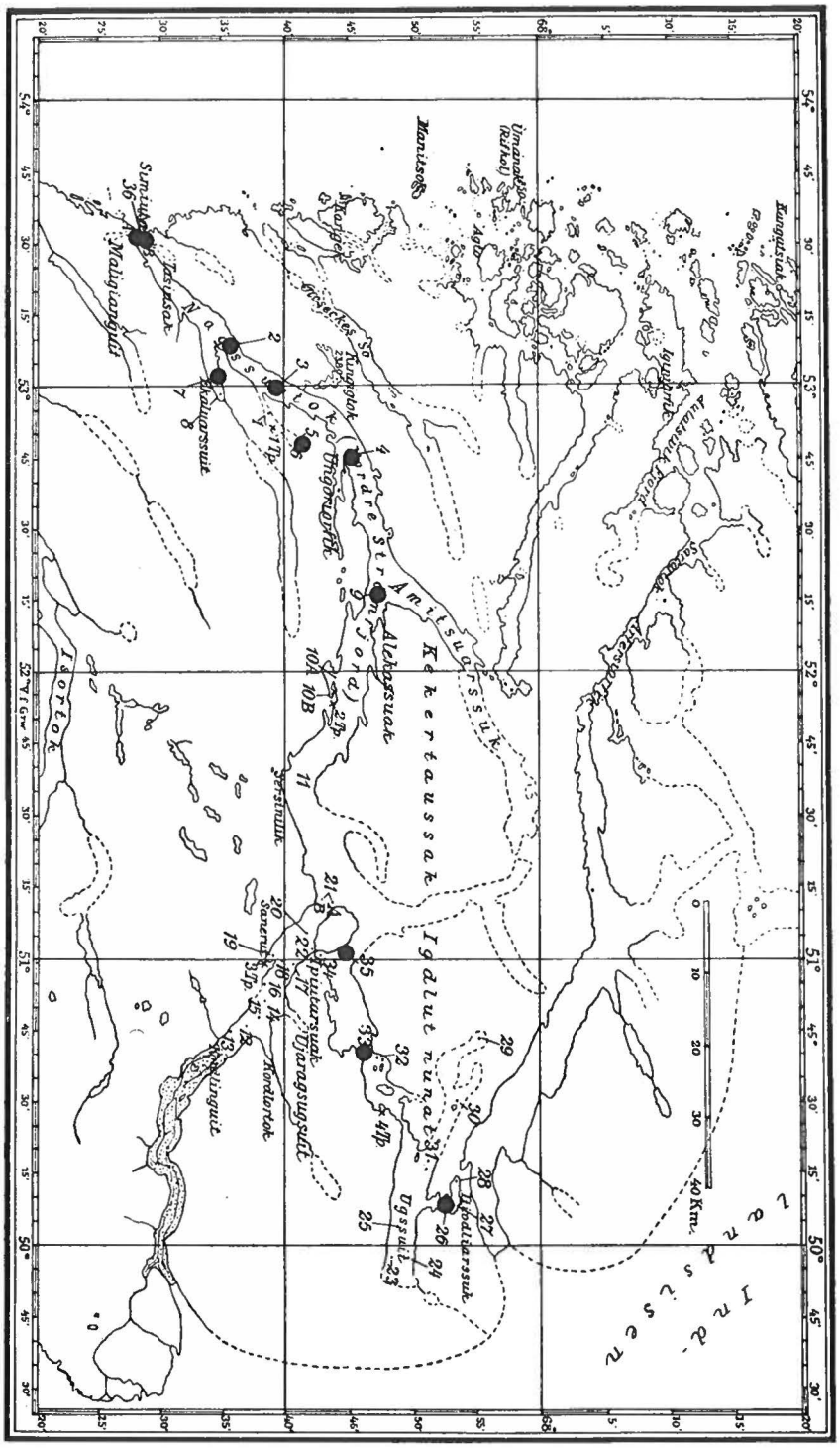

Fig. 8. Map of North Strömfjord. ● localities where Hydroids were collected.

The distribution of the hydroids in North Strömfjord is rather interesting and needs some remarks (see Table IV and the map, fig. 8). In Table IV the fjord is divided into four sections, and for each section is given the number of species of each zoogeographical group found in each of the bathymetrical zones, and also the temperatures observed. Section I only comprises stat. 36 A and B which are on the threshold at the mouth of the fjord. Section II is the outer part of the fjord and comprises the stations 1—8, where hydroids seem to find very good conditions and were found rather plentifully. Section III is the middle part from the mouth of Amitsuarssuk to the point where the fjord divides into two branches; in this section the bottom mostly consists of clay and mud, and hydroids are wanting except on the rocky bottom of stat. 9 A. Section IV is the north-eastern branch of the innermost part of the fjord, stat. 23—35; in most places and at very different depths the bottom consists of clay with or without stones and without hydroids, but in some localities hydroids thrive well, and several species were found. In the south-eastern branch of the fjord no hydroids were found; here the bottom consists of clay and stones from the glacier.

It will be observed that species of all zoogeographical groups are found at rather considerable depths and at low temperatures in section IV as well as in section II (the species placed in the rubric 70—150 m in section IV in the table are all from stat. 33, 150 m, temp. $-1°1$); also boreal species were found there, and this needs an explanation. Stephensen as well as Hartmeyer emphasize the constantly negative temperature of the water at all depths from about 60 m downwards in North Strömfjord, but I wonder whether this be quite correct. My studies on the distribution of the hydroids off the west coast of Greenland (Kramp 1932) have demonstrated that hydroids are able to live for a long time under very unfavourable conditions of temperature, when only there is a short period of the year when the conditions are favourable. Species which belong to boreal or even still warmer regions are quite common on the off-shore banks off southern Greenland, where the bottom temperature is negative during a great part of the year, but rises to fairly high values (5—6°) in late summer and autumn. If the temperature in the deeper parts of North Strömfjord is really negative throughout the year, we should not expect boreal species to occur there; but if sometimes the temperature rises to one or two degrees above 0°, their presence would be quite explicable, and that is what I really think it does. We must remember that the hydrographical observations from North Strömfjord are all from June and July, shortly after the winter ice had broken up, and then the deeper water layers will necessarily be very cold, and heating from above is not likely to occur, because the surface water, when it is heated from the air during the

summer, becomes so light that it cannot sink down into the deeper strata, unless it is brought down by vertical currents. It is, however, quite likely that Atlantic water from the outside may sometimes enter the fjord and owing to its fairly high salinity continue its way at intermediary depths and mix with the water layers there. We do not know for certain the depth of the threshold at the entrance to the fjord, but stat. 36 A, where the depth was 170—200 m, is supposed to be on about the shallowest part of the threshold, and this view is supported by the condition of the bottom which consisted of great quantities of dead shells, indicating that the very strong currents which have given the fjord its name (Ström = Current) rush violently over the bottom in this place. On July 31st 1911 the bottom temperature at stat. 36 A was 1—2°; later in the year it will probably even be somewhat higher. This comparatively warm water will enter the fjord and mix with the intermediary water layers, causing a rise in the temperature for a time. In the journal from Dr. NORDMANN's investigations in North Strömfjord positive temperatures are sometimes noted from rather considerable depths; these observations have been considered erroneous, but may be they were not altogether wrong. There can be no doubt but that the violent currents cause a considerable mixing up of the water layers in North Strömfjord; this is clearly seen from the observations on the salinity. In the upper strata the salinity was about 31—32 ‰, at depths between 100 and 400 m it was generally about 33.3 ‰; in section IV (the northeastern branch) the salinity was somewhat higher in all strata, 33.5—35 ‰. The small vertical variations of the salinity seem to me a token of considerable vertical movements of the water masses. The combined action of the influx of Atlantic water from the outside and of the vertical movements which bring down surface water which has been heated during the summer, will result in an increase of the temperature in the deeper strata at a certain period of the year, sufficient to enable some boreal species of hydroids (and ascidians) to propagate and grow for a while and so to live at intermediary depths in North Strömfjord.

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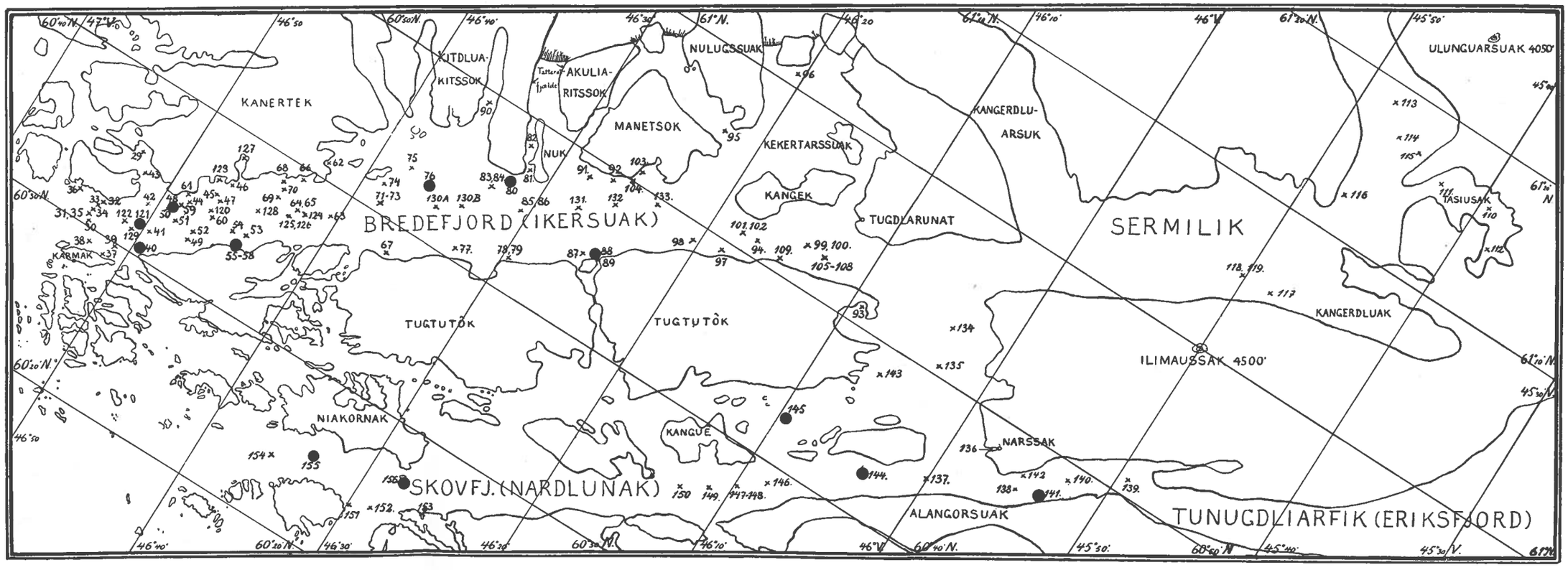

Fig. 6. Map of Bredefjord, Skovfjord, and adjacent fjords. ● localities where Hydroids were collected.