IV.

ON THE MARINE ALGÆ FROM NORTH-EAST GREENLAND

(N. OF 76° N. LAT.)

COLLECTED BY THE "DANMARK-EXPEDITION"

BY

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INTRODUCTION.

The Marine Algæ procured during the Danmark Expedition have been collected by the botanist of the Expedition, Mr. Andr. Lundager. As will be seen from the list of stations, they were procured by dredgings partly at the wintering place of the Expedition, partly at various distances from it, outwards and southwards to the small Island Maroussia, inwards and northwards to Stormbugt. Only some few samples of algæ found frozen in the ice or lying on or floating among the ice originate from more distant localities; these however are of less interest, as it is uncertain whether they have grown in the neighbourhood of the place where they were found or far from it. Almost all the gatherings have been made in August and September 1907 and in July 1908. Only the accidental samples mentioned have been collected at other seasons. The collected algæ are partly dried partly preserved in alcohol; some of the larger Laminariaceæ were dried in the air and afterwards salted.

A list of the localities where the algæ were collected is given here. They are disposed from South to North. With exception of the first and the two last, they are all situated between ca. 76° 30′ and ca. 76° 47′ Lat. N. From notes kindly given me by Mr. Lundager I have added some communications about the vegetation and the natural conditions at some of the places.

List of collecting places.

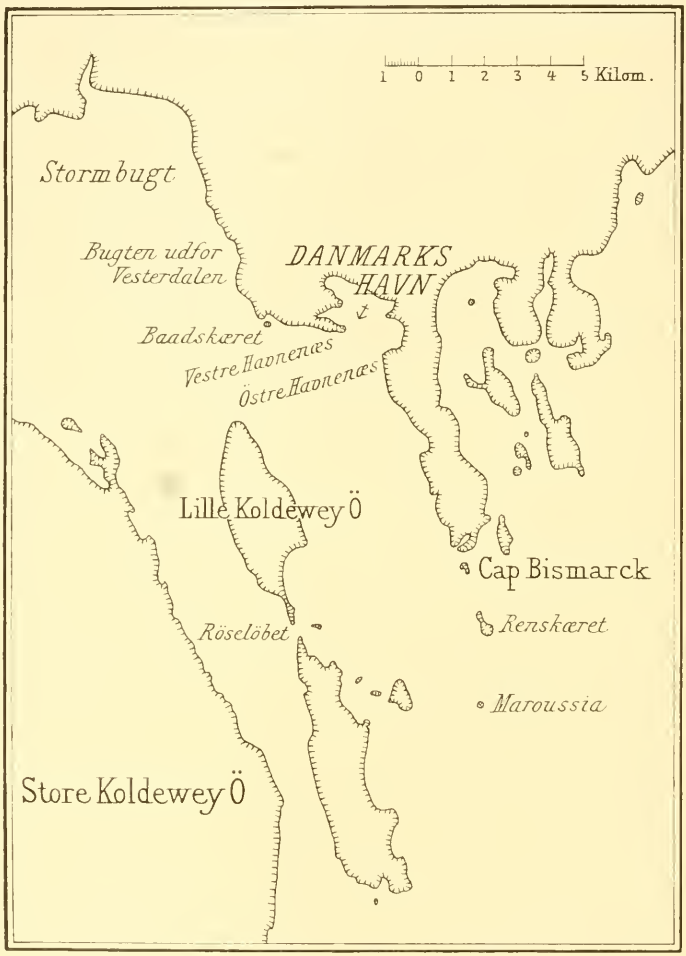
Ca. 75° 50′ Lat. N., 11° 23′ Long. W., Aug. 4th 1906. Floating in the ice.

Along the East side of Store Koldewey Island, and in the bay between the two islands, Aug. 26th. (Calcareous algæ).

— Sept. 5th 1907. In the bay near the low tongue between the islands *Fucus inflatus* was found growing in shallow water. At a depth of 6 to 9 meters were found *Alaria* and *Laminaria* (*saccharina v. grandis*), in 15 meters depth Florideæ. In 19 to 22 meters depth was found *Delesseria* (*sinuosa*) on soft bottom without stones or shells.

At Cape Bismarck, Sept. 28th 1906.

Along Cape Bismarck Peninsula, around Renskæret, and to Maroussia. July 20th 1908. The two *Laminariæ* and *Alaria* were seen growing more or less gregariously in comparatively shallow water between Cape Bismarck and Renskæret. *Delesseria sinuosa*, *Turnerella Pennyi*, *Polysiphonia arctica* a. o. occurred at a some-



Danmarks Havn and surroundings. By Captain J. P. Koch.

what greater depth, probably ca. 20 meters. At a depth of more than 24 meters *Lithothamnia* were dredged, but they were lost by an accident.

Østre Havnenæs. Aug. 15th 1907.

Danmarks Havn. Aug. 1906 (*Laminariæ*).

— Aug. 15th and 28th, Sept. 10th 1907. *Fucus* (*inflatus*) grows in shallow, disturbed water on stony ground around Vestre Havne-

næs at a depth of 2 to 4 meters. — 8 to 11 meters, soft bottom with Florideæ.

Entrance to the harbour (Danmarks Havn), Sept. 9—10th. Calcareous algæ (*Lithothamnia* and other incrusting algæ).

At Vestre Havnenæs, Sept. 4th and 10th 1907. On both sides of the reef projecting from the point of land, 28 meters. In 8 to 11 meters depth *Alaria* with large sporophylls; no calcareous algæ.

— One sample from Vestre Havnenæs, Sept. 4th 1907 must have been collected in the littoral (tidal) region. (Nothing has been noted about the place where it grew.) It contains decidedly littoral alga, such as *Calothrix scopulorum, Enteromorpha prolifera, Pseudendoclonium submarinum, Ectocarpus maritimus* (*Pilinia maritima* (Kjellm.) Rosenv.) further *Rhodochorton* and others.

Along Vestre Havnenæs and off Baadskæret, Aug. 26th 1907. 38 meters and deeper, stony bottom with calcareous algæ and shells of bivalves and barnacles. — In lesser depth associations of *Delesseria* (*sinuosa*) or *Phyllophora* (*Brodiæi* **interrupta*).

— Aug. 28th 1907, 19 to 47 meters, Florideæ.

Stormbugt. *Laminariæ* and *Alaria.*

Bay off Vesterdalen, Aug. 28th 1907, 4 to 11 meters.

Cap Amélie, 77° 32′ Lat. N., April 22th 1907, clumps of algæ frozen in the ice.

Hyde Fjord, 83° 15′ Lat. N., May 15th 1907. 4 stipes of a *Laminaria* (probably *L. saccharina* v. *grandis*), found lying on the ice in a dried state by Capt. Koch.

As will be seen from the above list, a well developed sublittoral vegetation seems to exist at several places in the explored area. Thus, *Fucus inflatus* forms a vegetation at a few meters depth under low-water mark. The Laminariaceæ (*Laminaria saccharina* v. *grandis, L. solidungula* and *Alaria Pylaii* v. *grandifolia*) also form true associations at a somewhat greater depth, while the Florideæ are predominant at other places, mostly in greater depths, in particular *Delesseria sinuosa, Turnerella Pennyi, Polysiphonia arctica* and *Phyllophora Brodiæi* * *interrupta.* The brown algæ, except the Laminariaceæ, seem to be less copious; one of the most abundant in the collection is *Desmarestia viridis.* The incrusting algæ seem to occur rather often abundantly at places where other algæ do not occur, in particular on stony bottom in great depths; the most common of these algæ is *Lithothamnion lævе;* further may be named *Lithoderma fatiscens, Lithothamnion glaciale* and *fœcundum, Cruoria arctica* and *Rhododermis elegans.*

Further, it results from the facts related in the list and from

the examination of the collection that associations of loose-lying algæ occur at several places on soft bottom. In this condition *Turnerella Pennyi* occurs in particular very abundantly and further *Phyllophora Brodiæi* f. *interrupta, Polysiphonia arctica, Delesseria sinuosa, Stictyosiphon tortilis, Ectocarpus littoralis, Chætomorpha Melagonium.* On the other hand, *Fucus inflatus,* which was so abundant among the loose algæ in Scoresby Sound (Comp. K. Rosenvinge 1898, I p. 47, II p. 219) seems to occur more rarely as loose-lying on the bottom in the explored area. Most of the species named continue probably vegetating for a long time in a loose condition. As formerly stated by me (1898 II p. 221), that *Polysiphonia arctica* is almost always sterile is certainly in connection with the fact that it is not attached to the bottom.

As to the littoral region, it will be seen from the list that one sample only has been collected above low-water mark; but Mr. Lundager has noted that *Fucus inflatus* occurs in clefts in the rocks in the lower part of the littoral region at Vestre Havnenæs and at Cape Bismarck.

Our knowledge of the Marine algæ of East Greenland is due for a great part to collections made during two Danish expeditions in the last decade of the nineteenth century, namely by N. Hartz in 1891—92 (K. Rosenvinge 1898, I) and by C. Kruuse in 1898—99 (H. Jónsson 1904). According to Jónsson 114 species were known from East Greenland in 1904. One of these species, however, *Lithothamnion varians* Foslie, must be omitted, as according to Foslie it must be regarded as a form of *Lithothamnion glaciale* Kjellm. The total number of species therefore becomes 113. The best investigated part of the coast is that situated between 65° 31′ and 70° 27′ Lat. N., while only very few species are known from more northern localities.

In the systematic part of this paper 60 species are recorded (besides two undetermined). 5 of these species are new to Greenland, 3 of them new to science (*Cruoriopsis hyperborea* sp. n., *Punctaria glacialis* sp. n., *Myrionema foecundum* (Strömf.) Sauv., *Arthrochæte phæophila* sp. n., *Pseudendoclonium submarinum* Wille). 11 are new to East Greenland (besides the last-named, further *Lithothamnion tophiforme, Chorda tomentosa, Phæostroma pustulosum, Ectocarpus maritimus* (= *Pilinia maritima* (Kjellm.) Rosenv.), *Epicladia Flustræ, Ulothrix scutata*). The total number of species known from East Greenland is thus 124 (besides an undescribed species of *Choreocolax* (?) and perhaps a species of *Acrosiphonia*)[1].

[1] The total number of species known from Greenland was in 1904, according to Jónsson, 176, of which 165 were recorded from the west coast. As *Lithotham-*

Of the 60 enumerated species not less than 9 (15 p. ct.) have only been found on the East coast (besides the five species new to Greenland, further *Chantransia efflorescens, Petrocelis polygyna, Laminaria saccharina* var. *grandis* and *Arthrochæte penetrans*). This rather high number seems to suggest a considerable difference between this area and that of the West coast. Some of these species are however very small and will probably be found also on the West coast on further investigation, like e. gr. *Pseudendoclonium submarinum,* but others are so large and conspicuous that they can scarcely be supposed to have been overlooked, as *Punctaria glacialis* and *Laminaria saccharina* var. *grandis.* It must however be remembered that only the southern part of the West coast can be said to be rather well investigated with regard to the marine algæ, while the part North of 73° Lat. N., with which a comparison would be particularly desirable, is very imperfectly known in that respect.

A comparison of the flora communicated below with a list of the species found in Scoresby sound, ca. 70° 27′ Lat. N. (comp. K. Rosenvinge 1898 I) shows nearly the same number of species. As the last-named locality, in particular Hekla Havn and surroundings, must be considered as comparatively well investigated through N. Hartz's careful collections, we may be permitted to conclude that the material brought home by Mr. Lundager also gives a rather exhaustive idea of the algal flora of that small part of the Arctic Sea where it was gathered. The comparison of the two floræ shows further that a great number of species are common, as was to be expected. Some of the not-common species are so inconspicuous that their absence from one of the areas ought not to be taken into consideration; in other cases their absence cannot be regarded as accidental. As species occurring in Scoresby Sound but wanting in the area here in question might be named: *Dilsea integra* (also found at Sabine Island, 74° 32′ Lat. N.), *Pessonellia Rosenvingii, Scaphospora arctica* (= *Haplospora globosa*?) *Chordaria flagelliformis, Dictyosiphon foeniculaceus, Punctaria plantaginea, Chætomorpha tortuosa.* Further may be named *Agarum Turneri,* the presence of which in Scoresby Sound, however, has not been proved with certainty, and *Ptilota pectinata,* which has been found at Cape Wynn (74° 32′ Nat. N.), though not in Scoresby Sound. Of the species only found North of 76° Lat. N. must especially be named the new species *Punctaria*

nion varians must be omitted (see above), the number must be diminished with 1, but as *Chantransia microscopica* var. *collopoda* must be regarded as a distinct species (comp. K. Rosenvinge 1909 p. 81) the number remains the same. Thus, after the new additions to the flora, the total number for Greenland is 181, for West Greenland 165.

glacialis, which seems to be a strongly arctic species with an extremely northern extension, at least on this coast. The occurrence of *Chorda tomentosa*, though only in feebly developed specimens, appears rather surprising, as it has not hitherto been observed on the East coast. *Lithothamnion tophiforme* may also be named, though it was only represented by one specimen. Thus, a certain floristic difference seems to exist between Scoresby Sound and the area North of 76° Lat. N., depending principally on the absence in the latter of a number of species with a comparatively southern extension but also on the presence of at least one species with hyperborean occurrence.

When considering the number of species within the main groups of algæ the following numbers are found for the area here in question, when the two undetermined species are included:

	Number of species	p. ct.
Rhodophyceæ	23	37·1
Phæophyceæ	23	37·1
Chlorophyceæ	15	24·2
Cyanophyceæ	1	1·6

It is rather surprising that the red and the brown algæ are found to be equally numerous in this area, as it has proved elsewhere that the Phæophyceæ are the most numerous group of algæ in the arctic regions. When comparing these numbers with those found by me for the whole of Greenland (1898, II p. 173[1]), we find that the percentage of the Rhodophyceæ has greatly increased, that of the other groups more or less diminished. On the other hand, we find the same proportion between the red and brown algæ in Scoresby Sound, for in Hekla Havn were found 21 red, 22 brown and 9 green algæ (l. c. p. 232), and including the species found in the neigbourhood of Hekla Havn (l. c. p. 231) we find the following numbers: 26 red, 26 brown and 10 green algæ. The relative number of the Phæophyceæ seems thus to be increasing and becomes predominant on going from the Atlantic northwards to the Arctic Sea, but it diminishes on going further northwards in the strongly arctic parts of the sea, dividing the dominion with the Florideæ which greatly increase in number.

When the 60 species of North-East Greenland are divided into three groups, arctic, subarctic and North Atlantic in a similar man-

[1] I take here the numbers as I found them in 1898 without considering the later additions and corrections to the flora.

ner as that used in 1898 (II), a much smaller number of North Atlantic species results than in the flora of the whole of Greenland, as might be expected. When all the species are included the following numbers result: arctic 35 p. ct., subarctic 46·6 p. ct. and North Atlantic 18·3 p. ct., while the numbers for the whole of Greenland are: arctic 30 p. ct., subarctic 37·7 p. ct. and North Atlantic 32·3 p. ct.[1] When the Rhodophyceæ and Phæophyceæ are only taken in consideration, we obtain for North-East Greenland: **35·6** p. ct. arctic, **53·3** p. ct. subarctic and **11·1** p. ct. North Atlantic species, for the whole of Greenland: 33 p. ct. arctic, 46·1 p. ct. subarctic and 20·9 p. ct. North Atlantic. The last named numbers for North-East Greenland are almost identical with the corresponding numbers for the whole of East Greenland found in 1898 (i. e. for the East coast south of 74° 30′ Lat. N. or more correctly south of 70° 30′ Lat. N.): **36·5** p. ct. arctic, **54** p. ct. subarctic and **11** p. ct. North Atlantic species, (K. Rosenvinge 1898 II p. 180). This striking agreement in spite of the existing floristic differences between the different parts of the East coast seems to be the expression of the pronounced arctic character of the whole coast. Even if the numbers given might be somewhat altered by taking Jónsson's paper (1904) into consideration, and will probably be altered by further investigations, I do not doubt that the agreement mentioned really exists.

LIST OF THE SPECIES.

A. Rhodophyceæ.

Fam. *Corallinaceæ.*

Lithothamnion Phil.

1. **L. tophiforme** Unger.

Foslie (1895) p. 119, (1905) p. 51, K. Rosenvinge (1898 I) p. 13.

The collection contains one specimen only which can be referred to this species. It agrees with the specimens formerly found in West Greenland and has bipartite sporangia (144 μ long, 45 μ thick).

Locality. Entrance to the harbour.

2. **L. glaciale** Kjellm.

Kjellman (1883) p. 123; K. Rosenvinge (1893) p. 773, (1898 I) p. 9.

f. **typica** Foslie (1905) p. 26.

[1] See note page 98.

f. **botrytoides** Foslie (1905) p. 26.

L. *botrytoides* Fosl. in K. Rosenvinge (1898 I) p. 10.
L. *delapsum* f. *conglutinata* Fosl. (1895) p. 50 pl. 14 fig. 4.

f. **subsimplex** Foslie (1905) p. 27.

L. *varians* Fosl. in K. Rosenvinge (1898 I) p. 11.

There are some few specimens belonging to f. *typica,* some others agreeing with f. *subsimplex* and a single specimen belonging to f. *botrytoides.* The specimens referred to f. *subsimplex* are mostly large flat crusts with low rounded processes, with very few and feebly developed or even without such processes. In the latter case I should perhaps not have dared to refer the plant to this species, had not Foslie referred to L. *glaciale* a similar crust from East Greenland which he had formerly referred to L. *varians.* The great variability of the processes and the gradual transition from forms with well-developed branches to those with even crusts make me have no doubt as to the correctness of this determination. The species has been dredged at a depth between 19 and 47 meters and in another place at a depth of 38 meters or deeper.

Loc. Entrance to the harbour; along Vestre Havnenæs; off Baadskæret.

3. **L. foecundum** Kjellm.

Kjellman (1883) p. 131; K. Rosenvinge (1898 I) p. 12, Foslie (1905) p. 21.

The collection contains a number of specimens which in my opinion must be referred to this species. They agree in habit and as to the size and form of conceptacles of sporangia with the descriptions and the formerly collected Greenlandic specimens of this species. The conceptacles, however, were most often empty, and in a single case, when they still contained sporangia, these were two-parted, while the species, according to Kjellman and Foslie, has ordinarily four-parted sporangia. Foslie has also sometimes found the sporangia two-parted, but he supposes that they were not fully developed. The sporangia observed by me were at all events well developed as to the size, for they measured 175—200 μ in length and 77—120 μ in breath. The conceptacles of sporangia were 400—500 μ in diameter. A crust with antheridial conceptacles, ca. 400 μ in diameter, was also met with. — The plants were found growing partly and principally on barnacle-shells, partly on stones, most often in company with *Lithothamnion læve.* — Collected at a depth of 38 meters.

Loc. Along Koldewey Island; entrance to the harbour; along Vestre Havnenæs; off the Baadskær.

4. **L. læve** (Strömf.) Foslie.

Foslie (1898) p. 7; K. Rosenvinge (1898 I) p. 14; Jónsson (1904) p. 6; Foslie (1905) p. 16.

Lithophyllum lævе Strömfelt (1886) p. 21 pl. I fig. 11—12.
Lithothamnion tenue K. Rosenvinge (1893) p. 778 ex parte.

This species has been collected in considerable quantities in various localities; it is the species of *Lithothamnion* most represented in the collection. It forms extended thin crusts over stones, and further over shells of bivalves and of barnacles. Usually it has conceptacles of sporangia the diameter of which most frequently attains or even exceeds 1 mm. The sporangia contained in all examined cases two spores only; they were 240—360 μ long, 93—167 μ broad. According to Foslie, (1905), p. 18 and 53, the sporangia are four-parted; he says however that he has "often seen two-parted ones, sometimes even only two-parted ones, particularly in the northern part of the arctic zone. But having found in other specimens, partly from the same places, both two-parted and four-parted ones,

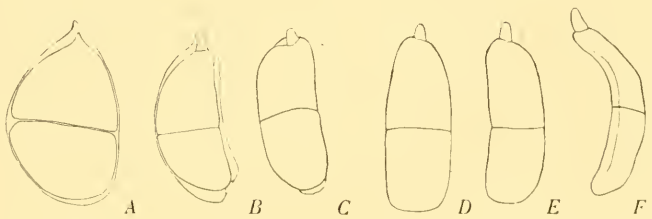


Fig. 1. *Lithothamnion lævе,* sporangia. *A*—*C* from the same conceptacle, *D*—*F* from another conceptacle. 95 : 1.

sometimes even in one and the same conceptacle, I think it fair to presume that the two-parted ones have not been fully, or normally developed". The fact that I have found only two-parted sporangia in all, not few, examined cases, seems however to favour the belief that this species has only two-parted sporangia in this arctic region. The only argument which could be alleged against this is, that all the specimens in question are collected in August and September and that the sporangia possibly at a later period might be four-parted. After what is known about the fructification of these Algæ, that supposition is however little probable. As shown in fig. 1, the breadth of the sporangia is rather variable, partly according to their place in the conceptacle.

Specimens with sexual conceptacles were also found, though in lesser quantity. These conceptacles are easily recognizable from their conical form and smaller diameter; the conceptacles of cystocarps were 500—800 μ broad, those of antheridia 500—600 μ.

Loc. Along Cape Bismarck Peninsula; in and off the entrance to the harbour; at Vestre Havnenæs, 28 meters; off Baadskæret, 19—47 meters.

Fam. *Squamariaceæ.*

Cruoria Fries.

5. **Cruoria arctica** Schmitz.

K. Rosenvinge (1893) p. 784, (1898 I) p. 15.

It forms crusts up to 4 cm. in diameter on barnacle-shells and on *Lithothamnion læve;* it seems to be always attached to a calcareous substratum. The specimens of the collection fully agree with the original ones from West Greenland and are, like those, provided with glandular cells. In a thick crust ripe sporangia (56 μ long, 23 μ broad) were found in the upper part while abortive sporangia were visible at a lower level. This species is always infested by *Chlorochytrium Schmitzii.* — Found in various depths e. g. ca. 38 meters.

Loc. Along Koldewey Island; off Baadskæret and along Vestre Havnenæs.

Cruoria firma Kjellman (1906) p. 14, is hardly specifically distinct from *C. arctica.* According to Kjellman it differs from this species by having the basal layer consisting of at least two layers. This statement, which is put forward however by the Swedish author with some reservation, I suppose to be founded on imperfect preparation; sections of *C. arctica* which are not very thin or exactly vertical lead easily to the belief that there is more than one basal layer of cells. The sporangia appear to offer no difference; they were only comparatively narrow in Kjellman's specimens. And the erect filaments seem to have essentially the same structure as in *Cr. arctica.*

Petrocelis J. Ag.

6. **P. polygyna** (Kjellm.) Schmitz.

K. Rosenvinge (1898 I) p. 16.

Hæmescharia polygyna Kjellman (1883) p. 182.

Some few crusts of this species, partly sterile, partly with carpogonia have been found growing on stones.

Loc. Along Vestre Havnenæs, ca. 38 meters, and another locality.

Cruoriopsis Dufour.

7. **C. hyperborea** sp. n.

Crusta intense sangvinea, 80—100 μ crassa. Stratum basale unistratosum, e filis radiantibus compositum, cellulis 4·5—5·5 μ crassis, 8—10·5 μ altis, crassitudine vulgo 2—3-plo longioribus. Fila erecta 5—8-cellularia, cylindrica vel sursum paulo incrassata, 7·5—10 μ crassa, cellulis diametro aequilongis vel ad duplo longioribus, chromatophorum unicum continentibus. Sporangia in filis erectis terminalia vel in parte superiori eorum lateralia, sessilia vel rarius stipitata, obovata vel breviter oblonga, 15—23 μ longa, 11—13 μ lata.

One crust only of this new species has been found growing on a stone. It has a deep blood-red colour, by which it differs from

the other crustiform Florideæ of the collection. The cells of the basal layer are about twice as high as they are broad. Fusions sometimes occur between cells belonging to neighbouring cell-rows of the basal layer. The erect filaments are not connected by any soft gelatinous matter; they are of the same thickness in their whole length or upwards somewhat thicker; their cells are usually $1^1/_2$ to 2 times as long as broad, more rarely of the same length. The cells contain a single chromatophore lying in the upper part of the cell, apparently cup-shaped. The filaments are sometimes a little branched at the upper end, bearing one or two (or perhaps

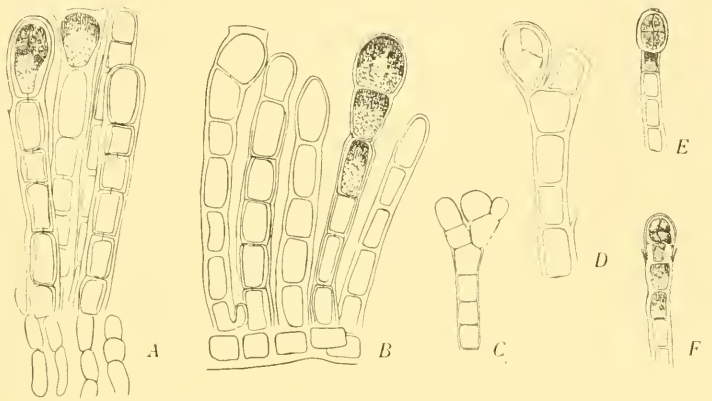


Fig. 2. *Cruoriopsis hyperborea*. *A*, portion of the basal layer seen from above and vertical filaments springing off from it, two of them ending in a sporangium. *B*, vertical section of a crust, the filaments somewhat disunited. *C*, vertical filament branched at the upper end. *D*, vertical filament bearing a lateral sporangium. *E* and *F*, vertical filaments with terminal sporangia. *A*, *B*, *D* 555 : 1; *C*, *E*, *F* 345 : 1.

more than two) short one- or two-celled branchlets. Possibly ramification only takes place by the formation of sporangia.

The sporangia are placed on the ordinary filaments and are usually terminal but never emerging over the surface of the frond. They may also be lateral on one of the upper joints of a filament and are then usually sessile (fig. 2 *D*); sometimes however two-celled branchlets occur, the upper cell of which will develop into a sporangium (fig. 2 *C*). The sporangia are obovate, more rarely shortly oblong; their division is always cruciate, the first dividing wall being horizontal. Sometimes the first division wall is oblique and the arrangement of the spores somewhat irregular.

Our plant having no sex-organs, its systematic position cannot be determined with certainty. I think however it could be referred

to the genus *Cruoriopsis,* as a new species. At all events it cannot belong to the genus *Cruoriella,* the sporangia not occurring in nemathecia but scattered in the very crust. It reminds one somewhat of *Cruoriella armorica* Hauck (1885, p. 31, non Crouan) which is referred to the genus *Cruoriopsis* by Batters (1896, p. 387) under the name of *C. Hauckii.* De-Toni (1905, p. 1690), has certainly protested against its translation to this genus, as it has terminal sporangia; this however does not appear convincing to me, the diagnosis of the genus *Cruoriopsis* containing nothing very precise as to the position of the sporangia (comp. De-Toni l. c. and Schmitz und Hauptfleisch (1897, p. 535)). In *Cruoriopsis cruciata* Dufour the sporangia are certainly lateral on the filaments (comp. Zanardini (1876), Tav. 86), but in our species lateral sporangia also occur though more rarely than the terminal ones. I think it therefore most correct, at least provisionally, to refer it to the same genus.

I have been able to compare our plant with a microscopical preparation of *Cruoriopsis Hauckii* Batt. from Plymouth, kindly sent me by the late Mr. Batters, thus an original specimen. It differs by having thinner erect filaments, ca. 4 μ thick or a little thicker, consisting of more elongated and more thin-walled cells. The sporangia are more lengthened, narrower, 21—25 μ long, 7—8 μ broad, always terminal on the ordinary erect filaments, scattered in the crust; the divisions are cruciate but oblique. In the basal layer numerous transversal fusions occur.

Through the kindness of Mrs. Weber—van Bosse I have also been able to examine two microscopical preparations of *Cruoriella armorica* Hauck, from the collection of Hauck, originating from Naples. This plant is also different from the Greenland one. The basal layer consists of broad cells arranged in regular radiating filaments, the erect filaments are thinner, sometimes dichotomous above. The sporangia are always terminal, they are larger, 46—56 μ long, 26—28 μ broad, regularly cruciate.

Loc. Along the Koldewey Island, Aug. 26th 1907 (No 556).

Rhododermis Crouan.

8. **R. elegans** Crouan.

K. Rosenvinge (1898 I) p. 18.

Crusts of this species, recognizable by their dull rose-red or light purple colour have been found growing on stones from various localities. They are always polystromatical and may be up to 20 cells thick and even thicker. The vertical filaments are 7—9 μ thick; the height of the cells is variable, sometimes about the same

as the breadth or a little greater, in other cases smaller; in the upper part of some crusts the cells were very low, several times broader than high. Transversal fusions between the cells, especially those of the basal layer, but also those of the vertical filaments (fig. 3 *A*) occur here and there.

Some crusts bear sori of sporangia, with unripe or fully developed sporangia; in other cases the sori had fully developed paraphyses but no sporangia, these having probably decayed. Ripe sporangia, found in August, were 30—32 μ long, 19—20 μ broad.

Some other crusts, collected in August and September, bear antheridia, which organs were hitherto unknown in this genus. They covered a great part of the surface of the frond as a continuous layer of much greater extent than the sporangial sori. The antheridia (spermatangia) are obovate, 10—11 μ long, 4 μ broad. In a vertical section the vertical cell-rows are seen bearing at their upper end one or usually two cells, which are smaller and richer in plasmatic contents than the vegetative cells and bear the antheridia. These cells (Svedelius's spermatangial mother-cells) bear at the top two antheridia, a terminal and a lateral one, or perhaps more. By the development of the antheridia the thick cuticula is lifted and finally thrown off by the developing antheridia. The spermatia are, like the antheridia, obovate and contain a very distinct nucleus, lying in the upper part or the middle of the cell.

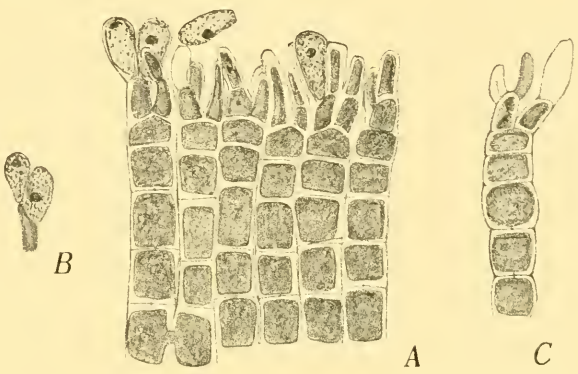


Fig. 3. *Rhododermis elegans*, sections of male plant. *A*, Vertical section of crust with antheridia. *B*, antheridia-bearing cell with two antheridia. *C*, Vertical cell-row with two antheridia-bearing cells. 830 : 1.

Carpogonia were not observed.

Loc. Along Koldewey Island; entrance to the harbour (♂ and spor.); off Baadskæret and along W. Havnenæs, ca. 38 meters (♂ and spor.)

Fam. *Ceramiaceæ*.

Antithamnion Næg.

9. **A. Plumula** (Ellis) Thur. *β*, **boreale** Gobi

K. Rosenvinge (1898 I) p. 21, Jónsson (1904) p. 8.

This species has been found growing on *Phyllophora Brodiæi* *interrupta, Delesseria sinuosa* and *Lithothamnion glaciale.* The specimens were 1 to 2 cm. long, all sterile.

Loc. Danmarks Havn and the entrance to it.

Rhodochorton Næg.

10. **R. Rothii** (Turt.) Næg.

K. Rosenvinge (1893) p. 791, (1898 I) p. 23, Jónsson (1904) p. 8.

This species has been found in two different sublittoral localities in up to ca. 40 meters depths; it was here mostly found in company with *Cruoria arctica,* forming scattered tufts on the surface of the latter. A closer examination showed however that, at all events in some cases, it had grown through the crust of *Cruoria,* the basal layer being situated under the crust. This has probably been occasioned by the *Cruoria* overwhelming the *Rhodochorton* growing previously on the stone. This supposition is supported by the fact that the same *Rhodochorton* was found growing on *Lithothamnion læve* covering the stone beside the *Cruoria.* These specimens were all sterile.

Fertile specimens with ripe and empty sporangia were found in September in company with *Calothrix scopulorum* a. o. in a gathering from the littoral region.

Loc. Along Koldewey Island; Vestre Havnenæs, in the tidal region; off Baadskærel and along Vestre Havnenæs, ca. 40 meters.

11. **R. penicilliforme** (Kjellm.) K. Rosenv.

K. Rosenvinge (1894) p. 66, (1898 I) p. 23, Jónsson (1904) p. 9.

R. *mesocarpum* (Carm.) Kjellm. var. *penicilliforme* Kjellm., K. Rosenvinge (1893) p. 792.

One specimen of this easily recognizable species was found on *Polysiphonia arctica;* the upright filaments were 10 μ thick and bore young sporangial branchlets but without sporangia.

Loc. Along Koldewey Island, ca. 8 fathoms.

Fam. *Rhodomelaceæ.*

Rhodomela C. Ag.

12. **R. lycopodioides** (L.) Ag. f. **tenuissima** (Rupr.) Kjellm.

K. Rosenvinge (1893) p. 797, (1898 I) p. 24, Jónsson (1904). p. 9.

This species is only feebly represented in the collection. At Koldewey Island, where it was collected by dredging in September, it occurred in small quantity among *Stictyosiphon tortilis;* the specimens had still hairs (trichoblasts), branched and unbranched, but

were sterile. Specimens found frozen in the ice in April bore tetrasporangia in the shoots of the previous year.

Loc. Along Koldewey Island; in clumps frozen in the ice at Cap Amélie.

Polysiphonia Grev.

13. **P. arctica** J. Ag.

K. Rosenvinge (1893) p. 800, (1898 I) p. 25; Jónsson (1904), p. 10.

Non *Pterosiphonia arctica* Setchell and Gardner (1903) p. 329.

A considerable number of specimens of this strongly arctic species has been collected in two localities situated comparatively near the open sea; they fully agree with typical specimens, reaching a length of over 20 cm. and are as usual without basal part. They seem not to have been fixed to the bottom and are all sterile.

Pterosiphonia arctica Setchell and Gardner (l. c.) which these authors have thought identical with *Polysiphonia arctica*, after comparison with a specimen from Greenland determined by me, is fairly distinct from it, judging from the remarks and the figures of the authors. The Northwest American species has a complanated frond, is plainly distichous near the tips and has constantly 6 or 7 pericentral cells, while *Polysiphonia arctica* has a cylindrical frond with branches given off on all sides and 4—7 pericentral cells. As no figures of this species have ever been published, I give here some drawings, showing the ramification and transverse sections of the frond (fig. 4). The branches are spirally arranged with an angle of divergence approaching to 180°, however somewhat smaller. As shown before (1893, p. 800) no hairs (trichoblasts)

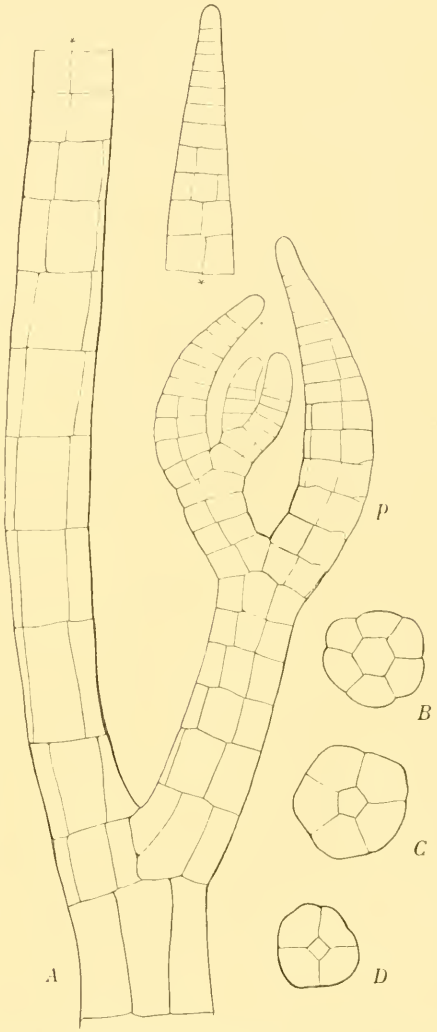


Fig. 4. *Polysiphonia arctica*. *A*, Upper end of a plant; at *p* formation of the secondary pores. *B—D*, transverse sections of fronds. 200 : 1.

occur. The specimen figured had 4—6 pericentral cells; the number was greatest in the main axes.

Loc. Along the East side of Koldewey Island, ca. 15 meters; off Cape Bismarck Peninsula.

Fam. *Delesseriaceæ.*

Delesseria Lamour.

14. **D. sinuosa** (Good. et Woodw.) Lamour.

K. Rosenvinge (1893) p. 808, (1898 I) p. 27; Jónsson (1904) p. 11.

The collection contains a considerable number of well-developed specimens of this species. They attain a length of 25—30 cm. or even more and are also broad, and they belong to the f. *typica.* Some of them bear at the base a considerable number of narrow shoots which had attached themselves on gravel or fragments of shells. One specimen was attached to a barnacle. A number of the specimens seem however to have been loose-lying on the bottom. Specimens collected in July and August showed ripe tetrasporangia, in small marginal leaflets, or cystocarps.

Loc. Along the East side of Koldewey Island, 19—23 meters; along Cape Bismarck Peninsula; off Cape Bismarck; Danmarks Havn; off Baadskæret; the bay off Vesterdalen.

Fam. *Rhodymeniaceæ.*

Halosaccion Kütz.

15. **H. ramentaceum** (L.) J. Ag.

K. Rosenvinge (1893) p. 825, (1898 I) p. 43; Jónsson (1904) p. 12.

Only 3 specimens have been met with in the collection. They have a single set of unbranched branches, are provided with hyaline hairs but are sterile.

Loc. The bay off Vesterdalen, in at most 4 meters depth.

Fam. *Rhodophyllidaceæ.*

Euthora J. Ag.

16. **E. cristata** (L.) J. Ag.

K. Rosenvinge (1893) p. 813, (1898 I) p. 28; Jónsson (1904) p. 13.

A number of specimens, all epiphytic, mostly on *Chætomorpha Melagonium* and *Delesseria sinuosa,* further on *Phyllophora Brodiæi* **interrupta* and *Turnerella Pennyi,* are contained in the collection. They all belong to f. *angustata.* The largest specimens are 5 cm. long. Ripe tetrasporangia and cystocarps occurred in specimens collected in August and September.

Loc. At Koldewey Island; Danmarks Havn.

Turnerella Schmitz.

17. **T. Pennyi** (Harv.) Schmitz emend.

F. Schmitz in K. Rosenvinge (1893) p. 815; K. Rosenvinge (1898 I) p. 29; Jónsson (1904) p. 13.

Inclus. *Kallymenia rosacea* J. Ag. (1876) p. 220, comp. Børgesen and Jónsson (1905) p. XII.

A great number of specimens of this arctic species have been collected at various localities, most abundantly in Danmarks Harbour. The form of the frond is somewhat variable, in some cases of nearly orbicular outline, usually however more or less lobed and often also undulated. Most of the specimens are devoid of basal disc and have probably been so at the moment of dredging. Some of the specimens, however, show well-developed basal discs mostly attached to barnacles. Some of the specimens provided with basal disc seem not to have been attached, when they were collected, as is to be concluded from the form of the basal disc, its under face not being plain but hollow, by strong development of the border, probably after its detachment from the substratum. The reason why almost all the specimens are without basal disc may be in some cases, that the plant has been torn away from its substratum, leaving its basal part; I imagine however that most of the specimens have been really loose-lying on the bottom. This is suggested by the form of the frond and by the fact that most of the numerous specimens from Danmarks Harbour have been dredged at a locality where the bottom is soft.

Some of the specimens agree fully with specimens referred by J. Agardh to *Kallymenia rosacea*, which however is not specifically distinct from *Turnerella Pennyi*, as stated by Børgesen and Jónsson (l. c.) and as suspected already by J. Agardh (l. c.)

The largest of the specimens contained in the collection measures 50 cm. in greatest diameter in a dried state. Some specimens contain numerous cystocarps, partly ripe, partly empty.

Loc. Along the East side of Koldewey Island, ca. 15 meters; off Cape Bismarck; along Cape Bismarck Peninsula; Danmarks Havn, 7—11 meters, soft bottom; off Baadskæret, 28 meters; the bay off Vesterdalen, 4—11 meters.

Fam. *Gigartinaceæ.*

Phyllophora Grev.

18. **Ph. Brodiæi** (Turn.) J. Ag. ***interrupta** (Grev.) K. Rosenv.

K. Rosenvinge (1893) p. 821, (1898 I) p. 32; Jónsson (1904) p. 14.

All the specimens of the collection belong to the subsp. *interrupta;* they are well-developed; partly very broad, and up to 18 cm. high. Nearly all the specimens have no basal portion and have

certainly been lying loose on the bottom; in some of them the undermost part is in a state of disintegration. For most of the specimens from the harbour it has also been stated, that they have been dredged on soft bottom. Some smaller specimens are however provided with basal disc.

Loc. Along Koldewey Island, 15 meters and deeper; Danmarks Havn, 7—11 meters, soft bottom.

Actinococcus Kütz.

19. **A. subcutaneus** (Lyngb.) K. Rosenv.

K. Rosenvinge (1893) p. 822. (1898 I) p. 33; Jónsson (1904) p. 14.

A large specimen of *Phyllophora Brodiæi* **interrupta* bears numerous specimens of this much disputed alga attached to the upper margin of some of the one-year old segments.

Loc. Along Koldewey Island, ca. 15 meters.

Ceratocolax K. Rosenv.

20. **C. Hartzii** K. Rosenv.

K. Rosenvinge (1898 I) p. 34.

Several specimens of *Phyllophora Brodiæi* **interrupta* are infested with this parasite which is situated partly on the border partly on the flat side of the frond. The specimens of the parasite form small bushes up to 3 mm. in diameter, fully agreeing with the previously found Greenlandic specimens; several of them bore nemathecia, but the sporangia were still undivided in August. The specimens of *Phyllophora* on which they were parasitic were certainly all loose-lying when dredged.

Loc. Danmarks Havn, 7—11 meters, August.

Choreocolax sp.?

In a specimen of *Euthora cristata* from Koldewey Island were found some cushions of a small parasitic Floridea looking much like a *Choreocolax* or *Harveyella*. As there is not sufficient material for a detailed description, I shall not mention it closer but only state that it grows in the same manner as *Harveyella* and *Choreocolax*, sending out from the underside of the cushion-shaped or nearly globular frond filaments penetrating between the cells of the host. In a dried state the parasite has a pretty red colour.

Fam. *Helminthocladiaceæ*.

Chantransia (D. C.)

21. **Ch. efflorescens** (J. Ag.) Kjellm.

K. Rosenvinge (1898 I) p. 40, (1909) p. 134.

Found in small quantity on *Delesseria sinuosa* and *Cruoria arctica*. The thickness of the filaments is 5—6 μ. Antheridia, carpogonia and ripe cystocarpia occurred in August.

Loc. Along Koldewey Island; Danmarks Havn and the entrance to the harbour.

Fam. *Bangiaceæ*.

Conchocelis Batt.

22. **C. rosea** Batters.

Batters (1892 p. 25; K. Kosenvinge (1898 I) p. 44.

Non *Ostreobium Queketti* Born. et Flah. var. *rosea* Nadson (1900) p. 36.

This perforating alga is frequently met with in old shells in particular of *Mya* and *Saxicava*, which assume a rose-red colour when the alga occurs alone or is predominant. It agrees very well with Batters' description and figures. According to Nadson (l. c.) this alga should not be a *Rhodophycea* but a red variety of *Ostreobium Queketti;* this however does not agree with my observations of the material from North-East Greenland. *Conchocelis* and *Ostreobium* grow frequently intermingled in these shells, but they are very easy to distinguish and do not show any indication of mutual transition. *Conchocelis* is always rose-coloured, while *Ostreobium* is constantly green. *Conchocelis* consists always of articulated filaments, the cells of which are more or less inflated in the middle but narrow at the transverse walls, while the filaments of *Ostreobium* are continuous and show here and there large irregular inflations. As far as I know, Nadson has given no account of the manner in which the transition takes place between these two widely different algæ[1], and it seems therefore most probable, that the red alga which Nadson examined is not the true *Conchocelis rosea* but rather a red variety of *Ostreobium Queketti*.

As stated by Batters, the alga forms within the surface of the shell a horizontal layer of interlaced filaments of very various shapes and widths. The cells are often inflated in the middle and the filaments may then be more or less moniliform. I have not been able to detect any pore in the middle of the transverse walls. In the deeper parts of the shell some filaments are thicker, consisting of short cylindric cells separated by broader transverse walls and with rich plasmatic contents (comp. Batters l. c. pl. VIII figs. 2—6). In the thinner cells I have found a parietal chromatophore which seems to be much branched; in some cases I saw however several intensely red-coloured bodies in each cell, probably chromatophores. In some

[1] Mag. O. Paulsen has most kindly translated for me the part of Nadson's Russian text treating of *Conchocelis*.

cases I have found in the thicker filaments one intensely red-coloured body in some of the cells, similar to those taken for spores by Batters. I have not submitted this interesting alga to a more detailed study and therefore cannot express an opinion on the question of its systematic position; I refer it with doubt to the *Bangiaceæ*[1].

Loc. East side of Koldewey Island; entrance to the harbour; at Vestre Havnenæs; off Baadskæret.

B. Phæophyceæ.

Fam. *Fucaceæ*.

Fucus (L.) Dcne et Thur.

23. **F. inflatus** L.

K. Rosenvinge (1893) p. 834, (1898 I) p. 45; Jónsson (1904) p. 19.

This species seems to be common in the upper sublittoral region, in particular in the harbour where it grows gregariously at a depth of 2 to 4 meters, on stony ground, but it occurs also in the littoral region (comp. p. 96). It occurs in a form coming near to f. *evanescens*. The frond is up to 12 mm. broad, the midrib well developed, the border sometimes feebly undulato-serrate. The receptacles are short, seldom over 5 mm. long. The largest specimen is 30 cm. long. Inflations filled with air have not been observed. Some plants, which have perhaps been loose, approach to f. *membranacea*. The species for the rest only rarely occurs among other loose algæ. Found with ripe sex-organs in August and September.

Loc. East side of Koldewey Island; Cape Bismarck; Danmarks Havn; Baadskæret.

Fam. *Laminariaceæ*.

Alaria Grev.

24. **A. Pylaii** (Bory) J. Ag. emend. var. **grandifolia** (J. Ag.) Jónsson.

Jónsson (1904) p. 21.

The Alariæ contained in the collection belong undoubtedly all to the same species. They have all a long stipital part, the greater part of which belongs to the rachis. It agrees in this and in its large dimensions with *A. grandifolia* J. Ag. The base of the lamina, however, is often comparatively narrow, cuneate; it may also be rounded ovate, but I have never found it „eximie subcordato-ovata",

[1] In (1909) I have not mentioned this alga under the *Bangiaceæ*, as a provisional examination led me to believe, that Nadson's above-mentioned supposition was right.

as J. Agardh describes it (1872 p. 26). The lamina is thin as in *A. membranacea* J. Ag. (*A. Pylaii β, membranacea* K. Rosenv.). Jónsson

Fig. 5. *Alaria Pylaii* var. *grandifolia*. The lower part of the stipe is wanting in *B*. From dredging along Cape Bismarck Peninsula, July. *A* 1 : 11·5. *B* 1 : 13.

also found, in Kruuse's collection from East Greenland, specimens of *A. grandifolia*, but he thought that this species, at least provisionally, might be regarded as a variety of *A. Pylaii*, and he pointed

out in particular its close relation to the var. *membranacea*. Considering the great variability of *A. Pylaii* which I have been acquainted with on the Western coast of Greenland, I am inclined to believe that this translation is legitimate, but it must be admitted, that it is very difficult to decide, whether the differences existing between the plants from North-East Greenland and those from the southern part of the West coast are due to the differences in the external conditions or are of specific value. When considering the great number of species of *Alaria* described, I cannot help thinking, that the variation of the species has often been taken too little into consideration. The specimens from North-East Greenland are distinguished from those from West Greenland — which I have determined formerly as *A. Pylaii α typica* and *β membranacea* — in my opinion only by their long and well-developed rachis.

The collection contains unfortunately only a few complete and well-developed specimens. In order to give an idea of the dimensions, I give here some measurements in centimeters:

Stipe, included rachis	Length of new lamina	Length of rest of old lamina	Greatest breadth of lamina	Greatest length of sporophylls
$26 + x$	80	17	17	30
64	82	13	13	18
$33 + x$	160	20	33	46
71	151	22	ca. 40	42
$72 + x$	70		32	over 100

The costa was in all cases convex on both sides, the cryptostomata were usually very distinct. As will be seen from the table, the sporophylls attain a very considerable length; their sterile upper part is sometimes bipartite.

According to Kjellman (1877, p. 11) the lamina of *Alaria grandifolia* is shed in winter at Spitzbergen, and that seems to be the case also at the shores of North-east Greenland. The lower part of the old lamina remains however and is to be found still in the following summer. The limit between the laminæ of the two years is marked as a strong narrowing (fig. 5), much as in *A. esculenta*, as shown by R. Rasmussen (1909).

Loc. Along Koldewey Island, ca. 5—15 meters; along Cape Bismarck Peninsula; Stormbugt.

Laminaria Lamx.

25. **L. saccharina** (L.) Lamx. var. **grandis** Kjellm.

Kjellman (1890) p. 25; Jónsson (1904) p. 27.

This species is common in the region explored. A considerable number of specimens have been collected in various localities; only

a few large and well preserved plants have however been brought home. They seem to be referable to f. *grandis* Kjellm. and agree with the specimens from East Greenland determined to this form by Jónsson. The stipe is, in larger plants, now rather short, e. gr. 30 cm., now long (over 106 cm.). The lamina bears always, in July to September, a remnant of the lamina of the foregoing year at the top, sharply marked against the new lamina by means of a strong narrowing. The new lamina is up to 100 cm. long, up to 50 cm. broad, with very undulated border and with broadly cuneate to rounded base. In older plants the lamina may be provided with a network of lists, in the median part as well as the marginal ones. The lamina has always muciparous canals; in some cases they are rather small, in others they are larger and visible with the naked eye from the face, in particular after staining with methylene-blue. The sorus is distinctly limited, elliptical or oblong. In most of the fertile specimens only remains or traces of a sorus are visible in the old lamina, most often only a hole indicating the outline of the sorus, while a sorus is not yet visible on the new lamina, which seems to show that the sorus is not developed before winter. The hole reached in a larger plant to the very base of the old lamina.

The hapteræ are always feeble with long thin branches. Some specimens were attached to stipes of the same species.

Some narrow specimens approach to f. *glacialis* K. Rosenv. (1898 I).

Loc. Along Koldewey Island; along Cape Bismarck Peninsula; Danmarks Havn; Baadskæret; bay off Vesterdalen, 2—11 meters. From Hyde Fjord were brought home by Capt. Koch 4 stipes with hapteræ, probably belonging to this species, found on the ice on May 15th 1907.

26. L. solidungula J. Ag.

J. Agardh (1868) p. 3; K. Rosenvinge (1893) p. 850, (1898 I) p. 57; Jónsson (1904) p. 28.

This strongly arctic species is common within the explored area, where it seems to thrive well. The plants had only one constriction, at the limit between the new lamina and that of the foregoing year, but in most of the plants the latter is not complete, probably because it has been lost during collection or under the preservation. In a few cases only the lamina of the foregoing year was complete and bore further at the top a remnant of the two years old lamina (comp. J. Agardh l. c. plate I fig. 2). The largest specimen brought home has a total length of 133 cm.; thereof the stipe 39 cm. long, the new lamina 69 cm. long, 40 cm. broad, the lamina of the foregoing year (incomplete) 25 cm. long. The broadest specimen is 45 cm. broad. In some cases a well-developed sorus occurred at the base of the one year old lamina. The named greatest

specimen, collected Aug. 15th, has a sorus at the base of the old lamina, and a new sorus is developing in the lower part of the new lamina, but in the other plants collected in July and August a new sorus was yet not visible[1].

The muciparous canals are particularly well-developed in this species; they form a network which is easily visible with the naked eye in dried specimens and in specimens preserved in alcohol; they become particularly conspicuous after staining with methylen-blue[2].

Loc. Renskæret, 2—4 meters; along Cape Bismarck Peninsula; east side of Koldewey Island; Danmarks Havn; Baadskæret.

Fam. *Chordaceæ.*

Chorda (Stackh.)

27. **Ch. tomentosa** Lyngb.

K. Rosenvinge (1893) p. 854.

In a gathering preserved in alcohol two small specimens of a *Chorda* were found, intermingled among other algæ. They were certainly sterile and feebly developed, but the hairs containing numerous chromatophores showed them to belong to *Ch. tomentosa.* They were about 5 cm. long and had not yet begun to develop the outer, fertile layer.

Loc. Bay off Vesterdalen in a depth of at most 4 meters, Aug. 28th.

Fam. *Desmarestiaceæ.*

Desmarestia Lamx.

28. **D. aculeata** (L.) Lamx.

K. Rosenvinge (1893) p. 857, (1898 I) p. 59; Jónsson (1904) p. 32.

Found at several localities, but only abundant at one. One specimen has the basal portion; in this the primary axis bears below two pairs of opposite branches, while the branches otherwise are always alternate. I have found the same in plants collected on the shores of Denmark. Plants collected in the middle of July

[1] Jónsson found many specimens in Kruuse's collections from East Greenland, the lamina of which was divided into four parts (in one plant into five) and he takes it for granted that these sections or laminæ have developed in four (five) consecutive years. The fact that some of these plants bear a sorus or mark after an emptied sorus on the uppermost section only, while the three younger segments do not yet show any trace of a sorus, (l. c. p. 28, fig. 2), suggests the question whether more than one section may not exceptionally be formed in the same year.

[2] While Areschoug (1883 p. 7) did not find muciparous canals in the lamina of this species, Guignard (1892 p. 37) found them in all examined specimens, though in some cases they were small and not easily visible.

were still in growth and had the new branches beset with long brown hairs. One specimen dredged in August was still beset with hairs while hairs were wanting in the other specimens gathered in August and September.

Loc. At the East side of Koldewey Island; along Cape Bismarck Peninsula (abundantly); Danmarks Havn; Baadskæret; bay off Vesterdalen.

29. **D. viridis** (O. F. Müll.) Lamx.

K. Rosenvinge (1893) p. 859, (1898) p. 60; Jónsson (1904) p. 32.

The plants collected are on the whole well-developed and attain a length of over 30 cm. The growth has ceased and the hairs are thrown off in August. — Found in depths from 4 to 11 meters, and perhaps deeper.

Loc. Along Koldewey Island; Danmarks Havn; bay off Vesterdalen.

Fam. *Punctariaceæ.*

Scytosiphon (Ag.)

30. **S. Lomentaria** (Lyngb.) J. Ag.

K. Rosenvinge (1893) p. 863, (1898 I) p. 62; Jónsson (1904) p. 33.

A very badly preserved, ca. 4 cm. long fragment of a tubular brown alga without base and upper part seems to belong to this species. As it has neither sporangia nor paraphyses, the determination is however uncertain. It differs from *Chorda* through lesser consistency and the structure of the frond.

Loc. East side of Koldewey Island, September.

Symphyocarpus K. Rosenv.

31. **S. strangulans** K. Rosenv.

K. Rosenvinge (1893) p. 896, (1898 I) p. 67.

Found in small quantities on older fronds of *Turnerella Pennyi* and on crusts of *Lithothamnion*, in the latter case forming ca. 2 mm. broad crusts. In all cases brown paraphyses were observed; young and empty plurilocular sporangia were also recorded. The plants were collected in September.

Loc. Danmarks Havn; along Vestre Havnenæs and off Baadskæret.

Phæostroma Kuckuck.

32. **Ph. pustulosum** Kuckuck.

Kuckuck (1895) p. 182; K. Rosenvinge (1898 I) p. 68, fig. 15.

This minute species was found on the upper end of a young *Alaria*. The plants agreed with those found on young fronds of *Laminaria nigripes* which I have formerly mentioned (l. c. p. 68 lowest). The plurilocular sporangia reach as a rule to the bottom

of the plant, a sterile basal cell, as in Kuckuck's plants (l. c.), being not developed. Such a cell, however, is always met with under the hairs which have the structure described by me (l. c.). The undermost long cell of the hair is as a rule somewhat constricted at some distance from the base. In some cases I found the cell situated under the hair developed into a sporangium, the cell having protruded on one side and upwards along the base of the hair and formed an opening at the upper end of the prolongation. I am uncertain whether unripe unicellular sporangia also occur.

Loc. Along Cape Bismarck Peninsula.

Stictyosiphon Kütz.

33. **S. tortilis** (Rupr.) Reinke.

K. Rosenvinge (1893) p. 868, (1898 I) p. 70; Jónsson (1904) p. 34.

Occurs rather abundantly in gatherings from the harbour and some other localities, but almost always loose, together with other loose algæ, as *Pylaiella*, and sterile. One filament only, taken in the harbour in August, had well-developed, rather prominent plurilocular sporangia. In the old loose plants the articulation is often very prominent, much as in some *Sphacelaria*. Hairs occur only rarely. Found in 4 to 11 meters depth.

Loc. Danmarks Havn; Baadskæret; bay off Vesterdalen. In clumps in the ice at Cape Amélie, April.

Punctaria Grev.

34. **P. glacialis** n. sp.

Frons eximie stipitata, stipite 5 — c. 14 mm. longo, superne abrupte cuneatim dilatato. Lamina oblonga vel lingulata aut late elliptica, basi late cuneata, long. 17 — c. 45 cm., latit. 4—14·5 cm., plerumque 4—7·5 cm., crassit. ad 140 μ, colore in sicco olivaceo-fusco, substantia tenera, fragili, e stratis cellularibus 3—6 composita, cellulis interioribus quam exterioribus aliquantum majoribus. Pili omnino desunt. Sporangia unilocularia sparsa, ex exteriori visa eadem fere forma ac cellulæ vegetativæ exteriores, parte interne sæpe latiore, alt. 45—53 μ, latitudine supra 21—25 μ, infra 30—50 μ.

This good-sized species most resembles *Punctaria latifolia* Grev. as to the form and the consistency of the frond. It is distinguished from it through the darker colour and the want of plurilocular sporangia. In colour and structure it more resembles *P. plantaginea* (Roth) Grev. The want of hairs distinguishes it from both the named species as well as from all other species of the genus. Most of the specimens are oblong or lingulate of nearly equal breadth in the whole length of the frond, only at the base and usually also at

Fig. 6. *Punctaria glacialis.* From the east side of Koldewey Island. 2 : 3.

the upper end narrower. Most of the specimens were dried, but some fragments are preserved in alcohol; one of these, which was fructifying, had a thickness of 130—140 μ, another sterile was 77—95 μ thick.

The outer cells are as a rule somewhat smaller than the inner, and the structure thus most resembles that of the genus *Punctaria*

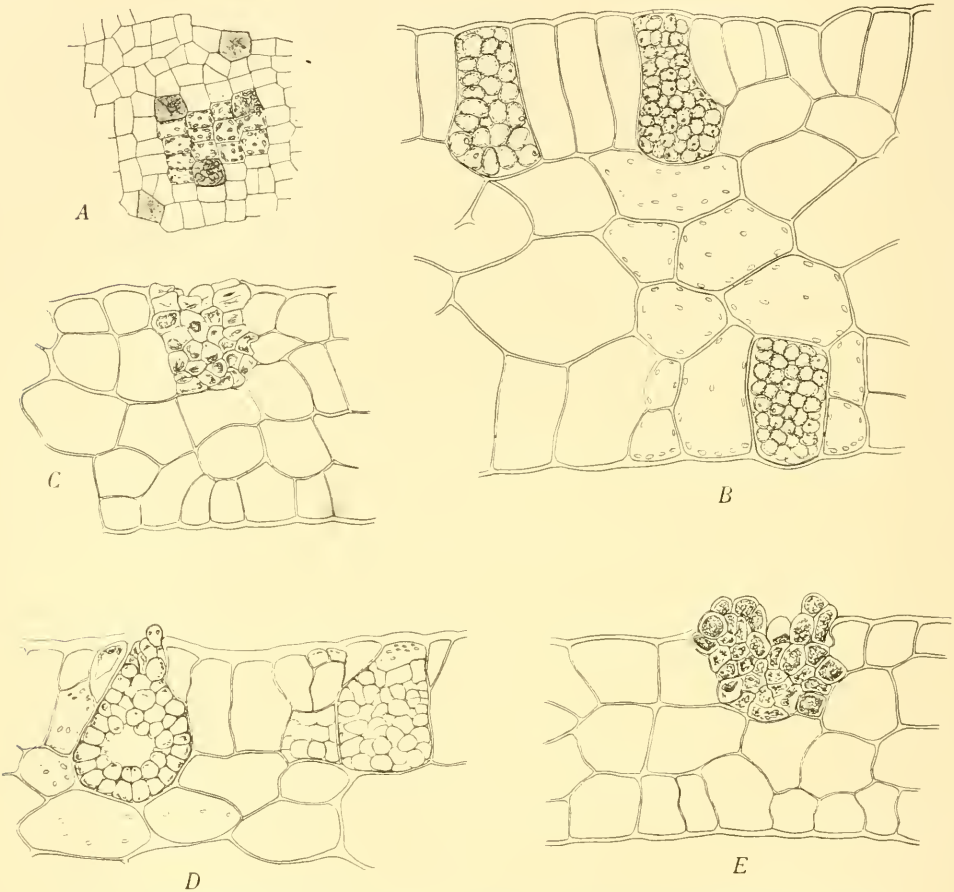


Fig. 7. *Punctaria glacialis*. *A*, part of frond seen from the surface; the shaded cells are sporangia. 200 : 1. *B*—*E*, transverse sections of fronds with unilocular sporangia. 340 : 1.

in the sense of J. Agardh (1896, p. 4). The frond is usually 4 to 5 cells thick. The cells contain numerous small disc-shaped chromatophores.

Some plants contain rather numerous sporangia which are all unilocular. Seen from the face they have nearly the same form and size as the vegetative cells, or they are a little more rounded. In transverse sections of the frond they appear often enlarged in-

wardly, a result of the growth of the sporangium and the surrounding cells after the formation of the former and often combined with cell-divisions of the latter (fig. 7 *B, D*). Strange to say, the zoospores had not developed normally but had formed a cell wall without having been set free, and the older sporangia thus became filled with closely packed polygonal cells, which gradually became rather poor in contents and might sometimes suggest the structure of plurilocular sporangia (fig. 6, *C*). Not seldom the older sporangia are open and the cells derived from the abortive zoospores are prominent above the surface of the frond (fig. 6, *D, E*), but normally developed and emptied sporangia have not been met with. Sometimes the zoospores do not fill the sporangium but leave an empty place in the middle of it (fig. 6, *D*). It may also happen that the upper part of the cell has not participated in the formation of zoospores.

Notwithstanding that this species differs from the other hitherto described species of the genus *Punctaria* by the want of hairs, I think it unnecessary to remove it from that genus. It is noteworthy that two other arctic members of the same family are also entirely devoid of hairs, namely *Omphalophyllum ulvaceum* and *Phæosaccion Collinsii*. Gathered in the end of August and the beginning of September.

Loc. Along Koldewey Island; Danmarks Havn; Baadskæret; bay off Vesterdalen, 4 to 11 meters depth.

Omphalophyllum K. Rosenv.

35. **O. ulvaceum** K. Rosenv.

K. Rosenvinge (1893) p. 873, (1898 I) p. 73; Jónsson (1904) p. 34.

The collection contains a large specimen of this arctic species, no doubt the largest hitherto found; it measures 28 cm. in greatest diameter, 16 cm. in greatest radius. It was sterile in the beginning of September. A small fragment without indication of locality was also sterile.

Loc. Along Koldewey Island.

Fam. *Elachistaceæ.*

Elachista Dub.

36. **E. fucicola** (Vell.) Aresch.

K. Rosenvinge (1893) p. 878, (1898 I) p. 74; Jónsson (1904) p. 35.

A few specimens occur attached to *Halosaccion ramentaceum* and *Punctaria glacialis*. They belong to the f. *typica* and had unilocular sporangia in August.

Loc. Bay off Vesterdalen.

Leptonema Reinke.

37. **L. fasciculatum** Reinke.

K. Rosenvinge (1893) p. 879; Jónsson (1904) p. 35.
Elachista fasciculata (Reinke) Gran, K. Rosenvinge (1898 I) p. 35.

Attached to *Lithothamnion glaciale*, mostly f. *subcylindrica* K. Rosenv., some filaments f. *uncinata* Reinke.

Loc. Entrance to the harbour.

Fam. *Ectocarpaceæ*.

Ectocarpus Lyngb.

38. **E. (Pylaiella) littoralis** (L.) Lyngb.

K. Rosenvinge (1893) p. 881, (1898 I) p. 75; Jónsson (1904) p. 35.

Found in various localities, mostly loose and in company with other loose algæ, in particular *Stictyosiphon tortilis*. Also found attached to stipes of *Alaria*. The latter specimens were very branched with secund branches, the others had often opposite branches. Unilocular sporangia were met with in plants collected in July and August.

Loc. East Side of Koldewey Island; along Cape Bismarck Peninsula; Danmarks Havn; bay off Vesterdalen, at most 4 meters; Cape Amélie, in clumps in the ice.

39. **E. ovatus** Kjellm. var. **tenuis** K. Rosenv.

K. Rosenvinge (1898 I) p. 77; Jónsson (1904) p. 37.

Small ca. 1 mm. high plants were found epiphytic on *Turnerella Pennyi* and *Lithothamnion glaciale*. They bear plurilocular sporangia which are mostly alternate or secund; opposite sporangia however also occur. The upright filaments are often unbranched (comp. Jónsson l. c.).

Loc. Danmarks Havn, and the entrance to the harbour.

40. **E. maritimus** (Kjellm.) K. Rosenv. comb. nov.

Chætophora maritima Kjellman (1877) p. 51, pl. V fig. 15—16.
Pilinia maritima (Kjellm.) K. Rosenv. (1893) p. 932.

In company with *Calothrix scopulorum* and other littoral algæ a small, branched filamentous alga was met with, occurring partly in a rather elongated partly in a shorter and denser form. The latter agrees pretty well with *Chætophora maritima* Kjellm., which has been referred by me to the genus *Pilinia*. On the other hand the more elongated plants remind one so much of *Ectocarpus lucifugus* Kuckuck, which has been so carefully described by its author (Kuckuck 1897, p. 35, pl. XI—XII), that the question arises whether it has been legitimate to refer this plant to the Chlorophyceæ. It is in reality very imperfectly known in regard to the cell-contents

and to the reproduction. Thus, the zoospores seem never to have been observed. The colour was yellow-green in the dried specimens from West Greenland I have examined, and according to Kjellman the colour of the cell-contents is brownish-green (fusco-viride) (l. c. p. 51). An examination of specimens from West Greenland and from Spitzbergen (communicated by Kjellman) showed really that the cells contained no starch and that the cell-wall did not consist of cellulose, the walls of the empty sporangia only staining violet by chlor-iodide of zinc. There is thus reason to believe that the alga in question is not a Chlorophycea but a Phæophycea, and as the more elongated plants in the material from East Greenland much resemble *Ectocarpus lucifugus* Kuck. the plant must be in that case a species of *Ectocarpus* related to *E. lucifugus*. On account of the good state of preservation (alcohol) of the material from North-East Greenland it was easy to see that the cells contain a parietal chromatophore like that described by Kuckuck. The plants had unilocular sporangia agreeing with those described by me in *Pilinia maritima* (1893 fig. 43) and with those of *Ectocarpus lucifugus* (l. c.); they were only a little smaller than the latter, namely 20—24 μ long, 9—10 μ broad, while the sporangia in Kuckuck's plants were 30—35 μ long and 11—15 μ broad.

As the more elongated and the denser plants undoubtedly belong to the same species, and as the denser form fully agrees with *Chætophora maritima* Kjellm., the species must retain Kjellman's specific name but it must be referred to the genus *Ectocarpus*. It is beyond doubt that the species is nearly related to *E. lucifugus* Kuck., and the resemblance is so great that there is reason to ask if these two species might not be identical. There seems however to be at least one distinctive character, some of the branches in *E. maritimus* terminating in hairs or hair-like filaments consisting of narrower and longer cells with scarcer and less coloured contents, as in several species of *Ectocarpus,* while such hairs are wanting in *E. lucifugus* according to the express statement of Kuckuck (l. c. p. 35) and to what I found on examining original specimens sent by Prof. Kuckuck. In the plants from North-East Greenland, however, the hairs were only fully developed in the specimens with short and dense branches.

This species much resembles the fresh-water alga *Pleurocladia lacustris* A. Br. (comp. Wille (1895) and Klebahn (1895)) and seems to be related to it. In my opinion, the genus *Pleurocladia* cannot be maintained as distinct from *Ectocarpus;* the species named must therefore be called *Ectocarpus lacustris* (A. Br.) nob.

Loc. Vestre Havnenæs.

Fam. *Myrionemaceæ.*

Myrionema Grev.

41. **M. foecundum** (Strömf.) Sauv.

Sauvageau (1898) p. 10; Børgesen (1902) p. 426.
Phycocelis foecunda Strömfelt (1888) p. 7.

A small *Myrionema* which seems referable to this species was met with in the upper end of a young *Alaria* in close company with *Phæostroma pustulosum*. The hairs were provided with a sheath at the base, and were 4—5 μ thick. The sporangia which showed here and there a few longitudinal divisions were 7—9 μ broad.

Loc. Along Cape Bismarck Peninsula.

Sorapion Kuck.

42. **S. Kjellmani** (Wille) K. Rosenv.

K. Rosenvinge (1898 I) p. 95.

Some crusts of this species agreeing with the formerly collected specimens from Greenland were met with growing on *Lithothamnion*-crusts. They were up to 4 mm. in diameter and bore empty unilocular sporangia which were scattered over the surface of the frond. Sterile specimens undoubtedly of the same species were found on *Turnerella Pennyi*.

Loc. Danmarks Havn; off Baadskæret.

Lithoderma Aresch.

43. **L. fatiscens** (Aresch.) emend. Kuckuck.

Kuckuck (1894) p. 238; K. Rosenvinge (1893) p. 901, (1898 I) p. 97; Jónsson (1904) p. 39.

This species is common, forming more or less extended crusts on the stones, often confluent so that the stones are covered with a continuous brown crust which easily loosens from the stone on drying. The crust is often fairly thick, e. gr. 30 cells thick and more. Some of the specimens collected in the end of August (or perhaps also in the beginning of September) showed plurilocular sporangia, as described by Kuckuck (l. c. p. 238 fig. 11 A), partly young partly fairly well developed, however scarcely fully ripe. This agrees with what I have found in specimens from Scoresby Sound (1898 I p. 98).

Loc. Danmarks Havn; entrance to the Harbour; along Vestre Havnenæs, ca. 38 meters.

Fam. *Sphacelariaceæ.*

Chætopteris Kütz.

44. **Ch. plumosa** (Lyngb.) Kütz.

K. Rosenvinge (1893) p. 903, (1908 I) p. 99; Jónsson (1904) p. 40.

Only a few badly developed and sterile specimens were met with.

Loc. Danmarks Havn; bay off Vesterdalen; Cape Amélie, in clumps in the ice, April.

Sphacelaria Lyngb.

45. **S. racemosa** Grev. var. **arctica** (Harv.) Reinke.

K. Rosenvinge (1893) p. 904, (1898 I) p. 100; Jónsson (1904) p. 40.

A couple of well-developed but sterile specimens have been found at Cape Bismarck Peninsula. Specimens found in the harbour in August had young unilocular sporangia sitting solitary on short 1—3-celled stalks, which were as a rule monosiphonous, more rarely two in one stalk.

Loc. East Side of Koldewey Island; along Cape Bismarck Peninsula; Danmarks Havn, very scarce.

C. Chlorophyceæ.

Fam. *Phyllosiphonaceæ.*

Ostreobium Born. et Flah.

46. **O. Queketti** Born. et Flah.

K. Rosenvinge (1893) p. 906, (1898 I) p. 101.

Occurs frequently in old shells of various bivalves (*Mya, Saxicava*), but also met with in *Lithothamnion foecundum*. It is well-developed and has often the characteristic swellings described by Bornet and Flahault. These swellings often reach considerable dimensions and are then filled with a granular green matter, but I cannot state anything about their significance. The colour is always green. Transverse walls do not occur.

Loc. East Side of Koldewey Island; entrance to the harbour; along Vestre Havnenæs, 19—47 meters; off Baadskæret 38 meters.

Fam. *Cladophoraceæ.*

Acrosiphonia (J. Ag.) Kjellm.

47. **A. hystrix** (Strömf.) Jónss.

Jónsson (1904) p. 46.

Spongomorpha hystrix Strömfelt (1886) p. 54.

Cladophora arcta γ, hystrix K. Rosenv. (1893) p. 907.

A fragment of an *Acrosiphonia* which seems to belong to this species has been met with. The filaments are 154—175 μ thick and are partly composed of rather short cells, only twice as long as broad. They are much like *A. hystrix* f. *debilis* (K. Rosenv.), only a little thinner (comp. Jónsson l. c. p. 48).

Loc. Danmarks Havn.

A. sp.

Some of the samples contain fragments of another species of *Acrosiphonia* in small quantities. They occur together with several loose algæ and have undoubtedly also been loose. Owing to their small quantity and their incomplete and sterile condition they are scarcely determinable. The filaments are 50—90 μ thick; hooked branches do not occur. A complete specimen, possibly belonging to the same species, was met with on a stone dredged at Cape Bismarck Peninsula. Its filaments were up to 121 μ thick. The cells were in this specimen, as well as in the loose ones, several times as long as broad, and rhizoidal branches were abundant. The last-named specimen was also sterile.

Loc. East Side of Koldewey Island; along Cape Bismarck Peninsula; bay off Vesterdalen.

Chætomorpha Kütz.

48. Ch. Melagonium (Web. et Mohr) Kütz.

K. Rosenvinge (1893) p. 917, (1898 I) p. 104; Jónsson (1904) p. 51.

Most of the specimens in the collection seem to have been loose. Some of these specimens are very vigorous, about 1 mm. in diameter and consist of cells which are one to two diameters long, while others are much thinner, from 100 μ up to 300 μ in diameter, and composed of cells which are 3 to 4 diameters long. As there is so great a break between these two forms, one might be inclined to think that they represent two different species, but the specimens being on the whole rather scarce in the collection, and the species being very variable in breadth also in other arctic regions (comp. K. Rosenvinge 1898 p. 104), I judge it preferable to consider the thin filaments as an extremely thin form of the same species. It might be named f. *tenuis*. The thinnest specimens approach in breadth to the thickest filaments of *Chætomorpha tortuosa;* they differ however in having much more numerous nuclei, viz.

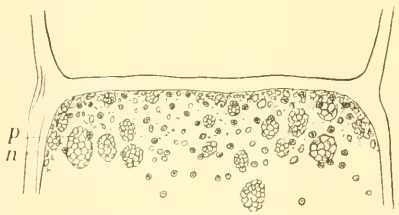


Fig. 8. *Chætomorpha Melagonium* f. *tenuis*. Upper end of a cell, showing nuclei, *n*, pyrenoids, *p*, and stroma starch. 200 : 1.

one to several hundreds (fig. 8), while *Ch. tortuosa* has ca. 20 nuclei in each cell (K. Rosenvinge 1893 p. 917).

The species seems to attain a greater thickness in high latitudes than farther south. According to Kjellman (1877 p. 56) it also reaches at Spitzbergen a diameter of ca. 1 mm., while its maximum diameter is otherwise stated to be 800 μ on the West coast of Sweden (Areschoug (1850) p. 202), 700 μ in the North Sea (Hauck 1885 p. 438) and 500 μ on the New England coast (Farlow 1881 p. 46).

In one gathering only it was found attached to a stone. These filaments had a diameter of at least 400 μ.

Loc. East Side of Koldewey Island; Danmarks Havn.

Fam. *Chætophoraceæ.*

Arthrochæte K. Rosenv.

49. **A. penetrans** K. Rosenv.

K. Rosenvinge (1898 I) p. 111.

This peculiar epi- and endophytic alga, which seems not to have been found by others since it was described in 1898, is rather frequently met with in older fronds of *Turnerella Pennyi*, in particular on discoloured spots. The plants fully agree with those from Scoresby Sound. The epiphytic crusts are in great measure polystromatic. Numerous sporangia, mostly empty, were found in plants collected in September.

Loc. East Side of Koldewey Island; Danmarks Havn.

50. **A. phæophila** sp. n.

Thallus endophyticus e filis irregulariter ramosis inter fila thalli *Symphyocarpi strangulantis* repentibus compositus. Fila primaria horizontalia ramosa, ramos breves verticales etiam emittentia; fila nonnunquam in massam pseudoparenchymaticam confluentia. Cellulæ subcylindricæ aut magis rotundatæ ad subglobosæ, longitudine diametro æquantes vel ad duplo longiores, lat. 9—15 μ, chromatophorum pyrenoide uno vel duobus instructum continentes. Pili articulati laterales vel terminales filis repentibus et erectis impositi, inferne 5·5—6·5 μ crassi. Sporangia obovata ad subglobosa in filis repentibus vel erectis lateralia aut terminalia, nonnunquam plura dense aggregata, apice dehiscentia, long. 14—25 μ, lat. 10—21 μ.

This new species has only been met with in small quantity in a few dried crusts of *Symphyocarpus strangulans* growing on a *Lithothamnion*-crust. The filaments creep irregularly between the cells of the host, in particular horizontally, in accordance with the small thickness of the host. They are often much branched, particularly in a horizontal direction, but short erect filaments are also given

off. Sometimes, when the filaments are much branched, they are united to pseudoparenchymatous bodies. I am uncertain whether the plant may also be partly epiphytic. Here and there vigorous hairs, slowly tapering upwards, occur; they show one or two transverse walls, and their cells, in particular the upper, have not much contents. The vegetative cells almost certainly contain one parietal chromatophore, which however could not be distinguished in the dried plants; on the other hand one or two pyrenoids were often distinctly visible (fig. 9, *A*, *I*). Besides the pyrenoid-starch, the chromatophores contained abundant stroma-starch. The cell-wall gave intense cellulose-reaction with chlor-iodide of zinc. The position of the sporangia is different; they may be terminal on the erect filaments and lateral, sessile, on the same and on the creeping filaments. Once I have seen a terminal and a subterminal sporangium on the end of a filament, (fig. 9 *G*). The sporangia observed were all emptied through a split in the upper part of the cell-wall. They have undoubtedly contained swarm-cells, but whether asexual zoospores or gametes, it is impossible to say.

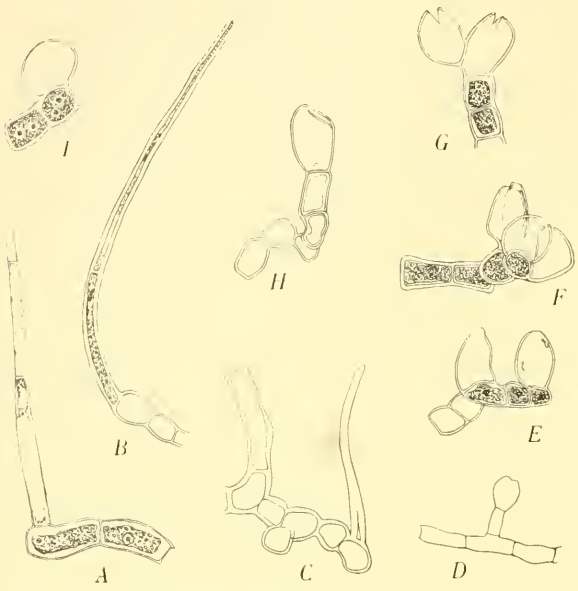


Fig. 9. *Arthrochæte phæophila*. *A*, creeping filament with lateral hair. *B*, terminal hair. *C*, branched filament with hair. *D*, creeping filament with erect filament bearing a sporangium. *E*, creeping filament with two sessile sporangia. *F*, erect filament, given off from a creeping one, bearing four sporangia, seen from above. *G*, filament with a terminal and a subterminal sporangium. *H*, erect filament with a terminal sporangium. *I*, lateral sporangium. 350 : 1.

I was at first inclined to refer this alga to the genus *Pilinia* which it somewhat resembles in its mode of growth. It is distinguished however from this genus by the presence of pyrenoids which, as far as known, are wanting in *Pilinia*. Moreover, it differs by the pluricellular hairs. Such hairs were certainly pointed out in *Pilinia maritima*, but as this plant has turned out to be a species of *Ectocarpus*, as shown above (p. 123), hairs are now not to be found

in any species of *Pilinia*. By these hairs it resembles *Arthrochæte penetrans*, and as the sporangia and the structure of the vegetative cells are also similar, it might be referred to the same genus. It is distinguished from the species named by the arrangement of the filaments and the broader, often nearly globular sporangia. The differences in the structure of the vegetative frond are probably partly dependent on the differences in structure of the host plants. In this respect the new species is too little known, owing to the scarce material.

Loc. Off Baadskæret.

Epicladia Reinke.

51. **E. Flustræ** Reinke.

K. Rosenvinge (1898 I) p. 115.

The determination of the plants referred to this species is not quite sure, as they were not fructiferous. They agreed with Reinke's description and figures; the creeping filaments were partly confluent, forming a membrane, and the cells showed here and there foldings inward of the cell-wall. Found on *Delesseria sinuosa* and *Desmarestia aculeata*.

Loc. East Side of Koldewey Island; Danmarks Havn.

Gomontia Born. et Flah.

52. **G. polyrrhiza** (Lagerh.) Born. et Flah.

K. Rosenvinge (1893) p. 907, (1898 I) p. 101.

In old dead greenish crusts of *Lithothamnion læve* and in shells of *Mya* and *Saxicava*, in the latter case together with other perforating algæ (*Conchocelis, Ostreobium*) and as a rule in lesser quantity than these. Found in 19 meters depth, at least. With sporangia in the beginning of September.

Loc. Entrance to the harbour; along Vestre Havnenæs.

Pseudendoclonium Wille.

53. **P. submarinum** Wille.

Wille (1901) p. 29.

In company with *Calothrix scopulorum* and other littoral algæ a small alga was found which agreed well with Wille's description and figures, as to the mode of growth, dimensions and structure of the cells. The elongated cells were 5—6 μ broad; the cells contained a parietal chromatophore.

Loc. Vestre Havnenæs.

Fam. *Ulothricaceæ.*

Ulothrix Kütz.

54. **U. flacca** (Dillw.) Thur.

K. Rosenvinge (1893) p. 935; Wille (1901) p. 18; Jónsson (1904) p. 54.

At the upper end of a young *Alaria* some filaments of a *Ulothrix* were met with which must be referred to this species. The swarm-cell producing parts of the filaments were curved in the manner characteristic of the species and consisted of low cells undoubtedly producing gametes[1]. The filaments were comparatively thin, the fertile parts only reaching 33 μ in diameter. The cells often contained only one pyrenoid, probably in connexion with the small thickness of the filaments.

Loc. Along Cape Bismarck Peninsula.

55. **U. scutata** Jónsson.

Jónsson (1904) p. 57.

This species seems to be common within the region explored. However, I am only sure of the determination of the specimens from one locality, as I have seen only in these the basal part characteristic of the species. Most of the specimens from the other localities are dried. At the base the filaments were 5—7 μ thick, and the cells in the lower part of the filaments were frequently up to 4 times as long as broad.

Loc. East Side of Koldewey Island. Further, uncertain as to the determination from dredging along Cape Bismarck Peninsula, Danmarks Havn and Baadskæret.

56. **U. consociata** Wille.

Wille (1901) p. 25; Jónsson (1904) p. 60.

The North-East Greenland specimens agree with Wille's description; only they were rather thin. Young sterile plants were only 7—7·5 μ thick near the base, older filaments 10·5 μ, fertile filaments 12·5 μ thick. The filaments are often decumbent at the base and form rhizoids there. Sometimes two filaments were found coalesced near the base. The apical cell is rounded. — It was found growing on *Enteromorpha prolifera* in the tidal region.

Loc. Vestre Havnenæs, September.

[1] In stating (1893 p. 935—36) that I have found this species with zoospores in West Greenland, I have not intended to say anything about the question whether the swarm-cells were asexual zoospores or gametes. Probably they were gametes (comp. Wille (1901) p. 21).

Fam. *Ulvaceæ.*

Enteromorpha (Link.)

57. **E. prolifera** (O. F. Müll.)

K. Rosenvinge (1893) p. 960; Jónsson (1904) p. 66.

It is with hesitation that I have referred to this species some specimens collected in the littoral region. They are rather much branched, thin, with still thinner branches. The arrangement of the cells in longitudinal series is sometimes tolerably distinct, the new cell-walls being mainly perpendicular to the axis of the frond, sometimes indistinct or wanting. The cells are angular with somewhat rounded edges, much as in the typical form of *E. intestinalis,* but only 7—9 μ in diameter. The membrane of the frond is 11—12 μ thick, the cell-wall is not thickened on the inner side. A great number of very young plants were met with. Some of the large plants looked as if they had wintered and later on produced new branches. No "trabeculæ" were observed in the cavity of the frond.

In view of the great difficulty of determining species of *Enteromorpha* much stress cannot be laid on the determination of the above-mentioned specimens; nor shall I enter into the question whether *E. prolifera* is specifically distinct from *E. intestinalis.*

Loc. Vestre Havnenæs, September.

Fam. *Protococcaceæ.*

Chlorochytrium Cohn.

58. **Ch. inclusum** Kjellm.

K. Rosenvinge (1893) p. 963, (1898 I) p. 119; Jónsson (1904) p. 69.

Very common in *Turnerella Pennyi.*

Loc. East Side of Koldewey Island; Danmarks Havn; off Baadskæret a. 28 meters.

59. **Ch. Schmitzii** K. Rosenv.

K. Rosenvinge (1893) p. 964, (1898 I) p. 119; Jónsson (1903) p. 338.

Very common in *Cruoria arctica* and in *Petrocelis polygyna.*

Loc. Off Baadskæret and along Vestre Havneaæs, ca. 28 meters.

D. Cyanophyceæ.

Fam. *Rivulariaceæ.*

Calothrix Ag.

60. **C. scopulorum** (Web. et Mohr) Ag.

K. Rosenvinge (1893) p. 966, (1898 I) p. 121; Jónsson (1904) p. 70.

Well developed filaments, in a great measure with hormogonia. In the littoral zone.

Loc. Vestre Havnenæs, September.

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